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## A Comparison between GUI Prompts of SAS® Enterprise Guide® 4.1 and 4.3 and Approaches for Developing Next-Generation Prompts

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### ABSTRACT

SAS® codes have to be edited as and when the criteria of execution changes. The use of GUI Prompts helps in preserving source code from changes and in automation of SAS® Enterprise Guide® Projects by passing run time parameters to SAS. The main purpose of this paper is to compare the advanced features or functionalities of GUI Prompts between SAS Enterprise Guide 4.1 and SAS Enterprise Guide 4.3. This paper also discusses the limited ability of prompts and provides tips for handling such situations or highlights the need for development of future generation prompts.

### INTRODUCTION

There is a definitive need to automate forecasting models developed by statisticians when there is a recurring business process to create weekly and/or monthly reports. A GUI Prompt tagged with a code of SAS Enterprise Guide Project (EPG) is an effective tool for automation of forecasting models as it prevents hard-coding and/or editing of global macro parameters. The efforts spent around the automation of forecasting models gave us valuable insights into business need for effective User Interface Design. SAS 9.1 to SAS 9.2 migration activity provided business users with an opportunity to analyze and compare GUI features of both versions. There were quite a few out-of-the box functionalities that directly satisfied business needs and other features that could be incorporated into subsequent versions.

This paper is split into two sections with the first section focusing on functionality difference between SAS Enterprise Guide 4.1 to 4.3 and second section elaborating on functionality that are currently missing in a GUI Prompt of SAS Enterprise Guide 4.1 and 4.3 (refer Table 1). The table below compares functionalities of a GUI Prompt from the perspective of SAS Programmer and Business User. In this table '+' represents the presence of a functionality and '-' represents the absence of functionality.

Functionalities of a GUI Prompt	SAS Enterprise Guide 4.1	SAS Enterprise Guide 4.3
Select Values from a Dynamic List	-	+
Auto Correction Mode	-	+
Enclose Values within Quotes	+	-
Multiple User Selection	+	+
Cascading Prompts	-	-
Arrangement of elements in UI	-	-
Shared Prompts	-	-
Other Features (like Radio Box)	-	-

**Table 1. Functionalities of a GUI Prompt in SAS Enterprise Guide 4.1 and 4.3**

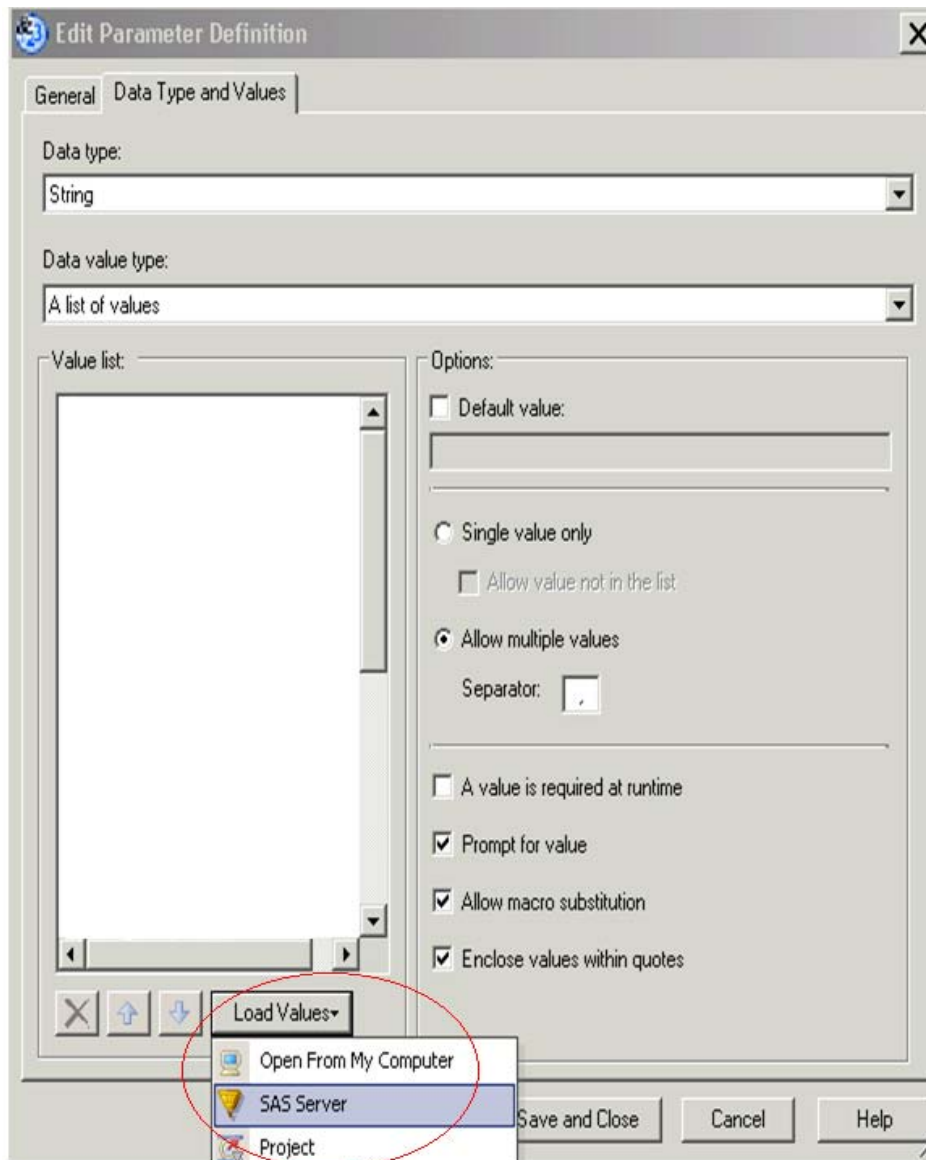
Let us see the functionalities of a GUI Prompt in detail.

