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Application Development with SAS Stored Process

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The Need for SAS Application

As SAS Programmer, we often

- Write SAS program with SAS Data step and PROCs to implement business logic.
- Use SAS Macro for similar tasks or repeated processes.
- Create SAS Macro Variables to create Input parameters.
- This works well for us SAS programmers. We can even set up daily/weekly/month production jobs.

The Need for SAS Application

We often do a great job implementing very complicated business logic, Creating a nice report, or perform extensive statistical analysis.

But end users are more demanding, they often

- Like a Graphic User Interface (GUI).
- And the output in Excel file.

The Need for SAS Application

We often do a great job implementing very complicated business logic, Creating a nice report, or perform extensive statistical analysis.

But end users are more demanding, they often

- Like a Graphic User Interface (GUI).
- And the output in Excel file.

Potential Problems Sharing Code

- Data may not be available: Your C: drive has data but not on others’ PC.

- Different version of data: One might be from this month, other from last month.

- Different version of Program: You updated the program but others are still using the old code.

- File Permission issue: Common on UNIX.

- User may not know SAS!

Potential Problems Sharing Code

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Advantage of Server Application

- Same Data.
- Same Program
- Same result
- Security

What is SAS Stored Process

SAS program stored on a server that can be accessed by a client application.

SAS has done a lot work to allow access from MS Office, Internet, and SAS software tool, such as Enterprise Guide.

For people who know database application, think about Stored Procedure for SQL application.

Advantage of Stored Process

- Code is on the server.
- Access Security
- Data Security
- Code/Logic Security
- Consistent among users
- Easier to support and maintain
- Support multiple client applications
- Support multiple users

Two Parts of the Presentation

- An Introduction to SAS Stored Process through an simple example

- Practical Design and Implementation of an real world application

What Do You Need for SP work?

- Regular SAS is not enough
- Need SAS Metadata server,
- Typically, company will license SAS Business Intelligence Package
- We assume the server is ready

Steps in SP Development

- Develop and test your SAS program
- Create SAS macro variables as parameters
- Use Enterprise Guide to Create and test Stored Process
- Configure client application to access Stored Process

Let’s get started… Sorry I can only show screens

1 - Develop & Test SAS Program

Create data on server:

```
rsubmit;
options ls=64;
libname test '/users/apps/xujohn';

data test.SP;
   name='John'; score=80; output;
   name='Jack'; score=90; output;
run;
```

1 - Develop & Test SAS Program

Create data on server:

```
rsubmit;
options ls=64;
libname test
'/users/apps/xujohn';

data test.SP;
   name='John'; score=80;
output;
   name='Jack'; score=90;
output;
run;
```

SAS Output:

```
    Score
Obs    name    score

 1     John      80
 2     Jack      90
```

2 - Create SAS Macro Variables

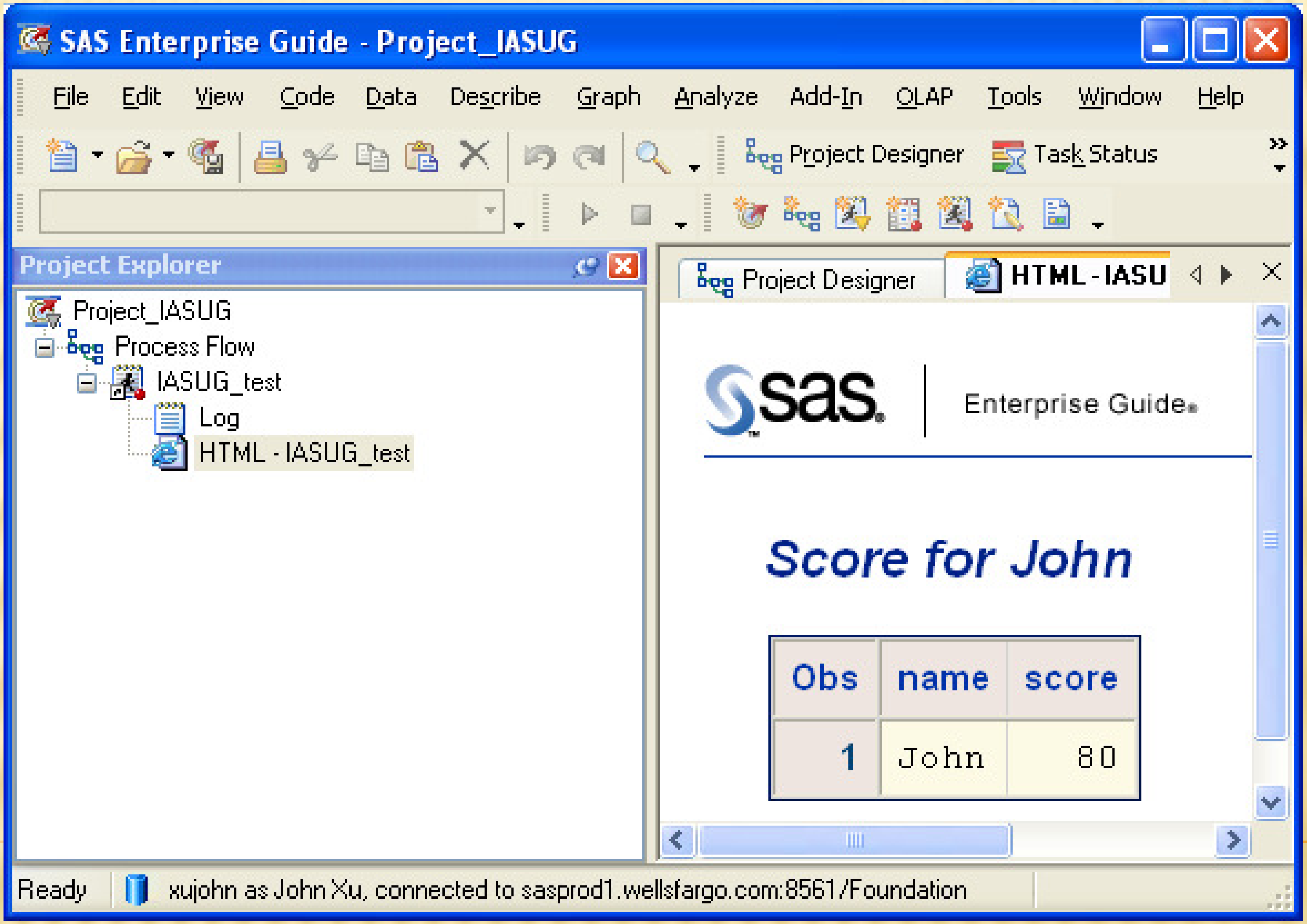
(We now want to print the score for a selected name)

```
rsubmit;
%let name_selected=John;

libname test '/xxxxxx/xujohn';

proc print data=test.SP;
   where name="&name_selected";
   title "Score for &name_selected";
   var name score;
run;
```

