

## Creating a Widget

MiServer contains collections of classes which provide functionality which make JavaScript-based widgets easier to use for an APL developer. This guide explains how to add support for new widgets. From an implementor's point of view, there are three fundamentally different classes of widgets

- 1) Widgets entirely based on standard HTML controls, like most of the "Dialog" controls in the `_DC` namespace.
- 2) Widgets based on Javascript libraries which are already included with MiServer (jQueryUI and Syncfusion).
- 3) Widgets based on new Javascript libraries.

When the document is complete, it will provide step-by-step instructions for all of the above. At the moment, the only description provided is for the addition of new Syncfusion controls. Only a few Syncfusion widgets have complete wrappers and we hope to encourage users of MiServer to contribute!

## Wrapping Syncfusion Controls

This document is based around recording work actually done to add support for the `ejTextBoxes` control. If a Syncfusion widget has been around any length of time, the MiServer team will almost certainly have generated a shell class for the widget, making it accessible to the APL developer. In the case of `ejTextBoxes`, the class looked like this:

```
:Class ejTextBoxes : #._SF._ejWidget

  :Field Public Shared Readonly DocBase←
    'http://help.syncfusion.com/UG/JS_CR/ejTextBoxes.html'
  :Field Public Shared Readonly ApiLevel←1
  :Field Public Shared Readonly DocDialog←
    '/Documentation/DialogAPIs/Syncfusion/ejTextBoxes.html'

  ▽ make
    :Access public
    JQueryFn←Uses←'ejTextBoxes'
    :Implements Constructor
  ▽

  ▽ make1 args
    :Access public
    JQueryFn←Uses←'ejTextBoxes'
    :Implements Constructor
  ▽
```

```
:EndClass
```

The base class `#._SF.ejWidget` provides common functionality for all Syncfusion widgets and should not be changed. The `DocBase` field documents the location of the Syncfusion documentation, and `DocDialog` points to (currently non-existent) documentation of the widget itself. An `ApiLevel` of 1 is intended to inform developers that this is a completely basic widget with no added support for use from APL.

In fact, this class does not work as generated because it assumes that the base HTML object is a `<div>`, while the `ejTextBoxes` javascript function expects to run off an `<input>` element. To correct this, we need to add two lines of code to each of the constructors:

```
ContainerTag←'input'  
Container.type←'text'
```

The first statement sets the base HTML object type, and must appear before the `:Implements Constructor` statement. The second one must appear after the base constructor has run and the `Container` object has been created; at this point we can set the type of this `<input>` element to `text`.

```
▽ make  
  :Access public  
  JQueryFn←Uses←'ejTextBoxes'  
  ContainerTag←'input'  
  :Implements Constructor  
  Container.type←'text'  
▽  
  
▽ make1 args  
  [...otherwise identical to make...]  
▽
```

There are two almost identical constructors at this point; they will eventually separate so that we can properly support niladic construction and also provide a constructor which takes arguments. We are now able to test our class from immediate execution – assuming the `Start` function was run with a left argument of 1:

```
p←NEW MiPage A Create an instance of MiPage  
tb←'myTB' p.New _SF.ejTextBoxes A Add an instance of our class  
tb.Render A Ask the textbox to render itself  
<input type="text" id="myTB" name="myTB"></input>  
<script>$(function(){$("#myTB").ejTextBoxes({});});</script>
```

This illustrates the functionality exposed by the base class `_SF.ejWidget`, it has:

- 1) Created an HTML object of the requested type `<input type="text">`, with the specified id (and default name = id).
- 2) Added the Javascript call to the Syncfusion function specified by the JQueryFn property. Like other JQuery-based widget systems, Syncfusion widgets are activated by selecting a part of the DOM using JQuery (`$("#myTB")`) and applying a Javascript function to it (`ejTextBoxes({})`).
- 3) If the page had been rendered in the context of a proper MiServer request, the "Uses" information would be used to determine Javascript dependencies, and ensure that the necessary Javascript libraries were also loaded. This is done by looking up the `ejTextBoxes` name in the configuration file `MiServer/Config/Resources.xml`.