## SELECT VALUES FROM A DYNAMIC LIST

Dynamic GUI Prompt is one in which current list of values from a data set is populated to a prompt. On every data refresh an updated list of values from a refreshed data set is displayed in a GUI Prompt. This dynamic nature of a GUI Prompt helps business user to select most recent values from a data set.

### GUI PROMPTS IN SAS ENTERPRISE GUIDE 4.1

Let us see how SAS handles this in SAS Enterprise Guide 4.1. If a data set is static, then the option in SAS Enterprise Guide 4.1 is sufficient to load values from a data set to the GUI Prompt. What do we do if there is a data refresh? Although the underlying data have changed as a result of the data refresh, the GUI prompt continues to display the original values; needless to say, this can lead to errors cascading through the model. In order to work around this limitation, a SAS business user must edit prompt (see Display 1) to load an updated list of values from a refreshed data set to the GUI Prompt; which is a time-consuming manual activity based on data refresh frequency.



Display 1. Manual Loading of a List of Values from a Data Set to the GUI Prompt in SAS Enterprise Guide 4.1

### GUI PROMPTS IN SAS ENTERPRISE GUIDE 4.3

SAS Enterprise Guide 4.3 provides a much easier approach (see Display 2) “User selects values form a dynamic list”. For example, select the “User selects values form a dynamic list” Option in Method for populating prompt drop down to update the GUI Prompt automatically whenever there is a data refresh. This avoids considerable manual efforts that are needed to update and maintain the GUI Prompts of SAS Enterprise Guide 4.1. Current approach used in SAS Enterprise Guide 4.3 does not require any direct access and/or changes to the production environment and ensures compliance to all configuration control processes that are in place.

The screenshot shows the 'Edit Prompt' dialog box with the following settings:

- Prompt type:** Text
- Method for populating prompt:** User selects values from a dynamic list
- Number of values:** Multiple values
- Minimum value count:** (empty)
- Maximum value count:** (empty)
- Minimum length:** (empty)
- Maximum length:** (empty)
- Data source:** CATG
- Unformatted Values Column:** catg\_desc
- Formatted (Displayed) Values Column:** Use 'Unformatted Values' column
- Formatted (Displayed) Values Format:** Default format
- Append formatted values with unformatted values:**
- Include Special Values:**  All possible values
- Sort order:** Default sort order
- Default value:** (None)
- Allow user to specify additional (unformatted) values:**

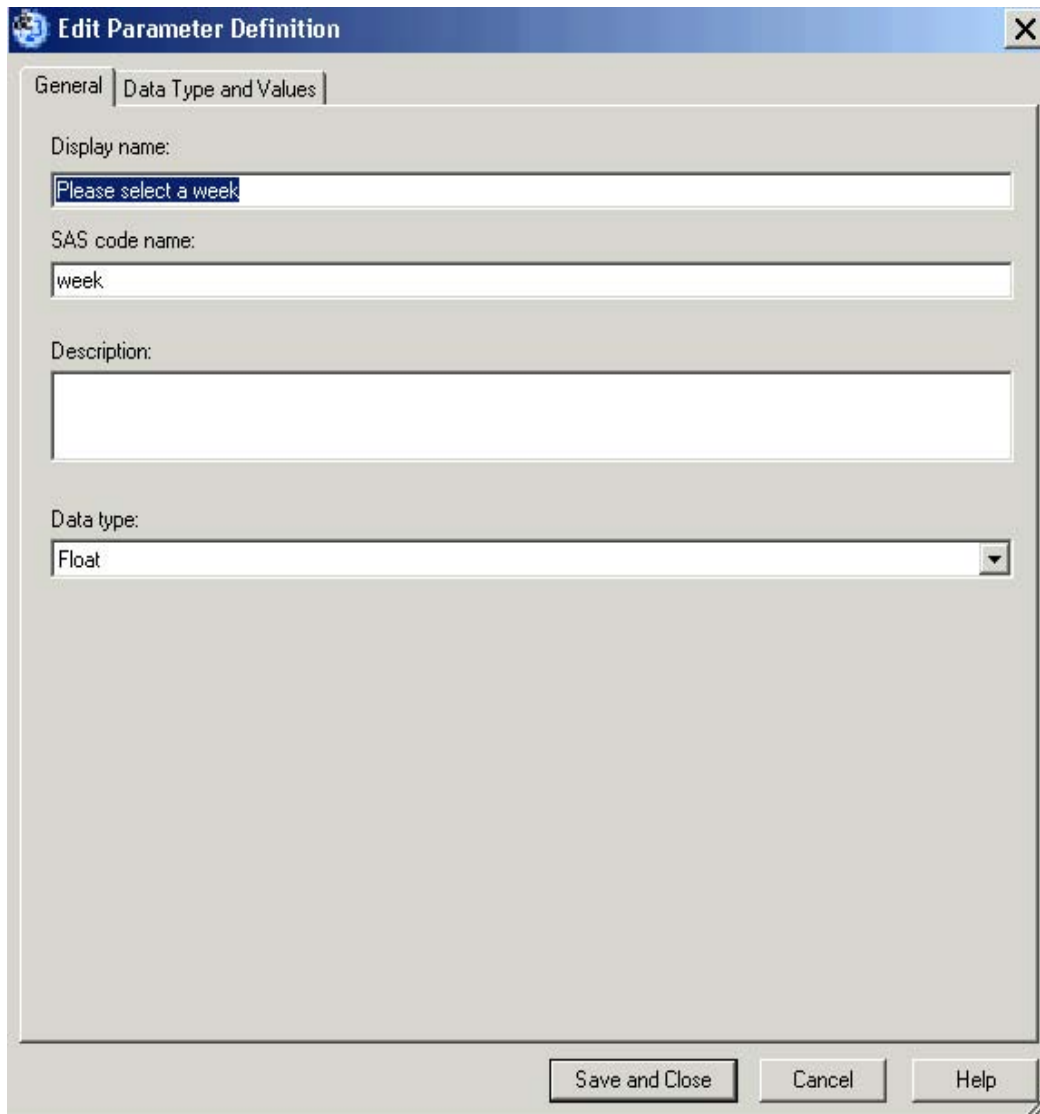
Display 2. Option for SAS User to Select Value from a Dynamic List in SAS Enterprise Guide 4.3