SAS Output:

```
 Score for John

Obs    name    score

 1     John      80
```

3 - Use EG to Create and Test SP



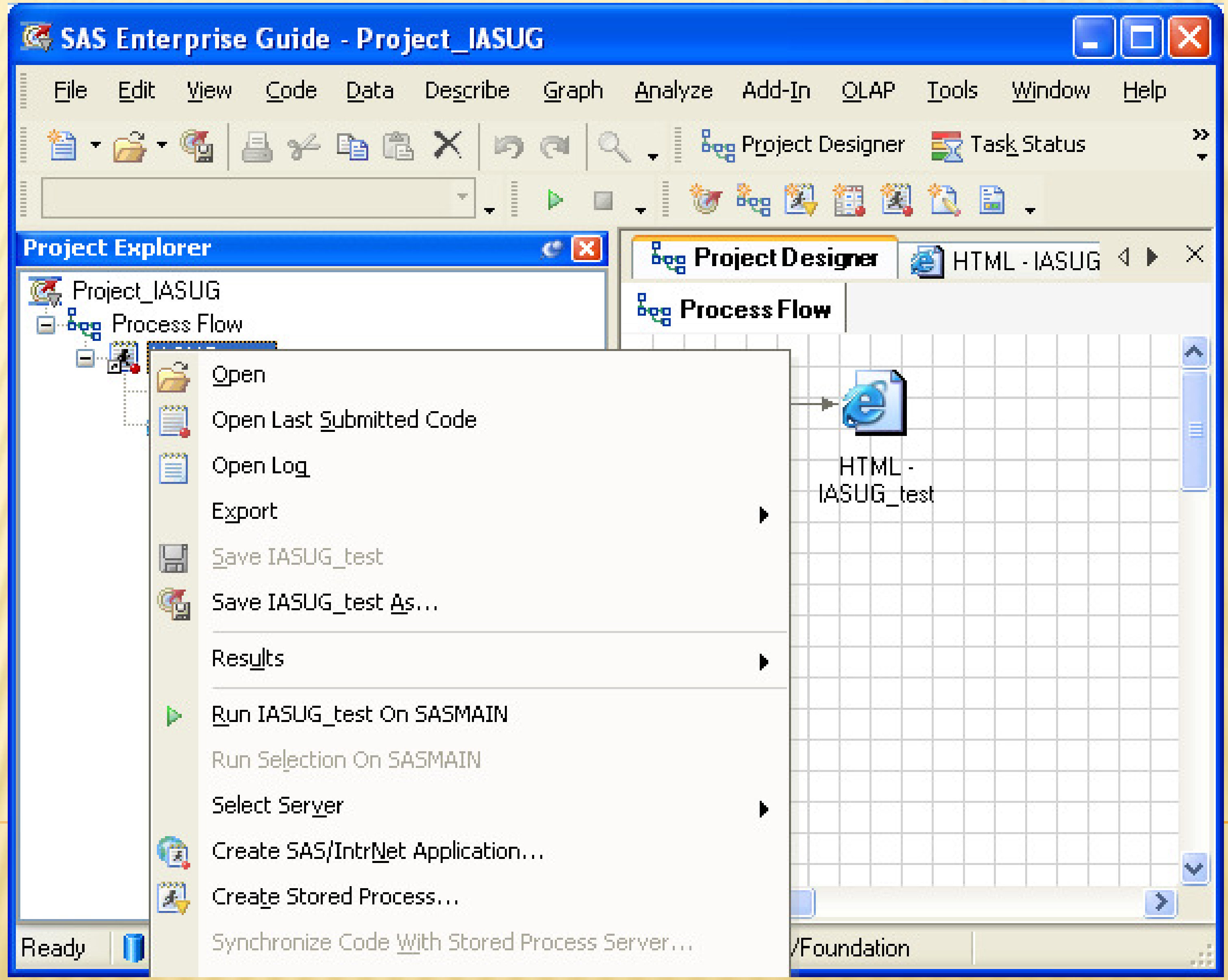
Score for John

Obs	name	score
1	John	80

Ready | xujohn as John Xu, connected to sasprod1.wellsfargo.com:8561/Foundation

A quick test. Just comment out ‘rsubmit’ and run SAS program in EG.

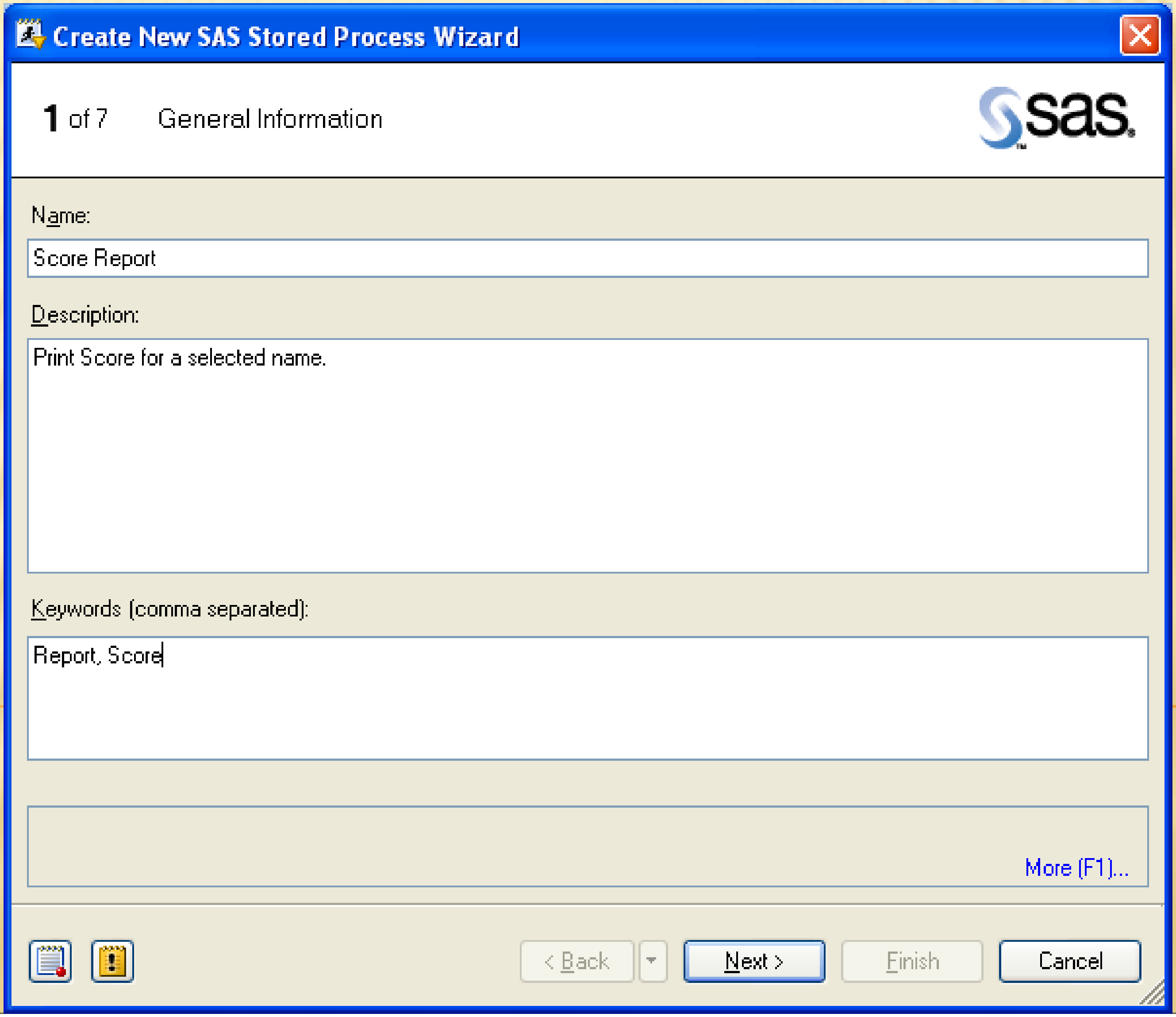
3 - Use EG to Create and Test SP



Right click to get popup menu and select Create Stored Process.

3 - Use EG to Create and Test SP

Step 1: General Information



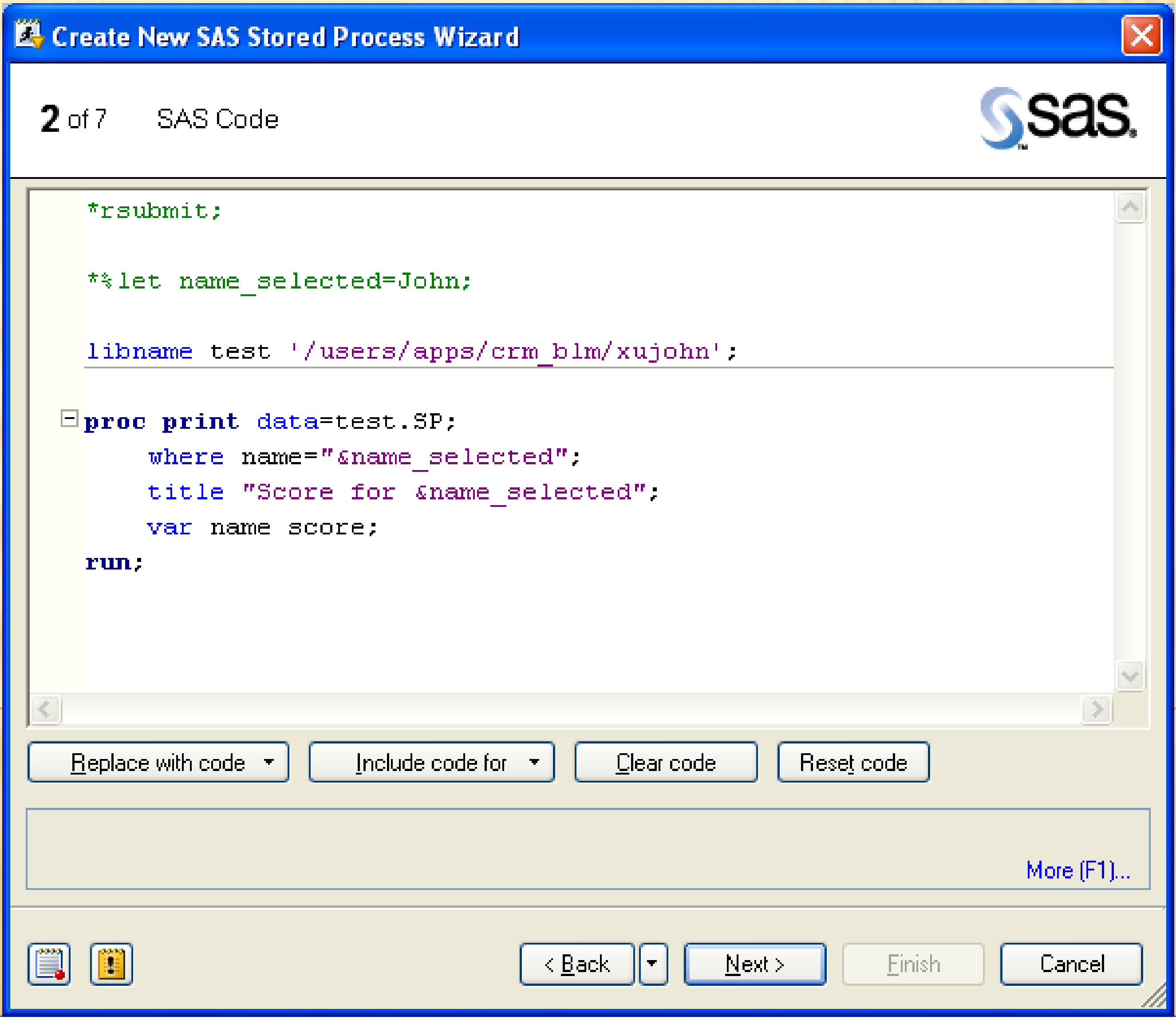
Name:
Score Report

Description:
Print Score for a selected name.