We can now create a MiPage to test our new widget. Syncfusion widgets should have at least one sample page created in the `MS3/Examples/SF` folder, named `<widget name>Simple.dyalog`. A minimal sample might look like this:

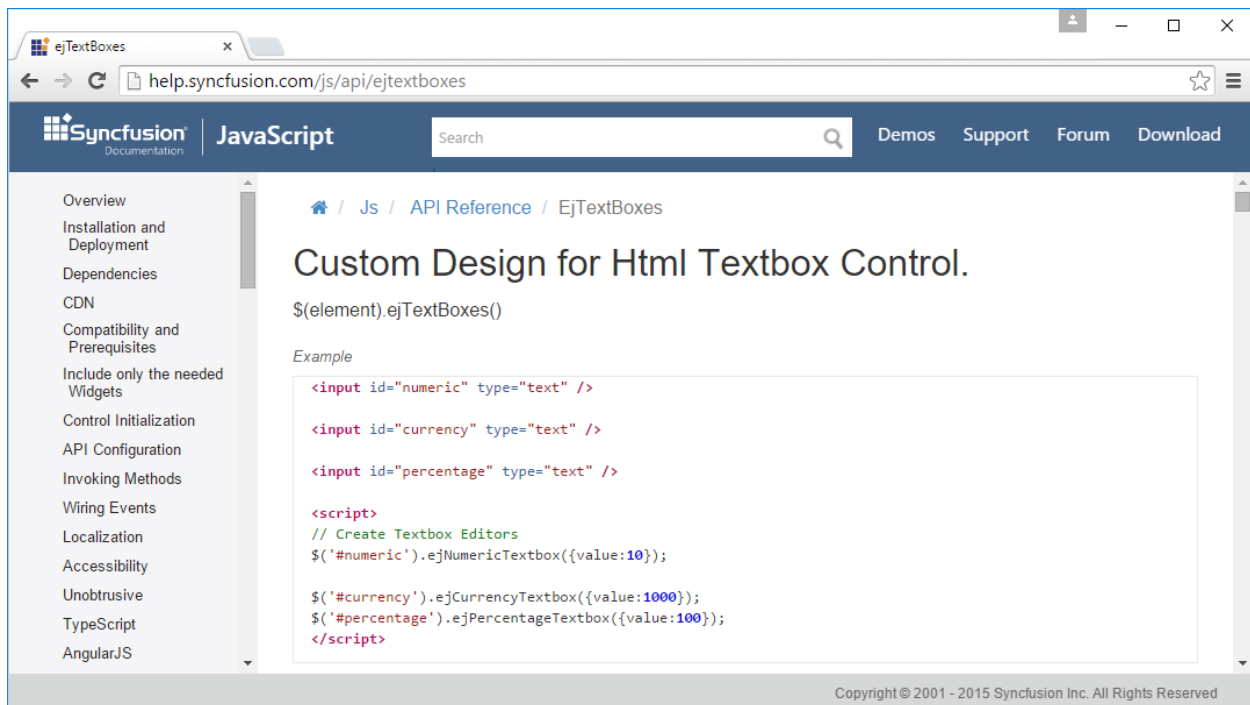
```
:Class ejTextBoxSimple : MiPageSample
A Control:: _SF.ejTextBox
A Description:: Validate numbers, currency and percentages

    ▽ Compose;tb1
        :Access Public

        tb1←'tb1'Add _ .ejTextBoxes
    ▽

:EndClass
```

If we direct a web browser at this web page, an input field is indeed rendered, but "nothing works" (you get an input field, but it has none of the `ejTextBox` functionality. If we take a look at the Syncfusion documentation for the widget, can see why:



There is in fact no function called `ejTextboxes`, instead a different function is used for each of the variants (inconsistently named with lowercase "b"). We need to add some code to our widget to set `jQueryFn` to the right value. First, add a public field to set the type, defaulting to numeric:

```
:Field Public Type←'Numeric'  A Numeric|Currency|Percentage
```

Second, we need to add a `Render` function to the `ejTextboxes` class, because we want to set `jQueryFn` at the last moment before calling the base class render method:

```

▽ r←Render
  :Access Public

  JQueryFn←'ej',Type,'Textbox'
  r←BASE.Render
▽

```

The reason for doing this at the last moment is to allow the user to modify the type after creating the instance. Our simple sample now works, displaying a single numeric `ejTextbox`.

