BrightScript

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BrightScript is a powerful scripting language for building media and networked applications for embedded devices. This language features integrated support for a lightweight library of BrightScript objects, which are used to expose the API of the platform (device) that is running BrightScript. The BrightScript language connects generalized script functionality with underlying components for networking, media playback, UI screens, and interactive interfaces; BrightScript is optimized for generating user-friendly applications with minimal programmer effort.

The BrightScript section is divided into two categories:

- Language Reference: Outlines the characteristics of the BrightScript language, such as syntax, operators, statements, types, core library, etc.
- Object Reference: Provides a directory of publicly available objects, interfaces, and methods that comprise the BrightScript API.

Language Reference

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The following are some general characteristics of BrightScript, as compared to other common scripting languages:

- BrightScript is not case sensitive.
- Statement syntax is similar to Python, Basic, Ruby, and Lua (and dissimilar to C).
- Like JavaScript and Lua, objects and named data-entry structures are associative arrays.
- BrightScript supports dynamic typing (like JavaScript) and declared types (like C and Java).
- Similar to .Net and Java, BrightScript uses "interfaces" and "components" (i.e. objects).

BrightScript code is compiled into bytecode that is run by an interpreter. The compilation step occurs every time a script is loaded and run. Similar to JavaScript, there is no separate compilation step that results in a saved binary file.

BrightScript and its component architecture are written in 100% C for speed, efficiency, and portability. Since many embedded processors do not have floating-point units, BrightScript makes extensive use of the "integer" type. Unlike some languages (including JavaScript), BrightScript only uses floating point numbers when necessary.

Variables, Literals, and Types

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Identifiers

Identifiers are names of variables, functions, and labels. They also apply to BrightScript object methods (i.e. functions) and interfaces (which appear after a "." Dot Operator). Identifiers have the following rules:

- Must start with an alphabetic character (a-z).
- May consist of alphabetic characters, numbers, or the underscore symbol ("_").

- Are not case sensitive.
- May be of any length.
- May not be a reserved word.
- (**variables only**) May end with an optional type declaration ("$" for a string, "%" for an integer, "!" for a float, "#" for a double).

Examples

```
a
boy5
super_man$
42%
```

Types

BrightScript supports both dynamic typing and declared types. This means that every value has a type determined at runtime, but variables can also be instructed to always contain a value of a specified type. If a value is assigned to a variable that has a specified type, the type of the value will be converted to the variable type if possible. If conversion is impossible, a runtime error will occur.

A variable that does not end in a type declaration may change its type dynamically. For example, the statement `a=4` will create an integer, while a following statement specifying that `a="hello"` will change the type of the variable a to a string.

BrightScript supports the following types:

- **Boolean**: True or False
- **Integer**: A 32-bit signed integer number
- **Float**: The smallest floating point number format supported by either the hardware or software
- **Double**: The largest floating point number format supported by either the hardware or software. Although Double is an intrinsically understood type, it is implemented internally with the *roIntrinsicDouble* object. As a general rule, this type is hidden from developers.
- **String**: A sequence of ASCII (not UTF-8) characters. BrightScript uses two intrinsic string states:
  - **Constant strings**: A statement such as `s="astring"` will create an intrinsic constant string.
  - **roString instances**: Once a string is used in an expression, it becomes an *roString* instance. For example, the statement `s = s + "bstring"` will cause the intrinsic string `s` to convert to an *roString* instance. If this is followed by the statement `s2 = s`, the `s2` value will be a reference to `s`, not a copy of it. The behavior of reference counting strings is new to BrightScript version 3.0.
- **Object**: A reference to a BrightScript object (i.e. a native component). Note that the `type()` function will not return "Object" but the type of object instead (e.g. *roList*, *roVideoPlayer*). Also note that there is no separate type for intrinsic BrightScript Objects. All intrinsic BrightScript Objects are built on the *roAssociativeArray* object type.
- **Interface**: An interface in a BrightScript Object. If a `"."` Dot Operator is used on an interface type, the member must be static (since there is no object context).
- **Invalid**: A type that can have only one value: `Invalid`. This type is returned in various instances when no other type is valid (for example, when indexing an array that has never been sent).

The following are examples of different types. The `?` statement is a shortcut for `print`, while the `type()` function returns a string that identifies the type of the passed expression.

```
BrightScript Micro Debugger.
Enter any BrightScript statement, debug commands, or HELP.
BrightScript> ?type(1)
Integer

BrightScript> ?type(1.0)
Float

BrightScript> ?type("hello")
String

BrightScript> ?type(CreateObject("roList"))
roList

BrightScript> ?type(1%)
Integer

BrightScript> b!=1
BrightScript> ?type(b!)
Float

BrightScript> c$="hello"
BrightScript> ?type(c$)
String

BrightScript> d="hello again"
BrightScript> ?type(d)
String

BrightScript> d=1
BrightScript> ?type(d)
Integer

BrightScript> d=1.0
BrightScript> ?type(d)
Float
```

Type Declaration Characters

A type declaration may be used at the end of a variable or literal to fix its type. Variables with the same identifier but separate types are separate variables: For example, defining a$ and a% would create two independent variables.

Character	Type	Examples
$	String	A$, ZZ$
%	Integer	A1%, SUM%
!	Single-Precision (Float)	B!, N1!
#	Double-Precision (Double)	A#, 1/3#, 2#

Literals (Constants)

The following are valid literal types:

- Type Boolean: Either `True` or `False`
- Type Invalid: `Invalid` only
- Type String: A string in quotes (e.g. `"This is a string"`)
- Type Integer: An integer in hex (e.g. `HFF`) or decimal (e.g. `255`) format
- Type Float: A number with a decimal (e.g. `2.01`), in scientific notation (e.g. `1.23456E+30`), or with a Float type designator (e.g. `2!`)
- Type Double: A number in scientific notation containing a double-precision exponent symbol (e.g. `1.23456789D-12`) or with a Double

type declaration (e.g. `2.3#`)
- Type Function: Similar to variable formatting (e.g. `MyFunction`)
- Type Integer: LINE_NUM – The current source line number

Array Literals

The `[]` Array Operator can be used to declare an array. It can contain literals (constants) or expressions.

```
Myarray = []
Myarray = [ 1, 2, 3]
Myarray = [ x+5, true, 1<>2, ["a","b"]]
```

Associative Array Literals

The { } Associative Array Operator can be used to define an associative array. It can contain literals (constants) or expressions.

```
aa={ }
aa={key1:"value", key2: 55, key3: 5+3 }
```

Arrays and associative arrays can also be defined with the following format:

```
aa = {
   Myfunc1: aFunction
   Myval1 : "the value"
}
```

Invalid Object Return

Many methods (i.e. functions) that return objects can also return Invalid (for example, in cases where there is no object to return). In these cases, the variable accepting the result must be dynamically typed since it may be assigned either type.

The following code will return a type mismatch: a$ is a string that has a string type declaration, and thus it cannot contain Invalid.

```
l=[]
a$=l.pop()
```

Numbers

`Dynamic Typing`

The following rules determine how integers, doubles, and floats are dynamically typed:

1. If a constant contains 10 or more digits, or if `D` is used in the exponent, the number is Double. Adding a `#` type declaration also forces a constant to be a Double.
2. If the number is not double precision and it contains a decimal point, the number is a Float. Expressing a number in scientific notation using the `E` exponent also forces a constant to be a Float.
3. If neither of the above conditions is true for a constant, the number is an Integer.

`Type Conversion`

When operations are performed on one or two numbers, the result must be typed as an Integer, Float, or Double. When an addition (+), subtraction (-), or multiplication (*) operation is performed, the result will have the same degree of precision as the most precise operand: For example, multiplying an Integer by a Double will return a number that is a Double.

Only when both operands are Integers will the result be an Integer number. If the result of two Integer operands is outside the 32-bit range, the operation and return will be carried out with Doubles.

Division (/) operates using the same rules as above, except that it can never be carried out at the Integer level: When both operators are Integers, the operation and return will be carried out with Floats.

Comparison operations (e.g. <, >, =) will convert the numbers to the same type before they are compared. The less precise type will always be converted to the more precise type.

`Type Conversion and Accuracy`

When a Float or Double number is converted to the Integer type, it is *rounded down*: The largest integer that is not greater than the number is used. This also happens when the INT function is called on a number.

When a Double number is converted to the Float type, it is *4/5 rounded*: The least significant digit is rounded up if the fractional part is >=5 (otherwise, it is left unchanged).

When a Float number is converted to the Double type, only the seven most significant digits will be accurate.

Operators

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Operations in the innermost level of parentheses are performed first. Evaluation then proceeds according to the precedence in the following table. Operations on the same precedence are left-associative, except for exponentiation, which is right-associative.

Description	Symbol(s)
Function Calls or Parentheses	()
Array Operators	. , []
Exponentiation	^
Negation	–, +
Multiplication, Division, Modulus	*, /, MOD
Addition, Subtraction	+, -
Comparison	<, >, = , <>, <=, >=
Logical Negation	NOT
Logical Conjunction	AND
Logical OR	OR

String Operators: The following operators work with strings: `<, >, =, <>, <=, >=, +`

Function References: The = and <> operators work on variables that contain function references and function literals.

Logical and Bitwise Operators

The `AND`, `OR`, and `NOT` operators are used for logical (Boolean) comparisons if the arguments for these operators are Boolean:

```
if a=c and not(b>40) then print "success"
```

On the other hand, if the arguments for these operators are numeric, they will perform bitwise operations:

```
x = 1 and 2   ' x is zero
y = true and false  ' y is false
```

When the `AND` or `OR` operator is used for a logical operation, only the necessary amount of the expression is executed. For example, the first statement below will print "True", while the second statement will cause a runtime error (because "invalid" is not a valid operand for `OR`):

```
print true or invalid
print false or invalid
```

Dot Operator

The "." Dot Operator can be used on any BrightScript object. It also has special meaning when used on an *roAssociativeArray* object, as well as *roXMLElement* and *roXMLList* objects. When used on a BrightScript Object, it refers to an interface or method associated with that object. In the following example, `IfInt` refers to the interface and `SetInt()` refers to a method that is part of that interface:

```
i=CreateObject("roInt")
i.ifInt.SetInt(5)
i.SetInt(5)
```

Every object method is part of an interface. However, specifying the interface with the "." Dot Operator is optional. If the interface is omitted, as in the third line of the above example, each interface that is part of the object will be searched for the specified member. If there is a naming conflict (i.e. a method with the same name appears in two interfaces), then the interface should be specified.

Associative Arrays

When the "." Dot Operator is used on an Associative Array, it is the same as calling the `Lookup()` or `AddReplace()` methods, which are member functions of the *roAssociativeArray* object:

```
aa=CreateObject("roAssociativeArray")
aa.newkey="the value"
print aa.newkey
```

Note that the parameters of the "." Dot Operator are set at compile time; they are not dynamic, unlike the `Lookup()` and `AddReplace()` method s.

The "." Dot Operator is always case insensitive: For example, the statement `aa.NewKey=55` will create the entry "newkey" in the associative array. To generate case-sensitive keys, instantiate an *roAssociativeArray* object and use the `SetModeCaseSensitive()` method.

Array and Function-Call Operators

The [ ] operator is used to access an array (i.e. any BrightScript object that has an *ifArray* interface, such as *roArray* and *roList* objects). It can also be used to access an associative array. The [ ] operator takes expressions that are evaluated at runtime, while the "." Dot Operator takes identifiers at compile time.

The ( ) operator can be used to call a function. When used on a function literal (or variable containing a function reference), that function will be called.

The following code snippet demonstrates the use of both array and function-call operators.

```
aa=CreateObject("roAssociativeArray")
aa["newkey"]="the value"
print aa["newkey"]

array=CreateObject("roArray", 10, true)
array[2]="two"
print array[2]

fivevar=five
print fivevar()

array[1]=fivevar
print array[1]()   ' print 5

function five() As Integer
   return 5
end function
```

Array Dimensions

Arrays in BrightScript are one dimensional. Multi-dimensional arrays are implemented as arrays of arrays. The [ ] operator will automatically map multi-dimensionality. For example, the following two fetching expressions are the same:

```
dim array[5,5,5]
item = array[1][2][3]
item = array[1,2,3]
```

If a multi-dimensional array grows beyond its hint size, the new entries are not automatically set to *roArray*.

Equals Operator

The = operator is used for both assignment and comparison:

```
a=5
If a=5 then print "a is 5"
```

Unlike the C language, BrightScript does not support use of the = assignment operator inside an expression. This is meant to eliminate a common class of bugs caused by confusion between assignment and comparison.

When assignment occurs, intrinsic types are copied, while BrightScript Objects are reference counted.

Objects and Interfaces

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BrightScript Objects

Though BrightScript operates independently of its object architecture and library, they are both required for programming BrightScript applications. The API of a BrightSign platform is exposed to BrightScript as a library objects: Platforms must register a new BrightScript object to expose some part of its API.

BrightScript objects are written in C (or a compatible language such as C++), and are robust against version changes: Scripts are generally backwards compatible with objects that have undergone revisions.

BrightScript objects keep a reference count; they delete themselves when the reference count reaches zero.

Wrapper Objects

All intrinsic BrightScript types (Boolean, Integer, Float, Double, String, and Invalid) have object equivalents. If one of these intrinsic types is passed to a function that expects an object, the appropriate wrapper object will be created, assigned the correct value, and passed to the function (this is sometimes referred to as "autoboxing"): This allows, for example, *roArray* objects to store values (e.g. integers and strings) as well as objects.

Any expression that expects one of the above types will work with the corresponding wrapper object as well: *roBoolean*, *roInt*, *roFloat*, *roDouble*, *r oString*.

The following examples illustrate how wrapper objects work.

```
Print 5.tostr()+"th"
Print "5".toint()+5

-5.tostr()    'This will cause an error. Instead, use the following:
(-5).tostr()

if type(5.tostr())<> "String" then stop
if (-5).tostr()<>"-5" then stop
if (1+2).tostr()<>"3" then stop
i=-55
if i.tostr()<>"-55" then stop
if 100%.tostr()<>"100" then stop
if (-100%).tostr()<>"-100" then stop
y%=10
if y%.tostr()<>"10" then stop

if "5".toint()<>5 or type("5".toint())<>"Integer" then stop
if "5".tofloat()<>5.0 or type("5".tofloat())<>"Float" then stop
fs="-1.1"
if fs.tofloat()<>-1.1 or fs.toint()<>-1 then stop

if "01234567".left(3)<>"012" then stop
if "01234567".right(4)<>"4567" then stop
if "01234567".mid(3)<>"34567" then stop
if "01234567".mid(3,1)<>"3" then stop
if "01234567".instr("56")<>5 then stop
if "01234567".instr(6,"56")<>-1 then stop
if "01234567".instr(0,"0")<>0 then stop
```

Interfaces

Interfaces in BrightScript operate similarly to Java or Microsoft COM: An interface is a known set of member functions that implement a set of logic. In some ways, an interface is similar to a virtual base class in C++; any script or program that is compatible with C can use an object interface without regards to the type of object it belongs to: For example, the *roSerialPort* object, which controls the standard serial interface (RS-232), implements three interfaces: *ifSerialControl*, *ifStreamReceive*, and *ifStreamSend*. Since the print statement sends its output to any object that has an *ifStreamSend* interface, it works with the *roSerialPort* object, as well as any other object with the *ifStreamSend* interface.

Statement and Interface Integration

Some BrightScript statements have integrated functionality with interfaces. This section describes how to use statements with interfaces.

`PRINT`

Using the `PRINT` statement in the following format will print into an object that has an *ifStreamSend* interface, including the *roTextField* and *roSerialPort* objects:

```
print #object, "string"
```

If the expression being printed evaluates to an object with an *ifEnum* interface, the `PRINT` statement will print every item that can be enumerated.

In addition to printing the values of intrinsic types, the `PRINT` statement can also be used to print any object that exposes one of the following interfaces: *ifString*, *ifInt*, *ifFloat*.

`WAIT`

The `WAIT` statement can work in conjunction with any object that has an *ifMessagePort* interface.

`Expression Parsing`

Any expression that expects a certain type of variable—including Integer, Float, Double, Boolean, or String—can accept an object with an interface equivalent of that type: *ifInt*, *ifFloat*, *ifDouble*, *ifBoolean*, *ifString*.

`Array Operator`

The [ ] array operator works with any object that has an *ifArray* or *ifAssociativeArray* interface, including arrays, associative arrays, and lists.

`Member Access Operator`

The member access operator (i.e. Dot Operator) works with any object that has an *ifAssociativeArray* interface. It also works with any object when used to call a member function (i.e. method). It also has special meaning when used on an *roXMLElement* or *roXMLList* object.

XML Support

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BrightScript provides XML support with two BrightScript objects and a set of dedicated language features:

- **roXMLElement**: This object provides support for parsing, generating, and containing XML.
- **roXMLList**: This object is used to contain a list of *roXMLElement* instances.

Dot Operator

The "." Dot Operator has the following features when used with XML objects:

- When used with an *roXMLElement* instance, the "." Dot Operator returns an *roXMLList* instance of the child tags that match the dot operand. If no tags match the operand, an empty list is returned.
- When applied to an *roXMLList* instance, the "." Dot Operator aggregates the results of performing the above operation on each *roXMLElement* in the list.
- When applied to XML, which is technically case sensitive, the "." Dot Operator is still case insensitive. If you wish to perform a case-sensitive XML operation, use the member functions of the *roXMLElement*/*roXMLList* objects.

Attribute Operator

The “@” Attribute Operator can be used with an *roXMLElement* instance to return a named attribute. Though XML is case sensitive, the Attribute Operator is always case insensitive. If the Attribute Operator is used with an *roXMLList* instance, it will only return a value if that list contains exactly one element.

Examples

```
<?xml version="1.0" encoding="utf-8" ?>
<rsp stat="ok">
    <photos page="1" pages="5" perpage="100" total="500">
        <photo id="3131875696" owner="21963906@N06" secret="f248c84625" server="3125"
        farm="4" title="VNY 16R" ispublic="1" isfriend="0" isfamily="0" />
        <photo id="3131137552" owner="8979045@N07" secret="b22cfde7c4" server="3078"
        farm="4" title="hoot" ispublic="1" isfriend="0" isfamily="0" />
        <photo id="3131040291" owner="27651538@N06" secret="ae25ff3942" server="3286"
        farm="4" title="172 • 365 :: Someone once told me..." ispublic="1" isfriend="0"
        />
    </photos>
</rsp>
```

Given the XML in the above *example.xml* file, then the following code will return an *roXMLList* instance with three entries:

```
rsp=CreateObject("roXMLElement")
rsp.Parse(ReadAsciiFile("example.xml"))

? rsp.photos.photo
```

The following will return an *roXMLElement* reference to the first photo (id="**3131875696**"):

```
? rsp.photos.photo[0]
```

The following will return an *roXMLList* reference containing the <photos> tag:

```
? rsp.photos
```

The following will return the string “100”:

```
rsp.photos@perpage
```

You can use the *roXMLElement.GetText()* method to return an element’s text: For example, if the variable `<booklist>` contains the element `<book lang=eng>The Dawn of Man</book>`, then the following code will print the string “The Dawn of Man”.

```
Print booklist.book.gettext()
```

Alternatively, using the Attribute Operator will print the string “eng”.

```
print booklist.book@lang
```

Flikr code clip

```
REM
REM Interestingness
REM pass an (optional) page of value 1 - 5 to get 100 photos
REM starting at 0/100/200/300/400
REM
REM returns a list of "Interestingness" photos with 100 entries
REM


Function GetInterestingnessPhotoList(http as Object, page=1 As Integer) As Object


 print "page=";page



http.SetUrl("http://api.flickr.com/services/rest/?method=flickr.interestingness.getList&api_ke
y=YOURKEYGOESHERE&page="+mid(stri(page),2))


    xml=http.GetToString()


    rsp=CreateObject("roXMLElement")
    if not rsp.Parse(xml) then stop

       return helperPhotoListFromXML(http, rsp.photos.photo) 'rsp.GetBody().Peek().GetBody())


End Function


Function helperPhotoListFromXML(http As Object, xmllist As Object, owner=invalid As dynamic)
As Object


    photolist=CreateObject("roList")
    for each photo in xmllist
       photolist.Push(newPhotoFromXML(http, photo, owner))
    end for
    return photolist


End Function


REM
REM newPhotoFromXML
REM
REM    Takes an roXMLElement Object that is an <photo> ... </photo>
REM    Returns an brs object of type Photo
REM       photo.GetTitle()
REM       photo.GetID()
REM       photo.GetURL()
REM       photo.GetOwner()
REM
```

```
Function newPhotoFromXML(http As Object, xml As Object, owner As dynamic) As Object
    photo = CreateObject("roAssociativeArray")
    photo.http=http
    photo.xml=xml
    photo.owner=owner
    photo.GetTitle=function():return m.xml@title:end function
    photo.GetID=function():return m.xml@id:end function
    photo.GetOwner=pGetOwner
    photo.GetURL=pGetURL
    return photo
End Function


Function pGetOwner() As String
 if m.owner<>invalid return m.owner
 return m.xml@owner
End Function


Function pGetURL() As String
 a=m.xml.GetAttributes()
 url="http://farm"+a.farm+".static.flickr.com/"+a.server+"/"+a.id+"_"+a.secret+".jpg"
 return url
End Function
```

Garbage Collection

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BrightScript automatically frees strings when they are no longer used, and it will free objects when their reference count goes to zero. This is carried out at the time the object or string is no longer used; there is no background garbage collection task. The result is a predictable garbage-collection process, with no unexpected stalls in execution.

Objects may enter a state of circular reference counting: Objects that reference each other will never reach a reference count of zero and will need to be freed manually using the `RunGarbageCollector()` method. This method is useful when destroying old presentation data structures and creating a new presentation.

Events

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Events in BrightScript center around an event loop and the *roMessagePort* object. Most BrightScript objects can post to a message port in the form of an event object: For example, the *roTimer* object posts events of the type *roTimerEvent* when configured intervals are reached.

The following script sets the destination message port using the `SetPort()` method, waits for an event in the form of an *roGpioButton* object, and then processes the event.

```
print "BrightSign Button-LED Test Running"
p =   CreateObject("roMessagePort")
gpio =  CreateObject("roGpioControlPort")
gpio.SetPort(p)

while true
   msg=wait(0, p)
   if type(msg)="roGpioButton" then
       butn = msg.GetInt()
       if butn <=5 then
           gpio.SetOutputState(butn+17,1)
           print "Button Pressed: ";butn
           sleep(500)
           gpio.SetOutputState(butn+17,0)
        end if
    end if

   REM ignore buttons pressed while flashing led above
   while p.GetMessage()<>invalid
         end while
end while
```

Note that lines 6-7 can be replaced using the following (and substituting `end while` with `end for`):

```
For each msg in p
```

Threading Model

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BrightScript runs in a single thread. In general, BrightScript object calls are synchronous if they return quickly, and asynchronous if they take a substantial amount of time to complete. For example, methods belonging to the *roArray* object are all synchronous, while the `Play()` method that is part of the *roVideoPlayer* object will return immediately (it is asynchronous). As a video plays, the *roVideoPlayer* object will post messages to the message port, indicating such events as “media playback finished” or “frame x reached”.

The object implementer decides whether a BrightScript object should launch a background thread to perform a synchronous operation. Sometimes, an object will feature synchronous and asynchronous versions of the same method.

This threading model ensures that the script writer does not have to deal with mutexes and other synchronization objects. The script is always single threaded, and the message port is polled or waited on to receive events into the thread. On the other hand, those implementing BrightScript objects have to consider threading issues: For example, the *roList* and *roMessagePort* objects are thread-safe internally, allowing them to be used by multiple threads.

Scope

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BrightScript uses the following scoping rules:

- Global variables are not supported; however, there is a single hard-coded global variable (“global”) that is an interface to the global BrightScript object, which contains all global library functions.
- Functions declared with the `Function` statement are global in scope; however, if the function is anonymous, it will still be local in scope.
- Local variables exist within the function scope. If a function calls another function, that new function has its own scope.
- Labels exist within the function scope.
- Block statements such as `For / End For` and `While / End While` do not create a separate scope.

Intrinsic Objects

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In general, this manual uses the term “object” to refer to “BrightScript components”, which are C or C++ components with interfaces and member functions that BrightScript uses directly. With the exception of some core objects (*roArray*, *roAssociativeArray*, *roInt*, *roMessagePort*, etc.), BrightScript objects are platform specific.

You can create intrinsic objects in BrightScript, but these objects are not BrightScript components. There is currently no way to create a BrightScript component in BrightScript or to create intrinsic objects that have interfaces (intrinsic objects can only contain member functions, properties, and other objects).

A BrightScript object is simply an *roAssociativeArray*: When a member function is called from an associative array, a “this” pointer is set to “m”, and “m” is accessible inside the Function code to access object keys. A “constructor” in BrightScript is simply a normal function at a global scope that creates an *roAssociativeArray* instance and fills in its member functions and properties

See the “snake” game in the appendix for examples of creating intrinsic objects.

Program Statements

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BrightScript supports the following statement types (note that BrightScript is not case sensitive). The syntax of each statement is documented in more detail later in this chapter.

- `Library`
- `Dim`
- = (assignment)
- `End`
- `Stop`
- `Goto`
- `Rem` (or ')
- `print`
- `For / To / End For / Step / Exit For`
- `For Each / In / End For / Exit For`
- `While / End While / Exit While`
- `Function / End Function / As / Return`

Example

```
Function Main() As Void

       dim cavemen[10]

       cavemen.push("fred")
       cavemen.push("barney")
       cavemen.push("wilma")
       cavemen.push("betty")

       for each caveman in cavemen
             print caveman
       end for

End Function
```

Statement Syntax

Each line may contain a single statement. However, a colon (:) may be used to separate multiple statements on a single line.

Example

```
myname = "fred"
if myname="fred" then yourname = "barney":print yourname
```

LIBRARY

`LIBRARY Filename.brs`

BrightScript 3.0 allows you to add your own BrightScript libraries (*.brs* files), which can then be utilized by your script. To include a library, use the LIBRARY statement in your script or at the BrightScript shell prompt. The LIBRARY statement(s) must occur at the beginning of a script, before any other statements, functions, operators, etc.

The system locates a library by searching the directory containing the current script, as well as the `SYS:/script-lib/` directory. Note that the `Run()` function does not currently change the path of a LIBRARY statement to that of the called script (i.e. the system will continue searching the directory of the caller script). On the other hand, running a script directly from the BrightSign shell does modify the library search path to that of the called script.

The first statement will include a library in the same folder as the script, while the second will include a library in a sub-folder.

```
LIBRARY "myBSL1.brs"
LIBRARY "new_lib/myBSL2.brs"
```

The following statement will include the *bslCore.brs* library, which has some useful BrightScript features, from the `SYS:/script-lib/` directory.

```
LIBRARY "v30/bslCore.brs"
```

DIM

`DIM Name (dim1, dim2, …, dimK)`

The `DIM` (“dimension”) statement provides a shortcut for creating *roArray* objects. It sets the variable Name to type “roArray”. It can create arrays of arrays as needed for multi-dimensionality. The dimension passed to `DIM` is the index of the maximum entry to be allocated (i.e. the array initial size = dimension+1), though the array will be resized larger automatically if needed.

The following two lines create identical arrays.

```
Dim array[5]
array = CreateObject(“roArray”, 6, true)
```

Note
The expression x[a,b] is equivalent to x[a][b].

The following script demonstrates useful operations on a DIM array.

```
Dim c[5, 4, 6]


For x = 1 To 5
   For y = 1 To 4
        For z = 1 To 6
           c[x, y, z] = k
           k = k + 1
       End for
   End for
End for


k=0
For x = 1 To 5
    For y = 1 To 4
       For z = 1 To 6
          If c[x, y, z] <> k Then print"error" : Stop
          if c[x][y][z] <> k then print "error":stop
          k = k + 1
          End for
   End for
End for
```

Assignment ("=")

`variable = expression`

The assignment statement (“=”) assigns a variable to a new value.

In each of the following lines, the variable on the left side of the equals operator is assigned the value of the constant or expression on the right side of the equals operator.

```
a$="a rose is a rose"
b1=1.23
x=x-z1
```

END

The `END` statement terminates script execution normally.

STOP

The `STOP` statement interrupts script execution, returns a “STOP” error, and invokes the debugger. Use the `cont` command at the debugger prompt to continue execution of the script or the `step` command to execute a single step in the script.

GOTO

`GOTO label`

The `GOTO` statement transfers program control to the line number specified by Label. The `GOTO` label statement results in a branching operation. A label is an identifier terminated with a colon on a line that contains no other statements or expressions.

Example

```
mylabel:
print "Hello World"
goto mylabel
```

RETURN

`RETURN expression`

The `RETURN` statement returns from a function back to its caller. If the function is not type Void, `RETURN` can also return a value to the caller.

PRINT

`PRINT [#output_object], [@location], item list`

The PRINT statement prints an item or list of items in the console. The item(s) may be strings, integers, floats, variables, or expressions. An object with an *ifInt*, *ifFloat*, or *ifString* interface may also be printed. If the `output_object` is specified, this statement will print to an object with an *ifStreamSend* interface.

If the statement is printing a list of items, the items must be separated with semicolons or commas. If semicolons are used, spaces are not inserted between printed items; if commas are used, the cursor will automatically advance to the next print zone before printing the next item.

Positive numbers and zero are printed with a leading space (without a plus sign). Spaces are not inserted before or after strings.

Example

```
> x=5:print 25; " is equal to"; x ^2
> run
25 is equal to 25
```

Example

```
> a$="string"
> print a$;a$,a$;" ";a$
> run
stringstring          string string
```

Each print zone in the following example is 16 characters wide. The cursor moves to the next print zone each time a comma is encountered.

```
> print "zone 1","zone 2","zone 3","zone 4"
> run
zone 1          zone 2          zone 3          zone 4
```

Example

```
> print "print statement #1 ";
> print "print statement #2"
> run
print statement #1 print statement #2
```

In some cases, semicolons can be dropped. For example, the following statement is legal:

```
Print "this is a five "5"!!"
```

A trailing semicolon overrides the cursor-return so that the next `PRINT` statement begins where the last left off. If no trailing punctuation is used with a `PRINT` statement, the cursor drops to the beginning of the next line.

[@location]

If the console you are printing to has the *ifTextField* interface, you can use the `@` character to specify where printing will begin.

Example

```
print #m.text_field,@width*(height/2-1)+(width-len(msg$))/2,msg$;
```

Whenever you use `PRINT @` on the bottom line of the display, an automatic line-feed causes all displayed lines to move up one line. To prevent this from happening, use a trailing semicolon at the end of the statement.

TAB (expression)

This statement moves the cursor to the specified position on the current line (modulo the width of the console if the TAB position is greater than the console width).

Example

```
print tab(5)"tabbed 5";tab(25)"tabbed 25"
```

Note the following about the TAB statement:

- The TAB statement may be used several times in a `PRINT` list.
- No punctuation is required after a TAB statement.
- Numerical expressions may be used to specify a TAB position.
- The TAB statement cannot be used to move the cursor to the left.
- If the cursor is beyond the specified position, the TAB statement is ignored.

POS(x)

This statement returns an integer that indicates the current cursor position from 0 to the maximum width of the window. This statement requires a dummy argument in the form of any numeric expression.

```
print tab(40) pos(0)   'prints 40 at position 40

print "these" tab(pos(0)+5)"words" tab(pos(0)+5)"are";
print tab(pos(0)+5)"evenly" tab(pos(0)+5)"spaced"
```

FOR / END FOR

`FOR counter_variable = initial_value TO final_value STEP increment / END FOR`

The `FOR` statement creates an iterative loop that allows a sequence of program statements to be executed a specified number of times.

The `initial_value`, `final_value`, and `increment` can be any expression. The first time the `FOR` statement is executed, these three variables are evaluated and their values are saved; changing the variables during the loop will have no affect on the operation of the loop. However, the `counter_variable` must not be changed, or the loop will not operate normally. The first time the `FOR` statement is executed, the counter is set to both the value and type of the `initial_value`.

At the beginning of each loop, the value of the `counter_variable` is compared with the `final_value`. If the value of the `counter_variabl` e is greater than the `final_value`, the loop will complete and execution will continue with the statement following the `END FOR` statement. If, on the other hand, the counter has not yet exceeded the `final_value`, control passes to the first statement after the `FOR` statement. If increment is a negative number, the loop will complete when the value of the `counter_variable` is less than the `final_value`.

When program flow reaches the `END FOR` statement, the counter is incremented by the specified increment amount (or decremented if increment is a negative value). If the `STEP [increment]` language is not included in the `FOR` statement, the increment defaults to 1.

Use `EXIT FOR` to exit a `FOR` block prematurely.

The following script decrements `i` at the beginning of each loop until it is less than 1.

```
for i=10 to 1 step -1
       print i
end for
```

FOR EACH IN / END FOR

`FOR EACH item IN object / END FOR`

The `FOR EACH` statement can iterate through a set of items in any object that has an *ifEnum* interface (i.e. an enumerator). The `FOR` block is terminated with the `END FOR` statement. Objects that are ordered intrinsically (such as *roList*) are enumerated in order, while objects that have no intrinsic order (such as *roAssociativeArray*) are enumerated in apparent random order. It is possible to delete entries as they are enumerated.

Use `EXIT FOR` to exit a `FOR` block prematurely.

The following objects can be enumerated: *roList*, *roArray*, *roAssociativeArray*, *roMessagePort*.

The following script iterates over an associative array in random order, prints each key/value pair, then deletes it.

```
aa={joe: 10, fred: 11, sue:9}
For each n in aa
   Print n;aa[n]
   aa.delete[n]
end for
```

WHILE / EXIT WHILE

`WHILE expression / EXIT WHILE`

A `WHILE` loop executes until the specified expression is false. Use the `EXIT WHILE` statement to exit a `WHILE` block prematurely.

```
k=0
while k<>0
   k=1
   Print "loop once"
end while

while true
   Print "loop once"
   Exit while
End while
```

IF / THEN / ELSE

`IF expression THEN statements [ELSE statements]`

> This is the single-line form of the IF THEN ELSE statement; see the next section for more details about the block form of the IF THEN ELSE statement.

The `IF` statement instructs the interpreter to test the following expression. If the expression is True, control will proceed to the statements immediately following the expression. If the expression is False, control will jump to either the matching `ELSE` statement (if there is one) or to the next program line after the block.

Example

```
if x>127 then print "out of range" : end
```

THEN is optional in the above and similar statements. However, THEN is sometimes required to eliminate ambiguity, as in the following example

```
if y=m then m=o 'won't work without THEN
```

Block IF / ELSEIF / THEN / ENDIF

The block (i.e. multi-line) form of IF / THEN / ELSE has the following syntax:

```
If BooleanExpression [ Then ]
   [ Block ]
   [ ElseIfStatement+ ]
   [ ElseStatement ]
End If

ElseIfStatement ::=
   ElseIf BooleanExpression [ Then ]
   [ Block ]

ElseStatement ::=
   Else
   [ Block ]
```

Example

```
vp_msg_loop:
        msg=wait(tiut, p)
        if type(msg)="rovideoevent" then
            if debug then print "video event";msg.getint()
            if lm=0 and msg.getint() = meden then
                if debug then print "videofinished"
                retcode=5
                return
            endif
        else if type(msg)="rogpiobutton" then
            if debug then print "button press";msg
            if esc0 and msg=b0 then retcode=1:return
            if esc1 and msg=b1 then retcode=2:return
            if esc2 and msg=b2 then retcode=3:return
            if esc3 and msg=b3 then retcode=4:return
        else if type(msg)=" Invalid" then
            if debug then print "timeout"
            retcode=6
            return
        endif

        goto vp_msg_loop
```

Function() As Type / End Function

```
Function name(parameter As Type, …) As Type
```

Each function has its own scope.

A function is declared using the `Function()` statement. The parentheses may contain one or more optional parameters; parameters can also have default values and expressions.

The type of each parameter may be declared. The return type of the function may also be declared. If a parameter type or return type is not declared, it is Dynamic by default. Intrinsic types are passed by value (and a copy is made), while objects are passed by reference. The `Sub` statement can be used instead of `Function` as a shortcut for creating a function with return type Void.

A parameter can be one of the following types:

- Integer
- Float
- Double
- String
- Object
- Dynamic

The function return can be one of the following types:

- Void
- Integer
- Float
- Double
- String
- Object
- Dynamic

"M" Identifier

If a function is called from an associative array, then the local variable `m` is set to the associative array in which the function is stored. If the function is not called from an associative array, then its `m` variable is set to an associative array that is global to the module and persists across calls.

The `m` identifier should only be used for the purpose stated above: We do not recommend using `m` as a general-purpose identifier.

Example

```
sub main()
   obj={
       add: add
       a: 5
       b: 10
       }

   obj.add()
   print obj.result
end sub

function add() As void
    m.result=m.a+m.b
end function
```

Anonymous Functions

A function without a name declaration is considered anonymous.

The following is a simple anonymous function declaration:

```
myfunc=function (a, b)
       Return a+b
end function

print myfunc(1,2)
```

Anonymous functions can also be used with associative-array literals:

```
q = {

starring : function(o, e)
str = e.GetBody()
print "Starring: " + str
toks = box(str).tokenize(",")
for each act in toks
actx = box(act).trim()
if actx <> "" then
print "Actor: [" + actx + "]"
                o.Actors.Push(actx)
endif
end for
return 0
end function
}

q.starring(myobj, myxml)
```

Built-In Functions

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BrightScript features a set of built-in, module-scope, intrinsic functions. A number of file I/O, string, mathematics, and system functions are also available via the *roGlobal* object.

Type()

`Type(a As Variable) As String`

This function returns the type of the passed variable and/or object.

GetGlobalAA()

`GetGlobalAA() As Object`

This function fetches the global associative array for the current script.

Rnd()

```
Rnd(range As Integer) As Integer
Rnd(0) As Float
```

If passed a positive, non-zero integer, this function returns a pseudo-random integer between 1 and the argument value. The range includes the argument value: For example, calling `Rnd(55)` will return a pseudo-random integer greater than 0 and less than 56.

If the argument is 0, this function returns a pseudo-random Float value between 0 and 1.

Note
The `Rnd()` functions utilize a pseudo-random seed number that is generated internally and not accessible to the user.

Box()

```
Box(type As Dynamic) As Object
```

This function returns an object version of the specified intrinsic type. Objects will be passed through.

Example

```
b = box("string")
b = box(b)  ' b does not change
```

Run()

```
Run(file_name As String, [optional_arg As Dynamic, …]) As Dynamic
Run(file_names As roArray, [optional_arg As Dynamic, …]) As Dynamic
```

This function runs one or more scripts from the current script. You may append optional arguments, which will be passed to the `Main()` function of the script(s). The called script may also return arguments to the caller script.

If a string file name is passed, the function will compile and run the corresponding file. If an array of files is passed, the function will compile each file, link them together, and run them.

Example

```
Sub Main()
       Run("test.brs")
       BreakIfRunError(LINE_NUM)
       Print Run("test2.brs", "arg 1", "arg 2")
       if Run(["file1.brs","file2.brs"])<>4 then stop
       BreakIfRunError(LINE_NUM)
       stop
End Sub


Sub BreakIfRunError(ln)
       el=GetLastRunCompileError()
       if el=invalid then
             el=GetLastRunRuntimeError()
             if el=&hFC or el=&hE2 then return
             'FC==ERR_NORMAL_END, E2=ERR_VALUE_RETURN
             print "Runtime Error (line ";ln;"): ";el
             stop
       else
             print "compile error (line ";ln;")"
             for each e in el
                    for each i in e
                          print i;": ";e[i]
                    end for
             end for

             stop
       end if
End Sub
```

Eval()

`Eval(code_snippet As String) As Dynamic`

This function runs the passed code snippet in the context of the current function. The function compiles the snippet, then executes the byte-code. If the code compiles and runs successfully, it will return zero. If the code compiles successfully, but encounters a runtime error, it will return an integer indicating the error code (using the same codes as the `GetLastRunRuntimeError()` function). If compilation fails, it will return an *roList* object; the *roList* structure is identical to that of the `GetLastRunCompileError()` function.

The `Eval()` function can be useful in two cases:

- When you need to dynamically generate code at runtime.
- When you need to execute a statement that could result in a runtime error, but you don't want code execution to stop.

Example

```
PRINT Eval("1/0") ‘Returns a divide by zero error.
```

GetLastRunCompileError()

`GetLastRunCompileError() As roList`

This function returns an *roList* object containing compile errors (or Invalid if no errors occurred). Each *roList* entry is an *roAssociativeArray* object containing the following keys:

- `ERRSTR`: The compile error type (as String)
- `FILESPEC`: The file URI of the script containing the error (as String)
- `ERRNO`: The error number (as Integer)
- `LINENO`: The line number where the error occurs (as Integer)

The following are possible `ERRNO` values:

Error Code		Description	Expanded Description
&hBF	191	ERR_NW	`ENDWHILE` statement occurs without statement.
&hBE	190	ERR_MISSING_ENDWHILE	`WHILE` statement occurs without `ENDWHILE` statement.
&hBC	188	ERR_MISSING_ENDIF	End of script reached without finding an `ENDIF` statement.
&hBB	187	ERR_NOLN	No line number found.
&hBA	186	ERR_LNSEQ	Line number sequence error.
&hB9	185	ERR_LOADFILE	Error loading file.
&hB8	184	ERR_NOMATCH	`MATCH` statement does not match.
&hB7	183	ERR_UNEXPECTED_EOF	Unexpected end of string encountered during string compilation.
&hB6	182	ERR_FOR_NEXT_MISMATCH	Variable on `NEXT` does not match `FOR`.
&hB5	181	ERR_NO_BLOCK_END	
&hB4	180	ERR_LABELTWICE	Label defined more than once.
&hB3	179	ERR_UNTERMED_STRING	Literal string does not have end quote.
&hB2	178	ERR_FUN_NOT_EXPECTED	
&hB1	177	ERR_TOO_MANY_CONST	
&hB0	176	ERR_TOO_MANY_VAR	
&hAF	175	ERR_EXIT_WHILE_NOT_IN_WHILE	
&hAE	174	ERR_INTERNAL_LIMIT_EXCEDED	
&hAD	173	ERR_SUB_DEFINED_TWICE	
&hAC	172	ERR_NOMAIN	
&hAB	171	ERR_FOREACH_INDEX_TM	
&hAA	170	ERR_RET_CANNOT_HAVE_VALUE	
&hA9	169	ERR_RET_MUST_HAVE_VALUE	
&hA8	168	ERR_FUN_MUST_HAVE_RET_TYPE	
&hA7	167	ERR_INVALID_TYPE	
&hA6	166	ERR_NOLONGER	Feature no longer supported.
&hA5	165	ERR_EXIT_FOR_NOT_IN_FOR	
&hA4	164	ERR_MISSING_INITILIZER	
&hA3	163	ERR_IF_TOO_LARGE	
&hA2	162	ERR_RO_NOT_FOUND	
&hA1	161	ERR_TOO_MANY_LABELS	
&hA0	160	ERR_VAR_CANNOT_BE_SUBNAME	
&h9F	159	ERR_INVALID_CONST_NAME	
&h9E	158	ERR_CONST_FOLDING	

GetLastRunRuntimeError()

`GetLastRunRuntimeError() As Integer`

This function returns the error code that resulted from the last `Run()` function.

These codes indicate a normal result:

Error Code		Description	Expanded Description
&hFF	255	ERR_OKAY	

&hFC	252	ERR_NORMAL_END	Execution ended normally, but with termination (e.g. END, shell "exit", window closed).
&hE2	226	ERR_VALUE_RETURN	Return executed with value returned on the stack.
&hE0	224	ERR_NO_VALUE_RETURN	Return executed without value returned on the stack.

The following codes indicate runtime errors:

Error Code		**Description**	**Expanded Description**
&hFE	254	ERR_INTERNAL	Unexpected condition occurred.
&hFD	253	ERR_UNDEFINED_OPCD	Opcode could not be handled.
&hFB	251	ERR_UNDEFINED_OP	Expression operator could not be handled.
&hFA	250	ERR_MISSING_PARN	
&hF9	249	ERR_STACK_UNDER	No value to pop off the stack.
&hF8	248	ERR_BREAK	`scriptBreak()` function called.
&hF7	247	ERR_STOP	STOP statement executed.
&hF6	246	ERR_RO0	bscNewComponent failed because object class not found.
&hF5	245	ERR_R01	BrightScript member function call does not have right number of parameters.
&hF4	244	ERR_RO2	BrightScript member function not found in object or interface.
&hF3	243	ERR_RO3	BrightScript interface not a member of the object.
&hF2	242	ERR_TOO_MANY_PARAM	Too many function parameters to handle.
&hF1	241	ERR_WRONG_NUM_PARAM	Number of function parameters incorrect.
&hF0	240	ERR_RVIG	Function returns a value, but is ignored.
&hEF	239	ERR_NOTPRINTABLE	Value not printable.
&hEE	238	ERR_NOTWAITABLE	`WAIT` statement cannot be applied to object because object does not have an *roMessagePort* interface.
&hED	237	ERR_MUST_BE_STATIC	Interface calls from rotINTERFACE type must be static.
&hEC	236	ERR_RO4	"." Dot Operator used on object that does not contain legal object or interface reference.
&hEB	235	ERR_NOTYPEOP	Operation attempted on two type-less operands.
&hE9	233	ERR_USE_OF_UNINIT_VAR	Uninitialized variable used illegally.
&hE8	232	ERR_TM2	Non-numeric index applied to array.
&hE7	231	ERR_ARRAYNOTDIMMED	
&hE6	230	ERR_USE_OF_UNINIT_BRSUBREF	Reference to uninitialized SUB.
&hE5	229	ERR_MUST_HAVE_RETURN	
&hE4	228	ERR_INVALID_LVALUE	Left side of the expression is invalid.
&hE3	227	ERR_INVALID_NUM_ARRAY_IDX	Number of array indexes is invalid.
&hE1	225	ERR_UNICODE_NOT_SUPPORTED	
&hE0	224	ERR_NOTFUNOPABLE	
&hDF	223	ERR_STACK_OVERFLOW	
&h20	32	ERR_CN	Continue (`cont` or `c`) not allowed.
&h1C	28	ERR_STRINGTOLONG	
&h1A	26	ERR_OS	String space has run out.
&h18	24	ERR_TM	A Type Mismatch (string /number operation mismatch) has occurred.
&h14	20	ERR_DIV_ZERO	
&h12	18	ERR_DD	Attempted to re-dimension array.
&h10	16	ERR_BS	Array subscript out of bounds.
&h0E	14	ERR_MISSING_LN	

&h0C	12	ERR_OUTOFMEM	
&h08	8	ERR_FC	Invalid parameter passed to function/array (e.g. a negative matrix dim or square root).
&h06	6	ERR_OD	Out of data (READ).
&h04	4	ERR_RG	Return without Gosub.
&h02	2	ERR_SYNTAX	
&h00	0	ERR_NF	`Next` without `For`.

Core Library Extension

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There are a number of built-in functions that are not part of the BrightScript Core Library. You can use the LIBRARY statement to include this subset of functions:

```
LIBRARY "v30/bslCore.brs"
```

bslBrightScriptErrorCodes() As roAssociativeArray

Returns an associative array of name/value pairs corresponding to BrightScript error codes and their descriptions.

bslGeneralConstraints() As roAssociativeArray

Returns an associative array of name/value pairs corresponding to system constants.

bslUniversalControlEventCodes() As roAssociativeArray

Returns an associative array of name/value pairs corresponding to the remote key code constraints.

AsciiToHex(ascii As String) As String

Returns a hex-formatted version of the passed ASCII string.

HexToAscii(hex As String) As String

Returns an ASCII-formatted version of the passed hex string.

HexToInteger(hex As String) As Integer

Returns the integer value of the passed hex string.

BrightScript Debug Console

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- Previous Versions

If, while a script is running, a runtime error occurs or a `STOP` statement is encountered, the BrightSign application will enter the BrightScript debug console. You can also access the debug console at bootup by following these steps:

1. Power on the device.
2. Wait at least 5 seconds after the power LED (**pwr**) lights up.
3. Use a paperclip or pen to press and hold the **SVC** button on the side of the player.
4. Wait until the `brightsign>` prompt appears in the terminal.
5. Enter `brightsign>` at the prompt. This will take you to the BrightScript debug console.

The debug console can be accessed from a terminal program using a null-modem cable connected to the RS-232, GPIO, or VGA port (depending on the player model). Networked players can also be accessed via Telnet or SSH.

The console scope is set to the function that was running when a runtime error or `STOP` statement occurred. While in the console, you can type in any BrightScript statement; it will then be compiled and executed in the current context.

In most cases, the debug console is the default device for the `PRINT` statement.

Console Commands

The following console commands are currently available:

bt	Print a backtrace of call-function context frames.
classes	List all public classes.
cont or c	Continue script execution.
counts	List count of BrightScript Component instances.
da	Show disassembly and bytecode for this function.
down or d	Move one position down the function context chain.
exit	Exit the debug shell.
gc	Run the garbage collector and show collection statistics.
hash	Print the internal hash-table histograms.
last	Show the last line that executed.
method <class>	List methods provided by specified class.
method <class>.<interface>	List methods provided by the specified interface or class.
list	List the current source of the current function.
ld	Show line data (source records)
next	Show the next line to execute.
bsc	List all allocated BrightScript Component instances.
stats	Show statistics.
step or s	Step one program statement.
t	Step one statement and show each executed opcode.
up or u	Move one function up the context chain.
var	Display local variables and their types/values.
print or p or ?	Print variable value or expression.

BrightScript Versions

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- Previous Versions

BrightScript Version Matrix			
January 9, 2009			
	HD20000 1.3 Branch	HD2000 2.0 Branch	Compact Main Line
SnapShot Date	1/7/2008	7/16/2008	1/9/2009
Defxxx, on, gosub, clear, random, data, read, restore, err, errl, let, clear, line numbers	X	X	
Intrinsic Arrays	X	X	
Compiler		X	X
AA & dot Op & m reference		X	X

Sub/Functions		X	X
ifEnum & For Each		X	X
For/Next Does Not Always Execute At Least Once		X	X
Exit For		X	X
Invalid Type. Errors that used to be Int Zero are now Invalid. Added roInvalid; Invalid Autoboxing			X
Array's use roArray; Added ifArray			X
Uninit Var Usage No Longer Allowed			X
Sub can have "As" (like Function)			X
roXML Element & XML Ops dot and @			X
Type() Change: Now matches declaration names (eg. Integer not roINT32)			X
Added roBoolean			X
Added dynamic Type; Type now optional on Sub/Functions			X
And/Or Don't Eval un-needed Terms			X
Sub/Fun Default Parameter Values (e.g. `Sub (x=5 As Integer))`			X
AA declaration Op { }			X
Array Declaration Op [ ]			X
Change Array Op from ( ) to []			X
Anonymous Functions			X
Added Circ. Ref. Garbage Collector			X
Add Eval(), Run(), and Box()			X

Reserved Words

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AND	ENDSUB	LINE_NUM	RND
CREATEOBJECT	ENDWHILE	M*	STEP
DIM	EXIT	NEXT	STOP
EACH	EXITWHILE	NOT	SUB
EACH	FALSE	OBJFUN	TAB
ELSE	FOR	OR	THEN
END	FUNCTION	POS	TO
ENDFOR	GOTO	PRINT	TRUE
ENDFUNCTION	IF	REM	TYPE
ENDIF	INVALID	RETURN	WHILE

* Although `M` is not strictly a reserved word, it should not be used as an identifier outside of its intended purpose.

Example Script

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The following code uses GPIO buttons 1, 2, 3, 4 for controls. It will work on any BrightSign model that has a video output and a GPIO port.

```
REM
REM The game of Snake
REM demonstrates BrightScript programming concepts
REM June 22, 2008
```

```
REM
REM Every BrightScript program must have a single Main()
REM

Sub Main()

    game_board=newGameBoard()

    While true
        game_board.SetSnake(newSnake(game_board.StartX(), game_board.StartY()))
        game_board.Draw()
        game_board.EventLoop()
        if game_board.GameOver() then ExitWhile
    End While
End Sub


REM *******************************************************
REM *******************************************************
REM ***************                   ********************
REM *************** GAME BOARD OBJECT ********************
REM ***************                   ********************
REM *******************************************************
REM *******************************************************


REM
REM An example BrightScript constructor.   "newGameBoard()" is regular Function of module
scope
REM BrightScript Objects are "dynamic" and created at runtime.  They have no "class".
REM The object container is a BrightScript Component of type roAssocitiveArray (AA).
REM The AA is used to hold member data and member functions.
REM

Function newGameBoard() As Object
    game_board=CreateObject("roAssociativeArray")       ' Create a BrightScript Component of
type/class roAssociativeArray
    game_board.Init=gbInit                         ' Add an entry to the AA of type roFunction
with value gbDraw (a sub defined in this module)
    game_board.Draw=gbDraw
    game_board.SetSnake=gbSetSnake
    game_board.EventLoop=gbEventLoop
    game_board.GameOver=gbGameOver
    game_board.StartX=gbStartX
    game_board.StartY=gbStartY
    game_board.Init()                                   ' Call the Init member function (which
is gbInit)

    return game_board

End Function


REM
REM gbInit() is a member function of the game_board BrightScript Object.
REM When it is called, the "this" pointer "m" is set to the appropriate instance by
REM the BrightScript bytecode interpreter
REM
Function gbInit() As Void
    REM
    REM button presses go to this message port
    REM
    m.buttons = CreateObject("roMessagePort")
    m.gpio =  CreateObject("roGpioControlPort")
    m.gpio.SetPort(m.buttons)
    REM
    REM determine optimal size and position for the snake gameboard
    REM
    CELLWID=16     ' each cell on game in pixels width
    CELLHI=16      ' each cell in pix height
    MAXWIDE=30    ' max width (in cells) of game board
    MAXHI=30      ' max height (in cells) of game board
    vidmode=CreateObject("roVideoMode")
    w=cint(vidmode.GetResX()/CELLWID)
    if w>MAXWIDE then w = MAXWIDE
    h=cint(vidmode.GetResY()/CELLHI)
    if h>MAXHI then h=MAXHI

    xpix = cint((vidmode.GetResX() - w*CELLWID)/2)     ' center game board on screen
    ypix = cint((vidmode.GetResY() - h*CELLHI)/2)      ' center game board on screen

    REM
    REM Create Text Field with square char cell size
    REM
    meta=CreateObject("roAssociativeArray")
    meta.AddReplace("CharWidth",CELLWID)
    meta.AddReplace("CharHeight",CELLHI)
    meta.AddReplace("BackgroundColor",&H202020)   'very dark grey
    meta.AddReplace("TextColor",&H00FF00)   ' Green
    m.text_field=CreateObject("roTextField",xpix,ypix,w,h,meta)
    if type(m.text_field)<>"roTextField" then
        print "unable to create roTextField 1"
        stop
    endif
End Function

REM
REM As Object refers to type BrightScript Component
REM m the "this" pointer
REM
Sub gbSetSnake(snake As Object)
    m.snake=snake
End Sub


Function gbStartX() As Integer
    return cint(m.text_field.GetWidth()/2)
End Function


Function gbStartY() As Integer
    return cint(m.text_field.GetHeight()/2)
End Function


Function gbEventLoop() As Void

    tick_count=0

    while true
        msg=wait(250, m.buttons)   ' wait for a button, or 250ms (1/4 a second) timeout
        if type(msg)="roGpioButton" then
            if msg.GetInt()=1 m.snake.TurnNorth()
            if msg.GetInt()=2 m.snake.TurnSouth()
            if msg.GetInt()=3 m.snake.TurnEast()
            if msg.GetInt()=4 m.snake.TurnWest()
        else  'here if time out happened, move snake forward
            tick_count=tick_count+1
            if tick_count=6 then
                tick_count=0
                if m.snake.MakeLonger(m.text_field) then return
            else
```

```
                if m.snake.MoveForward(m.text_field) then return
            endif
        endif
    end while

End Function


Sub gbDraw()
    REM
    REM given a roTextField Object in "m.text_field", draw a box around its edge
    REM

    solid=191   ' use asc("*") if graphics not enabled
    m.text_field.Cls()

    for w=0 to m.text_field.GetWidth()-1
        print #m.text_field,@w,chr(solid);
        print
#m.text_field,@m.text_field.GetWidth()*(m.text_field.GetHeight()-1)+w,chr(solid);
    end for

    for h=1 to m.text_field.GetHeight()-2
        print #m.text_field,@h*m.text_field.GetWidth(),chr(solid);
        print #m.text_field,@h*m.text_field.GetWidth()+m.text_field.GetWidth()-1,chr(solid);
    end for

    m.snake.Draw(m.text_field)

End Sub

Function gbGameOver() As Boolean
    msg$= " G A M E    O V E R "
    msg0$="                    "
    width = m.text_field.GetWidth()
    height = m.text_field.GetHeight()

    while true
        print #m.text_field,@width*(height/2-1)+(width-len(msg$))/2,msg$;
        sleep(300)
        print #m.text_field,@width*(height/2-1)+(width-len(msg$))/2,msg0$;
        sleep(150)
        REM  GetMessage returns the message object, or an int 0 if no message available
        If m.buttons.GetMessage() <> invalid Then Return False
    endwhile

End Function


REM *******************************************************
REM *******************************************************
REM ******************              **********************
REM ****************** SNAKE OBJECT **********************
REM ******************              **********************
REM *******************************************************
REM *******************************************************

REM
REM construct a new snake BrightScript object
REM
Function newSnake(x As Integer, y As Integer) As Object

' Create AA BrightScript Component; the container for a "BrightScript Object"
    snake=CreateObject("roAssociativeArray")
    snake.Draw=snkDraw
    snake.TurnNorth=snkTurnNorth
    snake.TurnSouth=snkTurnSouth
    snake.TurnEast=snkTurnEast
    snake.TurnWest=snkTurnWest
    snake.MoveForward=snkMoveForward
    snake.MakeLonger=snkMakeLonger
    snake.AddSegment=snkAddSegment
    snake.EraseEndBit=snkEraseEndBit

    REM
    REM a "snake" is a list of line segments
    REM a line segment is an roAssociativeArray that conains a length and direction (given by
the x,y delta needed to move as it is drawn)
    REM

    snake.seg_list = CreateObject("roList")
    snake.AddSegment(1,0,3)

    REM
    REM The X,Y pos is the position of the head of the snake
    REM
    snake.snake_X=x
    snake.snake_Y=y
    snake.body=191   ' use asc("*") if graphics not enabled.
    snake.dx=1      ' default snake direction / move offset
    snake.dy=0      ' default snake direction / move offset

    return snake

End Function


Sub snkDraw(text_field As Object)
    x=m.snake_X
    y=m.snake_Y
    for each seg in m.seg_list
        xdelta=seg.xDelta
        ydelta=seg.yDelta
        for j=1 to seg.Len
            text_field.SetCursorPos(x, y)
            text_field.SendByte(m.body)
            x=x+xdelta
            y=y+ydelta
        end for
    end for
End Sub


Sub snkEraseEndBit(text_field As Object)
    x=m.snake_X
    y=m.snake_Y
    for each seg in m.seg_list
        x=x+seg.Len*seg.xDelta
        y=y+seg.Len*seg.yDelta
    end for

    text_field.SetCursorPos(x, y)
    text_field.SendByte(32)    ' 32 is ascii space, could use asc(" ")

End Sub


Function snkMoveForward(text_field As Object)As Boolean
    m.EraseEndBit(text_field)
    tail=m.seg_list.GetTail()
    REM
    REM the following shows how you can use an AA's member functions to perform the same
    REM functions the BrightScript . operator does behind the scenes for you (when used on an
AA).
```

```
    REM there is not point to this longer method other than illustration
    REM
    len=tail.Lookup("Len")          ' same as len = tail.Len (or tail.len, BrightScript syntax
is not case sensative)
    len = len-1
    if len=0 then
        m.seg_list.RemoveTail()
    else
        tail.AddReplace("Len",len)  ' same as tail.Len=len
    endif

    return m.MakeLonger(text_field)

End Function

Function snkMakeLonger(text_field As Object) As Boolean
    m.snake_X=m.snake_X+m.dx
    m.snake_Y=m.snake_Y+m.dy
    text_field.SetCursorPos(m.snake_X, m.snake_Y)
    if text_field.GetValue()=m.body then return true
    text_field.SendByte(m.body)
    head = m.seg_list.GetHead()
    head.Len=head.Len+1
    return false
End Function

Sub snkAddSegment(dx As Integer, dy As Integer, len as Integer)

    aa=CreateObject("roAssociativeArray")
    aa.AddReplace("xDelta",-dx)  ' line segments draw from head to tail
    aa.AddReplace("yDelta",-dy)
    aa.AddReplace("Len",len)
    m.seg_list.AddHead(aa)

End Sub


Sub snkTurnNorth()
    if m.dx<>0 or m.dy<>-1 then m.dx=0:m.dy=-1:m.AddSegment(m.dx, m.dy, 0)      'north
End Sub

Sub snkTurnSouth()
     if m.dx<>0 or m.dy<>1 then m.dx=0:m.dy=1:m.AddSegment(m.dx, m.dy, 0)       'south
End Sub

Sub snkTurnEast()
     if m.dx<>-1 or m.dy<>0 then m.dx=-1:m.dy=0:m.AddSegment(m.dx, m.dy, 0)     'east
End Sub
```

```
Sub snkTurnWest()
     if m.dx<>1 or m.dy<>0 then m.dx=1:m.dy=0:m.AddSegment(m.dx, m.dy, 0)       'west
End Sub
```

Object Reference

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BrightSign players use a standardized library of BrightScript objects to expose functionality for software development. To publish a new API for interacting with BrightSign hardware, we create a new BrightScript object.