Keywords (comma separated):
Report, Score

3 - Use EG to Create and Test SP

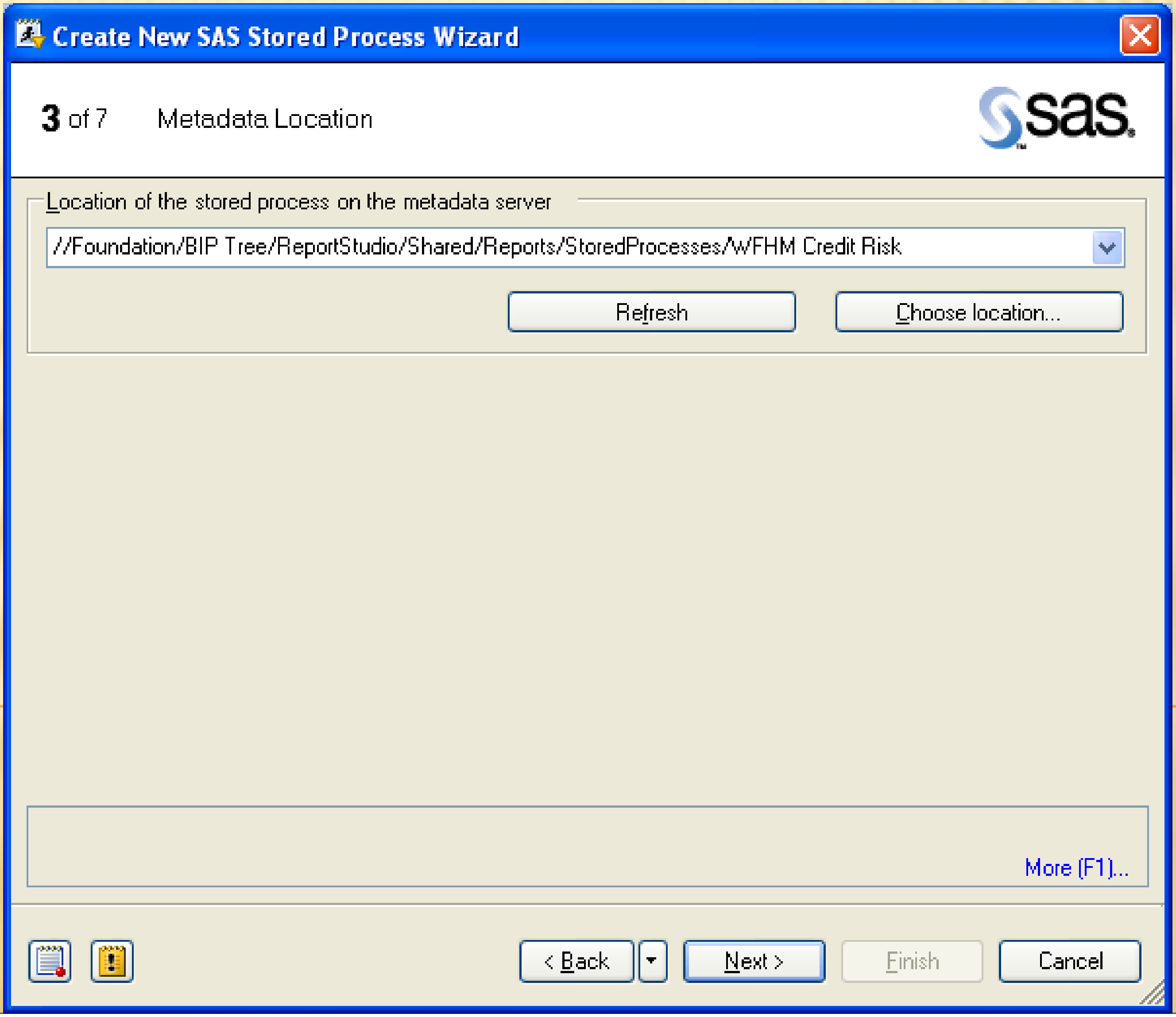
Step 2: SAS Code (Comment out %let lines)



```
*rsubmit;

*%let name_selected=John;

libname test '/users/apps/crm_blm/xujohn';

proc print data=test.SP;
     where name="&name_selected";
     title "Score for &name_selected";
     var name score;
run;
```

3 - Use EG to Create and Test SP

Step 3: Metadata Location


Create New SAS Stored Process Wizard

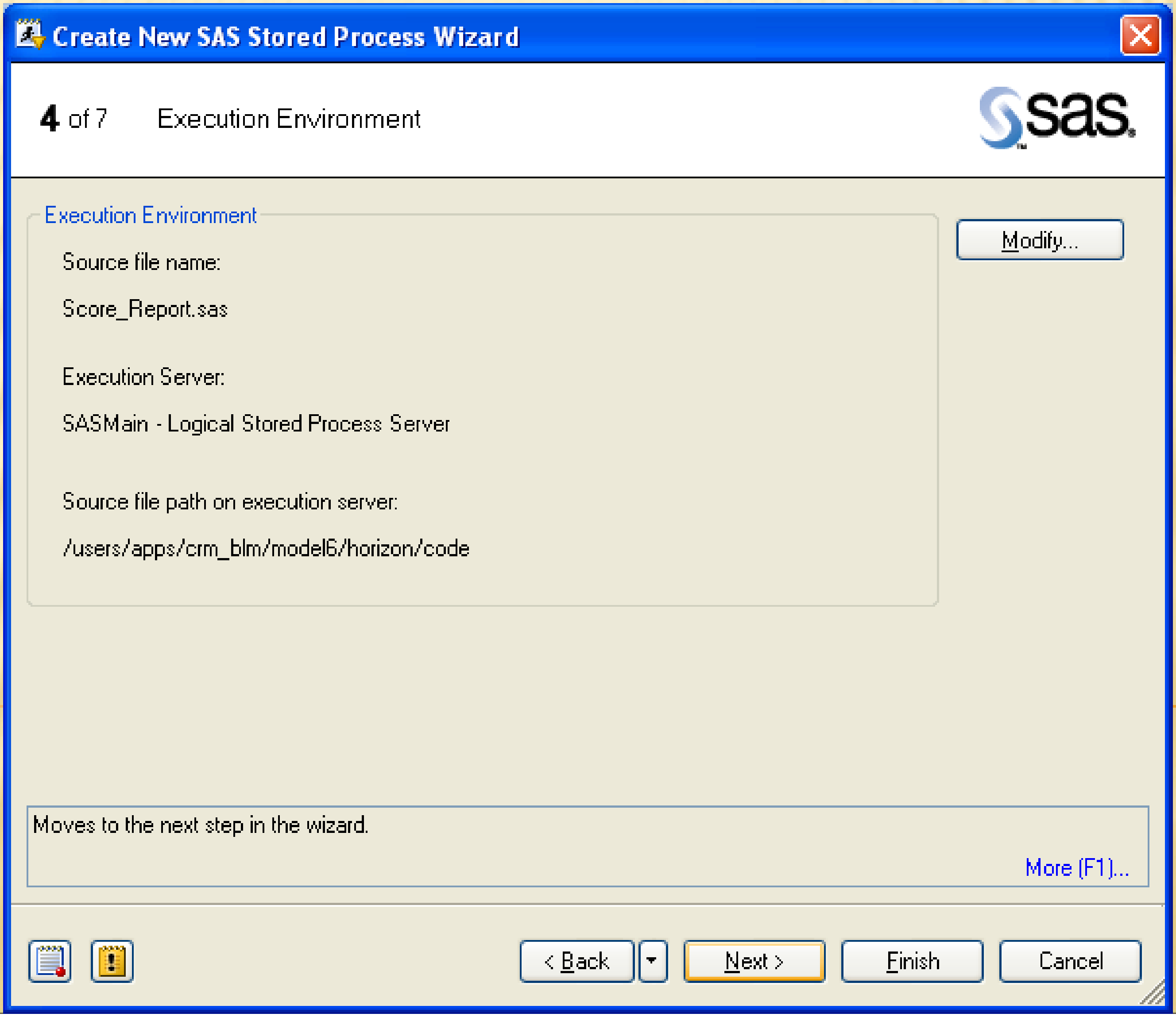
3 of 7 Metadata Location

Location of the stored process on the metadata server

//Foundation/BIP Tree/ReportStudio/Shared/Reports/StoredProcesses/WFHM Credit Risk

