Subclassing the FRAME Class to Incorporate Documentation Templates and Standard Widgets.

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Abstract

When a new FRAME entry is created using the build window, *SAS*® uses the FRAME class that is provided with SAS/AF software.

Standardising the look and feel of an SAS/AF application is one factor that determines how intuitive an application is. Frames often have common components such as OK, Cancel, Help buttons etc. The layout and positioning of these is important to ensure uniformity across different screens of an application. Features of SAS/AF release 6.11 (aka Orlando) promote Object Oriented Application Design and allow developers to develop their own classes to ensure that visual standards are easily incorporated into an application.

The SAS/AF FRAME class is one object that can be subclassed to aid developing applications that have a uniform look & feel. This paper will discuss the subclassing of the FRAME class, working through an example where on creating a new frame entry, the type of FRAME (eg dialog box) and the population of widgets in the FRAME will be demonstrated. Initialising the new FRAME's SCL entry with a standard template will also be discussed.

By subclassing the FRAME class in this manner, development time can be greatly reduced as it is not necessary to define the standard widgets and frame attribute settings each time a new frame is created. Uniformity of screens is also encouraged by initialising the screen layout.

The examples in the paper will detail all the steps and code required to subclass the FRAME class.

Scope

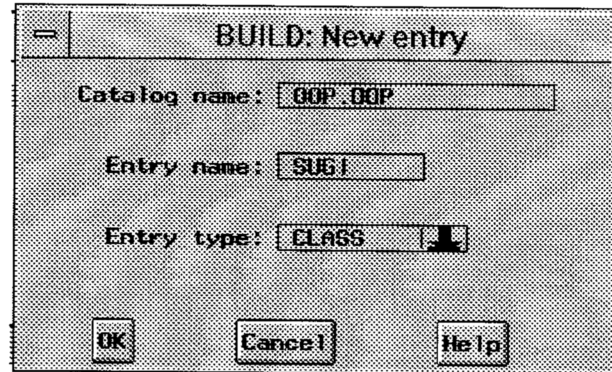
This paper covers topics discussed during the 20 minute Coders' Corner presentation. The basics of subclassing the FRAME class are outlined. However it is not intended to thoroughly discuss the topic. I am hoping to write an article for a future *Observations*® issue which cover this topic in depth.

Introduction

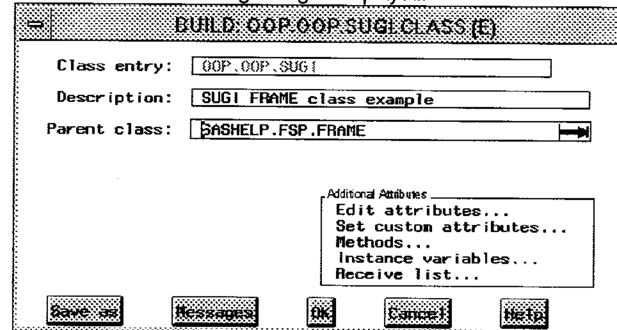
When a new FRAME entry is created in the Build window, *SAS* uses the FRAME class. By default, a blank FRAME is displayed and the SCL entry is empty. This default behaviour can be overridden by subclassing the FRAME class. This paper discusses the basics of creating a subclass of the FRAME Class. The subclass will allow the developer to specify whether the new FRAME is to initialise as the default blank FRAME, or as a dialog box with an OK widget. The subclass will also initialise the SCL window with a standard SCL template, containing a documentation header etc. As the time set for the paper is only 20 minutes, the examples will be kept very simple.

Creating a subclass of the FRAME class.

For the purposes of the example, a libname of *OOP* and a catalog called *OOP.OOP* are created. In the build window, a new class is created by using the pull-down menu options *File-New-Entry*. The following dialog is displayed:



Enter *SUGI* for the Entry name & *Class* for the Entry type. Then click on OK. The following dialog is displayed:



Methods

FRAME developers will be familiar with the use of methods. In Object Oriented Programming, methods are used to initiate actions on an object. For example to hide an OK button on a FRAME, the following code could be used:

```
Call Notify('OK','_hide_');
```