## AUTO CORRECTION MODE

The data type of a prompt and the list of values that are entered must be compatible. If it is not compatible then, there must be visual aid that must help a SAS programmer to identify data type mismatch in a GUI Prompt. Auto Correction Mode is a useful visual aid or a validation feature that helps a SAS programmer to identify data type mismatch in a GUI Prompt when migrating from SAS Enterprise Guide 4.1 to 4.3. This is quite useful feature as it enables SAS programmers to choose the correct data type for a GUI Prompt.

## GUI PROMPTS IN SAS ENTERPRISE GUIDE 4.1

For example, let us create a prompt in Version 4.1 with incorrect Data Type Float (see Display 3) and enter Integer in List of Values. Ideally there should be some system alert or visual aid that must help the user realize that there is a data type mismatch in the GUI Prompt, but in SAS Enterprise Guide 4.1 there is no such alert currently. SAS programmer continues with this incorrect Data Type that is chosen in Parameters Manager. There are no obvious run time errors due to this data type mismatch, but it would be a good idea to have a screen similar to Display 4 to highlight this.



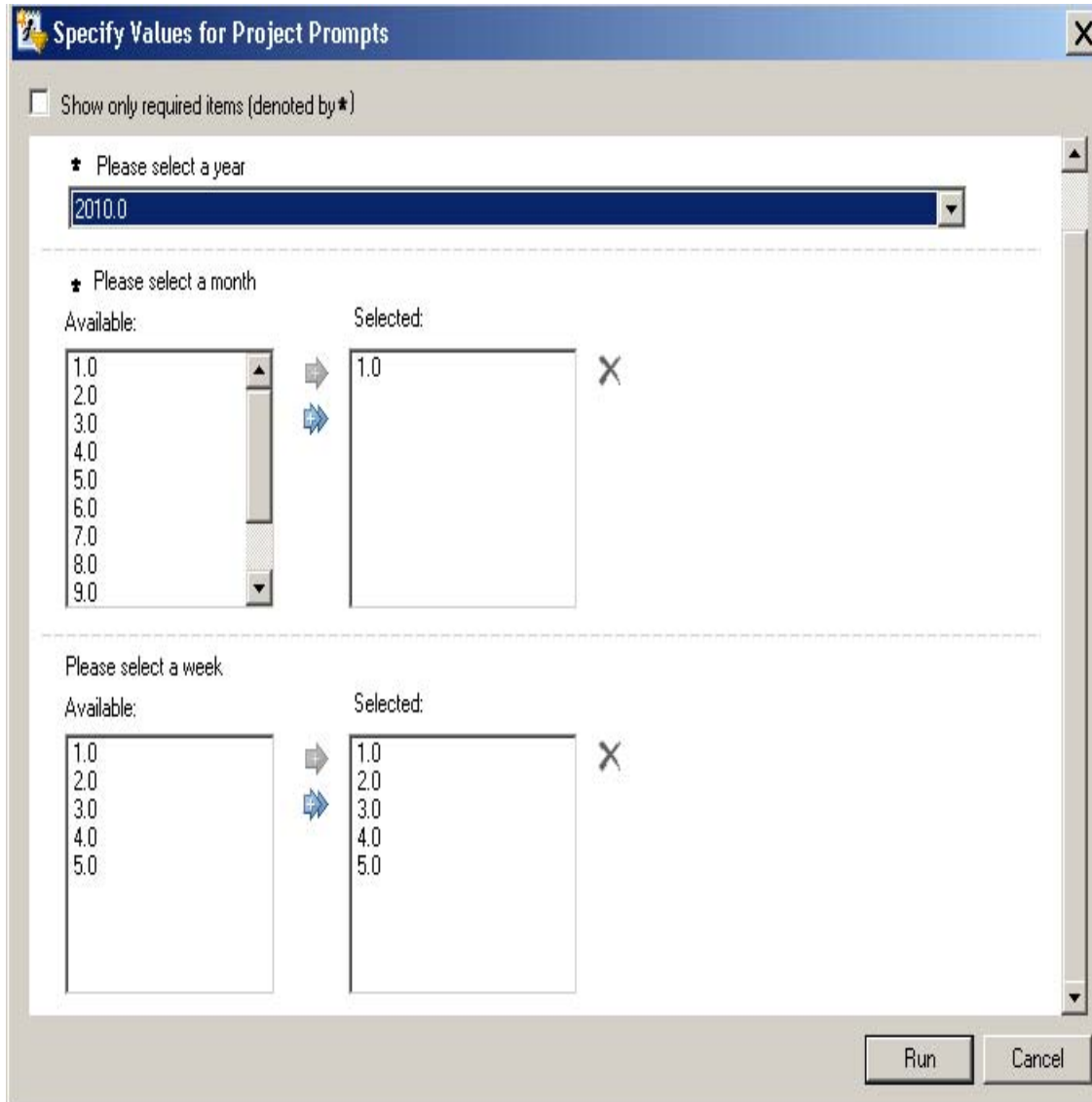
The screenshot shows the 'Edit Parameter Definition' dialog box. The 'Data Type and Values' tab is selected. The 'Display name' field contains 'Please select a week'. The 'SAS code name' field contains 'week'. The 'Description' field is empty. The 'Data type' dropdown menu is set to 'Float'. The 'Save and Close', 'Cancel', and 'Help' buttons are visible at the bottom.