3 - Use EG to Create and Test SP

Step 4: Metadata Location



4 of 7 Execution Environment

Execution Environment

Source file name:

Score_Report.sas

Execution Server:

SASMain - Logical Stored Process Server

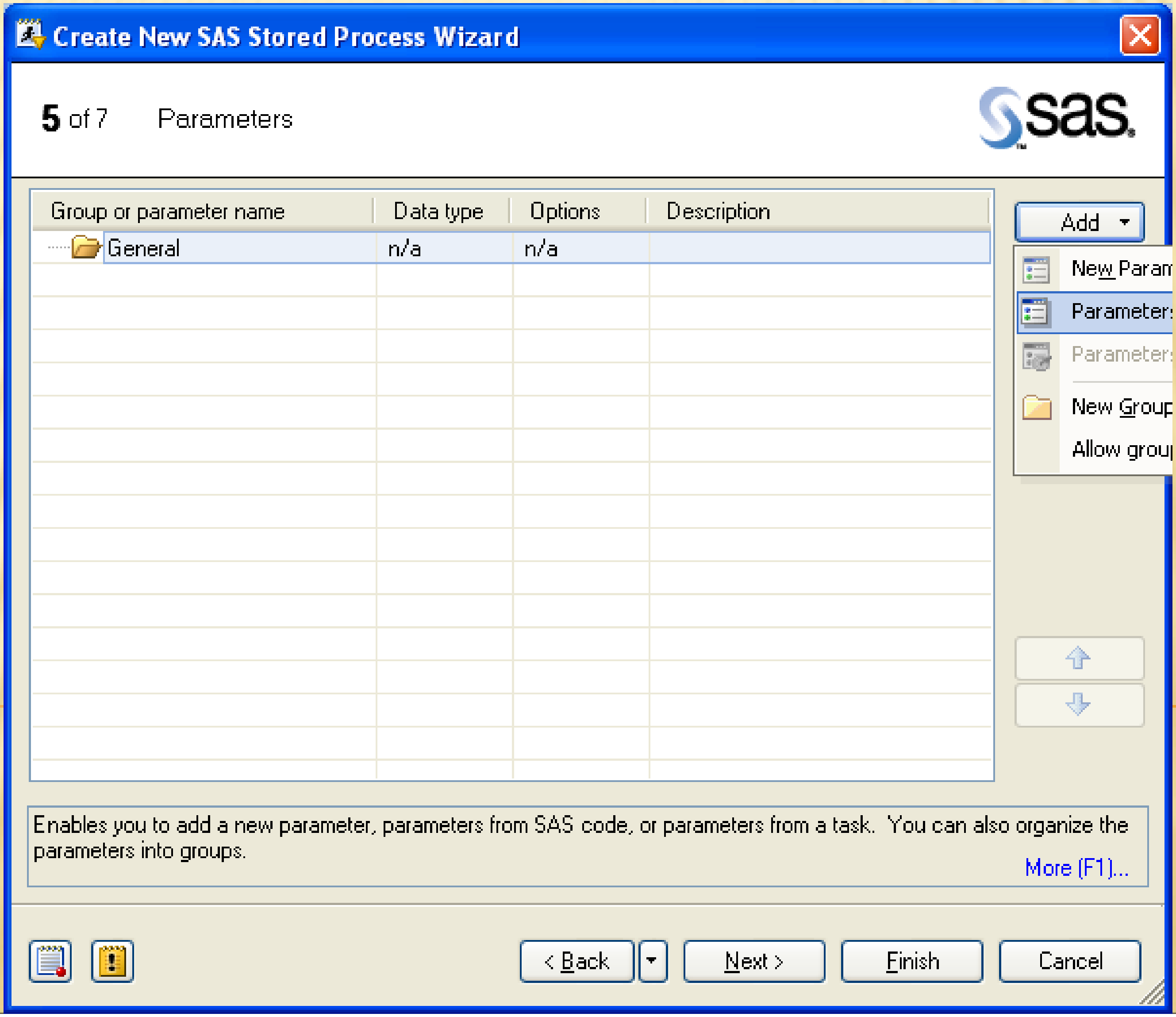
Source file path on execution server:

/users/apps/crm_blm/model6/horizon/code

Moves to the next step in the wizard.

3 - Use EG to Create and Test SP

Step 5-1: Parameters (The key step to create user interface)



Create New SAS Stored Process Wizard

5 of 7 Parameters

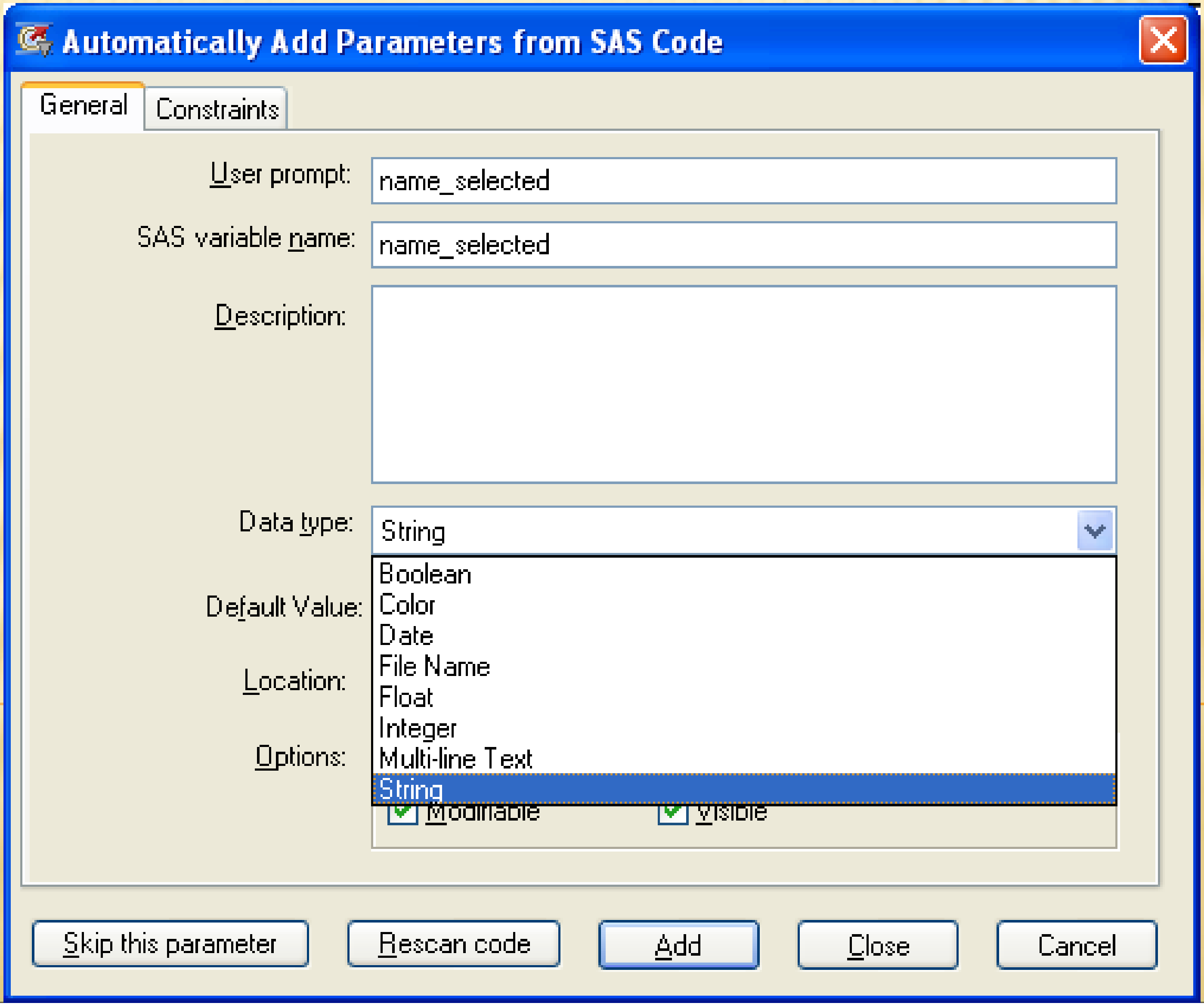
Group or parameter name	Data type	Options	Description
General	n/a	n/a	

Enables you to add a new parameter, parameters from SAS code, or parameters from a task. You can also organize the parameters into groups.

More (F1)...