Note that we can already make use of **all** the features of the Syncfusion widget at this point, by using the `Set` function to give values to the members documented by Syncfusion. For example, we could enhance our `Compose` function as follows:

```

▽ Compose;tb1
  :Access Public

  tb1←'tb1' Add _.ejTextBoxes
  'watermarkText' 'width' tb1.Set 'Enter a 3-digit Number' 200
  'minValue' 'maxValue' tb1.Set 100 999
▽

```

This gives us a form with a watermark and a spinner which will go from 100 to 999.



## Design - Public Fields and Constructor Arguments

So far, we have just been ironing out wrinkles in naming, to get to the point where the Syncfusion widget is working. For most Syncfusion widgets, this would not even have been necessary, the automatically generated class would have been sufficient.

To complete the design, we need to read the Syncfusion documentation for the control and decide:

- 1) Whether there are other properties of the control which have a structure which means that it would be advantageous to expose as properties or fields of the APL class, rather than just setting them using the Set function.
- 2) What the constructor arguments should be – this is typically closely related to the first question.

In this case, we have already decided to expose the `Type` of the `TextBox`. None of the other properties really seem worth supporting, as they are easily set using the `Set` function - but we will add support for a “value” property. This group of Syncfusion controls is behaving slightly badly in that they ignore the actual content of the underlying HTML control (`<input>`) – instead there is a `value` member that overrides this. By exposing a `value` property in our class, and having a constructor which takes `Type` and `value`, we can increase the likelihood of correct use of our widget. The final code for our widget follows:

```
:Class ejTextBox : #._SF._ejWidget

    :Field Public Shared Readonly DocBase<... A As before
    :Field Public Shared Readonly ApiLevel<3
    :Field Public Shared Readonly DocDialog<...
    :Field Public Shared Readonly IntEvt<
        'change' 'create' 'destroy' 'focusIn' 'focusOut'

    :Field Public Type<'Numeric' A Numeric|Currency|Percentage
    :Field Public value<'

▽ make
    :Access Public
    Uses<'ejTextBoxes'
    ContainerTag<'input'
    :Implements Constructor
    Container.type<'text'
    InternalEvents<IntEvt
▽

▽ make1 args
    :Access Public
    A args: Type [value]
    args<eis args A Enclose if simple
    (Type value)<args,(pargs)↓'Numeric' ''
    Uses<'ejTextBoxes'
    ContainerTag<'input'
    :Implements Constructor
    Container.type<'text'
    InternalEvents<IntEvt
▽
```

```

▽ r←Render
  :Access Public
  'Invalid Type set for ejTextBox'□SIGNAL
      ((<Type)ε'Numeric' 'Currency' 'Percentage')↓11
  JQueryFn←'ej',Type,'Textbox'
  :If value≠'' ◇ 'value'Set value ◇ :EndIf
  r←□BASE.Render
▽

```

```
:EndClass
```

## Internal Events

Syncfusion widgets typically support a number of events which are listed in the relevant documentation page. The `ejWidget` base class has a property `InternalEvents` which allows the `On` function to direct these calls to the Syncfusion functions which have access to the data model (`ejModel`) and function argument (`argument`) – making it easy to return data with the callback. Events which do not appear in this list will be handled by generic JQuery handlers. See the document on event handling for more details; the important thing for a Syncfusion widget developer is to add the list of internal events. Setting the `InternalEvents` property needs to be done in the constructor *after* the base class has been initialized.

## Renaming the Widget

In the above code, the widget was also renamed to the singular `ejTextBox`. The Syncfusion widget is described as “ejTextBoxes” in Syncfusion documentation, but turns out to be a collection of functions, none of which have that name. The singular form seems more natural. This requires changing the name of the class and the file `.../HTML/_SF/ejtextbox.dyalog`. The sample was somehow already named `ejTextBoxSimple` 😊.

## Validation

One of the more sophisticated features of the `ejTextBox` controls is validation, so [needs to be written up].

## Resources

Also explain why it is necessary to add the link to `jquery.validate` in resources to get validation to work.

```

<resource>
  <name>ejTextBoxes</name>
  <uses>Syncfusion</uses>
  <uses>jquery.globalize</uses>
  <uses>jquery.validate</uses>
  <uses>cultures</uses>
</resource>

```