Display 3. Choose Incorrect Data Type 'Float' and Enter Integer in List of Values in SAS Enterprise Guide 4.1

### GUI PROMPTS IN SAS ENTERPRISE GUIDE 4.3

When this Enterprise Guide Project is migrated to SAS Enterprise Guide 4.3, the Prompts Manager auto corrects and highlights the mistake by adding '.0' to all values in the list (i.e., it displays float values instead of integer values). This auto correction feature helps a SAS user understand or correct the incorrect data type chosen. Let us see this feature in detail.

Displayed below is the GUI Prompt that had been created in SAS Enterprise Guide 4.1. The User Interface was designed to have three different prompts (i.e., user selection for year, month and week). All three were created with an incorrect Data Type of Float, but Integer values were entered in the List of Values. This GUI Prompt, when migrated to SAS Enterprise Guide 4.3, auto corrects to add '.0' to the values of all three prompts (see Display 4). The user selection for year month and a week should not be Float and until the form is changed the user cannot make the right selection. This display alerts the developer on potential problems before the project is widely released.



**Display 4. Auto Correction Mode Helps in Identifying Incorrect Data Type 'Float' Chosen for 'Integer' in SAS Enterprise Guide 4.3**

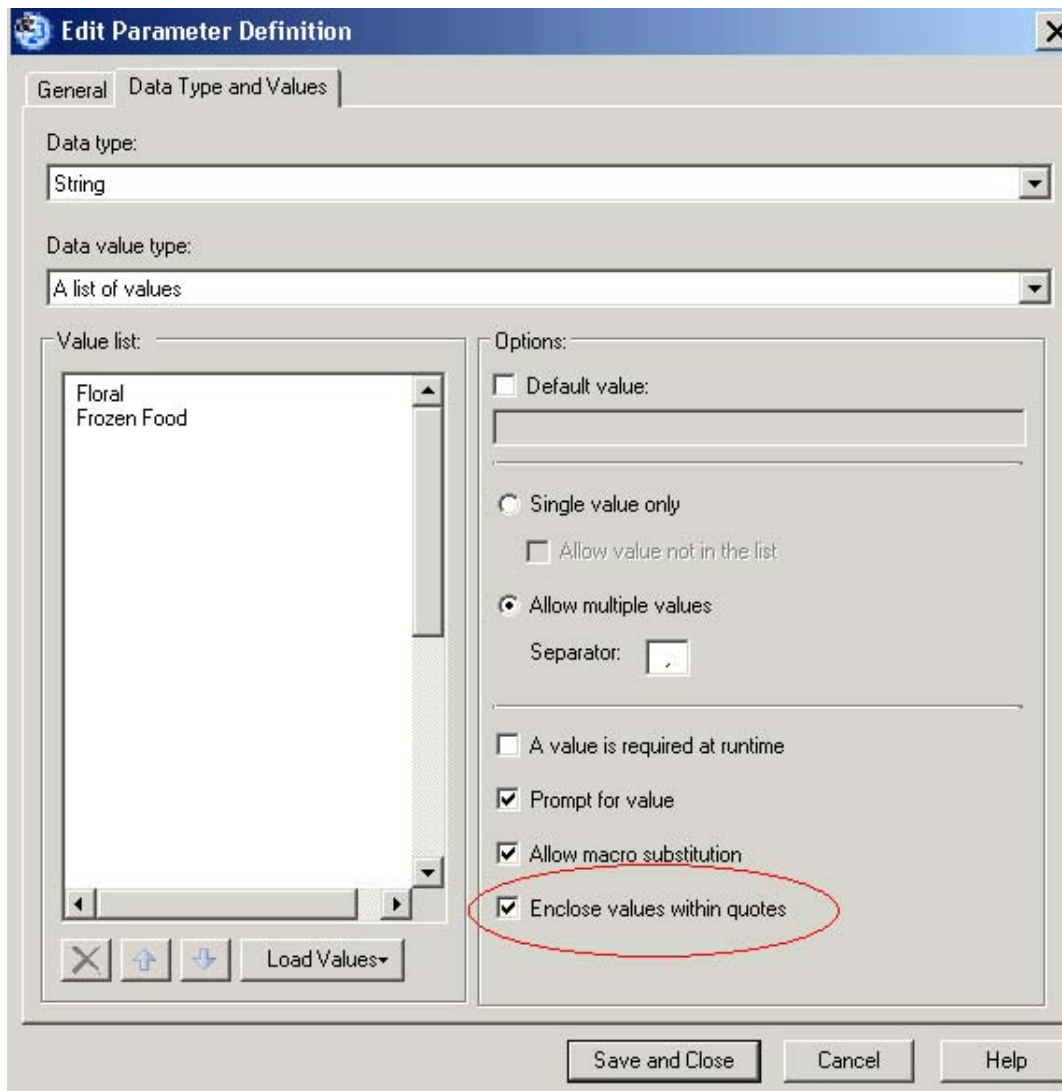
## ENCLOSE VALUES WITHIN QUOTES

Mostly a String data type (sequence of characters) is enclosed within quotation mark in all programming languages. Likewise, macro variable values created through a GUI Prompts for String data type is enclosed within quotes to preserve any business logic and avoid run time errors when the macro variables are resolved within a SAS DATA step or PROC processing.