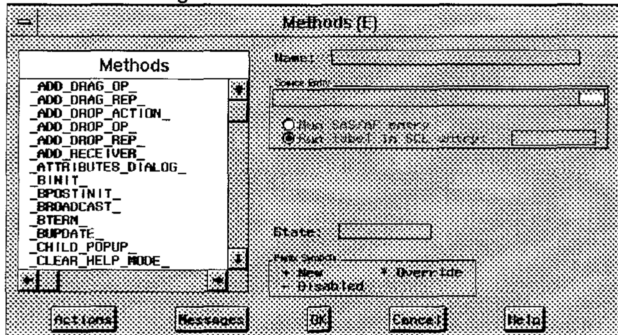
In this case the method that is used is the _hide_ method. It is not the intention discuss OOP concepts in this paper, but it helps to understand how the objectives will be achieved in this example.

Each Object comes with standard methods. The FRAME class also has methods. To achieve our objectives, the default behaviour of the FRAME class when a new FRAME is created needs to be changed. The FRAME class has several methods that are used at build time. These methods have a prefix of _B. The methods are:

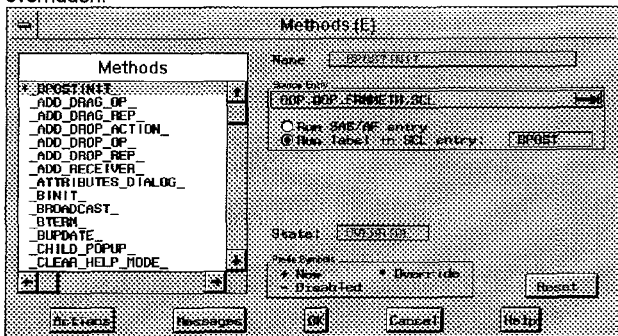
- _BINIT_ Which runs when the build window for the FRAME is initialised.
- _BPOST_ Which runs after the build window has been created., ie after the _BINIT_ method has run.
- _BTERM_ Which runs when the Build window for the FRAME is closed.
- _BUPDATE_ Which runs after the GATTR (General Attributes) window for the FRAME is closed.

Overriding the _BPOSTINIT_ Method.

In order to modify the behaviour of the FRAME class on creating a new FRAME entry during a build, the _BINIT_ or _BPOSTINIT_ method needs to be modified. In the example, the _BPOSTINIT_ method is modified. In the dialog displayed above, click on *Methods*. The *Methods* dialog is shown as follows:



All the methods that are applicable to the FRAME class are shown in the *Methods* List Box. Click on the *_BPOSTINIT_* method. In the *Source entry*, enter *OOP.OOP.FRMMETH.SCL,* ensure that the *Run label in SCL entry* is selected and the label *BPOST* is entered. Click on *_BPOSTINIT_* in the list box. The *_BPOSTINIT_* is shifted to the top of the list box an has an * indicating that the method is overridden.



By carrying out the above actions, we have specified that the *SAS* provided _BPOSTINIT_ method is to be overridden, and that the new method to run is in the catalog entry OOP.OOP.FRMMETH.SCL under the label BPOST. The next step is to write the overridden method.

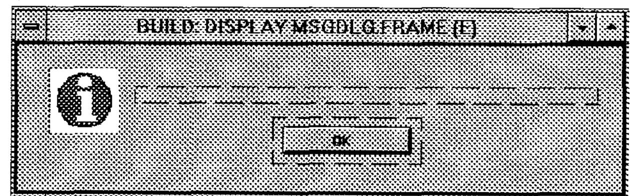
The _BPOSTINIT_ Method.

By double clicking on the _ BPOSTINIT_ in the list box, the Source Entry, or the Label will display the SCL entry for the method. In the overridden _BPOSTINIT_ method, the user is to be prompted to specify what type of frame is required and what widgets are required on the new frame. This is done by using a selection dialog. Firstly however, an example of a simple message dialog will be built and various settings will be noted.

Building a Sample Dialog Window.

The only reason for building this dialog is to visualise how the required dialog box is to look, and once the appearance is as required, various attributes will be noted for use when creating a dialog box in the _BPOSTINIT_ method. This dialog is not actually required for the FRAME subclass, it is merely a simple way to determine the values of various attributes.

For the example, I have used a simple message dialog as shown below:



The dialog contains an Information icon, stored as a catalog image entry, a text widget and an OK pushbutton.

For the example, we want to be able to create this type of dialog when creating a new FRAME entry. The easiest way to do this is to create and populate the frame with widgets, exactly as what you require. This includes positioning, colours, banner settings etc.