3 - Use EG to Create and Test SP

Step 5-2: Parameters (The key step to create user interface)



Automatically Add Parameters from SAS Code

User prompt: name_selected

SAS variable name: name_selected

Description:

Data type: String

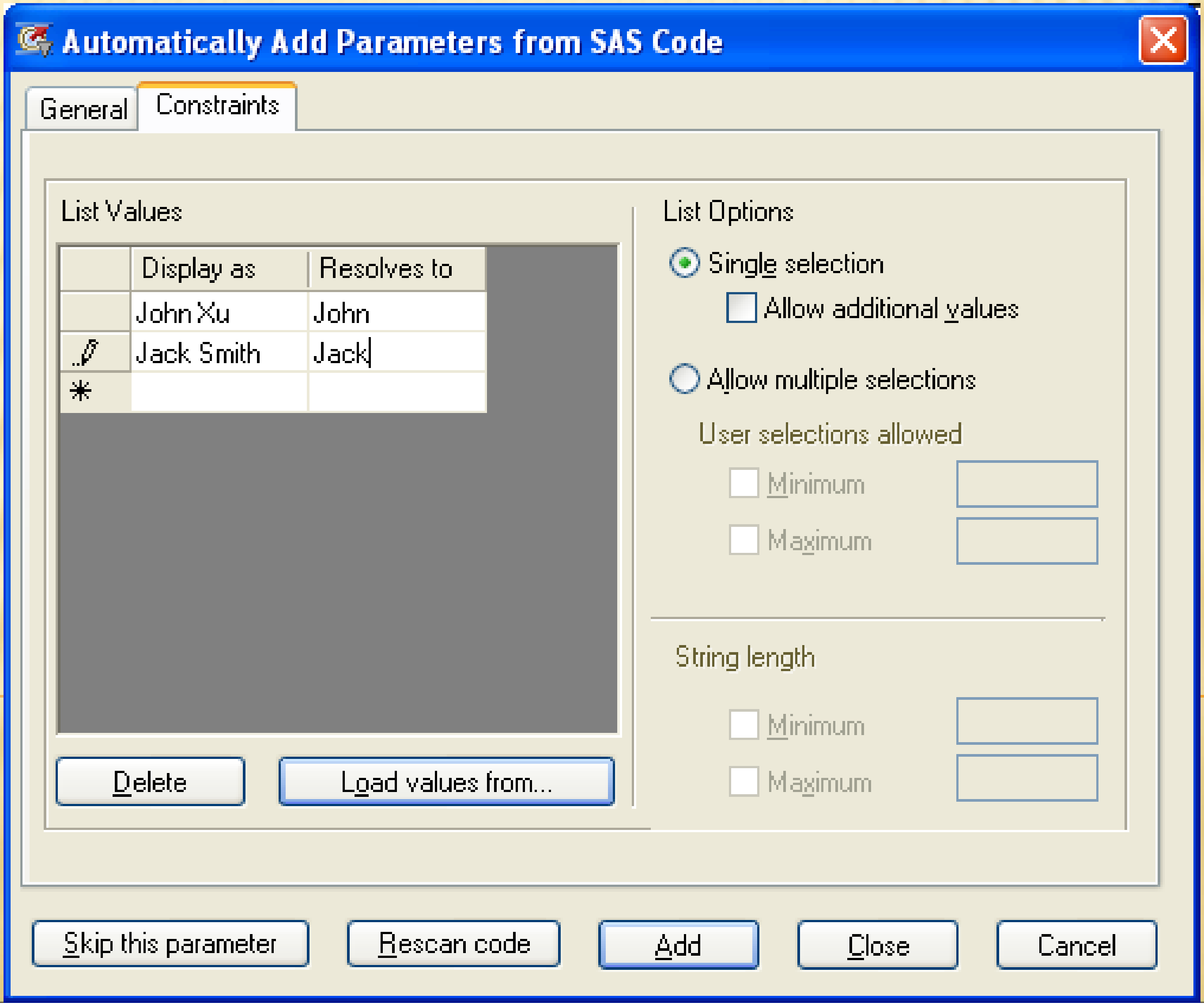
Default Value:

Location:

Options: ☑ Modifiable ☑ Visible

3 - Use EG to Create and Test SP

Step 5-3: Parameters (The key step to create user interface)



Automatically Add Parameters from SAS Code

General | Constraints

List Values

	Display as	Resolves to
	John Xu	John
✎	Jack Smith	Jack
✳		

List Options

● Single selection

□ Allow additional values

○ Allow multiple selections

User selections allowed

□ Minimum

□ Maximum

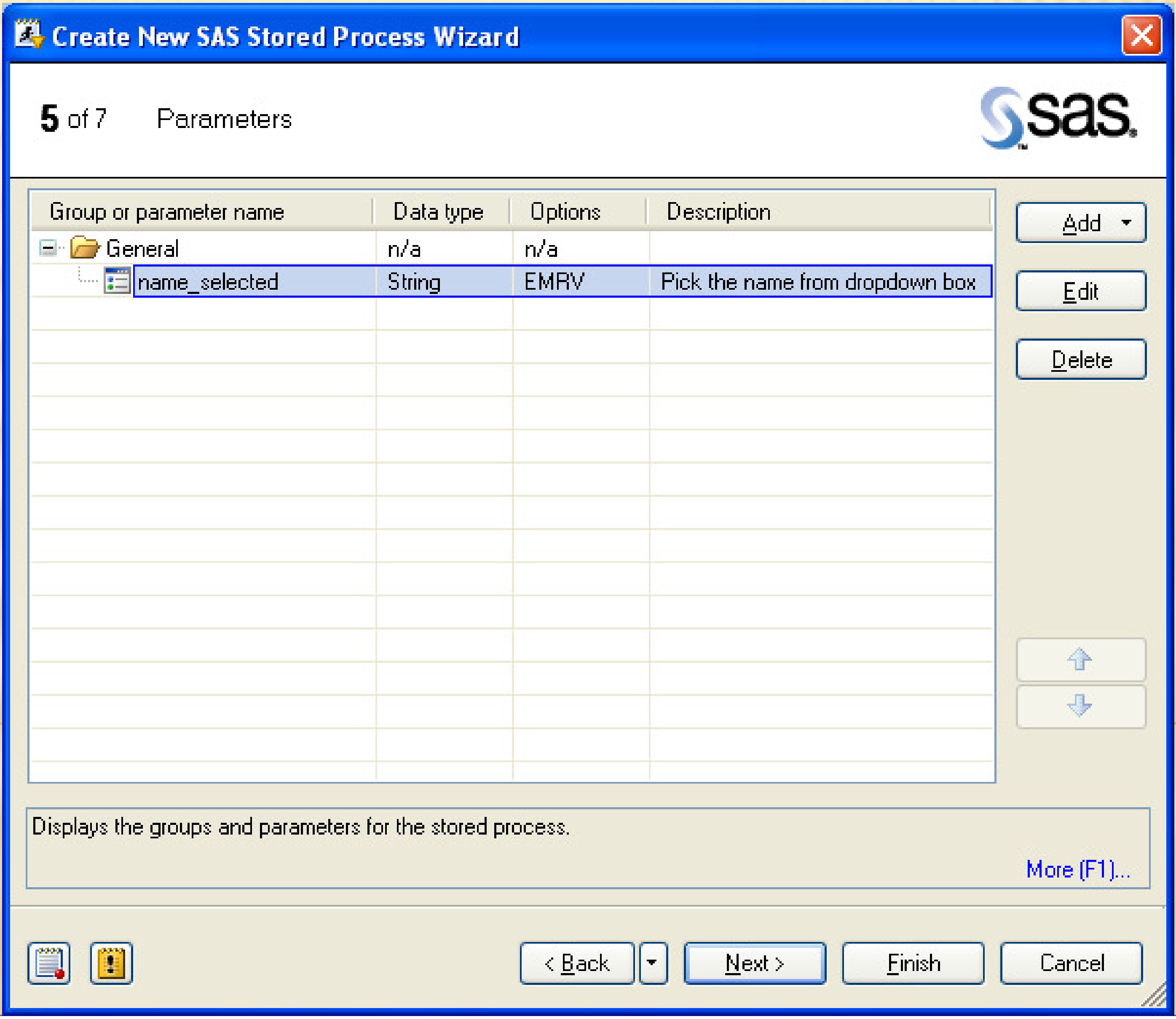
String length

□ Minimum

□ Maximum

3 - Use EG to Create and Test SP

Step 5-4: Parameters (The key step to create user interface)