### GUI PROMPTS IN SAS ENTERPRISE GUIDE 4.1

SAS Enterprise Guide 4.1 provides an option (see Display 5) "Enclose values within quotes" in the GUI Prompt that ensures all values of the list which code has substituted during run time are within quotes as they are of String data type. SAS Enterprise Guide generates code automatically (see below) to initialize global macro parameters when the GUI Prompt is triggered. The String data type value is automatically placed within double quotes and eliminates need to have double quotes included manually.

```
%LET store_type = %STR("Floral");
```



Display 5. Option Available to "Enclose Values within Quotes" in SAS Enterprise Guide 4.1

### GUI PROMPTS IN SAS ENTERPRISE GUIDE 4.3

The option to place String data type values within double quotes is not available in SAS Enterprise Guide 4.3. If your programs were developed expecting the strings to be quoted, then you will have to programmatically add the quotes. The code automatically generated (see below) by SAS Enterprise Guide 4.3 for a similar case described earlier shows String data type value not placed within double quotes.

**EG 4.1:** `%LET store_type = %STR("Floral");`

**EG 4.3:** `%LET store_type = Floral;`

**Edit Prompt**

General | Prompt Type and Values

Prompt type:  
Text

Method for populating prompt:  
User selects values from a static list

Number of values:  
Multiple values

Minimum value count:  
Maximum value count:

Minimum length:  
Maximum length:

Include Special Values  
 All possible values  Missing values

Append formatted values with unformatted values

List of values:

Unformatted Value	Formatted (Displayed) Value	Defaults
Floral	Floral	<input type="checkbox"/>
Frozen Food	Frozen Food	<input type="checkbox"/>
		<input type="checkbox"/>
		<input type="checkbox"/>
		<input type="checkbox"/>
		<input type="checkbox"/>

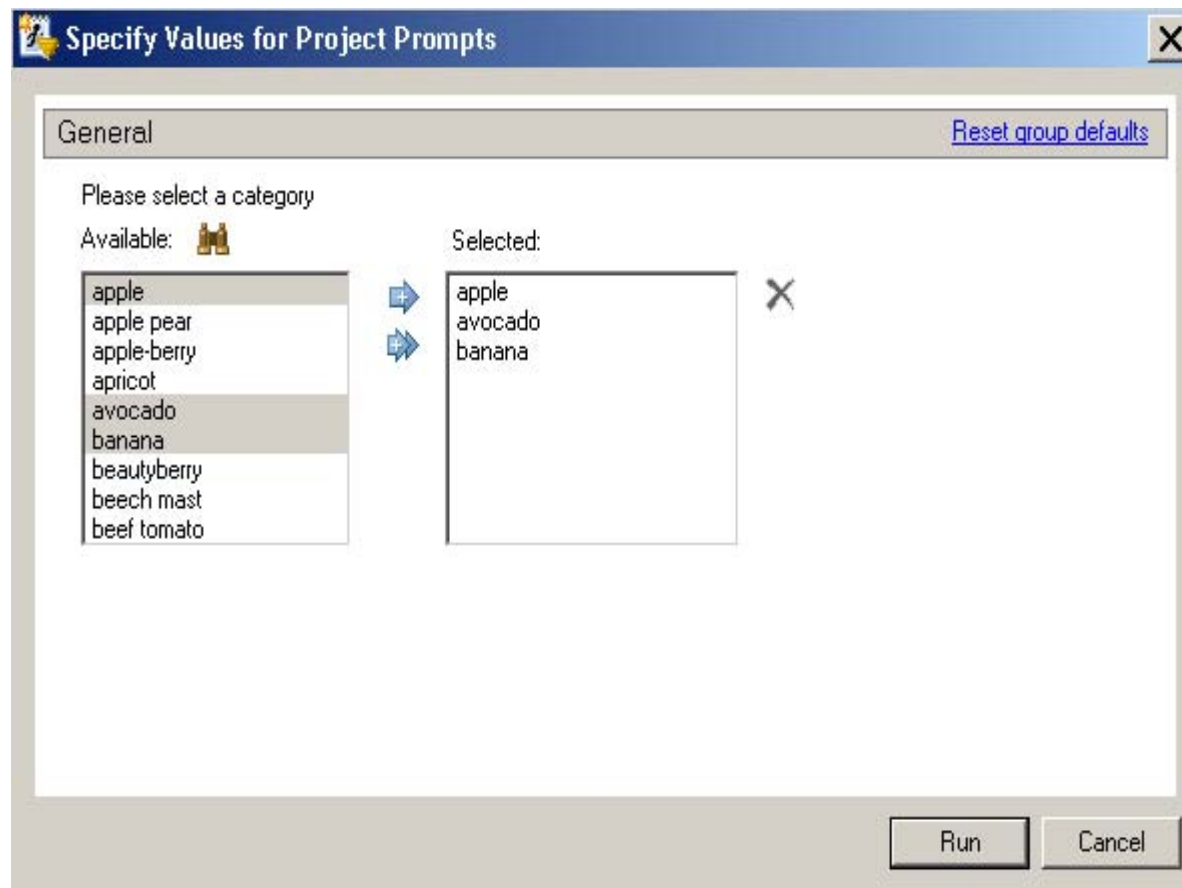
Allow user to specify additional (unformatted) values