The pages in this section provide definitions for objects that can be used in BrightScript. A brief description, a list of interfaces, and the member functions of the interfaces are provided for each object class. While most BrightScript objects have self-contained pages, some objects are grouped on the same page if they are closely related or depend on one another for functionality.

Here is a sample of objects that are used frequently when creating applications in BrightScript:

roVideoMode	Configures video output and interacts with displays using CEC/EDID.
roRectangle	Used to define zones/widgets on the screen. This object is passed to many other objects to define their screen area, including *roVideoPlayer*, *roImagePlayer, roImageWidget*, *roHtmlWidget*, *roClockWidget*, and *roCanvasWidget.*
roVideoPlayer	Plays video files, streams, and HDMI input.
roImagePlayer	Displays images.
roHtmlWidget	Displays local or remote HTML content using the Chromium rendering engine.
roNetworkConfiguration	Used to configure Ethernet, WiFi, and local network parameters.
roDeviceInformation	Used to retrieve a wide array of system information, including model type, device serial number, and firmware version.

INTERFACES AND METHODS

Every BrightScript object consists of one or more "interfaces." An interface consists of one or more "methods." For example, the *roVideoPlayer* object has several interfaces, including *ifMessagePort*. The interface *ifMessagePort* has one method: `SetPort()`.

The abstract interface *ifMessagePort* is exposed and implemented by both the *roControlPort* and the *roVideoPlayer* objects. Once the SetPort() method is called, these objects will send their events to the supplied message port. This is discussed more in the Event Loops section below.

Example

```
p = CreateObject("roMessagePort")
video = CreateObject("roVideoPlayer")
gpio = CreateObject("roControlPort", "BrightSign")
gpio.SetPort(p)
video.SetPort(p)
```

The above syntax makes use of a shortcut provided by the language: The interface name is optional, unless it is needed to resolve name conflicts. For example, the following two lines of code carry out the exact same function:

```
gpio.SetPort(p)
gpio.ifMessagePort.SetPort(p)
```

BrightScript Objects consist *only* of interfaces, and interfaces define *only* methods. There is no concept of a "property" or variable at the object or interface level. These must be implemented as "set" or "get" methods in an interface.

CLASSES

A *class name* is used to create a BrightScript object. For example, the class name for a video playback instance is *roVideoPlayer*, so, to initialize a video playback instance, you would use code similar to the following:

Example

```
video = CreateObject("roVideoPlayer")
```

Note that "video" can be any name that follows the syntax outlined in the next section.

OBJECT AND CLASS NAME SYNTAX

Class names have the following characteristics:

- Must start with an alphabetic character (a – z).
- May consist of alphabetic characters, numbers, or the "_" (i.e. underscore) symbol.
- Are not case sensitive.
- May be of any reasonable length.

ZONES

With the BrightSign Zones feature, you can divide the screen into rectangles and play different content in each rectangle.

Depending on the BrightSign model, zones can contain video, images, HTML content, audio, a clock, or text. 4Kx42, XDx32, and XDx30 models can display two video zones on screen, while the HDx22, HDx20, and LSx22 models can only display one. There can be multiple zones of other types on the screen. A text zone can contain simple text strings or can be configured to display an RSS feed in a ticker-type display.

As of firmware 6.0.x, zone support is enabled by default. When zones are enabled, the image layer is on top of the video layer by default. The default behavior can be modified using the*roVideoMode.SetGraphicsZOrder()* method.

Zone support can be disabled by calling `EnableZoneSupport(false)`. When zones are not enabled, the image layer is hidden whenever video is played, and the video layer is hidden whenever images are played.

EVENT LOOPS

When writing anything more than a very simple script, an "event loop" will need to be created. Event loops typically have the following structure:

1. Wait for an event.
2. Process the event.
3. Return to step 1.

An event can be any number occurrences: a button has been pressed; a timer has been triggered; a UDP message has been received; a video has finished playing back; etc. By convention, event scripting for BrightScript objects follows this work flow:

1. An object of the type *roMessagePort* is created by the user's script.
2. Objects that can send events (i.e. those that support the *ifMessagePort/ifSetMessagePort* interface) are instructed to send their events to this message port using the `SetPort()` method. You can set up multiple message ports and have each event go to its own message port, but it is usually simpler to create one message port and have all the events sent to this one port.
3. The script waits for an event. The actual function to do this is *ifMessagePort.WaitMessage()*, but the built-in `Wait()` statement in BrightScript allows you to do this more easily.
4. If multiple event types are possible, your script should determine which event the wait function received, then process it. The script then

jumps back to the wait.

An event can be generated by any BrightScript Object. For example, the class *roControlPort* sends events of type *roControlDown* and *roControlUp*. The *roControlDown* implements the *ifInt* interface, which allows access to an integer. An event loop needs to be aware of the possible events it can receive and be able to process them.

Global Functions

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BrightScript provides a set of standard, module-scope functions that are stored in the global object. If a global function is referenced, the compiler directs the runtime to call the appropriate global object member. When calling a global function, you do not need to use the dot operator to reference the *roGlobal* object.

Note that global trigonometric functions accept and return values in radians, not degrees.

ifGlobal

CreateObject(name As String) As Object

Creates a BrightScript object corresponding to the specified class name. This method returns invalid if object creation fails. Some objects have optional parameters in their constructor, which must be passed after the class `name`.

```
sw = CreateObject("roGpioControlPort")
serial = CreateObject("roSerialPort", 0, 9600)
```

RestartScript() As Void

Exits the current script. The system then scans for a valid autorun file to run.

RestartApplication() As Void

Restarts the BrightSign application.

Sleep(milliseconds As Integer)

Instructs the script to pause for a specified amount of time without wasting CPU cycles. The sleep interval is specified in milliseconds.

asc(letter As String) As Integer

Returns the ASCII code for the first character of the specified string. A null-string argument will cause an error.

chr(character As Integer) As String

Returns a one-character string containing a character reflected by the specified ASCII or control. For example, because quotation marks are normally used as string delimiters, you can pass ASCII code 34 to this function to add quotes to a string.

len(target_string As String) As Integer

Returns the number of characters in a string.

str(value As Double) As String

Converts a specified float value to a string. This method also returns a string equal to the character representation of a value. For example, if "A" is assigned a value of 58.5, then calling `str(A)` will return "58.5" as a string.

strI(value As Integer) As String

Converts a specified integer value to a string. This method also returns a string equal to the character representation of a value. For example, if "A" is assigned a value of 58.5, then calling stri(A) will return "58" as a string.

val(target_string As String) As Double

Returns a number represented by the characters in the string argument. This is the opposite of the str() function. For example, if "A" is assigned the string "58", and "B" is assigned the string "5", then calling `val(A+"."+B)` will return the float value 58.5.

abs(x As Double) As Double

Returns the absoule vale of the argument *x*.

atn(x As Double) As Double

Returns the arctangent (in radians) of the argument *x* (i.e. `Atn(x)` returns "the angle whose tangent is *x*"). To get the arctangent in degrees, multiply `Atn(x)` by 57.29578.

csng(x As Integer) As Float

Returns a single-percision float representation of the argument *x*.

cdbl(x As Integer) As Double

Returns a double-percision float representation of the argument *x*.

cint(x As Double) As Integer

Returns an integer representation of the argument *x* by rounding to the nearest whole number.

cos(x As Double) As Double

Returns the cosine of the arugment *x*. The argument must be in radians. To obtain the cosine of *x* when *x* is in degrees, use `Cos(x*.01745329)`.

exp(x As Double) As Double

Returns the natural exponential of *x*. This is the inverse of the `log()` function.

fix(x As Double) As Integer

Returns a truncated representation of the argument *x*. All digits to the right of the decimal point are removed so that the resultant value is an integer. For non-negative values of *x*, `fix(x)` is equal to `int(x)`. For negative values of *x*, `fix(x)` is equal to `int(x)+1`.

int(x As Double) As Integer

Returns an integer representation of the argument *x* using the largest whole number that is not greater than the argument. For example, `int(2.2)` returns 2, while `fix(-2.5)` returns -3.

log(x As Double) As Double

Returns the natural logarithm of the argument *x*(i.e. $log_e(x)$). This is the inverse of the exp() function. To find the logarithm of a number to a base *b*, use the following formula: $log_b(x) = log_e(x)/log_e(b)$.

sgn(x As Double) As Integer

Returns an integer representing how the float argument *x* is signed: -1 for negative, 0 for zero, and 1 for positive.

sgnI(x As Integer) As Integer

Returns an integer representing how the integer argument *x* is signed: -1 for negative, 0 for zero, and 1 for positive.

sin(x As Double) As Double

Returns the sine of the argument *x*. The argument must be in radians. To obtain the sine of *x* when *x* is in degrees, use `sin(x*.01745329)`.

tan(x As Double) As Double

Returns the tangent of the argument *x*. The argument must be in radians. To obtain the tangent of *x* when *x* is in degrees, use `tan(x*.0174532 9)`.

sqr(x As Double) As Double

Returns the square root of the argument *x*. This function is the same as *x^(1/2)*, but calculates the result faster.

Left(target_string As String, n As Integer) As String

Returns the first *n* characters of the specified string.

Right(target_string As String, n As Integer) As String

Returns the last *n* characters of the specified string.

StringI(n As Integer, character As Integer) As String

Returns a string composed of a character symbol repeated *n* times. The character symbol is passed to the method as an ASCII code integer.

String(n As Integer, character As String) As String

Returns a string composed of a character symbol repeated *n* times. The character symbol is passed to the method as a string.

Mid(target_string As String, start_position As Integer, length As Integer) As String

Returns a substring of the target string. The first integer passed to the method specifies the starting position of the substring, and the second integer specifies the length of the substring. The start position of a string begins with 1.

Instr(start_position As Integer, search_text As String, substring_to_find As String) As Integer

Returns the position of a substring within a string. This function is case sensitive and returns 0 if the specified substring is not found. The start position of a string begins with 1.

GetInterface(object As Object, ifname As String) As Interface

Returns a value of the type Interface. All objects have one or more interfaces. In most cases, you can skip interface specification when calling an object component. This will not cause problems as long as the method names within a function are unique.

Wait(timeout As Integer, port As Object) As Object

Instructs the script to wait on an object that has an *ifMessagePort* interface. This method will return the event object that was posted to the message port. If the timeout is specified as zero, `Wait()` will wait indefinitely; otherwise, Wait() will return Invalid after the specified number of milliseconds if no messages have been received.

```
p =   CreateObject("roMessagePort")
sw =  CreateObject("roGpioControlPort")
sw.SetPort(p)
msg=wait(0, p)
print type(msg)     ' should be roGpioButton
print msg.GetInt()  ' button number
```

ReadAsciiFile(file_path As String) As String

Reads the specified text file and returns it as a string.

WriteAsciiFile(file_path As String, buffer As String) As Boolean

Creates a text file at the specified file path. The text of the file is passed as the second parameter. This method cannot be used to edit files: A preexisting text file will be overwritten if it has the same name and directory path as the one being created.

> **Note**
> The *roCreateFile* object provides more flexibility if you need to create or edit files.

ListDir(path As String) As Object

Returns an *roList* object containing the contents of the specified directory path. File names are converted to all lowercase.

MatchFiles(path As String, pattern_in As String) As Object

Takes a directory to look in (it can be as simple as "." or "/") and a pattern to be matched and then returns an *roList* containing the results. Each listed result contains only the part of the filename that is matched against the pattern, not the full path. The match is only applied in the specified directory; you will get no results if the pattern contains a directory separator. The pattern is a case insensitive wildmat expression. It may contain the following special characters:

- ? -- Matches any single character.
- * -- Matches zero or more arbitrary characters.
- […] -- Matches any single character specified within the brackets. The closing bracket is treated as a member of the character class if it immediately follows the opening bracket (i.e. "[]]" matches a single closed bracket). Within this class, "-" can be used to specify a range unless it is the first or last character (e.g. "[A-Cf-h"] is equivalent to "[ABCfgh]"). A character class may be negated by specifying "^" as the first character. To match a literal of this character, place it elsewhere in the class.

Note
The special characters "?", "*", and "[" lose their function if preceded by a single "\", and a single "\" can be matched using "\\".

LCase(target_string As String) As String

Converts the specified string to all lower case.

UCase(target_string As String) As String

Converts the specified string to all upper case.

DeleteFile(file_path As String) As Boolean

Deletes the file at the specified file path. This method returns False if the delete operation fails or if the file does not exist.

DeleteDirectory(diretory As String) As Boolean

Deletes the specified directory. This method will recursively delete any files and directories that are necessary for removing the specified directory. This method returns False if it fails to delete the directory, but it may still delete some of the nested files or directories.

CreateDirectory(directory As String) As Boolean

Creates the specified directory. Only one directory can be created at a time. This method returns True upon success and False upon failure.

RebootSystem() As Void

Causes a soft reboot.

ShutdownSystem() As Void

UpTime(dummy As Integer) As Double

Returns the uptime of the system (in seconds) since the last reboot.

FormatDrive(drive As String, fs_type As String) As Boolean

Formats the specified drive using one of the file systems listed below. This function returns True upon success and False upon failure:

- `vfat` (DOS/Windows file system): Readable and writable by Windows, Linux, and MacOS.
- `ext2` (Linux file system): Writable by Linux and readable by Windows and MacOS with additional software.
- `ext3` (Linux file system): Writable by Linux and readable by Windows and MacOS with additional software. This file system uses journaling for additional reliability.

EjectDrive(drive As String) As Boolean

Ejects the specified drive (e.g. "SD:") and returns True if successful. If the script is currently accessing files from the specified drive, the ejection process will fail.

CopyFile(source As String, destination As String) As Boolean

Copies the file at the specified source file-path name to the specified destination file-path name. The function returns True if successful and False in the event of failure.

MoveFile(a As String, b As String) As Boolean

Moves the specified source file to the specified destination. The function returns True if successful and False in the event of failure.

> **Note**
> Both path names must be on the same drive.

MapFilenameToNative(path As String) As String

Converts the specified BrightScript-style path to the corresponding native path and returns it as a string (e.g. the path "SD:/mydir" will be returned as "/storage/sd/mydir").

strtoi(target_string As String) As Integer

Converts the target string to an integer. Any non-integer characters (including decimal points and spaces), and any numbers to the right of a non-integer character, will not be part of the integer output.

rnd(a As Dynamic) As Dynamic

RunGarbageCollector() As roAssociativeArray

Destroys objects that are currently in a state of circular reference counting. BrightScript normally removes any objects that become unreferenced as part of its automated garbage collection algorithm. However, objects that reference each other will never reach a reference count of zero, and will need to be destroyed manually using this method.

This method is useful when destroying old presentation data structures and generating a new presentation. This method returns an associative array outlining the results of the garbage-collection process.

GetDefaultDrive() As String

Returns the current default drive complete with a trailing slash. When running autorun.brs, the drive containing the autorun is designated as the current default.

SetDefaultDrive(a As String)

Sets the current default drive, which does not need to include a trailing slash. This method does not fail; however, if the specified default drive does not exist, it will not be possible to retrieve anything.

EnableZoneSupport(enable As Boolean)

Allows for display of multiple video, HTML, image, and text zones. As of firmware 6.0.x, zone support is enabled by default.

EnableAudioMixer(a As Boolean)

Pi() As Double

Returns the value of pi as a double-precision floating-point number.

ParseJson(json_string As String) As Object

Parses a string formatted according to the RFC4627 standard and returns an equivalent BrightScript object, which can consist of the following: Booleans, integers, floating point numbers, strings, *roArray* objects, and *roAssociativeArray* objects. The `ParseJson()` method has the following properties:

- Invalid will be returned if the string is not syntactically correct.
- Any *roAssociativeArray* objects that are returned will be case sensitive.
- An error will be returned if an *roArray* or *roAssociativeArray* is nested more than 256 levels deep.

The following script demonstrates how to use `ParseJson()` to process a JSON object containing the titles and URLs of a set of images.

JSON Script

```
{
"photos" : [
        {
              "title" : "View from the hotel",
              "url" : "http://example.com/images/00012.jpg"
        },
        {
              "title" : "Relaxing at the beach",
              "url" : "http://example.com/images/00222.jpg"
        },
        {
              "title" : "Flat tire",
              "url" : "http://example.com/images/00314.jpg"
        }
]
}
```

BrightScript

```
 searchRequest = CreateObject("roUrlTransfer")
searchRequest.SetURL("http://api.example.com/services/rest/getPhotos")
response = ParseJson(searchRequest.GetToString())
For Each photo In response.photos
        GetImage(photo.title, photo.url)
End For
```

FormatJson(json As roAssociativeArray, flags As Integer) As String

Converts an associative array to a JSON string (i.e. formatted according to the RFC4627 standard). The following are supported data types: Boolean, Integer, Float, String, *roArray*, and *roAssociativeArray*. If the flags parameter is set to 0 or not specified, non-ASCII characters are escaped in the output string as “\uXXXX”, where “XXXX” is the hexadecimal representation of the Unicode character value. If the `flags` paramet er is set to 1, non-ASCII characters are not escaped. If arrays or associative arrays are nested more than 256 levels deep, an error will occur. If an error occurs, an empty string will be returned.

BrightScript Core Objects

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This section describes objects that provide core BrightScript functionality.

- roArray
- roAssociativeArray
- roBoolean
- roByteArray
- roDouble, roIntrinsicDouble
- roFunction
- roInt, roFloat, roString
- roList
- roMessagePort
- roRegex
- roXMLElement
- roXMLList

ROARRAY

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This object stores objects in a continuous array of memory locations. Since an *roArray* contains BrightScript components, and there are object wrappers for most intrinsic data types, entries can either be different types or all of the same type.

Object Creation: The *roArray* object is created with two parameters.

```
CreateObject("roArray", size As Integer, resize As Boolean)
```

- `size`: The initial number of elements allocated for an array.
- `resize`: If true, the array will be resized larger to accommodate more elements if needed. If the array is large, this process might take some time.

The `DIM` statement may be used instead of the `CreateObject()` function to create a new array. The `DIM` statement can be advantageous because it automatically creates array-of-array structures for multi-dimensional arrays.

`ifArray`

Peek() As Dynamic

Returns the last (highest index) array entry without removing it.

Pop() As Dynamic

Returns the last (highest index) entry and removes it from the array.

Push(a As Dynamic)

Adds a new highest index entry to the end of the array.

Shift() As Dynamic

Removes index zero from the array and shifts all other entries down by one unit.

Unshift(a As Dynamic)

Adds a new index zero to the array and shifts all other entries up by one unit.

Delete(a As Integer) As Boolean

Deletes the indicated array entry and shifts all above entries down by one unit.

Count() As Integer

Returns the index of the highest entry in the array plus one (i.e. the length of the array).

Clear()

Deletes every entry in the array.

Append(a As Object)

Appends one *roArray* to another. If the passed *roArray* contains entries that were never set to a value, they are not appended.

> **Note**
> The two appended objects must be of the same type.

`ifEnum`

Reset()

Resets the position to the first element of enumeration.

Next() As Dynamic

Returns a typed value at the current position and increment position.

IsNext() As Boolean

Returns True if there is a next element.

IsEmpty() As Boolean

Returns True if there is not an exact statement.

`ifArrayGet`

GetEntry(a As Integer) As Dynamic

Returns an array entry of a given index. Entries start at zero. If an entry that has not been set is fetched, Invalid is returned.

`ifArraySet`

SetEntry(a As Integer, b As Dynamic)

Sets an entry of a given index to the passed type value.

ROASSOCIATIVEARRAY

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This object allows you to generate an associative array (also known as a map, dictionary, or hash table), a data structure that associates objects with string keys.

The *roAssociativeArray* object is created with no parameters:

```
CreateObject("roAssociativeArray")
```

`ifEnum`

Reset() As Void

Resets the position to the first element of enumeration.

Next() As Dynamic

Returns a typed value at the current position and increment position.

IsNext() As Boolean

Returns True if there is a next element.

IsEmpty() As Boolean

Returns True if there is not an exact statement.

`ifAssociativeArray`

AddReplace(key As String, value As Object) As Void

Adds a new entry to the associative array, associating the supplied object with the supplied string. Only one object may be associated with a string, so any existing object linked to that string is discarded.

Lookup(key As String) As Object

Looks for an object in the associative array linked to the specified key. If there is no object associated with the string, then this method will return Invalid.

DoesExist(key As String) As Boolean

Looks for an object in the associative array linked to the specified key. If there is no associated object, then False is returned. If there is such an object, then True is returned.

Delete(key As String) As Boolean

Looks for an object in the associative array linked to the specified key. If there is such an object, then it is deleted and True is returned. If not, then False is returned.

Clear() As Void

Removes all objects from the associative array.

SetModeCaseSensitive() As Void

Makes all subsequent actions case sensitive. All lookups and created keys are case insensitive by default.

LookupCi(a As String) As Dynamic

Looks for an object in the array associated with the specified string. This method functions similarly to Lookup(), with the exception that key comparisons are always case insensitive, regardless of case mode.

Append(a As Object) As Void

Appends a second associative array to the first.

Example

```
aa = CreateObject("roAssociativeArray")
aa.AddReplace("Bright", "Sign")
aa.AddReplace("TMOL", 42)
print aa.Lookup("TMOL")
print aa.Lookup("Bright")
```

The above script produces the following:

```
42
Sign
```

ROBOOLEAN

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- Previous Versions

This is the object equivalent for the Boolean intrinsic type. It is useful in the following situations:

- **When an object is needed instead of an intrinsic value**: For example, if a Boolean is added to *roList*, it will be automatically wrapped in an *roBoolean* object by the language interpreter. When a function that expects a BrightScript component as a parameter is passed a Boolean, BrightScript automatically creates the equivalent BrightScript component.
- **When an object exposes the *ifBoolean* interface**: That object can then be used in any expression that expects an intrinsic value.

ifBoolean

GetBoolean() As Boolean

SetBoolean(a As Boolean)

ROBYTEARRAY

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This object contains functions for converting strings to or from a byte array, as well as to or from ASCII hex or ASCII base64. Note that if you are converting a byte array to a string, and the byte array contains a zero, the string conversion will end at that point.

The byte array will automatically resize to become larger as needed. If you wish to disable this behavior, use the `SetResize()` method. If an uninitialized index is read, Invalid is returned.

Since *roByteArray* supports the *ifArray* interface, it can be accessed with the `array []` operator. The byte array is always accessed as unsigned bytes while this interface is being used. This object also supports the *ifEnum* interface, and so can be used with a `FOR EACH` statement.

Interfaces: *ifByteArray*, *ifArray*, *ifArrayGet*, *ifEnum*, *ifArraySet*

`ifByteArray`

WriteFile(file_path As String) As Boolean

Writes the bytes contained in the byte array to the specified file. This method returns True if successful.

WriteFile(file_path As String, start_index As Integer, length As Integer) As Boolean

Writes a subset of the bytes contained in the byte array to the specified file. This method writes `length` bytes, beginning at `start_index` of the byte array.

ReadFile(file_path As String) As Boolean

Reads the specified file into the byte array. This operation will discard any data currently contained in the byte array.

ReadFile(file_path As String, start_index As Integer, length As Integer) As Boolean

Reads a section of the specified file into the byte array. This method reads `length` bytes, beginning at `start_index` of the file. This operation will discard any data currently contained in the byte array.

AppendFile(file_path As String) As Boolean

Appends the contents of the byte array to the specified file.

SetResize(minimum_allocation_size As Integer, autoresize As Boolean)

Expands the size of the byte array to the `minimum_allocation_size` if it is less than the `minimum_allocation_size`. This method also accepts a Boolean parameter that specifies whether the byte array should be resized automatically or not.

ToHexString() As String

Returns a hexadecimal string representation of the contents of the byte array. Each byte is represented as two hex digits.

FromHexString(hex_string As String)

Writes the contents of the passed hexadecimal string to the byte array. The passed string must contain an even number of hex digits. This operation will discard any data currently contained in the byte array.

ToBase64String() As String

Returns the contents of the byte array as a base64-formatted string.

FromBase64String(base_64_string As String)

Writes the contents of a valid base64-formatted string to the byte array. This operation will discard any data currently contained in the byte array.

ToAsciiString() As String

Returns the contents of the byte array as an ASCII-formatted string.

FromAsciiString(a As String)

Writes the contents of a valid ASCII-formatted string to the byte array. This operation will discard any data currently contained in the byte array.

GetSignedByte(index As Integer) As Integer

Returns the signed byte at the specified zero-based index in the byte array. To read an unsigned byte within a byte array, use the *ifArrayGet.GetEntry()*method or the [] array operator.

GetSignedLong(index As Integer) As Integer

Retrieves the integer located at the specified long-word index of the byte array. Note that this method cannot accept a byte index as its parameter.

IsLittleEndianCPU() As Boolean

Returns True if the CPU architecture is little-endian.

`ifArray`

Peek() As Dynamic

Returns the last (highest index) array entry without removing it.

Pop() As Dynamic

Returns the last (highest index) entry and removes it from the array.

Push(a As Dynamic)

Adds a new highest index entry to the end of the array.

Shift() As Dynamic

Removes index zero from the array and shifts all other entries down by one unit.

Unshift(a As Dynamic)

Adds a new index zero to the array and shifts all other entries up by one unit.

Delete(a As Integer) As Boolean

Deletes the indicated array entry and shifts all above entries down by one unit.

Count() As Integer

Returns the index of the highest entry in the array plus one (i.e. the length of the array).

Clear()

Deletes every entry in the array.

Append(a As Object)

Appends one *roArray* to another. If the passed *roArray* contains entries that were never set to a value, they are not appended.

> **Note**
> The two appended objects must be of the same type.

`ifEnum`

Reset()

Resets the position to the first element of enumeration.

Next() As Dynamic

Returns a typed value at the current position and increment position.

IsNext() As Boolean

Returns True if there is a next element.

IsEmpty() As Boolean

Returns True if there is not an exact statement.

`ifArrayGet`

GetEntry(a As Integer) As Dynamic

Returns an array entry of a given index. Entries start at zero. If an entry that has not been set is fetched, Invalid is returned.

`ifArraySet`

SetEntry(a As Integer, b As Dynamic)

Sets an entry of a given index to the passed type value.

RODOUBLE, ROINTRINSICDOUBLE

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`ifDouble`

GetDouble() As Double

SetDouble(a As Double)

ROFUNCTION

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`ifFunction`

GetSub() As Function

SetSub(value As Function)

ROINT, ROFLOAT, ROSTRING

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The intrinsic types `Int32`, `Float`, and `String` have object and interface equivalents. These are useful in the following situations:

- An object is needed instead of a typed value. For example, *roList* maintains a list of objects.
- If any object exposes the *ifInt*, *ifFloat*, or *ifString* interfaces, that object can be used in any expression that expects a typed value. For example, an *roTouchEvent* can be used as an integer whose value is the *userid* of the *roTouchEvent*.

If "o" is of type *roInt*, then these statements will have the following effects:

- `print o`: Prints the value of `o.GetInt()`
- `i%=o`: Assigns the integer `i%` the value of `o.GetInt().`
- `k=o`: Presumably `k` is automatically typed, so it becomes another reference to the *roInt* `o.`
- `o=5`: This is NOT the same as `o.SetInt(5)`. Instead it releases `o`, changes the type of `o` to *roINT32* (`o` is automatically typed), and assigns it to 5.

When a function that expects a BrightScript object as a parameter is passed an *int*, *float*, or *string*, BrightScript automatically creates the equivalent object.

`ifInt`

roInt contains the *ifInt* interface, which provides the following:

GetInt() As Integer

SetInt(value As Integer) As Void

`ifIntOps`

roInt also contains the *ifIntOps* interface, which provides the following:

ToStr() As String

Returns the integer value as a string. A space is not appended to the front for positive numbers.

`ifFloat`

roFloat contains *the* *ifFloat* interface, which provides the following:

GetFloat() As Float

SetFloat(value As Float) As Void

`ifString`

roString contains the *ifString* interface, which provides the following:

GetString() As String

SetString(value As String) As Void

`ifStringOps`

roString also contains the *ifStringOps* interface, which provides the following:

> **Note**
> Some global functions offer the same functionality as *ifStringOps* methods. The function indexes of *ifStringOps* methods start at zero, while those of global functions start at one.

SetString(str As String, str_len As Integer)

Sets a string using the specified string and string-length values. This is similar to the *roString.SetString()* method, which does not accept a parameter for string length.

AppendString(str As String, str_len As Integer)

Appends to a string using the specified string and string-length values. This method modifies itself—this can cause unexpected results when you pass an intrinsic string type, rather than a string object.

Example

```
x="string"
x.ifstringops.appendstring("ddd",3)
print x 'will print 'string'
y=box("string")
y.ifstringops.appendstring("ddd",3)
print y 'will print 'stringddd'
```

Len() As Integer

Returns the number of characters in a string.

GetEntityEncode() As String

Returns the string with certain characters replaced with HTML entity encoding sequences:

Character	Replaced with
`" (double quote)`	`&quot;`
`' (single quote)`	`&apos;`
`<`	`&lt;`
`>`	`&gt;`
`&`	`&amp;`

Tokenize(delim As String) As Object

Splits a string into substrings using the specified delimiter character(s). The `delim` parameter can contain one or more characters to treat as delimiters. If the string object contains multiple contiguous delimiters, they will be treated as a single delimiter. This method returns the substrings as an *roList* object; the delimiters are not returned with the substrings.

Example

```
BrightScript> s = "one&&two"
BrightScript> print s.Tokenize("&")
one
two
```

Trim() As String

Returns the string with any leading and trailing whitespace characters (e.g. TAB, LF, CR, VT, FF, NO-BREAK SPACE) removed.

ToInt() As Integer

Returns the value of the string as an integer number.

ToFloat() As Float

Returns the value of the string as a floating point number.

Left(n As Integer) As String

Returns the first n characters of the string.

Right(n As Integer) As String

Returns the last n characters of the string.

Mid(start_index As Integer) As String

Returns a subset of the string that begins at the zero-based `start_index` and terminates at the end of the string.

Mid(start_index As Integer, n As Integer) As String

Returns a subset of the string, beginning at the zero-based `start_index` and consisting of n characters. If the string contains fewer than n char acters after the specified `start_index`, this method will return all characters after the `start_index`.

Instr(substring As String) As Integer

Returns the zero-based index of the first occurence of the substring in the string. If the substring does not occur in the string, this method returns -1.

Instr(start_index As Integer, substring As String) As Integer

Returns the zero-based index of the first occurence of the substring after the specified `start_index` in the string. If the substring does not occur after the specified `start_index`, this method returns -1.

Example

```
BrightScript> o=CreateObject("roInt")
BrightScript> o.SetInt(555)
BrightScript> print o
555
BrightScript> print o.GetInt()
555
BrightScript> print o-55
500
```

An integer value of 5 is converted to type roInt automatically because the `AddTail()` method expects a BrightScript object as its parameter:

Example

```
BrightScript> list=CreateObject("roList")
BrightScript> list.AddTail(5)
BrightScript> print type(list.GetTail())
```

Here the `ListDir()` method returns an *roList* object containing *roString* objects:

Example

```
BrightScript> l=ListDir("/")
BrightScript> for i=1 to l.Count():print l.RemoveHead():next
test_movie_3.vob
test_movie_4.vob
test_movie_1.vob
test_movie_2.vob
```

ROLIST

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This object functions as a general-purpose, doubly linked list. It can be used as a container for arbitrary-length lists of BrightSign objects. The array operator [ ] can be used to access any element in an ordered list.

`ifList`

Count() As Integer

Returns the number of elements in the list.

ResetIndex() As Boolean

Resets the current index or position in the list to the head element.

AddTail(obj As Object) As Void

Adds a typed value to the tail of the list.

AddHead(obj As Object) As Void

Adds a typed value to the head of the list.

RemoveIndex() As Object

Removes an entry from the list at the current index or position and increments the index or position in the list. It returns Invalid when the end of the list is reached.

GetIndex() As Object

Retrieves an entry from the list at the current index or position and increments the index or position in the list. It returns Invalid when the end of the list is reached.

RemoveTail() As Object

Removes the entry at the tail of the list.

RemoveHead() As Object

Removes the entry at the head of the list.

GetTail() As Object

Retrieves the entry at the tail of the list and keeps the entry in the list.

GetHead() As Object

Retrieves the entry at the head of the list and keeps the entry in the list.

Clear()

Removes all elements from the list.

`ifEnum`

Reset()

Resets the position to the first element of enumeration.

Next() As Dynamic

Returns a typed value at the current position and increment position.

IsNext() As Boolean

Returns True if there is a next element.

IsEmpty() As Boolean

Returns True if there is not an exact statement.

`ifArray`

Peek() As Dynamic

Returns the last (highest index) array entry without removing it.

Pop() As Dynamic

Returns the last (highest index) entry and removes it from the array.

Push(a As Dynamic)

Adds a new highest index entry to the end of the array.

Shift() As Dynamic

Removes index zero from the array and shifts all other entries down by one unit.

Unshift(a As Dynamic)

Adds a new index zero to the array and shifts all other entries up by one unit.

Delete(a As Integer) As Boolean

Deletes the indicated array entry and shifts all above entries down by one unit.

Count() As Integer

Returns the index of the highest entry in the array plus one (i.e. the length of the array).

Clear() As Void

Deletes every entry in the array.

Append(a As Object)

Appends one *roArray* to another. If the passed *roArray* contains entries that were never set to a value, they are not appended.

Note
The two appended objects must be of the same type.

`ifArrayGet`

GetEntry(a As Integer) As Dynamic

Returns an array entry of a given index. Entries start at zero. If an entry that has not been set is fetched, Invalid is returned.

`ifArraySet`

SetEntry(a As Integer, b As Dynamic)

Sets an entry of a given index to the passed type value.

Example

```
list = CreateObject("roList")
list.AddTail("a")
list.AddTail("b")
list.AddTail("c")
list.AddTail("d")
list.ResetIndex()
x= list.GetIndex()
while x <> invalid
print x
x = list.GetIndex()
end while
print list[2]
```

ROMESSAGEPORT

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A message port is the destination where messages (events) are sent. See the explanation of Event Loops for more details. You do not call these functions directly when using BrightScript. Instead, use the `Wait()` global function.

`ifMessagePort`

GetMessage() As Object

WaitMessage(timeout As Integer) As Object

PostMessage(msg As Object) As Void

PeekMessage() As Object

SetWatchdogTimeout(seconds As Integer) As Integer

Enables a watchdog timeout on the *roMessagePort* instance. The watchdog on *roMessagePort* is disabled by default. Passing a positive integer to this method instructs the watchdog to crash and reboot the player if `GetMessage()` or `WaitMessage()` does not return after the specified number of seconds. Passing zero to this method disables the watchdog again.

> **Note**
> The watchdog timeout will not trigger while waiting on the BrightScript debugger prompt.

DeferWatchdog(a As Integer)

Defers the watchdog timeout set by the `SetWatchdogTimeout()` method. Passing an integer to this method defers the timeout for the specified number of seconds.

DeferWatchdog()

Defers the watchdog timeout by the amount of seconds set in the `SetWatchdogTimeout()` method.

> **Note**
> Calls to either DeferWatchdog() method cannot cause the watchdog to trigger earlier than it already will. For example, calling DeferWatchdog(100) followed by DeferWatchdog(10) will still cause the watchdog to trigger after 100 seconds.

`ifEnum`

Reset()

Resets the position to the first element of enumeration.

Next() As Dynamic

Returns the typed value at the current position and increment position.

IsNext() As Boolean

Returns True if there is a next element.

IsEmpty() As Boolean

Returns True if there is not a next element.

ROREGEX

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This object allows the implementation of the regular-expression processing provided by the PCRE library. This object is created with a string to represent the "matching-pattern" and a string to indicate flags that modify the behavior of one or more matching operations:

```
CreateObject("roRegex", "[a-z]+", "i")
```

The match string (in the example above, `"[a-z]+"`, which matches all lowercase letters) can include most Perl compatible regular expressions found in the PCRE documentation.
This object supports any combination of the following behavior flags (in the example above, "i", which can be modified to match both uppercase and lowercase letters):

- `"i"`: Case-insensitive match mode.
- `"m"`: Multiline mode. The start-line ("^") and end-line ("$") constructs match immediately before or after any newline in the subject string. They also match at the absolute beginning or end of a string.
- `"s"`: Dot-all mode, which includes a newline in the ".*" regular expression. This modifier is equivalent to "/s" in Perl.
- `"x"`: Extended mode, which ignores whitespace characters except when escaped or inside a character class. This modifier is equivalent to "/x" in Perl.

`ifRegex`

IsMatch(a As String) As Boolean

Returns True if the string is consistent with the matching pattern.

Match(a As String) As roArray

Returns an *roArray* of matched substrings from the string. The entire match is returned in the form array[0].This will be the only entry in the array if there are no parenthetical substrings. If the matching pattern contains parenthetical substrings, the relevant substrings will be returned as an array of length n+1, where array[0] is the entire match and each additional entry in the array is the match for the corresponding parenthetical expression.

Replace(a As String, b As String) As String

Replaces the first occurrence of a match to the matching pattern in the string with the subset. The subset may contain numbered back-references to parenthetical substrings.

ReplaceAll(a As String, b As String) As String

Performs a global search and replace.

Split(a As String) As roList

Uses the matching pattern as a delimiter and splits the string on the delimiter boundaries. The function returns an*roList* of strings that were separated by the matching pattern in the original string.

ROXMLELEMENT

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This object is used to contain an XML tree.

The *roXMLElement* object is created with no parameters:

```
CreateObject("roXMLElement")
```

The following examples illustrate how XML elements are parsed in BrightScript:

```
<tag1>This is example text</tag1>
```

- Name = tag1
- Attributes = Invalid
- Body = *roString* containing "This is example text"

```
<tag2 caveman="barney"/>
```

- Name = tag2
- Attributes = *roAssociativeArray* with one entry, {caveman, barney}
- Body = Invalid

If the tag contains other tags, the body will be of the type *roXMLList*.

To generate XML content, create an *roXMLElement* and call the `SetBody()` and `SetName()` methods to build it–then call the `GenXML()` metho d to generate it.

Example

```
root.SetName("myroot")
root.AddAttribute("key1","value1")
root.AddAttribute("key2","value2")
ne=root.AddBodyElement()
ne.SetName("sub")
ne.SetBody("this is the sub1 text")
ne=root.AddBodyElement()
ne.SetName("subelement2")
ne.SetBody("more sub text")
ne.AddAttribute("k","v")
ne=root.AddElement("subelement3")
ne.SetBody("more sub text 3")
root.AddElementWithBody("sub","another sub (#4)")
PrintXML(root, 0)
print root.GenXML(false)
```

`ifXMLElement`

GetBody() As Object

GetAttributes() As Object

GetName() As String

GetText() As String

GetChildElements() As Object

GetNamedElements(a As String) As Object

GetNamedElementsCi(a As String) As Object

SetBody(a As Object)

Generates an *roXMLList* for the body if needed. The method then adds the passed item (which should be an *roXMLElement* tag).

AddBodyElement() As Object

AddElement(a As String) As Object

AddElementWithBody(a As String, b As Object) As Object

AddAttribute(a As String, b As String)

SetName(a As String)

Parse(a As String) As Boolean

Parses the XML content passed to it. In the event of failure, this method returns False. However, it also populates *roXMLElement* with whatever text could be successfully parsed. To avoid passing along erroneous strings, it is always best to have the script check the return value of `Parse()` before using them.

GenXML(a As Object) As String

Generates XML content. This method takes a single Boolean parameter, indicating whether or not the XML should have an `<?xml …>` tag at the top.

Clear() As Void

GenXMLHdr(a As String) As String

IsName(a As String) As Boolean

HasAttribute(a As String) As Boolean

ParseFile(a As String) As Boolean

The following is an example subroutine to print out the contents of an *roXMLElement* tree:

```
PrintXML(root, 0)

Sub PrintXML(element As Object, depth As Integer)
    print tab(depth*3);"Name: ";element.GetName()
    if not element.GetAttributes().IsEmpty() then
        print tab(depth*3);"Attributes: ";
        for each a in element.GetAttributes()
            print a;"=";left(element.GetAttributes()[a], 20);
            if element.GetAttributes().IsNext() then print ", ";
        end for
        print
    end if
    if element.GetText()<>invalid then
        print tab(depth*3);"Contains Text: ";left(element.GetText(), 40)
    end if
    if element.GetChildElements()<>invalid
        print tab(depth*3);"Contains roXMLList:"
        for each e in element.GetChildElements()
            PrintXML(e, depth+1)
        end for
    end if
    print
end sub
```

ROXMLLIST

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`ifXMLList`

Simplify() As Object

Returns an *roXmlElement* if the list contains exactly one element. Otherwise, it will return itself.

GetAttributes() As Object

GetText() As String

GetChildElements() As Object

GetNamedElements(a As String) As Object

Returns a new XMLList that contains all *roXmlElements* that match the name of the passed element. This action is the same as using the dot operator on an *roXmlList*.

GetNamedElementsCi(a As String) As Object

`ifList`

Count() As Integer

Returns the number of elements in the list.

ResetIndex() As Boolean

Resets the current index or position in the list to the head element.

AddTail(obj As Object) As Void

Adds a typed value to the tail of the list.

AddHead(obj As Object) As Void

Adds a typed value to the head of the list.

RemoveIndex() As Object

Removes an entry from the list at the current index or position and increments the index or position in the list. It returns Invalid when the end of the list is reached.

GetIndex() As Object

Retrieves an entry from the list at the current index or position and increments the index or position in the list. It returns Invalid when the end of the list is reached.

RemoveTail() As Object

Removes the entry at the tail of the list.

RemoveHead() As Object

Removes the entry at the head of the list.

GetTail() As Object

Retrieves the entry at the tail of the list and keeps the entry in the list.

GetHead() As Object

Retrieves the entry at the head of the list and keeps the entry in the list.

Clear() As Void

Removes all elements from the list.

`ifEnum`

Reset()

Resets the position to the first element of enumeration.

Next() As Dynamic

Returns a typed value at the current position and increment position.

IsNext() As Boolean

Returns True if there is a next element.

IsEmpty() As Boolean

Returns True if there is not an exact statement.

`ifArray`

Peek() As Dynamic

Returns the last (highest index) array entry without removing it.

Pop() As Dynamic

Returns the last (highest index) entry and removes it from the array.

Push(a As Dynamic)

Adds a new highest index entry to the end of the array.

Shift() As Dynamic

Removes index zero from the array and shifts all other entries down by one unit.

Unshift(a As Dynamic)

Adds a new index zero to the array and shifts all other entries up by one unit.

Delete(a As Integer) As Boolean

Deletes the indicated array entry and shifts all above entries down by one unit.

Count() As Integer

Returns the index of the highest entry in the array plus one (i.e. the length of the array).

Clear() As Void

Deletes every entry in the array.

Append(a As Object) As Void

Appends one *roArray* to another. If the passed *roArray* contains entries that were never set to a value, they are not appended.

> **Note**
> The two appended objects must be of the same type.

`ifArrayGet`

GetEntry(a As Integer) As Dynamic

Returns an array entry of a given index. Entries start at zero. If an entry that has not been set is fetched, Invalid is returned.

`ifArraySet`

SetEntry(a As Integer, b As Dynamic) As Void

Sets an entry of a given index to the passed type value.

Presentation and Widget Objects

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This section describes objects that relate directly to audio/video playback on BrightSign players.

- roAudioEventMx
- roAudioOutput
- roAudioPlayer
- roAudioPlayerMx
- roCanvasWidget
- roClockWidget
- roHdmiInputChanged, roHdmiOutputChanged

ROAUDIOEVENTMX

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- Previous Versions

The *roAudioPlayerMx* object can generate *roAudioEventMx* messages with the following values:

- 8 EVENT_MEDIAENDED
- 14 EVENT_OVERLAY_MEDIAENDED
- 16 EVENT_MEDIAERROR
- 17 EVENT_OVERLAY_MEDIAERROR

"Media ended" events are sent when a track finishes and there are no more queued tracks for the player, while "Media error" events are sent when a queued file is not found (e.g. when it does not exist).

`ifInt`

GetInt() As Integer

SetInt(a As Integer)

`ifSourceIdentity`

GetSourceIdentity() As Integer

SetSourceIdentity() As Integer

`ifAudioUserData`

GetSourceIdentity() As Integer

SetSourceIdentity() As Integer

ROAUDIOOUTPUT

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This object allows individual control of audio outputs on the player.

Object Creation: The *roAudioOutput* object requires a single output parameter upon creation.

```
CreateObject("roAudioOutput", output As String)
```

The `output` parameter can take the following strings:

- "Analog"
- "SPDIF"
- "HDMI"
- "USB"
- "NONE"

These strings can be extended if future BrightSign players have multiple channels of the same type of audio output. For example, "Analog" could be extended to "Analog:1" or "Analog:0-2".

You can create any number of *roAudioOutput* objects. There can be multiple instances of this object that represent the same audio output, but in these cases one object will override another.

`ifAudioOutput`

SetVolume(a As Integer) As Boolean

Sets the volume of the specified output as a percentage represented by an integer between 0 and 100.

SetTone(treble As Integer, bass As Integer) As Boolean

Sets the treble and bass of the specified output. The treble and bass integers can range from -1000 to 1000, with 0 indicating no modification to the audio signal. Each increment represents a change of 0.01db.

SetMute(a As Boolean) As Boolean

Mutes the specified output if True. This method is set to False by default.

GetOutput() As String

Returns the string with which the *roAudioOutput* object was created.

SetAudioDelay(delay_in_milliseconds As Integer) As Boolean

Delays the audio for a specific audio output by lagging decoded samples before they reach that output. Delays are limited to 150ms or less. Currently, the system software only supports positive delays; therefore, if you need to set the audio ahead of the video, you will need to use *roVideoPlayer.SetVideoDelay()* instead.

The `SetVolume()` and `SetMute()` methods work in conjunction with the volume and mute functionality offered by *roAudioPlayer*. The *roAudioP layer* volume settings affect the audio decoder volume. The audio stream is then sent to the assigned outputs, which have an additional level of volume control enabled by *roAudioOutput*.

The *roAudioOutput* object affects the absolute volume (as well as mute settings) for an audio output. If two players are streaming to the same output, both will be affected by any settings implemented through *roAudioOutput*.

Note
To control which audio outputs connect to audio player outputs generated by *roAudioOutput*, use the SetPcmAudioOutputs() and SetCompressedAudioOutputs() methods, which can be used for *roVideoPlayer* and *roAudioPlayer*. See the *roAudioPlayer* entry for further explanation of these methods.

ROAUDIOPLAYER

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An audio player is used to play back audio files using the generic *ifMediaTransport* interface. If the message port is set, the object will send events of the type *roAudioEvent*. All object calls are asynchronous. In other words, audio playback is handled in a different thread from the script. The script may continue to run while audio is playing.

`IfIdentity`

GetIdentity() As Integer

`ifMessagePort`

SetPort(As Object) As Void

SetPort(a As Object)

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

`ifMediaTransport`

See *roVideoPlayer* for a description of *ifMediaTransport* methods.

`ifAudioControl`

SetPcmAudioOutputs(outputs As roArray) As Boolean

Specifies which audio connectors should output PCM audio. This method accepts one or more outputs in the form of an *roArray* of *roAudioOutput* instances.

SetCompressedAudioOutputs(outputs As roArray) As Boolean

Specifies which audio connectors should output compressed audio (e.g. Dolby AC3 encoded audio). This method accepts one or more outputs in the form of an *roArray* of *roAudioOutput* instances. When one or both of the above output methods are called, they will override the settings of the following *ifAudioControl* methods: `SetAudioOutput(), MapStereoOutput(), SetUsbAudioPort(), MapDigitalOutput()`.

SetMultichannelAudioOutputs(array As Object) As Boolean

SetAudioOutput(audio_output As Integer) As Boolean

SetAudioMode(audio_mode As Integer) As Boolean

MapStereoOutput(mapping As Integer) As Boolean

MapDigitalOutput(mapping As Integer) As Boolean

SetVolume(volume As Dynamic) As Boolean

Specifies the volume of the audio output as either a percentage or decibel amount. To use a percentage measurement, pass an integer value between 0 and 100. To use a decibel measurement, pass an *roAssociativeArray* containing a single {db:<value As Float>} parameter. The decibel measurement is an absolute value: passing 0 specifies no change to the audio output, and the effective range of measurements is from aprrroximately -80 to 20 decibels.

SetChannelVolumes(channel_mask As Integer, volume As Integer) As Boolean

SetUsbAudioPort(a As Integer) As Boolean

SetSpdifMute(a As Boolean) As Boolean

StoreEncryptionKey(a As String, b As String) As Boolean

StoreObfuscatedEncryptionKey(a As String, b As String) As Boolean

SetStereoMappingSpan(a As Integer) As Boolean

ConfigureAudioResources() As Boolean

SetAudioStream(stream_index As Integer) As Boolean

SetAudioDelay(delay_in_milliseconds As Integer) As Boolean

Adds a presentation time stamp (PTS) offset to the audio. This makes it possible to adjust for file multiplexing differences. Delays are limited to 150ms or less. Currently, the system software only supports positive delays; therefore, if you need to set the audio ahead of the video, you will need to use `SetVideoDelay()` instead.

SetVideoDelay(delay_in_milliseconds As Integer) As Boolean

Adds a presentation time stamp (PTS) offset to the video. This makes it possible to adjust for file multiplexing differences. Delays are limited to 150ms or less.

HD2000 Only:

SetAudioOutputAux(audio_output As Integer) As Boolean

SetAudioModeAux(audio_mode As Integer) As Boolean

MapStereoOutputAux(mapping As Integer) As BooleanSetVolumeAux(volume As Integer) As Boolean

SetChannelVolumesAux(channel_mask As Integer, volume As Integer) As Boolean

SetAudioStreamAux(stream_index As Integer) As Boolean

If a video file is playing or has played, you need to call *roVideoPlayer.Stop()* before changing the audio output.

The following script shows how to use the `SetPcmAudioOutputs()` and `SetCompressedAudioOutputs()` methods in conjunction with *roAudioOutput*. The video player is configured to output decoded audio to the analog output or compressed audio to the HDMI and SPDIF outputs.

```
ao1=CreateObject("roAudioOutput", "Analog")
ao2=CreateObject("roAudioOutput", "HDMI")
ao3=CreateObject("roAudioOutput", "SPDIF")


v1=CreateObject("roVideoPlayer")
v1.SetPcmAudioOutputs(ao1)
```

--or--

```
ar = CreateObject("roArray", 2, true)
ar[0] = ao2
ar[1] = ao3
v1.SetCompressedAudioOutputs(ar)
```

In most cases, rerouting audio outputs during audio/video playback will cause playback to stop. The system software will still be responsive, so you can use commands to exit playback during or following an audio output modification.

audio_output values

0 – Analog audio
1 – USB audio
2 – Digital audio, stereo PCM
3 – Digital audio, raw AC3
4 – Onboard analog audio with HDMI mirroring raw AC3

digital audio values

0 – Onboard HDMI
1 – SPDIF from expansion module

audio_mode values

Options 0 and 1 only apply to video files, while option 2 applies to all audio sources.
0 – AC3 Surround
1 – AC3 mixed down to stereo
2 – No audio
3 – Left
4 – Right

mapping values

Use mapping values to select which analog output to use if `audio_output` is set to 0.
0 – Stereo audio is mapped to onboard analog output
1 – Stereo audio is mapped to expansion module leftmost output
2 – Stereo audio is mapped to expansion module middle output
3 – Stereo audio is mapped to expansion module rightmost output

set_volume

Volume functions as a percentage and therefore takes a value between 0-100. The volume value is clipped prior to use (i.e. `SetVoume(101)` will set the volume to 100 and return True). The volume is the same for all mapped outputs and USB/SPDIF/analog.

Separate volume levels are stored for roAudioPlayer and roVideoPlayer.

set_channel_volumes

You can control the volume of individual audio channels. This volume command takes a hex channel mask, which determines the channels to apply the volume to, and a level, which is a percentage of the full scale. The volume control works according to audio channel rather than the output. The channel mask is a bit mask with the following bits for MP3 output:

- &H01 Left
- &H02 Right
- &H03 Both left and right

This code sets audio output to the rightmost expansion module audio port.

```
video = CreateObject("roVideoPlayer")
video.SetAudioOutput(0)
video.MapStereoOutput(3)
```

This code sets the volume level for individual channels.

```
audio = CreateObject("roAudioPlayer")
audio.SetChannelVolumes(&H01, 60)      ‘left channel to 60%
audio.SetChannelVolumes(&H02, 75)      ‘right channel to 75%
audio.SetChannelVolumes(&H03, 65)      ‘all channels to 65%
```

Playing Multiple Audio Files Simultaneously

Multiple MP3 files, as well as the audio track of a video file, can be played to any combination of the following:

- Analog outputs
- SPDIF / HDMI
- USB

Only a single file can be sent to an output at any given time. For example, two *roAudioPlayers* cannot simultaneously play to the SPDIF output. The second one to attempt a *PlayFile* will get an error. To free an output, the audio or video stream must be stopped (using the *ifMediaTransport* `Stop` or `StopClear` calls).

Note the following about multiple audio-file functionality:

- The onboard analog audio output and HDMI output are clocked by the same sample-rate clock. Therefore, if different content is being played out of each, the content must have the same sample rate.
- Currently, only a single set of USB speakers is supported.
- Each audio and video stream played consumes some of the finite CPU resources. The amount consumed depends on the bitrates of the streams. Testing is the only way to determine whether a given set of audio files can be played at the same time as a video. The maximum recommended usage is a 16Mbps video file with three simultaneous MP3 160kbps streams.

This code plays a video with audio over HDMI and an MP3 file to the onboard analog port.

```
video=CreateObject("roVideoPlayer")

video.SetAudioOutput(3)
video.PlayFile("video.mpg")

audio=CreateObject("roAudioPlayer")

audio.MapStereoOutput(0)
audio.PlayFile("audio.mp3")
```

ROAUDIOPLAYERMX

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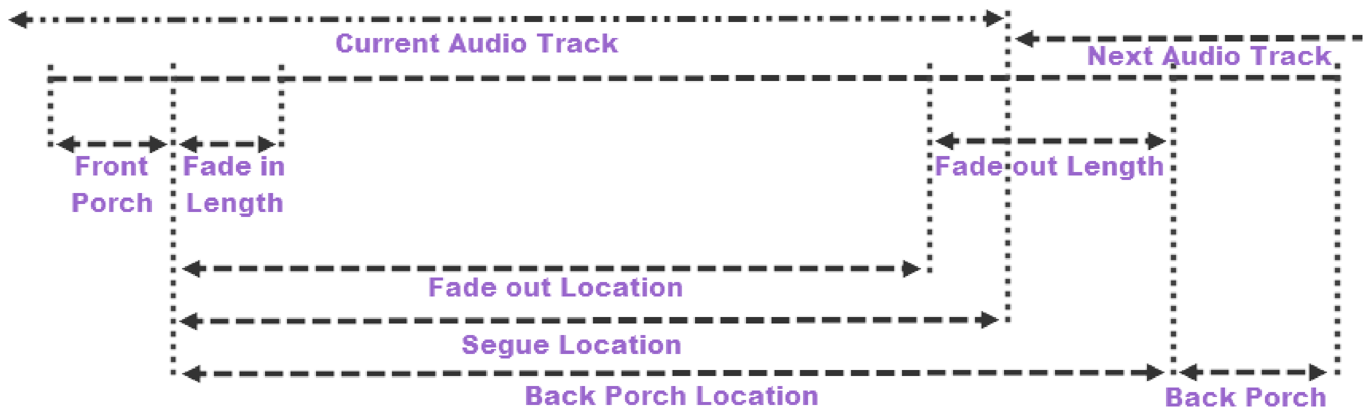
This object allows you to mix audio files, as well as HLS audio streams. Each roAudioPlayerMx object contains two internal audio players: The main audio playlist consists of queued audio tracks that play sequentially, while the audio overlay plays files on top of the main playlist. A fade will not occur if it is called while an overlay is playing, but the next audio track will start playing as expected.

Tracks are queued to PlayFile with their fade parameters specified in an associative array. These are the parameters you can pass to PlayFile:

- `Filename`: The filename of the track
- `FrontPorch`: The length (in milliseconds) to skip from the start of the track. This value is 0 by default.
- `FadeOutLocation`: The location (in milliseconds) of the fade out relative to the value of the FrontPorch. If the FrontPorch value is 0 (which is the default setting), and the FadeOutLength value is non-zero, then the fade out is calculated back from the end of the file.
- `FadeOutLength`: The length of the fade out (in milliseconds). This value is 0 by default.
- `SegueLocation`: The location (in milliseconds) of the event that triggers the next audio file to play. This location is relative to the first audio file that is played. If the SegueLocation parameter is not included, the value defaults to the FadeOutLocation.
- `BackPorchLocation`: The location (in milliseconds) of the termination point for the audio track. This location is relative to the first audio file that is played. If the BackPorchLocation parameter is not included, the audio file plays to the end. The value is 0 by default, which disables the back porch.
- `TrackVolume`: The relative volume of of the audio track, measured as a percentage. Specify the percentage using values between 0 and 100.
- `EventID`: The ID for an audio event.
- `EventTimeStamp`: The timestamp for the audio event. There can only be one event per audio file.
- `QueueNext`: The queuing of an audio track. Set the parameter value to 1 to queue an audio file to play after the current track.
- `Overlay`: The overlay specification of an audio track. Set the parameter value to 1 to fade down the main audio playlist while playing the audio track as an overaly. Overlays have additional parameters:
  - `AudioBedLevel`: The volume-level percentage of the main audio playlist while the overlay is playing. Specify the percentage using values between 0 and 100.
  - `AudioBedFadeOutLength`: The fade-out length of the main audio playlist.

    - `AudioBedFadeInLength`: The fade-in lenth for the length of the underlying audio track once the segue is triggered.
- `FadeCurrentPlayNext`: A fade command. Set the parameter value to 1 to fade out the current main audio playlist track and fade in the designated audio file.
- `CrossfadeCurrentPlayNext`: A crossfade command. Set the parameter value to 1 to force an immediate crossfade between the current main audio playlist track and the designated audio file.
- `UserString`: A string that can be set to a unique value for each *roAudioPlayerMx* instance. This string is returned with every event generated by the instance. Since all current platforms can support multiple *roAudioPlayerMx* instances running at the same time, the UserString allows the script to distinguish between event returns.

The following diagram illustrates how some of these timing parameters work together:



The following script illustrates a simple crossfade between audio tracks:

```
a = CreateObject("roAudioPlayerMx")

track1 = CreateObject("roAssociativeArray")
track1["Filename"] = "file1.mp3"
track1["FadeInLength"] = 4000
track1["FadeOutLength"] = 4000
track1["QueueNext"] = 1

track2 = CreateObject("roAssociativeArray")
track2["Filename"] = "file2.mp3"
track2["FadeInLength"] = 4000
track2["FadeOutLength"] = 4000
track2["QueueNext"] = 1

a.PlayFile(track1)
a.PlayFile(track2)
```

`ifMediaTransport`

PlayFile(a As Object) As Boolean

Stop() As Boolean

Play() As Boolean

Pause() As Boolean

Resume() As Boolean

SetLoopMode(a As Boolean) As Boolean

GetPlaybackStatus() As Object

`ifSetMessagePort`

SetPort(a As Object)

`ifAudioControl`

MapStereoOutput(a As Integer) As Boolean

SetVolume(a As Integer) As Boolean

SetChannelVolumes(a As Integer, b As Integer) As Boolean

SetAudioOutput(a As Integer) As Boolean

SetAudioMode(a As Integer) As Boolean

SetAudioStream(a As Integer) As Boolean

SetUsbAudioPort(a As Integer) As Boolean

SetSpdifMute(a As Boolean) As Boolean

MapDigitalOutput(a As Integer) As Boolean

StoreEncryptionKey(a As String, b As String) As Boolean

StoreObfuscatedEncryptionKey(a As String, b As String) As Boolean

SetStereoMappingSpan(a As Integer) As Boolean

ConfigureAudioResources() As Boolean

SetPcmAudioOutputs(a As Object) As Boolean

SetCompressedAudioOutputs(a As Object) As Boolean

`ifIdentity`

GetIdentity() As Integer

`ifAudioControlMx`

SetDecoderCount(a As Integer) As Boolean

ROCANVASWIDGET

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This object composites background color, text, and images into a single rectangle, allowing you to layer images on a z-axis.

Object Creation: Like other widgets, *roCanvasWidget* is created with an *roRectangle* to set its size and position on the screen.

```
CreateObject ("roCanvasWidget", r As roRectangle) As Object
```

ifCanvasWidget

Hide() As Boolean

Hides the widget.

Show() As Boolean

Shows the widget.

SetRectangle(r As roRectangle) As Boolean

Changes the size and positioning of the widget rectangle using the passed *roRectangle* object.

SetLayer(content As Object, z-level As Integer) As Boolean

Sets the contents of a layer within the widget. The lowest z-level is drawn first, and the highest z-level is drawn last. The object content is described below.