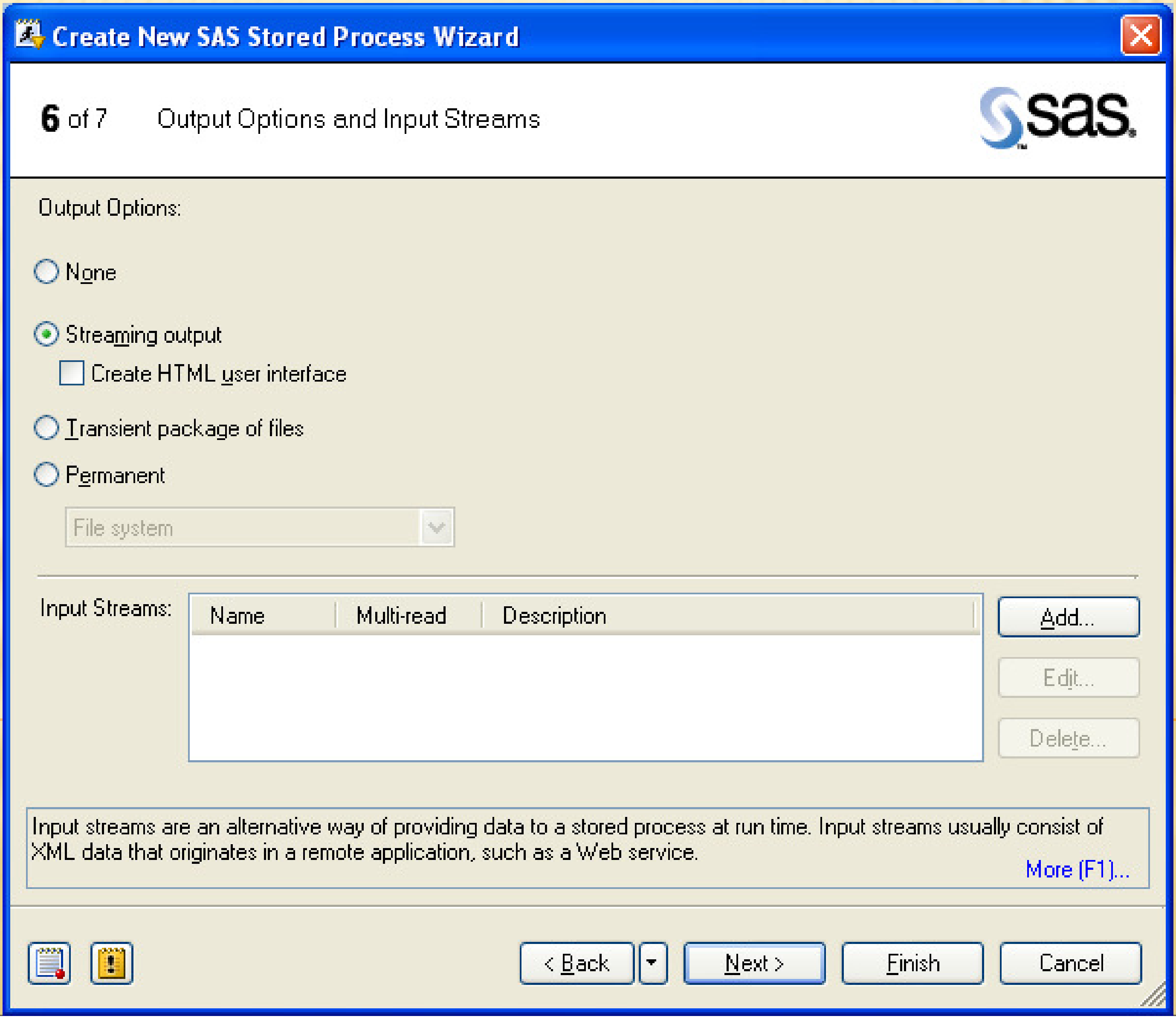


Group or parameter name	Data type	Options	Description
General	n/a	n/a	
name_selected	String	EMRV	Pick the name from dropdown box

Displays the groups and parameters for the stored process.

3 - Use EG to Create and Test SP

Step 6: Output Options and Input Streams (default)



6 of 7 Output Options and Input Streams

Output Options:

○ None

● Streaming output

□ Create HTML user interface

○ Transient package of files

○ Permanent

File system

Input Streams:

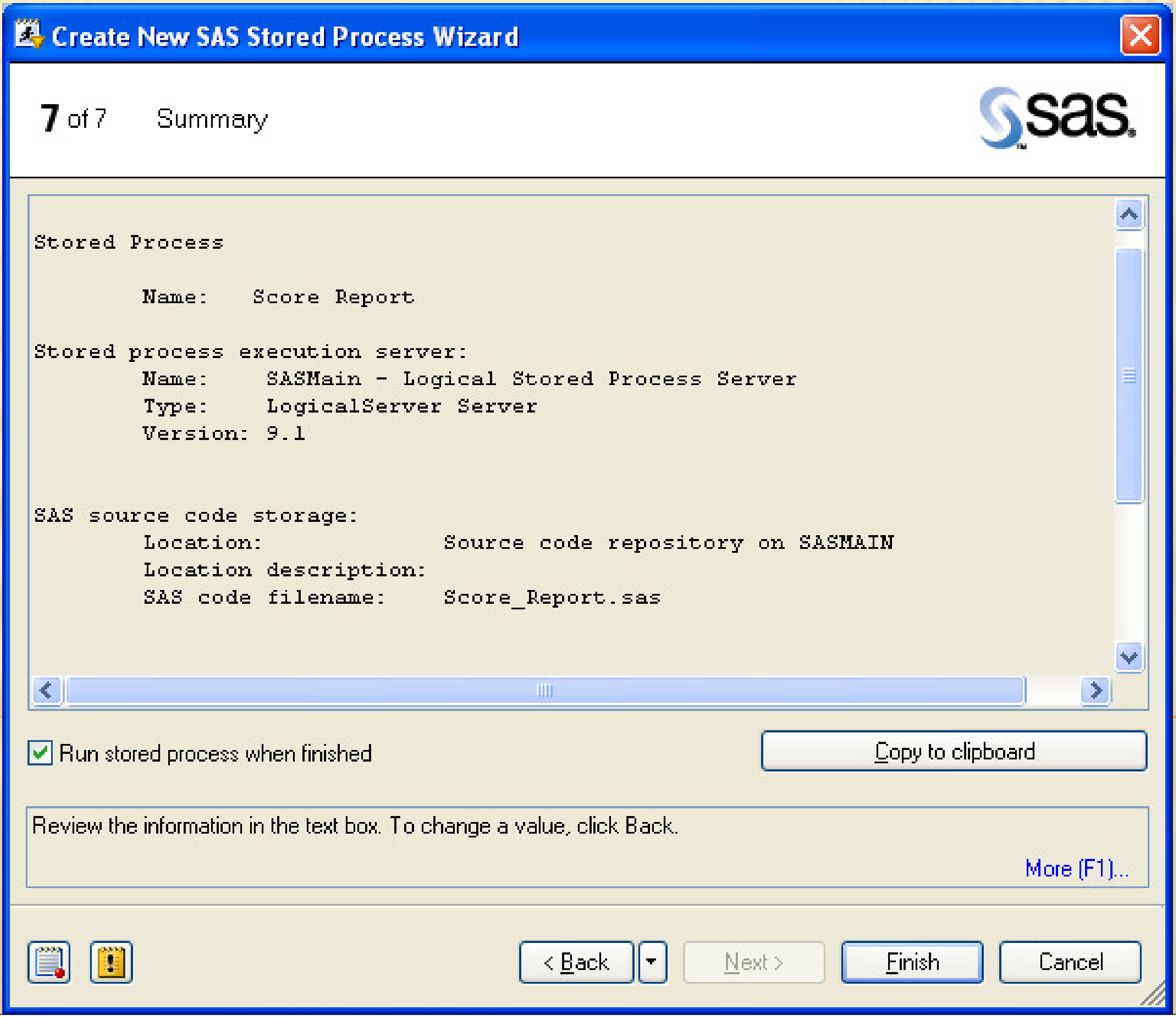
Name	Multi-read	Description

Input streams are an alternative way of providing data to a stored process at run time. Input streams usually consist of XML data that originates in a remote application, such as a Web service.

More (F1)...

3 - Use EG to Create and Test SP

Step 7: Summary (default)