Buttons: Add, Get Values..., Delete, Clear Defaults, Move up, Move down, OK, Cancel, Help

Display 6. No Option Available for Enclosing Values within Quotes in SAS Enterprise Guide 4.3

## MULTIPLE USER SELECTION

The “Multiple User Selection” provides an option to choose multiple items from a list of values prompted for user selection. This helps the user to make multiple choices in a single prompt instance instead of having to select individual values multiple times. Let us consider the following example in which the GUI screen has been designed for selection of category description of fruits (catg\_desc).



Display 7. The GUI Screen Designed for Selection of Category Description of Fruits

### GUI PROMPTS IN SAS ENTERPRISE GUIDE 4.1

When a multiple user selection is made in SAS Enterprise Guide 4.1, single macro variable created will hold the values of the entire selection. The code generated automatically for such multiple user selection is shown below:

```
%LET catg_desc = "apple", "avocado", "banana";
```

And the SAS query looks simpler as it reads single macro variable created through the GUI Prompt.

```
%macro catg;
/*use one macro variable generated from multiple user selection*/
proc sort data=abc.catg out=catg(keep=catg_desc) nodupkey;
  where catg_desc in (&catg_desc);
  by catg_desc;
run;
%mend;
%catg
```



### GUI PROMPTS IN SAS ENTERPRISE GUIDE 4.3

When the same multiple user selection is made in SAS Enterprise Guide 4.3, the GUI Prompt creates individual macro variable per selection. This one macro variable per selection makes it essential to modify code in SAS Enterprise Guide 4.3; as the change in versions will introduce errors into otherwise correct code. A SAS programmer has to accommodate for this change by taking into account each macro variable individually when writing logic. The auto generated code for Version 4.3 would look like –

```
%LET catg_desc = apple;
%LET catg_desc1 = apple;
%LET catg_desc2 = avocado;
%LET catg_desc3 = banana;
%LET catg_desc_COUNT = 3;
%LET catg_desc0 = 3;
```

SAS Enterprise Guide 4.3 creates catg\_desc not catg\_desc1 when only one selection is made in the GUI (see below). It is always good to program your logic based on the number of items selected as there is a difference in handling by SAS Enterprise Guide 4.3. If this value is not considered in the code, then it leads to incorrect filtering of data set.

```
%LET catg_desc = apple;
%LET catg_desc_COUNT = 1;
```

SAS Enterprise Guide 4.1 query needs to be modified (see below) for SAS Enterprise Guide 4.3 considering macro variables generated in the above two cases, hence when you are migrating you do not migrate in-place; you need to be sure you have the old release working and available until all the new features are debugged.

```
%macro catg;
/*use if then else to handle each macro variable of multiple user selection*/
proc sort data=abc.catg out=catg(keep=catg_desc) nodupkey;
  where catg_desc in
    (%if &catg_desc_COUNT = 1 %then "&catg_desc";
     %else %do i=1 %to &catg_desc_COUNT;
       "&catg_desc&i"
     %end;);
  by catg_desc;
run;
%mend;
%catg
```

If the above code looks like a complex programming logic, then one can make use of new macro “%\_eg\_WhereParam” which handles multiple user selection in Version 4.3. The parameters for %\_eg\_WhereParam macro include Column, Parm, Operator and Type. The first parameter Column specifies variable that a user query, second parameter Parm specifies the name of macro variable passed through a GUI Prompt, third parameter Operator specifies the condition for evaluation, and fourth parameter Type specifies the data type of the variable.