ClearLayer(z-level As Integer) As Boolean

Clears the specified layer.

Clear() As Boolean

Clears all of the layers.

EnableAutoRedraw(enable As Boolean) As Boolean

Enables or disables the automatic redrawing of the widget.

- When this function is enabled, each call to SetLayer, ClearLayer, or Clear results in a redraw. If you need to change multiple layers, then you should disable auto redraw while calling the SetLayer function.
- SetLayer enables or disables redrawing of the widget when layer content is changed. When auto-redraw is enabled, each call to SetLayer, ClearLayer, or Clear results in a redraw. To batch multiple updates together, you should first suspend drawing using EnableAutoRedraw(false), then make the changes to the content, and finally re-enable drawing using EnableAutoRedraw(true). The redraw happens in a separate thread, so EnableAutoRedraw returns almost immediately.

`Object Content`

The content specified in each layer can consist of one or more objects. Each object is defined by an *roAssociativeArray*. If there is more than one object, then each is placed into an *roArray* prior to passing to the `SetLayer()` method. Currently, there are four object types.

Background color

- `color`: The #[aa]rrggbb hex value of the background color
- `targetRect`: A target rectangle, which is another *roAssociativeArray* consisting of x, y, w, and h values. These values are relative to the top left corner of the widget.

Text

- `text`: A string of text to display
- `targetRect`: The rectangle in which the text is displayed
- `textAttrs`: An *roAssociativeArray* containing attributes to be applied to the text. The attributes can be any of the following:
    - `font`: A string indicating whether the text should be displayed as "small"/"medium"/"large"/"huge"
    - `fontSize`: A point size that is used directly when creating the font. If the value is set to 0, then the font automatically resizes to fit the targetRect.
    - `fontfile`: The filename for a non-system font to use
    - `hAlign`: A string indicating the "left"/"center"/"right" alignment of the text on a line
    - `vAlign`: A string indicating the "top"/"center"/"bottom" alignment of the text perpendicular to the line
    - `rotation`: A string indicating the "0"/"90"/"180"/"270" degree rotation of the text
    - `color`: The #[aa]rrggbb hex value of the text

Image

- `filename`: The filename of the image
- `encryptionalgorithm`: The file-encryption algorithm. Currently the options are "AesCtr" and "AesCtrHmac".
- `encryptionkey`: The key to decrypt the image file. This is a byte array consisting of 128 bits of key, followed by 128 bits of IV.

Note
See the Image Decryption section in the *roImagePlayer* entry for details on displaying encrypted images.

- `targetRect`: The rectangle in which the image is displayed. The image will be automatically resized to fit into the target area.
- `sourceRect`: The source rectangle to clip from a source image
- `compositionMode`: Enter either source or source_over. The latter alpha blends with underlying objects. The former replaces the underlying values completely.
- `imgAttrs`: An *roAssociativeArray* containing attributes to be applied to the image:
    - `rotation`: A string indicating the "0"/"90"/"180"/"270" degree rotation of the image

QR Codes

QR (quick response) codes appear as squares of black dots on a white background. They are used to encode URLs, email addresses, etc, and they can be scanned using readily available software for smart phones. Although the codes usually appear as black on white, you can, in theory, use any two contrasting colors.

- `targetRect`: The rectangle in which the QR code is displayed. Regardless of the aspect ratio of this rectangle, the QR code itself will always be squared with the background color that fills the gaps.
- `QrCode` (simple form): Contains the string to encode into the QR code.
- `QrCode` (complex form): Contains an array of parameters for the QR code. The parameters can be any of the following:
    - `color`: The foreground color in the QR code (the default is black)
    - `backgroundColor`: The background color in the QR code (the default is white)
    - `rotation`: A string indicating the "0"/"90"/"180"/"270" degree rotation of the code. The code will scan regardless of rotation.
    - `qrText`: Contains the text to encode into the QR code.

This code contains most of the *roCanvasWidget* features outlined above:

```
rect=CreateObject("roRectangle", 0, 0, 1920, 1080)
cw=CreateObject("roCanvasWidget", rect)

aa=CreateObject("roAssociativeArray")
aa["text"] = "Primal Scream"
aa["targetRect"] = { x: 280, y: 180, w: 500, h: 30 }
aa["textAttrs"] = { Color:"#AAAAAA", font:"Medium", HAlign:"Left", VAlign:"Top"}

aa1=CreateObject("roAssociativeArray")
aa1["text"] = "Movin' on up, followed by something else, followed by something else, followed
by something else, followed by something else"
aa1["targetRect"] = { x: 282, y: 215, w: 80, h: 500 }
aa1["textAttrs"] = { Color:"#ffffff", font:"Large", fontfile:"usb1:/GiddyupStd.otf",
HAlign:"Left", VAlign:"Top", rotation:"90"}

array=CreateObject("roArray", 10, false)
array.Push({ color: "5c5d5f" })
array.Push({ filename: "transparent-balls.png" })
array.Push(aa)

aa2=CreateObject("roAssociativeArray")
aa2["filename"] = "transparent-balls.png"
aa2["CompositionMode"] = "source_over"
aa2["targetRect"] = { x: 400, y: 200, w: 200, h: 200 }

aa3=CreateObject("roAssociativeArray")
aa3["QrCode"] = "www.brightsign.biz"
aa3["targetRect"] = { x: 100,  y: 100,  w: 400, h: 400  }

aa4=CreateObject("roAssociativeArray")
aa4["QrCode"] = { qrText:"www.brightsign.biz", rotation:"90" }
aa4["targetRect"] = { x: 1200,  y: 100,  w: 400, h: 600  }

aa5=CreateObject("roAssociativeArray")
aa5["QrCode"] = { color:"#964969", backgroundColor:"#FFFF77", qrText:"www.brightsign.biz",
rotation:"180" }
aa5["targetRect"] = { x: 100,  y: 600,  w: 400, h: 400  }

cw.Show()
cw.EnableAutoRedraw(0)
cw.SetLayer(array, 0)
cw.SetLayer(aa1, 1)
cw.SetLayer(aa1, 2)
cw.SetLayer(aa3, 3)
cw.SetLayer(aa4, 4)
cw.SetLayer(aa5, 5)
cw.EnableAutoRedraw(1)

cw.ClearLayer(0)
```

ROCLOCKWIDGET

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This object places a clock on the screen. It has construction arguments only.

Object Creation: The *roClockWidget* object is created with several parameters.

```
CreateObject("roClockWidget", rect As roRectangle, res As roResourceManager, display_type As
Integer)
```

- `rect`: The rectangle in which the clock is displayed. The widget picks a font based on the size of the rectangle.
- `res`: A *resources.txt* file that allows localization via the *roResourceManager* object (see below for further details).
- `display_type`: Use 0 for date only, and 1 for clock only. To show both on the screen, you need to create two widgets.

Example

```
rect=CreateObject("roRectangle", 0, 0, 300, 60)
res=CreateObject("roResourceManager", "resources.txt")
c=CreateObject("roClockWidget", rect, res, 1)
c.Show()
```

The resource manager is passed into the widget, which uses the following resources within the *resources.txt* file to display the time and date correctly. Here are the "eng" entries:

```
[CLOCK_DATE_FORMAT]
eng "%A, %B %e, %Y"
[CLOCK_TIME_FORMAT]
eng "%l:%M"
[CLOCK_TIME_AM]
eng "AM"
[CLOCK_TIME_PM]
eng "PM"
[CLOCK_DATE_SHORT_MONTH]
eng "Jan|Feb|Mar|Apr|May|Jun|Jul|Aug|Sep|Oct|Nov|Dec"
[CLOCK_DATE_LONG_MONTH]
eng
"January|February|March|April|May|June|July|August|September|October|November|December"
[CLOCK_DATE_SHORT_DAY]
eng "Sun|Mon|Tue|Wed|Thu|Fri|Sat"
[CLOCK_DATE_LONG_DAY]
eng "Sunday|Monday|Tuesday|Wednesday|Thursday|Friday|Saturday"
```

Control Characters

The following are the control characters for the date/time format strings:

```
// Date format
//
// %a Abbreviated weekday name
// %A Long weekday name
// %b Abbreviated month name
// %B Full month name
// %d Day of the month as decimal 01 to 31
// %e Like %d, the day of the month as a decimal number, but without leading zero
// %m Month name as a decimal 01 to 12
// %n Like %m, the month as a decimal number, but without leading zero
// %y Two digit year
// %Y Four digit year

// Time format
//
// %H The hour using 24-hour clock (00 to 23)
// %I The hour using 12-hour clock (01 to 12)
// %k The hour using 24-hour clock (0 to 23); single digits are preceded by a blank.
// %l The hour using 12-hour clock (1 to 12); single digits are preceded by a blank.
// %M Minutes (00 to 59)
// %S Seconds (00 to 59)
```

ifWidget

SetForegroundColor(color As Integer) As Boolean

Sets the foreground *color* in ARGB format.

SetBackgroundColor(color As Integer) As Boolean

Sets the background *color* in ARGB format.

SetFont(font_filename As String) As Boolean

Sets the *font_filename* using a TrueType font (for example, `SD:/Arial.ttf`).

SetBackgroundBitmap(bitmap_filename As String, stretch As Boolean) As Boolean

Sets the background bitmap image. If stretch is True, then the image is stretched to the size of the window.

SetBackgroundBitmap(parameters As roAssociativeArray, stretch As Boolean) As Boolean

Sets the background bitmap image. If *stretch* is True, then the image is stretched to the size of the window. The associative array can contain the following parameters:

- `Filename`: The name of the image file
- `EncryptionAlgorithm`: The file-encryption algorithm. Currently the options are "AesCtr" and "AesCtrHmac".
- `EncryptionKey`: The key to decrypt the image file. This is a byte array consisting of 128 bits of key, followed by 128 bits of IV.

Note
See the Image Decryption section in the *roImagePlayer* entry for details on displaying encrypted images.

SetSafeTextRegion(region As roRectangle) As Boolean

Specifies the rectangle within the widget where the text can be drawn safely.

Show() As Boolean

Displays the widget. After creation, the widget is hidden until Show() is called.

Hide() As Boolean

Hides the widget.

GetFailureReason() As String

Yields additional useful information if a function return indicates an error.

SetRectangle(r As roRectangle) As Boolean

Changes the size and positioning of the widget rectangle using the passed *roRectangle* object.

ROHDMIINPUTCHANGED, ROHDMIOUTPUTCHANGED

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The *roVideoMode* object generates an *roHdmiInputChanged* or *roHdmiOutputChanged* event object whenever the hotplug status of the HDMI input or output changes.

At least one *roHdmiOutputChanged* event object will always be generated for a hotplug event, even for very quick disconnect/connect hotplug events. In most cases, a disconnect/connect hotplug event will generate two event objects.

`ifInt`

GetInt() As Integer

SetInt(a As Integer)

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROHTMLWIDGET

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This object embeds the Chromium HTML rendering engine, which can be rendered at full screen or as a widget. You can display multiple *roHtml Widget* instances at the same time.

Tip
Use the *roKeyStore* object to provide client certificates for websites.

Object creation: Like other widgets, an *roHtmlWidget* is created with an *roRectangle*, which specifies the size and positioning of the widget on the screen.

```
CreateObject("roHtmlWidget", rect As roRectangle)
```

ifHtmlWidget

GetFailureReason() As String

Gives more information when a member function returns False.

Hide() As Boolean

Hides the widget.

Show() As Boolean

Shows the widget.

SetRectangle(r As roRectangle) As Boolean

Changes the size and positioning of the widget rectangle using the passed *roRectangle* object.

SetURL(URL As String) As Boolean

Displays content from the specified URL.

When using SetUrl to retrieve content from local storage, you do not need to specify the full file path: `SetUrl("file:///example.html")`.

If the content is located somewhere other than the current storage device, you can specify it within the string itself. For example, you can use the following syntax to retrieve content from a storage device inserted into the USB port when the current device is an SD card: `SetUrl(" file:///USB1:/example.html ")`.

MapFilesFromAssetPool(asset_pool As roAssetPool, asset_collection As roAssetCollection, pool_prefix As String, uri_prefix As String) As Boolean

Sets the mapping between the URL space and the pool files. HTML content that has been deployed via BrightAuthor will typically reside in the pool and have encrypted SHA1-based filenames. A mapping mechanism is required to allow any relative URIs contained in the HTML content to continue working and to locate the appropriate resources in their respective pool locations.

You can use this method to bind part of the resource URI space onto pool locations, as long as you use the following: an *roAssetPool* object containing some assets, an *roAssetCollection* object identifying them, and two semi-arbitrary strings (URI_PREFIX and POOL_PREFIX).

Any URI in the form `"file:///[URI_PREFIX][RESOURCE_ID]"` will be rewritten into the form `"[POOL_PREFIX] [RESOURCE_ID]"`. It will then be located in the pool as if that name had been passed to the *roAssetPoolFiles.GetPoolFilePath()* method. This binding occurs for every instance of *roHtmlWidget*, so different mappings can be used for different bundles of content.

SetZoomLevel(scale_factor as Float) As Boolean

Adjusts the scale factor for the displayed page (the default equals 1.0).

EnableSecurity(enable As Dynamic) As Boolean

Enables or disables Chromium security checks for cross-origin requests, local video playback from HTTP, etc. This method accepts either a Boolean argument or an associative array, which can contain the following parameters:

- `websecurity`: A Boolean parameter that enables or disables Chromium security checks. This parameter is identical to passing a Boolean argument to the method itself.
- `camera_enabled`: A Boolean parameter that allows or disallows webpage access to USB cameras connected to the player (access is disabled by default). This allows support for WebRTC applications.

Note
The `camera_enabled` parameter is currently only supported by 4Kx42 models.

EnableMouseEvents() As Boolean

Enables response to button presses if True. Setting this method to False (the default) disables this feature.

SetPortrait(portrait_mode As Boolean) As Boolean

Sets the widget orientation to portrait if True. If this method is False (the default), the widget is oriented as a landscape.

Important
The `SetPortrait()` method has been deprecated in firmware 6.1. We recommend using the `SetTransform()` method instead.

SetTransform(transform As String) As Boolean

Sets the screen orientation of the widget. This method accepts the following strings:

- "identity": There is no transform (i.e. the widget is oriented as landscape). This is the default setting.

- "rot90": The widget is rotated to portrait at 90 degrees.
- "rot270": The widget is rotated to portrait at 270 degrees.

SetAlpha(alpha As Integer) As Boolean

Sets the overall alpha level for the widget (the default equals 255).

EnableScrollbars(scrollbars As Boolean) As Boolean

Enables automatic scrollbars for content that does not fit into the viewport if True. Setting this method to False (the default) disables this feature.

AddFont(filename As String) As Boolean

Makes a font available for text rendering. The `AddFont()` method can be used to supply additional or custom typefaces for the HTML rendering engine. These should be supplied in the form of TTF files, and the filename should be passed as the argument to `AddFont()`.

SetHWZDefault(default As String) As Void

Sets the default HWZ mode for HTML video. Normally, HWZ must be enabled in each `<video>` tag, but passing "on" to this string enables HWZ for all `<video>` elements. This method can also accept a semicolon-separated list of HWZ parameters:

- `on/off`: Enables or disables HWZ mode.
- `z-index`: Sets the default z-ordering for `<video>` elements. A positive integer places the video in front of all graphics; a negative integer places the video behind all graphics; and a zero value disables HWZ mode completely. You can customize the z-ordering of individual video elements with respect to each other by inserting the "z-index" parameter into the `<video>` tag.
- `transform`: Sets the default rotation for `<video>` elements. HWZ mode must be enabled for transforms to work.
    - `identity`: No transformation (default behavior)
    - `rot90`: 90 degree clockwise rotation
    - `rot180`: 180 degree rotation
    - `rot270`: 270 degree clockwise rotation
    - `mirror`: Horizontal mirror transformation
    - `mirror_rot90`: Mirrored 90 degree clockwise rotation
    - `mirror_rot180`: Mirrored 180 degree clockwise rotation
    - `mirror_rot270`: Mirrored 270 degree clockwise rotation
- `fade`: Sets the fading behavior for `<video>` elements.
    - `auto`: Videos transition without fade effects. This is the default behavior.
    - `always` : When a video ends, the video window will go black. The new video will then fade in.
- `luma-key/cr-key/cb-key`: Enables luma and/or chroma keying for `<video>` elements. HWZ mode must be enabled for luma/chroma keying to work.

Example

```
html.SetHWZDefault("on; transform:rot90; luma-key:#ff0020;")
```

ForceGpuRasterization(enable As Boolean) As Boolean

Enables GPU rasterization for HTML graphics. This method will take effect for subsequent page loads only. If Chromium determines that a page is not compatible, it will refuse to enable GPU rasterization for that page.

SetUserStylesheet(URI As String) As Boolean

Applies the specified user stylesheet to the page(s) loaded in the widget. The parameter can be a URI specifying any `file:` resource in the storage. The stylesheet can also be specified as inline data in the following form:

```
"data:text/css;charset=utf-8;base64,<base64 encoded data>"
```

This method will fail if you specify the inline data in any other order or if you use any data format other than base64.

SetAppCacheDir(file_path As String) As Boolean

Sets the directory to use for storing the application cache (which services `<html manifest="example.appcache">` tags). The file path is passed to the method as a string (e.g. "SD:/appcache").

SetAppCacheSize(maximum As Integer) As Boolean

Sets the maximum size (in bytes) for the application cache. Changing the storage size of the application cache will clear the cache and rebuild the cache storage. Depending on database-specific attributes, you will only be able to set the size in units that are equal to the page size of the database, which is established at creation. These storage units will occur only in the following increments: 512, 1024, 2048, 4096, 8192, 16384, 32768.

FlushCachedResources() As Boolean

Discards any resources that Chromium has cached in memory.

SetLocalStorageDir(file_path As String) As Boolean

Creates a "Local Storage" subfolder in the specified directory. This folder is used by local storage applications such as the JavaScript *storage* clas s.

SetLocalStorageQuota(maximum As Integer) As Boolean

Sets the total size (in bytes) allotted to all local storage applications. The default total size is 5MB.

SetWebDatabaseDir(file_path As String) As Boolean

Specifies the directory that should be used for web database applications (e.g. "SD:/webdb"). This method must be called before using web database applications such as Web SQL or IndexedDB.

SetWebDatabaseQuota(maximum As Integer) As Boolean

Sets the total size (in bytes) allotted to all web database applications. The default total size is 5MB.

EnableJavaScript(enable As Boolean) As Boolean

AllowJavaScriptURLs(url_collection As roAssociativeArray)

Allows the specified JavaScript BrightScript classes to be used by the specified URLs (all BrightScript classes in JavaScript are disabled by default). This method accepts an associative array that maps JavaScript BrightScript classes to the URL(s) that are allowed to use them.

- An `all` key indicates that all classes are authorized for the associated URL(s).
- An asterisk `"*"` value indicates that all URLs are authorized for the associated BrightScript class.
- A `"local"` value indicates that all local pages are authorized for the associated BrightScript class.

The following will enable all BrightScript classes for all URLs:

```
html.AllowJavaScriptUrls({ all: "*" })
```

The following will enable all BrightScript classes for local pages and the BrightSign homepage:

```
html.AllowJavaScriptUrls({ all: ["local", "http://www.brightsign.biz"]})
```

PostJSMessage(data As roAssociativeArray) As Boolean

Posts a collection of key:value pairs to the *BSMessagePort* JavaScript class (see the JavaScript Objects for BrightScript tech note for more details). This method does not support passing nested associative arrays.

StartInspectorServer(port As Integer) As Boolean

Enables the JavaScript console, which allows you to debug JavaScript applications while a webpage is running. To access the console, navigate to the player IP address at the specified port number. See this page for documentation relating to the JavaScript console.

SetUserAgent(user_agent As String) As Boolean

Changes the default user-agent string reported by the rendering engine.

The following is an example of a default user-agent string sent by a BrightSign player:

```
BrightSign/4.7.85.2-8-g1a6e6f6-td-debug (XD1230) Mozilla/5.0 (compatible; Linux mips)
AppleWebKit/537.4 (KHTML, like Gecko)
Chromium/18.0.1025.168 Chrome/18.0.1025.168 Safari/537.4
```

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roHtmlWidgetEvent* to the attached message port.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROHTMLWIDGETEVENT

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If an *roMessagePort* is attached to an *roHtmlWidget*, it will receive *roHtmlWidgetEvent* objects when something happens to the parent *roHtmlWid get* instance.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifHTMLWidgetEvent`

GetData() As Object

Returns an associative array of key/value pairs. The `reason` key identifies the cause of the event:

- `load-started`: The HTML widget has started loading a page.
- `load-finished`: The HTML widget completed loading a page.
- `load-error`: The HTML widget has failed to load a page. Use the `uri` key to identify the failing resource and the `message` key to retrieve some explanatory text.

ROIMAGEBUFFER

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This object allows you to access decoded image-file data. You can then copy or manipulate that data.

Object Creation: An *roImageBuffer* object is instantiated with an *roImagePlayer* object and a string specifying the file path of an image file.

```
CreateObject(“roImageBuffer”, image_player As Object, file_path As String)
```

Example

```
imgPlayer = CreateObject("roImagePlayer")

imgBuffer = CreateObject("roImageBuffer", imgPlayer, "SD:/content/image.png")
```

ifImageBufferControl

DisplayBuffer(x As Integer, y As Integer) As Boolean

Displays the image on screen. The x and y integers specify the coordinates of the top-left corner of the image.

GetBufferByteArray() As roByteArray

Returns the decoded image-file data as an *roByteArray*.

GetBufferMetadata() As roAssociativeArray

Returns an associative array containing information about the image file. The associative array contains the following keys:

- `width`: The width of the image file
- `height`: The height of the image file
- `acceptable`: A Boolean integer value indicating whether the image can be displayed by the *roImagePlayer* instance
- `format`: The color space (ARGB/CMYK) of the image file

ConvertFormat(a As String) As Object

ROIMAGEPLAYER

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This object displays static bitmap images on the video display. The simplest way to use *roImagePlayer* is to make calls to `DisplayFile()` with the filename as a String. Alternatively, you can use `PreloadFile()` in conjunction with `DisplayPreload()` to have more control. For more pleasing aesthetics when generating an image player, use the *roImageWidget* object.

Object Creation: The image player is displayed by first creating *roRectangle* and *roImagePlayer* instances, then calling `SetRectangle()` using the *roRectangle* instance as the argument.

```
rectangle = CreateObject("roRectangle", 0, 0, 1024, 768)
i = CreateObject("roImagePlayer")
i.SetRectangle(rectangle)
```

`ifImageControl`

DisplayFile(image_filename As String) As Boolean

Displays the image with the specified filename. The image_filename string must point to a *.png*, *.jpeg*, or 8-bit, 24-bit, or 32-bit *.bmp* file. Note that *.jpeg* image files with CMYK color profiles are not supported.

DisplayFile(parameters As roAssociativeArray) As Boolean

Displays an image using an associative array of display parameters:

- `Filename`: The name of the image file
- `Mode`: The image mode. See the entry for SetDefaultMode() below for more details.
- `Transition`: The image transition setting. See the entry for SetDefaultTransition() below for more details.
- `EncryptionAlgorithm`: The file-encryption algorithm. Currently the options are "AesCtr" and "AesCtrHmac".
- `EncryptionKey`: The key to decrypt the image file. This is a byte array consisting of 128 bits of key, followed by 128 bits of IV.

See the Image Decryption section below for details on displaying encrypted images.

PreloadFile(image_filename As String) As Boolean

Loads the specified image file into an offscreen memory buffer.

PreloadFile(parameters As roAssociativeArray) As Boolean

Loads an image file into an offscreen memory buffer. Image display properties are determined by an associative array of parameters:

- `Filename`: The name of the image file
- `Mode`: See the entry for SetDefaultMode() below for more details.
- `Transition`: See the entry for SetDefaultTransition() below for more details.

DisplayPreload() As Boolean

Uses the on-screen memory buffer to display the image stored in the offscreen memory buffer using `PreloadFile()`. There are only two memory buffers: one is displayed on screen; and the other is used for preloading images. `PreloadFile()`can be called multiple times before `DisplayPreload()` is called, and will keep loading into the same off-screen buffer. The `DisplayFile()` method calls `PreloadFile()` followed immediately by `DisplayPreload()`, so any previously preloaded image will be lost. If no image is preloaded, `DisplayPreload()` will have no effect.

StopDisplay() As Boolean

Removes an image from the display.

DisplayFileEx(filename As String, mode As Integer, x As Integer, y As Integer) As Boolean

PreloadFileEx(filename As String, mode As Integer, x As Integer, y As Integer) As Boolean

SetDefaultMode(mode As Integer) As Boolean

Sets the default image display mode for DisplayFile() and PreloadFile(). If SetDefaultMode() is not called, then the default mode is set to 0 (equivalent to the image being centered without scaling). The supported display mode are listed below:

- **0 – Center image**: No scaling takes place. Cropping only occurs if the image is bigger than the window.
- **1 – Scale to fit**: The image is scaled so that it is fully viewable, with its aspect ratio maintained.
- **2 – Scale to fill and crop**: The image is scaled so that it completely fills the window, with its aspect ratio maintained.
- **3 – Scale to fill**: The image is stretched so that it fills the window and the whole image is viewable. The aspect ratio will not be maintained if it is different from the window.

SetDefaultTransition(transition As Integer) As Boolean

Sets the transition to be used when the next image is displayed. The following are available transitions:

- 0: No transition: immediate blit
- 1-4: Wipes from top, bottom, left, or right.
- 5-8: Explodes from centre, top left, top right, bottom left, or bottom right.
- 10-11: Uses vertical or horizontal venetian-blind effect.
- 12-13: Combs vertical or horizontal.
- 14: Fades out to background color, then back in.
- 15: Fades between current image and new image.
- 16-19: Slides from top, bottom, left or right.
- 20-23: Slides entire screen from top, bottom, left, or right.
- 24-25: Scales old image in, then the new one out again (this works as a pseudo rotation around a vertical or horizontal axis).
- 26-29: Expands a new image onto the screen from right, left, bottom, or top.

`SetTransform(transform As String) As Boolean`

Applies one of eight transforms to the image. Calls to this method only take effect when the next file is displayed. Note that the image rectangle itself does not change to accommodate the new height and width ratio of a transformed image. This method can be called separately on multiple *roImagePlayer* or *roImageWidget* instances.

- `identity`: No transformation (default behavior)
- `rot90`: 90 degree clockwise rotation
- `rot180`: 180 degree rotation
- `rot270`: 270 degree clockwise rotation
- `mirror`: Horizontal mirror transformation
- `mirror_rot90`: Mirrored 90 degree clockwise rotation

- `mirror_rot180`: Mirrored 180 degree clockwise rotation
- `mirror_rot270`: Mirrored 270 degree clockwise rotation

OverlayImage(image_filename As String, x As Integer, y As Integer) As Boolean

Composites the image with the specified filename on top of the primary `DisplayFile()` image. Use the `x` and `y` integers to specify its location within the image widget.

SetRectangle(r As roRectangle) As Boolean

Changes the size and positioning of the image rectangle using the passed *roRectangle* object.

GetRectangle() As roRectangle

Returns an *roRectangle* object that has the same location and dimensions as the *roRectangle* object used to define the image window.

CreateTestHole(hole As roRectangle) As Boolean

Creates a hole in the image with the location and dimensions specified in the passed *roRectangle* instance. Any video windows located directly beneath the image will show through. This method will disrupt image playback and should be used for test purposes only.

SetTransitionDuration(duration As Integer) As Boolean

Sets the amount of time it takes (in milliseconds) for a specified transition effect to take place. The default transition duration is 1000 milliseconds.

DisplayBuffer(a As Object, b As Integer, c As Integer) As Boolean

Hide() As Boolean

Hides the image currently being displayed by the *roImagePlayer* widget.

Show() As Boolean

Shows the image currently being displayed by the *roImagePlayer* widget.

X, Y

The x and y values indicate which position of the image to center as near as possible, or both x and y can be set to -1, which uses the center of the image as the point to position nearest to the center.

To display images in a zone, `SetRectangle()` must be called, and `EnableZoneSupport()` must be included in a script to use the zones functionality.

Testing Display Modes

Here are some example shell commands you can use to test the different display modes:

```
BrightSign> image filename.bmp 0
BrightSign> image filename.bmp 1
BrightSign> image filename.bmp 2
BrightSign> image filename.bmp 3

BrightSign> image filename.bmp 0 0 0
BrightSign> image filename.bmp 2 0 0
```

Preloading Images

The following example script uses preloaded images to improve the UI speed when the user hits a key on the keyboard. As soon as a key is struck, the display switches to the new image, which has already been preloaded. The only possible delay occurs if the key is hit while the image is preloading. In this case, the image will display as soon as it is loaded.

```
i = CreateObject("roImagePlayer")
p = CreateObject("roMessagePort")
k = CreateObject("roKeyboard")
k.SetPort(p)

i.PreloadFile("one.bmp")

loop:
i.DisplayPreload
i.PreloadFile("two.bmp")
Wait(0,p)
i.DisplayPreload
i.PreloadFile("one.bmp")
Wait(0,p)
goto loop
```

Image Decryption

The *roImagePlayer*, *roImageWidget*, *roClockWidget*, *roTextWidget*, and *roCanvasWidget* objects can be used to display encrypted images. Each object has an image playback method that accepts an associative array, which can include the `EncryptionAlgorithm` and `EncryptionKey` decryption parameters.

> **Note**
> Contact support@brightsign.biz to learn more about generating a key for obfuscation and storing it on the player.

You can call `roDeviceInfo.HasFeature("media_decryption")` to determine if a player model and firmware version supports image decryption.

Example

```
print "Play ENCRYPTED image in an image widget"

imagePlayer = CreateObject("roImageWidget", r1)

aa=CreateObject("roAssociativeArray")
aa.filename = "sd:/images_enc.jpg"
aa.encryptionalgorithm = "AesCtr"
aa.encryptionkey = CreateObject("roByteArray")
aa.encryptionkey.fromhexstring("01030507090b0d0f00020406080a0c0e000000000000000000000000000000
00")

imagePlayer.DisplayFile(aa)
sleep(10000)
imagePlayer.Hide()

print "Play ENCRYPTED image with PlayStaticImage"

videoPlayer = CreateObject("roVideoPlayer")

aa=CreateObject("roAssociativeArray")
aa.filename = "sd:/images_enc.jpg"
aa.encryptionalgorithm = "AesCtr"
aa.encryptionkey = CreateObject("roByteArray")
aa.encryptionkey.fromhexstring("01030507090b0d0f00020406080a0c0e000000000000000000000000000000
00")

videoPlayer.PlayStaticImage(aa)
sleep(10000)
videoPlayer = invalid

print "Show CLOCK image"
```

```
resourceManager = CreateObject("roResourceManager", "sd:/resources.txt")

clockWidget = CreateObject("roClockWidget", r1, resourceManager, {})

aa=CreateObject("roAssociativeArray")
aa.filename = "sd:/images_enc.jpg"
aa.encryptionalgorithm = "AesCtr"
aa.encryptionkey = CreateObject("roByteArray")
aa.encryptionkey.fromhexstring("01030507090b0d0f00020406080a0c0e000000000000000000000000000000
00")

clockWidget.SetBackgroundBitmap(aa, True)
clockWidget.Show()
sleep(10000)
clockWidget.Hide()

print "Text widget with encrypted background image"

twParams = CreateObject("roAssociativeArray")
twParams.LineCount = 1
twParams.TextMode = 1
twParams.Rotation = 0
twParams.Alignment = 1

tw=CreateObject("roTextWidget",r1,1,2,twParams)
tw.SetBackgroundColor(&h00ff0000)
tw.SetForegroundColor(&hff00ff00)
tw.PushString("Encrypted Background")
'tw.SetRectangle(r)

aa=CreateObject("roAssociativeArray")
aa.filename = "sd:/images_enc.jpg"
aa.encryptionalgorithm = "AesCtr"
aa.encryptionkey = CreateObject("roByteArray")
aa.encryptionkey.fromhexstring("01030507090b0d0f00020406080a0c0e000000000000000000000000000000
00")

tw.SetBackgroundBitmap(aa, True)
tw.Show()
sleep(10000)
tw.Hide()

cw=CreateObject("roCanvasWidget", rect)
canvas_aa=CreateObject("roAssociativeArray")
canvas_aa.Filename = "sd:/images_enc.jpg"
canvas_aa.Encryptionalgorithm = "AesCtr"
canvas_aa.EncryptionKey = CreateObject("roByteArray")
canvas_aa.EncryptionKey.FromHexString("01030507090b0d0f00020406080a0c0e0000000000000000000000
000000000")
cw.SetLayer(canvas_aa, 1)
cw.Show()
```

ROIMAGEWIDGET

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This object can be used in place of *roImagePlayer* in cases where the image is displayed within a rectangle. Using an *roImageWidget* can result in more pleasing aesthetics for image player creation; it can also be used to display images in a multi-screen array. Beyond this, *roImageWidget* b ehaves identically to *roImagePlayer*.

Object Creation: The image widget area is generated using an *roRectangle* object.

```
rectangle = CreateObject("roRectangle", 0, 0, 1024, 768)
i = CreateObject("roImageWidget", rectangle)
```

`ifImageControl`

DisplayFile(image_filename As String) As Boolean

Displays the image with the specified filename. The image_filename string must point to a *.png*, *.jpeg*, or 8-bit, 24-bit, or 32-bit *.bmp* file. Note that *.jpeg* image files with CMYK color profiles are not supported.

DisplayFile(parameters As roAssociativeArray) As Boolean

Displays an image using an associative array of display parameters:

- `Filename`: The name of the image file
- `Mode`: The image mode. See the entry for SetDefaultMode() below for more details.
- `Transition`: The image transition setting. See the entry for SetDefaultTransition() below for more details.
- `EncryptionAlgorithm`: The file-encryption algorithm. Currently the options are "AesCtr" and "AesCtrHmac".
- `EncryptionKey`: The key to decrypt the image file. This is a byte array consisting of 128 bits of key, followed by 128 bits of IV.

See the Image Decryption descrption in the *roImagePlayer* entry for details on displaying encrypted images.

PreloadFile(image_filename As String) As Boolean

Loads the specified image file into an offscreen memory buffer.

PreloadFile(parameters As roAssociativeArray) As Boolean

Loads an image file into an offscreen memory buffer. Image display properties are determined by an associative array of parameters:

- `Filename`: The name of the image file
- `Mode`: See the entry for SetDefaultMode() below for more details.
- `Transition`: See the entry for SetDefaultTransition() below for more details.

DisplayPreload() As Boolean

Uses the on-screen memory buffer to display the image stored in the offscreen memory buffer using `PreloadFile()`. There are only two memory buffers: one is displayed on screen; and the other is used for preloading images. `PreloadFile()`can be called multiple times before `DisplayPreload()` is called, and will keep loading into the same off-screen buffer. The `DisplayFile()` method calls `PreloadFile()` followed immediately by `DisplayPreload()`, so any previously preloaded image will be lost. If no image is preloaded, `DisplayPreload()` will have no effect.

StopDisplay() As Boolean

Removes an image from the display.

DisplayFileEx(filename As String, mode As Integer, x As Integer, y As Integer) As Boolean

PreloadFileEx(filename As String, mode As Integer, x As Integer, y As Integer) As Boolean

SetDefaultMode(mode As Integer) As Boolean

Sets the default image display mode for DisplayFile() and PreloadFile(). If SetDefaultMode() is not called, then the default mode is set to 0 (equivalent to the image being centered without scaling). The supported display mode are listed below:

- **0 – Center image**: No scaling takes place. Cropping only occurs if the image is bigger than the window.
- **1 – Scale to fit**: The image is scaled so that it is fully viewable, with its aspect ratio maintained.
- **2 – Scale to fill and crop**: The image is scaled so that it completely fills the window, with its aspect ratio maintained.
- **3 – Scale to fill**: The image is stretched so that it fills the window and the whole image is viewable. The aspect ratio will not be maintained if it is different from the window.

SetDefaultTransition(transition As Integer) As Boolean

Sets the transition to be used when the next image is displayed. The following are available transitions:

- 0: No transition: immediate blit
- 1-4: Wipes from top, bottom, left, or right.
- 5-8: Explodes from centre, top left, top right, bottom left, or bottom right.
- 10-11: Uses vertical or horizontal venetian-blind effect.
- 12-13: Combs vertical or horizontal.
- 14: Fades out to background color, then back in.
- 15: Fades between current image and new image.
- 16-19: Slides from top, bottom, left or right.
- 20-23: Slides entire screen from top, bottom, left, or right.
- 24-25: Scales old image in, then the new one out again (this works as a pseudo rotation around a vertical or horizontal axis).
- 26-29: Expands a new image onto the screen from right, left, bottom, or top.

SetTransform(transform As String) As Boolean

Applies one of eight transforms to the image. Calls to this method only take effect when the next file is displayed. Note that the image rectangle itself does not change to accommodate the new height and width ratio of a transformed image. This method can be called separately on multiple *roImagePlayer* or *roImageWidget* instances.

- `identity`: No transformation (default behavior)
- `rot90`: 90 degree clockwise rotation
- `rot180`: 180 degree rotation

- `rot270`: 270 degree clockwise rotation
- `mirror`: Horizontal mirror transformation
- `mirror_rot90`: Mirrored 90 degree clockwise rotation
- `mirror_rot180`: Mirrored 180 degree clockwise rotation
- `mirror_rot270`: Mirrored 270 degree clockwise rotation

OverlayImage(image_filename As String, x As Integer, y As Integer) As Boolean

Composites the image with the specified filename on top of the primary `DisplayFile()` image. Use the `x` and `y` integers to specify its location within the image widget.

SetRectangle(r As roRectangle) As Boolean

Changes the size and positioning of the image rectangle using the passed *roRectangle* object.

GetRectangle() As roRectangle

Returns an *roRectangle* object that has the same location and dimensions as the *roRectangle* object used to define the image window.

CreateTestHole(hole As roRectangle) As Boolean

Creates a hole in the image with the location and dimensions specified in the passed *roRectangle* instance. Any video windows located directly beneath the image will show through. This method will disrupt image playback and should be used for test purposes only.

SetTransitionDuration(duration As Integer) As Boolean

Sets the amount of time it takes (in milliseconds) for a specified transition effect to take place. The default transition duration is 1000 milliseconds.

DisplayBuffer(a As Object, b As Integer, c As Integer) As Boolean

Hide() As Boolean

Hides the image currently being displayed by the *roImageWidget* instance.

Show() As Boolean

Shows the image currently being displayed by the *roImageWidget* instance.

Multiscreen Images

This object includes overloaded `PreloadFile()` and `DisplayFile()` methods. These methods receive an *roAssociativeArray* object that stores various options to be passed. They must be used when displaying images across multiple screens in an array, or displaying a portion of an image—though they can also be used in place of the original method calls in all cases.

The following code uses the `PreloadFile()` method for a multiscreen display:

```
i=CreateObject("roImageWidget")
a=CreateObject("roAssociativeArray")
a["Filename"] = "test.jpg"
a["Mode"] = 1
a["Transition"] = 14
a["MultiscreenWidth"] = 3
a["MultiscreenHeight"] = 2
a["MultiscreenX"] = 0
a["MultiscreenY"] = 0
i.PreloadFile(a)
i.DisplayPreload
```

The `filename`, `mode`, and `transition` values are the same as those documented for the `DisplayFile()` and `PreloadFile()` methods above. The `MultiscreenWidth` and `MultiscreenHeight` parameters specify the width and height of the multi-screen matrix. For example, 3x2 would be three screens wide and two screens high. The `MultiscreenX` and `MultiscreenY` specify the position of the current screen within that matrix.

In the above case, on average only 1/6 of the image is drawn on each screen, though the image mode still applies so that, depending on the shape of the image, it may have black bars on the side screens. It is relatively simple, therefore, for an image widget to display part of an image based on its position in the multiscreen array. The following are default values for the parameters:

- Mode = 0
- Transition = 0
- MultiscreenWidth = 1
- MultiscreenHeight = 1
- MultiscreenX = 0
- MultiscreenY = 0

This code uses `DisplayFile()` to display a portion of an image:

```
i=CreateObject("roImageWidget")
a=CreateObject("roAssociativeArray")
a["Filename"] = "test.JPG"
a["Mode"] = 0
a["SourceX"] = 600
a["SourceY"] = 600
a["SourceWidth"] = 400
a["SourceHeight"] = 400
i.DisplayFile(a)
```

This displays just a portion of the image test JPG starting at coordinates `SourceX`, `SourceY`, and `SourceWidth` by `SourceHeight` in size. The `viewmode` is still honored as if it were displaying the whole file.

RORECTANGLE

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This object is passed to various video and graphics widgets (*roVideoPlayer*, *roImageWidget*, *roHtmlWidget*, etc.) to specify their size and positioning.

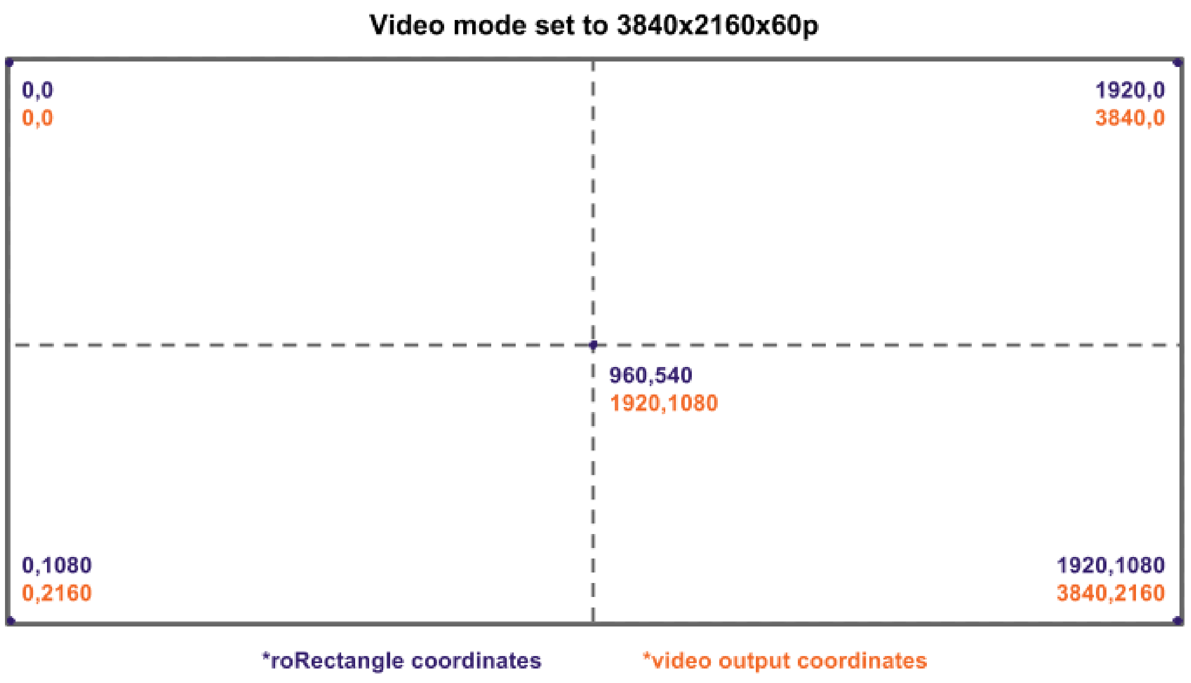
Object Creation: This object is created with coordinate and dimension parameters.

```
CreateObject("roRectangle", x As Integer, y As Integer, width As Integer, height As Integer)
```

`SetRectangle()` calls made by widget objects (e.g. *roImageWidget.SetRectangle()*) honor the view-mode or aspect-ratio conversion mode set by the user. If the user has set the video player for letterboxing, it will occur if the video does not fit in the new rectangle exactly.

Rectangles with 4K Video Modes

When the player is using a 4K video mode (e.g. 3840x2160x60p), rectangles still operate as if the total screen area is 1920x1080. They are then scaled by a factor of 2 when the video is output. For example, to display a full-screen 4K video, set the *roRectangle* instance to `0,0,1920,1080`; to display an additional HD video in the top-right quadrant of the screen, set another *roRectangle* instance to `960,0,960,540`.



Note that, while 4Kx42 players output 4K video using a 1:1 pixel ratio, graphics elements (*roImageWidget*, *roCanvasWidget*, etc.) are upscaled to match the size of the 4K video output. This occurs irrespective of the size of the original image and widget rectangle: For example, an image in a 960x540 rectangle will first be downscaled to 960x540, then upscaled to 1920x1080. If you want to display images without upscaling on 4K video modes, display them in a video window using the *roVideoPlayer.PlayStaticImage()* method.

`ifRectangle`

SetX(x As Integer) As Void

Specifies a new x coordinate for the rectangle.

SetY(y As Integer) As Void

Specifies a new y coordinate for the rectangle.

SetWidth(width As Integer) As Void

Specifies a new width value for the rectangle.

SetHeight(height As Integer) As Void

Specifies a new height value for the rectangle.

GetX() As Integer

Returns the x coordinate of the rectangle.

GetY() As Integer

Returns the y coordinate of the rectangle.

GetWidth() As Integer

Returns the width of the rectangle.

GetHeight() As Integer

Returns the height of the rectangle.

ROSHOUTCASTSTREAM

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Important
The *roShoutcastStream* object has been deprecated and will be removed in a future version of firmware.

This object enables playback of SHOUTcast streams.

Object Creation: The *roShoutcastStream* object is created with a URL object, a maximum buffer size (in seconds), and an initial buffering duration (in seconds).

```
CreateObject("roShoutcastStream", url_transfer As Object, buffer_size As Integer,
buffer_duration As Integer)
```

ifShoutcastStream

GetUrl() As String

GetBufferedDuration() As Integer

GetTimeSinceLastData() As Integer

GetCurrentMetadata() As String

Rebuffer() As Boolean

AsyncSaveBuffer(a As String) As Boolean

RestartBufferRecord() As Boolean

ifMessagePort

SetPort(port As roMessagePort)

Posts messages of type *roShoutcastStreamEvent* to the attached message port

ifSourceIdentity

GetSourceIdentity() As Integer

Retrieves the identity value that can be used to associate events with the source *roShoutcastStream* instance.

ROSHOUTCASTSTREAMEVENT

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Important
The *roShoutcastStreamEvent* object has been deprecated and will be removed in a future version of firmware.

`ifInt`

GetInt() As Integer

SetInt(a As Integer)

`ifSourceIdentity`

GetSourceIdentity() As Integer

SetSourceIdentity(a As Integer)

ROSTREAMQUEUE

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This object allows you to play a list of video files seamlessly (i.e. without any blank frames or interrupts between one video and the next). You can link *roStreamQueue* to an *roVideoPlayer* instance for seamless video playback or to an *roMediaStreamer* instance for seamless video streaming.

Object Creation: This object is created with no parameters.

```
CreateObject("roStreamQueue")
```

ifSteamQueue

QueueFile(filename As String) As Boolean

Adds the specified video file to the queue.

Loop(loop As Boolean) As Boolean

Specifies that playback/streaming should return to the beginning of the queue once it reaches the end. If `Loop(false)` and `LoopLast(false)` are both called, playback/streaming will stop once the end of the queue is reached. This is also the default behavior.

LoopLast(loop_last As Boolean) As Boolean

Specifies that playback/streaming should loop the last file in the queue once it reaches the end. This method has no effect if `Loop(true)` is called as well.

NextFile(a As Boolean) As Boolean

Start() As Boolean

ifMessagePort

SetPort(port As roMessagePort)

Posts messages of type *roStreamQueueEvent* to the attached message port. An event is raised whenever the end of the queue is reached.

ifIdentity

GetIdentity() As Integer

Returns a unique number that can be used to identify when events originate from this object.

ifUserData

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

Playing and Streaming Queues

To use *roStreamQueue* as a streaming playlist, include it as the source component in an *roMediaStreamer.SetPipeline()* call. For video playback, use an *roVideoPlayer* instance as the destination component in the `SetPipeline()` call.

Example

```
q=createobject("rostreamqueue")
q.queuefile("sd:/Test_Count_Up_Blue_Frames.ts")
q.queuefile("sd:/Test_Count_Up_Green_Frames.ts")
q.loop(true)
c=createobject("romediastreamer")
v=createobject("rovideoplayer")
c.setpipeline([q, v])
c.start()
```

ROTEXTFIELD

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A text field represents an area of the screen that can contain arbitrary text. This feature is intended for presenting diagnostic and usage information. Use the *roTextWidget* object to generate text for user interfaces and signage.

Object Creation: The object is created with several parameters:

```
CreateObject("roTextField", xpos As Integer, ypos As Integer, width_in_chars As Integer,
height_in_chars As Integer, metadata As Object)
```

- `xpos`: The horizontal coordinate for the top left of the text field.
- `ypos`: The vertical coordinate for the top left of the text field. The top of the screen is equivalent to zero.
- `width_in_chars`: The width of the text field in character cells.
- `height_in_chars`: The height of the text field in character cells.
- `metadata`: An optional *roAssociativeArray* containing extra parameters for the text field. You can pass zero if you do not require this.

The metadata associative array supports the following extra parameters:

- "CharWidth": The width of each character cell in pixels.
- "CharLength": The height of each character cell in pixels.
- "BackgroundColor": The background color of the text field as an integer specifying eight bits (for each) for red, green and blue in the form &Hrrggbb.
- "TextColor": The color of the text as an integer specifying eight bits (for each) for red, green and blue in the form &Hrrggbb.
- "Size": An alternative to "CharWidth" and "CharLength" for specifying either normal size text (0) or double-sized text (1).

Note
In TV modes, a border around the screen may not be displayed due to overscanning. You may want to use the *roVideoMode* object functions `GetSafeX()` and `GetSafeY()` to ensure that the coordinates you use will be visible.

ifTextField

Cls() As Void

Clears the text field.

GetWidth() As Integer

Returns the width of the text field

GetHeight() As Integer

Returns the height of the text field.

SetCursorPos(x As Integer, y As Integer) As Void

Moves the cursor to the specified position. Subsequent output will appear at this position.

GetValue() As Integer

Returns the value of the character currently under the cursor.

`ifStreamSend`

SendByte(byte As Integer) As Void

Writes the character indicated by the specified number at the current cursor position within the text field. It then advances the cursor.

SendLine(string As String) As Void

Writes the characters specified at the current cursor position followed by the end-of-line sequence.

SendBlock(string As Dynamic) As Void

Writes the characters specified at the current cursor position and advances the cursor to one position beyond the last character. This method can support either a string or an *roByteArray* . If the block is a string, any null bytes will terminate the block.

SetSendEol(string As String) As Void

Sets the sequence sent at the end of a SendLine() value. You should leave this at the default ASCII value of 13 (Carriage Return) for normal use. If you need to change this value to another non-printing character, use the `chr` global function.

Note
The ifStreamSend interface is also described in the section documenting the various file objects. The interface is described again here in a manner more specific to the roTextField object.

`Printing a Text Field`

As with any object that implements the *ifStreamSend* interface, a text field can be written to using the PRINT #textfield syntax. See the example below for more details.

It is also possible to write to a text field using the syntax PRINT #textfield, @pos, where *pos* is the character position in the *textfield*. For example, if your *textfield* object has 8 columns and 3 rows, writing to position 17 writes to row 3, column 2 (positions 0-7 are in row 1; positions 8-15 are in row 2; and positions 16-23 are in the last row).

When output reaches the bottom of the text field, it will automatically scroll.

Example

```
meta = CreateObject("roAssociativeArray")
meta.AddReplace("CharWidth", 20)
meta.AddReplace("CharLength", 32)
meta.AddReplace("BackgroundColor", &H101010) ' Dark grey
meta.AddReplace("TextColor", &Hffff00) ' Yellow
vm = CreateObject("roVideoMode")
tf = CreateObject("roTextField", vm.GetSafeX(), vm.GetSafeY(), 20, 20, meta)
print #tf, "Hello World"
tf.SetCursorPos(4, 10)
print #tf, "World Hello"
```

ROTEXTWIDGET

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This object is used to display text on the screen.

Object Creation: This object is created using one of two variants.

Option 1

```
CreateObject("roTextWidget", r As roRectangle, line_count As Integer, text_mode As Integer,
pause_time As Integer)
```

- `r` : An *roRectangle* instance that contains the text
- `line_count`: The number of lines of text to show within the rectangle
- `text_mode`: The animation characteristics of the text:
  - 0: An animated view similar to teletype
  - 1: Static text
  - 2: Simple text with no queue of strings
  - 3: Smooth right-to-left scrolling ticker
- `pause_time`: The length of time each string is displayed before displaying the next string. This does not apply to text mode 2 or 3 because the strings on screen are updated immediately.

Option 2

```
CreateObject("roTextWidget", r As roRectangle, line_count As Integer, text_mode As Integer,
parameters As roAssociativeArray)
```

- `r`: An *roRectangle* instance that contains the text
- `line_count`: The number of lines of text to show within the rectangle
- `text_mode`: The animation characteristics of the text:
  - 0: An animated view similar to teletype
  - 1: Static text
  - 2: Simple text with no queue of strings

        - 3: Smooth scrolling ticker (strings are separated by a diamond)
- `parameters`: An associative array that can include the following values:
    - `LineCount`: The number of lines of text to show within the rectangle.
    - `TextMode`: The animation characteristics of the text:
        - 0: An animated view similar to teletype
        - 1: Static text
        - 2: Simple text with no queue of strings
        - 3: Smooth scrolling ticker (strings are separated with a diamond by default; the separator can be modified using the `SetSeparator()` method)
    - `PauseTime`: The length of time each string is displayed before displaying the next string. This does not apply to text mode 2 or 3 because the strings on screen are updated immediately.
    - `Rotation`: The rotation of the text within the widget:
        - 0: 0 degrees
        - 1: 90 degrees. This value can also be represented in degrees (90) or radians (.5).
        - 2: 180 degrees. This value can also be represented in degrees (180) or radians ().
        - 3: 270 degrees. This value can also be represented in degrees (270) or radians (1.5).
    - `Alignment`: The alignment of the text:
        - 0: Left
        - 1: Center
        - 2: Right

Tip
Modes 0, 1, and 3 are useful for displaying RSS feeds and ticker-type text. However, for dynamic data where immediate screen updates are required, mode 2 may be more appropriate. Mode 2 allows text to be drawn immediately to the screen.

Note
Text-mode 3 (smooth scrolling ticker) supports both right-to-left and left-to-right (e.g. Arabic, Hebrew) scrolling modes, depending on the language of the first string or file added to the widget. To change the scrolling direction, you will first need to remove all strings from the ticker.

`ifTextWidget`

PushString(str As String) As Boolean

Adds the string to the list of strings to display in modes 0 and 1. Strings are displayed in order, and when the end is reached, the object loops, returning to the beginning of the list. In mode 2, the string is displayed immediately.

PopStrings(number_of_string_to_pop As Integer) As Boolean

Pops strings off the front of the list (using "last in, first out" ordering) in modes 0 and 1. This occurs the next time the widget wraps so that strings can be added to and removed from the widget seamlessly. In mode 2, the string is cleared from the widget immediately.

GetStringCount() As Integer

Returns the number of strings that will exist once any pending pops have taken place.

Clear() As Boolean

Clears the list of strings, leaving the widget blank and able to accept more `PushString()` calls.

SetStringSource(file_path As String) As Boolean

Displays the text file at the specified path as a single, continuous string. This method is only applicable to text mode 3 (scrolling ticker). When the end of the file is reached, the text widget loops to the beginning, using a diamond symbol as the separator.

SetAnimationSpeed(speed As Integer) As Boolean

Sets the speed at which animated text displays. This method is applicable to text modes 0 and 3 only:

- Mode 0: The default speed value is 10000. Setting an integer above this value decreases the speed of the teletype-style ticker: For example, specifying a value of 20000 will decrease the default speed at which text displays by half, while a value of 5000 will double the default speed.
- Mode 3: The default speed value is 10000. Because the speed of a scrolling ticker is measured in pixels per second (PPS), the speed

must be a multiple of the current framerate, or else it will be rounded down to the nearest multiple (for example, a framerate of 60p will honor PPS values of 60, 120, 180, etc.). The software determines the speed of the scrolling ticker by performing the following calculation on the passed `speed` parameter:
`PPS = (speed * 60) / 10000`

SetSeparator(separator As String) As Boolean

Changes the separator between strings. The default diamond separator will be replaced by the contents of the passed string. This method applies to Text Mode 3 (smooth scrolling ticker) only. The following strings indicate special symbols: ":diamond:", ":circle:", ":square:".

SetMultiscreen(offset As Integer, size As Integer, ip_address As String, port As Integer) As Boolean

Allows for a smooth-scrolling ticker to be displayed across multiple screens. The master screen is designated as the instance with the rightmost offset of all the players in the multiscreen array; all PushString() and Show() calls (as well as any other changes) must be made on the master instance. Slave instances of the text widget will remain blank until the master starts. This method requires the following parameters:

- `offset`: The offset (in pixels) of the display in the multiscreen array. For example, using an offset of 1920 in a two-screen array of 1920x1080 screens would specify this player as the right-hand (master) display.
- `size`: The total width (in pixels) of the multiscreen array. For example, defining a size of 3840 would specify a two-screen array of 1920x1080 screens.
- `ip_address`: A string specifying the multicast IP address for the PTP synchronization process (e.g. "239.192.0.0")
- `port`: A string specifying the multicast port for the PTP synchronization process (e.g. "1234").

Note
Players can support more than one multiscreen ticker at a time.

`ifWidget`

Show() As Boolean

Displays the widget. After creation, the widget is hidden until Show() is called.

Hide() As Boolean

Hides the widget.

SetForegroundColor(color As Integer) As Boolean

Sets the foreground color in ARGB format.

SetBackgroundColor(color As Integer) As Boolean

Sets the background color in ARGB format.

Note
The top 8 bits of the color value are "alpha," affecting both the foreground text color and the widget background color. Zero is equivalent to fully transparent and 255 to fully non-transparent. This feature allows effects similar to subtitles. For example, you can create a semi-transparent black box containing text over video.

SetFont(font_filename As String) As Boolean

Sets the *font_filename* using a TrueType font (for example, "SD:/ComicSans.ttf").

SetBackgroundBitmap(bitmap_filename As String, stretch As Boolean) As Boolean

Sets the background bitmap image. If stretch is True, then the image is stretched to the size of the window.

SetBackgroundBitmap(parameters As roAssociativeArray, stretch As Boolean) As Boolean

Sets the background bitmap image. If *stretch* is True, then the image is stretched to the size of the window. The associative array can contain the following parameters:

- `Filename`: The name of the image file
- `EncryptionAlgorithm`: The file-encryption algorithm. Currently the options are "AesCtr" and "AesCtrHmac".
- `EncryptionKey`: The key to decrypt the image file. This is a byte array consisting of 128 bits of key, followed by 128 bits of IV.

Note
See the Image Decryption section in the *roImagePlayer* entry for details on displaying encrypted images.

SetSafeTextRegion(region As roRectangle) As Boolean

Specifies the rectangle within the widget where the text can be drawn safely.

SetRectangle(r As roRectangle) As Boolean

Changes the size and positioning of the widget rectangle using the passed *roRectangle* object.

GetFailureReason() As String

Yields additional useful information if a function return indicates an error.

ROTOUCHEVENT, ROTOUCHCALIBRATIONEVENT

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The *roTouchEvent* object is generated by the *roTouchScreen* object whenever a touch or mouse event is detected within a defined region.

`ifInt`

GetInt() As Integer: Retrieves the region ID of the event.

SetInt(a As Integer): Sets the region ID of the event.

`ifPoint`

The *ifPoint* interface is not available on the *roTouchCalibrationEvent* object.

GetX() As Integer

Retrieves the x coordinate of the mouse/touch event.

GetY() As Integer

Retrieves the y coordinate of the mouse/touch event.

SetX(a As Integer)

Sets the x coordinate of the event.

SetY(a As Integer)

Sets the y coordinate of the event.

`ifEvent`

The *ifEvent* interface is not available on the *roTouchCalibrationEvent* object.

GetEvent() As Integer

SetEvent(a As Integer)

ROTOUCHSCREEN

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This object accepts inputs from touchscreen panels or mice. For each recognized input, the object will generate an *roTouchEvent* object.

Not all touchscreens are supported, but we are always working to extend driver support. Please see this FAQ for a full list of supported touchscreens, or contact sales@brightsign.biz if you want to know whether a specific touch-screen model is supported. The *roTouchScreen* objec t responds to the clicks of a USB mouse in the same way it responds to touch events on a touchscreen.

To set up touchscreen/mouse interactivity, follow this outline:

1. Create an *roTouchScreen* instance.
2. Use `SetPort()` to specify an *roMessagePort* instance to receive the *roTouchScreen* events.
3. Define one or more touch regions.

   a. A touch region may be rectangular or circular.
   b. When a touch or click occurs anywhere inside the area of a touch region, an event will be sent to the message port.
   c. If touch regions overlap such that a click or touch hits multiple regions, an event for each affected region will be sent.
4. Process the events.

The *roTouchScreen* object supports rollover regions. Rollovers are based around touch regions. When a rectangular or circular region is added, it defaults to having no rollover. You can use the `EnableRollover()` method to add an *on* and *off* image for a region. Whenever the mouse cursor is within that region, the *on* image is displayed. In all other cases, the *off* image is displayed. This allows buttons to be highlighted as the mouse cursor moves over them.