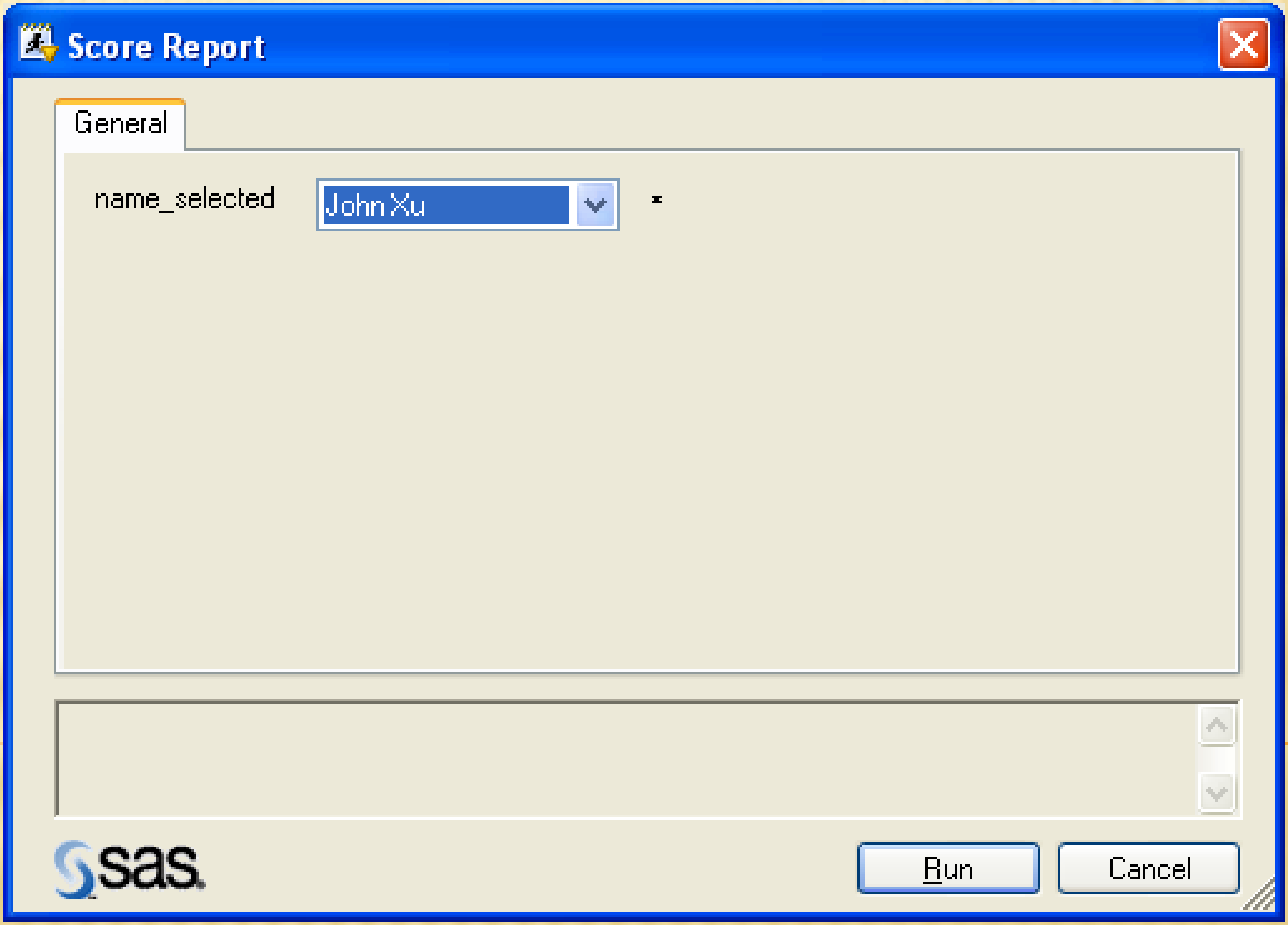


```
Stored Process

        Name:   Score Report

Stored process execution server:
        Name:    SASMain - Logical Stored Process Server
        Type:    LogicalServer Server
        Version: 9.1


SAS source code storage:
        Location:             Source code repository on SASMAIN
        Location description:
        SAS code filename:    Score_Report.sas
```

☑ Run stored process when finished

Review the information in the text box. To change a value, click Back.

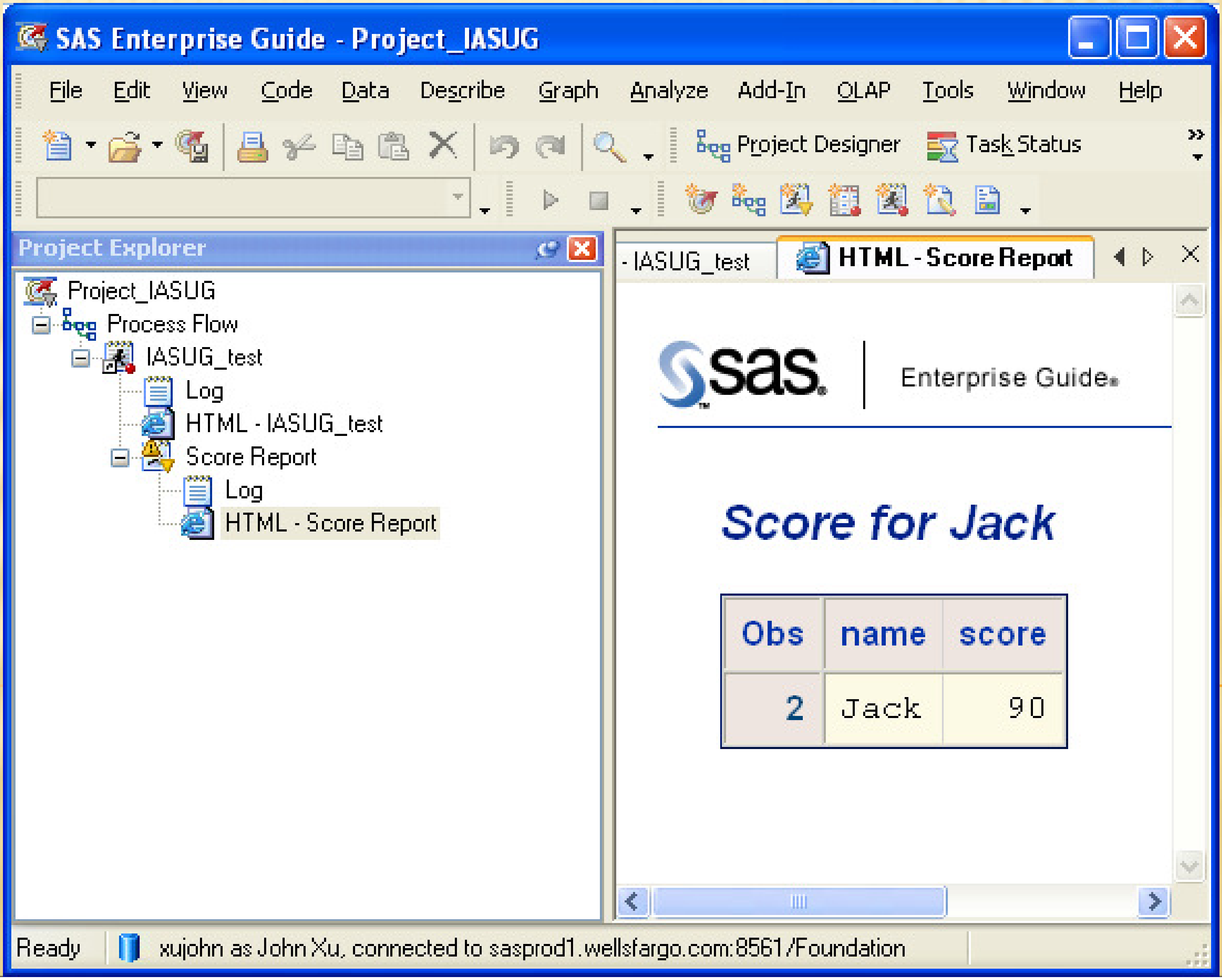
4 - Stored Process in Enterprise Guide (UI)



name_selected: John Xu *

4 - Stored Process in Enterprise Guide (UI)

Stored Process in Enterprise Guide (Output)