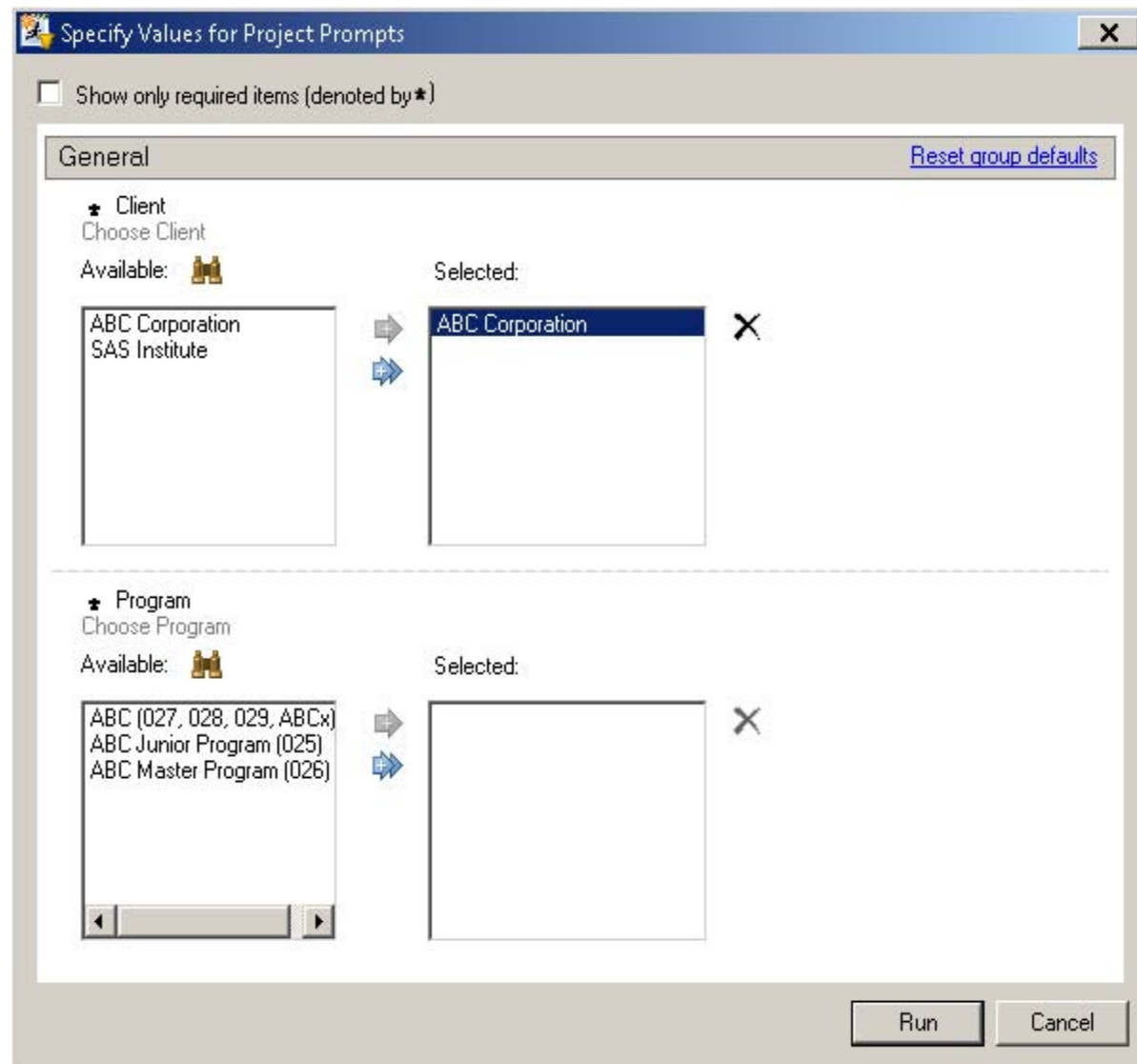
SAS Enterprise Guide 4.1 query need to be modified to include %\_eg\_WhereParam in WHERE clause for SAS Enterprise Guide 4.3.

```
%macro catg;
/*use inbuilt macro for multiple user selection*/
proc sort data=abc.catg out=catg(keep=catg_desc) nodupkey;
  where %_eg_WhereParam (CATG_DESC, catg_desc, IN, TYPE=S);
  by catg_desc;
run;
%mend;
%catg
```