`ifTouchScreen`

SetResolution(x As Integer, y As Integer) As Void

AddRectangleRegion(x As Integer, y As Integer, w As Integer, h As Integer, region_id As Integer) As Void

Adds a rectangular touch region to the screen. The region_id is used to associate the touch region with *roTouchEvent* events and to link the region with rollover images.

AddCircleRegion(x As Integer, y As Integer, radius As Integer, region_id As Integer) As Void

Adds a circular touch region to the screen. The `region_id` is used to associate the touch region with *roTouchEvent* events and to link the region with rollover images.

ClearRegions() As Void

Clears the list of regions added using `AddRectangleRegion()` or `AddCircleRegion()` so that any contacts in those regions no longer generate events. This call has no effect on the rollover graphics.

GetDeviceName() As String

SetCursorPosition(x As Integer, y As Integer) As Void

SetCursorBitmap(filename As String, x As Integer, y As Integer) As Void

Specifies a BMP or PNG file as the mouse cursor icon. This method also accepts a "hot spot" (i.e. the point within the icon rectangle that will trigger events when the mouse is clicked) as a set of **x,y** coordinates. The icon can be a rectangle of any width or height. The colors are specified internally in YUV (6-4-4 bits respectively), but pixels in the passed image file can be one of 16 different colors. These colors are 16 bits, with 14 bits of color and 2 bits of alpha. If you use all of the alpha levels on all shades, then you limit the number of available shades to five (five shades at three alpha levels plus one fully transparent color gives 16).

EnableCursor(enable As Boolean) As Void

Displays a cursor on screen if passed True.

EnableRollover(region_id As Integer, on_image As String, off_image As String, cache_image As Boolean, image_player As Object) As Void

Enables a rollover for a touch region. This method accepts the ID of the touch region, as well as two strings specifying the names of the *on* and *of f* bitmap images, a cache setting, and the image player that draws the rollover. The `cache_image` parameter simply tells the script whether to keep the bitmaps loaded in memory or not. This setting uses up memory very quickly, so we recommend that `cache_image` normally be set to 0.

EnableRegion(region_id As Integer, enabled As Boolean) As Void

Enables or disables a rollover region. This method accepts the ID of the touch region, as well as a Boolean value (True or False). The rollover regions default to "enabled" when created, but you can set up all of the regions at the start of your script and then enable regions as required.

SetRollOverOrigin(region_id As Integer, x As Integer, y As Integer) As Void

Changes the origin so that more (or less) of the screen changes when the mouse rolls in and out of the region. This means that bitmaps that are larger than the region can be drawn. The default requirement is that rollover bitmaps be the same size and position as the touch region. Note that the bitmap is square for circular regions. The default origin for circular regions is [x - r]**,** [y – r], where x**,** y is the center of the circle, and r is the radius.

IsMousePresent() As Boolean

Returns True if a relative pointing device is attached to the player. This does not work for absolute devices like touchscreens.

SetMouseRotation(rotation As Integer) As Boolean

Transforms mouse-movement inputs to account for screen rotation. This method can accept the following integers:

- 0: Inputs are unchanged (i.e. landscape orientation).
- 1, 90: Rotated 90 degrees (i.e. clockwise portrait orientation).
- 2, 180: Rotated 180 degrees.
- 3, 270: Rotated 270 degrees (i.e. counter-clockwise portrait orientation).

EnableSerialTouchscreen(a As Integer) As Boolean

SetSerialTouchscreenConfiguration(a As String) As Boolean

GetDiagnosticInfo() As String

Returns an HTML string with captured information describing hardware that was connected and events that occurred during the calibration process. This method is used by the calibration script to diagnose touchscreen issues.

`ifSetMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roTouchEvent* and *roTouchCalibrationEvent* to the attached message port.

`ifTouchScreenCalibration`

StartCalibration() As Boolean

GetCalibrationStatus() As Integer

GetDiagnosticInfo() As String

ClearStoredCalibration() As Boolean

StartEventLogging() As Boolean

StopEventLogging() As Boolean

ClearEventLogs() As Boolean

SetCalibrationRanges(x-min As Integer, x-max As Integer, y-min As Integer, y-max As Integer) As Boolean

Overrides the screen range values provided by the touchscreen. This method is useful when the entirety of the video output is not being displayed on the touch surface. Practical use of this method usually requires a custom calibration script, appropriate images, and a calibration setting matched to a particular setup.

`ifSerialControl`

SetBaudRate(baud_rate As Integer) As Boolean

Sets the baud rate of the device. The supported baud rates are as follows: 50, 75, 110, 134, 150, 200, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400.

NotUsed1(a As String)

SetMode(a As String) As Boolean

NotUsed2(a As Boolean) As Boolean

Examples

This script loops a video and waits for a mouse click or touchscreen input. It outputs the coordinates of the click or touch to the shell if it is located within the defined region.

```
v=CreateObject("roVideoPlayer")
t=CreateObject("roTouchScreen")
p=CreateObject("roMessagePort")

v.SetPort(p)
t.SetPort(p)
v.SetLoopMode(True)
v.PlayFile("testclip.mp2v")

t.AddRectangleRegion(0,0,100,100,2)

loop:
    msg=Wait(0, p)
    print "type: ";type(msg)
    print "msg=";msg
    if type(msg)="roTouchEvent" then
        print "x,y=";msg.GetX();msg.GetY()
    endif
    goto loop:
```

This script includes mouse support.

```
t=CreateObject("roTouchScreen")
t.SetPort(p)
REM Puts up a cursor if a mouse is attached
REM The cursor must be a 16 x 16 BMP
REM The x,y position is the "hot spot" point
t.SetCursorBitmap("cursor.bmp", 16, 16)
t.SetResolution(1024, 768)
t.SetCursorPosition(512, 389)
REM
REM Pass enable cursor display:  TRUE for on, and FALSE for off
REM The cursor will only enable if there is a mouse attached
REM
t.EnableCursor(TRUE)
```

This script includes a rollover region and mouse support.

```
img=CreateObject("roImagePlayer")
t=CreateObject("roTouchScreen")
p=CreateObject("roMessagePort")
t.SetPort(p)


t.SetCursorBitmap("cursor.bmp", 16, 16)
t.SetResolution(1024, 768)
t.SetCursorPosition(512, 389)
t.EnableCursor(1)


img.DisplayFile("\menu.bmp")


REM Adds a rectangular touch region
REM Enables rollover support for that region
REM Sets the rollover origin to the same position as the touch region REM
t.AddRectangleRegion(0, 0, 100, 100, 1)
t.EnableRollOver(1, "on.bmp", "off.bmp", true, img)
t.SetRollOverOrigin(1, 0, 0)
```

ROVIDEOEVENT, ROAUDIOEVENT

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Video and audio events are declared as separate classes. Events can have one of the following values, which are retrieved using the `GetInt()` method:

3	`Playing`	The current media item has started playing.
8	`MediaEnded`	The media item has completed playback.
12	`TimeHit`	A particular timecode has been reached. See the entry on Timecode Events for more details.
13	`Overlay_Playing`	An *roAudioPlayerMx* instance has begun playback of an audio file.
14	`Overlay_MediaEnded`	An *roAudioPlayerMx* instance has completed playback of an audio file.
15	`Overlay_TimeHit`	The EventTimeStamp of an *roAudioPlayerMx* instance has been been reached.
16	`MediaError`	A media error has been detected.
17	`Overlay_MediaError`	A media error has been detected during *roAudioPlayerMx* playback.
18	`FadingOut`	The current media item has completed fading out. See the *roVideoPlayer.SetFade()* entry for more details.
19	`DecoderEOS`	
20	`Overlay_FadingOut`	The FadeOutLocation of an *roAudioPlayerMx* instance has been reached.
21	`Overlay_DecoderEOS`	
26	`Underflow`	The stream seems to be underflowing. This event usually indicates that the streaming latency is set too low. It will be generated every few seconds as long as underflow is detected.

`ifInt`

The *ifInt* interface contains the event ID enumerated above and provides the following:

GetInt As Integer()

SetInt(a As Integer)

GetSourceIdentity() As Integer

SetSourceIdentity() As Integer

`ifData`

The ifData interface contains userdata and provides the following:

GetData() As Integer

SetData(a As Integer)

Example

```
vp_msg_loop:
    msg=Wait(tiut, p)
    if type(msg)="roVideoEvent" then
        if debug then print "Video Event";msg.GetInt()
        if msg.GetInt() = 8 then
            if debug then print "VideoFinished"
            retcode=5
            return
        endif
    else if type(msg)="roGpioButton" then
        if debug then print "Button Press";msg
        if escm and msg=BM then retcode=1:return
        if esc1 and msg=B1 then retcode=2:return
        if esc2 and msg=B2 then retcode=3:return
        if esc3 and msg=B3 then retcode=4:return
    else if type(msg)="rotINT32" then
        if debug then print "TimeOut"
        retcode=6
        return
    endif


    goto vp_msg_loop
```

ROVIDEOINPUT

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This object allows playback of HDMI input or video provided by a video capture dongle. Note that the *ifVideoInput* methods do not apply to HDMI input, which can be achieved by passing an unmodified *roVideoInput* instance to the *roVideoPlayer.PlayFile()* method (see below for examples).

Object Creation: *roVideoInput* is created with no parameters:

```
CreateObject("roVideoInput")
```

ifVideoInput

GetStandards() As roArray

GetInputs() As roArray

These return an array of strings describing the various inputs and video standards that the video capture device supports. The following are the possible standards that can be returned: PAL-D/K, PAL-G, PAL-H, PAL-I, PAL-D, PAL-D1, PAL-K, PAL-M, PAL-N, PAL-Nc, PAL-60, SECAM-B/G, ECAM-B, SECAM-D, SECAM-G, SECAM-H, SECAM-K, SECAM-K1, SECAM-L, SECAM-LC, SECAM-D/K, NTSC-M, NTSC-Mj, NTSC-443, NTSC-Mk, PAL-B and PAL-B1. Inputs returned are s-video and composite.

SetStandard(standard As String) As Boolean

GetCurrentStandard() As String

SetInput(input As String) As Boolean

GetCurrentInput() As String

Use the above to get and set the input and video standard.

GetControls() As roArray

Returns the possible controls on the input. These include "Brightness," "Contrast," "Saturation," "Hue," and others.

SetControlValue(control_name As String, value As Integer) As Boolean

Sets the value of the specified control.

GetCurrentControlValue(control_name As String) As roAssociativeArray

Returns an associative array with 3 members: "Value," "Minimum," and "Maximum." "Value" is the current value, and the possible range is specified by "Minimum" and "Maximum."

GetFormats() As Object

SetFormat(a As String, b As Integer, c As Integer) As Boolean

GetCurrentFormat() As String

This script uses the HDMI Input as the video source to create a full-screen display.

```
v = CreateObject("roVideoPlayer")
i = CreateObject("roVideoInput")
p = CreateObject("roMessagePort")


vm = CreateObject("roVideoMode")
vm.SetMode("1920x1080x60p")


r = CreateObject("roRectangle", 0, 0, 1920, 1080)
v.SetRectangle(r)


v.PlayFile(i)
```

This script uses the video capture dongle as the video source to create a full-screen display.

```
v=CreateObject("roVideoPlayer")
i=CreateObject("roVideoInput")
p=CreateObject("roMessagePort")


vm=CreateObject("roVideoMode")
vm.SetMode("1280x720x60p")


r = CreateObject("roRectangle", 0, 0, 1280, 720)
v.SetRectangle(r)


i.SetInput("s-video")
i.SetStandard("ntsc-m")


v.PlayFile(i)
```

ROVIDEOMODE

ON THIS PAGE

Firmware Version 6.1

- Previous Versions

This object allows you to configure resolution and other video output settings. The same video resolution is applied to all video outputs on a BrightSign player. Video or images that are subsequently decoded and displayed will be scaled (using the hardware scalar) to this output resolution if necessary.

Object Creation: The *roVideoMode* object is created with no parameters.

```
CreateObject("roVideoMode")
```

The *roVideoMode* object generates *roHdmiInputChanged* and *roHdmiOutputChanged* event objects whenever the hotplug status of the HDMI input or output changes.

`ifVideoMode`

SetMode(mode As String) As Boolean

Sets the video output mode. If the specified video mode is different from the current video mode of the object, the unit will reboot and change the video mode to the new setting during system initialization. The supported video modes are listed in the Video Resolutions FAQ. This method also accepts "auto" as a mode parameter. The following optional parameters can be appended to the string

- `<resolution>:<color_space>:<depth>bit`: The video profile for HDMI output. For example, to output 4Kp60 at the 4:2:0 color space with 10 bits of depth, you would pass the following string: `"3840x2160x60p:420:10bit"`.
- `<resolution>:preferred`: A preferred video-mode flag. This instructs the player to only use the video mode if the display EDID indicates that it is supported. Otherwise, the output will default to "auto" mode. If no EDID is detected at bootup, the player will output the preferred video mode. If an HDMI hotplug event occurs afterward, then the player will perform the preferred video-mode check again. The `:preferred` flag currently ignores video profile settings (i.e. color space and bit depth).
- `<resolution>:rgb:<range>`: The RGB range setting for the video mode. The `<range>` parameter can be either "fullrange" for RGB Full (0-255) or "limitedrange" for RGB Limited (16-235). For example, to output 1080p60 at RGB Full, you would pass the following string: `"1920x1080x60:rgb:fullrange"`.

BrightSign hardware has a video anti-aliasing low-pass filter that is set automatically.

SetModeForNextBoot(video_mode As String) As Boolean

Specifies the target video mode of the device the next time it reboots. Once a video mode is specified using `SetMode()`, it can only be changed by a device reboot.

GetModeForNextBoot() As String

Returns the target video mode of the device the next time it reboots. The return value is specified with the `SetModeForNextBoot()` method.

GetBestMode(connector As String) As String

GetMode() As String

Returns the current video mode of the device, which is specified using the `SetMode()` method.

GetActiveMode() As AssociativeArray

Returns information about the current video mode as an associative array. All values in the *roAssociativeArray* are strings:

- `videomode`: The current video mode (e.g. "3840x2160x60p")
- `colordepth`: The current color depth ("8bit", "10bit", or "12bit")
- `colorspace`: The current color space ("RGB" or "YUV")
- `preferred`: A "true" or "false" string indicating whether the current video mode is the preferred mode, which is set using the `SetMode()` method.

GetConfiguredMode() As AssociativeArray

Returns information about the video mode configured using the `SetMode()` method. This method returns an *roAssociativeArray* of strings. If the video mode is set to "auto", this method will return Invalid:

- `videomode`: The configured video mode (e.g. "3840x2160x60p")
- `colordepth`: The configured color depth ("8bit", "10bit", or "12bit")
- `colorspace`: The configured color space ("rgb", "yuv420", or "yuv422")
- `preferred`: A "true" or "false" string indicating whether the configured video mode is the preferred mode, which is specified using the `SetMode()` method.
- `width`: The width of the video plane
- `height`: The height of the video plane
- `graphicsPlaneHeight`: The height of the graphics plane. The maximum value is "1080", even for 4K video.
- `graphicsPlaneWidth`: The width of the graphics plane. The maximum value is "2048", even for 4K video.
- `framerate`: The framerate of the video output
- `interlaced`: A "true" or "false" string indicating whether the video output is interlaced
- `dropframe`: A "true" or "false" string indicating whether the video output is dropping frames to account for an FPS discrepancy between the source video and the display

GetFPS() As Integer

Returns the current framerate of the video output.

SetDecoderMode(decoder As String, timeslice_mode As String, z_order As Integer, friendly_name As String, enable_mosaic_deinterlacer As Boolean) As Boolean

Configures the video decoder(s) on the player for either standard mode or Mosaic mode. In standard mode, a single decoder is used to play a single video; in Mosiac mode, the decoder can be used to decode multiple videos from different local or remote sources. See the Selecting Decoders section below for more information on assigning video players to decoders in HTML or BrightScript.

- `decoder`: The video decoder to be used (decoder availability differs by model).
  - "4K": The 4K decoder (on 4Kx42 models only)
  - "HD1": The first HD decoder
  - "HD2": The second HD decoder
- `timeslice_mode`: The maximum resolution that the decoder will accept (at framerates up to 60p). If this resolution is the same as the decoder's maximum resolution limit, the decoder will use standard mode, not Mosaic mode.
  - "4K": 4096x2160
  - "HD": 1920x1080
  - "SD": 720x576
  - "CIF": 352x288
  - "QCIF": 176x144

Important
Upscaling videos in Mosaic mode currently causes severe performance degradation.

- `z_order`: The z-order of the video window (in standard mode) or group of video windows (in Mosaic mode). To change the z-order of Mosiac-mode windows, use the *roVideoPlayer.ToFront()* method.
- `friendly_name`: A human-readable name for referencing the decoder in HTML and scripts
- `enable_mosaic_deinterlacer`: A Boolean value indicating whether Mosaic-mode videos can be interlaced or not. Enabling the deinterlacer will allow playback of interlaced videos in Mosiac mode, but will reduce the number of Mosiac-mode videos that can be decoded simultaneously as well.

GetDecoderModes() As roArray

Returns an array of associative arrays, each one corresponding to a single decoder. Each associative array contains the following entries:

- `decoder_name`: The system name of the decoder
- `friendly_name`: The name of the decoder as specified when calling `SetDecoderMode()`
- `max_decode_size`: The maximum resolution of the decoder, as set by system software. This value can be either "4K" or "HD"
- `configured_decode_size`: The maximum resolution of the decoder that is specified when calling `SetDecoderMode()`
- `mode`: The current mode of the decoder, which can be either "Regular" or "Mosaic"
- `usage_count`: The number of videos currently being decoded by the decoder
- `max_usage`: The maximum number of videos that can be decoded simultaneously by the decoder. The optimum `max_usage` limits are described below; the limit may be lower depending on a number of factors, including interlacing and frame rate.
  - 4K decoder:
    - 1 4K video
    - 2 HD videos
    - 4 SD videos

        - 8 CIF videos
        - 10 QCIF videos
    - HD decoder:
        - 0 4K videos
        - 1 HD video
        - 3 SD videos
        - 4 CIF videos
        - 5 QCIF videos
- `mosaic_mode_interlace`: The current deinterlacing mode of the decoder, which can be either "Enabled" or "Disabled". This value is specified when calling `SetDecoderMode()`.

Set3dMode(mode As Integer) As Boolean

Sets the 3D video output mode, which is specified by passing one the following parameters:

- 0: Standard mono video (default)
- 1: Side-by-side stereo video
- 2: Top-and-bottom stereo video

Screenshot(parameters As roAssociativeArray) As Boolean

Captures a screenshot of the video and graphics layer as a *.jpeg* or *.bmp* file. The screenshot is configured by passing an associative array of parameters to the method:

- `filename`: A string specifying the name and path of the image file that will be saved (e.g. "SD:/myscreenshots/screen.jpg").
- `width`: An integer specifying the width of the image file.
- `height`: An integer specifying the height of the image file.

Note
The default dimensions of the image file is 640x480.

- `filetype`: A string determining whether the image is a "JPEG" or "BMP" file type. Note that the file extension (".jpg" or ".bmp") is not appended to the filename by default and, if needed, should be included in the `filename` string.
- `quality`: An integer value (between 0 and 100) that determines the image quality of the screenshot. This parameter is set to 50 by default.
- `async`: An integer value that determines whether the screenshot should be taken synchronously or asynchronously. If set to 0, the function returns True after the image file has successfully finished writing. If set to 1, the function will return True prior to saving the file, then return an *roScreenShotComplete* event once the file has finished writing.

GetResX() As Integer

Returns the current width of the graphics plane.

GetResY() As Integer

Returns the current height of the graphics plane.

GetVideoResX() As Integer

Returns the current width of the video plane.

GetVideoResY() As Integer

Returns the current height of the video plane.

GetOutputResX() As Integer

Returns the width of the display for the current video mode.

GetOutputResY() As Integer

Returns the height of the display for the current video mode.

GetSafeX() As Integer

Returns the horizontal coordinate for the upper-left corner of the "safe area". For modes that are generally displayed with no overscan, this will be zero.

GetSafeY() As Integer

Returns the vertical coordinate for the upper-left corner of the "safe area". For modes that are generally displayed with no overscan, this will be zero.

GetSafeWidth() As Integer

Returns the width of the "safe area." For modes that are generally displayed with no overscan, this will return the same as *GetResX*.

GetSafeHeight() As Integer

Returns the height of the "safe area." For modes that are generally displayed with no overscan, this will return the same as *GetResY*.

More information about safe areas can be found here:

- http://en.wikipedia.org/wiki/Safe_area
- http://en.wikipedia.org/wiki/Overscan_amounts

SetGraphicsZOrder(order As String)

Specifies the order of the graphics plane (which includes all graphical elements) in relation to the video plane(s). This method accepts three parameters:

- `"front"`: Places the graphics plane in front of the video plane(s).
- `"middle"`: Places the graphics plane between two video planes. This option is only applicable to XDx30, XDx32, and 4Kx42 models.
- `"back"`: Places the graphics plane behind the video plane(s).

If the player is rendering two videos, the `front` and `back` options will always place the graphics plane in front of or behind both video planes. To determine the z-order of video planes in relation to one another, use the `ToFront()` and `ToBack()` methods provided by the *roVideoPlayer* obje ct. The following table shows all possible video and graphics z-order arraignments that can be specified using the `SetGraphicsZOrder()` meth od and calling the `ToFront()` and `ToBack()` methods on a "Video1" *roVideoPlayer* instance.

SetGraphicsZOrder()	front		middle		back	
ToFront()/ToBack()	ToFront()	ToBack()	ToFront()	ToBack()	ToFront()	ToBack()
Z-Order	Graphics	Graphics	Video1	Video2	Video1	Video2
	Video1	Video2	Graphics	Graphics	Video2	Video1
	Video2	Video1	Video2	Video1	Graphics	Graphics

SetImageSizeThreshold(parameters As roAssociativeArray) As Boolean

Changes the maximum allowed resolution for images. The default image resolution limit is 2048x1280x32bpp (or 4096x2160x32bpp for 4K players), though you can sacrifice width to increase height. Displaying images larger than the default value may deplete the graphics memory and cause a crash, so we recommend testing a script that uses this method thoroughly before deploying it in a production environment. This method accepts an associative array with the following parameters:

- `width`: Overrides the maximum allowed width with the specified value.
- `height`: Overrides the maximum allowed height with the specified value.
- `ignore`: Disables resolution limits completely if the value is 1.

Tip
Without altering the default maximum resolution, you can increase the maximum width of images by sacrificing height (e.g. using a 4096x640x32bpp image on non-4K players is allowed). You can also increase the maximum width/height by reducing the bpp value (e.g. using a 4096x1280x16bpp on non-4K players is allowed).

AdjustGraphicsColor(parameters As roAssociativeArray) As Boolean

Adjusts the video and graphics output of the player using the following parameters, which can be passed to the method as an associative array: "brightness", "hue", "contrast", "saturation". Each parameter has a default value of 0 and can accept a range of values between -1000 and 1000.

ConfigureHdmiInput(parameters As roAssociativeArray) As Boolean

Configures EDID reporting for the HDMI input. By default, the input EDID includes video modes from the display attached to the HDMI output, some video modes supported by the player, and support for PCM audio up to 48kHz; it does not report proprietary media codecs that can be decoded by the device connected to the HDMI output, so you can use this method to announce such support if available at the endpoint. Using this method to change the default configuration will trigger a reboot on the player. The passed associative array can contain the following parameters:

- `MaxSampleRate`: An integer value specifying the maximum supported PCM audio sampling rate in Hz (e.g. the default sampling rate is 48000)
- `EnableAC3`: An integer value specifying whether AC-3 is not supported (0) or supported (1)
- `EnableEAC3`: An integer value specifying whether E-AC-3 is not supported (0) or supported (1)
- `EnableTrueHDMlp`: An integer value specifying whether TrueHD MLP is not supported (0) or supported (1)
- `EnableDTS`: An integer value specifying whether DTS is not supported (0) or supported (1)
- `EnableDTSHD`: An integer value specifying whether DTS-HD is not supported (0) or supported (1)

GetHdmiOutputStatus() As roAssociativeArray

Returns an associative array of Boolean and integer values if an HDMI output is currently connected to a display device. This method will return Invalid if the HDMI output is currently not connected to a display device. The associative array contains the following parameters:

- `output_present`: Returns True if the HDMI output is connected to a display device or False if no device is present.
- `output_powered`: Returns True if the display device is on (i.e. RX powered) or False if it is off.
    - `EOTF`: Returns a string indicating the current electro-optical transfer function (EOTF) used by the display.
        - "HDR (GAMMA)"
        - "SDR (GAMMA)"
        - "SMPTE 2084 (PQ)"
        - "Future (BBC/NHK)"
        - "unspecified"
- `audio_bits_per_sample`: The number of bits per audio sample
- `audio_format`: The format of the audio output. A "PCM" value indicates that the player is sending decoded output.
- `audio_channel_count`: The number of audio channels in the output
- `audio_sample_rate`: The audio sample rate (in hertz)

Note
If an HDR video is playing, the following values will be retrieved from the video file: "max_cll", "max_fall", "red_primary_x", "red_primary_y", "green_primary_x", "green_primary_y", "blue_primary_x", "blue_primary_y", "white_point_x", "white_point_y", "min_mastering_luminance", "max_mastering_luminance".

GetHdmiInputStatus() As roAssociativeArray

Returns an associative array of Boolean and integer values if an HDMI input is currently connected to the device (4K1142, XD1132, XD1230 only). This method will return Invalid if there is currently no HDMI input source. The associative array contains the following parameters:

- `width`: Lists the pixel width of the video input.
- `height`: Lists the pixel height of the video input.
- `interlaced`: Returns True if the video input is interlaced or False if it is not interlaced.
- `device_present`: Returns True if there is an HDMI input device present or False if there is no HDMI input device present.

GetTxHDCPStatus() As roAssociativeArray

Returns an associative array indicating the current HDCP status of the HDMI output. The associative array currently contains a single key labeled `state`, which can have the following values:

- "not-required": HDCP has not been requested.
- "authenticated": HDCP has been enabled and successfully negotiated.
- "authentication-in-progress": HDCP has been enabled, but authentication has not been completed.
- "authentication-failed": HDCP has been requested but could not be negotiated.

ForceHDCPOn(force As Boolean) As Boolean

Forces HDCP authentication on the HDMI output if passed True. Passing False to this method will prevent forced authentication attempts with subsequent hotplug events. This method will return False if the player does not support HDCP or if `ForceHDCPOn()` has already been called with the same value.

DisableHDCPRepeater(disable As Boolean) As Boolean

Prevents HDCP authentication from taking place on the HDMI input if passed True. The HDMI source will treat the player like any other non-HDCP authenticated HDMI sink. This method returns False if the HDCP state could not be changed, indicating that there's no HDMI input on the player or that HDCP has already been disabled.

SetBackgroundColor(a As Integer) As Boolean

Specifies the background color using an `#rrggbb` hex value.

SetPowerSaveMode(power_save_enable As Boolean) As Boolean

Turns off the syncs for VGA output and the DAC output for component video. This will cause some monitors to go into standby mode.

EnableVideo(enable As Boolean) As Boolean

Enables video output from the device if True. Setting this method to False disables all video output from the device. This method is set to True by default.

IsAttached(connector As String) As Boolean

Returns True if the specified video connector is attached to an output device. This method can be passed the following parameters (note that they are case sensitive):

- "hdmi"
- "vga"

HdmiAudioDisable(disable As Boolean) As Boolean

Disables audio output if True. This method is set to False by default.

SetMultiscreenBezel(x_pct As Integer, y_pct As Integer) As Boolean

Adjusts the size of the bezel used in calculations when using multiscreen displays for video and images. It allows users to compensate for the width of their screen bezels in multiscreen configurations. The calculations for the percentages are as follows:

x_percentage = (width_of_bezel_between_active_screens / width_of_active_screen) * 100

y_percentage = (height_of_bezel_between_active_screens / height_of_active_screen) * 100

The bezel measurement is therefore the total of the top and bottom bezels in the y case, or the left and right bezels in the x case. When this value is set correctly, images spread across multiple screens take account of the bezel widths, leading to better alignment of images.

SaveEdids(filename As String) As Boolean

Saves the EDID information of the display(s) connected via HDMI and/or VGA. The EDID fields are saved sequentially as raw binaries into the specified file. The EDID sets are two 2kb each, resulting in a maximum file size of 4kb. This method returns True upon success and False upon failure.

GetEdidIdentity(video_connector As Boolean) As roAssociativeArray

Returns an associative array with EDID information from a compatible monitor/television. Passing True with this method specifies EDID over HDMI, while passing False specifies EDID over VGA. These are the possible parameters returned in the associative array:

- `serial_number_string`
- `year_of_manufacture`
- `monitor_name`
- `manufacturer`
- `text_string`
- `serial_number`
- `product`
- `week_of_manufacture`

The system will generate an *roHdmiEdidChanged* event when an HDMI cable is hotplugged and the EDID information changes. Calling `GetEdidIdentity(true)` at this point retrieves the new EDID information.

SetMpcdi(enable As Boolean) As Boolean

Enables MPCDI if passed True. This will only happen if all of the resources needed for MPCDI have been allocated and set correctly—otherwise, this method will return False and not enable MPCDI. You can pass False to this method to disable MPCDI after it has been enabled.

Tip

See the MPCDI tech note for more information about configuring MPCDI on BrightSign players.

SetMpcdiRegionResRectangle(window As roRectangle) As Boolean

Sets the region viewport. Use the `<XResolution>` and `<YResolution>` attributes in the `<region>` tag to configure the dimensions of the *roRectangle*.

SetMpcdiRegionRectangle(x As Float, y As Float, xsize As Float, ysize As Float) As Boolean

Sets the region coordinates. Pass the values contained in the `<x>`, `<y>`, `<xsize>`, and `<ysize>` attributes in the `<region>` tag.

SetMpcdiAlphaMapRectangle(r As roRectangle) As Boolean

Sets the width and height of the Alpha blend map. The x and y coordinates are set to 0.

SetMpcdiAlphaMap(data As roByteArray) As Boolean

Sets the alpha blend map. Pass the decoded *.png* data in the form of an *roByteArray*.

SetMpcdiAlphaMapGamma(gamma As Float) As Boolean

Sets the gamma value of the alpha map. Pass the value contained in the `<gammaEmbedded>` attribute in the `<alphaMap>` tag.

SetMpcdiWarpMapRectangle(r As roRectangle) As Boolean

Sets the width and height of the warp grid. The x and y coordinates are set to 0.

SetMpcdiWarpMap(data As roArray) As Boolean

Sets the warp geometry grid data extracted from the *.pfm* file.

SetMpcdiBetaMapRectangle(r As roRectangle) As Boolean

Sets the Beta blend map width and height. The x and y coordinates are set to 0.

SetMpcdiBetaMap(data As roByteArray) As Boolean

Sets the beta blend map. Pass the decoded *.png* data in the form of an *roByteArray*.

`ifMessagePort`

SetPort(port As Object) As Void

Posts events to the attached message port

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`"Auto" Video Mode`

If the mode is set to "auto," the BrightSign player will use the following algorithm to determine the best video mode to use based on connected hardware:

1. Try VGA: If VGA is attached, use the highest-resolution mode (as reported by the monitor) that the player supports.
2. Try HDMI: If HDMI is attached, use the highest-resolution mode (as reported by the monitor) that the player supports.
3. Default to 1024x768x75p.
4. If an HDMI hotplug event occurs at any point, recheck the monitor EDID to determine if the highest-resolution mode has changed. If it has changed, reboot the player and use the new video mode.

Selecting Decoders for Playback

An *roVideoPlayer* instance selects which video decoder to use based on the resolution probed from the video file. It will attempt to select the decoder that has the closest maximum supported resolution (i.e. 1920x1080 for the HD decoder and 3840x2160 for the 4K decoder), without exceeding that maximum resolution. If a decoder has been configured using the *roVideoMode.SetDecoderMode()* method, it will match the video resolution against the specified `timeslice_mode` instead. If both decoders support the same maximum resolution, you can select a decoder by matching the z-order of the *roVideoPlayer* instance (set using the `ToFront()` and `ToBack()` methods) with the z-order of the decoder (set using the *roVideoMode.SetDecoderMode()* method).

You can also select the decoder manually. First, configure the decoder(s) using the *roVideoMode.SetDecoderMode()* method. Then, use the `friendly_name` specified when calling the method to designate a decoder to use for video playback.

To select a decoder in BrightScript, pass an associative array to the *roVideoPlayer.PlayFile()* method containing the `decoder:[friendly_name]` parameter:

```
PlayFile({filename:"text_1.mov", decoder:"main-video"})
```

To select a decoder for HTML video, include the `decoder:[friendly_name]` property with the `hwz` attribute:

```
<video hwz="decoder:main-video;"> </video>
<video hwz="decoder:sd-video;"> </video>
```

The `max_usage` of a decoder determines how many video players can be assigned to the decoder using the system software algorithm described above—video players beyond the `max_usage` limit may be assigned to another decoder or not displayed at all. On the other hand, if you manually assign video players using the `friendly_name` of the decoder, you can assign more video players to the decoder than the `max_usage` limit, but this may cause unpredictable video-display behavior.

ROVIDEOPLAYER

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This object is used to play back video files (using the generic *ifMediaTransport* interface). If the message port is set, the object will send events of the type *roVideoEvent*. All object calls are asynchronous. That is, video playback is handled in a different thread from the script, and the script will continue to run while video is playing. Decoded video will be scaled to the output resolution specified by *roVideoMode*.

To display video in a zone/window, you must call SetRectangle(). In firmware versions 6.0.x and later, zone support is enabled by default

`ifIdentity`

GetIdentity() As Integer

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roVideoEvent* to the attached message port.

ifUserData

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifAudioControl`

See the *roAudioPlayer* entry for documentation of *ifAudioControl*.

`ifAudioAuxControl`

MapStereoOutputAux(mapping As Integer) As Boolean

SetVolumeAux(a As Integer) As Boolean

SetChannelVolumesAux(channel_mask As Integer, b As Integer) As Boolean

SetAudioOutputAux(audio_output As Integer) As Boolean

SetAudioModeAux(audio_mode As Integer) As Boolean

SetAudioStreamAux(stream_index As Integer) As Boolean

SetUsbAudioPortAux(a As Integer) As Boolean

`ifVideoControl`

PlayStaticImage(filename As String) As Boolean

Uses the video decoder to display an image. On 4Kx42 models, you can use the video decoder to display 4K images.

PlayStaticImage(parameters As roAssociativeArray) As Boolean

Uses the video decoder to display an image. The passed associative array can contain the following parameters:

- `Filename`: The name of the image file
- `EncryptionAlgorithm`: The file-encryption algorithm. Currently the options are "AesCtr" and "AesCtrHmac".
- `EncryptionKey`: The key to decrypt the image file. This is a byte array consisting of 128 bits of key, followed by 128 bits of IV.

See the Image Decryption section in the roImagePlayer entry for details on displaying encrypted images.

SetViewMode(mode As Integer) As Boolean

Sets the scaling of the video in relation to the video window. The passed integer can be one of the following values:

- 0: Scales the video to fill the window. The aspect ratio of the source video is ignored, so the video may appear stretched/squashed.
- 1: Letterboxes and centers the window. The aspect ratio of the source window is maintained.
- 2:(Default) Scales the video to fill the window. The aspect ratio is maintained, so the video may appear cropped.

Note that view modes rely on correct aspect-ratio marking from video files, and not all files may be marked correctly.

SetRectangle(r As roRectangle) As Void

Specifies the placement and dimensions of the video window using a passed *roRectangle* instance.

Hide() As Boolean

Hides the video window.

Show() As Boolean

Shows the video window.

EnableSafeRegionTrimming(enable As Boolean) As Boolean

AdjustVideoColor(parameters As roAssociativeArray) As Boolean

Adjusts the video and graphics output of the player using the following parameters, which can be passed to the method as an associative array: "brightness", "hue", "contrast", "saturation". Each parameter has a default value of 0 and can accept a range of values between -1000 and 1000.

SetKeyingValue(keying_settings As roAssociativeArray) As Boolean

Applies a mask to each pixel in the video window. If the pixel value falls within the specified range of chroma and luma key values, the pixel will appear transparent, allowing video and graphics behind it to show through. If the pixel value does not fall within the specified range, the pixel is unaltered. The chroma and luma key values are set using integers contained in the passed associative array:

- `luma`
- `cr`
- `cb`

Each integer value is arranged as follows: `[8 bits of mask][8 bits of high-end range][8 bits of low-end range]`. For example, an 0xff8040 value for luma would mask luma at 0xff (no change) and then apply a range from 0x40 to 0x80 for changing to transparent alpha. Note that chroma and luma keying work well with simple shapes and patterns, while complex patterns like hair or grass will not be masked effectively.

SetTransform(transform As String) As Boolean

Applies one of eight transforms to the video plane. This method works equally well with all video sources (files, streams, HDMI input) and can be called separately on multiple *roVideoPlayer* instances. Calls to this method only take effect when the next file/source is played, and transitions to a transformed video do not take place seamlessly.

- `identity`: No transformation (default behavior)
- `rot90`: 90 degree clockwise rotation
- `rot180`: 180 degree rotation
- `rot270`: 270 degree clockwise rotation
- `mirror`: Horizontal mirror transformation
- `mirror_rot90`: Mirrored 90 degree clockwise rotation
- `mirror_rot180`: Mirrored 180 degree clockwise rotation
- `mirror_rot270`: Mirrored 270 degree clockwise rotation

GetFilePlayability(filename As String) As roAssociativeArray

Returns an associative array indicating the playability of the video file. For the following keys, a `"playable"` value indicates that the component is playable, while a `"no media"` value indicates that there is no media—any other value indicates that the media is unplayable.

- `audio`: The audio file associated with the video
- `video`: The video file associated with the video
- `file`: The video container file

GetProbePlayability(probe_string As String) As roAssociativeArray

Returns an associative array indicating the playability of the probe string. For the following keys, a `"playable"` value indicates that the component is playable, while a `"no media"` value indicates that there is no media—any other value indicates that the media is unplayable.

- `audio`: The audio file associated with the video
- `video`: The video file associated with the video
- `file`: The video container file

GetStreamInfo() As roAssociativeArray

Returns an associative array containing information about the current video. To retrieve metadata about a video file that is not currently playing, use the `ProbeFile()` method instead. The associative array can contain the following parameters:

- `Source`: The URI of the video file
- `SrcAddress`: The source IP address of the video stream
- `DstAddress`: The multicast address on which the IP stream is being transmitted. This value may be absent if the RTSP service has not redirected the stream (in this case, the IP address of the player may be displayed instead).
- `Encapsulation`: The encapsulation of the video. This value can be "ES" (elementary stream), "TS" (transport stream), or "UNKNOWN" for streaming video.
- `AudioFormat`: The format of the audio file
- `AudioSampleRate`: The audio sample rate (in hertz)
- `AudioChannelCount`: The number of audio channels
- `AudioDuration`: The duration of the audio track
- `VideoFormat`: The format of the video file
- `VideoFramerate`: The video frame rate (in frames per second)
- `VideoColorDepth`: The color depth of the video (in bits)
- `VideoWidth`: The width of the video (in pixels)
- `VideoHeight`: The height of the video (in pixels)
- `VideoAspectRatio`: The aspect ratio of the video
- `VideoDuration`: The duration of the video

GetStreamStatistics() As roAssociativeArray

Returns an associative array containing statistics associated with the IP stream. The associative array contains the following parameters:

Note
All counters are reset every time PlayFile() is called. The audio keys will not be included in the associative array if there is no audio in the stream.

- `Bitrate`: The video bitrate
- `NumDisplayed`: The number of video frames displayed. This is based on the refresh rate of the monitor.
- `NumUnderflowed`: The number of times the video FIFO has under-flowed. This usually indicates that the buffer size needs to be increased.
- `NumDecodeErrors`: The number of video frames with decode errors
- `NumDecoded`: The total number of video frames decoded
- `NumAudioDecoded`: The total number of audio frames decoded
- `NumAudioDecodeErrors`: The number of audio frames with decode errors
- `NumAudioDummy`: The total number of missing audio frames. This value will increment when an audio frame goes missing or a timestamp is incorrect. A couple of frames will often be registered when streaming begins.
- `NumAudioUnderflows`: The number of times the audio FIFO has under-flowed. This usually indicates that the buffer size needs to be increased.
- `VideoFramesPerSecond`: The video frame rate (in frames per second)
- `VideoInterlaced`: A flag indicating whether the video frames are interlaced or progressive

SetPreferredVideo(description As String) As Boolean

Chooses a video stream from the video input based on the parameters in the passed string.

SetPreferredAudio(description As String) As Boolean

Chooses an audio stream from the video input based on the parameters in the passed string.

SetPreferredCaptions(description As String) As Boolean

Chooses a data stream from the video input based on the parameters in the passed string.

`ifMediaTransport`

PlayFile(source As Object) As Boolean

Plays a video file or HDMI Input. To play a file, pass a string specifying the file name and path. To play HDMI Input, pass an *roVideoInput* instanc
e.

PlayFile(parameters As roAssociativeArray) As Boolean

Plays video using the parameters passed as an associative array. This method has several uses: Playing synchronized (and multiscreen) video using the parameters provided by the *roSyncManager* object; playing streaming video from a URL; playing encrypted files; or playing RF Input using the associative array provided by the `CreateChannelDescriptor()` method on the *roChannelManager* object. The associative array can contain the following parameters for audio/video playback:

- `Filename`: The name/path of a file to be used for playback
- `Url`: The URL of a video stream to be used for playback
- `FadeInLength`: The length (in milliseconds) of fade-in at the beginning of the media
- `FadOutLength`: The length (in milliseconds) of fade-out at the end of the media

SetPlaybackSpeed(speed as Float) As Boolean

Modulates the playback speed of the video, using the float 1.0 as the value for standard playback speed. To fast-forward the video, pass a value greater than 1.0; to rewind the video, pass a negative value. A value between 0 and 1.0 will the play the video in slow motion.

PreloadFile(parameters As roAssociativeArray) As Boolean

Stop() As Boolean

Play() As Boolean

SetLoopMode(mode As Dynamic) As Boolean

Specifies the looping mode for media playback. If this method is passed True, a single media file will loop seamlessly if possible. If the video file c
annot be looped seamlessly, then the video will loop with seams. Setting this method to False, which is the default behavior, allows for playback of multiple files in a playlist—with noticeable gaps between the end and beginning of the file. Alternatively, this method can accept an associative array with three Boolean parameters: `enable`, `enable_if_seamless`, `allow_seamless`. The following table describes how these parameters interact:

`enable`	`enable_if_seamless`	`allow_seamless`	Behavior
False	X	X	Looping is disabled in all cases (the `enable_if_seamless` and `allow_seamless` parameters are ignored).
True	False*	True*	The video is looped seamlessly if possible; otherwise, it is looped with seams.
True*	True	True*	The video is looped seamlessly if possible; otherwise, it is not looped at all.
True*	True	False	Looping is disabled in all cases.
True	False*	False	The video is looped with seams.

*or not specified.

> **Note**
> Media End events are only sent if seamless looping is disabled, or if enable_if_seamless is enabled and the file cannot be looped seamlessly.

AddEvent(user_data As Integer, time_in_ms As Integer) As Boolean

Adds a trigger that will generate an *roVideoEvent* when it reaches the specified time. The user data will be passed with the event and can be retrieved using the *roVideoEvent.GetData()* method. See the Video Timecode Events section below for more details.

ClearEvents() As Boolean

Removes all timecode events that have been added using the `AddEvent()` method.

GetEvents() As roArray

Returns an array of timecode events added to the *roVideoPlayer* instance using the AddEvent() method. Each entry in the array consists of an associative array with the following values:

- `id`: The `user_data` of the event (as an Integer)
- `timestamp`: The timestamp (in milliseconds)

StopClear() As Boolean

Pause(parameters As roAssociativeArray) As Boolean

Pauses the video file or stream. This method accepts an optional associative array containing the following parameter:

- `SyncIsoTimeStamp`: The time stamp for pausing synchronized video. This value is provided by the *roSyncManager.Synchronize()* meth od on the master unit and the *roSyncManagerEvent.GetIsoTimeStamp()* method on slave unit(s).

Resume(parameters As roAssociativeArray) As Boolean

Resumes a paused video file or stream. This method accepts an optional associative array containing the following parameter:

- `SyncIsoTimeStamp`: The time stamp for resuming synchronized video. This value is provided by the *roSyncManager.Synchronize()* met hod on the master unit and the *roSyncManagerEvent.GetIsoTimeStamp()* method on slave unit(s).

PlayEx(a As Object) As Boolean

This object has been deprecated. We suggest using the PlayFile() method for video playback instead.

GetPlaybackPosition() As Integer

Returns the amount of time the current file or IP stream has been playing (in milliseconds). If `SetLoopMode()` is set to True, the value will not reset when playback loops. If looping playback or IP streaming continues uninterrupted for approximately 25 days, the value will wrap around and become negative.

GetDuration() As Integer

Returns the total playback duration (in milliseconds) of the current file.

Seek(position As Integer) As Boolean

Seeks to the specified position in the audio/video file(measured in milliseconds). If the file is currently playing, then it will continue to play; otherwise, it will remain paused after seeking. This method only supports the MP4/MOV video container; all standard audio formats are supported.

SetFade(parameters As roAssociativeArray) As Boolean

Fades out both the video and audio when the method is called. When the fade completes, an *roVideoEvent* object with the `18 – FadeOut` value will be posted to the message port. This method accepts an associative array, which can currently contain only one parameter:

- `FadeOutLength`: The length of time (in milliseconds) over which the audio/video fades out.

ProbeFile(filename As String) As roAssociativeArray

Returns an associative array containing metadata about the specified video file. To retrieve metadata about a file that is currently playing, use the `GetStreamInfo()` method instead. The returned associative array can contain the following parameters:

- `Source`: The URI of the file
- `Encapsulation`: The encapsulation of the video
- `AudioFormat`: The format of the audio file
- `AudioSampleRate`: The audio sample rate (in hertz)
- `AudioChannelCount`: The number of audio channels
- `AudioDuration`: The duration of the audio track
- `VideoFormat`: The format of the video file
- `VideoColorDepth`: The color depth of the video (in bits)
- `VideoWidth`: The width of the video (in pixels)

- `VideoHeight`: The height of the video (in pixels)
- `VideoAspectRatio`: The aspect ratio of the video
- `VideoDuration`: The duration of the video

`ifZorderControl`

ToFront() As Boolean

Places the video layer of the *roVideoPlayer* instance in front of the other video player.

ToBack() As Boolean

Places the video layer of the *roVideoPlayer* instance behind the other video player.

Note
This feature is not available on HD/LS players, which only support a single video player. For more information on ordering video layers relative to the graphics layer, refer to the *roVideoMode.SetGraphicsZOrder()* entry.

`Timecode Events`

You can use the `AddEvent()` method to add triggers for *roVideoEvent* events, which will generate the `12 – Timecode Hit` value at the specified millisecond times in a video file. Use the *roVideoEvent.GetData()* method to retrieve the user data passed with `AddEvent()`.

The following example script uses timecode events. The script prints 2, 5, and 10 at 2 seconds, 5 seconds, and 10 seconds into the video, respectively. The "msg" is approaching frame accurate.

```
10 v = CreateObject("roVideoPlayer")
20 p = CreateObject("roMessagePort")
30 v.SetPort(p)
40 ok = v.AddEvent(2, 2000) ' Add timed events to video
50 ok = v.AddEvent(5, 5000)
60 ok = v.AddEvent(10, 10000)
70 ok = v.AddEvent(100, 100000)
80 ok = v.PlayFile("SD:/C5_d5_phil.vob")
90 msg = Wait(0,p) ' Wait for all events
95 if msg.GetInt() = 8 then stop ' End of file
100 if msg.GetInt() <> 12 goto 90      ' I only care about time events
110 print msg.GetData() ' Print out index when the time event happens
120 goto 90
```

`Multiscreen Video Playback`

The *roVideoPlayer* object features overloaded `PreloadFile()` and `PlayFile()` functions. These take an *roAssociativeArray*, rather than a string, as a parameter. These alternative methods are used in conjunction with *roSyncManager* to stretch an image across multiple screens in an array or display windowed portions of a video, though they can also be used in place of the original function calls for standard operations.

The following example script uses the `PreloadFile()` method for multiscreen display:

```
v=CreateObject("roVideoPlayer")
a=CreateObject("roAssociativeArray")
a["Filename"] = "test.ts"
a["MultiscreenWidth"] = 3
a["MultiscreenHeight"] = 2
a["MultiscreenX"] = 0
a["MultiscreenY"] = 0
v.PreloadFile(a)
…
…
v.Play()
```

The `MultiscreenWidth` and `MultiscreenHeight` values specify the width and height of the multiple-screen matrix. For example, 3x2 would be 3 screens wide and 2 high. `MultiscreenX` and `MultiscreenY` specify the position of the current screen within that matrix. In the case above, on average only 1/6th of the video is drawn on each screen (though the view mode still applies), so depending on the shape of the video, it may have black bars on the side screens. In this way, it is relatively simple for a video player to display part of an image based on its position in the multiscreen array.

`PreloadFile()` does all of the preliminary work to get ready to play the specified video clip, including stopping the playback of the previous video file. The call to "Play" starts the playback. This is good for synchronizing video across multiple players as they can all be prepared ready to play and then will immediately start playing when the "Play" command is issued. This reduces synchronization latencies.

The following are the default values for the parameters:

- `MultiscreenWidth= 1`
- `MultiscreenHeight= 1`
- `MultiscreenX= 0`
- `MultiscreenY= 0`

This script uses `PlayFile()` to display a portion of a video. This displays a windowed portion of the *test.ts* video file starting at coordinates SourceX, SourceY, and SourceWidth by SourceHeight in size. The `SetViewMode()` setting is still honored as if displaying the whole file.

```
v=CreateObject("roVideoPlayer")
a=CreateObject("roAssociativeArray")
a["Filename"] = "test.ts"
a["SourceX"] = 100
a["SourceY"] = 100
a["SourceWidth"] = 1000
a["SourceHeight"] = 500
v.PlayFile(a)
```

To create a multiple-screen matrix in portrait mode, call SetViewMode(0) and SetTransform("rot90") before calling PlayFile().

This script creates a 3x1 portrait-mode multiscreen display:

```
v=CreateObject("roVideoPlayer")
a=CreateObject("roAssociativeArray")
a["Filename"] = "test.ts"
a["MultiscreenWidth"] = 3
a["MultiscreenHeight"] = 1
a["MultiscreenX"] = 0
a["MultiscreenY"] = 0
v.PreloadFile(a)
v.SetViewMode(0)

v.Play()
```

RF Channel Scanning

The `PlayFile()` method can be used for channel scanning and handling functionality similar to *roChannelManager*. To use `PlayFile()` for channel scanning, pass an *roAssociativeArray* with the following possible parameters:

- VirtualChannel
- RfChannel
- SpectralInversion
    - INVERSION_ON
    - INVERSION_OFF
    - INVERSION_AUTO
- ModulationType
    - QAM_64
    - QAM_256
    - QAM_AUTO
    - 8VSB
- VideoCodec

    - MPEG1-Video
    - MPEG2-Video
    - MPEG4Part2-Video
    - H264
    - H264-SVC
    - H264-MVCAVSC
- AudioCodec
    - MPEG-Audio
    - AAC
    - AAC+
    - AC3AC3+DTS
- VideoPid
- AudioPid
- PcrPid

The `VirtualChannel` and `RfChannel` parameters must be present for `PlayFile()` to scan correctly. If you specify only these parameters, the player will scan the RF channel for a QAM/ATSC signal and attempt to retrieve the specified virtual channel from the results. The results from this action are cached so that subsequent calls to `PlayFile()` will take much less time. Providing the `SpectralInversion` and/or `ModulationType` parameters will further speed up the scanning process.

If all parameters are supplied, then no scanning is required and the player can tune to the channel immediately. If one or more of the optional parameters is missing, then the player must parse the transport stream metadata to find the appropriate values for the supplied `VirtualChannel` and `RfChannel`.

Playing Encrypted Files

The *roVideoPlayer* object can be used to play audio/video files that have been encrypted using AES. The associative array passed to the `PlayFile()` method can accept two parameters for file decryption:

- `EncryptionAlgorithm`: The file-encryption algorithm. Currently the options are "AesCtr" and "AesCtrHmac".
- `EncryptionKey`: A byte array consisting of 128 bits of key, followed by 128 bits of IV.

Note
File decryption is only supported on the 4Kx42, XDx32, XDx30, and HDx22 platforms. Contact support@brightsign.biz to learn more about generating a key for obfuscation and storing it on the player.

Example

```
v = CreateObject("roVideoPlayer")
aa=CreateObject("roAssociativeArray")
aa.filename = "wall-sync2.mp4"
aa.encryptionalgorithm = "AesCtr"
aa.encryptionkey = CreateObject("roByteArray")
aa.encryptionkey.fromhexstring("01030507090b0d0f00020406080a0c0e000000000000000000000000000000
00")


v.PlayFile(aa)
```

Preferred Streams

If multiple video, audio, or data streams are encapsulated in the video input, you can use the `SetPreferredVideo()`, `SetPreferredAudio()`, and `SetPreferredCaptions()` methods to determine which stream to use. For example, if a video may contain English and Spanish audio tracks, you can call `SetPreferredAudio()` to specify that the Spanish track should be played if it exists, with the video defaulting to English otherwise.

Preferred streams are chosen by matching the patterns in the passed string(s) against the textual description of the stream:

1. The passed string is a semicolon-separated list of templates.
2. Each template is a comma-separated list of patterns.
3. Each pattern is a `[field_name]=[field_value]` pair that is matched directly against the stream description.

SetPreferredVideo(description As String) As Boolean

Each template in the passed video description string can contain the following patterns:

- `pid=[integer]`: The packet identifier (PID) of the video stream you wish to display
- `codec=[video_codec]`: The preferred video codec, which can be any of the following:
  - `MPEG1`
  - `MPEG2`
  - `MPEG4Part2`
  - `H263`
  - `H264`
  - `VC1`
  - `H265`
- `width=[integer]`: The preferred video width
- `height=[integer]`: The preferred video height
- `aspect=[float(x.yy)]`: The preferred aspect ratio of the video stream as a floating-point number with two fractional digits.
- `colordepth=[integer]`: The preferred color depth of the video.

Example

```
"pid=7680, codec=H264, width=1280, height=720, aspect=1.78, colordepth=8;;"
```

SetPreferredAudio(description As String) As Boolean

Each template in the passed description string can contain the following patterns:

- `pid=[integer]`: The packer identifier (PID) of the audio stream you wish to play
- `codec=[audio_codec]`: The preferred audio codec, which can be any of the following:
  - `MPEG`
  - `MP3`
  - `AAC`
  - `AAC-PLUS`
  - `AC3`
  - `AC3-PLUS`
  - `DTS`
  - `PCM`
  - `FLAC`
  - `Vorbis`
- `channels=[integer]`: The preferred number of audio channels (from 1 to 8)
- `freq=[frequency]`: The preferred sample frequency of the audio track, which can be any of the following:
  - `32000`
  - `44100`
  - `4800`
- `lang=[language]`: A code that determines the preferred language of the audio track (e.g. eng, spa). The language codes are specified in the ISO 639-2 standard.
- `type=[audio_type]`: The preferred audio type, which can be one of the following:
  - `Main audio`
  - `Clean effects`
  - `Hearing impaired`
  - `Visual impaired commentary`

Example

```
“pid=4192, codec=AC3, channels=5, freq=48000, lang=eng, type=Main audio;;"
```

SetPreferredCaptions(description As String) As Boolean

Each template in the passed description string can contain the following patterns:

- `pid=[integer]`: The packer identifier (PID) of the caption stream you wish to play
- `type=[subtitle_type]`: The encoding standard of the subtitles. This value can be one of the following:
    - `CEA708`: If the CEA-708 standard is not present, the subtitle_type will default to CEA-608 (if it is present).
    - `CEA608`
    - `DVB`
- `lang=[language]`: A code that determines the preferred language of the subtitles (e.g. eng, spa). The language codes are specified in the ISO 639-2 standard.
- `service=[integer]`: The preferred service number of the caption stream

Example

```
"pid=0, type=Cea708, lang=eng service=1;;"
```

Pattern Matching Rules

Note the following rules when matching templates to video, audio, or caption stream descriptions:

- For a template to match a stream description, every pattern within the template must match.
- The first listed template to match the stream description (if any) will be used.
- An empty template string will match any stream description.
- All value comparisons are case-insensitive.
- Numerical values must match the stream description exactly (without leading zeroes). For example, the pattern `pid=016` will never match the stream PID value of 16.
- To indicate logical negation, apply the "!" exclamation mark to the beginning of a pattern. For example, specifying `SetPreferredVideo("!codec=H265")` will match only streams that are not encoded using H.265.
- Apply the ">" greater-than symbol before an integer to indicate that, for a successful match, the value in the stream description must be *g reater than* the value following the symbol. For example, specifying `SetPreferredVideo("width=<1921,height=<1081")` will match only videos that are no larger than full-HD.
- Apply the "<" less-than symbol before an integer to indicate that, for a successful match, the value in the stream description must be *less than* the value following the symbol.

Examples

The following examples illustrate some of the pattern matching behavior described above:

- The following template list contains three patterns: `lang=eng, lang=spa`, and an empty template. The first pattern specifies an English language channel; if the English channel does not exist, the second pattern specifies a Spanish language channel. The third pattern specifies any other channel if the first two don't exist (the empty template matches anything).

```
SetPreferredAudio("lang=eng;lang=spa;;")
```

- Since the following template list is empty, no captions are specified. This can be used to disable captions altogether.

```
SetPreferredCaptions("")
```

- The following template list contains an empty template. Since an empty template matches anything, the first video stream encountered will be played. This is the default behavior of all attributes.

```
SetPreferredVideo(";")
```

- The following template list specifies a 48KHz audio stream if there is one; otherwise, no audio stream will be played. Observe that the list is not correctly terminated with a semicolon; in this case, the semi-colon is implicitly supplied.

```
SetPreferredAudio("freq=48000")
```

- The following template list contains two templates. Note that all patterns within a template must match the stream description for the entire template to match. In this example, an AAC-encoded English track is preferred; an MP3-encoded English track is designated as the second option; and any track will be chosen if neither template is matched.

```
SetPreferredAudio("codec=aac,lang=eng;codec=mp3,lang=eng;;")
```

File Objects

Firmware Version 6.1

- Previous Versions

This section describes objects for creating, deleting, and manipulating files.

- roAppendFile
- roCreateFile
- roReadFile
- roReadWriteFile

ROAPPENDFILE

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Firmware Version 6.1

- Previous Versions

This object can be used to create a new file or append information to the end of an existing file.

Object Creation: Creating an *roAppendFile* object opens an existing file or creates a new file. The current position is set to the end of the file, and all writes are made to the end of the file.

```
CreateObject("roAppendFile", filename As String)
```

`ifStreamSend`

SetSendEol(eol_sequence As String) As Void

Sets the EOL sequence when writing to the stream. The default value is CR+LF. If you need to set this value to a non-printing character, use the `chr()` global function.

SendByte(byte As Integer) As Void

Writes the specified byte to the stream.

SendLine(string As String) As Void

Writes the specified characters to the stream followed by the current EOL sequence.

SendBlock(a As Dynamic) As Void

Writes the specified characters to the stream. This method can support either a string or an *roByteArray*. If the block is a string, any null bytes will terminate the block.

Flush()

AsyncFlush()

`ifStreamPosition`

CurrentPosition() As Integer

Returns the current position within the file.

ROCREATEFILE

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Firmware Version 6.1

- Previous Versions

This object can be used to write a new file or overwrite an existing file.

Object Creation: Creating an *roCreateFile* object opens an existing file or creates a new file. If the file exists, it is truncated to a size of zero.

```
CreateObject("roCreateFile", filename As String)
```

`ifReadStream`

SetReceiveEol(eol_sequence As String) As Void

Sets the EOL sequence when reading from the stream.

ReadByte() As Integer

Reads a single byte from the stream, blocking if necessary. If the EOF is reached or there is an error condition, then a value less than 0 is returned.

ReadByteIfAvailable() As Integer

Reads a single byte from the stream if one is available. If no bytes are available, it returns immediately. A return value less than 0 indicates either that the EOF has been reached or no byte is available.

ReadLine() As String

Reads until it finds a complete end of the line sequence. If it fails to find the sequence within 4096 bytes, then it returns the 4096 bytes that are found. No data is discarded in this case.

ReadBlock(size As Integer) As String

Reads the specified number of bytes. The number is limited to 65536 bytes. In the event of an EOF or an error, fewer bytes than requested will be returned. Any null bytes in the file will mask any further bytes.

AtEof() As Boolean

Returns True if an attempt has been made to read beyond the end of the file. If the current position is at the end of the file, but no attempt has been made to read beyond it, this method will return False.

`ifStreamSend`

SetSendEol(eol_sequence As String) As Void

Sets the EOL sequence when writing to the stream. The default value is CR+LF. If you need to set this value to a non-printing character, use the `chr()` global function.

SendByte(byte As Integer) As Void

Writes the specified byte to the stream.