Tip: An easy way to set the dialog position, and screen size attributes is by using the *setwsz* command. Follow these steps:

1. Re-size the frame to the size you require by clicking & dragging the lower right hand corner of the frame.
2. Drag the frame to the position that you require on the screen by clicking & dragging on the window's title bar.
3. When the frame is the size required and in the correct position on the screen, enter the command ***setwsz***. This will set the appropriate General Attributes (GATTR) for the frame.

Note down the window size attributes from the general attributes (Locals-General Attributes) dialog. In this example they were:

Row Start: 7 Column Start: 14
Number of Rows: 10 Number of Columns: 66

To keep this example simple, only one widget will be created in the _BPOSTINIT_ method, which will be the OK button. When the OK button is created in the _BPOSTINIT_ method, the coordinates of it's position on the frame need to be specified. This can be determined by counting the number of rows, columns etc, but an easy way is to position the OK button where it is required in the frame as in the above dialog, and write some simple code that returns the coordinates. In the SCL window for the above dialog, the following SCL is entered:

```
Init:

/*this is some temporary code to demonstrate how to
  determine the coordinates for a widget. In this example
  we will get the  coordinates for the OK button. */

  *create a temporary list;
   region_list=makelist();
  *get the region attributes and place them in the
   temporary list;
   call notify('ok','_get_region_',region_list);
  *put the list to the message window so we can examine
   the contents;
   call putlist(region_list,'This is the region list '||
               'for the OK widget',1);
  *delete the temporary list;
   if listlen(region_list)>=0 then
      rc=dellist(region_list);

Return;
```

'Testaf'ing the code lists the OK buttons region list in the message window as follows:

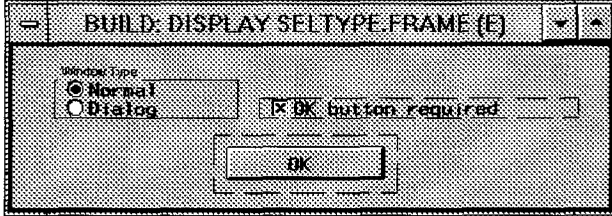
```
This is the region list for the OK widget
   ( ULX=28
     ULY=5
     LRX=44
     LRY=8
     UNITS='FONTS'
     _PARENT_=''
     TRANSPARENT='N'
 .... etc ....
```

Of interest are the coordinates of the OK button which are listed as

- ULX (Upper Left X)
- ULY (Upper Left Y)
- LRX (Lower Right X)
- LRY (Lower Right Y)

Note down these values.
Those are all the settings that are required from the dialog. The dialog is no longer needed as it is not used by the subclass that is being created. This SCL & Frame entry can be closed.

Creating the Selection Dialog.
When a new FRAME entry is created, the user is to be prompted to specify what type of frame is required and what widgets are required on the new frame. This is done by using a selection dialog. This dialog will now be built. A simple dialog is created as follows:



The widgets are as follows:

- A radiobox called Type which returns N for Normal & D for Dialog
- A Check Box called Okbutton which returns Y for selected or N for deselected.
- A Pushbutton called OK.

The SCL for the screen is shown below:

```
entry type okbutton $;

Init:
  *hide check box as required;
   link type;
Return;

Main:
Return;

Term:
Return;

type :
  if type='D' then call notify('okbutton','_unhide_');
   else call notify('okbutton','_hide_');
return;
```

Compile the frame and close it.

Writing a new _BPOSTINIT_ method.
Open the SCL window for the overridden _BPOSTINIT_ method. (Refer to 'The _BPOSTINIT_ method' section on the previous page). The SCL code that follows is to be entered in this SCL window. Note that for the purposes of explaining the code, the code will be discussed in sections.

```
*define lengths;
 length frame  classname $35 catname $17
         _method_  $200 frametype ok $1;

/* avoid compilation warnings */
 _self_   =_self_;  *special variable;
 _frame_  =_frame_ ;*special variable;
 _method_ =_method_;*special variable;
 rc       =rc;
 classname=classname;
```

In this first part of the SCL entry, the lengths are set for several variables. To avoid compilation warnings stating that a variable has not been initialised, some variables are initialised to themselves. The variables _self_, _frame_, and _method_ are special variables that are automatically set to the appropriate settings when the SCL program is executing.

```
BPOST   : method;
 *call parent class method;
   call super(_self_,'_bpostinit_');

 /*if the frame is new then we need to get the user to
   select the required attributes by calling a dialog.
   We can detect if the frame is new by checking if it
   exists in the catalog. */

 *get the name of the new frame;
   call send(_self_,'_GET_NAME_',frame);
```

The label that was specified for the overridden _BPOSTINIT_ method was BPOST. In actual fact, this code adds to the original method. For this reason the original method is called with the *call super(_self_,'_bpostinit_');* line.