## DEVELOPING SAS ENTERPRISE GUIDE GUI PROMPTS FOR FUTURE NEEDS

### CASCADING PROMPTS

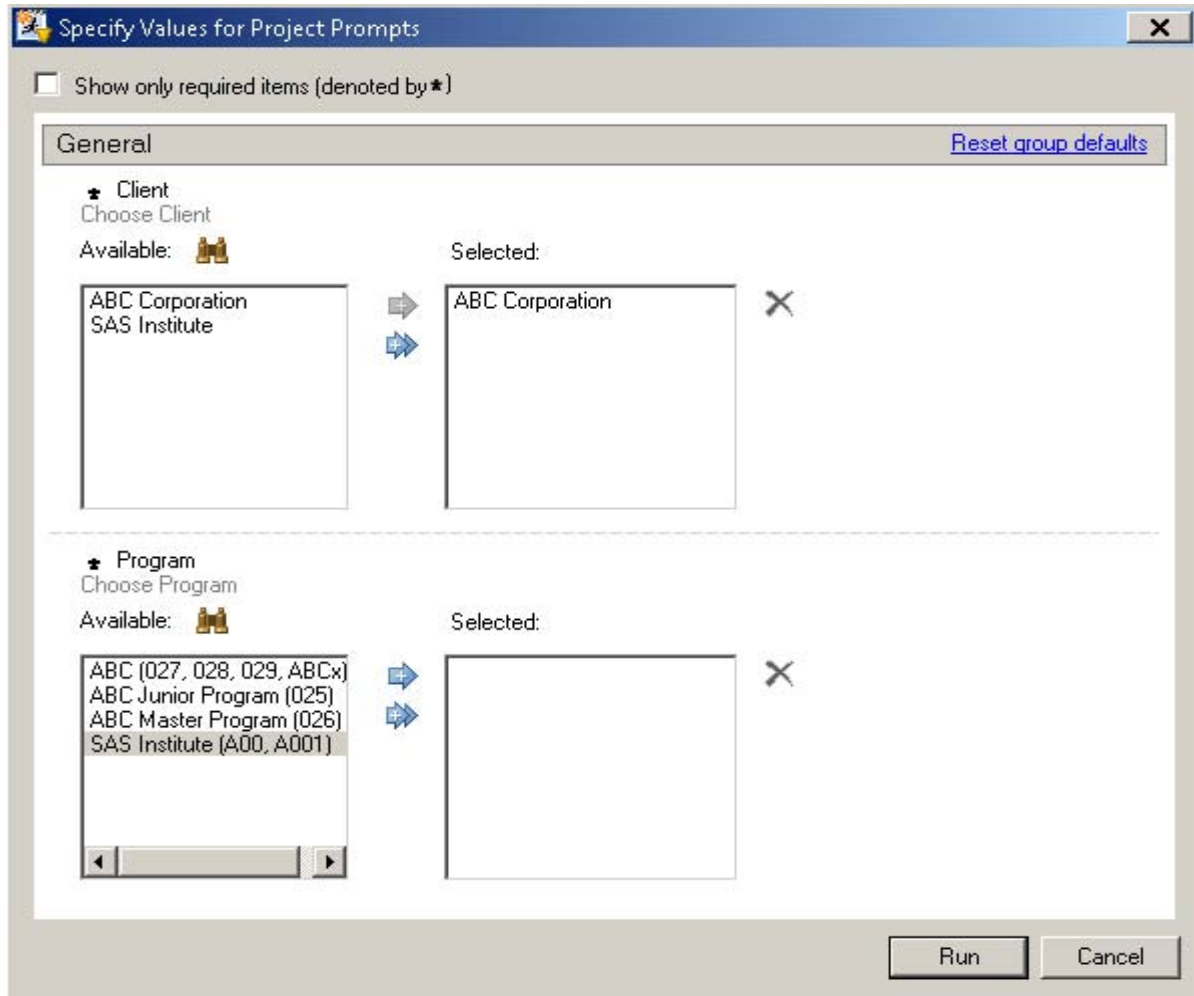
The GUI screen is designed for “Client and Program Selection” in SAS Stored Process. “Client Selection” control values that will be displayed in “Program Selection”. If SAS Institute as Client is chosen by a user, then corresponding SAS Institute related Programs are listed; likewise when a user selects ABC Corporation as Client then corresponding ABC Corporation related Programs are listed (see Display 8).



**Display 8. ‘Selection Specific’ Display in SAS Stored Process**

GUI Prompts Manager of SAS Enterprise Guide does not have an option for creating ‘selection specific display’ and hence prevents user from designing such screens. In SAS Stored Process there is ‘Dependencies Tab’ which helps in defining the dependencies of how a prompt should get populated. The values of second prompt are displayed based on the values selected in the first prompt (in SAS Stored Process). This functionality is missing in SAS Enterprise Guide.

If a user selects ABC Corporation as Client in SAS Enterprise Guide, not only ABC Corporation related Programs are displayed, but also SAS Institute related Programs are displayed (see Display 9). In the real time scenario, this selection could be quite confusing for a business user.



Display 9. SAS Enterprise Guide GUI Prompt is not ‘Selection Specific’

**ARRANGEMENT OF ELEMENTS**

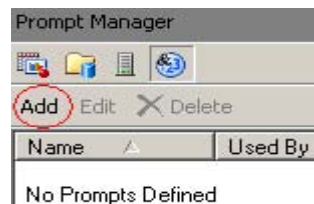
Sometime there is a need for the user to arrange the elements/ parameters of a GUI Screen horizontally (see Display 10) either because of the requirement or for user convenience where the user doesn’t want to scroll down to see a big list. It would be good to have this functionality in the future.

Size	Width	Height
Low	<input type="text"/>	<input type="text"/>
Medium	<input type="text"/>	<input type="text"/>
High	<input type="text"/>	<input type="text"/>

Display 10. Horizontal Arrangement of Prompts

## SHARED PROMPTS

A SAS Enterprise Guide user has options to add an existing prompt or to add a new prompt, but a set of prompts created in an order for one specific Enterprise Guide Project cannot be copied to a different project in the same order. A Prompt Manager Library is not available to provide a template for other projects, but this is possible with stored process.



### Display 11. No Option for Sharing Prompts between Projects

## OTHER FEATURES

Though the existing feature or functionalities suffice the needs, it would be better to have other elements (like Check Box, Combo Box and Radio Box) to improve user experience. Additionally, a user can be provided with three different options for handling string values which could differ based on business needs, i.e., to 'enclose values within double quotes', to 'enclose values within single quotes' or for 'not enclosing values within quotes'.

## CONCLUSION

SAS Enterprise Guide is a primary interface for SAS Programmers and Business User's who are not familiarized with BI tools like SAS Stored Processes. These enhanced features if present in SAS Enterprise Guide will make the GUI Prompt a powerful and user-friendly tool for automation. The Next-Generation Prompts can be further customized in SAS Enterprise Guide to improve business processes and or performance.

## REFERENCES

Angela Hall. "Using Multiple Selection Prompts in SAS Stored Process Code." Published post on the Blog. November 10, 2009. Available at <http://blogs.sas.com/content/bi/2009/11/10/using-multiple-selection-prompts-in-sas-stored-process-code/>.

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