SendLine(string As String) As Void

Writes the specified characters to the stream followed by the current EOL sequence.

SendBlock(a As Dynamic) As Void

Writes the specified characters to the stream. This method can support either a string or an *roByteArray*. If the block is a string, any null bytes will terminate the block.

Flush()

AsyncFlush()

`ifStreamSeek`

SeekAbsolute(offset As Integer) As Void

Seeks the specified offset. If the offset is beyond the end of the file, then the file will be extended upon the next write and any previously unoccupied space will be filled with null bytes.

SeekRelative(offset As Integer) As Void

Seeks to the specified offset relative to the current position. If the ultimate offset is beyond the end of the file, then the file will be extended as described in `SeekAbsolute()`.

SeekToEnd() As Void

Seeks to the end of the file.

CurrentPosition() As Integer

Retrieves the current position within the file.

ROREADFILE

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Firmware Version 6.1

- Previous Versions

Object Creation: Creating an *roReadFile* object opens the specified file for reading only. Object creation fails if the file does not exist.

```
CreateObject("roReadFile", filename As String)
```

ifStreamRead

SetReceiveEol(eol_sequence As String) As Void

Sets the EOL sequence when reading from the stream. The default EOL character is LF (ASCII value 10). If you need to set this value to a non-printing character, use the `chr()` global function.

ReadByte() As Integer

Reads a single byte from the stream, blocking if necessary. If the EOF is reached or there is an error condition, then a value less than 0 is returned.

ReadByteIfAvailable() As Integer

Reads a single byte from the stream if one is available. If no bytes are available, it returns immediately. A return value less than 0 indicates either that the EOF has been reached or no byte is available.

ReadLine() As String

Reads until it finds a complete end of the line sequence. If it fails to find the sequence within 4096 bytes, then it returns the 4096 bytes that are found. No data is discarded in this case.

ReadBlock(size As Integer) As String

Reads the specified number of bytes. The number is limited to 65536 bytes. In the event of an EOF or an error, fewer bytes than requested will be returned. Any null bytes in the file will mask any further bytes.

AtEof() As Boolean

Returns True if an attempt has been made to read beyond the end of the file. If the current position is at the end of the file, but no attempt has been made to read beyond it, this method will return False.

ifStreamSeek

SeekAbsolute(offset As Integer) As Void

Seeks the specified offset. If the offset is beyond the end of the file, then the file will be extended upon the next write and any previously unoccupied space will be filled with null bytes.

SeekRelative(offset As Integer) As Void

Seeks to the specified offset relative to the current position. If the ultimate offset is beyond the end of the file, then the file will be extended as described in `SeekAbsolute()`.

SeekToEnd() As Void

Seeks to the end of the file.

CurrentPosition() As Integer

Retrieves the current position within the file.

ROREADWRITEFILE

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Firmware Version 6.1

- Previous Versions

The object opens a file and allows both reading and writing operations on that file.

Object Creation: Creating an *roReadWriteFile* object opens an existing file for both reading and writing. Object creation fails if the file does not exist. The current position is set to the beginning of the file.

```
CreateObject("roReadWriteFile", filename As String)
```

ifReadStream

SetReceiveEol(eol_sequence As String) As Void

Sets the EOL sequence when reading from the stream.

ReadByte() As Integer

Reads a single byte from the stream, blocking if necessary. If the EOF is reached or there is an error condition, then a value less than 0 is returned.

ReadByteIfAvailable() As Integer

Reads a single byte from the stream if one is available. If no bytes are available, it returns immediately. A return value less than 0 indicates either that the EOF has been reached or no byte is available.

ReadLine() As String

Reads until it finds a complete end of the line sequence. If it fails to find the sequence within 4096 bytes, then it returns the 4096 bytes that are found. No data is discarded in this case.

ReadBlock(size As Integer) As String

Reads the specified number of bytes. The number is limited to 65536 bytes. In the event of an EOF or an error, fewer bytes than requested will be returned. Any null bytes in the file will mask any further bytes.

AtEof() As Boolean

Returns True if an attempt has been made to read beyond the end of the file. If the current position is at the end of the file, but no attempt has been made to read beyond it, this method will return False.

`ifStreamSend`

SetSendEol(eol_sequence As String) As Void

Sets the EOL sequence when writing to the stream. The default value is CR+LF. If you need to set this value to a non-printing character, use the `chr()` global function.

SendByte(byte As Integer) As Void

Writes the specified byte to the stream.

SendLine(string As String) As Void

Writes the specified characters to the stream followed by the current EOL sequence.

SendBlock(a As Dynamic) As Void

Writes the specified characters to the stream. This method can support either a string or an *roByteArray*. If the block is a string, any null bytes will terminate the block.

Flush()

AsyncFlush()

`ifStreamSeek`

SeekAbsolute(offset As Integer) As Void

Seeks the specified offset. If the offset is beyond the end of the file, then the file will be extended upon the next write and any previously unoccupied space will be filled with null bytes.

SeekRelative(offset As Integer) As Void

Seeks to the specified offset relative to the current position. If the ultimate offset is beyond the end of the file, then the file will be extended as described in `SeekAbsolute()`.

SeekToEnd() As Void

Seeks to the end of the file.

CurrentPosition() As Integer

Retrieves the current position within the file.

Hashing and Storage Objects

Firmware Version 6.1

- Previous Versions

This section describes objects related to local storage and the player registry, as well as generating data structures and hashing files.

- roBlockCipher
- roBrightPackage

ROBLOCKCIPHER

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Firmware Version 6.1

- Previous Versions

This object provides a means for symmetric block encryption. It currently supports AES and CBC ciphers, at block sizes of 128, 192, or 256 bits.

Object Creation: The *roBlockCipher* object is created with an associative array representing a set of parameters.

```
CreateObject("roBlockCipher", parameters As roAssociativeArray)
```

The associative array should contain the following parameters:

- mode: `"aes-128-cbc"`, `"aes-192-cbc"`, or `"aes-256-cbc"`
- padding: `"zero"` or `"pkcs7"`. The object defaults to zero padding if this parameter is omitted.

Padding is required for inputs that are not an exact multiple of the cipher block size. Specifying `"zero"` will add padding only when needed, while specifying `"pkcs7"` always adds padding, even if the data is already a multiple of the block size (in this case, an entire block will be added). PKCS#7 padding is automatically removed upon decryption, and zero padding will be retained since there are no means to unambiguously distinguish pad values from data.

`ifBlockCipher`

SetIV(iv As Object) As Void

Sets the Initialization Vector (IV) for CBC (Cipher-Block-Chaining) modes. If the supplied IV is shorter than required, then it will be zero padded (passing an empty string will set the vector to all zeroes). The IV will typically contain arbitrary characters and be in the form of an *roByteArray*, though it can also be a string.

Encrypt(key As Object, plaintext As Object) As roByteArray

Uses the specified key to encrypt the plaintext parameter, which can be passed as either a string or an *roByteArray*.

Decrypt(key As Object, cipher_text As Object) As roByteArray

Uses the specified key to decrypt cipher text, which should be passed as an *roByteArray*. Because the cipher text is encrypted, it can contain any character.

Example

```
' This is Case#4 from RFC3602
key = CreateObject("roByteArray")
iv = CreateObject("roByteArray")
plain = CreateObject("roByteArray")
key.FromHexString("56e47a38c5598974bc46903dba290349")
iv.FromHexString("8ce82eefbea0da3c44699ed7db51b7d9")
plain.FromHexString("a0a1a2a3a4a5a6a7a8a9aaabacadaeafb0b1b2b3b4b5b6b7b8b9babbbcbdbebfc0c1c2c3c
4c5c6c7c8c9cacbcccdcecfd0d1d2d3d4d5d6d7d8d9dadbdcdddedf")
c = CreateObject("roBlockCipher", { mode: "aes-128-cbc" })
c.SetIV(iv)
crypt = c.Encrypt(key, plain)
result = crypt.ToHexString()
expected =
UCase("c30e32ffedc0774e6aff6af0869f71aa0f3af07a9a31a9c684db207eb0ef8e4e35907aa632c3ffdf868bb7b
29d3d46ad83ce9f9a102ee99d49a53e87f4c3da55")


' Decrypt example to recover the encrypted data
c.SetIV(iv)
roundtrip = c.Decrypt(key, crypt)


' Second example selecting PKCS#7 padding
c = CreateObject("roBlockCipher", { mode: "aes-128-cbc", padding: "pkcs7" })
```

ROBRIGHTPACKAGE

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Firmware Version 6.1

- Previous Versions

An *roBrightPackage* object represents a *.zip* file, which can include arbitrary content or be installed on a storage device to provide content and script updates (for example, to distribute updates via USB thumb drives).

Object Creation: The *roBrightPackage* object is created with a filename parameter that specifies the name of the *.zip* file.

```
CreateObject("roBrightPackage", filename As String)
```

ifBrightPackage

ifBrightPackage is a legacy interface. We recommend you use *roAssetPool* instead to achieve better functionality.

Unpack(path As String) As Void

Extracts the *.zip* file to the specified destination path. Any preexisting files in the target directory will be deleted as part of this operation. Providing a destination path of "SD:/" will wipe all preexisting files from the card and extract the *.zip* contents to the root folder.

SetPassword(password As String) As Void

Provides the password specified when the *.zip* file was created. This method supports AES 128 and 256 bit encryption, as generated by WinZip.

GetFailureReason() As String

UnpackFile(a As String, b As String) As Boolean

Example

```
package = CreateObject("roBrightPackage", "newfiles.zip")
package.SetPassword("test")
package.Unpack("SD:/")
```

`Using roBrightPackage for Content Updates`

BrightSign players check storage devices for autorun scripts in the following order:

1. External USB devices 1 through 9
2. SD
3. µSD

In addition to looking for *autorun.brs* scripts, BrightSign players look for *autorun.zip* files that contain the script name *autozip.brs*. If an *autorun.zip* file with an *autozip.brs* file is found, and *autozip.brs* can be decrypted, then the player will execute the *autozip.brs* file.

Important
The *autozip.brs* file cannot reference any external files, as it is the only file to be automatically uncompressed by a BrightSign player prior to execution.

The *autozip.brs* script should unpack the contents of the *autorun.zip* file to an installed storage device and reboot to complete the update:

Example

```
package = CreateObject("roBrightPackage", "SD:/autorun.zip")
package.Unpack("SD:/")
MoveFile("SD:/autorun.zip", "SD:/autorun.zip_invalid")
RebootSystem()
```

Unpacking Encrypted Archives

If the *autorun.zip* file is encrypted, then the player uses the password stored in the registry, in the section "security" under the name "autozipkey," to decrypt the file.

Extended Example

```
' Content update application


r=CreateObject("roRectangle", 20, 668, 1240, 80)
t=CreateObject("roTextWidget",r,1,2,1)
r=CreateObject("roRectangle", 20, 20, 1200, 40)
t.SetSafeTextRegion(r)
t.SetForegroundColor(&hff303030)
t.SetBackgroundColor(&hffffffff)
t.PushString("Updating content from USB drive, please wait...")


package = CreateObject("roBrightPackage", "autorun.zip")
package.SetPassword("test")
package.Unpack("SD:/")
package = 0


t.Clear()
t.PushString("Update complete - remove USB drive to restart.")


while true
       sleep(1000)


       usb_key = CreateObject("roReadFile", "USB1:/autorun.zip")
       if type(usb_key) <> "roReadFile" then
             a=RebootSystem()
       endif
       usb_key = 0
end while
```

RODISKERROREVENT

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Firmware Version 6.1

- Previous Versions

This object is returned while waiting on a message port that is connected to an *roDiskMonitor* object.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifDiskErrorEvent`

GetDiskError() As Object

Returns an *roAssociativeArray* containing the following parameters:

Key	Type	Description
source	*roString*	The error type
time	*roDateTime*	The time at which the error occurred (with millisecond accuracy)
device	*roString*	The internal name for the device generating the error
error	*roString*	A description of the error (e.g."Timeout")
param	*roString*	The error parameter (use depends on type of error (e.g. the sector number))

Example

```
aa = msgp.GetDiskError()
report = "Time: " + aa["Time"] + "Error: " + aa["source"] + " " + aa["error"] + " " +
aa["device"] + " " + aa["param"]
```

This example uses an implicit conversion of *roDateTime*. You could also use *roDateTime.GetString()*.

RODISKMONITOR

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Firmware Version 6.1

- Previous Versions

This object provides access to low-level information about disk errors. It provides an event-based interface that delivers *roDiskErrorEvent* objects via *roMessageport*. Error messages are held for five seconds before delivery to minimize the chance of spurious error reports. Errors are not reported if the disk is removed during this five second interval because disk-removal detection takes several seconds. This allows for long-term monitoring of occasional media errors.

Object Creation: The *roDiskMonitor* object is created with no parameters.

```
CreateObject("roDiskMonitor")
```

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roDiskErrorEvent* to the attached message port.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

Example

```
diskmon=CreateObject("roDiskMonitor")

msgp=CreateObject("roMessagePort")
diskmon.Setport(msgp)
```

ROHASHGENERATOR

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Firmware Version 6.1

- Previous Versions

This object allows you to generate a variety of message digests.

Object Creation: The hashing algorithm is specified when creating the *roHashGenerator* object.

```
CreateObject("roHashGenerator", algorithm As String)
```

The algorithm parameter accepts the following strings:

- "SHA256"
- "SHA384"
- "SHA512"
- "SHA1"
- "MD5"
- "CRC32"

Note
CRC32 is only available on firmware versions 4.4.x or later.

`ifHashGenerator`

Hash(obj As Object) As Object

Hashes the payload, which can be supplied in the form of a string (or any object implementing *ifString*) or an *roByteArray*. The hash is returned as an *roByteArray*.

SetHmacKey(key As Dynamic) As Boolean

Supplies a cryptographic key for the hashing function. This method accepts a plain-text key.

SetObfuscatedHmacKey(key As String) As Boolean

Supplies a cryptographic key for the hashing function. This method accepts a key that is obfuscated using a shared secret.

GetFailureReason() As String

ROPASSKEY

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Firmware Version 6.1

- Previous Versions

This object provides a means for generating keys (hashes) from a password and salt.

Object Creation: The object is passed an associative array that specifies the generation methods and cipher.

```
CreateObject("roPassKey", parameters As roAssociativeArray)
```

The associative array should contain the following parameters:

- `method`: The key derivation method. Currently, only "pbkdf2" can be specified.
- `keyfn`: The pseudorandom function (PRF). Currently, only "hmac-sha256" can be specified.
- `keylen`: The key length
- `iterations`: The number of iterations

ifPassKey

GenerateKey(password As Object, salt As Object) As roByteArray

Generates a key using the supplied password and salt. The parameters may be passed as either strings or *roByteArray* instances. The generated *roByteArray* instance may contain all possible byte values, including NUL.

GenerateSalt(length As Integer) As roByteArray

Generates a salt of the specified length. This salt can be used when calling the `GenerateKey()` method. The generated *roByteArray* instance may contain all possible byte values, including NUL.

Example

```
' Create input test data
salt = CreateObject("roByteArray")
pass = CreateObject("roByteArray")
pass.FromAsciiString("password")
salt.FromAsciiString("salt")
' Create the key generator
pk = CreateObject("roPassKey",  { method: "pbkdf2", keyfn: "hmac-sha256", keylen: 32,
iterations: 4096 } )
' key with be a roByteArray
key = pk.GenerateKey(pass, salt)
```

ROREGISTRY

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Firmware Version 6.1

- Previous Versions

The registry is an area of memory where a small number of persistent settings can be stored. Access to the registry is available through the *roReg istry* object.

This object is created with no parameters:

```
CreateObject("roRegistry")
```

`ifRegistry`

GetSectionList() As roList

Returns a list with one entry for each registry section.

Delete(section As String) As Boolean

Deletes the specified section and returns an indication of success.

Flush() As Boolean

Flushes the registry out to persistent storage.

ROREGISTRYSECTION

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Firmware Version 6.1

- Previous Versions

This object represents a section of the registry, enabling the organization of settings within the registry. It allows the section to be read or written.

Object Creation: This object must be supplied with a registry-section name upon creation.

```
CreateObject("roRegistrySection", section As String)
```

`ifRegistrySection`

Read(key As String) As String

Reads and returns the value of the specified key. Performing `Read()` on an entry that does not exist, or on a key within a section that does not exist, will return an empty string ("").

Write(key As String, value As String) As Boolean

Replaces the value of the specified key.

Delete(key As String) As Boolean

Deletes the specified key.

Exists(key As String) As Boolean

Returns True if the specified key exists.

Flush() As Boolean

Flushes the contents of the registry out to persistent storage.

GetKeyList() As roList

Returns a list containing one entry per registry key in this section.

Example

```
registrySection = CreateObject("roRegistrySection", "widget-usage")
' An empty entry will read as an empty string and therefore be converted to zero.
hits = val(registrySection.Read("big-red-button-hits"))
hits = hits + 1
registrySection.Write("big-red-button-hits", strI(hits))
```

Writes do not always take effect immediately to prevent the system from exceeding the maximum number of writes on the onboard persistent storage. At most, 60 seconds after a write to the registry, the newly written data will be automatically written out to persistent storage. If, for some reason, the change must be written immediately, then one of the flush functions should be called. Changes are automatically written prior to exiting the application.

ROSQLITEDATABASE

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Firmware Version 6.1

- Previous Versions

This is the main SQLite object that "owns" the database. You can create as many of these objects as you need.

ifSqliteDatabse

Open(path As String) As Boolean

Opens an existing database file. This method returns True upon success.

Create(path As String) As Boolean

Creates a new, empty database file. This method returns True upon success.

Close()

Closes an open database.

CreateStatement(sql_text As String) As Object

Creates a new *roSqliteStatement* object using the specified SQL string.

RunBackground(sql_text As String, associative_array As Object) As Integer

Runs the specified SQL statement in the background and binds variables using the passed *roAssociativeArray*.

SetMemoryLimit(limit As Integer)

Sets the "soft" memory limit under which SQLite will attempt to remain (see the SQLite documentation for details).

> The SetMemoryLimit() method sets global parameters. It must, therefore, be called before any other calls are made on the database object.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roSqliteEvent* to the attached message port.

Example: Creating a Database

```
db = CreateObject("roSqliteDatabase")

print db

openResult = db.Create("SD:/test.db")

if openResult
    print "Created OK"
else
    print "Creation FAILED"
    end
endif
```

Example: Creating a Table in a Database

```
createStmt = db.CreateStatement("CREATE TABLE playback (md5 text PRIMARY KEY, path PATH,
playback_count INT);")

print createStmt

if type(createStmt) <> "roSqliteStatement" then
    print "We didn't get a statement returned!!"
    end
endif

sqlResult = createStmt.Run()

print sqlResult

if sqlResult = SQLITE_COMPLETE
    print "Table Created OK"
else
    print "Table Creation FAILED"
endif

createStmt.Finalise()
```

ROSQLITEEVENT

ON THIS PAGE

Firmware Version 6.1

- Previous Versions

This event object is returned when a RunBackground() operation is called by the associated *roSqliteDatabase* object.

`ifSqliteEvent`

GetTransactionId() As Integer

Returns an integer that matches the result of the originating RunBackground() operation.

GetSqlResult() As Integer

Returns the result code returned by the *roSqliteStatement.Run()* method. The possible return values are identical to the `Run()` method:

- 100: Statement complete
- 101: Busy
- 102: Rows available

Note
This *method can be used as the asynchronous alternative to the Run() method.*

ROSQLITESTATEMENT

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This object is created by calling the `CreateStatement()` method on an *roSqliteDatabase* object.

`ifSqliteStatement`

All *bind* methods return True upon success.

BindByName(associative_array As Object) As Boolean

Binds the SQL variable(s) using the names contained in the SQL statement.

BindByOffset(associative_array/enumerable As Object) As Boolean

Binds the SQL variable(s) using the index contained in the SQL statement. If passed an associative array, this method will convert the keys of the associative array into numeric offsets when binding. If passed an enumerable object (e.g. *roArray*), it will bind the values of the enumerable in the order that they are stored.

BindText(variable/index As Object, value As String) As Boolean

Binds the SQL variable indicated by the name or index parameter to the passed string value.

BindInteger(variable/index As Object, value As Integer) As Boolean

Binds the SQL variable indicated by the name or index parameter to the passed integer value.

Run() As Integer

Runs the SQL statement immediately and waits for the integer result. The following are possible integer result codes:

- 100: Statement complete
- 101: Busy
- 102: Rows available

RunBackground() As Integer

Runs the SQL statement in the background. You can use *roSqliteDatabase.SetPort()* to set a message port that will receive an *roSqliteEvent* mes sage at a later point. The RunBackground() call will result in an integer transaction ID, which will appear in the *roSqliteEvent* message that matches the transaction.

GetData() As Object

Returns an associative array of name/value pairs that are available after a SELECT (or similar) operation.

Finalise()

Finalizes the statement. This method should be applied to statements before the parent database is closed. The object should not be used after this method is called. Also note that objects are automatically finalized when they are deleted.

The following script inserts into a table using the `BindByName()` method:

```
insertStmt = db.CreateStatement("INSERT INTO playback (md5,path,playback_count)
VALUES(:md5_param,:path_param,:pc_param);")

print insertStmt

if type(insertStmt) <> "roSqliteStatement" then
    print "We didn't get a statement returned!!"
    end
endif

params = { md5_param: "ABDEF12346",  path_param: "/foo/bar/bing/bong", pc_param: 11 }

bindResult = insertStmt.BindByName(params)

if bindResult
    print "BindByName OK"
else
    print "BindByName FAILED"
    end
endif

sqlResult = insertStmt.Run()

print sqlResult

if sqlResult = SQLITE_COMPLETE
    print "Table Insertion OK"
else
    print "Table Insertion FAILED"
endif

insertStmt.Finalise()
```

The following script inserts into a table in the background:

```
' This examples assume you have set a message port on your roSqliteDatabase instance
'

insertStmt = db.CreateStatement("INSERT INTO playback (md5,path,playback_count)
VALUES(:md5_param,:path_param,:pc_param);")

print insertStmt

if type(insertStmt) <> "roSqliteStatement" then
    print "We didn't get a statement returned!!"
    end
endif

params = { md5_param: "ABDEF12348",  path_param: "/foo/bar/bing/bong", pc_param: 13 }

bindResult = insertStmt.BindByName(params)

if bindResult
    print "BindByName OK"
else
    print "BindByName FAILED"
    end
endif

expectedId = insertStmt.RunBackground()

e = mp.WaitMessage(10000)
if e <> invalid then
    if type(e) = "roSqliteEvent" then
        transId = e.GetTransactionId()
        sqlResult = e.GetSqlResult()
        print transId
        print sqlResult
        if transId <> expectedId then
            print "Incorrect transaction Id"
            end
        endif
        if sqlResult <> SQLITE_COMPLETE then
            print "SQL Insertion Failed"
            end
        endif
    else
        print "RunBackground() - Wrong event - FAILED"
        end
    endif
else
    print "RunBackground() - No Response - FAILED"
    end
endif

' You don't need to call Finalise() since that'll be done by the background processor.
```

The following script queries from a table:

```
selectStmt = db.CreateStatement("SELECT * FROM playback;")

if type(selectStmt) <> "roSqliteStatement" then
    print "We didn't get a statement returned!!"
    end
endif

sqlResult = selectStmt.Run()

print sqlResult

while sqlResult = SQLITE_ROWS
    resultsData = selectStmt.GetData()
    print resultsData;
    sqlResult = selectStmt.Run()
end while

selectStmt.Finalise()
```

ROSTORAGEATTACHED, ROSTORAGEDETACHED

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These event objects are generated by the *roStorageHotplug* object whenever a storage device becomes attached or detached from the player.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

`ifString`

GetString() As String

SetString(a As String)

ROSTORAGEHOTPLUG

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- Previous Versions

This object provides *roStorageAttached* messages when storage devices appear and *roStorageDetached* messages when storage devices disappear. There is currently no way to poll for media.

Object Creation: The *roStorageHotplug* object is created with no parameters.

```
CreateObject("roStorageHotplug")
```

ifUserData

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

ifMessagePort

SetPort(port As roMessagePort)

Posts messages of type *roStorageAttached* and *roStorageDetached* to the attached message port.

In order to avoid race conditions at startup, you should check for any storage devices that might have existed prior to the message port being set. We recommend doing this after the object is created and the message port is set, but before instructing the script to wait for any events.

Example

```
Sub Main()
    mp = CreateObject("roMessagePort")
    sh = CreateObject("roStorageHotplug")
    gpio = CreateObject("roControlPort", "brightsign")

    sh.SetPort(mp)
    gpio.SetPort(mp)

    finished = false
    while not finished
    ev = mp.WaitMessage(0)
    if type(ev) = "roControlDown"
        finished = true
    else if type(ev) = "roStorageAttached"
        print "ATTACHED "; ev.GetString()
    else if type(ev) = "roStorageDetached"
        print "DETACHED "; ev.GetString()
    else
        print type(ev)
        stop
    end if
    end while
End Sub
```

ROSTORAGEINFO

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This object is used to report storage device usage information.

Object Creation: The *roStorageInfo* object is created with a parameter that specifies the path of the storage device. The path does not need to extend to the root of the storage device.

```
CreateObject("roStorageInfo", path As String)
```

`ifStorageInfo`

GetFailureReason() As String

Yields additional useful information if a function return indicates an error.

GetBytesPerBlock() As Integer

Returns the size of a native block on the filesystem used by the specified storage device.

GetSizeInMegabytes() As Integer

Returns the total size (in mebibytes) of the storage device.

Important
On some filesystems that have a portion of space reserved for the super user, the following expression may not be true:
GetUsedInMegabytes() + GetFreeInMegabytes() == GetSizeInMegabytes()

GetUsedInMegabytes() As Integer

Returns the amount (in mebibytes) of space currently used on the storage device. This amount includes the size of the pool because this class does not integrate pools into its calculations.

GetFreeInMegabytes() As Integer

Returns the available space (in mebibytes) on the storage device.

GetFileSystemType() As String

Returns a string describing the type of filesystem used on the specified storage. The following are potential values:

- "fat12"
- "fat16"
- "fat32"
- "ext3"
- "ntfs"
- "hfs"
- "Hfsplus"

GetStorageCardInfo() As Object

Returns an associative array containing details of the storage device hardware (a memory card, for example). For SD cards, the returned data may include the following:

sd_mfr_id	Integer	Card manufacturer ID as assigned by the SD Card Association
sd_oem_id	String	Two-character card OEM identifier as assigned by the SD Card Association
sd_product_name	String	Product name, assigned by the card manufacturer (5 bytes for SD, 6 bytes for MMC)
sd_spec_vers	Integer	Version of SD spec to which the card conforms
sd_product_rev	String	Product revision assigned by the card manufacturer
sd_speed_class	String	Speed class (if any) declared by the card
sd_au_size	Integer	Size of the SD AU in bytes.

Example

```
si=CreateObject("roStorageInfo", "SD:/")
Print si.GetFreeInMegabytes(); "MiB free"
```

Content Management Objects

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- Previous Versions

This section describes objects that enable downloading, storage, and retrieval of content from a remote CMS.

ROASSETCOLLECTION

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This object is used to represent a collection of assets.

Object Creation: The *roAssetCollection* object is created with no parameters.

```
CreateObject("roAssetCollection")
```

You can populate an asset collection with individual calls to `AddAsset()` or `AddAssets()`. You can also populate an asset collection using the *roSyncSpec.GetAssets* method, as shown below:

```
assetCollection = CreateObject("roAssetCollection")

localCurrentSync = CreateObject("roSyncSpec")
       if localCurrentSync.ReadFromFile("local-sync.xml") then
             assetCollection = localCurrentSync.GetAssets("download")
       endif
```

`ifAssetCollection`

GetFailureReason() As String

AddAsset(asset_info As roAssociativeArray) As Boolean

Adds a single asset from an associative array.

AddAssets(asset_info_array As Object) As Boolean

Adds multiple assets from an enumerable object (*roList* or *roArray*) that contains compatible associative arrays.

GetAssetList() As roList

Returns an *roList* instance containing associative arrays of asset metadata. This method is not efficient and is, therefore, recommended for debugging and diagnostic purposes only.

Each associative array contains the following:

name	String	Required	The name of the asset. For a file to be realized, it must have a valid filename (i.e. no slashes).

link	String	Required	The download location of the asset
size	Integer/String	Optional	The size of the asset. Use a string if you want to specify a number that is too large to fit into an integer (this allows file sizes larger than 2 GB).
hash	String	Optional	A string in the form of "hash_algorithm:hash". See the next table for available hash algorithms.
change_hint	String	Optional	Any string that will change in conjunction with the file contents. This is not necessary if the link or hash is supplied and always changes.
auth_inherit	Boolean	Optional	Indication of whether or not this asset uses *roAssetFetcher* authentication information. The default is set to True.
auth_user	Boolean	Optional	User to utilize for authentication when downloading only this asset. This automatically disables "auth_inherit".
auth_password	Boolean	Optional	Password to use when downloading only this asset. This automatically disables "auth_inherit".
headers_inherit	Boolean	Optional	The command to pass any header supplier to *roAssetFetcher* when fetching this asset. The default is true.

Important
Any "optional" fields that are specified when populating the pool must also be specified when retrieving assets from the pool (i.e. they become "mandatory" once they are used for an asset). For example, if the hash value is specified when fetching into the pool, then it must also be specified when attempting to refer to files in the pool.

Hash algorithms:

sha1	If a sha1 is available, you can validate the hash as the file is downloaded. If such a hash is available, it should be used. The link and change_hint properties have no effect on the pool file name, so the file is shared even if it is downloaded from different locations.
besha1	This algorithm hashes some of the file along with the file size in order to verify the contents. It also moves the link and change_hint properties into the pool filename.
MD5	Uses the MD5 hash algorithm to validate files.
(none)	Without any hash, the file cannot be verified as it is downloaded, and the system will rely on the link and change_hint properties to give the pool a unique filename.

ROASSETFETCHER

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This object contains functions for downloading files to the pool.

Object Creation: The *roAssetFetcher* object must be passed an *roAssetPool* instance upon creation.

```
CreateObject("roAssetFetcher", pool As roAssetPool)
```

Example

```
Pool = CreateObject("roAssetPool", "pool")
Fetcher = CreateObject("roAssetFetcher", Pool)
```

`ifAssetFetcher`

GetFailureReason() As String

Returns an error string if an *roAssetFetcher* method has failed (this is usually indicated by returning False). The error string may help diagnose the failure.

SetUserAndPassword(user As String, password As String) As Boolean

Sets the default user and password strings to be used for all download requests that are not otherwise marked using the following attributes: <aut h inherit="no"> or <auth user="user" password ="password">.

EnableUnsafeAuthentication(enable As Boolean) As Boolean

Supports basic HTTP authentication if True. HTTP authentication uses an insecure protocol, which might allow others to easily determine the password. The *roAssetFetcher* object will still prefer the stronger digest HTTP if it is supported by the server. If this method is False (which is the default setting), it will refuse to provide passwords via basic HTTP authentication, and any requests requiring this authentication will fail.

EnableUnsafeProxyAuthentication(enable As Boolean) As Boolean

Supports basic HTTP authentication against proxies if True (which, unlike EnableUnsafeAuthentication(), is the default setting). HTTP authentication uses an insecure protocol, which might allow others to easily determine the password. If this method is False, it will refuse to provide passwords via basic HTTP authentication, and any requests requiring this authentication type will fail.

EnableEncodings(enable As Boolean) As Boolean

Enables HTTP compression, which communicates to the server that the system can accept any encoding that the *roAssetFetcher* object is capable of decoding by itself (this behavior is enabled by default). Supported encodings currently include "deflate" and "gzip", which allow for transparent compression of responses. Clients of the *roAssetFetcher* instance see only the decoded data and are unaware of the encoding being used.

AsyncDownload(assets As roAssetCollection) As Boolean

Begins populating the asset pool using the files listed in the passed *roAssetCollection* instance. Files that are not already in the pool will be downloaded automatically. Events are raised during the download process to indicate whether individual file downloads have succeeded or failed; finally, a single event will be raised indicating whether the entire asset collection has been downloaded successfully or not. See the *roAssetFetch erEvent* and *roAssetFetcherProgressEvent* entries for more details.

AsyncSuggestCache(a As Object) As Boolean

AsyncCancel() As Boolean

Cancels any pending “Async” requests. Note that, prior to and during this method call, events associated with an asynchronous action may be queued. No more events will be queued once this call returns. We recommend collecting any pending events prior to calling any further “Async” methods on the same object to avoid confusion.

EnablePeerVerification(verification As Boolean)

EnableHostVerification(verification As Boolean)

SetCertificatesFile(filename As String)

AddHeader(name As String, value As String)

Specifies a header that will be passed to HTTP requests made by the *roAssetFetcher* object. A particular download will not include the header if it has the <headers inherit="no"> attribute in the sync spec.

SetHeaders(headers As roAssociativeArray) As Boolean

Specifies all headers that will be passed to HTTP requests made by the *roAssetFetcher* object. This method removes any previously set headers. A particular download will not include the headers if it has the <headers inherit="no"> attribute in the sync spec.

SetProxy(proxy As String) As Boolean

Sets the name or address of the proxy server that will be used by the *roAssetFetcher* instance. The proxy string should be formatted as "http://user:password@hostname:port". It can contain up to four "*" characters; each "*" character can be used to replace one octet from the current IP address. For example, if the IP address is currently 192.168.1.2, and the proxy is set to "proxy-*-*", then the player will attempt to use a proxy named "proxy-192.168".

SetProxyBypass(hostnames As Array) As Boolean

Exempts the specified hosts from the proxy setting. The passed array should consist of one or more hostnames. The player will attempt to reach the specified hosts directly rather than using the proxy that has been specified with the SetProxy() method. For example, the hostname "example.com" would exempt "example.com", "example.com:80", and "www.example.com" from the proxy setting.

SetFileProgressIntervalSeconds(interval As Integer) As Boolean

Specifies the interval (in seconds) between progress events when an individual file is being downloaded. Setting the interval to -1 disables all progress events. Setting the interval to 0 specifies that events should be generated as often as possible, though this will slow down the transfer process. If the interval is set to 0 or any positive integer, events will always be generated at the start and end of the file download irrespective of elapsed time. The default interval is 300 seconds.

SetFileRetryCount(count As Integer) As Boolean

Specifies the maximum number of times each file download will be retried before moving on to the next file download. The default retry count is five.

SetRelativeLinkPrefix(prefix As String) As Boolean

Specifies a prefix that will be appended to the front of relative links in the sync spec. Normally, this method is used to make file:/// URIs drive agnostic, but it can also be used to reduce the size of the sync spec if all files are stored in the same place. Non-relative links are not affected by this method.

BindToInterface(interface As Integer) As Boolean

Ensures that the HTTP request goes out over the specified network interface (0 for Ethernet or 1 for WiFi). The default behavior (which can be specified by passing -1) is to send requests using the most appropriate network interface, which may depend on the routing metric configured via the *roNetworkConfiguration* object. If both interfaces are on the same layer 2 network, this method may not work as expected due to the Linux weak-host model.

SetMinimumTransferRate(bytes_per_second As Integer, period_in_seconds As Integer) As Boolean

Sets the minimum transfer rate for each file download. A transfer will be terminated if the rate drops below *bytes_per_second* when averaged over *period_in_seconds*. Note that if the transfer is over the Internet, you may not want to set `period_in_seconds` to a small number in case network problems cause temporary drops in performance. For large file transfers and a small `bytes_per_second` limit, averaging fifteen minutes or more may be appropriate.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roAssetFetcherEvent* and *roAssetFetcherProgressEvent* to the attached message port.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()` . It will return Invalid if no data has been set.

ROASSETFETCHEREVENT

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This event is generated by an *roAssetFetcher* instance when a file transfer succeeds or fails or when population of the asset pool as a whole succeeds or fails.

`ifAssetFetcherEvent`

GetEvent() As Integer

Returns an integer indicating the result of an *roAssetFetcher* download attempt:

- 1: POOL_EVENT_FILE_DOWNLOADED
- -1: POOL_EVENT_FILE_FAILED
- 2: POOL_EVENT_ALL_DOWNLOADED
- -2: POOL_EVENT_ALL_FAILED

GetName() As String

GetFailureReason() As String

Returns additional failure information associated with the event (if any).

GetFileIndex() As Integer

Retrieves the zero-based index from the sync spec of the file associated with the event.

GetResponseCode() As Integer

Returns the protocol response code associated with an event. The following codes indicate success:

- 200: Successful HTTP transfer
- 226: Successful FTP transfer
- 0: Successful local file transfer

For unexpected errors, the return value is negative. There are many possible negative errors from the CURL library, but it is often best to look at the text version by calling `GetFailureReason()`.

Here are some potential errors. Not all of them can be generated by a BrightSign player:

Status	Name	Description
-1	CURLE_UNSUPPORTED_PROTOCOL	

-2	CURLE_FAILED_INIT	
-3	CURLE_URL_MALFORMAT	
-5	CURLE_COULDNT_RESOLVE_PROXY	
-6	CURLE_COULDNT_RESOLVE_HOST	
-7	CURLE_COULDNT_CONNECT	
-8	CURLE_FTP_WEIRD_SERVER_REPLY	
-9	CURLE_REMOTE_ACCESS_DENIED	A service was denied by the server due to lack of access. When login fails, this is not returned.
-11	CURLE_FTP_WEIRD_PASS_REPLY	
-13	CURLE_FTP_WEIRD_PASV_REPLY	
-14	CURLE_FTP_WEIRD_227_FORMAT	
-15	CURLE_FTP_CANT_GET_HOST	
-17	CURLE_FTP_COULDNT_SET_TYPE	
-18	CURLE_PARTIAL_FILE	
-19	CURLE_FTP_COULDNT_RETR_FILE	
-21	CURLE_QUOTE_ERROR	Failed quote command
-22	CURLE_HTTP_RETURNED_ERROR	
-23	CURLE_WRITE_ERROR	
-25	CURLE_UPLOAD_FAILED	Failed upload command.
-26	CURLE_READ_ERROR	Could not open/read from file.
-27	CURLE_OUT_OF_MEMORY	
-28	CURLE_OPERATION_TIMEDOUT	The timeout time was reached.
-30	CURLE_FTP_PORT_FAILED	FTP PORT operation failed.
-31	CURLE_FTP_COULDNT_USE_REST	REST command failed.
-33	CURLE_RANGE_ERROR	RANGE command did not work.
-34	CURLE_HTTP_POST_ERROR	
-35	CURLE_SSL_CONNECT_ERROR	Wrong when connecting with SSL.
-36	CURLE_BAD_DOWNLOAD_RESUME	Could not resume download.
-37	CURLE_FILE_COULDNT_READ_FILE	
-38	CURLE_LDAP_CANNOT_BIND	
-39	CURLE_LDAP_SEARCH_FAILED	
-41	CURLE_FUNCTION_NOT_FOUND	
-42	CURLE_ABORTED_BY_CALLBACK	
-43	CURLE_BAD_FUNCTION_ARGUMENT	
-45	CURLE_INTERFACE_FAILED	CURLOPT_INTERFACE failed.
-47	CURLE_TOO_MANY_REDIRECTS	Catch endless re-direct loops.
-48	CURLE_UNKNOWN_TELNET_OPTION	User specified an unknown option.
-49	CURLE_TELNET_OPTION_SYNTAX	Malformed telnet option.

-51	CURLE_PEER_FAILED_VERIFICATION	Peer's certificate or fingerprint wasn't verified correctly.
-52	CURLE_GOT_NOTHING	When this is a specific error.
-53	CURLE_SSL_ENGINE_NOTFOUND	SSL crypto engine not found.
-54	CURLE_SSL_ENGINE_SETFAILED	Cannot set SSL crypto engine as default.
-55	CURLE_SEND_ERROR,	Failed sending network data.
-56	CURLE_RECV_ERROR	Failure in receiving network data.
-58	CURLE_SSL_CERTPROBLEM	Problem with the local certificate.
-59	CURLE_SSL_CIPHER	Could not use specified cipher.
-60	CURLE_SSL_CACERT	Problem with the CA cert (path?)
-61	CURLE_BAD_CONTENT_ENCODING	Unrecognized transfer encoding.
-62	CURLE_LDAP_INVALID_URL	Invalid LDAP URL.
-63	CURLE_FILESIZE_EXCEEDED,	Maximum file size exceeded.
-64	CURLE_USE_SSL_FAILED,	Requested FTP SSL level failed.
-65	CURLE_SEND_FAIL_REWIND,	Sending the data requires a rewind that failed.
-66	CURLE_SSL_ENGINE_INITFAILED	Failed to initialize ENGINE.
-67	CURLE_LOGIN_DENIED	User, password, or similar field was not accepted and login failed .
-68	CURLE_TFTP_NOTFOUND	File not found on server.
-69	CURLE_TFTP_PERM	Permission problem on server.
-70	CURLE_REMOTE_DISK_FULL	Out of disk space on server.
-71	CURLE_TFTP_ILLEGAL	Illegal TFTP operation.
-72	CURLE_TFTP_UNKNOWNID	Unknown transfer ID.
-73	CURLE_REMOTE_FILE_EXISTS	File already exists.
-74	CURLE_TFTP_NOSUCHUSER	No such user.
-75	CURLE_CONV_FAILED	Conversion failed.
-76	CURLE_CONV_REQD	Caller must register conversion callbacks using the following URL_easy_setopt options: CURLOPT_CONV_FROM_NETWORK_FUNCTION CURLOPT_CONV_TO_NETWORK_FUNCTION CURLOPT_CONV_FROM_UTF8_FUNCTION
-77	CURLE_SSL_CACERT_BADFILE	Could not load CACERT file, missing or wrong format.
-78	CURLE_REMOTE_FILE_NOT_FOUND	Remote file not found.
-79	CURLE_SSH	Error from the SSH layer (this is somewhat generic, so the error message will be important when this occurs).
-80	CURLE_SSL_SHUTDOWN_FAILED	Failed to shut down the SSL connection.

The following error codes are generated by the system software and are outside the range of CURL events:

Status	Name	Description
-1002	ENOENT	The specified file does not exist or cannot be created.
-10001	Cancelled	The operation has been cancelled.
-10002	Exception	The operation caused a local exception. Call GetFailureReason() for more details.

-10003	ERROR_EXCEPTION	An unexpected exception occurred.
-10004	ERROR_DISK_ERROR	A disk error occurred (usually as a result of the disk being full).
-10005	ERROR_POOL_UNSATISFIED	The expected files are not present in the pool.
-10006	ERROR_DOWNLOADING_ELSEWHERE	The file is being downloaded by another *roAssetFetcher* instance.
-10007	ERROR_HASH_MISMATCH	A downloaded file did not match its checksum or file size.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROASSETFETCHERPROGRESSEVENT

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This event is generated by the *roAssetFetcher* object at regular intervals during file downloads. Use the *roAssetFetcher.SetFileProgressIntervalSeconds()* method to customize how often progress events are generated.

`ifAssetFetcherProgressEvent`

GetFileName() As String

Returns the name of the file associated with the event. The file name is retrieved from the sync spec associated with the *roAssetFetcher* that generated the event.

GetFileIndex() As Integer

Returns the zero-based index from the sync spec of the file associated with the event.

GetFileCount() As Integer

Returns the total number of files within the sync spec.

GetCurrentFileTransferredMegabytes() As Integer

Returns the number of transferred megabytes belonging to the file associated with the event.

GetCurrentFileSizeMegabytes() As Integer

Returns the size of the file associated with the event.

GetCurrentFilePercentage() As Float

Returns a floating-point number representing the download percentage of the file associated with the event.

ifUserData

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

ROASSETPOOL

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An *roAssetPool* instance represents a pool of files for synchronization. You can instruct this object to populate the pool based on a sync spec and then realize it in a specified directory when required.

Object Creation: The *roAssetPool* object is created with a single parameter representing the rooted path of the pool.

```
CreateObject("roAssetPool", pool_path As String)
```

```
pool = CreateObject ("roAssetPool", "SD:/pool")
```

ifAssetPool

GetFailureReason() As String

ProtectAssets(name As String, collection As Object) As Boolean

Requests that the files specified in the "download" section of a sync spec receive a certain amount of protection. Specified files will not be deleted when the system software needs to reduce the size of the pool to make space.

UnprotectAssets(name As String) As Boolean

Removes the protected status placed on the specified files by the `ProtectAssets()` method. Asset collections are reference counted at the system-software level. As a result, when calling `UnprotectAssets()`, you must pass the same object that you previously passed to `ProtectAssets()`.

UnprotectAllAssets() As Boolean

ReserveMegabytes(size As Integer) As Boolean

Reserves the specified amount of storage space. This method is dynamic: The system software attempts to keep the space free even when parallel processes are filling up the storage.

SetMaximumPoolSizeMegabytes(maximum_size As Integer) As Boolean

Specifies the maximum size of an *roAssetPool* instance in megabytes. This method is more resource-intensive than `ReserveMegabytes()`, but it is useful when creating multiple pools on a storage device.

GetPoolSizeInMegabytes() As Integer

Validate(sync_spec As Object, options As roAssociativeArray) As Boolean

Checks the SHA1, BESHA1, or MD5 hash value of files that are in the sync spec and are currently present in the pool. This method returns True if all checks pass and False if one or more checks fail. Calling `GetFailureReason()` will return information about the corrupt file(s). Note that a True return may not mean that all files in the sync spec are currently present in the pool. The second parameter represents a table of validation options: The key specifies the option and the value specifies whether the option is enabled or not (as a Boolean value). Currently, the only option is "DeleteCorrupt", which determines whether the method should automatically delete corrupt files or not.

QueryFiles(a As Object) As Object

AssetsReady(collection As Object) As Boolean

ROASSETPOOLFILES

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Object Creation: The *roAssetPoolFiles* object is created with two parameters.

```
CreateObject("roAssetPoolFiles", pool As Object, assets As Object)
```

The "assets" can be either an *roAssetCollection* or *roSyncSpec* object. If more than one object requires use of the *roAssetCollection* object, it will be more efficient to convert *roSyncSpec* to *roAssetCollection* by calling `GetAssets()` once and then passing that collection to all objects requiring it.

This object works similarly to the *roSyncPoolFiles* object.

ifAssetPoolFiles

GetFailureReason() As String

Returns explanatory text if `GetPoolFilePath()` returns an empty string or `GetPoolFileInfo()` returns Invalid.

GetPoolFilePath(asset_name As String) As String

Looks up the specified file name in the asset collection and uses the information to determine the actual name of the file in the pool. This method returns an empty string if the name is not found in the asset collection, or if the file is not found in the pool.

GetPoolFileInfo(asset_name As String) As Object

Looks up the specified file name in the asset collection and returns all available information, including the pool file path, as an associative array. This method returns Invalid if the asset name is not found in the asset collection. If the file is not found in the pool, information from the asset collection will be returned without the pool path. See the table below for a description of assets in the associative array.

Field	Value	Description
name	String	Asset name
link	String	Asset URL

size	String	
hash	String	Hash in algorithm ":" hash format
change_hint	String	Only present if set
auth_user	String	Only present if set
auth_password	String	Only present if set
auth_inherit	Boolean	
headers_inherit	Boolean	
probe	String	Probe data
path	String	Absolute path of the file in the pool (or "invalid" if the file is not in the pool)

ROASSETREALIZER

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This object contains functions for realizing files.

Object Creation: The *roAssetRealizer* object requires two parameters upon creation: an *roAssetPool* object and a destination directory.

```
CreateObject("roAssetRealizer", pool As roAssetPool, destination_directory As String)
```

Example

```
pool = CreateObject("roAssetPool", "pool")
realizer = CreateObject ("roAssetRealizer", pool, "/")
```

IfUserData

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ifAssetRealizer

GetFailureReason() As String

Yields additional useful information if a function return indicates an error.

EstimateRealizedSizeInMegabytes(spec As Object) As Integer

Returns the estimated amount of space that would be taken up by the specified sync spec.

Realize(spec As roSyncSpec/roAssetCollection) As Object

Places the files into the destination directory specified in the passed *roSyncSpec* or *roAssetCollection*. If the pool does not contain the full set of required files, then this method will immediately fail before any files are changed (this method will always attempt to do as much work as possible before destructively modifying the file system). This method automatically checks the length of the file and any hashes that match the specification. If there is a mismatch, then the affected file is deleted and realization fails. This method indicates success or failure by returning an *roAssetRealizerEvent* object.

> **Note**
> The pool and the destination must be in the same file system.

ValidateFiles(spec As Object, options As Object) As Object

Checks the hash of every file in the spec against the corresponding file in the destination path and returns an associative array containing each mismatched fle name mapped to the reason. The options parameter is an *roAssociativeArray*, which can currently support a single option:

- "DeleteCorrupt": Automatically deletes any files that do not match the expected hash. By default, these hashes are not deleted.

ROASSETREALIZEREVENT

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This event object is returned by the *roAssetRealizer.Realize()* method. It yields information about the success or failure of the realization process.

ifAssetRealizerEvent

GetEvent() As Integer

Returns an integer value indicating the type of the event:

101	EVENT_REALIZE_SUCCESS	The specified sync list was successfully realized.
-102	EVENT_REALIZE_INCOMPLETE	Realization could not begin because at least one of the required files is not available in the pool.
-103	EVENT_REALIZE_FAILED_SAFE	Realization has failed. Nothing has been written to the destination, so it is likely safe to continue the realization process. More information is about the failure is available via the GetFailureReason() and GetName() methods.
-104	EVENT_REALIZE_FAILED_UNSAFE	Realization has failed while running, and changes have been made to destination files. It may not be safe to continue the realization process. More information about the failure is available via the GetFailureReason() and GetName() methods.

GetName() As String

Retrieves the name of the affected file if the realization process fails.

GetResponseCode() As Integer

Retrieves the *roUrlTransfer* response code associated with the event (if any).

GetFailureReason() As String

Returns additional information if the realization process fails.

GetFileIndex() As Integer

Retrieves the zero-based index number of the the file in the sync spec.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

ROSYNCSPEC

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This object represents a parsed sync spec. It allows you to retrieve various parts of the specification with methods.

`ifSyncSpec`

GetFailureReason() As String

Returns information if an *roSyncSpec* method indicates failure.

ReadFromFile(filename As String) As Boolean

Populates the sync spec by reading the specified file. This method returns True upon success and False upon failure.

ReadFromString(spec As String) As Boolean

Populates the sync spec by reading the passed string. This method returns True upon success and False upon failure.

WriteToFile(filename As String) As Boolean

Writes out the current sync spec to the specified file. Because the XML is regenerated, it is possible this file may not be textually identical to the specification that was read. This method returns True upon success and False upon failure.

WriteToString() As String

Writes out the current sync spec to a string and returns it. This method returns an empty string if the write operation fails.

GetMetadata(section As String) As roAssociativeArray

Returns an *roAssociativeArray* object containing the information stored in the specified metadata section of the sync spec (typically "client" or "server"). This method returns 0 if the read operation fails.

LookupMetadata(section As String, field As String) As String

Provides a shortcut for looking up specified metadata items in the specified section without needing to create a temporary *roAssociativeArray* obje ct. This method returns an empty string if the read operation fails.

GetFileList(section As String) As roList

Returns an *roList* object containing *roAssociativeArray* objects for each file in the specified section of the sync spec. This method returns Invalid if the read operation fails.

GetFile(section As String, index As Integer) As roAssociativeArray

Returns an *roAssociativeArray* object for the file in the specified section and at the specified index. This method returns Invalid if the read operation fails.

GetName() As String

Returns the name supplied for the sync spec in the <sync> XML element.

EqualTo(other As roSyncSpec) As Boolean

Compares the contents of the *roSyncSpec* object with another *roSyncSpec* object. This method compares the parsed contents of each sync spec rather than the XML files themselves.

VerifySignature(signature as String, obfuscated_passphrase as String) As Boolean

De-obfuscates the passphrase and uses it to verify the signature of the sync spec. This method returns True upon success and False upon failure.

FilterFiles(section As String, criteria As roAssociativeArray) As roSyncSpec

Returns a new *roSyncSpec* object that is a copy of the existing object, except that the specified section is filtered using the specified criteria. The criteria are matched against the file metadata. Multiple criteria can be specified in the passed associative array, and all criteria must be met for a file to be returned with the new *roSyncSpec*.

The following call will yield an *roSyncSpec* object with a "download" section that has been filtered so that only files of the group "scripts" will remain.

```
filtered_spec = spec.FilterFiles("download", { group: "scripts" })
```

FilesEqualTo(a As Object) As Boolean

GetAssets(a As String) As Object

Networking Objects

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- Previous Versions

This section describes objects related to networking, client/server applications, and feeds.

- roDatagramReceiver
- roDatagramSender
- roDatagramSocket
- roDatagramEvent
- roHttpServer
- roHttpEvent
- roKeyStore
- roMediaServer
- roMediaStreamer
- roMediaStreamerEvent

- roMimeStream
- roMimeStreamEvent
- roNetworkAdvertisement
- roNetworkConfiguration
- roNetworkAttached
- roNetworkDetached
- roNetworkDiscovery
- roNetworkHotplug
- roNetworkStatistics
- roPtp
- roPtpEvent
- roRssArticle
- roRssParser
- roRtspStream
- roSnmpAgent
- roSnmpEvent
- roStreamByteEvent
- roStreamConnectResultEvent
- roStreamEndEvent
- roStreamLineEvent
- roSyncManager
- roSyncManagerEvent
- roTCPServer
- roTCPConnectEvent
- roUPnPActionResult
- roUPnPController
- roUPnPDevice
- roUPnPSearchEvent
- roUPnPService
- roUPnPServiceEvent
- roTCPStream
- roUrlStream
- roUrlTransfer
- roUrlEvent

RODATAGRAMRECEIVER

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This object sends *roDatagramEvent* instances to a message port when UDP packets are received on a specified port.

Object Creation: The *roDatagramReceiver* object is created with a `port` parameter, which specifies the port on which to receive UDP packets.

```
CreateObject("roDatagramReceiver ", port As Integer)
```

`ifIdentity`

GetIdentity() As Integer

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roDatagramEvent* to the attached message port.

This example script listens for UDP packets on port 21075:

```
receiver = CreateObject("roDatagramReceiver", 21075)
mp = CreateObject("roMessagePort")
receiver.SetPort(mp)
while true
       event = mp.WaitMessage(0)
       if type(event) = "roDatagramEvent" then
             print "Datagram: "; event
       endif
end while
```

RODATAGRAMSENDER

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This object allows UDP packets to be sent to a specified network destination.

Object Creation: The *roDatagramSender* object is created with no parameters.

```
CreateObject("roDatagramSender")
```

ifDatagramSender

SetDestination(destination_address As String, destination_port As Integer) As Boolean

Specifies the destination IP address in dotted quad form along with the destination port. This function returns True if successful.

Send(packet As Object) As Integer

Sends the specified data packet as a datagram. The packet may be a string or an *roByteArray*. This method returns 0 upon success and a negative error code upon failure.

This example script broadcasts a single UDP packet containing "HELLO" to anyone on the network listening on port 21075:

```
sender = CreateObject("roDatagramSender")
sender.SetDestination("255.255.255.255", 21075)
sender.Send("Hello")
```

RODATAGRAMSOCKET

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This object both sends and receives UDP packets. Use *roDatagramSocket* if you need the player to communicate using protocols such as SSDP, which only allow a server to respond to the source of a received request.

Received packets are delivered to the message port as *roDatagramEvent* objects.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roDatagramEvent* to the attached message port.

`ifDatagramSocket`

GetFailureReason() As String

Returns additional information if the BindToLocalPort or Sendto methods fail.

BindToLocalPort(port As Integer) As Boolean

Binds the socket to the specified local port. Use this method to receive packets sent to a specific port. Alternatively, if you want to receive replies to sent packets (and it doesn’t matter which local port is used), pass a port number of 0, and the player will select an unused port. This method returns True upon success and False upon failure

GetLocalPort() As Integer

Returns the local port to which the socket is bound. Use this method if you passed a port number of 0 to BindToLocalPort and need to determine which port the player has selected.

SendTo(destination_address As String, destination_port As Integer, packet As Object) As Integer

Sends a single UDP packet, which can be an *roString* or *roByteArray*, to the specified address and port. This method returns 0 upon success and a negative error code upon failure.

JoinMulticastGroup(address as String) as Boolean

Joins the multicast group for the specified address on all interfaces that are currently up. This method returns True upon success and False upon failure. In the event of failure, GetFailureReason() may provide additional information. To ensure that you are joined on all network interfaces, you should register for *roNetworkHotplug* events and call the JoinMulticastGroup() method in response to the arrival of new networks.

`ifIdentity`

GetIdentity() As Integer

RODATAGRAMEVENT

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This event object is generated when datagram packets are received by the *roDatagramReceiver* or *roDatagramSocket* objects.

`ifDatagramEvent`

GetByteArray() as Object

Returns the contents of the packet as an *roByteArray*.

GetSourceHost() as String

Returns the source IP address of the packet in dotted form.

GetSourcePort() as Integer

Returns the source port of the packet.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifSourceIdentity`

GetSourceIdentity() As Integer

`ifString`

GetString() As String

ROHTTPSERVER

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This object allows for processing of RESTful HTTP requests from remote URLs to the embedded web server of the BrightSign player. Many of the requests are provided to the script as *roHttpEvent* objects for handling.

Object Creation: The *roHttpServer* object is created with an *roAssociativeArray*.

```
CreateObject("roHttpServer", parameters As roAssociativeArray)
```

Currently, the associative array can contain a single parameter:

- `port`: The port number of the embedded web server

ifHttpServer

Each “Add” handler method described below takes an associative array as its parameter. Values in the associative array specify how the handler behaves. See the table at the end of this section for common `key:value` pairs.

GetFailureReason() As String

Yields additional useful information if an *roHttpServer* method fails.

AddGetFromString(parameters As roAssociativeArray) As Boolean

Causes any HTTP GET requests for the specified URL path to be met directly with the contents of the "body" member of the parameter associative array. The MIME type (and potentially the entire character set) should be specified if the request is expected to come from a web browser. The request is handled entirely within the *roHttpServer* method; no events are sent to the message port.

AddGetFromFile(parameters As roAssociativeArray) As Boolean

Causes any HTTP GET requests for the specified URL path to be met directly from the specified file. You should always specify the MIME type (and possibly the character set) if you expect the request to come from a web browser. The request is handled entirely within the *roHttpServer* me thod; no events are sent to the message port.

AddGetFromFolder(parameters As roAssociativeArray) As Boolean

Constructs a dynamic handler that serves up static files, which will appear as children of the defined storage folder. This method accepts an associative array with the following parameters:

- `folder`: The file path of the folder that will act as the root directory of the server. If this parameter is absent, everything on the storage device will be served.
- `url_prefix`: The URL prefix under which files will be served. If this parameter is absent, the URL will match from root.
- `filters`: An array of filters. Each filter is an associative array with the following parameters:
    - `re`: The regular expression to match against the request URL.

- `ext`: The extension to match against the leaf file of the request URL.

If the "re" and "ext" parameters are absent, the filter will match everything.

- `headers`: An associative array containing arbitrary headers to be included with the automatic response.
- `content_type`: The contents of the "Content-Type" header included with the automatic response. This cannot be set in the same filter as the headers. The MIME type and character set can be specified together `(e.g. "text/plain; charset=utf-8")`.

AddGetFromEvent(parameters As roAssociativeArray) As Boolean

Requests that an event of type *roHttpEvent* be sent to the configured message port. This occurs when an HTTP GET request is made for the specified URL path.

AddPostToString(parameters As roAssociativeArray) As Boolean

Requests that an event of type *roHttpEvent* be sent to the configured message port. This occurs when an HTTP POST request is made for the specified URL path. Use the *roHttpEvent.GetRequestBodyString()* method to retrieve the posted body.

AddPostToFile(parameters As roAssociativeArray) As Boolean

Requests that, when an HTTP POST request is made to the specified URL path, the request body be stored in a temporary file according to the `parameters["destination_directory"]` value in the associative array. When this request is complete, an *roHttpEvent* event is sent to the configured message port. Use the *roHttpEvent.GetRequestBodyFile()* method to retrieve the name of the temporary file. If the file still exists at the time the response is sent, it will be automatically deleted. However, if the player reboots or loses power during the POST process, the file will not be deleted. For this reason, we recommend using a dedicated subdirectory as the `"destination_directory"` and wiping this subdirectory during startup (using `DeleteDirecotry()`) before adding handlers that refer to it.

AddPostToFormData(parameters As roAssociativeArray) As Boolean

Requests that, when an HTTP POST request is made to the specified URL path, an attempt be made to store form data (passed as `application/x-www-form-urlencoded or multipart/form-data`) in an associative array that can be retrieved by calling the *roHttpEvent.GetFormData()* method.

AddMethodFromEvent(parameters As roAssociativeArray) As Boolean

Requests that an event of type *roHttpEvent* be sent to the configured message port. Unlike `AddGetFromEvent()`, this method can support arbitrary HTTP methods. The HTTP method is specified using the method member in the associative array.

AddMethodToFile(parameters As roAssociativeArray) As Boolean

Requests that, when an arbitrary HTTP request is made to the specified URL path, the request body be stored in a temporary file according to the `parameters["destination_directory"]` value in the associative array. The HTTP method is specified using the `method` member in the associative array. When the request is complete, an *roHttpEvent* event is sent to the configured message port. Use the *roHttpEvent.GetRequestBodyFile()* method to retrieve the name of the temporary file. If the file still exists at the time the response is sent, it will be automatically deleted.