As the overridden _BPOSTINIT_ method runs every time a frame is opened, it is necessary to determine whether the _BPOSTINIT_ method is running for a new frame or for an existing frame that is to be edited. The creation of the new frame is only to be done for a new frame. Whether the frame is a new frame of an existing one is determined by checking whether the frame entry exists in the catalog. The _get_name_ method returns the 4 level catalog name of the frame.

```
 *check if frame does not exist then this is a new frame;
  if not cexist(frame) then do;*New Frame;


  *prompt user as to what type of frame they require;
    call display('seltype.frame',frametype,ok);


   *initialise frame as selected;

     if upcase(frametype)='D' then do;
      *set frame type & size for a dialog window;
        call send(_self_,'_set_window_size_',7,14,10,66);
        call send(_self_,'_set_window_type_','DIALOG');
      *switch off command line;
        call send(_self_,'_set_window_banner_','NONE');
      *Set the title of the window;
        call send(_self_,'_set_title_',
              'SUGI Frame class example');
      *Set the background colour of the window;
        call send(_self_,'_set_color_',
              'background','grey');
      /*This is just a sample of the frame attributes
        that can be set. Many other attributes can be
        set here. */

     end;
```

In this section of code, if the frame entry does not exist in the catalog, then the frame entry is new.
The user is prompted to select the type of frame and whether an OK button is required by calling the selection dialog built previously (*seltype.frame*). This returns two variables being:

- frametype D=Dialog N=Normal
- OK Y=Yes an OK button is required, N=No not required.

If the user selected a normal frame, then no frame attributes are altered. If the user selected Dialog (D) then several frame attributes need to be set. These are set using methods, which progammatically change the settings in the General Attributes (GATTR) dialog of the frame. Note the settings in the _set_window_size_ of 7,14,10,66. These are the window size settings that were noted in the section 'Building a Sample Dialog Window'. Only the basic attributes have been set in this example. There are numerous others that can be set if required.

```
   if ok='Y' then do;*create OK button selected;
       *create a list that contains the button's
        attributes;
        attr_list=makelist();
       *create a list that contains the button's region
        attributes;
        region_list=makelist();
       *the region list is a named sublist of the
        attributes list;
        rc=setniteml(attr_list,region_list,'_region_');

       *button coordinates;
         ulx=28;
         uly=5;
         lrx=44;
         lry=8;
```

```
rc=setnitemn(region_list,ulx,'ulx');
rc=setnitemn(region_list,uly,'uly');
rc=setnitemn(region_list,lrx,'lrx');
rc=setnitemn(region_list,lry,'lry');
```

Next the positioning of the pushbutton is to be determined. These settings are required in an attribute list that is used when the pushbutton widget is created on the frame. Within the attribute list is a sublist named _region_ which contains the button coordinates. The above section of code creates the two lists, inserts the _region_ list into the attribute list and creates named list items for the coordinates. Note that the pushbutton coordinates are the values that were noted in the section 'Building a Sample Dialog Window'.

```
/*the pushbutton class now has to be loaded */

  classid=loadclass('sashelp.fsp.pbutton.class');

/*now that the class is loaded, we can create a
  widget on the frame based on the coordinates in
  the region list. The first argument is the new
  widget's id. The second is the attribute list
  for the widget. Refer to the _new_ method in the
  Class Class SAS documentation*/

  call send(classid,'_new_',okid,attr_list);
```

The pushbutton class is now loaded. The pushbutton class is located in the catalog entry *sashelp.fsp.pbutton*. The classid returned by the loadclass function is the id for the loaded class. An instantiation of the class is created with the _new_ method. The attributes to use when instantiating the class are contained in the attribute list (attr_list) which was created in the previous section of code. The _new_ method returns the widget id of the new pushbutton. At this stage, the push button widget will be on the frame.

```
/*now that the widget is on the frame, further attributes
        can be set */

        call send(okid,'_set_label_','OK');

   end;*create OK button selected;
```

Now that the widget has been created and has a widget id (okid), any other attributes for the widget can be set. The example above sets the object label to 'OK'.