AddMethodToString(parameters As roAssociativeArray) As Boolean

Attempts to support an arbitrary HTTP method. The request body is placed in a string and an event is raised. This makes the request body available via the *roHttpEvent.GetRequestBodyString()* method. A response can be sent in the same manner as the `AddGetToEvent()` method.

SetupDWSLink(title As String) As Boolean

Generates a tab in the Diagnostic Web Server (DWS) that links directly to the base <ip_address:port> of the *roHttpServer* instance. The passed string specifies the title of the tab.

Example

```
server1.SetupDWSLink("My AWS Link")
server2.SetupDWSLink("My Other AWS Link")
```

Parameters for "Add" Handler Methods

The following table describes common key:value pairs for "Add" handler methods:

Name	Applies to	Value
url_path	All	The path for which the handler method will be used

user_data	GetFromEvent()
	PostToString()
	PostToFile()
	MethodToString()
		A user-defined value that can be retrieved by calling *roHttpEvent.GetUserData()*

method	AddMethodFromEvent()
	AddMethodToFile()
		The HTTP method associated with the generated *roHttpEvent*. The method type can then be retrieved using *roHttpEvent.GetMethod()*.

passwords	All	An associative array that contains a mapping between usernames and passwords
auth	All	The authentication type to use when passwords are set. This value can be either "basic" or "digest". The value defaults to “digest” if not specified.
realm	All	The authentication realm, which will be displayed by web browsers when prompting for a username and password
headers	GetFromFile()	An associative array that contains arbitrary headers to be included with the automated response
content_type	GetFromFile()	The contents of the "Content-Type" header that is included with the automated response. This may not be set at the same time as the headers member. You can set both the MIME type and character set together (e.g. "text/plain; charset=utf-8")
body	GetFromString()	The response body
filename	GetFromFile()	The path to the file used for the response body.
destination_directory	PostToFile()	The path to the directory used for the temporary file containing the request body. A random filename will be generated automatically.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roHttpEvent* to the attached message port.

ROHTTPEVENT

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- Previous Versions

This event object is used to handle requests generated by the *roHttpServer* object.

`ifHttpEvent`

GetFailureReason() As String

Yields additional useful information if a function return indicates an error.

GetMethod() As String

Returns the type of HTTP method that triggered the event on the *roHttpServer* instance.

SetResponseBodyString(body As String)

Sets the response body for an event generated via the AddGetFromEvent() or AddMethodToString() method on the *roHttpServer* object. This call is ignored with any other event.

SetResponseBodyFile(filename As String) As Boolean

Specifies the name of a file to use as the source response body for an event generated via the AddGetFromEvent() or AddMethodToString() method on the *roHttpServer* object. This call is ignored with any other event. This function will return False if the file cannot be opened or another failure occurs.

The specified file is read gradually as it is sent to the client.

GetRequestBodyString() As String

Returns the string received if the event was generated via *roHttpServer.AddPostToString()*. An empty string is returned with any other event.

GetRequestBodyFile() As String

Returns the name of the temporary file created if the event is generated via *roHttpServer.AddGetFromEvent*.This call is ignored with any other event.

GetRequestHeader(header_name As String) As String

Returns the value of the specified HTTP request header. If the header does not exist, an empty string is returned.

GetRequestHeaders() As Object

Returns an *roAssociativeArray* containing all the HTTP request headers.

GetRequestParam(URI_parameter As String) As String

Returns the value of the specified URI parameter. If the parameter does not exist, an empty string is returned.

GetRequestParams() As Object

Returns an *roAssociativeArray* containing all the URI parameters.

AddResponseHeader(header As String, value As String) As Boolean

Adds the specified HTTP header and value to the response. This function returns True upon success.

AddResponseHeaders(a As Object) As Boolean

Adds the specified HTTP header/value pairs to the response. This method expects an *roAssociativeArray* of header names mapped to header values, which can be of type *roString*, *roInt*, or *roFloat*. Any other value types will cause the request to fail, though a subset of headers to might be set before the failure occurs. This function returns True upon success.

SendResponse(http_status_code As Integer) As Boolean

Sends the HTTP response using the specified HTTP status code. To ensure that the response is sent, this function needs to be called once the script has finished handling the event. This function returns False upon failure.

GetFormData() As Object

Returns an *roAssociativeArray* containing all the form data. See the entry on *roHttpServer.AddPostToFormData()* for more information.

GetUrl() As String

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROKEYSTORE

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This object allows you to register client certificates with the player. These certificates can be used by *roHtmlWidget* objects when communicating with websites. If there are multiple *roHtmlWidget* instances, they will share the same certificate database.

Client certificates are not persistent on a BrightSign player; they must be registered with the certificate database after each reboot.

`ifKeyStore`

GetFailureReason() As String

Returns additional useful information if an *ifKeyStore* method returns False.

AddCACertificate(certificate_file As String) As Boolean

Registers the specified CA certificate with the certificate database. Client certificates can be either self-signed or signed using a 3rd-party certificate issuer (Versign, DigiCert, etc.).

AddClientCertificate(parameters As roAssociativeArray) As Boolean

Registers a .p12 client certificate with the certificate database. This method accepts an associative array with the following parameters:

- `certificate_file`: The file name and path of the .p12 client certificate.
- `passphrase`: A passphrase for the .p12 client certificate.
- `obfuscated_passphrase`: An obfuscated passphrase for the .p12 client certificate.

Important
Provide the passphrase using either the "passphrase" or "obfuscated_passphrase" parameter (not both). We recommend using the "obfuscated_passphrase" in production environments, while the "passphrase" should be used for testing purposes only. Contact support@brightsign.biz to learn more about generating a key for obfuscation and storing it on the player.

BrightSign players use the "nickname" of a .p12 client certificate to match it with a website. The "nickname" consists of the `host:port` of the web address you wish to match: For example, to use a client certificate for https://brightsign.biz, you would specify a "nickname" of `"brightsign.biz:443"`.

The following example uses an openssl terminal to generate a .p12 client certificate to use with https://brightsign.biz.

```
openssl pkcs12 -export -clcerts -in client.crt -inkey client.key -out client.p12 -name
"brightsign.biz:443"
```

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages to the attached message port.

Example

```
k=createobject("rokeystore")
k.addcacertificate("ssd:/apache.crt")
aa = CreateObject("roAssociativeArray")
aa.AddReplace("certificate_file", "ssd:/client.p12")
aa.AddReplace("passphrase", "1q2w3e4r")
k.addclientcertificate(aa)
```

ROMEDIASERVER

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The *roMediaServer* object waits for client requests, deals with negotiation, and ultimately generates an *roMediaStreamer* pipeline to fulfill the request. For more information, see the BrightSign Media Server section. This object currently supports RTSP and HTTP requests. Requests from the client must take the following form:

```
protocol://IP_address:port/media_streamer_pipeline
```

- `protocol`: Either rtsp or http
- `IP_address:port`: The IP address of the BrightSign player and the port number on which the media server is running.
- `media_streamer_pipeline`: A media streamer pipeline, but without the final destination component (as the destination is implicit in the request from the client).

Object Creation: The *roMediaServer* object is created with no parameters

```
CreateObject("roMediaServer")
```

ifMediaServer

GetFailureReason() As String

Returns useful information if the Start(), Stop(), or Terminate() methods return False.

Start(a As String) As Boolean

Begins a media server instance. This method can be passed a string that specifies the streaming protocol and the port number of the server:

```
s = CreateObject("roMediaServer")
s.Start("http:port=8080")
```

A number of optional parameters can be added after the port parameter using an "&" (ampersand):

- `trace`: Displays a trace of messages in the negotiation with the client. This parameter is useful particularly for debugging RTSP sessions. For example: `"rtsp:port=554&trace"`
- `maxbitrate`: Sets the maximum instantaneous bitrate (in Kbps) of the RTP transfer initiated by RTSP. This parameter has no effect for HTTP. The parameter value 80000 (i.e. 80Mbps) has been found to work well. The default behavior (also achieved by passing a zero value) is to not limit the bitrate at all. For example: `"rtsp:port=554&trace&maxbitrate=80000"`
- `threads`: Sets the maximum number of threads the server is prepared to have running. Each thread handles a single client request. The default value is "5". For example: `"http:port=8080&threads=10"`

Stop() As Boolean

Stops the media server. This method signals all threads to stop, but does not wait for this to happen before destroying the server instance.

Terminate() As Boolean

Stops the media server. This method waits for all threads to stop before destroying the server instance.

ifIdentity

GetIdentity() As Integer

ifUserData

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

`ifMessagePort`

SetPort(port As roMessagePort)

ROMEDIASTREAMER

ON THIS PAGE

The current implementation of this object allows a player to stream *.ts* files over UDP and RTP. For more information, see the BrightSign Media Server section.

Object Creation: The *roMediaStreamer* object is created with no parameters.

```
CreateObject("roMediaStreamer")
```

`ifMediaStreamer`

GetFailureReason() As String

SetPipeline(pipeline As String) As Boolean

Specifies a streaming pipeline. The source (a file URI) and destination (an IP address) of the stream are specified in the passed stream. This method replaces the SetSource() and SetDestination() methods from firmware version 4.7. To stream media as before, use the filesimple source designation and the udpsimple/rtpsimple destination designations:

Example

```
m = CreateObject("roMediaStreamer")
m.SetPipeline("filesimple:///data/clip.ts, udpsimple://239.192.0.0:1234/")
m.Start()
```

Initialize() As Boolean

Progresses the pipeline into the INITIALIZED state. This allocates some resources for the pipeline, but does not begin a stream.

Connect() As Boolean

Progresses the pipeline into the CONNECTED state. This allows the script to create a memory stream without starting it.

Start() As Boolean

Begins streaming.

Stop() As Boolean

Stops the pipeline stream. Some internal pipeline stages may continue running.

Disconnect() As Boolean

Regresses the steam back to the CONNECTED state.

Reset() As Boolean

Resets the pipeline stream. All internal pipeline stages are terminated.

Inject(a As Integer) As Boolean

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roMediaStreamerEvent* to the attached message port.

`Source Specifications`

The string passed to the *roMediaStreamer.SetPepline()* method can have unique parameters that determine the source type and playback behavior.

- **Looping**: By default, a stream from a media file will not loop when it ends. You can specify a looping parameter at the end of the source string as follows: """filesimple:///data/example.mp4?loop". It is also possible to loop the stream using end-of-stream messages from *roMe diaStreamerEvent*. However, the slightly longer restart gap that results from using BrightScript may cause problems with the streaming client. This is especially true if you attempt to set a new media file source upon looping the function.

Firmware Version 6.1

- Previous Versions

ROMEDIASTREAMEREVENT

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Firmware Version 6.1

- Previous Versions

This object is sent by instances of *roMediaStreamer.* It provides information about the current state of an IP stream being sent by the player.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifMediaStreamerEvent`

GetEvent() As Integer

Returns an integer describing the status of an *roMediaStreamer* instance:

- `0 – EOS_NORMAL`: The end of the stream has been reached without any errors being detected. This signal is not sent if the loop parameter is specified using the r*oMediaStreamer.SetSource()* method.
- `1 – EOS_ERROR`: The stream has been aborted prematurely because of an error condition.

ROMIMESTREAM

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This object passes an MJPEG stream in MIME format to the *roVideoPlayer.PlayFile()* method. There are some limitations to what MJPEG streams this object will play correctly. *roMimeStream* has been optimized to play streaming video from a local source with the smallest possible delay. The result is a short buffering window that is not appropriate for playing MJPEG streams from URLs outside of a local network. We are currently optimizing *roMimeStream* to work with different IP camera brands: see the IP Camera FAQ for more details.

Object Creation: To play an RTSP stream, first instantiate an *roUrlTransfer* object. Then wrap it in an *roMimeStream* object and pass the `PictureStream` to `PlayFile`, as shown in the following example.

```
u=createobject("roUrlTransfer")
u.seturl("http://mycamera/video.mjpg")
r=createobject("roMimeStream", u)
p=createobject("roVideoPlayer")
p.PlayFile({ PictureStream: r })
```

`ifPictureStream`

GetUrl() As String

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return `Invalid` if no data has been set.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts event messages to the attached message port. The event messages are of the type *roMimeStreamEvent*. There are currently two possible event messages:

- PICTURE_STREAM_FIRST_PICTURE_AVAILABLE = 0: The first picture is now available for decoding.
- PICTURE_STREAM_CONNECT_FAILED: The object is unable to connect to the specified URL.

ROMIMESTREAMEVENT

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Firmware Version 6.1

- Previous Versions

This object is generated by the *roMimeStream* object. It will return an integer corresponding to the event on the *roMimeStream* object:

`ifInt`

GetInt() As Integer

SetInt(a As Integer)

RONETWORKADVERTISEMENT

Firmware Version 6.1

- Previous Versions

This object is used to advertise services running on a BrightSign player to other devices on the network. The current implementation supports advertising via mDNS (which is part of Zeroconf via Bonjour™).

Object creation: The *roNetworkAdvertisement* object is created with an associative array of network parameters and arbitrary text information.

```
CreateObject("roNetworkAdvertisement", advertisement As roAssociativeArray) As Object
```

The *roAssociativeArray* can contain the following keys:

- `name`: The service name. This should be a readable string such as "Remote BrightSign Widget Service."
- `type`: The service type. This should be a service from the definitive list, formatted in the following manner: "_service._protocol" (for example, "_http._tcp").
- `port`: The port number on which the service runs.
- `_name`: Any arbitrary text key preceded by an underscore to avoid conflicts within the *roAssociativeArray*.

Note
The underscore is removed before the record is registered with mDNS.

Once the object is created, advertising starts immediately and continues until the object is destroyed (i.e. when it becomes unreferenced).

There are no interfaces on the *roNetworkAdvertisement* object.

Example

```
di = CreateObject("roDeviceInfo")
 props = { name: "My Hoopy Service", type: "_http._tcp", port: 8080, _serial: 
di.GetDeviceUniqueId() }
 advert = CreateObject("roNetworkAdvertisement", props)
 ...
 ' Stop advertising
 advert = invalid
```

RONETWORKCONFIGURATION

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Firmware Version 6.1

- Previous Versions

This object provides various methods for configuring the network interfaces on a BrightSign player.

Object Creation: The *roNetworkConfiguration* object is created with a single parameter.

```
CreateObject("roNetworkConfiguration", network_interface as Integer)
```

The `network_interface` parameter is used to distinguish between the following:

- 0: The Ethernet port (if available) on the rear of the BrightSign player
- 1: The optional internal WiFi

Some of the settings are specific to the network interface, while others are used by the BrightSign host for all network interfaces.

BrightSign players support most commonly used wireless encryption formats: WEP (64 & 128), WPA (TKIP), and WPA2 (AES). WPA Enterprise is also supported using DER, PEM, or PKCS#12 certificates. Wired authentication via 802.1x is not supported for WPA/WPA2 Enterprise, nor are other modes such as PEAPv0/MSCAPv2.

`ifNetworkConfiguration`

"Set" methods do not take effect until `Apply()` is called.

SetupDWS(settings As roAssociativeArray) As Boolean

Configures the Diagnostic Web Server (DWS). By default, the Diagnostic Web Server is enabled on port 80, with the player serial number as password. Settings for the DWS are specified in an associative array. These properties are written to the registry and persist after reboot:

- `port`: The port number of the Diagnostic Web Server, located at the IP address of the player. Setting this value to 0 will disable the DWS, while setting it to "default" will make the DWS accessible on the default port (80). Specifying *only* this parameter in the associative array is equivalent to enabling the DWS without password protection.
- `password`: An obfuscated password for the DWS. This method uses digest access authentication. Specifying this parameter without setting a `port` number will make the DWS accessible on the default port.
- `open`: An unobfuscated password for the DWS. This method uses digest access authentication. Specifying this parameter without setting a `port` number will make the DWS accessible on the default port.
- `basic`: A flag indicating whether basic authentication should be used or not. Setting this parameter to True allows the password set with the{{open}} parameter to be validated using basic authentication, rather than digest access authentication. This option allows for backwards compatibility with older platforms; most, if not all, modern browsers require basic authentication to be disabled in order to communicate with the DWS.

The user name is "admin" for all authentication configurations.

EnableLEDs(enable As Boolean) As Boolean

Enables or disables the Ethernet activity LED (i.e. flashing during link and activity behavior). The Ethernet LED is enabled by default. Changes to this setting do not persist across reboots. This method returns True upon success and False upon failure. Note that this method is not available on HDx10, HDx20, and LSx22 models.

GetClientIdentifier() As String

GetProxy() As String

SetClientIdentifier(a As String) As Boolean

SetLoginPassword(password As String)

Specifies a login password for the SSH connection (if SSH has been enabled in the registry). This method accepts a plain-text password.

SetObfuscatedLoginPassword(password As String)

Specifies a login password for the SSH connection (if SSH has been enabled in the registry). This method accepts a password that has been obfuscated using a shared secret.

> **Note**
> Contact support@brightsign.biz to learn more about generating a key for obfuscation and storing it on the player.

SetInboundShaperRate(rate As Integer) As Boolean

Sets the bandwidth limit for inbound traffic in bits per second. For the default bandwidth limit, pass -1 to the method; for no bandwidth limit, pass 0 (though these two settings are functionally the same). You will need to call `Apply()` for this setting to take effect, and changing this setting at any time will cause the network interface to be taken down and reinitialized.

> **Note**
> Because of overhead on the shaping algorithm, attempting to limit the bandwidth at rates greater than approximately 2Mbit/s will reduce speeds to less than the specified rate.

SetRoutingMetric(a As Integer) As Boolean

Configures the metric for the default gateway on the current network interface. Routes with lower metrics are preferred over routes with higher metrics. This function returns True upon success.

SetDHCP() as Boolean (interface)

Enables DHCP and disables all other settings. This function returns True if successful.

SetIP4Address(ip As String) As Boolean (interface)

SetIP4Netmask(netmask As String) As Boolean (interface)

SetIP4Broadcast(broadcast As String) As Boolean (interface)

SetIP4Gateway(gateway As String) As Boolean (interface)

Sets the IPv4 interface configuration. All values must be specified explicitly. Unlike the `ifconfig` shell command, there is no automatic inference. The parameter is a string dotted decimal quad (i.e. "192.168.1.2" or similar). It returns True upon success.

Example

```
nc.SetIP4Address("192.168.1.42")
nc.SetIP4Netmask("255.255.255.0")
nc.SetIP4Broadcast("192.168.1.255")
nc.SetIP4Gateway("192.168.1.1")
```

SetWiFiESSID(essid as String) as Boolean

Configures the WiFi ESSID of the wireless network that the player will connect to. This method returns True on success.

GetWiFiESSID() As String

Retrieves the configured WiFi ESSID, even if the player is not currently connected to that wireless network. Use the `GetCurrentConfig().wifi_essid` value to retrieve the ESSID of the wireless network that the player is currently connected to.

SetWiFiPassphrase(passphrase as String) as Boolean

Configures the passphrase or key for the wireless network. This method accepts a plain-text passphrase. It returns True if the passphrase is successfully set.

SetWiFiPassphraseAndObfuscate(a As String) As String

Configures the passphrase or key for the wireless network. This method accepts a plain-text passphrase and returns the obfuscated result. If the passphrase is not set, an empty string is returned instead.

SetObfuscatedWiFiPassphrase(password As String) As Boolean

Configures the passphrase or key for the wireless network. This method accepts a passphrase that has been obfuscated using a shared secret. It returns True if the password is successfully set.

Note
Contact support@brightsign.biz to learn more about generating a key for obfuscation and storing it on the player.

SetDomain(domain As String) As Boolean (host)

Sets the device domain name. This will be appended to names to fully qualify them, though it is not necessary to call this. This method returns True on success.

Example

```
nc.SetDomain("brightsign.biz")
```

AddDNSServer(server As String) (host)

Adds another server to the list when the object is created and there are no DNS servers. There is currently a maximum of three servers, but adding more will not cause any errors. This method returns True on success. There is no way to remove all the servers; it will be easier to recreate the object instead.

GetFailureReason() As String

Returns additional information when a member function returns False.

Apply() As Boolean

Applies the requested changes to the network interface. This may take several seconds to complete.

SetTimeServer(time_server As String) As Boolean (host)

Sets the default time server, which is "time.brightsignnetwork.com". You can disable the use of NTP by calling `SetTimeServer("")`. You can use URL syntax to specify that the player use an HTTP or HTTPS server to synchronize the clock. The following are valid time server addresses:

- http://time.brightsignnetwork.com/
- https://time.brightsignnetwork.com/
- ntp://time.brightsignnetwork.com/
- time.brightsignnetwork.com

Note
`The last two addresses are equivalent.`

GetTimeServer() As String

Retrieves the (host) time server currently in use.

SetTimeServerIntervalSeconds(interval_in_seconds As Integer) As Boolean

Specifies how often the player should communicate with the time server and adjust its clock via NTP. The default interval is 12 hours; passing a value of 0 specifies the default interval. The minimum interval allowed is 120 seconds.

GetTimeServerIntervalSeconds() As Integer

Returns the current interval for NTP time-server renewal (in seconds).

SetHostName(name as String) as Boolean (host)

Sets the device host name. If no host name has been explicitly set, then a host name is automatically generated based on the device serial number. Passing an empty string to this method resets the device host name to its automatically generated value.

GetHostName() As String (host)

Retrieves the host name currently in use.

SetProxy(proxy as String) As Boolean (host)

Sets the name or address of the proxy server used for HTTP and FTP requests. The proxy string should be formatted as "http://user:password@hostname:port". It can contain up to four "*" characters; each "*" character can be used to replace one octet from the current IP address. For example, if the IP address is currently 192.168.1.2, and the proxy is set to "proxy-*-*", then the player will attempt to use a proxy named "proxy-192.168".

SetProxyBypass(hostnames As Array) As Boolean

Exempts the specified hosts from the proxy setting. The passed array should consist of one or more hostnames. The player will attempt to reach the specified hosts directly rather than using the proxy that has been specified with the `SetProxy()` method. For example, the hostname "example.com" would exempt "example.com", "example.com:80", and "www.example.com" from the proxy setting.

GetProxyBypass() As roArray

Returns an array of hostnames that have been exempted from the proxy setting using the `SetProxyBypass()` method.

GetRecoveryUrl() As String

Returns the current recovery URL stored in the registry. The recovery URL can be configured by modifying the registry entry or via DHCP Option 43.

GetCurrentConfig() As Object

Retrieves the entire current configuration as an associative array containing the following members:

metric	Integer	Interface	Returns the current routing metric for the interface. See the `SetRoutingMetric()` entry for more details.
dhcp	Boolean	Interface	Returns True if the system is currently configured to use DHCP. Returns False otherwise.
hostname	String	Host	The currently configured host name
mdns_hostname	String	Host	The Zeroconf host name currently in use. This may be longer than the host name if there is a collision on the current network.
ethernet_mac	String	Interface	The Ethernet MAC address
ip4_address	String	Interface	The current IPv4 address. If none is currently set, the string will be empty.
ip4_netmask	String	Interface	The current IPv4 network mask. If none is currently set, the string will be empty.
ip4_broadcast	String	Interface	The current IPv4 broadcast address. If none is currently set, the string will be empty.
ip4_gateway	String	Interface	The current IPv4 gateway address. If none is currently set, the string will be empty.
domain	String	Host	The current domain suffix
dns_servers	*roArray* of Strings	Host	The currently active DNS servers
time_server	String	Host	The current time server
configured_proxy	String	Host	The currently configured proxy. This may contain magic characters as explained under `SetProxy()` above.
current_proxy	String	Host	The currently active proxy. Any magic characters will have been replaced as explained under `SetProxy()` above.
shape_inbound	Integer	Interface	The current bandwidth shaping for inbound traffic determined by the `SetInboundShaperRate()` method.
type	String	Interface	Either "wired" or "wifi"
link	Boolean	Interface	Indicates whether the network interface is currently connected.
wifi_essid	String	Interface	The name of the current Wi-Fi network (if any)
wifi_signal	Integer	Interface	An indication of the received signal strength. The absolute value of this field is usually not meaningful, but it can be compared with the reported value on other networks or in different locations.

TestInterface() As Object

Performs various tests on the network interface to determine whether it appears to be working correctly. It reports the results via an associative array containing the following members:

ok	Boolean	This value is True if the tests find no problems, or False if at least one problem was identified.
diagnosis	String	A single-line diagnosis of the first problem identified in the network interface.
log	*roArray* of strings	A complete log of all the tests performed and their results.

TestInternetConnectivity() As Object

Performs various tests on the Internet connection (via any available network interface, not necessarily the one specified when the *roNetworkConfiguration* object was created) to determine whether it appears to be working correctly. It reports the results via an associative array containing the following members:

ok	Boolean	This value is True if the tests find no problems, or False if at least one problem was identified.
diagnosis	String	A single line diagnosis of the first problem identified with the Internet connection.
log	*roArray* of strings	A complete log of all the tests performed and their results.

GetNeighborInformation() As roAssociativeArray

Retrieves location information from the network infrastructure using the LLDP-MED protocol. The information is returned as an associative array of strings corresponding to civic-address types, which are defined as follows according to the LLDP-MED specification:

CAtype	Label	Description
1	A1	national subdivisions (state, region, province, prefecture)
2	A2	county, parish, gun(JP), district(IN)
3	A3	city, township, shi(JP)
4	A4	city division, borough, city district, ward, chou(JP)
5	A5	neighborhood, block
6	A6	street

CAtype	NENA	PIDF	Description	Examples
0			language	i-default [3]
16	PRD	PRD	leading street direction	N
17	POD	POD	trailing street suffix	SW
18	STS	STS	street suffix	Ave, Platz
19	HNO	HNO	house number	123
20	HNS	HNS	house number suffix	A, 1/2
21	LMK	LMK	landmark or vanity address	Columbia University
22	LOC	LOC	additional location information	South Wing
23	NAM	NAM	name (residence and office occupant)	Joe's Barbershop
24	ZIP	PC	postal/ZIP code	10027-1234
25			building (structure)	Low Library
26			unit (apartment, suite)	Apt 42
27		FLR	floor	4
28			room number	450F
29			placetype	office
30	PCN		postal community name	Leonia
31			post office box (P.O Box)	12345
32			additional code	13203000003
128			script	Latn
255			reserved	

`ifWiFiConfiguration`

ScanWiFi() As roArray

Scans for available wireless networks. The results are reported as an *roArray* containing one or more associative arrays with the following members:

essid	String	Network name
bssid	String	Access point BSSID
signal	Integer	Received signal strength indication. The absolute value of this field is not usually relevant, but it can be compared with the reported value on other networks or in different locations.

RONETWORKATTACHED

Firmware Version 6.1

- Previous Versions

This object implements *ifInt* to report the index of the attached network interface. Instances of this object are posted by *roNetworkHotplug* when a configured network connection becomes available. It may take some time after the cable is inserted for this to take place.

`ifInt`

GetInt() As Integer

SetInt(a As Integer)

RONETWORKDETACHED

Firmware Version 6.1

- Previous Versions

This object implements *ifInt* to report an index of the detached network interface. Instances of this object are posted by *roNetworkHotplug* when a configured network connection becomes unavailable.

`ifInt`

GetInt() As Integer

SetInt(a As Integer)

RONETWORKDISCOVERY

Firmware Version 6.1

- Previous Versions

This object allows for Zeroconf discovery of other BrightSign players on the local network. Only players running an instance of *roNetworkAdvertis ement* can be discovered using the *roNetworkDiscovery* object.

Object Creation: The *roNetworkDiscovery* object is created with no parameters.

```
CreateObject("roNetworkDiscovery")
```

ifNetworkDiscovery

Search(parameters As roAssociativeArray) As Boolean

Searches for BrightSign players on the local network. A player will only respond to the search if it is currently running an instance of *roNetworkAdvertisement*. Search results will be posted to the attached message port. Search parameters are passed to this method as an associative array containing the following values:

- `type`: The service type. If this entry is omitted, the search will default to "_http._tcp".
- `protocol`: The IP protocol. Acceptable values are "IPv4" and "IPv6". You can also omit this entry if you wish to search for players using either protocol.

ifMessagePort

SetPort(port As roMessagePort)

Posts events to the attached message port. See the Event Types section below for more details.

ifUserData

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

Event Types

The *roNetworkDiscovery* object can post three event object types to the attached message port:

- *roNetworkDiscoveryResolvedEvent*: Raised when a host is fully resolved.
- *roNetworkDiscoveryCompletedEvent*: Raised when the search is complete.
- *roNetworkDiscoveryGeneralEvent*: Raised for events other than the above two. This event rarely occurs.

All three event objects offer the `SetUserData()`, `GetUserData()`, and `GetData()` methods. Use `GetData()` to retrieve an associative array of results. For the *roNetworkDiscoveryResolvedEvent* object, calling `GetData()` will return the following entries:

- `protocol`: Either "IPv4" or "IPv6"
- `host_name`: The hostname of the player
- `name`: The service name
- `txt`: An associative array containing arbitrary text entries specified during instantiation of the *roNetworkAdvertisement* instance.
- `domain`: The domain of the player
- `type`: The service type
- `address`: The IPv4 or IPv6 address

The following script searches for a player running an *roNetworkAdvertisement* instance and prints the results of the discovery.

```
complete = false
while not complete
    ev = mp.WaitMessage(10000)
    if ev = invalid then
        stop
    end if

    if type(ev) = "roNetworkDiscoveryCompletedEvent" then
        print "roNetworkDiscoveryCompletedEvent"
    end if

    if type(ev) = "roNetworkDiscoveryGeneralEvent" then
        print "roNetworkDiscoveryGeneralEvent"
    end if

    if type(ev) = "roNetworkDiscoveryResolvedEvent" then
        complete = true
        data = ev.GetData()
        print "DATA:"; data
        print "DONE"
        textdata = data[ "txt" ]
        if textdata <> invalid then
            print "TEXT: "; textdata
        endif
    end if

end while
```

RONETWORKHOTPLUG

Firmware Version 6.1

- Previous Versions

This object can be used to generate events when a network interface becomes available or unavailable. It will post events of the type *roNetworkAttached* and *roNetworkDetached* to the associated message port.

To determine which network was attached or detached, the script needs to call *roNetworkAttached.GetInt* or *roNetworkDetached.GetInt*. These methods provide an index of the network interface that was attached or detached.

Note
Reconfiguring a network interface using *roNetworkConfiguration* may cause it to detach and attach again.

ifMessagePort

SetPort(a As Object)

ifUserData

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

RONETWORKSTATISTICS

ON THIS PAGE

Firmware Version 6.1

- Previous Versions

This object allows you to monitor and post how much bandwidth the player is using.

Object Creation: The *roNetworkStatistics* object is created with a single parameter.

```
CreateObject("roNetworkStatistics", network_interface as Integer)
```

The network_interface parameter is used to distinguish between the following:

- 0: The Ethernet port on the BrightSign player.
- 1: The optional internal Wi-Fi.

ifNetworkStatistics

GetTotals() As roAssociativeArray

Yields the total network figures since booting up.

GetIncremental() As roAssociativeArray

Yields the total network figures since booting up. Then, every subsequent time this method is called, it will yield the amount each figure has changed since the previous call.

Note
If multiple instances of roNetworkStatistics are created, GetIncremental() calls for each instance will track changes independently.

Both methods return the following statistics as floating point values:

- tx_carrier_errors
- tx_packets
- rx_packets
- tx_errors
- rx_frame_errors
- tx_bytes
- rx_errors
- tx_collisions
- rx_dropped
- tx_compressed
- rx_multicast
- tx_dropped
- rx_fifo_errors
- rx_bytes
- tx_fifo_errors
- rx_compressed

ROPTP

Firmware Version 6.1

- Previous Versions

This object can be used to retrieve information about the network PTP state of the player.

Object Creation: This object is created with no additional parameters.

```
ptp = CreateObject("roPtp")
```

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of the type *roPtpEvent* to the attached message port.

`ifPtp`

GetPtpStatus() As roAssociativeArray

Returns an associative array containing information about the network PTP state of the player:

- `state`: A string indicating the current PTP state of the player. Values can be "MASTER", "SLAVE", or "UNCALIBRATED".
- `timestamp`: A value indicating when the PTP state was last changed. This value is measured in seconds since the player booted. This value can be compared against the total uptime of the player, which is retrieved by calling `UpTime(0)`.

ROPTPEVENT

Firmware Version 6.1

- Previous Versions

This event object is generated by the *roPtp* object whenever the PTP status of the player changes.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifPtpEvent`

GetPtpStatus() As roAssociativeArray

Returns an associative array containing information about the network PTP state of the player:

- `state`: A string indicating the current PTP state of the player. Values can be "MASTER", "SLAVE", or "UNCALIBRATED".
- `timestamp`: A value indicating when the PTP state was last changed. This value is measured in seconds since the player booted. This value can be compared against the total uptime of the player, which is retrieved by calling `UpTime(0)`.

RORSSARTICLE

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Firmware Version 6.1

- Previous Versions

Objects of type *roRssArticle* are returned by the *roRssParser.GetNextArticle()* method. These instances can be passed to the *roTextWidget* object to display the feed on-screen.

`ifRssArticle`

GetTitle() As String

Returns the title of the RSS item.

GetDescription() As String

Returns the content of the RSS item.

GetTimestampInSeconds(a As Integer) As Boolean

Returns in seconds the difference in publication date between this RSS item and the most recent item in the feed. The user can utilize this to decide if an article is too old to display.

SetTitle(a As String) As Boolean

SetDescription(a As String) As Boolean

SetTimestampInSeconds(a As Integer) As Boolean

Important
For firmware versions 4.7.x and above, if no alpha value is specified when *roTextWidget.SetForegroundColor()* is called, the text widget area will appear blank.

Example

```
u=CreateObject("roUrlTransfer")
u.SetUrl("http://www.lemonde.fr/rss/sequence/0,2-3208,1-0,0.xml")
u.GetToFile("tmp:/rss.xml")

r=CreateObject("roRssParser")
r.ParseFile("tmp:/rss.xml")

EnableZoneSupport(1)
b=CreateObject("roRectangle", 0, 668, 1024, 100)
t=CreateObject("roTextWidget", b, 3, 2, 2)
t.SetForegroundColor(&hFFD0D0D0)
t.Show()

a = r.GetNextArticle()
while type(a) = "roRssArticle"
       t.PushString(a.GetDescription())
       sleep(1000)
       a = r.GetNextArticle()
end while

while true
       sleep(1000)
end while
```

RORSSPARSER

Firmware Version 6.1

- Previous Versions

The *roRssParser* object is used to parse an RSS feed before displaying it. Each item in an RSS feed is represented by an *roRssArticle* object.

ifRssParser

ParseFile(filename As String) As Boolean

Parses an RSS feed from a file.

ParseString(filename As String) As Boolean

Parses an RSS feed from a string.

GetNextArticle() As Object

Gets the next article parsed by the RSS parser. The articles are sorted by publication date, with the most recent article first. This returns an *roRss Article* object if there is one. Otherwise, an integer is returned.

RORTSPSTREAM

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This is a simple media-streaming object that is passed to the *roVideoPlayer.PlayFile()* method. Use this object to play UDP, RTP, HLS, and HTTP streams. See the Video Streaming and IP Camera FAQs for more details.

Object Creation: To play a stream, instantiate an *roRtspStream* object with a URL as its argument. Then pass it to the `PlayFile()` method as shown in the following example:

```
v = createobject("rovideoplayer")
r = createobject("rortspstream", "http://172.30.1.37/alldigital/1080p/playlist.m3u8")
v.playfile({rtsp:r})
```

Note
The key in the passed associative array will always be "rtsp", no matter which streaming protocol is used.

`ifRtspStream`

GetUrl() As String

Retrieves the currently configured URL.

AddHeader(header As String, text As String)

Adds the specified header and header text to the streaming request. The ":" after the header and the "\r\n" after the header text are supplied automatically by the method. Headers only take effect when a stream is played; you cannot add more headers when a stream is playing (though these headers will be applied if the stream is played again).

ClearHeaders()

Removes headers that have been added using the `AddHeader()` method.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts event messages to the attached message port. The event messages are of the type *roRtspStreamEvent* and will implement the *ifInt* interfac
e.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROSNMPAGENT

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When this object is created, it starts an SNMP process that handles some standard SNMP MIBs such as system uptime. Prior to starting the SNMP agent, you can register other OIDs for handling. You can set and retrieve these by both an SNMP client and the script.

OID values are retrieved by an SNMP client without script interaction. Setting OID values will generate an *roSnmpEvent* object stating that they have been changed. The script event handler can then retrieve new values and take appropriate action.

Setting an OID value from an SNMP client doesn't block the client waiting on any script action; there is a short, but indeterminate, time delay for scripts to act on a value change. This isn't a problem generally because of the way SNMP MIBs are designed. If you want to provide constantly updating OID values, you can update them using either a timer or state changes.

`ifSnmpAgent`

AddOidHandler(oid_string As String, writable_flag As Boolean, initial_value As Object) As Boolean

Adds an OID handler with the following parameters to the SNMP agent:

- `oid_string`: The OID string (e.g. "1.3.6.1.4.1.26095.1.1.1.4.4.0"). All OID strings should be numerical.
- `writable_flag`: A Boolean value indicating whether the value can be changed by an SNMP client.
- `initial_value`: The initial value, which can be either an *roString* or *roInt*. The OID will reflect the type chosen here.

GetOidValue(oid_string As String) As Object

Returns the current value (as either *roString* or *roInt*) for a given OID.

SetOidValue(oid_string As String, new_value As Object) As Boolean

Changes the current value for a given OID. The passed value can be either an *roString* or *roInt*.

Start() As Boolean

Starts the SNMP agent. Call this method once all OID handlers have been registered.

Example

```
agent = CreateObject("roSnmpAgent")
agent.AddOidHandler("1.3.6.1.4.1.26095.1.1.1.4.4.0", false, "ValueOfOid")
agent.AddOidHandler("1.3.6.1.4.1.26095.1.1.1.4.5.0", true, 10)
agent.Start()
```

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roSnmpEvent* to the attached message port.

ROSNMPEVENT

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`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifString`

GetString() As String

SetString(a As String)

ROSTREAMBYTEEVENT

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`ifInt`

GetInt() As Integer

SetInt(a As Integer)

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROSTREAMCONNECTRESULTEVENT

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- Previous Versions

This event is sent to a message port associated with an *roTCPStream* object when an `AsyncConnectTo()` request has been completed or has failed.

`ifInt`

GetInt() As Integer

Returns the result code of the event. If the connection was successfully established, then this method will return 0. If connection failed for any reason, this method will return a non-zero integer.

SetInt(a As Integer)

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROSTREAMENDEVENT

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`ifInt`

GetInt() As Integer

SetInt(a As Integer)

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROSTREAMLINEEVENT

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`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifString`

GetString() As String

SetString(a As String)

ROSYNCMANAGER

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This object provides advanced synchronization capabilities for video walls and other deployments that require closely calibrated interaction among players. *roSyncManager* handles all network traffic for master/slave synchronization, including the network clock. Multiple synchronization groups are allowed on the same local network and even within the same video wall.

Before using *roSyncManager*, you will need to instantiate a synchronization group by setting all players within the group to the same PTP domain value. To do this, use the *roRegistrySection.Write()* method to set the `ptp_domain` key of the “networking” section to a value between 0 and 127. In general, changes to the registry only take effect after a reboot, so the PTP synchronization service will start on each player after it is rebooted.

Example

```
regSec = CreateObject("roRegistrySection", "networking")
regSec.Write("ptp_domain", "0")
regSec.Flush()

RebootSystem()
```

Object Creation: The *roSyncManager* object is created with an associative array representing a set of parameters.

```
CreateObject("roSyncManager", parameters as roAssociativeArray)
```

The associative array can have the following parameters:

- `Domain`: A string that is used to distinguish among different *roSyncManager* instances within the same synchronization group (i.e. PTP domain). The default string is "BrightSign". This parameter allows multiple *roSyncManager* instances to operate at the same time.
- `MulticastAddress`: A string specifying to which multicast address synchronization messages are communicated. The default address is "224.0.126.10".
- `MulticastPort`: A string specifying to which multicast port synchronization messages are communicated. The default port is "1539".

`ifMessagePort`

SetPort(port As roMessagePort)

`ifSyncManager`

SetMasterMode(master_mode As Boolean) As Boolean

Specifies whether the unit is running the master instance of *roSyncManager*.

Synchronize(identifier As String, ms_delay As Integer) As Object

Configures how the master unit will broadcast the time-stamped event to other players. It continues to send out this event every second to allow slave units that are powered on late to catch up. The network message contains the sync ID, as well as the domain and a timestamp. The timestamp is created at the point when this method is called; however, it can be offset by passing a non-zero `ms_delay`, allowing synchronization points to be set slightly in the future and giving the client enough time to switch video files and perform other actions. The event is returned from the call so that the caller can access the timestamp. The `identifier` parameter allows scripts to pass a filename, or some other useful marker, to the slave units as part of the synchronization message.

Note
Because synchronization can involve slave units seeking to catch up with the playback of a master unit, we recommend using the more efficient MOV/MP4 container format when synchronizing video files. Transport Stream files (MPEG-TS) are also supported, but they must begin with a presentation timestamp (PTS) of 0. Program Stream files (MPEG-PS) are not supported.

Currently, there are two objects that can accept synchronization parameters: The *roVideoPlayer.PlayFile()* call accepts the parameters provided by *ifSyncManagerEvent* messages, while the *roImagePlayer.DisplayFile()* and *roImagePlayer.PreloadFile()* calls accept `SyncIsoTimestamp` in an associative array. To synchronize image playback, an *roImagePlayer* object will simply delay the transition thread prior to running the transition. If there is a separate call for `DisplayFile()`, then the transition will be cancelled and the image will be displayed immediately (as with non-synchronized `DisplayFile()` calls).

Example

```
' Create a sync manager with default address and port.
aa1=CreateObject("roAssociativeArray")
aa1.Domain = "BS1"
s=CreateObject("roSyncManager", aa1)
p=CreateObject("roMessagePort")
s.SetPort(p)

' Create a video player - we're going to play a seamlessly looped file
v=CreateObject("roVideoPlayer")
v.SetLoopMode(True)

' THIS SECTION IS ONLY DONE BY THE MASTER
' We're the master unit - send out a synchronize event saying that we're starting.
' playback 1000ms from now
s.SetMasterMode(True)
msg = s.Synchronize("Blah1", 1000)

' THIS SECTION IS ONLY DONE BY THE SLAVE
' We're a slave unit, and we're sitting waiting for a sync message.
msg=Wait(4000, p)

' EVERYONE DOES THE REST
aa=CreateObject("roAssociativeArray")
aa.Filename = "Text_1.mov"
aa.SyncDomain = msg.GetDomain()
aa.SyncId = msg.GetId()
aa.SyncIsoTimestamp = msg.GetIsoTimestamp()

v.PlayFile(aa)
```

ROSYNCMANAGEREVENT

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These events are generated on slave units in response to *roSyncManager.Synchronize()* calls from the master unit. The *roSyncManager* on each slave unit will handle message duplicates, so the script will receive the sync message only once during normal operations.

If the slave unit is already booted up, then the event will arrive from the first network event generated by *roSyncManager.Synchronzie()*. On the other hand, if the slave unit is booted up while the master is in the middle of playing a video file or displaying an image file, then one of the message resends (generated at one second intervals by the master unit) will trigger the event. The script passes on the data from the event to the `PlayFile()` command of the video player or the `DisplayFile()` command of the image player, which will then determine how far forward in the file it needs to seek.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()` . It will return Invalid if no data has been set.

`ifSyncManagerEvent`

GetDomain() As String

Returns the domain of the sync group, which is specified during creation of the *roSyncManager* object on the master unit.

GetId() As String

Returns the identifier of the event.

GetIsoTimestamp() As String

Returns the timestamp of the event in ISO format.

ROTCPSERVER

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`ifTCPServerInstance`

GetFailureReason() As String

Yields additional useful information if an *roTCPServer* method fails.

SetPort(port As Object)

Sets the message port that will receive events from an *roTCPServer* instance.

BindToPort(port As Dynamic) As Boolean

Prepares to accept incoming TCP connections on the specified port. Passing an integer to this method will specify a standard port number. This method can also accept an index of integer interfaces contained within an associative array, which can contain the following members:

- -1: Any (this is the default value)
- 0: Ethernet
- 1: WiFi
- 2: Modem
- 32767: Loopback (i.e. TCP connections can only be established by internal sources)

`ifUserData`

SetUserData(a As Object)

Supplies an object that will be provided by every event called by an *roTCPServer* instance.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROTCPCONNECTEVENT

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The event is posted when a new connection is made to an *roTCPServer* port. The normal response to receiving such an event is to create a new *r oTCPStream* object and pass the event to its AcceptFrom call.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifSocketInfo`

GetSourceAddress() As String

Returns the IP address of the remote end of the TCP connection.

ROUPNPACTIONRESULT

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This object contains the results of an *roUPnPService.Invoke()* call. It is important to match the transaction ID of this object with the value returned by the Invoke() method.

`ifUPnPActionResult`

GetType() As Integer

Returns the result type, which can be one of the following:

- 1 – Invoke result
- 2 – Subscribe result

GetID() As Integer

Returns the transaction ID of the result as an integer. Use it to match the *roUPnPActionResult* instance with the *roUPnPService.Invoke()* call that generated it.

GetResult() As Boolean

Returns True if the originating Invoke() call was successful.

GetValues() As roAssociativeArray

Returns an associative array containing the "out" values (if any) of the originating Invoke() call.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

ROUPNPCONTROLLER

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This object establishes and maintains a UPnP Control Point. It must exist for the entirety of UPnP discovery operations. Refer to the UPnP Device Architecture document for more information about UPnP discovery protocols.

Object Creation: The *roUPnPController* object is created without any parameters.

```
CreateObject("roUPnPController")
```

`ifUPnPController`

SetDebug(debug As Boolean) As Void

Enables detailed debugging in the UPnP engine.

Search(searchTarget As String, mx As Integer) As Boolean

Issues a Search request for a UPnP device. The parameters correspond to the ST (Search Target) and MX (Maximum wait time) header values that are sent with a UPnP M-SEARCH command. Responses to the Search request will generate messages in the form of *roUPnPSearchEvent* o bjects.

Note
The most common value for the searchTarget parameter is "upnp:rootdevice". This allows you to search all root devices, identify which devices you wish to interact with, and then get the roUPnPDevice and UPnPService instances for these embedded devices and services.

`RemoveDevice(udn As String) As Boolean`

Forces removal of the specified device from the Control Point device list. The passed string must include `"uuid:"` prepended to the UDN value.

`ifMessagePort`

SetPort(port As roMessagePort)

Specifies the port that will receive events generated by the *roUPnPController* instance.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`UPnP Controller Operation`

The *roUPnPController* object maintains a list of all currently detected UPnP devices accessible via the local network. To maintain this list, the *roU PnPController* object follows these generally accepted control-point practices:

- If an `ssdp:alive` multicast notification is received from a device that is not part of the list, it is queried for its device information and added to the list. However, the `ssdp:alive` message is not intended as the primary means for device discovery; rather, this behavior is intended to keep the list up-to-date and remove devices that disappear without an `ssdp:byebye` notification.
- If an `ssdp:byebye` multicast notification is received form a device that is part of the list, it will be removed from the list.
- The UPnP Controller allows a client to issue a Search request for UPnP devices. All devices on the network are expected to respond directly to the requesting device. If a response is received from a device that is not part of the list, it is queried for its device information and added to the list.
- UPnP devices report a "time-to-live" for notifications. For UPnP NOTIFY and search-response messages, this is contained in the "Cache-Control: max-age" header. Typically, this "time-to-live" is 20 or 30 minutes, though some devices have much shorter time values. Every device is configured to expire after its "time-to-live" is reached, at which point it is removed from the device list. The counter is reset (i.e. the device is renewed) after each receipt of an `ssdp:alive` message.

BrightScript does not allow direct access to its internal DeviceList. Rather, it raises events in the form of *roUPnPSearchEvent* objects when devices are added or removed from the list. These objects can, in turn, be used to retrieve *roUPnPDevice* objects containing all device information.

The controller also raises events whenever it receives a NOTIFY multicast message or a response to an M-SEARCH message (i.e. a response to a controller search request). These events return associative arrays containing headers from the NOTIFY multicast message or from the HTTP response to the M-SEARCH message.

The associative arrays may also contain additional non-header items. For an SSDP multicast message notification (type 0), the associative array will contain an "ssdpType" key, the value of which designates whether it is a NOTIFY or M-SEARCH message. In most cases, it is best to ignore M-SEARCH messages, unless you are implementing a UPnP device (the UPnP controller object does allow this).

During an M-SEARCH request, a "new device" notification (type 2) will only be sent when a device is added to the controller's internal list. Once a device is part of the device list, subsequent M-SEARCH requests will only return type 1 (search response) values for that device. This type 1 response returns an associative array with message headers, but not an *roUPnPDevice* object (which is used to contain a complete set of device information).

> See the *roUPnPSearchEvent* page for more information about the messages sent by the UPnP Controller.

ROUPNPDEVICE

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This object is returned by the *roUPnPSearchEvent.GetObject()* method under certain conditions.

`ifUPnPDevice`

GetUUID() As String

GetHeaders() As roAssociativeArray

Returns an associative array of headers (including vendor-specific extensions) associated with the advertisement or search.

GetDeviceInfo() As roAssociativeArray

Returns an associative array of device metadata from the device XML (applicable to root items only).

GetEmbeddedDevices() As roAssociativeArray

Returns an associative array of embedded *roUPnPDevice* object instances, keyed by device type.

GetEmbeddedDevice(deviceType As String) As roUPnPDevice

Returns an *roUPnPDevice* instance, using the specified deviceType as a unique identifier. The `deviceType` parameter must use one of the following formats:

- `urn:schemas-upnp:device:deviceType:v`: Search for any device of this type. The `deviceType` and version (v) are defined by the UPnP Forum working committee.
- `urn:domain-name:device:deviceType:v`: Search for any device of this type. The domain-name, `deviceType`, and version (v) are defined by the UPnP vender. Period characters in the domain name must be replaced with hyphens in accordance with RFC2141.

GetServices() As roAssociativeArray

Returns an associative array of embedded *roPnPService* object instances, keyed by type.

GetService(serviceType As String) As roUPnPService

Returns an *roUPnPService* instance of the specified type.

ROUPNPSEARCHEVENT

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This event object is returned when there is a response to a *roUPnPController.Search()* operation. It is also returned when the *roUPnPController* o bject receives multicast UDP SSDP messages.

`ifUPnPSearchEvent`

GetObject() As Object

Returns either an *roUPnPDevice* or an *roAssociativeArray* instance, depending on the value returned from the GetType() method.

GetType() As Integer

Returns an integer value indicating the type of response:

- 0 (Advertisement) – Indicates the receipt of an SSDP multicast message, which can be either a NOTIFY message or an M-SEARCH message. The `GetObject()` method will return an associative array with all SSDP headers and an "ssdpType" key, which can have a value of either "m-search" or "notify".
- 1 (Search response) – Indicates that the message is a response to an *roUPnPControllor.Search()* request. The `GetObject()` method will return an associative array with all headers from the HTTP M-SEARCH response.
- 2 (New device added to the device list) – Indicates that the *roUPnPController* object has detected a new device and added it to the device list, which is maintained internally. Device detection can result from receiving either an `ssdp:alive` message or a response to an M-SEARCH message. The `GetObject()` method will return an *roUPnPDevice* instance containing information about the added device. This message type is only delivered once per new device. Once a device is part of the device list, subsequent M-SEARCH requests will only return type 1 (Search response) values for that device.
- 3 (Device will be deleted from the device list) – Indicates that a device will be deleted from the device list, which is maintained internally. A device is deleted from the list when the player receives an ssdp:byebye message from the device, when the device does not send an `ssdp:alive` message within the defined "max-age" interval, or when the device is forcibly removed using the *roUPnPController.RemoveDevice()* method. The `GetObject()` method will return an *roUPnPDevice* instance containing information about the device to be removed.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROUPNPSERVICE

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This object is returned by the `GetServces()` and `GetService()` methods on the *roUPnPDevice* object.

`ifUPnPService`

Invoke(actionName As String, params As Object) As Integer

Invokes an action asynchronously on the UPnP service. This method returns a transaction ID that can be used to match it against the associated *roUPnPActionResult* instance.

Subscribe() As Integer

Subscribes to events on the UPnP service asynchronously.

RenewSubscription() As Integer

Resubscribes to events on the UPnP service asynchronously. This method should only be called after calling `Subscribe()`.

GetSID() As String

Returns the subscription ID. This method should only be called after calling `Subscribe()`.

GetTimeout() As Integer

Returns the service timeout period. This method should only be called after calling `Subscribe()`.

`ifMessagePort`

SetPort(port As roMessagePort)

Specifies the port that will receive events generated by the *roUPnPService* instance.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

ROUPNPSERVICEEVENT

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This event object is returned whenever a UPnP event message is received (for example, from a Subscribe() operation on the *roUPnPService* obje ct). If a UPnP event message contains multiple state variables, separate event objects will be returned for each state variable.

`ifUPnPServiceEvent`

GetUUID() As String

Returns the subscription ID of the subscription service sending the event. This string matches the value returned by the GetSID() method of the *ro UPnPService* instance that generated the event.

GetVariable() As String

Returns the name of the UPnP state variable to which the value corresponds.

GetValue() As String

Returns the value of the variable.

GetSequence() As Integer

Returns the incrementing sequence number, which denotes the UPnP message from which the update originated. The sequence number will be the same for multiple variable updates reported in a single UPnP event.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

ROTCPSTREAM

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`ifStreamReceive`

SetLineEventPort(a As Object)

SetByteEventPort(a As Object)

SetReceiveEol(a As String)

SetMatcher(matcher As Object) As Boolean

Instructs the stream to use the specified matcher. This object returns True if successful. Pass Invalid to this method to stop using the specified matcher.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

`ifStreamSend`

SetSendEol(eol_sequence As String) As Void

Sets the EOL sequence when writing to the stream. The default value is CR (ASCII value 13). If you need to set this value to a non-printing character, use the `chr()` global function.

SendByte(byte As Integer) As Void

Writes the specified byte to the stream.

SendLine(string As String) As Void

Writes the specified characters to the stream followed by the current EOL sequence.

SendBlock(a As Dynamic) As Void

Writes the specified characters to the stream. This method can support either a string or an *roByteArray*. If the block is a string, any null bytes will terminate the block.

Flush()

`ifTCPStream`

GetFailureReason() As String

Yields additional useful information if an *roTCPStream* method fails.

ConnectTo(a As String, b As Integer) As Boolean

Connects the stream to the specified host (designated using a dotted quad) and port. The function returns True upon success.

Accept(a As Object) As Boolean

Accepts an incoming connection event. The function returns True upon success.

AsyncConnectTo(a As String, b As Integer) As Boolean

Attempts to connect the stream to the specified host (designated using a dotted quad) and port. The function returns False if this action is immediately impossible (for example, when the specified host is not in the correct format). Otherwise, the function returns True upon success. The connect proceeds in the background, and an *roStreamConnectResultEvent* is posted to the associated message port when the connect attempt succeeds or fails.

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Important
The *roUrlStream* object has been deprecated and will be removed in a future version of firmware.

This object allows playback of content from a URL; the current implementation is only designed to work from local NAS storage.

This object is created with an associated *roUrlTransfer* object, as well as a number of other numeric parameters that define buffer size, etc. The *ro UrlTransfer* object defines the retrieval URL and is documented separately.

To use the final object to play back content, you must put the object into an associative array with the parameter name "Url". This array can then be sent to *roVideoPlayer.PlayFile()* for playback.

`ifUrlStream`

GetUrl() As String

GetBufferSize() As Integer

GetRewindSize() As Integer

GetMinimumFill() As Integer

ROURLTRANSFER

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- ifUserData
  - SetUserData(user_data As Object)
  - GetUserData() As Object
- ifIdentity
  - GetIdentity() As Integer
- ifMessagePort
  - SetPort(port As roMessagePort)
- ifGetMessagePort
  - GetPort() As Object
- ifUrlTransfer
  - SetUrl(URL As String) As Boolean
  - AddHeader(name As String, value As String) As Boolean
  - GetToString() As String
  - GetToFile(filename As String) As Integer
  - AsyncGetToString() As Boolean
  - AsyncGetToFile(filename As String) As Boolean
  - EnableResume(enable As Boolean) As Boolean
  - Head() As Object
  - AsyncHead() As Boolean
  - PostFromString(request As String) As Integer
  - PostFromFile(filename As String) As Integer
  - AsyncPostFromString(request As String) As Boolean
  - AsyncPostFromFile(filename As String) As Boolean
  - SetUserAndPassword(user As String, password As String) As Boolean
  - SetMinimumTransferRate(bytes_per_second As Integer, period_in_seconds As Integer) As Boolean
  - GetFailureReason() As String
  - SetHeaders(a As Object) As Boolean
  - AsyncGetToObject(type As String) As Boolean
  - AsyncCancel() As Boolean
  - EnableUnsafeAuthentication(enable As Boolean) As Boolean
  - EnableUnsafeProxyAuthentication(enable As Boolean) As Boolean
  - EnablePeerVerification(a As Boolean) As Boolean
  - EnableHostVerification(a As Boolean) As Boolean
  - SetCertificatesFile(a As String) As Boolean
  - SetClientCertificate(parameters As roAssociativeArray) As Boolean
  - SetCookie(cookie As String) As Boolean
  - SetCookieFile(filename As String) As Boolean
  - GetCookies() As roList
  - EnableEncodings(enable As Boolean) As Boolean
  - SetUserAndPassword(a As String, b As String) As Boolean
  - Head() As Object
  - Escape(unescaped As String) As String
  - Unescape(a As String) As String
  - GetUrl() As String
  - SetProxy(proxy As String) As Boolean
  - SetProxyBypass(hostnames As Array) As Boolean
  - PutFromString(a As String) As Integer
  - SetTimeout(milliseconds As Integer) As Boolean
  - SetUserAgent(a As String) As Boolean
  - PutFromFile(a As String) As Integer
  - AsyncPutFromString(a As String) As Boolean
  - AsyncPutFromFile(a As String) As Boolean
  - Delete() As Object
  - AsyncDelete() As Boolean
  - ClearHeaders() As Void
  - AddHeaders(a As Object) As Boolean
  - SyncMethod(a As Object) As Object
  - SetRelativeLinkPrefix(prefix As String) As Boolean
  - BindToInterface(interface As Integer) As Boolean
  - AsyncMethod(parameters As roAssociativeArray) As Boolean

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This object is used for reading from and writing to remote servers through URLs. It reports transfer status using the *roUrlEvent* object.

Object Creation: This object is created with no parameters.

```
CreateObject("roUrlTransfer")
```

> **Note**
> You must create a separate roUrlTransfer instance for each asset you wish to read/write.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

`ifIdentity`

GetIdentity() As Integer

Returns a unique number that can be used to identify when events originate from this object.

`ifMessagePort`

SetPort(port As roMessagePort)

Sets the message port to which events will be posted for asynchronous requests.

`ifGetMessagePort`

GetPort() As Object

`ifUrlTransfer`

SetUrl(URL As String) As Boolean

Sets the URL for the transfer request. This function returns False on failure. Use *GetFailureReason* to learn the reason for the failure.

When using SetUrl to retrieve content from local storage, you do not need to specify the full file path: `SetUrl("file:/example.html")`. If the content is located somewhere other than the current storage device, you can specify it within the string itself. For example, you can use the following syntax to retrieve content from a storage device inserted into the USB port when the current device is an SD card: `SetUrl("file:///USB1:/example.html")`.

AddHeader(name As String, value As String) As Boolean

Adds the specified HTTP header. This is only valid for HTTP URLs. This function returns False on failure. Use `GetFailureReason()` to learn the reason for the failure.

GetToString() As String

Connects to the remote service as specified in the URL and returns the response body as a string. This function cannot return until the exchange is complete, and it may block for a long time. Having a single string return means that much of the information (headers, response codes) has been discarded. If you need this information, you can use `AsyncGetToString()` instead.

> The size of the returned string is limited to 65,536 characters.

GetToFile(filename As String) As Integer

Connects to the remote service as specified in the URL and writes the response body to the specified file. This function does not return until the exchange is complete and may block for a long time. The response code from the server is returned. It is not possible to access any of the response headers. If you need this information, use `AsyncGetToFile()` instead.

AsyncGetToString() As Boolean

Begins a GET request to a string asynchronously. Events will be sent to the message port associated with the object. If False is returned, then the request could not be issued and no events will be delivered.

AsyncGetToFile(filename As String) As Boolean

Begins a GET request to a file asynchronously. Events will be sent to the message port associated with the object. If False is returned, then the request could not be issued and no events will be delivered.

EnableResume(enable As Boolean) As Boolean

Specifies the file-creation behavior of the `GetToFile()` and `ASyncGetToFile()` methods. If this method is set to False (the default setting), each download will generate a temporary file: if the download is successful, the temporary file will be renamed to the specified filename; if the download fails, the temporary file will be deleted. If this method is set to True, the file with the specified filename will be created regardless of whether the download is successful or not—this allows the download to be resumed by a subsequent `GetToFile()` or `ASyncGetToFile()` call .

Head() As Object

Synchronously perform an HTTP HEAD request and return the resulting response code and headers through an *roUrlEvent* object. In the event of catastrophic failure (e.g. an asynchronous operation is already active), a null object is returned.

AsyncHead() As Boolean

Begins an ansynchronous HTTP HEAD request. Events will be sent to the message port associated with the object. If the request could not be issued, the method will return False and will not deliver any events.

PostFromString(request As String) As Integer

Uses the HTTP POST method to post the supplied string to the current URL and return the response code. Any response body is discarded.

PostFromFile(filename As String) As Integer

Uses the HTTP POST method to post the contents of the file specified to the current URL and then return the response code. Any response body is discarded.

AsyncPostFromString(request As String) As Boolean

Uses the HTTP POST method to post the supplied string to the current URL. Events of type *roUrlEvent* will be sent to the message port associated with the object. A False return indicates that the request could not be issued and no events will be delivered.

AsyncPostFromFile(filename As String) As Boolean

Uses the HTTP POST method to post the contents of the specified file to the current URL. Events of the type *roUrlEvent* will be sent to the message port associated with the object A False return indicates that the request could not be issued and no events will be delivered.

SetUserAndPassword(user As String, password As String) As Boolean

Enables HTTP authentication using the specified user name and password. Note that HTTP basic authentication is deliberately disabled due to it being inherently insecure. HTTP digest authentication is supported.

SetMinimumTransferRate(bytes_per_second As Integer, period_in_seconds As Integer) As Boolean

Causes the transfer to be terminated if the rate drops below `bytes_per_second` when averaged over `period_in_seconds`. Note that if the transfer is over the Internet, you may not want to set `period_in_seconds` to a small number in case network problems cause temporary drops in performance. For large file transfers and a small `bytes_per_second` limit, averaging fifteen minutes or more might be appropriate.

GetFailureReason() As String

May provide additional information if any of the *roUrlTransfer* methods indicate failure.

SetHeaders(a As Object) As Boolean

AsyncGetToObject(type As String) As Boolean

Begins an asynchronious GET request and uses the contents to create an object of the specified type. Events will be sent to the message port associated with the object. If this method returns False, the request could not be issued and no events will be delievered.

AsyncCancel() As Boolean

EnableUnsafeAuthentication(enable As Boolean) As Boolean

Supports basic HTTP authentication if True. HTTP authentication uses an insecure protocol, which might allow others to easily determine the password. The *roUrlTransfer* object will still prefer the stronger digest HTTP if it is supported by the server. If this method is False (which is the default setting), it will refuse to provide passwords via basic HTTP authentication, and any requests requiring this authentication will fail.

EnableUnsafeProxyAuthentication(enable As Boolean) As Boolean

Supports basic HTTP authentication against proxies if True (which, unlike `EnableUnsafeAuthentication()`, is the default setting). HTTP authentication uses an insecure protocol, which might allow others to easily determine the password. If this method is False, it will refuse to provide passwords via basic HTTP authentication, and any requests requiring this authentication type will fail.

EnablePeerVerification(a As Boolean) As Boolean

EnableHostVerification(a As Boolean) As Boolean

SetCertificatesFile(a As String) As Boolean

SetClientCertificate(parameters As roAssociativeArray) As Boolean

Specifies an HTTPS Client Certificate for use with server authentication. PKCS#12 certificates are not supported. This method accepts an associative array with the following parameters:

- `certificate_file`: The filename of the Client Certificate file
- `key_file`: The filename of the key file. You do not need to specify a key file if the key is embedded in the Client Certificate file (which might be the case when using PEM format).
- `type`: Either "PEM" or "DER"
- `passphrase`: The string passphrase to use if the key is encrypted
- `obfuscated_passphrase`: The obfuscated string passphrase to use if the key is encrypted.

> **Note**
> If any of the parameters are set incorrectly, you'll likely get a -35 error when making a request.

SetCookie(cookie As String) As Boolean

Adds the specified cookie to the player storage and enables the cookie parsing/sending engine. The cookie can be either a single line in Netscape/Mozilla format or a standard HTTP-style header (i.e. `Set-Cookie:`). You can also carry out commands by passing these exact strings to the method:

- "ALL": Erases all cookies held in memory.
- "SESS": Erases all session cookies held in memory.
- "RELOAD": Loads all cookies from files specified by SetCookieFile() calls.

SetCookieFile(filename As String) As Boolean

Adds cookies to the player storage using the specified cookie file and enables the cookie parsing/sending engine. The cookie data can be in either Netscape/Mozilla format or standard HTTP format.

GetCookies() As roList

Returns a string list of all cookies (including expired cookies).

EnableEncodings(enable As Boolean) As Boolean

Enables HTTP compression, which communicates to the server that the system can accept any encoding that the *roUrlTransfer* object is capable of decoding by itself. This currently includes "deflate" and "gzip", which allow for transparent compression of responses. Clients of the *roUrlTransf* *er* instance see only the decoded data and are unaware of the encoding being used.

> **Note**
> HTTP compression is enabled by default in firmware versions 6.0.x and later.

SetUserAndPassword(a As String, b As String) As Boolean

Head() As Object

Performs a synchronous HTTP HEAD request and returns the resulting response code and headers through an *roURLEvent* object. In the event of catastrophic failure (e.g. an asynchronous operation is already active), a null object is returned.

Escape(unescaped As String) As String

Converts the provided string to a URL-encoded string. All characters that could be misinterpreted in a URL context are converted to the `%XX` form.

Unescape(a As String) As String

GetUrl() As String

SetProxy(proxy As String) As Boolean

Sets the name or address of the proxy server that will be used by the *roUrlTransfer* instance. The proxy string should be formatted as follows: "http://user:password@hostname:port". It can contain up to four "*" characters; each "*" character can be used to replace one octet from the current IP address. For example, if the IP address is currently 192.168.1.2, and the proxy is set to "proxy-*-*", then the player will attempt to use a proxy named "proxy-192.168".

SetProxyBypass(hostnames As Array) As Boolean

Exempts the specified hosts from the proxy setting. The passed array should consist of one or more hostnames. The player will attempt to reach the specified hosts directly rather than using the proxy that has been specified with the `SetProxy()` method. For example, the hostname "example.com" would exempt "example.com", "example.com:80", and "www.example.com" from the proxy setting.

PutFromString(a As String) As Integer

Uses the HTTP PUT method to write the supplied string to the current URL and return the response code. Any response body is discarded; use *roUrlTransfer.SyncMethod* to retrieve the response body.

SetTimeout(milliseconds As Integer) As Boolean

Terminates the transfer if the request takes longer than the specified number milliseconds. Note that this includes the time taken by any name lookups, so setting this value too low will cause undesirable results. Passing 0 to the method disables the timeout. This method returns True upon success and False upon failure. In the event of failure, using the `GetFailureReason()` method may provide more information. If the operation times out, the status return is -28.

SetUserAgent(a As String) As Boolean

PutFromFile(a As String) As Integer

Uses the HTTP PUT method to write the contents of the specified file to the current URL and return the response code. Any response body is discarded; use *roUrlTransfer.SyncMethod* to retrieve the response body.

AsyncPutFromString(a As String) As Boolean

Uses the HTTP PUT method to write the supplied string to the current URL. Events of type *roUrlEvent* will be sent to the message port associated with the object. A False return indicates that the request could not be issued and no events will be delivered. Any response body is discarded; use *roUrlTransfer.AsyncMethod* to retrieve the response body.

AsyncPutFromFile(a As String) As Boolean

Uses the HTTP PUT method to write the contents of the specified file to the current URL. Events of type *roUrlEvent* will be sent to the message port associated with the object. A False return indicates that the request could not be issued and no events will be delivered. Any response body is discarded; use *roUrlTransfer.AsyncMethod* to retrieve the response body.

Delete() As Object

Uses the HTTP DELETE method to delete the resource at the current URL and return the response code. Any response body is discarded; use *roUrlTransfer.SyncMethod* to retrieve the response body.

AsyncDelete() As Boolean

Uses the HTTP DELETE method to delete the resource at the current URL. Events of type *roUrlEvent* will be sent to the message port associated with the object. A False return indicates that the request could not be issued and no events will be delivered. Any response body is discarded; use *roUrlTransfer.AsyncMethod* to retrieve the response body.

ClearHeaders() As Void

Removes all headers that would be supplied with an HTTP request.

AddHeaders(a As Object) As Boolean

Adds one or more headers to HTTP requests. Pass headers to this object as an *roAssociativeArray* of name/value pairs. This method returns True upon success and False upon failure. All headers that are added with this method will continue to be sent with HTTP requests until `ClearHeaders()` is called.

SyncMethod(a As Object) As Object

Performs a synchronous HTTP method request using the specified parameters. If the request is started successfully, then the method returns an roUrlEvent object containing the results of the request. This method returns Invalid if the the request could not be started. In this case, the `GetFailureReason()` method may provide more information.

SetRelativeLinkPrefix(prefix As String) As Boolean

Places the specified prefix in front of the URL if the URL is relative. Use this method to easily make `file:///` URLs drive agnostic.

BindToInterface(interface As Integer) As Boolean

Ensures that the request only goes out over the specified network interface. By default, the request goes out over the most appropriate network interface (which may depend on the routing metric configured via *roNetworkConfiguration*). Note that if both interfaces are on the same layer 2 network, this method may not always work as expected due to the Linux weak host model. The default behavior can be selected by passing -1 to the method. This method returns False upon failure. In this case, the `GetFailureReason()` method may provide more information.

AsyncMethod(parameters As roAssociativeArray) As Boolean

Begins an asynchronous HTTP method request using the specified parameters (see below). If the request is started successfully, the method returns True and and will deliver an event. If the request could not be started, then the method returns False and will not deliver an event. If this occurs, you may be able to use the `GetFailureReason()` method to get more information.

The parameters are sepecifed using an *roAssociativeArray* instance that may contain the following members:

Name	Type	Description
method	String	An HTTP method. Normal values include "HEAD", "GET", "POST", "PUT", and "DELETE". Other values are supported; however, depending on server behavior, they may not work as expected.
request_body_string	String	A string containing the request body.
request_body_file	String	The name of a file that contains the request body
response_body_string	Boolean	If specified and set to True, the response will be stored in a string and provided via the *roUrlEvent.GetString()* method.
response_body_file	String	The name of the file that will contain the response body. The body is written to a temporary file and then renamed to the specified filename if successful.
response_body_resume_file	String	The name of the file that will contain the response body. For a GET request, a RANGE header is sent based on the current size of the file, which is written in place rather than using a temporary file.
response_body_object	String	Uses the response body to create an object of the specified type. See the entry for AsyncGetToObject() for supported object types.
response_pipe	*roArray*	Use a pipeline of handlers to process the response body as it is received. See below for more details.

The *roArray* response for `response_pipe` consists of one or more *roAssociativeArray* instances containing a filter description (see below). The last associative array is usually an output filter.

Name	Type	Description
hash	String	Calculate a hash (digest) of the data using the specified algorithm as it passes through the pipeline. Supported hashes include the following: "CRC32", "MD5", "SHA1", "SHA256", "SHA384", "SHA512". The resulting hash can be retrieved as a hexadecimal string using the *roUrlEvent.GetHash()* method.
decompress	String	Decompress the response body using the specified algorithm. Currently, the only supported algorithm is "gzip". It is often easier to use an HTTP Content-Encoding rather than explicitly decompressing the body.
prefix_capture	Integer	Capture the specified number of bytes (between 1 and 16384) from the start of the stream and store them separately. The bytes can be retrieved using the *roUrlEvent.GetPrefix()* method, but they cannot be passed on to subsequent filters.
output file	String	Output the pipeline to the specified file. The output is written to a temporary file and then renamed to the specified filename if successful.
output_string	Boolean	If specified and set to True, the response will be stored in a string and provided via the *roUrlEvent.GetString()* meth od.

The following example code specifies an array of handlers to filter the response body of an HTTP request.

```
url = CreateObject("roUrlTransfer")
pipe = [ { decompress: "gzip"}, { hash: "MD5" }, { output_file: "test.txt" } ]
result = url.AsyncMethod({ method: "GET", response_pipe: pipe })
```

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This event is generated by the *roUrlTransfer* object.

`ifInt`

GetInt() As Integer

Returns the type of event. The following event types are currently defined: transfer complete (1), transfer started (2).

`ifString`

GetString() As String

Returns the string associated with the event. For transfer-complete `AsyncGetToString()`, `AsyncPostFromString()`, and `AsyncPostFromFile()` requests, this will be the actual response body from the server, truncated to 65,536 characters.

`ifSourceIdentity`

GetSourceIdentity() As Integer

Returns a unique number that can be matched with the value returned by *roUrlTransfer.GetIdentity()* to determine where this event originated.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

`ifUrlEvent`

GetResponseCode() As Integer

Returns the protocol response code associated with an event. The following codes indicate success:

- 200: Successful HTTP transfer
- 226: Successful FTP transfer
- 0: Successful local file transfer

For unexpected errors, the return value is negative. There are many possible negative errors from the CURL library, but it is often best to look at the text version by calling `GetFailureReason()`.

Here are some potential errors. Not all of them can be generated by a BrightSign player:

Status	Name	Description
-1	CURLE_UNSUPPORTED_PROTOCOL	
-2	CURLE_FAILED_INIT	
-3	CURLE_URL_MALFORMAT	
-5	CURLE_COULDNT_RESOLVE_PROXY	
-6	CURLE_COULDNT_RESOLVE_HOST	
-7	CURLE_COULDNT_CONNECT	
-8	CURLE_FTP_WEIRD_SERVER_REPLY	
-9	CURLE_REMOTE_ACCESS_DENIED	A service was denied by the server due to lack of access. When login fails, this is not returned.
-11	CURLE_FTP_WEIRD_PASS_REPLY	
-13	CURLE_FTP_WEIRD_PASV_REPLY	
-14	CURLE_FTP_WEIRD_227_FORMAT	
-15	CURLE_FTP_CANT_GET_HOST	
-17	CURLE_FTP_COULDNT_SET_TYPE	
-18	CURLE_PARTIAL_FILE	
-19	CURLE_FTP_COULDNT_RETR_FILE	

-21	CURLE_QUOTE_ERROR	Failed quote command
-22	CURLE_HTTP_RETURNED_ERROR	
-23	CURLE_WRITE_ERROR	
-25	CURLE_UPLOAD_FAILED	Failed upload command.
-26	CURLE_READ_ERROR	Could not open/read from file.
-27	CURLE_OUT_OF_MEMORY	
-28	CURLE_OPERATION_TIMEDOUT	The timeout time was reached.
-30	CURLE_FTP_PORT_FAILED	FTP PORT operation failed.
-31	CURLE_FTP_COULDNT_USE_REST	REST command failed.
-33	CURLE_RANGE_ERROR	RANGE command did not work.
-34	CURLE_HTTP_POST_ERROR	
-35	CURLE_SSL_CONNECT_ERROR	Wrong when connecting with SSL.
-36	CURLE_BAD_DOWNLOAD_RESUME	Could not resume download.
-37	CURLE_FILE_COULDNT_READ_FILE	
-38	CURLE_LDAP_CANNOT_BIND	
-39	CURLE_LDAP_SEARCH_FAILED	
-41	CURLE_FUNCTION_NOT_FOUND	
-42	CURLE_ABORTED_BY_CALLBACK	
-43	CURLE_BAD_FUNCTION_ARGUMENT	
-45	CURLE_INTERFACE_FAILED	CURLOPT_INTERFACE failed.
-47	CURLE_TOO_MANY_REDIRECTS	Catch endless re-direct loops.
-48	CURLE_UNKNOWN_TELNET_OPTION	User specified an unknown option.
-49	CURLE_TELNET_OPTION_SYNTAX	Malformed telnet option.
-51	CURLE_PEER_FAILED_VERIFICATION	Peer's certificate or fingerprint wasn't verified correctly.
-52	CURLE_GOT_NOTHING	When this is a specific error.
-53	CURLE_SSL_ENGINE_NOTFOUND	SSL crypto engine not found.
-54	CURLE_SSL_ENGINE_SETFAILED	Cannot set SSL crypto engine as default.
-55	CURLE_SEND_ERROR,	Failed sending network data.
-56	CURLE_RECV_ERROR	Failure in receiving network data.
-58	CURLE_SSL_CERTPROBLEM	Problem with the local certificate.
-59	CURLE_SSL_CIPHER	Could not use specified cipher.
-60	CURLE_SSL_CACERT	Problem with the CA cert (path?)
-61	CURLE_BAD_CONTENT_ENCODING	Unrecognized transfer encoding.
-62	CURLE_LDAP_INVALID_URL	Invalid LDAP URL.
-63	CURLE_FILESIZE_EXCEEDED,	Maximum file size exceeded.
-64	CURLE_USE_SSL_FAILED,	Requested FTP SSL level failed.
-65	CURLE_SEND_FAIL_REWIND,	Sending the data requires a rewind that failed.

-66	CURLE_SSL_ENGINE_INITFAILED	Failed to initialize ENGINE.
-67	CURLE_LOGIN_DENIED	User, password, or similar field was not accepted and login failed .
-68	CURLE_TFTP_NOTFOUND	File not found on server.
-69	CURLE_TFTP_PERM	Permission problem on server.
-70	CURLE_REMOTE_DISK_FULL	Out of disk space on server.
-71	CURLE_TFTP_ILLEGAL	Illegal TFTP operation.
-72	CURLE_TFTP_UNKNOWNID	Unknown transfer ID.
-73	CURLE_REMOTE_FILE_EXISTS	File already exists.
-74	CURLE_TFTP_NOSUCHUSER	No such user.
-75	CURLE_CONV_FAILED	Conversion failed.
-76	CURLE_CONV_REQD	Caller must register conversion callbacks using the following URL_easy_setopt options: CURLOPT_CONV_FROM_NETWORK_FUNCTION CURLOPT_CONV_TO_NETWORK_FUNCTION CURLOPT_CONV_FROM_UTF8_FUNCTION
-77	CURLE_SSL_CACERT_BADFILE	Could not load CACERT file, missing or wrong format.
-78	CURLE_REMOTE_FILE_NOT_FOUND	Remote file not found.
-79	CURLE_SSH	Error from the SSH layer (this is somewhat generic, so the error message will be important when this occurs).
-80	CURLE_SSL_SHUTDOWN_FAILED	Failed to shut down the SSL connection.

The following error codes are generated by the system software, and are outside the range of CURL events:

Status	Name	Description
-10001	ERROR_CANCELLED	The transfer request has been cancelled because the *roUrlTransfer* instance is out of scope.
-10002	ERROR_EXCEPTION	The callback threw an exception.

GetObject() As Object

Returns the object associated with the event. Currently, this method can only return an object created in response to an *roUrlTransfer.AsyncGetToObject* request.

GetFailureReason As String

Returns a description of the failure that occurred.

GetSourceIdentity As Integer

Returns a unique number that can be matched with the value returned by *roUrlTransfer.GetIdentity()* to determine where the event came from.

GetResponseHeaders() As roAssociativeArray

Returns an associative array containing all the headers returned by the server for appropriate protocols (such as HTTP).

GetHash() As String

The hash (digest) of the response body, as specified by the `response_pipe{hash:}` parameter of the *roUrlTransfer.AsyncMethod()* method.

GetPrefix() As String

A number of bytes from the start of the response body. The amount of bytes is specified with the `response_pipe{prefix_capture:}` parameter of the *roUrlTransfer.AsyncMethod()* method.

Input/Output Objects

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This section describes objects that enable input/output functions on hardware interfaces.

- roBtManager
- roCecInterface
- roCecRxFrameEvent
- roCecTxCompleteEvent
- roChannelManager
- roControlPort
- roControlUp, roControlDown
- roGpioButton
- roGpioControlPort
- roIRReceiver
- roIRDownEvent, roIRRepeatEvent, roIRUpEvent
- roIRTransmitter
- roIRTransmitCompleteEvent
- roIRRemote
- roIRRemotePress
- roKeyboard
- roKeyboardPress
- roSequenceMatcher
- roSequenceMatchEvent
- roSerialPort

ROBTMANAGER

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Use the *roBtManager* object to discover whether any BLE adapters are present and to send BLE advertisements using the adapters.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roBtEvent* to the attached message port. Use these messages to detect insertion or removal of Bluetooth adapters.

`ifIdentity`

GetIdentity() As Integer

Returns a unique number that can be used to identify events that originate from the object instance.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Retrieves an arbitrary object set via the `SetUserData()` method.

`ifBtPeripheralManager`

GetFailureReason() As String

Returns additional diagnostic information if a method returns False.

GetAdapterList() As roArray

Returns an array describing all available Bluetooth adapters. Each entry in the array consists of an associative array containing adapter properties. At present, each associative array contains a single `name` property that describes the adapter name. Use this method to determine if Bluetooth adapters are connected to the player.

StopAdvertising() As Boolean

Stops all BLE advertisements. This method returns True on success and False on failure.

GetAdvertisingList() As roArray

Returns an array describing all active Bluetooth advertisements. Each entry in the array consists of an associative array describing a single advertisement. The associative-array values correspond to the properties set using the `StartAdvertising()` method, but can also include default parameter values that were not set explicitly. Note that all UUID values will be returned in lowercase.

StartAdvertising(data As roAssociativeArray) As Boolean

Begins transmitting a BLE "beacon" message. This method returns True on success and False on failure. Each message can contain data in a standard format or arbitrary custom values. The message format is specified using the `mode` parameter, and other required values in the associative array will depend on the value of this parameter:

- `mode:"beacon"`: This mode uses a simple beaconing format.
  - `beacon_uuid`: A string representation of a UUID, which can be in 16-bit, 32-bit, or 128-bit format. A 16-bit UUID must be exactly four hex digits with no punctuation; a 32-bit UUID must be exactly eight hex digits with no punctuation; and a 128-bit UUID must be punctuated exactly as follows: "cd7b6f81-f738-4cad-aebf-d2a2ea36d996".
  - `beacon_major`: An integer specifying the 2-byte Major value (0 to 65535)
  - `beacon_minor`: An integer specifying the 2-byte Minor value (0 to 65535)
  - `beacon_level`:(optional) An 8-bit signed integer (-127 to 128) that configures the power level of the beacon. The default level is -60.
  - `beacon_manufacturer`:(optional) A 2-byte integer value (0 to 65535) specifying the beacon manufacturer. The default value is 76 (&H4C).
  - `connectable`:(optional) A Boolean value indicating whether the advertisement should be connectable or not. Advertisements are non-connectable by default.
  - `persistent`:(optional) A Boolean value indicating whether the advertisement should persist after every reboot. Beacon advertisements are persistent by default.
- `mode:"eddystone-url"`: This mode uses the Eddystone-URL format.
  - `url`: The URL to encapsulate in the advertisement packet. If the URL is too long to fit in the packet, the `StartAdvertising()` call will return False and `GetFailureReason()` will report "Compressed URL is too long".
  - `tx_power`:(optional) An integer value specifying the Tx power level in dBm at 0 meters. The default value is -19, which corresponds to a level of -60dBm at 1 meter. The recommended calibration practice is to measure at 1 meter and add 41: For example, -65dBm RSSI leads to a value of -24.
  - `connectable`:(optional) A Boolean value indicating whether the advertisement should be connectable or not. Advertisements are non-connectable by default.
  - `persistent`:(optional) A Boolean value indicating whether the advertisement should persist after every reboot. Eddystone-URL advertisements are persistent by default.
- `mode:"custom"`: This mode supports arbitrary custom data in a vendor-specific field.

  `cutom_manufacturer_data`:(optional) An associative array containing two keys:
    - `manufacturer`: A 2-byte integer value (0 to 65535)
    - `data`: An *roByteArray* instance containing data
  - `service_uuid`:(optional) A set of ServiceUUID elements, which can be specified as either an array of UUID strings or an array of associative arrays containing a `uuid` key/value pair. Each associative array can also contain a `data` key, which specifies

ServiceData as an *roByteArray* instance.

- `connectable`:(optional) A Boolean value indicating whether the advertisement should be connectable or not. Advertisements are non-connectable by default.
- `persistent`:(optional) A Boolean value indicating whether the advertisement should persist after every reboot. Custom advertisements are not persistent by default.

To specify multiple advertisements, pass an array of associative arrays to the `StartAdvertising()` method. Advertisements will be sent in rotation. The method will fail if one or more advertisement is incorrect—try each advertisement individually and call `GetFailureReason()` to determine which advertisement is causing the error.

Calling the `StartAdvertising()` method will replace any previous advertisements. You can change a list of advertisements by modifying the array and calling `StartAdvertising()` again.

This script uses *roBtManager.GetAdapterList()* to determine if there are any Bluetooth adapters available:

```
btm = CreateObject("roBtManager")
if btm.GetAdapterList().Count() > 0 then print "Bluetooth available"
```

This script constructs two associative arrays for advertising with the "beacon" format and then broadcasts them both:

```
adv1 = { mode : "beacon", beacon_uuid : "41fac2b21-c8cb-41e7-b011-12d1016dd39e", beacon_major
: 400, beacon_minor : 22 }
adv2 = { mode : "beacon", beacon_manufacturer: &H4C, beacon_uuid :
"41fac221-c8cb-41e7-b011-12d1016dd39e", beacon_major : &H1234, beacon_minor : &HFF01,
beacon_level : -50 }

advlist = [adv1, adv2]
bm.StartAdvertising(advlist)
```

The associative array can also be constructed in parts:

```
adv1 = { mode: "beacon"}
adv1.Append({ beacon_uuid : "41fac221-c8cb-41e7-b011-12d1016dd39e" })
adv1.Append({ beacon_major : 32000, beacon_minor : 100 })
```

This script constructs an advertisement with the "Eddystone-URL" format. It uses the optional `tx_power` parameter as well:

```
adv1 = { mode: "eddystone-url", url: "http://www.brightsign.biz", tx_power: -24}
```

This script constructs a custom-formatted advertisement:

```
custom_adv = CreateObject("roByteArray")
custom_adv.FromHexString("0215434B2EB8C28F40898E7A1E644BB13B9FA000B001C5")
adv2 = { mode : "custom", custom_manufacturer_data : { manufacturer: &H4C, data : custom_adv }
}
```

ROCECINTERFACE

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Firmware Version 6.1

- Previous Versions

This object provides access to the HDMI CEC channel.

Object Creation: The *roCecInterface* object is created with no parameters.

```
CreateObject("roCecInterface")
```

`IfCecInterface`

SendRawMessage(packet As Object) As Void

Sends a message on the CEC bus. The frame data should be provided as an *roByteArray*, with the destination address in the low 4 bits of the first octet. The high 4 bits of the first octet should be supplied as zero because they will be replaced with the source address (unless source bit replacement is disabled using the `UseInitiatorAddressFromPacket()` method).

UseInitiatorAddressFromPacket(enable As Boolean) As Boolean

Removes the source address included by system software if passed True. This method allows you to transmit unmodified bytes via CEC.

GetLogicalAddress() As Integer

EnableCecDebug(a As String)

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via SetUserData(). It will return Invalid if no data has been set.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roCecRxFrameEvent and roCecTxCompleteEvent* to the attached message port.

ROCECRXFRAMEEVENT

Firmware Version 6.1

- Previous Versions

If an *roMessagePort* is attached to an *roCecInterface* instance, it will receive events of type *roCecRxFrameEvent*.

`ifCecRxFrameEvent`

GetByteArray() As Object

Returns the message data as an *roByteArray*.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned by `GetUserData()`.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROCECTXCOMPLETEEVENT

Firmware Version 6.1

- Previous Versions

If an *roMessagePort* is attached to an *roCecInterface* instance, it will receive events of type *roCecTxCompleteEvent*.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned by `GetUserData()`.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifCecRxFrameEvent`

GetByteArray() As Object

Returns the message data as an *roByteArray*.

0x00	Transmission successful
0x80	Unable to send, CEC hardware powered down

0x81	Internal CEC error
0x82	Unable to send, CEC line jammed
0x83	Arbitration error
0x84	Bit-timing error
0x85	Destination address not acknowledged
0x86	Data byte not acknowledged

ROCHANNELMANAGER

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Firmware Version 6.1

- Previous Versions

You can use this object to manage RF channel scanning and tuning. The *roVideoPlayer* method also has channel scanning capabilities.

Object Creation: The *roChannelManager* object is created with no parameters.

```
CreateObject("roChannelManager")
```

ifUserData

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ifMessagePort

SetPort(port As roMessagePort)

ifChannelManager

The *ifChannelManager* interface provides both a Synchronous and Asynchronous API:

Synchronous API

Scan(parameters As roAssociativeArray) As Boolean

Performs a channel scan on the RF input for both ATSC and QAM frequencies and builds a channel map based on what it finds. The *roChannelManager* object stores a list of all channels that are obtained using the `CreateChannelDescriptor()` method (described below). The list is cleared on each call to `Scan()` by default, but this behavior can be overridden.

Each channel takes approximately one second to scan; you can limit the scope of the channel scan with the following parameters:

- ["ChannelMap"] = "ATSC" or "QAM": Limits the frequency scan to either QAM or ATSC.
- ["ModulationType"] = "QAM64" or "QAM256": Limits the modulation type of the scan to QAM64 or QAM256.
- ["FirstRfChannel"] = Integer and/or ["LastRfChannel"] = Integer: Limits the scan to the specified range of channels. The high end of the channel range is an optional parameter.
- ["ChannelStore"] = "DISCARD ALL" or "MERGE": Controls how the script handles previous channel scan information. The default setting is DISCARD ALL, which clears all channel data prior to scanning. On the other hand, MERGE overwrites the data only for channels specified in the scan.

GetChannelCount() As Integer

Returns the number of found channels.

ClearChannelData() As Boolean

Clears all stored channel scanning data, including that which persists in the registry. This method also cancels any `AsyncScan()` calls that are currently running.

GetCurrentSnr() As Integer

Returns the SNR (in centibels) of the currently tuned channel.

ExporttoXML() As String

Serializes the contents of RF channels into XML. You can write the XML to a file that can be used at a later point on the same or other units. See below for an example of XML output.

ImportFromXML(a As String) As Boolean

Retrieves the RF channel contents stored as XML. The formatting of the XML is controlled using version tags.

Example

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
<!DOCTYPE boost_serialization>
<boost_serialization signature="serialization::archive" version="7">
<ChannelList class_id="0" tracking_level="0" version="0">
<ChannelCount>2</ChannelCount>
<Channel class_id="1" tracking_level="0" version="0">
<RfChannel>42</RfChannel>
<ModulationType>7</ModulationType>
<SpectralInversion>0</SpectralInversion>
<MajorChannelNumber>1</MajorChannelNumber>
<MinorChannelNumber>1</MinorChannelNumber>
</Channel>
<Channel>
<RfChannel>42</RfChannel>
<ModulationType>7</ModulationType>
<SpectralInversion>0</SpectralInversion>
<MajorChannelNumber>1</MajorChannelNumber>
<MinorChannelNumber>2</MinorChannelNumber>
</Channel>
</ChannelList>
```

EnableScanDebug(filename As String) As Boolean

Allows all scan debugging to be written to a text file. By default, there is no debug output from a scan. You can close the debug file by passing an empty string.

Example

```
c=CreateObject("roChannelManager")
c.EnableScanDebug("tmp:/scandebug.txt")

v = CreateObject("roVideoPlayer")
aa = CreateObject("roAssociativeArray")
aa["RfChannel"] = 12
aa["VirtualChannel"] = "24.1"
print v.PlayFile(aa)

c.EnableScanDebug("")
```

CreateChannelDescriptor(a As Object) As Object

Creates an associative array that can either be passed to the *roVideoPlayer.PlayFile()* method (to tune to a channel) or parsed for metadata. The generated channel object can be based on one of the following:

- Index:

```
["ChannelIndex"] = 0
```

- Virtual channel number as a string in an associative array:

```
["VirtualChannel"] = "12.1"
```

- Channel name as a string:

```
["ChannelName"] = "KCBS"
```

Note
Channels are sorted internally by virtual channel, so you could use a Channel Index script to implement standard channel up/down behavior.

These are the entries generated in the array:

- VirtualChannel
- ChannelName
- CentreFrequency
- ModulationType
- VideoPid
- VideoCodec
- AudioPid
- AudioCodec
- SpectralInversion
- ChannelMap
- FirstRfChannel
- LastRfChannel

The last three entries in this array allow you to use the same *roArray* as a parameter for `Scan()` and `PlayFile()`. The first and last RF channel values are set to the same value so that only one RF channel will be scanned. This kind of scan can be performed at the same time as playing the channel because it doesn’t require retuning.

Example

```
c=CreateObject("roChannelManager")
aa=CreateObject("roAssociativeArray")
aa["ChannelMap"] = "QAM"
aa["FirstRfChannel"] = 10
aa["LastRfChannel"] = 15
c.Scan(aa)

cinfo  = CreateObject("roAssociativeArray")
cinfo["ChannelIndex"] = 0
desc = c.CreateChannelDescriptor(cinfo)
print desc

v = CreateObject("roVideoPlayer")
v.PlayFile(desc)
c.Scan(desc)
```

Asynchronous API

AsyncScan(parameters As roAssociativeArray) As Boolean

Begins a channel scan on the RF input and returns the results immediately. Otherwise, the behavior and parameters of this method are identical to `Scan()`. When completed or cancelled, `AsyncScan()` generates an *roChannelManagerEvent*, which supports *ifUserData* and outputs two types of event:

- 0 – Scan Complete: Generated upon the completion of a scan. No extra data is supplied.
- 1 – Scan Progress: Generated upon every tune that is performed during the scan. `GetData()` returns the percentage complete of the scan.

CancelScan() As Boolean

Cancels any asynchronous scans that are currently running. This method does not generate an *roChannelManagerEvent*.

Synchronous Example

```
 c = CreateObject("roChannelManager")

' Scan the channels
aa  = CreateObject("roAssociativeArray")
aa["ChannelMap"] = "ATSC"
aa["FirstRfChannel"] = 12
aa["LastRfChannel"] = 50
c.Scan(aa)

' Start at the first channel
index = 0
cinfo  = CreateObject("roAssociativeArray")
cinfo["ChannelIndex"] = index
desc = c.CreateChannelDescriptor(cinfo)

' Play the first channel
v = CreateObject("roVideoPlayer")
v.PlayFile(desc)

' Play the second channel
index = index + 1
cinfo["ChannelIndex"] = index
desc = c.CreateChannelDescriptor(cinfo)
v.PlayFile(desc)
```

Asynchronous Example

```
 c = CreateObject("roChannelManager")
p = CreateObject("roMessagePort")
c.SetPort(p)

' Scan the channels
aa  = CreateObject("roAssociativeArray")
aa["ChannelMap"] = "ATSC"
aa["FirstRfChannel"] = 12
aa["LastRfChannel"] = 50
c.AsyncScan(aa)

loop:
  msg = Wait(2000,p)
  if msg = 0 then goto scan_complete
  goto loop

scan_complete:
' Start at the first channel
index = 0
cinfo  = CreateObject("roAssociativeArray")
cinfo["ChannelIndex"] = index
desc = c.CreateChannelDescriptor(cinfo)

' Play the first channel
v = CreateObject("roVideoPlayer")
v.PlayFile(desc)

' Rescan the current channel, and update the
desc["ChannelStore"] = MERGE
c.Scan(desc)
```

ROCONTROLPORT

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Firmware Version 6.1

- Previous Versions

This object is an improved version of *roGpioControlPort*. It provides support for the I/O port of the BP200 and BP900 USB button boards, as well as the on-board I/O port and side buttons on the BrightSign player. It also supports "button-up" events. The object is used to configure output levels on the I/O connector and monitor inputs. Typically, LEDs and buttons are attached to the I/O connector on the BrightSign player or the BrightSign Expansion Module.

Object Creation: The *roControlPort* object is created with a single parameter that specifies the port being used.

```
CreateObject("roControlPort", port As String)
```

The port parameter can be one of the following:

- `BrightSign`: Specifies the onboard DA-15 connector, as well the SVC (GPIO12) and Reset buttons.
- `Expander-GPIO`: Specifies the DB-25 connector on the BrightSign Expansion Module. If no BrightSign Expansion module is attached, then object creation will fail and Invalid will be returned.
- `Expander-DIP`: Specifies the eight DIP switches on the BrightSign Expansion Module. If no BrightSign Expansion module is attached, then object creation will fail and Invalid will be returned.

Note
Hot-plugging the BrightSign Expansion Module is not supported.

- `Touchboard-<n>-GPIO`: Retrieves events from the specified BP200/BP900 button board. Events are handled in the same manner as events from the BrightSign port.
- `Touchboard-<n>-LED-SETUP`: Sets various LED output options for the specified BP200/BP900 button board.
- `Touchboard-<n>-LED`: Sets the bits for each button on the specified BP200/BP900 button board. The bits indicate whether the associated LED should be on or off.

Note
Since multiple BP200/BP900 button boards can be connected to a player simultaneously, the <n> value specifies the port enumeration of each board. An unspecified enumeration value is synonymous with a button board with an enumeration value of 0 (e.g. Touchboard-GPIO and Touchboard-0-GPIO are identical).

`ifControlPort`

GetVersion() As String

Returns the version number of the firmware (either the main BrightSign firmware or the BrightSign Expansion Module firmware) responsible for the control port.

EnableOutput(pin As Integer) As Boolean

Marks the specified pin as an output. If an Invalid pin number is passed, False will be returned. If successful, the function returns True. The pin will be driven high or low depending on the current output state of the pin.

EnableInput(pin As Integer) As Boolean

Marks the specified pin as an input. If an Invalid pin number is passed, False will be returned. If successful, the function returns True. The pin will be tri-stated and can be driven high or low externally.

GetWholeState() As Integer

Returns the state of all the inputs attached to the control port as bits in an integer. The individual pins can be checked using binary operations, although it is normally easier to call `IsInputActive()` instead.

IsInputActive(pin As Integer) As Boolean

Returns the state of the specified input pin. If the pin is not configured as an input, then the result is undefined.

SetWholeState(state As Integer) As Boolean

Specifies the desired state of all outputs attached to the control port as bits in an integer. The individual pins can be set using binary operations, although it is normally easier to call *SetOutputState* instead.

GetIdentity() As Integer

Returns the identity value that can be used to associate *roControlUp* and *roControlDown* events with this control port.

SetOutputState(pin As Integer, level As Boolean) As Boolean

Specifies the desired state of the specified output pin. If the pin is not configured as an output, the resulting level is undefined. This method can also be used to configure LED output behavior on BP200/B900 button boards; see the **BP200/BP900 Setup** section below for more details.

SetOutputValue(offset As Integer, bit-mask As Integer)

Configures the BP200/BP900 button board when *roControlPort* object is instantiated with the `Touchboard-<n>-LED-SETUP` or `Touchboard-<n>-LED` parameter. See the **BP200/900 Setup** section below for more details.

GetProperties() As roAssociativeArray

Returns an associative array of values related to the attached BP200/BP900 button board, including hardware, header, and revision. This method can only be used with an *roControlPort* instantiated with the `Touchboard-<n>-GPIO` parameter.

SetPulseParams(parameters As roAssociativeArray) As Boolean

Specifies a period of time, as well as the time slices within that period, for pulsing GPIO LED pins. These properties are applied to all GPIO pins. This method is passed an associative array with the following parameters:

- `milliseconds`: An integer specifying the time period (in ms) for pulsing
- `slices`: An integer specifying the number of divisions within the milliseconds time period: For example, a 500ms time period with slices:2 is divided into two 250ms slices.

SetPulse(pin As Integer, bit-field As Integer) As Boolean

Sets the off/on bit field for a particular GPIO pin. Use the slices parameter of the `SetPulseParams()` method to determine the number of bits in the bit field. For example, specifying `milliseconds:500, slices:2`, and a bit field of `10` will cause the pin to turn on every other 250 millisecond period.

RemovePulse(pin As Integer) As Boolean

Removes the specified GPIO pin from the set of pins affected by the pulse.

ifMessagePort

SetPort(port As Object)

Posts messages raised by this instance to the attached message port.

ifUserData

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ifIdentity

GetIdentity() As Integer

Returns a unique number that can be used to identify when events originate from this object.

This example script applies timed pulses to a set of GPIO pins:

```
' set up pin 2 and 3 to flash at 2Hz (i.e. on & off twice in a second) in an alternating '
fashion.

gpioPort = CreateObject("roControlPort", "BrightSign")

gpioPort.EnableOutput(2)
gpioPort.SetOutputState(2, true)

gpioPort.EnableOutput(3)
gpioPort.SetOutputState(3, true)

' set up pulse to have two time slices of 250ms each.
gpioPort.SetPulseParams({ milliseconds: 500, slices: 2 })

' pin 2 will have slice 1 on and slice 2 off.
gpioPort.SetPulse(2, &h01)

' pin 3 will have the reverse of pin 2.
gpioPort.SetPulse(3, &h02)

' wait for a bit.
sleep(10000)

' stop pulsing on pin 2.
gpioPort.RemovePulse(2)
```

BP200/BP900 Setup

To send a configuration to the BP200/BP900 button board, instantiate *roControlPort* with the `Touchboard-<n>-LED-SETUP` parameter and call the `SetOuputValue()` method. This method accepts two integers: the first integer specifies one of three command types (offsets); the second integer is a bit field consisting of 32 bits.

- **Offset 0**: Configures the button board using a bit field that is split into four bytes of eight bits each. Each byte is a separate part of the configuration. In the script, these bytes need to be listed from right to left in hex value (i.e. Byte 1 + Byte 2 + Byte 3 + Byte 4).
  - Byte 1: Specifies the configuration type for the button board. Currently, the only configuration type is for LED output, which is

    specified with the value &hA0.
    - Byte 2: The button number(s) that will be configured. Buttons are numbered beginning from 1. The value is set to 0 (&h00) if this command is not required.
    - Byte 3: The LED bit-field configuration. This value specifies how many on/off bits should be used (up to 32 bits) when `SetOutputValue()` is called on a `Touchboard-<n>-LED` instance (see the **BP200/BP900 LED Output** section below for details). Set the value to 0 (&h00) if this command is not required (the bit field will be set to eight bits by default).
    - Byte 4: This value is currently always set to 0 (&h00).
- **Offset 1**: Disables buttons on the button board according to values in the bit field. Each button is disabled individually by setting bits 0-10: For example, passing the hex value &h00000008 will disable button 4 only.
- **Offset 2**: Disables LEDs on the button board according to values in the bit field. Each LED is disabled individually by setting bits 0-10: For example, passing the hex value &h00000080 will disable the LED on button 8 only.

Note
Disabling a button LED will not automatically disable the button itself (and vice-versa). To disable both the button and the LED, make separate SetOutputValue() calls for Offset 1 and Offset 2.

`BP200/BP900 LED Output`

To control the behavior of individual button LEDs, instantiate *roControlPort* with the `Touchboard-<n>-LED` parameter, then pass per-LED bit fields to the `SetOutputValue()` method. This method accepts two integers: the first integer specifies the button number (0-11), while the second integer uses a bit field to specify the on/off behavior of the button LED. The size of the bit field (up to 32 bits) is determined with the Offset 0 – Byte 3 value described in the section above.

Each bit specifies the on/off behavior of a single cycle, and the BP200/BP900 button boards run at approximately 11Hz. For example, if you want an LED to cycle on every other second, you would set the Offset 0 – Byte 3 value to &h16 (22 bits) and the bit field itself to &h3FF800 (0000000000011111111111).

This example script sets a BP900 to “twinkle” by turning off each button LED at a different point in the cycle:

```
led=CreateObject("roControlPort", "TouchBoard-0-LED")
led_setup=CreateObject("roControlPort", "TouchBoard-0-LED-SETUP")
led_setup.SetOutputValue(0, &h000B00A0)
led.SetOutputValue(0, &h07fe)
led.SetOutputValue(1, &h07fd)
led.SetOutputValue(2, &h07fb)
led.SetOutputValue(3, &h07f7)
led.SetOutputValue(4, &h07ef)
led.SetOutputValue(5, &h07df)
led.SetOutputValue(6, &h07bf)
led.SetOutputValue(7, &h077f)
led.SetOutputValue(8, &h06ff)
led.SetOutputValue(9, &h05ff)
led.SetOutputValue(10, &h03ff)
```

ROCONTROLUP, ROCONTROLDOWN

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- Previous Versions

These objects are posted by the control port to the configured message port when inputs change state. The *roControlUp* and *roControlDown* objects are not normally created directly.

An *roControlDown* event is posted when the input level goes from high to low. An *roControlUp* event is posted when the input level goes from low to high.

`ifInt`

GetInt() As Integer

Retrieves the pin number associated with the event.

`ifSourceIdentity`

GetSourceIdentity() As Integer

Retrieves the identity value that can be used to associate events with the source *roControlPort* instance.

ROGPIOBUTTON

Firmware Version 6.1

- Previous Versions

`ifInt`

The ifInt interface contains the input ID from the *roGpioControlPort* instances and provides the following:

- GetInt() As Integer
- SetInt(a As Integer)

ROGPIOCONTROLPORT

Firmware Version 6.1

- Previous Versions

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Important
New scripts should use *roControlPort* instead of *roGpioControlPort*.

This object is used to control and wait for events on the BrightSign generic GPIO control port. Typically, LEDs or buttons are connected to the GPIO port. Turning on a GPIO output changes the voltage on the GPIO port to 3.3V. Turning off a GPIO output changes the voltage on the GPIO port to 0V.

The GPIO ports are bidirectional and must be programmed as either inputs or outputs. The IDs range from 0–7. The `SetWholeState()` method will overwrite any prior output settings. The `SetOutputState()` takes an output ID (1, 2, or 6, for example). The `SetWholeState()` method takes a mask (for example, `SetWholeState(SetWholeState(2^1 + 2^2)` will set IDs 1 and 2).

`ifMessagePort`

SetPort(obj As Object) As Void

`ifGpioControlPort`

IsInputActive(input_id As Integer) As Boolean

GetWholeState() As Integer

SetOutputState(output_id As Integer, onState As Boolean) As Void

SetWholeState(on_state As Integer) As Void

EnableInput(input_id As Integer) As Boolean

EnableOutput(output_id As Integer) As Boolean

ROIRRECEIVER

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Firmware Version 6.1

- Previous Versions

This object supports receiving arbitrary Infrared remote control codes using the NEC and RC5 protocols.

Object Creation: The *roIRReceiver* object is created with an associative array.

```
CreateObject("roIRReceiver", config As roAssociativeArray)
```

The associative array can contain the following parameters:

- `source`: A string value indicating the source of the input.
  - "IR-in": The 3.5mm IR input/output connector (available on 4Kx42 and XDx32 models)
  - "GPIO": Pin 1 of the GPIO connector
  - "Iguana": The Iguanaworks IR transceiver. This source can support both NEC and RC5 encodings simultaneously.
- `encodings`: An array indicating the required encodings.
  - "NEC"
  - "RC5" (supported on the Iguanaworks IR transceiver only)

NEC codes are expressed in 24 bits:

- Bits 0-7: Button code
- Bits 8-23: Manufacturer code

Note
If the manufacturer code is zero, then the code is considered to be intended for the Roku SoundBridge remote control.

The *roIRReceiver* object can generate the following events:

- *roIRDownEvent*: Generates when a button is pressed.
- *roIRRepeatEvent*: Generates when a button repeats.
- *roIRUpEvent* (Iguanaworks IR transceiver only): Generates when a button is released.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifMessagePort`

SetPort(port As roMessagePort)

Specifies the port that will receive events generated by the *roIRReceiver* instance.

ROIRDOWNEVENT, ROIRREPEATEVENT, ROIRUPEVENT

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- Previous Versions

An IR event object is generated when an IR button input (button press, button repeat, button release) is received by the *roIRReceiver* object. Use these objects to retrieve the message body of the IR input.

Note
The *roIRUpEvent* object is generated with the Iguanaworks IR transceiver only.

`ifInt`

GetCode() As Integer

Returns the IR code received by the *roIRReceiver* instance.

SetCode(a As Integer)

Overrides the IR code received by the *roIRReceiver* instance, replacing it with the specified binary code.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned by `GetUserData()`.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifReceivedEvent`

GetEncoding() As String

Returns the encodings setting of the *roIRReceiver* instance. This setting can be one of the following strings:

- "NEC"
- "RC5" (supported on the Iguanaworks IR transceiver only)

ROIRTRANSMITTER

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- Previous Versions

This object supports sending arbitrary remote control Infrared remote control codes using the NEC, RC5, or PHC (Pronto Hex Controls) protocols.

Object Creation: The *roIRTransmitter* is created with an associate array.

```
CreateObject("roIRTransmitter", config as roAssociativeArray)
```

The associative array can contain the following parameter:

- `destination`: A string value indicating the connector that will be used to output the signal.
  - "IR-out": The 3.5mm IR output connector (available on XDx30 models) or 3.5mm IR input/output connector (available on 4Kx42 and XDx32 models)
  - "Iguana": The Iguanaworks IR transceiver

Note
System software will not prevent you from generating both an *roIRTransmitter* instance set to "IR-out" and an roIRReceiver instance set to "IR-in" (i.e. configuring the 3.5mm IR connector for input and output at the same time). However, input/output performance will not be reliable.

`ifMessagePort`

SetPort(message_port_object As Object) As Void

Posts event messages to the attached message port.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifIRTransmitter`

GetFailureReason() As String

Send(protocol As String, code As Dynamic) As Boolean

Sends the specified code using the output destination set during object creation. The system currently supports two IR transmission protocols: "NEC" and "PHC" (Pronto Hex Code). This method returns True if the code was successfully transmitted, but there is no way to determine from BrightScript if the controlled device actually received it.

AsyncSend(protocol As String, code As Dynamic) As Boolean

Sends the specified code and generates an *roIRTransmitCompleteEvent* object upon completion. The system currently supports two IR transmission protocols: "NEC" and "PHC" (Pronto Hex Code). This method is only supported using the IR-out destination.

ROIRTRANSMITCOMPLETEEVENT

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- Previous Versions

This event object is generated by the *roIRTransmitter.ASyncSend()* method. It does not return any information other than user data.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned by `GetUserData()`.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROIRREMOTE

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- Previous Versions

This object supports receiving and transmitting arbitrary Infrared remote control codes using the NEC protocol. You can also use this object to send PHC (Pronto Hex Code) commands. The best way to determine the required send values is to capture the codes received by *roIRRemote* w hen the remote buttons of the device are pressed and then send the same codes.

Important
The *roIRRemote* object cannot be used to receive input over the 3.5mm IR port on the 4Kx42 and XDx32 series—use the *roIRReceiver* object instead.

NEC codes are expressed in 24 bits:

- Bits 0-7: Button code
- Bits 8-23: Manufacturer code

Note
If the manufacturer code is zero, then the code is considered to be intended for the Roku SoundBridge remote control.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roIRRemotePress* to the attached message port.

ifIRRemote

Send(protocol as String, code as Dynamic) As Boolean

Sends the specified code using the IR blaster. The system currently supports two IR transmission protocols: "NEC" and "PHC" (Pronto Hex Code). This method returns True if the code was successfully transmitted, but there is no way to determine from BrightScript if the controlled device actually received it.

Pronto Hex Format

Raw captures of Pronto Hex commands will likely not work with the inbuilt IR blaster, though they should work with Iguanaworks IR transceivers. This is a result of the trailing *off* periods, which are too long to be ecoded properly. Changing the *off* periods to all zeros ("0000") will fix this issue.

The following example sends an "ON" command to a Panasonic television using a single string of Pronto Hex Code. You can also provide Pronto Hex Code as an *roArray* of hex values, which results in less work for the script engine.

```
ir = CreateObject("roIRRemote")

pronto_hex_Panasonic_on_str = " 0000 0071 0000 0032 0080 003F 0010 0010 0010 0030 0010 0010
0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010
0010 0010 0030 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010
0010 0010 0010 0030 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010 0010
0010 0010 0010 0010 0030 0010 0030 0010 0030 0010 0030 0010 0030 0010 0010 0010 0010 0010 0010
0010 0030 0010 0030 0010 0030 0010 0030 0010 0030 0010 0010 0010 0030 0010 0000"

ir.Send("PHC", pronto_hex_lg_on_str)
```

ROIRREMOTEPRESS

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- Previous Versions

Messages of the type *roIRRemotePress* are generated upon key presses from a Roku Soundbridge remote.

ifInt

GetInt() As Integer

SetInt(a As Integer)

For the Roku SoundBridge remote control, the Integer returned can have one of the following values:

Integer	Command	Integer	Command
0	West	8	Search
1	East	9	Play
2	North	10	Next
3	South	11	Previous
4	Select	12	Pause
5	Exit	13	Add

6	Power	14	Shuffle
7	Menu	15	Repeat
8	Search	16	Volume up
9	Play	17	Volume down
10	Next	18	Brightness

ROKEYBOARD

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- Previous Versions

This object is used to wait for events from a USB keyboard. It can also be used to configure the localization of the keyboard.

Object Creation: The *roKeyboard* object is created with no parameters.

```
CreateObject("roKeyboard")
```

ifMessagePort

SetPort(port As roMessagePort)

Posts messages of type *roKeyboardPress* to the attached message port.

ifUserData

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ifKeyboardConfig

IsPresent() As Boolean

Returns True if a USB keyboard is connected to the player. This method counts a connected device as a keyboard if it reports having the following keys: "A", "Z", "0", "9", ".", and Enter.

SetLayout(layout As String) As Boolean

Specifies the localized layout for the attached USB keyboard. This setting takes effect immediately and persists in the registry after a reboot. The following table lists valid keymap parameters (players are set to us by default):

af	Afghanistan	es	Spain	kh	Cambodia	pk	Pakistan
al	Albania	et	Ethiopia	kr	Korea, Republic of	pl	Poland
am	Armenia	fi	Finland	kz	Kazakhstan	pt	Portugal

at	Austria	fo	Faroe Islands	la	Laos	ro	Romania
az	Azerbaijan	fr	France	lk	Sri Lanka	rs	Serbia
ba	Bosnia and Herzegovina	gb	United Kingdom	lt	Lithuania	ru	Russia
bd	Bangladesh	ge	Georgia	lv	Latvia	se	Sweden
be	Belgium	gh	Ghana	ma	Morocco	si	Slovenia
bg	Bulgaria	gn	Guinea	md	Moldova	sk	Slovakia
br	Brazil	gr	Greece	me	Montenegro	sn	Senegal
bt	Bhutan	hr	Croatia	mk	Macedonia	sy	Syria
bw	Botswana	hu	Hungary	ml	Mali	th	Thailand
by	Belarus	ie	Ireland	mm	Myanmar	tj	Tajikistan
ca	Canada	il	Israel	mn	Mongolia	tm	Turkmenistan
cd	Congo (DRC)	in	India	mt	Macao	tr	Turkey
ch	Switzerland	iq	Iraq	mv	Maldives	tw	Taiwan
cm	Cameroon	ir	Iran	ng	Nigeria	tz	Tanzania
cn	China	is	Iceland	nl	Netherlands	ua	Ukraine
cz	Czech Republic	it	Italy	no	Norway	us*	United States
de	Germany	jp	Japan	np	Nepal	uz	Uzbekistan
dk	Denmark	ke	Kenya	pc	Pitcairn	vn	Vietnam
ee	Estonia	kg	Kyrgyzstan	ph	Philippines	za	South Africa

*The default setting.

ROKEYBOARDPRESS

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Firmware Version 6.1

- Previous Versions

This is an event object resulting from the user pressing a key on a USB keyboard. The returned integer value is equivalent to the ASCII code of the key that was pressed.

`ifInt`

GetInt() As Integer

Returns the ASCII value of the key press.

SetInt(a As Integer)

Sets the value returned by the `GetInt()` method.

The returned *roInt32* can have one of the following values:

Letter Keys		Number Keys	Function Keys	Misc Keys	Special Keys			
A - 97	R - 114	0 - 48	F1 - 32826	Del - 127	"-"	45	:	58
B - 98	S - 115	1 - 49	F2 - 32827	Backspace - 8	"="	61	"	34
C - 99	T - 116	2 - 50	F3 - 32828	Tab - 9	\	92	<	60
D - 100	U - 117	3 - 51	F4 - 32829	Enter - 13	`	96	>	62
E - 101	V - 118	4 - 52	F5 - 32830	Print Scrn - 32838	[	91	?	63
F - 102	W - 119	5 - 53	F6 - 32831	Scrl Lock - 32839	]	93	!	33

G - 103	X - 120	6 - 54	F7 - 32832	Pause/Brk - 32840	;	59	@	64
H - 104	Y - 121	7 - 55	F8 - 32833	INS - 32841	" ' "	39	#	35
I - 105	Z - 122	8 - 56	F9 - 32834	Home - 32842	,	44	$	36
J - 106		9 - 57	F11 - 32836	Page Up - 32843	.	46	%	37
K - 107			F12 - 32837	Page Down - 32846	/	47	^	94
L - 108				End - 32845	_	95	&	38
M - 109				Caps - 32811	"+"	43	*	42
N - 110				Left Arrow - 32848	|	124	(	40
O - 111				Right Arrow - 32847	~	126	)	41
P - 112				Up Arrow - 32850	{	123		
Q - 113				Down Arrow - 32849	}	125		

ROSEQUENCEMATCHER

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- Previous Versions

This object is used to send *roSequenceMatchEvent* events when the specified byte sequence patterns are matched. Once a pattern has been matched and the event has been posted, all contributing bytes are discarded. As a result, if one pattern is a prefix of another pattern, then the second, longer pattern will never be matched by the object.

This object provides both a standard interface and an overloaded interface for sending events to a message port.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roSequenceMatchEvent* to the attached message port.

`ifSequenceMatcher`

SetPort(a As Object)

Specifies the message port where *roSequenceMatchEvent* objects will be posted.

Add(pattern As Object, user_data As Object) As Boolean

Adds a pattern to be matched by the *roSequenceMatcher* object instance. The pattern should be specified as an object that is convertible to a byte sequence (e.g. *roByteArray*, *roString*). For the user data, pass the object that should be returned if the specified pattern is matched.

Example

```
Function FromHex(hex as String) as Object
    bytes = CreateObject("roByteArray")
    bytes.FromHexString(hex)
    return bytes
End Function

Sub Main()
    serial = CreateObject("roSerialPort", 1, 115200)
    mp = CreateObject("roMessagePort")

    button1_seq = FromHex("080a01040001e000")
    button2_seq = FromHex("080e01040001e000")

    matcher = CreateObject("roSequenceMatcher")
    matcher.SetMessagePort(mp)
    matcher.Add(button1_seq, { name: "button1" })
    matcher.Add(button2_seq, { name: "button2" })
    matcher.Add("flibbet", { name: "flibbet" })
    matcher.Add("flobbet", { name: "flobbet" })

    if not serial.SetMatcher(matcher) then
       stop
    end if

    finished = false
    while not finished
       ev = mp.WaitMessage(10000)
       if ev = invalid then
           finished = true
       else if type(ev) = "roSequenceMatchEvent" then
           print "Got button: "; ev.GetUserData().name
       else
           print "Unexpected event: "; type(ev)
       end if
    end while
End Sub
```

ROSEQUENCEMATCHEVENT

Firmware Version 6.1

- Previous Versions

This object is generated whenever *roSequenceMatcher* matches a specified byte sequence pattern.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned by `GetUserData()`.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROSERIALPORT

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Firmware Version 6.1

- Previous Versions

This object controls the RS-232 serial port, allowing you to receive input and send responses.

Object Creation: The *roSerialPort* object is created with two parameters.