The above steps demonstrated how the new frame attributes were set and how a widget can be programmatically placed on the frame. Only one widget was placed on the frame to keep the example simple, however more extensive processing can completely populate a frame with widgets and set all the attributes for each widget.

Creating the SCL template.

Most developers have their own standards for the layout of their SCL code, which may include a header describing the purpose of the code, who wrote the code etc. The second half of the _BPOSTINIT_ method looks after the initialising of the new SCL screen from a template.

```
/* Create an SCL program for the frame */

    * Create name for SCL entry to be copied;

    *get the library and catalog of the SCL template;

     /* this will be in the same catalog as the class
        therefore we will find out the class name and
        extract the library and catalog names */

        call send(_self_,'_GET_CLASS_',classid);
        call send(classid,'_GET_NAME_',classname);
        catname=scan(classname,1,'.')||'.'||
                scan(classname,2,'.');

    *assemble new SCL entry name;
     scl_template=getnitemc(_self_,'SCL_TEMPLATE');
     scl_template=compress(catname||'.'||scl_template);
```

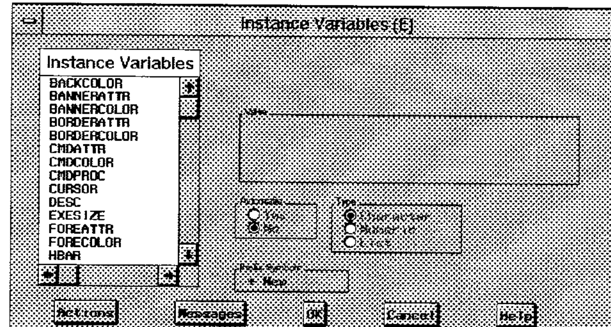
The above section of code determines the catalog member name of the SCL template. For this example, the template is held in the same catalog as the SUGI FRAME class. The catalog name is determined by getting the name of the class. This returns a four level catalog name for the class. As only the two level time is needed, the catalog name (catname) is extracted using the scan function.

The name of the SCL template is held in an instance variable. The instance variable will be set later in this paper. It is a value that is stored with the class.

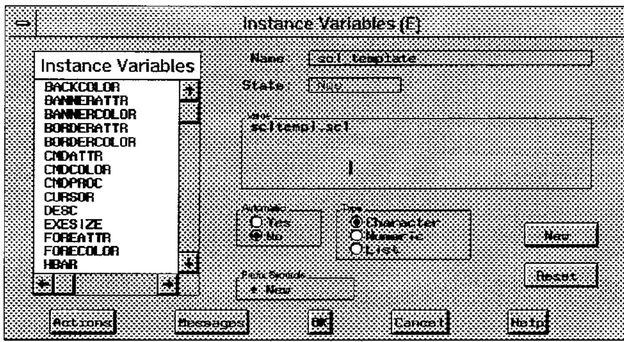
```
     *assemble new SCL entry name;
       scl=substr(frame,1,length(frame)-5)||'SCL';
      /*if the SCL entry does not exist then create it
        based on the SCL template. */
    if not cexist(scl) then do;
     rc=copy(scl_template,scl,'CATALOG');
     if rc ne 0 then do;*copy failed - error handling;
       sysmsg=sysmsg();
       put 'ERROR: New SCL entry ' scl
       ' could not be created.';
       put '        The system message was: ' sysmsg;
      end;*copy failed - error handling;
     else do;
       *rename SCL entry description;
        scl1=scan(scl,3,'.');/*get one level name*/
        rc=rename(scl,scl1,'CATALOG','SCL entry for '||
           scan(frame,3,'.')||'.FRAME');
     end;
    end; *create SCL entry;
 end; *new frame;
endmethod;
```

The name of the SCL entry associated with the frame is built by using the four level frame name, stripping of the *FRAME* part of the name and replacing it with *SCL*. The new SCL entry name is checked to ensure that it does not exist, to avoid overwriting an existing entry. If the entry does not exist then the template is copied to the name of the new SCL entry. Lastly, the description for the SCL entry is set to 'SCL entry for....FRAME'.