```
CreateObject(roSerialPort, port As Integer, baud_rate As Integer)
```

- `port`: The port enumeration of the serial device. Most standard RS-232 serial devices enumerate on port 0. If you are connecting a USB-serial device (such as a GPS receiver), it will enumerate on port 2.
- `baud_rate`: The baud rate for serial communication. The serial port supports the following baud rates: 1800, 2400, 4800, 9600, 19200, 38400, 57600, 115200.

The *roSerialPort* object sends the following event types:

- *roStreamLineEvent*: The line event is generated whenever the end of line string set using *SetEol* is found and contains a string for the whole line. This object implements the *ifString* and *ifUserData* interfaces.
- *roStreamByteEvent*: The byte event is generated on every byte received. This object implements the *ifInt* and *ifUserData* interfaces.

`ifStreamSend`

SetSendEol(eol_sequence As String) As Void

Sets the EOL sequence when writing to the stream. The default value is CR (ASCII value 13). If you need to set this value to a non-printing character, use the `chr()` global function.

SendByte(byte As Integer) As Void

Writes the specified byte to the stream.

SendLine(string As String) As Void

Writes the specified characters to the stream followed by the current EOL sequence.

SendBlock(a As Dynamic) As Void

Writes the specified characters to the stream. This method can support either a string or an *roByteArray*. If the block is a string, any null bytes will terminate the block.

Flush()

`ifStreamReceive`

SetLineEventPort(port As Object) As Void

SetByteEventPort(port As Object) As Void

SetReceiveEol(eol_sequence As String)

Sets the EOL sequence to detect when receiving the stream. The default value is CR (ASCII value 13). If you need to set this value to a non-printing character, use the `chr()` global function.

SetMatcher(matcher As Object) As Boolean

Instructs the stream to use the specified matcher. This method returns True if successful. Pass Invalid to this method to stop using the specified matcher.

`ifSerialControl`

SetBaudRate(baud_rate As Integer) As Boolean

Sets the baud rate of the device. The supported baud rates are as follows: 50, 75, 110, 134, 150, 200, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400.

SetMode(mode As String) As Boolean

Sets the serial mode in "8N1" syntax. The first character is the number of data bits. It can be either 5, 6, 7, or 8. The second number is the parity. It can be "N"one, "O"dd, or "E"ven. The third is the number of stop bits. It can be 1 or 2.

SetEcho(enable As Boolean) As Boolean

Enables or disables serial echo. It returns True on success and False on failure.

SetEol(a As String)

SetFlowControl(enalbe As Boolean) As Boolean

Enables or disable RTS/CTS handshaking over the serial port. This feature is currently only available on 4Kx42, XDx32, and HDx22 models.

SetInverted(inverted As Boolean) As Boolean

Inverts the signals on the player serial port. This allows the player to communicate with most PCs that use -12v to 12v signaling. Passing True to the method enables inversion, whereas passing False disables it.

SendBreak(duration_in_ms As Integer) as Boolean

Sends a serial break or sets the serial break condition. This method returns True upon success and False upon failure.

- `duration_in_ms = -1`: Sends a continuous break.
- `duration_in_ms = 0`: Clears the break state.
- `duration_in_ms >= 100`: Sets the break condition for the specified period of milliseconds (note that this integer is only accurate to the tenth of a second).

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

This example script waits for a serial event and echoes the input received on the serial port to the shell:

```
serial = CreateObject("roSerialPort", 0, 9600)
p = CreateObject("roMessagePort")
serial.SetLineEventPort(p)

serial_only:
msg = Wait(0,p) ' Wait forever for a message.
if(type(msg) <> "roStreamLineEvent") goto serial_only 'Accept serial messages only.
serial.SendLine(msg) ' Echo the message back to serial.
```

System Objects

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- Previous Versions

This section describes objects that interact with system software.

- roDeviceCustomization
- roDeviceInformation
- roResourceManager
- roSystemLog

RODEVICECUSTOMIZATION

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- Previous Versions

This object provides miscellaneous device configuration and customization methods.

`ifFailureReason`

GetFailureReason() As String

Returns helpful information if one of the *ifDeviceCustomization* methods fail.

`ifDeviceCustomization`

WriteSplashScreen(filename As String) As Boolean

Removes the default splash screen (or a previously set splash screen) and replaces it with the specified image file. The image file must use a supported format. This method returns True upon success and False upon failure.

FactoryReset(confirm As String) As Boolean

Applies a factory reset to the player. This method must be passed the string "confirm" to work; otherwise, it will return False and do nothing. If successful, this method will reboot without a return value. The following steps will be carried out during a factory reset:

1. All files are wiped from the `BOOT:` drive (including custom splash screens and autorun scripts).
2. All values are wiped from the registry.
3. The RTC is reset (if the player has an RTC).
4. The `FLASH:` drive is wiped.

RODEVICEINFORMATION

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Firmware Version 6.1

- Previous Versions

This object provides information about the device hardware, firmware, and features.

`ifDeviceInfo`

GetModel() As String

Returns the model name for the BrightSign device running the script as a string (for example, "HD1020" or "XD230").

GetVersion() As String

Returns the version number of BrightSign firmware running on the device (for example, "4.0.13").

GetVersionNumber() As Integer

Returns the version number of the BrightSign firmware running on the device in comparable numeric form: `major*65536 + minor*256 + build`

GetBootVersion() As String

Returns the version number of the BrightSign boot firmware, also known as "safe mode", as a string (for example, "1.0.4").

GetBootVersionNumber() As Integer

Returns the version number of the BrightSign boot firmware, also known as "safe mode," in comparable numeric form: `major*65536 + minor*256 + build`

FirmwareIsAtLeast(version As String) As Boolean

Returns True if the BrightSign firmware version on the device is less than or equal to the version number represented by the passed string (e.g. "6.0.1").

BootFirmwareIsAtLeast(version As String) As Boolean

Returns True if the BrightSign boot firmware version on the device is less than or equal to the version number represented by the passed string (e.g. "4.4.22").

GetDeviceUptime() As Integer

Returns the number of seconds that the device has been running since the last power cycle or reboot.

GetLoadStatistics(parameters As roAssociativeArray) As String

Provides current performance information related to the Linux kernel. This method accepts an associative array with a single key/value pair formatted as {item: <parameter>}; it will then return a string containing information associated with that parameter. The following are recognized parameters:

- "loadavg": Provides information about system performance. The first three columns measure CPU and I/O utilization over the past 1, 5, and 10 minutes, respectively. The fourth column displays the number of currently running processes and the total number of processes. The last column displays the ID of the most recently used process.
- "meminfo": Displays physical and swap memory usage.
- "slabinfo": Provides information about memory usage at the slab level.
- "stat": Provides overall statistics about the system (e.g. the number of page faults since the system booted).
- "vmstat": Displays detailed virtual memory statistics from the kernel.
- "zoneinfo": Provides overall statistics about the system, broken down by system Node.
- "interrupts": Displays which interrupts are in use and how many of each type there have been.
- "version": Provides the kernel version.

GetDeviceUniqueId() As String

Returns an identifier that, if not an empty string, is unique to the unit running the script.

GetFamily() As String

Returns a single string that indicates the family to which the device belongs. A device family is a set of models that are all capable of running the same firmware.

GetDeviceLifetime() As Integer

HasFeature(feature As String) As Boolean

Returns True if the player feature, which is passed as a case-insensitive string parameter, is present on the current device and firmware. The possible features that can be queried from the script are listed below:

Important
If you pass a parameter other than one of those listed below, it may return False even if the feature is available on the hardware and firmware.

- "brightscript1": BrightScript Version 1
- "brightscript2": BrightScript Version 2
- "networking": Any form of networking capability; there may be no network currently available.
- "hdmi"
- "component video"
- "vga"
- "audio1": The first audio output
- "audio2": A second audio output
- "audio3": A third audio output
- "ethernet"
- "usb"
- "serial port 0": The first RS-232 serial port
- "serial port 1": A second RS-232 serial port
- "serial port 2": A third RS-232 serial port
- "5v serial"
- "gpio connector"
- "gpio12 button"
- "reset button"
- "rtc"
- "registry"
- "nand storage"
- "sd": SD or SDHC

- "sdhc": SDHC only

Example

```
di = CreateObject("roDeviceInfo")
print di.GetModel()
print di.GetVersion(), di.GetVersionNumber()
print di.GetBootVersion(), di.GetBootVersionNumber()
print di.GetDeviceUptime(), di.GetDeviceBootCount()
```

On a particular system, this will generate the following:

```
HD1010
3.2.41           197161
3.2.28           197148
 14353            3129
```

RORESOURCEMANAGER

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- Previous Versions

The *roResourceManager* object is used to manage strings in multiple languages.

Object creation: The *roResourceManager* object is created with a single filename parameter that specifies the name of the file that contains all of the localized resource strings required by the user. This file must be in UTF-8 format.

```
CreateObject("roResourceManager", filename As String)
```

ifResourceManager

SetLanguage(language_identifier As String) As Boolean

Instructs the *roResourceManager* object to use the specified language. False is returned if there are no resources associated with the specified language.

GetResource(resource_identifier As String) As String

Returns the resource string in the current language for a given resource identifier.

GetFailureReason() As String

Yields additional useful information if a function return indicates an error.

GetLanguage() As String

Usage

At present, *roResourceManager* is primarily used for localizing the *roClockWidget*. The resource file passed in during creation has the following format for each string entry:

```
[RESOURCE_IDENTIFIER_NAME_GOES_HERE]
eng "Jan|Feb|Mar|Apr|May|Jun|Jul|Aug|Sep|Oct|Nov|Dec"
ger "Jan|Feb|Mär|Apr|Mai|Jun|Jul|Aug|Sep|Okt|Nov|Dez"
spa "Ene|Feb|Mar|Abr|May|Jun|Jul|Ago|Sep|Oct|Nov|Dic"
fre "Jan|Fév|Mar|Avr|Mai|Jun|Jul|Aou|Sep|Oct|Nov|Déc"
ita "Gen|Feb|Mar|Apr|Mag|Giu|Lug|Ago|Set|Ott|Nov|Dic"
dut "Jan|Feb|Mar|Apr|Mei|Jun|Jul|Aug|Sep|Okt|Nov|Dec"
swe "Jan|Feb|Mar|Apr|Maj|Jun|Jul|Aug|Sep|Okt|Nov|Dec"
```

The name in square brackets is the resource identifier. Each line after it is a language identifier followed by the resource string. Multiple *roResourceManager* objects can be created. A default "resources.txt" file, which contains a range of internationalization values for the clock widget, is available from the BrightSign website.

ROSYSTEMLOG

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- Previous Versions

This object enables the application to receive events that are intended for reporting errors and trends, rather than for triggering a response to a user action.

The *roSystemLog* object requires specific design patterns in your BrightScript application:

- Use one *roMessagePort* throughout the application (instead of creating a new *roMessagePort* for each screen).
- Create one *roSystemLog* instance at startup that remains for the entire lifetime of the application.
- Pass the global *roMessagePort* mentioned above to `SetMessagePort()` on the *roSystemLog* component.
- Enable the desired log types using `EnableType()`.

Object Creation: This object is created with no parameters:

```
CreateObject("roSystemLog")
```

`ifStreamSend`

SetSendEol(eol_sequence As String) As Void

Sets the EOL sequence when writing to the stream. The default value is CR+LF. If you need to set this value to a non-printing character, use the `chr()` global function.

SendByte(byte As Integer) As Void

Writes the specified byte to the stream.

SendLine(string As String) As Void

Writes the specified characters to the stream followed by the current EOL sequence.

SendBlock(a As Dynamic) As Void

Writes the specified characters to the stream. This method can support either a string or an *roByteArray*. If the block is a string, any null bytes will terminate the block.

Flush()

`ifSystemLog`

ReadLog() As Object

Date and Time Objects

Firmware Version 6.1

- Previous Versions

This section describes objects that manipulate date and time settings on the player.

- roDateTime
- roNetworkTimeEvent
- roSystemTime
- roTimer
- roTimerEvent
- roTimeSpan

RODATETIME

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Firmware Version 6.1

- Previous Versions

This object is used to represent an instant in time.

At the time of its creation, a new object represents zero seconds.

`ifDateTime`

GetDayOfWeek() As Integer

GetDay() As Integer

GetMonth() As Integer

GetYear() As Integer

GetHour() As Integer

GetMinute() As Integer

GetSecond() As Integer

GetMillisecond() As Integer

SetDay(day As Integer) As Void

SetMonth(month As Integer) As Void

SetYear(year As Integer) As Void

SetHour(hour As Integer) As Void

SetMinute(minute As Integer) As Void

SetSecond(second As Integer) As Void

SetMillisecond(millisecond As Integer) As Void

AddSeconds(seconds As Integer) As Void

SubtractSeconds(seconds As Integer) As Void

AddMilliseconds(milliseconds As Integer) As Void

SubtractMilliseconds(milliseconds As Integer) As Void

Normalize() As Boolean

Checks that all the fields supplied are correct. This function fails if the values are out of bounds.

ToIsoString() As String

Returns the current *roDateTime* value as an ISO-8601 basic formatted string. Hyphens for date and colons for time are omitted, and a comma is used to separate seconds from milliseconds: For example, the ISO-8601 standard "2014-05-29T12:30:00.100" would be formatted as "20140529T123000,100".

FromIsoString(date-time As String) As Boolean

Sets the value of the *roDateTime* object using an ISO-8601 basic formatted string. Hyphens for date and colons for time are omitted, and either a period or comma can be used to separate seconds from milliseconds: The ISO-8601 standard "2014-05-29T12:30:00.100" could, for example, be formatted as either "20140529T123000,100" or "20140529T123000.100". This method will return False (indicating that it has not affected changes to the *roDateTime* object) if the string is formatted incorrectly or if the date passed is outside the range of January 1, 1970 and December 31, 2100.

ToSecondsSinceEpoch() As Integer

Returns the number of seconds that have elapsed since midnight on January 1, 1970, as represented by the *roDateTime* instance (not the system time).

FromSecondsSinceEpoch(seconds As Integer) As Boolean

Populates the *roDateTime* instance with the specified number of seconds since midnight on January 1, 1970.

GetString() As String

`ifString`

GetString() As String

Returns the current date using a sortable date format: "YYYY/MM/DD hh:mm:ss.sss".

RONETWORKTIMEEVENT

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Firmware Version 6.1

- Previous Versions

This event object is generated by the *roSystemTime* object.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned by `GetUserData()`.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifNetworkTimeEvent`

WasSuccessful() As Boolean

Returns True if the last attempt to set the clock via the network (i.e. NTP or HTTP) was successful.

GetFailureReason() As String

Returns a description of the error if the last attempt to set the clock via the network failed.

ROSYSTEMTIME

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- Previous Versions

This object provides the ability to read and write the time stored in the real-time clock (RTC). It can also be used to read and write the time-zone setting.

Note
Dates up to January 1, 2038 are supported.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of the type *roNetworkTimeEvent* to the attached message port.

`ifSystemTime`

GetLocalDateTime() As roDateTime

Returns the current time from the RTC (modulated using the current time zone) as an *roDateTime* instance.

GetUtcDateTime() As roDateTime

Returns the current time from the RTC (modulated using the UTC/GMT time zone) as an *roDateTime* instance.

GetZoneDateTime(timezone_name As String) As Object

Returns the current time from the RTC (modulated using the specified time zone) as an *roDateTime* instance. Supported time zones are listed below.

SetLocalDateTime(local_DateTime As roDateTime) As Boolean

Specifies a new time for the RTC using the current time zone.

SetUtcDateTime(utc_DateTime As roDateTime) As Boolean

Specifies a new time for the RTC using the UTC/GMT time zone.

GetTimeZone() As String

Returns the current time-zone setting of the player. A `POSIX:` value is appended to the beginning of the string if the time zone has been set using the POSIX format.

SetTimeZone(zone_name As String) As Boolean

Specifies a new time-zone setting for the player (supported time zones are listed below). Alternatively, a POSIX formatted time zone can be applied by appending a `POSIX:` value to the beginning of the string.

The following code specifies a POSIX-formatted time zone:

```
t = CreateObject("roSystemTime")
t.SetTimeZone("POSIX:GMT-0BST-1,M3.5.0/1:00,M10.5.0/2:00")
```

IsValid() As Boolean

Returns True if the system time is set to a valid value. The time can be set from the RTC or with NTP.

GetLastNetworkTimeResult() As roAssociativeArray

Returns an associative array containing information about the last attempt to set the time via the network:

- `success_timestamp`: A value indicating when the clock was last set successfully via the network. This value is zero if the clock has never been set successfully via the network.
- `attempt_timestamp`: A value indicating when the last attempt was made to set the clock via the network. This value is zero if no attempt has been made yet.
- `failure_reason`: If the last attempt to set the clock via the network failed, this string will contain an error message. If the last attempt was successful, this string will be empty.

In this associative array, "timestamp" refers to the number of seconds since the player booted. This value can be compared against the total uptime of the player, which is retrieved by calling `UpTime(0)`.

Supported Time Zones

The following are supported system time zones (this list does not apply to POSIX-formatted time zones):

- EST: US Eastern Time
- CST: US Central Time
- MST: US Mountain Time
- PST: US Pacific Time
- AKST: Alaska Time
- HST: Hawaii-Aleutian Time with no Daylight Savings (Hawaii)
- HST1: Hawaii-Aleutian Time with Daylight Saving
- MST1: US MT without Daylight Saving Time (Arizona)
- EST1: US ET without Daylight Saving Time (East Indiana)
- AST: Atlantic Time
- CST2: Mexico (Mexico City)
- MST2: Mexico (Chihuahua)
- PST2: Mexico (Tijuana)
- BRT: Brazil Time (Sao Paulo)
- NST: Newfoundland Time
- AZOT: Azores Time
- GMTBST: London/Dublin Time
- WET: Western European Time
- CET: Central European Time
- EET: Eastern European Time
- MSK: Moscow Time

- SAMT: Delta Time Zone (Samara)
- YEKT: Echo Time Zone (Yekaterinburg)
- IST: Indian Standard Time
- NPT: Nepal Time
- OMST: Foxtrot Time Zone (Omsk)
- JST: Japanese Standard Time
- CXT: Christmas Island Time (Australia)
- AWST: Australian Western Time
- AWST1: Australian Western Time without Daylight Saving Time
- ACST: Australian Central Standard Time (CST) with Daylight Saving Time
- ACST1: Darwin, Australia/Darwin, and Australian Central Standard Time (CST) without Daylight Saving Time
- AEST: Australian Eastern Time with Daylight Saving Time
- AEST1: Australian Eastern Time without Daylight Saving Time (Brisbane)
- NFT: Norfolk (Island) Time (Australia)
- NZST: New Zealand Time (Auckland)
- CHAST: , Fiji Time, , Fiji, Pacific/Fiji, Yankee Time Zone (Fiji)
- SST: X-ray Time Zone (Pago Pago)
- GMT: Greenwich Mean Time
- GMT-1: 1 hour behind Greenwich Mean Time
- GMT-2: 2 hours behind Greenwich Mean Time
- GMT-3: 3 hours behind Greenwich Mean Time
- GMT-3:30: 3.5 hours behind Greenwich Mean Time
- GMT-4: 4 hours behind Greenwich Mean Time
- GMT-4:30: 4.5 hours behind Greenwich Mean Time
- GMT-5: 5 hours behind Greenwich Mean Time
- GMT-6: 6 hours behind Greenwich Mean Time
- GMT-7: 7 hours behind Greenwich Mean Time
- GMT-8: 8 hours behind Greenwich Mean Time
- GMT-9: 9 hours behind Greenwich Mean Time
- GMT-9:30: 9.5 hours behind Greenwich Mean Time
- GMT-10: 10 hours behind Greenwich Mean Time
- GMT-11: 11 hours behind Greenwich Mean Time
- GMT-12: 12 hours behind Greenwich Mean Time
- GMT-13: 13 hours behind Greenwich Mean Time
- GMT-14: 14 hours behind Greenwich Mean Time
- GMT+1: 1 hour ahead of Greenwich Mean Time
- GMT+2: 2 hours ahead of Greenwich Mean Time
- GMT+3: 3 hours ahead of Greenwich Mean Time
- GMT+3:30: 3.5 hours ahead of Greenwich Mean Time
- GMT+4: 4 hours ahead of Greenwich Mean Time
- GMT+4:30: 4.5 hours ahead of Greenwich Mean Time
- GMT+5: 5 hours ahead of Greenwich Mean Time
- GMT+5:30: 5.5 hours ahead of Greenwich Mean Time
- GMT+6: 6 hours ahead of Greenwich Mean Time
- GMT+6:30: 6.5 hours ahead of Greenwich Mean Time
- GMT+7: 7 hours ahead of Greenwich Mean Time
- GMT+7:30: 7.5 hours ahead of Greenwich Mean Time
- GMT+8: 8 hours ahead of Greenwich Mean Time
- GMT+8:30: 8.5 hours ahead of Greenwich Mean Time
- GMT+9: 9 hours ahead of Greenwich Mean Time
- GMT+9:30: 9.5 hours ahead of Greenwich Mean Time
- GMT+10: 10 hours ahead of Greenwich Mean Time
- GMT+10:30: 10.5 hours ahead of Greenwich Mean Time
- GMT+11: 11 hours ahead of Greenwich Mean Time
- GMT+11:30: 11.5 hours ahead of Greenwich Mean Time
- GMT+12: 12 hours ahead of Greenwich Mean Time
- GMT+12:30: 12.5 hours ahead of Greenwich Mean Time
- GMT+13: 13 hours ahead of Greenwich Mean Time
- GMT+14: 14 hours ahead of Greenwich Mean Time

ROTIMER

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Firmware Version 6.1

- Previous Versions

This object allows the script to trigger events at a specific date/time or during specified intervals. Events are triggered by delivering *roTimerEvent* objects to the specified message port.

`ifTimer`

SetTime(hour As Integer, minute As Integer, second As Integer, millisecond As Integer) As Void

Sets the time for the event to trigger. In general, if a value is -1, then it is a wildcard and will cause the event to trigger every time the rest of the specification matches. If there are no wildcards, then the timer will trigger only once when the specified time occurs.

SetTime(a As Integer, b As Integer, c As Integer)

SetDate(year As Integer, month As Integer, day As Integer) As Void

Sets the date for the event to trigger. In general, if a value is -1, then it is a wildcard and will cause the event to trigger every time the rest of the specification matches. If there are no wildcards, then the timer will trigger only once when the specified date/time occurs.

SetDayOfWeek(day_of_week As Integer) As Void

Sets the day of week for the event to trigger. In general, if a value is -1, then it is a wildcard and will cause the event to trigger every time the rest of the specification matches. If there are no wildcards, then the timer will trigger only once when the specified date/time occurs.

It is possible, using a combination of SetDate() and SetDayOfWeek() calls, to specify invalid combinations that will never occur. If specifications include any wildcard, then the second and millisecond specifications must be zero; events will be raised at most once per minute near the whole minute.

SetDateTime(date_time As roDateTime) As Void

Sets the time when you wish the event to trigger from an *roDateTime* object. It is not possible to set wildcards using this method.

Start() As Boolean

Starts the timer based on the current values specified using the above functions.

Stop() As Void

Stops the timer.

SetElapsed(seconds As Integer, milliseconds As Integer)

Configures a timer to trigger once the specified time period has elapsed. Unlike the absolute timer methods above, changes to the system clock will not affect the period of the SetElapsed() timer.

`ifIdentity`

GetIdentity() As Integer

Returns a unique number that can be used to identify when events originate from this object.

`ifMessagePort`

SetPort(port As roMessagePort)

Posts messages of type *roTimerEvent* to the attached message port.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned when events are raised.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

`Examples`

This script uses the `SetElapsed()` method to create a timer that triggers every 30 seconds:

```
Sub Main()
    mp = CreateObject("roMessagePort")
    timer = CreateObject("roTimer")
    timer.SetPort(mp)

    timer.SetElapsed(30, 0)

    print "Start at "; Uptime(0)
    timer.Start()

    while true
       ev = mp.WaitMessage(0)
       if type(ev) = "roTimerEvent" then
           print "Timer event received at "; Uptime(0)
           timer.Start()
       else
           print "Another event arrived: "; type(ev)
       end if
    end while
End Sub
```

This script creates a timer that triggers every minute using wildcards in the timer spec:

```
st=CreateObject("roSystemTime")
timer=CreateObject("roTimer")
mp=CreateObject("roMessagePort")
timer.SetPort(mp)

timer.SetDate(-1, -1, -1)
timer.SetTime(-1, -1, 0, 0)
timer.Start()

while true
       ev = Wait(0, mp)
       if (type(ev) = "roTimerEvent") then
             print "timer event received"
       else
             print "unexpected event received"
       endif
endwhile
```

This script creates a timer that triggers once at a specific date/time.

```
timer=CreateObject("roTimer")
mp=CreateObject("roMessagePort")
timer.SetPort(mp)

timer.SetDate(2008, 11, 1)
timer.SetTime(0, 0, 0, 0)

timer.Start()

while true
       ev = Wait(0, mp)
       if (type(ev) = "roTimerEvent") then
             print "timer event received"
       else
             print "unexpected event received"
       endif
endwhile
```

ROTIMEREVENT

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Firmware Version 6.1

- Previous Versions

This event object is generated by the *roTimer* object.

`ifSourceIdentity`

GetSourceIdentity() As Integer

Retrieves the identity value that can be used to associate events with the source *roTimer* instance.

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned by `GetUserData()`.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROTIMESPAN

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- Previous Versions

This object provides an interface to a simple timer for tracking the duration of activities. It is useful for tracking how long an action has taken or whether a specified time has elapsed from a starting event.

`ifTimeSpan`

Mark()

TotalMilliseconds() As Integer

TotalSeconds() As Integer

GetSecondsToISO8601Date(a As String) As Integer

Legacy Objects

Firmware Version 6.1

- Previous Versions

This section describes objects that are still offered by BrightScript, even though their primary functionality has been replaced by more modern objects.

- roRtspStreamEvent
- roSyncPool
- roSyncPoolEvent
- roSyncPoolFiles
- roSyncPoolProgressEvent

RORTSPSTREAMEVENT

ON THIS PAGE

This object is no longer used to return events related to RTSP streams. The *roVideoPlayer* object now returns events related to an associated *roRtspStream*.

`ifInt`

GetInt() As Integer

SetInt(a As Integer)

`ifUserData`

SetUserData(user_data As Object)

Sets the user data that will be returned by `GetUserData()`.

GetUserData() As Object

Returns the user data that has previously been set via `SetUserData()`. It will return Invalid if no data has been set.

ROSYNCPOOL

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- Previous Versions

We recommend using *roAssetPool* instead.

Object Creation: The *roSyncPool* object is created with a single parameter that specifies the file path where the pool is located.

```
CreateObject("roSyncPool", pool_path As String)
```

Example

```
pool = CreateObject ("roSyncPool", "SD:/pool")
```

`ifSyncPool`

ValidateFiles(sync_spec As roSyncSpec, directory As String, options_array As roAssociativeArray) As Object

Validates the files in the specified directory against the hashes in the specified sync spec. Files that are not in the sync spec are ignored. The options array can currently contain the following optional parameters:

- `DelteCorrupt` (Boolean): Automatically delete files that do not match the sync spec. The method will return an associative array that maps each fileneame to an explanation of why it is corrupt. The array only contains corrupt files, so the success is reported by the method returning an empty associative array.

GetFailureReason() As String

AsyncDownload(a As Object) As Boolean

AsyncCancel() As Boolean

Realize(a As Object, b As String) As Object

ProtectFiles(a As Object, b As Integer) As Boolean

ReserveMegabytes(a As Integer) As Boolean

GetPoolSizeInMegabytes() As Integer

EstimateRealizedSizeInMegabytes(a As Object, b As String) As Integer

IsReady(a As Object) As Boolean

Validate(a As Object, b As Object) As Boolean

EnablePeerVerification(a As Boolean)

EnableHostVerification(a As Boolean)

SetCertificatesFile(a As String)

SetUserAndPassword(a As String, b As String) As Boolean

AddHeader(a As String, b As String)

SetHeaders(a As Object) As Boolean

SetMinimumTransferRate(a As Integer, b As Integer) As Boolean

AsyncSuggestCache(a As Object) As Boolean

SetProxy(a As String) As Boolean

SetProxyBypass(a As Array) As Boolean

SetFileProgressIntervalSeconds(a As Integer) As Boolean

QueryFiles(a As Object) As Object

SetFileRetryCount(a As Integer) As Boolean

SetRelativeLinkPrefix(prefix As String) As Boolean

BindToInterface(interface As Integer) As Boolean

EnableUnsafeAuthentication(a As Boolean)

EnableUnsafeProxyAuthentication(enable As Boolean) As Boolean

EnableEncodings(enable As Boolean) As Boolean

SetMaximumPoolSizeMegabytes(maximum_size As Integer) As Boolean

`ifIdentity`

GetIdentity() As Integer

`ifMessagePort`

SetPort(a As Object)

`ifUserData`

SetUserData(a As Object)

GetUserData () As Object

ROSYNCPOOLEVENT

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Firmware Version 6.1

- Previous Versions

We recommend using *roAssetFetcherEvent* instead.

`ifSourceIdentity`

GetSourceIdentity() As Integer

`ifSyncPoolEvent`

GetEvent() As Integer

GetName() As String

GetResponseCode() As Integer

GetFailureReason() As String

GetFileIndex() As Integer

`ifUserData`

SetUserData(a As Object)

GetUserData() As Object

ROSYNCPOOLFILES

Firmware Version 6.1

- Previous Versions

We recommend using *roAssetPoolFiles* instead.

`ifSyncPoolFiles`

GetFailureReason() As String

GetPoolFilePath(a As String) As String

GetPoolFileInfo(a As String) As Object

ROSYNCPOOLPROGRESSEVENT

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Firmware Version 6.1

- Previous Versions

We recommend using *roAssetFetcherProgressEvent* instead.

`ifSourceIdentity`

GetSourceIdentity() As Integer

`ifSyncPoolProgressEvent`

GetFileName() As String

GetFileIndex() As Integer

GetFileCount() As Integer

GetCurrentFileTransferredMegabytes() As Integer

GetCurrentFileSizeMegabytes() As Integer

GetCurrentFilePercentage() As Float

`ifUserData`

SetUserData(a As Object)

GetUserData() As Object

BrightSign Media Server

This section describes the Media Server application as it applies to 4Kx42 and XDx32 players running firmware versions 6.0.x and later. Most BrightSign models can stream files on local storage to other sources on the local network, but the 4Kx42 and XDx32 are the only models that support encoding and transcoding of multimedia sources.

The Media Streamer page outlines how to perform unicast and multicast streaming using the *roMediaStreamer* object. The Media Server page outlines how to use the *roMediaServer* object to deploy a 4Kx42 and XDx32 player as a media server. The Media Server Performance page discusses performance estimates and limitations of the Media Server.

Currently, all media streaming and serving applications are handled using BrightScript.

Note
4Kx42 models can stream 4K (H.265) content from a file or an incoming stream, but they cannot encode or transcode 4K content.

Media Streamer

ON THIS PAGE

The media streamer is controlled by setting a pipeline configuration. The stream-source component and stream-destination component are specified by passing a string to the *roMediaStreamer.SetPipeline()* method. This string contains both the source and destination components concatenated together; the different stages of the pipeline are delimited by commas.

The pipeline is started by calling the `start()` method (without extra arguments). The `stop()` method can be used to stop the pipeline. However, some of the pipeline stages (described in the Media Streamer State Machine section below) will continue running internally, so the `reset()` method may be preferable for terminating the stream.

SIMPLE FILE STREAMING

The following example shows how to stream from a file source to a single client:

```
m = CreateObject("roMediaStreamer")
m.SetPipeline("file:///data/clip.ts, udp://239.192.0.0:1234/")
m.Start()
```

To stop the stream, call `m.reset()`.

The `file` source and `udp/rtp` destinations do not function the same as in 4.7 firmware. However, the 4.7 method of file streaming is still available using the `filesimple`, `udpsimple` and `rtpsimple` components. The following example works exactly the same as media streaming in 4.7:

```
m.SetPipeline("filesimple:///data/clip.ts, udpsimple://239.192.0.0:1234/")
```

Note that the `filesimple` component only works with `udpsimple/rtpsimple`, and vice versa.

MEDIA STREAMER STATE MACHINE

The media streamer, represented by the `SetPipeline()` method, has four states:

- RESET: The media streamer has been created, but nothing is allocated or running.
- INITIALISED: Some allocation may have happened and some resources may be reserved, but nothing is running.
- CONNECTED: All structures have been created and all the pipeline components are connected together. Though the pipeline is producing no output, some internal parts of it may already be running.
- RUNNING: The pipeline is running.

When a media streamer is created, it starts in the RESET state. After calling `SetPipeline()`, the states can be progressed through using the following *roMediaStreamer* methods: `Initialise()`, `Connect()`, and `Start()`. Moving to a later state causes any intervening states to be traversed automatically, which is why a pipeline can be started by simply calling `Start()`.

When a media streamer is in the RUNNING state, it can be moved backwards through the states by calling, respectively, `Stop()`, `Disconnect()`, and `Reset()`. As before, intermediate states can be omitted, so it is possible to stop the media streamer and de-allocate all its resources simply by calling `Reset()`. While `Stop()` does stop any output from emerging from the pipeline, there may still be some internal activity.

Calling `SetPipeline()` always causes the media streamer to return to the RESET state. All of the above interface functions, aside from `SetPipeline()`, take no arguments.

SOURCE COMPONENTS

This section lists the currently available source components for a streaming pipeline. Note that some source components (i.e. `mem:/` and `memsimple:/`) cannot be called until they are first created using destination components, which are described in the next section.

filesimple:///filename

This component reads the named file from the local storage. The file must be an MPEG-2 transport stream (usually with a *.ts* suffix). This component can only be connected to `udpsimple:`, `rtpsimple:`, or `memsimple:` components. The optional `loop` parameter can be appended to cause the input file to loop:

```
m.SetPipeline("filesimple:///file.ts?loop, udpsimple://239.192.0.0:1234/")
```

file:///filename

This component can act as either a source or a destination. As a source, it reads from an MPEG-2 transport stream file and can be connected more generally to other components. This non-simple component must be used when connected to `hls:` destination components (because it uses an indexed stream). Because it uses fewer resources, we recommend using the `filesimple:` component instead of the `file:` componen t whenever it is sufficient.

This component accepts the optional `key` and `iv` parameters for file encryption/decryption.

The optional loop parameter can be appended to cause the input file to loop:

```
m.SetPipeline("file:///file.ts?loop, hls:///file?duration=3")
```

hdmi:[///]

This component receives audio and video from the HDMI Input. It can then be fed through an encoder component and streamed or written to a file.

display:[///]

This component receives the audio and video of the current presentation, allowing the player to encode and stream its current display output. See the Display Encoding page for more information about using this component.

udp://IP_address:port/

This component receives a stream using the UDP protocol.

rtp://IP_address:port/

This component receives a stream using the RTP protocol.

rtsp://IP_address:port/path

This component receives a stream using the RTSP protocol. An optional `dtcp.port` parameter can be included to specify a DTCP-IP encrypted session:

```
rtsp://10.1.243:554/stream1?dtcp.port=8888
```

http://IP_address:port/path

This component receives a stream using the HTTP protocol.

https://IP_address:port/path

This component receives a stream using the HTTPS protocol.

gst://IP_address:port/path

This component receives a GStreamer pipeline and generates a non-simple stream using it.

gstsimple://IP_address:port/path

This component receives a GStreamer pipeline and generates a simple stream using it.

memsimple:/name/stream.ts

This component reads from a previously created (destination) memory stream component with the given name, and forwards the results to other simple components. Note that `/stream.ts` is appended to denote "the entire memory buffer". The following example will multicast a memory stream:

```
m.SetPipeline("memsimple:/livestream/stream.ts, rtpsimple://239.192.0.0:5004/")
```

A `memsimple:` source component can originate from either a simple memory stream (using the `memsimple:` destination component) or a non-simple, "indexed" memory stream (using the `mem:` destination component).

See the Memory Streaming page for more details.

mem:/name/stream.ts

This component reads from a previously created destination memory stream with the given `name`; it can then forward the results to other non-simple components. Note that `/stream.ts` is appended to denote "the entire memory buffer". Assuming sufficient resources, the following example will transcode and stream a memory stream:

```
m.SetPipeline("mem:/livestream/stream.ts, decoder:, encoder:, rtp://239.192.0.0:5004/")
```

DESTINATION COMPONENTS

This section lists the currently available destination components.

udpsimple://IP_address:port/

This component streams its input over UDP to the given IP address and port. This destination only works with the `filesimple:` or `memsimple:` source component as input.

rtpsimple://IP_address:port/

This component streams its input over RTP to the given IP address and port. This destination only works with the `filesimple:` or `memsimple:` source component as input.

httpsimple:///socket=num

This component streams its input over an HTTP connection. This destination only works with the `filesimple:` or `memsimple:` source component as input. It is intended for use as an HTTP media server and cannot be used to stream directly to a client.

udp://IP_address:port/

This component streams its input over UDP to the given IP address and port.

rtp://IP_address:port/

This component streams its input over RTP to the given IP address and port.

http:///socket=num

This component streams its input over an HTTP connection. This component is intended for use as an HTTP media server and cannot be used to stream directly to a client.

file:///filename

This component writes its input to the named file, which will be saved as an MPEG-2 transport stream file. This component accepts the optional `k ey` and `iv` parameters for file encryption.

display:[///]

This component allows you to see what's in a stream (often in conjunction with the decoder component) and is provided for debugging only: BrightScript primarily utilizes the *roVideoPlayer* and *roAudioPlayer* objects to play back streaming content.

memsimple:/name

This component works only with the `filesimple:` component. It writes its input to a memory stream named `/name`. This constitutes a simple memory stream, meaning that it is not indexed and cannot be input to a `mem:` source, only another `memsimple:` source. This component takes an optional size parameter that specifies the size of the memory buffer in megabytes. The default memory buffer size is 5MB.

```
m.SetPipeline("filesimple:///file.ts, memsimple:/file?size=2")
```

mem:/name

This component creates a memory stream with the specified `/name`. This component can receive input from general components and writes to an indexed (rather than simple) memory stream, which can be re-read by the `mem:` source component. It can therefore be used to support HLS streaming.

```
m.SetPipeline("file:///file.ts, mem:/file?duration=3&size=25")
```

The `mem:` destination component accepts two optional parameters:

- `size`: The size of the memory buffer in MB (megabytes). For HLS streaming, this needs to be a large buffer.
- `duration`: The target duration of the index points (which become HLS segments).

hls:///path

This component segments the incoming stream and writes it to the given path. The written segments will have the name "path_000000.ts", "path_0000001.ts", etc., and the index file will be named "path_index.m3u8".

The HLS destination component accepts the parameter `duration`, which specifies the approximate target length, in seconds, of the HLS segments. The default value is 5, so to segment a file into 3 second durations you could use code similar to the following:

```
m.SetPipeline("file:///file.ts, hls:///file?duration=3")
```

The above function would split the file.ts file into segments of approximately 3 seconds each, named "file_000000.ts", "file_000001.ts", "file_000002.ts", etc.

DESTINATION COMPONENT OPTIONS

The following options apply to the `udpsimple`, `rtpsimple`, `udp`, and `rtp` destination components.

maxbitrate

The `maxbitrate` parameter throttles the maximum instantaneous bitrate (in Kbps) of a stream. For example, the following component would never stream at a rate greater than approximately 2Mbps:

```
rtp://IP_address:port/?maxbitrate=2000
```

This number needs tuning both for the content being streamed and the network over which they are being sent. Note that it can be challenging to configure bitrates for some wireless networks.

ttl

The `ttl` parameter specifies how many times multicast packets can be forwarded across switches and other network infrastructure. The default value for this parameter is 1.

Example

```
rtp://IP_address:port/?ttl=64
```

OTHER COMPONENTS

encoder:[///][param=value]

This component receives an un-encoded input and outputs audio/video data encoded as an MPEG-2 transport stream. The following are valid parameters:

- `audiodelay=[delay_in_ms]`: The audio synchronization offset in milliseconds. The default value is 0. A positive value will delay the audio with respect to the video, while a negative value will delay the video with respect to the audio.
- `vbitrate=[bitrate]`: The video bitrate specified in Kbps.
- `vformat=[format]`: The resolution and frame rate of the video output. The `format` can be specified as any of the following:
    - 480i50

- 480p25
- 720p24
- 720p25
- 720p30
- 720p50
- 720p60
- 1080i50
- 1080i60
- 1080p24
- 1080p25
- 1080p30
- 1080p50
- 1080p60

This component utilizes H.264 for video and AAC for audio. The default video format is 720p30, and the default bitrate is 6Mbps.

The following example encodes video from the HDMI Input and writes it to the local storage as a *.ts* file:

```
m.SetPipeline("hdmi:, encoder:vformat=480p25&vbitrate=1000, file:///hdmi.ts")
```

esencoder:[///][param=value]

This component receives an un-encoded input and outputs video data as an elementary H.264 stream (as opposed to the standard `encoder:` component, which outputs an MPEG-2 transport stream). The H.264 stream has no audio data. This component accepts the same `audiodelay`, `vformat`, and `vbitrate` parameters as the encoder: component.

Since non-simple components expect an MPEG-2 transport stream, this component only works with the following: `rtpsimple:`, `udpsimple:`, `httpsimple:`, and `memsimple:`.

decoder:[///]

This component receives an encoded input and decodes it. The primary uses of this component are to pass a video stream to the `display:` destination for playback or to pass a video file to an `encoder:` component for transcoding.

HDCP

The *roMediaStreamer* object will honor the copy-protection status of its inputs by assigning the same status to its outputs. Each stream can have one of the following levels of copy protection:

- **None**: No copy protection is enabled. These streams can be saved to files or streamed over the network without restriction.
- **HDCP**: The input is protected with HDCP. It can be neither saved nor streamed, but it can be output to an HDCP-authenticated display.

HDCP Workflow

The *roMediaStreamer* object will handle HDCP authentication and de-authentication as follows:

- If a non-HDCP authenticated stream becomes HDCP authenticated, any file or IP-streaming destination components will stop immediately and send an EOS_ERROR event. If the connected display cannot be HDCP authenticated, the display destination will hide the video output .
- If a stream that was previously HDCP authenticated becomes unprotected, the file and IP streaming destination components *will not* be resumed. However, if the display destination is not HDCP authenticated, it will begin displaying video. An HDCP-authenticated display will be unaffected either way.

Encryption Flags

The encryption level can be forced by flagging it on the source component. For example, the following source component will force any connected display receiving HDMI input to be HDCP authenticated:

```
hdmi:encryption=hdcp
```

Important
The HDCP encryption status of a stream cannot be removed by setting the encryption parameter to none.

FILE ENCRYPTION

The `file:///` source and destination components accept the optional `key` and iv parameters, which can be used to encrypt or decrypt a file using the AES CTR algorithm. The `key` and iv values must be specified as 16-byte hex strings.

Note that this file encryption process is distinct from HDCP authentication. There are no restrictions on how encrypted files may be used in a pipeline, but you cannot use this form of encryption on a stream that was originally HDCP protected.

The following example saves an HLS stream as an encrypted file. Once the file is written, it can be decrypted from a `file:///` source component using the same `key` and iv values:

```
m = CreateObject("roMediaStreamer")
m.SetPipeline("http://<ip-address>/playlist.m3u8,file:///file.ts?key=
30313233343536373839616263646566&iv=30313233343536373839616263646566")
m.Start()
```

STREAMING EXAMPLES

The following code snippets provide examples for common types of media streaming.

Streaming an MPEG-2 TS File over UDP

To initialize the *roMediaStreamer* instance and begin the stream, use the following:

```
m = CreateObject("roMediaStreamer")
m.SetPipeline("file:///data/clip.ts, udp://239.192.0.0:1234/")
m.Start()
```

To stop the stream, use the following:

```
m.reset()
```

You can also use the simple form of components for most common streaming tasks. The following would operate identically to the above stream, while using fewer resources:

```
m.SetPipeline("filesimple:///data/clip.ts, udpsimple://239.192.0.0:1234/")
```

Streaming an Encoded HDMI Input over RTP

The resolution and bitrate of the streamed video can be changed by adding parameters to the `encoder:` component. Use the following code to stream the input using the native resolution and default bitrate:

```
m = CreateObject("roMediaStreamer")
m.SetPipeline("hdmi:, encoder:, rtp://239.192.0.0:1234/")
m.Start()
```

To stop the stream, use the following:

```
m.reset()
```

Recording a File

The following code will record an HDMI Input and save it as a file named *hdmi.ts*:

```
m = CreateObject("roMediaStreamer")
m.SetPipeline("hdmi:, encoder:, file:///hdmi.ts")
m.Start()
```

To stop the recording process, use the following:

```
m.reset()
```

Transcoding and Streaming a File

The output of a `decoder:` component can be connected to the input of an `encoder:` component to transcode the data. This is useful if you want to modify the bitrate of the video before streaming it over the network. The following code will transcode the *file.ts* video before streaming it over RTP:

```
m = CreateObject("roMediaStreamer")
m.SetPipeline("file:///file.ts, decoder:, encoder:vbitrate=1000, rtp://239.192.0.0:5004/")
m.Start()
```

To stop the transcoding process, use the following:

```
m.reset()
```

Re-streaming

The player can be used to output a streaming input using a different protocol by connecting an IP client component to an IP server component. The following code will receive an HTTP stream and then stream it using RTP:

```
m = CreateObject("roMediaStreamer")
m.SetPipeline("http://172.30.1.37/file.ts, rtp://239.192.0.0:5004/")
m.Start()
```

To stop the stream, use the following:

```
m.reset()
```

Segmenting a File Using HLS

An existing *.ts* file can be segmented for streaming using the HLS protocol. The resulting file segments can then be streamed directly by making HTTP requests to an HTTP Media Server. The following code will use the *file.ts* video to generate segments that are approximately 10 seconds in duration:

```
m = CreateObject("roMediaStreamer")
m.SetPipeline("file:///file.ts, hls:///media_segment?duration=10")
m.Start()
```

In this case, the files will begin with *media_segment_000000.ts*, and the counter will increment once for each segment. The index file will be written as "media_segment_index.m3u8".

SIMPLE AND NON-SIMPLE COMPONENTS

To conserve system resources, we recommend using the simple versions of components whenever possible. Use the following guidelines to determine whether simple or non-simple components should be used:

- Use *simple components* when streaming a file from local storage using UDP, RTP, or HTTP protocols (without any encoding or transcoding involved in the pipeline).
- Use *non-simple components* whenever the pipeline includes encoding, transcoding, or HLS streaming.
- When ingesting a stream from a remote source and re-streaming it, use the `udpsimple:`, `rtpsimple:`, and `httpsimple:` destination components. If you need to modulate the stream (or re-stream using HLS), use *non-simple components*.
- Since a `memsimple:` source component can read from a `mem:` destination component, use the `memsimple:` source component in conjunction with `udpsimple:`, `rtpsimple:`, or `httpsimple:` when memory streaming. The `mem:` source component should only be used with the `hls:` destination component (or `file:` if debugging).

Memory Streaming

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As outlined above, the *roMediaStreamer* object provides a means of specifying a single flexible pipeline of multimedia processing. However, the pipeline is constrained to having a single input and a single output. The *memory streaming* feature adds a means of bifurcating the data stream so that multiple outputs can be created, and more than one thread of processing can be realized.

Note that memory streaming is especially important when serving live-encoded media such as HDMI Input. Memory streaming ensures that only a single encoder is needed to distribute a live-encoded stream to multiple clients.

HTTP MULTIPLE UNICASTING

To unicast a source stream to multiple clients, output the source (in this case, encoded HDMI Input) to a memory stream:

```
m = CreateObject("roMediaStreamer")
m.SetPipeline("hdmi:, encoder:, mem:/livehdmi")
m.Start()
```

Now a large number of clients can receive the same stream named "livehdmi" (the name is arbitrary but must not conflict with any other memory stream).

When a client accesses the following URL, the HTTP media-server code creates a separate *roMediaServer* instance reading from the source `mem:/livehdmi/stream.ts` and forwards it to the HTTP socket:

```
http://IP_address:port/mem:/livehdmi/stream.ts
```

Notice that `/stream.ts` must be appended to the memory stream name to denote that the entire stream should be used.

Note
In the above instance, the media streamer code will actually create the source component *memsimple:/livehdmi/stream.ts* as it uses fewer resources and is more efficient.

Once the memory stream has been created, it can also be simultaneously multicast using another Media Streamer instance:

```
m1 = CreateObject("roMediaStreamer")
m1.SetPipeline("memsimple:/livehdmi/stream.ts,rtpsimple://239.192.0.0:5004/")
m1.Start()
```

MEM: AND MEMSIMPLE:

As with certain other components, there is a "simple" and a "non-simple" version of memory streaming. The simple version (`memsimple:`) can only be used in a pipeline with other simple components, although simple memory streams can read from non-simple `mem:` memory streams (as shown above, where the `memsimple:/livehdmi` component reads from the `mem:/livehdmi` component). However, the converse is not possible: The `mem:` source component cannot be used to read from a memory stream that was created with the `memsimple:` destination component.

Because simple memory streams are not indexed, they cannot support HLS streaming operations downstream (other components will not receive information about the HLS segments).

As is the case with other "simple" components, simple memory streams should be used wherever possible because they consume fewer resources.

HLS MULTIPLE UNICASTING

HLS multiple unicasting functions similarly to the HTTP multicast example given above, but with one exception: Stream indexing filters only work on streams read into the transport stream processor, not on streams read into the encoder (both of which are handled by the `mem:` component). As a result, encoded streams such as HDMI Input must be passed to the `mem:` component twice before they can be multicast. This is easily accomplished using two `SetPipeline()` calls:

```
m = CreateObject("roMediaStreamer")
m1 = CreateObject("roMediaStreamer")
m.SetPipeline("hdmi:,encoder:,mem:/hdmi_unindexed?size=5")
m1.SetPipeline("mem:/hdmi_unindexed/stream.ts ,mem:/hdmi_indexed?size=30&duration=5")
m.Start()
m1.Start()
```

Note that a larger memory buffer (30MB in this instance) must be specified for the second `mem:` component because it must hold at least five complete 5-second segments at any time. Clients generally require 5 complete segments at all times for HLS streams, so they will often need to wait at least 25 seconds before the stream can be played successfully.

Clients can then access HLS streams using the following URL:

```
http://IP_address:port/mem:/hdmi_indexed/index.m3u8
```

Like HTTP multicasting, the media streamer will generate additional *roMediaStreamer* instances for each client that connects. In addition to HLS clients, HTTP and RTSP clients can also connect to the indexed stream using the following URLs:

HTTP

```
http://IP_address:port/mem:/hdmi_indexed/stream.ts
```

RTSP

```
rtsp://IP_address:port/mem:/hdmi_indexed/stream.ts
```

Note
The indexed stream can also be multicast by another *roMediaStreamer* instance.

Accessing an Indexed Memory Stream

As shown in previous examples, appending `stream.ts` to the memory stream identifier denotes the entire buffer, while appending `index.m3u8` to an indexed (HLS) stream denotes the entire index file. Similarly, appending the name of a segment listed in the index file will access that segment for the duration of its lifetime in the memory stream buffer. For example, if the index file lists a segment named `000179.ts` as available in the `mem:/livestream component`, then the following source component can be used to fetch that segment:

```
mem:/livestream/000179.ts
```

Note
The memsimple: component can also be used to fetch the segment.

MEMORY STREAM PACING

The flow of data into the memory stream is always paced in real time to give the reading clients time to keep up. An *roMediaStreamer* instance that is writing will never wait for any of the reading clients; if any client gets too far behind (which is detected by the writing edge of the FIFO overtaking the client's reading edge), the client will abort and issue an EVENT_EOS_ERROR message.

Because of this limitation, it is important to note the following: If a memory stream is used to work around the fact that data cannot be passed directly from an encoder to a decoder (as in the below example), then processing cannot happen faster than in real time.

Example

```
m1 = CreateObject("roMediaStreamer")
m2 = CreateObject("roMediaStreamer")
m1.SetPipeline("hdmi:,encoder:,mem:/hdmi")
m2.SetPipeline("mem:/hdmi/stream.ts,decoder:,file:///file.ts")
m1.Start()
m2.Start()
```

MEMORY STREAM STATES

Note
See the Media Streamer State Machine section for more information on *roMediaStreamer* states.

A memory stream is only created when the Media Streamer that names it as a destination is in at least the CONNECTED state. This means it is possible to connect the pipeline (using `Connect()`) that creates the memory stream but not start it. Any number of Media Streamers reading from a memory stream can be created (and even started) before the original Media Streamer is itself started, beginning the flow of data into the memory stream.

ENCRYPTION AND COPY PROTECTION

Generally speaking, an *roMediaStreamer* instance reading from a memory stream will adopt the same encryption/copy-protection as the associated *roMediaStreamer* instance that is writing to it. The specific rules are as follows:

- **Simple writer**: A `memsimple:` destination cannot be marked as requiring protection (nor can it receive such a stream).
- **Simple reader**: A `memsimple:` source will only read from a memory stream that was marked as unencrypted (requiring no protection)

when it was created.

- **Non-simple writer**: A `mem:` destination will be marked as requiring protection when it is created according to the source of the pipeline. If a stream becomes protected later, it will continue to operate if it was marked as requiring protection initially (optionally with the `encrypt` parameter), otherwise it will stop.
- **Non-simple reader**: A `mem:`source inherits the protection status of its associated writer, and therefore its output will ultimately require HDCP or DTCP protection if the source was similarly marked.

Display Encoding

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The `display:` source component allows the player to accurately stream the graphics and video output of the current presentation (without audio). Once encoded, the display can be used like any other stream: It can be unicast, multicast, saved to a file, passed to a memory stream, or accessed via HTTP or RTSP servers. There are some limitations to what can be streamed, but the `display:` component is able to provide a near facsimile of what is currently being output on the display.

Example

```
m.SetPipeline("display:mode=1,encoder:,rtp://239.192.0.0:5004/")
```

MODES AND LIMITATIONS

The `display:` component has two video streaming modes, which are specified as follows:

```
display:mode=[mode_number]
```

- **Mode 1**: Like the primary display, the stream supports two video zones. This guarantees that the stream will include all videos in the display area. However, the stream will not scale graphics properly, so it is best not to specify a display resolution: In other words, the resolution of the display source will need to match that of the stream destination.
- **Mode 2**: The graphics can be properly scaled to any size, but the stream can only support one video zone. This means that, depending on the presentation, the stream may not always include all videos in the display area.

Video Transforms

Neither streaming mode supports displaying a video window that has a transformation applied to it (for example, by calling *roVideoPlayer.SetTransform()* in BrightScript). In these cases, the video zone will appear in the encoded display stream, but without the transform applied to it (the primary display will be unaffected either way).

HDCP

If a video zone is playing from a source that is HDCP, that video will not appear in the encoded display stream. The video will still appear on a display connected to the player that is streaming.

DISPLAY RESOLUTIONS

Similar to the `encoder:` component, the resolution of an encoded display stream can be specified using the `vformat` parameter.

```
display:mode=[mode_number]&vformat=[resolution]
```

As noted above, the video `mode` will usually need to be set to 2 to ensure accurate scaling of graphics in the presentation. For display encoding, the `vformat` parameter of the `encoder:` destination component is ignored. However, the `vbitrate` parameter of the `encoder:` destination component is still used to specify the bitrate of the encoded display stream.

When the `vformat` parameter is not specified, the encoded video stream will match the resolution of the primary display (i.e. the video output of presentation). This means that the video `mode` can be set to `1` without causing graphics-scaling issues. The `vformat` parameter currently accepts the following values:

- 480i*
- 480p25
- 480p30
- 720p60
- 720p50
- 720p24
- 720p30
- 1080i60
- 1080i50
- 1080p24
- 1080p25
- 1080p30
- 1080p50
- 1080p60

**This mode runs at 50Hz.*

Media Server

ON THIS PAGE

The *roMediaStreamer* object allows you to configure a pipeline of multimedia processing elements for execution. This may involve streaming the results over RTP or UDP, but it is not capable of behaving as a true server, which listens for connections and then acts upon them. This is the job of the Media Server, represented by the *roMediaServer* object.

The Media Server waits for requests, deals with any negotiation, and ultimately creates a Media Streamer pipeline which it executes to fulfill the request. The Media Server currently supports the RTSP protocol (as used, for example, by VLC), and HTTP requests. These requests from the client must take the following form:

```
protocol://IP_address:port/media_streamer_pipeline
```

- `protocol`: Either rtsp or http
- `IP_address:port`: The IP address of the BrightSign player and the port number on which the Media Server is running. For more information, refer to the example below.
- `media_streamer_pipeline`: A Media Streamer pipeline as given in previous examples, but without the final destination component (as the destination is implicit in the request from the client).

INITIALIZING THE MEDIA SERVER

An RTSP Media Server can be started as follows:

```
s = CreateObject("roMediaServer")
s.Start("rtsp:port=554")
```

This will start an RTSP server listening on port 554. The port number and streaming protocol can be customized: For example, an HTTP server can be started on port 8080 instead as follows:

```
s = CreateObject("roMediaServer")
s.Start("http:port=8080")
```

The media server supports a number of optional parameters after the `port` parameter, which may be appended to the command string with an "&" (ampersand):

- `port`: Specifies a port number for the server. If this parameter is not specified, the server defaults to 554 for RTSP and 8080 for HTTP.
- `trace`: Displays a trace of messages in the negotiation with the client. This parameter is useful primarily for debugging RTSP sessions. For example: `rtsp:port=554&trace`
- `maxbitrate`: Sets the maximum instantaneous bitrate (in Kbps) of the RTP transfer initiated by RTSP. This parameter has no effect for HTTP. The parameter value 80000 (i.e. 80Mbps) has been found to work well. The default behavior (also achieved by passing 0) is to not limit the bitrate at all. For example: `rtsp:port=554&trace&maxbitrate=80000`
- `threads`: Sets the maximum number of threads the server is prepared to have running. Each thread handles a single client request. The default value is 5. For example: `http:port=8080&threads=10`

To stop the Media Server, use the `Stop()` method. This actually signals all the threads to stop, but does not wait for this to happen. To block until everything has truly finished, either use `s.Terminate()` (which may also be used on its own), or simply allow the Media Server object to be subject to garbage collection.

MEDIA SERVER EXAMPLES

These examples are client-side URLs that can be pasted into VLC for testing. Note that spaces between the Media Streamer pipeline components, as well as filenames containing commas, are not permitted.

Requesting a File To Be Streamed

Use the following URL to request the server to stream a file from local storage.

```
rtsp://IP_address:port/file:///file.ts
```

The loop parameter can be appended to loop the file indefinitely:

```
rtsp://IP_address:port/file:///file.ts?loop
```

Use the following to stream the file.ts using HTTP instead:

```
http://IP_address:port/file:///file.ts
```

Requesting an Encoded HDMI Input Stream

Use the following URL to request the server stream its HDMI Input:

```
rtsp://IP_address:port/hdmi:,encoder:
```

Requesting a Memory Stream

Memory streams that have been previously configured can be requested either by RTSP or HTTP. The following example will stream the memory stream named name, which has been previously set running:

```
http://IP_address:port/mem:/name/stream.ts
```

Note that `/stream.ts` is appended to denote the entire stream, rather than merely portions of it (as in the HLS case).

Requesting an HLS Stream

An indexed (i.e. non-simple) memory stream component must be already running to service an HLS request. HLS streaming can be initiated by requesting the following URL:

```
http://IP_address:port/mem:/name/index.m3u8
```

This will fetch the playlist file for the memory stream named name. Observe that /index.m3u8 must be appended to denote the *index file*, rather than the stream itself. Alternatively, if the HLS index and segment files have been pre-saved onto the storage of the server, they can be accessed by regular HTTP requests.

URL SYNTAX FOR AN RTSP CLIENT

When specifying the URL, a BrightSign player acting as a client may interpret parts of the URL after a "?" (question mark) as options for it to parse; likewise, the stages on the Media Server that fulfill the client request may expect the same. For example, in the following URL, it may be ambiguous whether the `loop` parameter is destined for the player on the client side or the media streamer on the server side:

```
rtsp://IP_address:port/file:///file.ts?loop
```

To clarify this ambiguity, the client-side player will look for parameters after the final "?", though it will ignore parameters that it does not recognize. To ensure that all parameters are going through to the server side, append an additional final "?" to the URL:

```
rtsp://IP_address:port/file:///file.ts?loop?
```

MULTI-DEVICE PIPELINE STAGES

When one player is acting as the streaming client, and another player is acting as the Media Server, it may at times be necessary for the client to define pipeline stages on the Media Server. For example, the client may require the Media Server to encode its HDMI Input before streaming it over HTTP (because a server cannot stream raw HDMI video frames over the network). In these cases, you can use parentheses in the client request to delineate pipeline stages on the server:

```
(http://IP_address:port/hdmi:,encoder:),file:///hdmi.ts
```

In the above example, the client-side code instructs the Media Server to encode HDMI input and stream it to the client, which then saves it as a file.

REMOTE PIPELINES

It is possible to have a client player specify pipeline stages on the Media Server only. For example, the client can have the Media Server initialize a multicast stream, without actually connecting to the stream. The following code will command the Media Server to initialize a multicast stream using a file on its local storage:

```
(remote://IP_address:port/filesimple:///file.ts,rtpsimple://239.192.0.0:5004/)
```

The `remote:` protocol and encompassing parentheses indicate to the server that this is a fully self-contained pipeline to execute. No media is streamed to the client, but any signals (including end-of-stream and error messages) are forwarded across the socket to the client, which can use the *roMessagePort* object to receive such messages.

Resetting the *roMediaStreamer* instance on the client side will force the socket connection to close, and will thus terminate the pipeline on the server as well.

Media Server Performance

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The number of streams a 4Kx42 and XDx32 players can maintain, along with the maximum sustained bitrate of those streams, is dependent on a number of factors.

4KX42

Tests suggest that a 4Kx42 player can reliably maintain up to 50 simultaneous streams of a single 19Mb/s file (or 11 streams of different files with an average bitrate of approximately 16Mb/s). The network bandwidth will often be the limiting factor for streaming performance with a 4K player.

XDX32

An XDx32 player is usually limited by its 10/100 network interface. For example, the player can reliably stream four simultaneous streams of a single 19Mb/s file, while the fifth stream will begin to exhibit noticeable pauses.

OPTIMIZING THE MEDIA SERVER

If during testing you are unable to replicate the level of performance outlined above, there are several steps you can take to ensure that there are no other bottlenecks in the streaming pipeline:

1. Ensure that the Media Server uses the `filesimple` source component and `udpsimple/rtpsimple` destination components whenever possible. The file and `udp/rtp` components consume more system resources than their simple counterparts.
2. Ensure the Media Server is not performing other tasks that are unrelated to streaming: downloading content, displaying content, etc.
3. Ensure the SD card or mSATA drive has a sufficient data read speed.
4. If you are attempting to stream a single large file, try using a file less than 200MB in size. This ensures that the file is read from the cache, rather than the SD card. Note that the filesize may need to be even smaller, depending on how memory is currently being consumed by other processes.