Once the method code has been entered, compile it and close the SCL & the Methods window. In the Class window, click on *Instance Variables*. The Instance variables dialog is displayed as shown below:



The list box lists the standard instance variables for the FRAME class. In this example, an additional instance variable is required: SCL_TEMPLATE. Click on *Actions-Add mode on* and enter the values for *Name* (scl_template) and *Value* (scltempl.scl) as shown below. Ensure that Type is set to character.



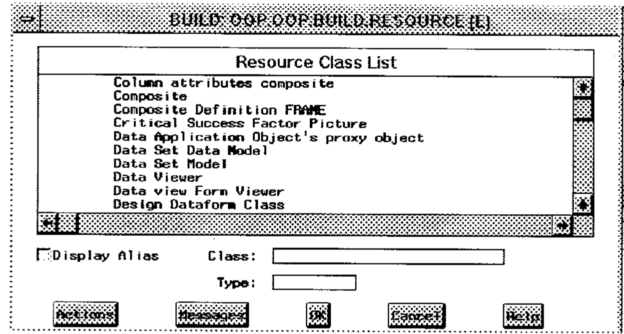
Once these settings have been completed, *OK* out of the instance variables dialog and also out of the Class entry window.

This concludes the creating of the SUGI FRAME subclass. The last two things that need to be done are to put together an SCL template and to define the class in the Resource entry.

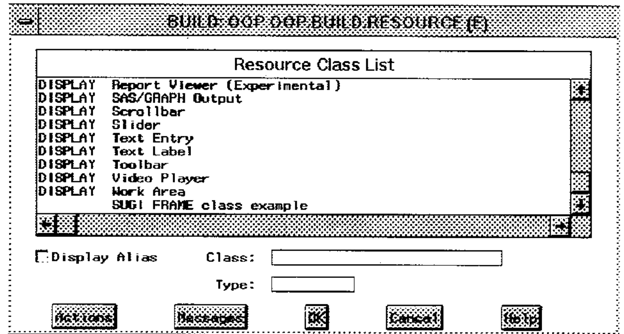
The SCL Template.
The SCL template is simply an SCL entry that contains any code that is to be used as a template in the new SCL window when creating a new FRAME entry. The entry must have the same name as specified in the instance variable *SCL_TEMPLATE* . ie SCLTEMPL.SCL
The contents of the SCL entry SCLTEMPL.SCL for the example is:

```
*********************************************************;
* Sunken Treasure Software Systems Limited.             *;
* ---------------------------------------------         *;
* 73 Pine St, Mt Eden, Auckland, New Zealand.           *;
* Ph: (025) 725 386 Fax: +64 9 620 9079                 *;
* Email: markbodt@stss.co.nz                            *;
*                                                       *;
* SAS Institute (NZ) Quality Partner                    *;
*                                                       *;
*********************************************************;
* Function:                                             *;
*                                                       *;
*                                                       *;
* Written by: M.R.Bodt       Date:                      *;
*                                                       *;
*********************************************************;
* Modifications:                                        *;
*                                                       *;
*********************************************************;

*define lengths;

/* avoid compilation warnings */


Init:

Return;


Main:

Return;


Term:

Return;
```

Registering the New Subclass in the Resource Entry.
For the example, a copy of the default resource entry will be made and the copy modified, so as not to affect the original resource entry. The resource entry *sashelp.fsp.build.resource* is copied to the catalog where the SUGI FRAME class has been developed: *oop.oop* .
In the build window, double click on the build.resource entry in the oop.oop catalog. The resource window is displayed as shown below:



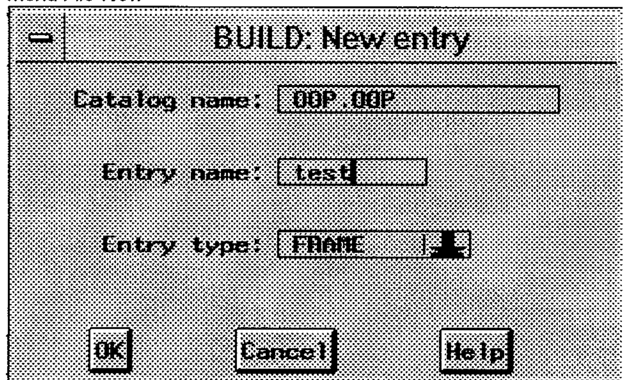
To add the new SUGI FRAME class to the resource entry, click on *Actions-Add* Select OOP.OOP.SUGI.CLASS and click on *OK* . The class is then added to the bottom of the list in the list box. Scroll to this entry as shown below:



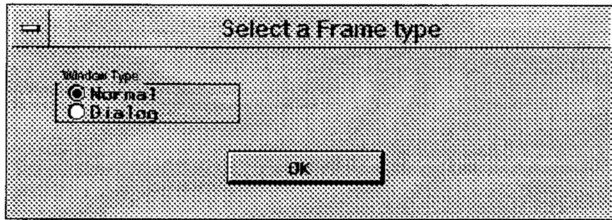
Select the SUGI FRAME class by single clicking the list box entry, then click on Actions-Set active. By setting the SUGI FRAME class as active specifies that this class is to be used when opening a build window for a FRAME entry. Close the resource window by clicking *OK*.

The new SUGI FRAME class is now ready to use. The following screen prints demonstrate the results.

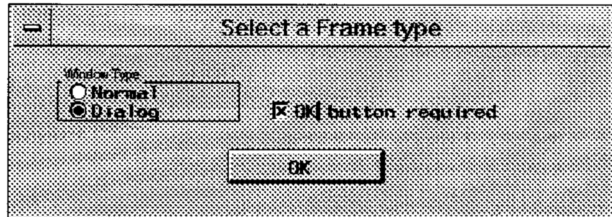
In the build window, a new frame is requested using the pull down menu *File-New*



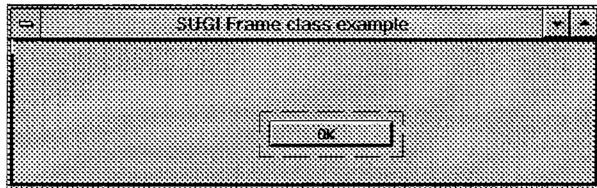
The new entry dialog is shown and *test* is entered by the user. On clicking *OK* the dialog is closed and the *Select a Frame Type* dialog is displayed:



Selecting the *Dialog* option displays the OK button check box. The check box is checked:



and the OK button clicked. The frame is then displayed and has been pre-set to have dialog box attributes:



The Frame can be edited as normal, widgets can be added, deleted, moved around etc. Moving to the SCL window, it can be seen that the it has been initialised from the template.:

```
BUILD: SOURCE TEST.SCL (E)
00001 **********************************************************;
00002 * Sunken Treasure Software Systems Limited.                *;
00003 * ---------------------------------------                  *;
00004 * 73 Pine St, Mt Eden, Auckland, New Zealand.              *;
00005 * Ph: (025) 725 386 Fax: +64 9 620 9079                    *;
00006 * Email: markbodt@stss.co.nz                               *;
00007 *                                                          *;
00008 * SAS Institute (NZ) Quality Partner                       *;
00009 *                                                          *;
00010 **********************************************************;
00011 * Function:                                                *;
00012 *                                                          *;
00013 *                                                          *;
00014 * Written by: M.R.Bodt       Date:                         *;
00015 *                                                          *;
00016 **********************************************************;
00017 * Modifications:                                           *;
00018 *                                                          *;
00019 **********************************************************;
00020
00021 *define lengths;
00022
00023 /* avoid compilation warnings */
00024
00025
00026
00027 Init:
00028
00029 Return;
00030
00031
00032 Main:
00033
00034 Return;
00035
00036
00037 Term:
00038
00039 Return:
```

Conclusion:
Subclassing the FRAME class as shown in this paper promotes standardising the look and feel of an SAS/AF application as well as documentation layout standards for the associated SCL entry. Although the example was very simple, all the requirements of subclassing the FRAME class were covered. The simple example in this paper can be expanded to incorporate more sophisticated Frame initialisation.

Further Reading
Don Stanley's Book 'An Applications Oriented FRAME text' contains an entire chapter about subclassing the Frame class and covers other functionality that can be achieved using the Frame class. The book is part of the *SAS* Institute's Books By Users scheme and is available from you local *SAS* Institute Office.

References

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