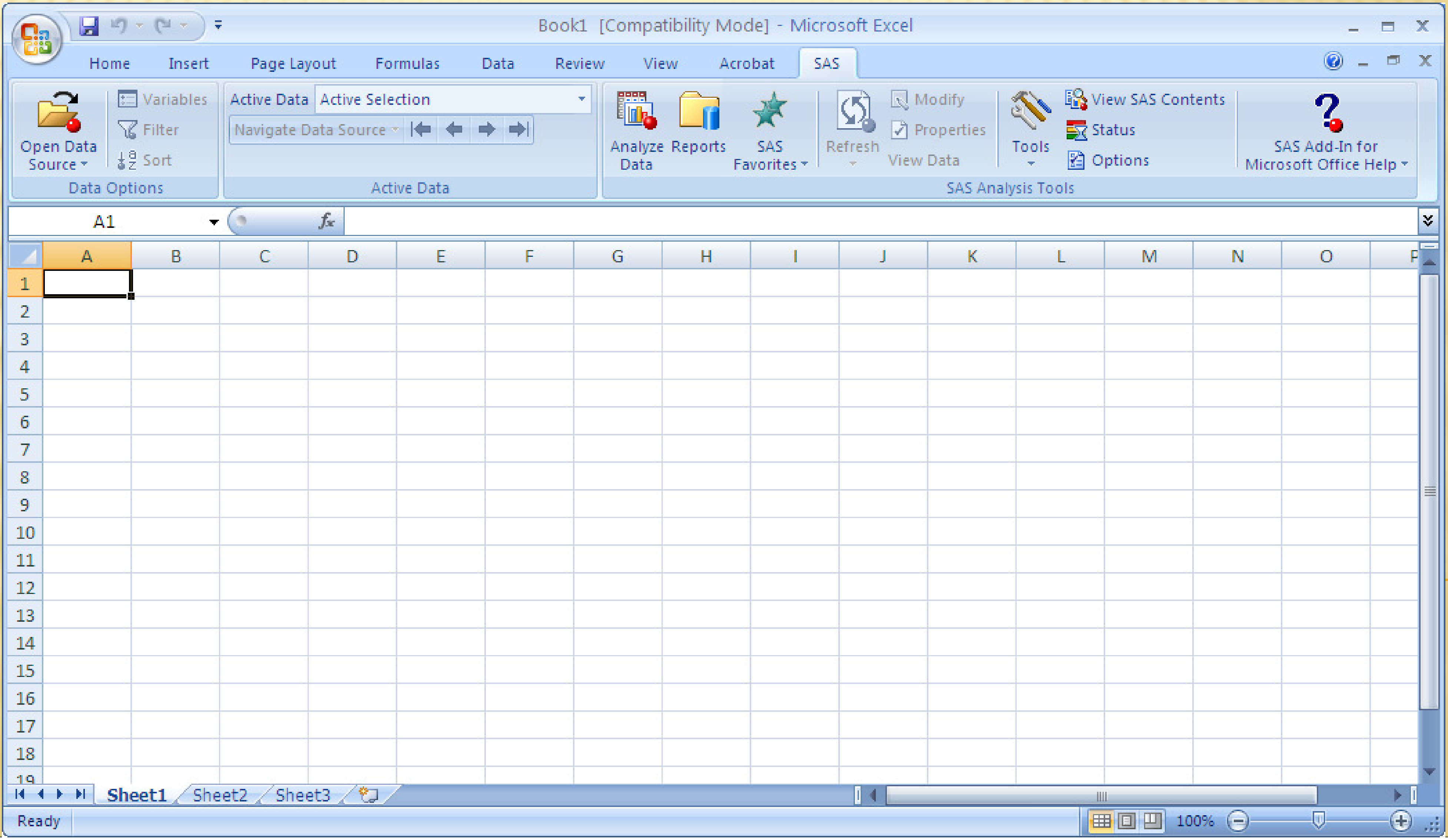
Score for Jack

Obs	name	score
2	Jack	90

xujohn as John Xu, connected to sasprod1.wellsfargo.com:8561/Foundation

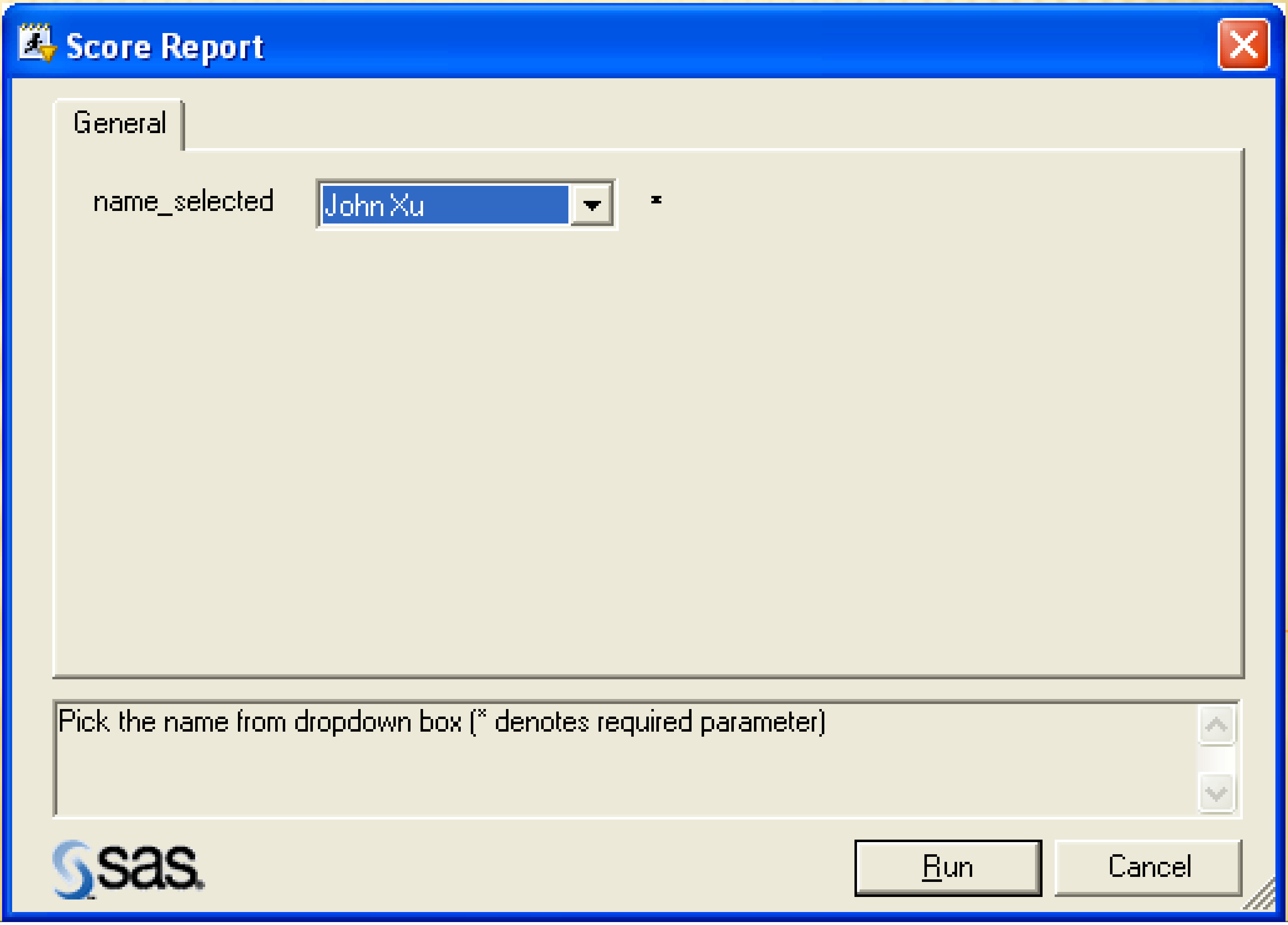
4 – Use Stored Process in MS Excel

Stored Process in MS Excel (Requires SAS Add-in for MS Office)



4 – Use Stored Process in MS Excel

Stored Process in MS Excel (Requires SAS Add-in for MS Office)

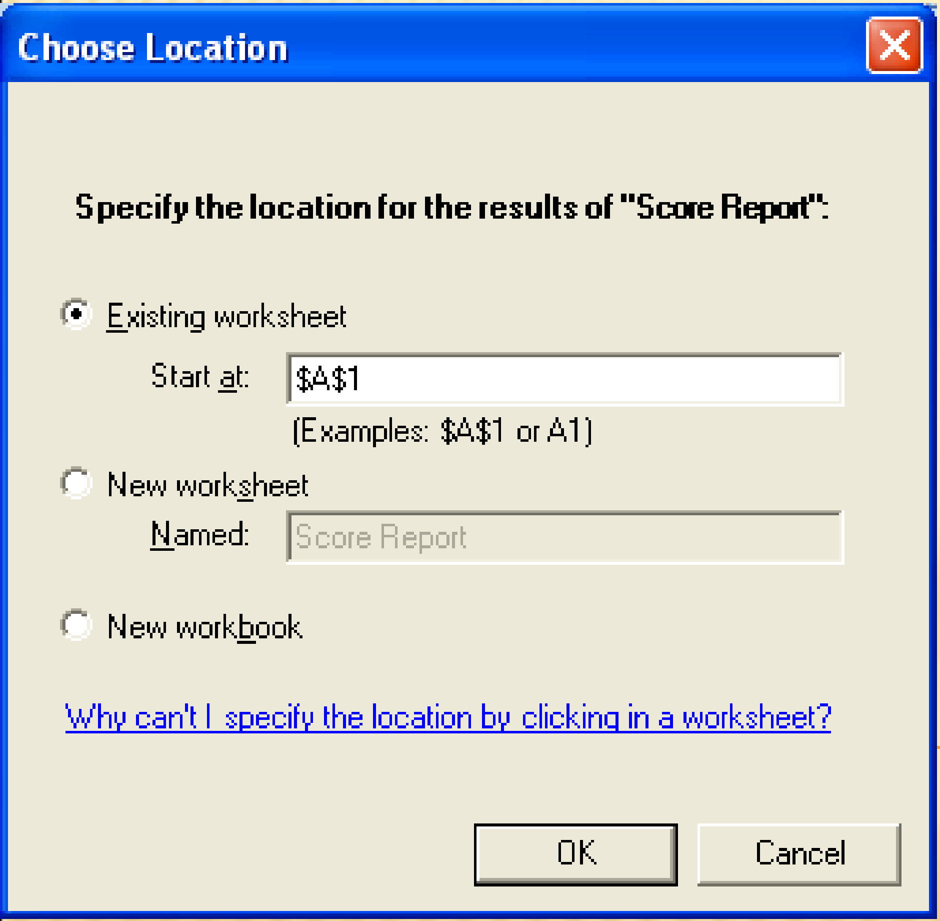


name_selected John Xu *

Pick the name from dropdown box (* denotes required parameter)

4 – Use Stored Process in MS Excel

Stored Process in MS Excel (Requires SAS Add-in for MS Office)



Choose Location

Specify the location for the results of "Score Report":

● Existing worksheet

Start at: A1

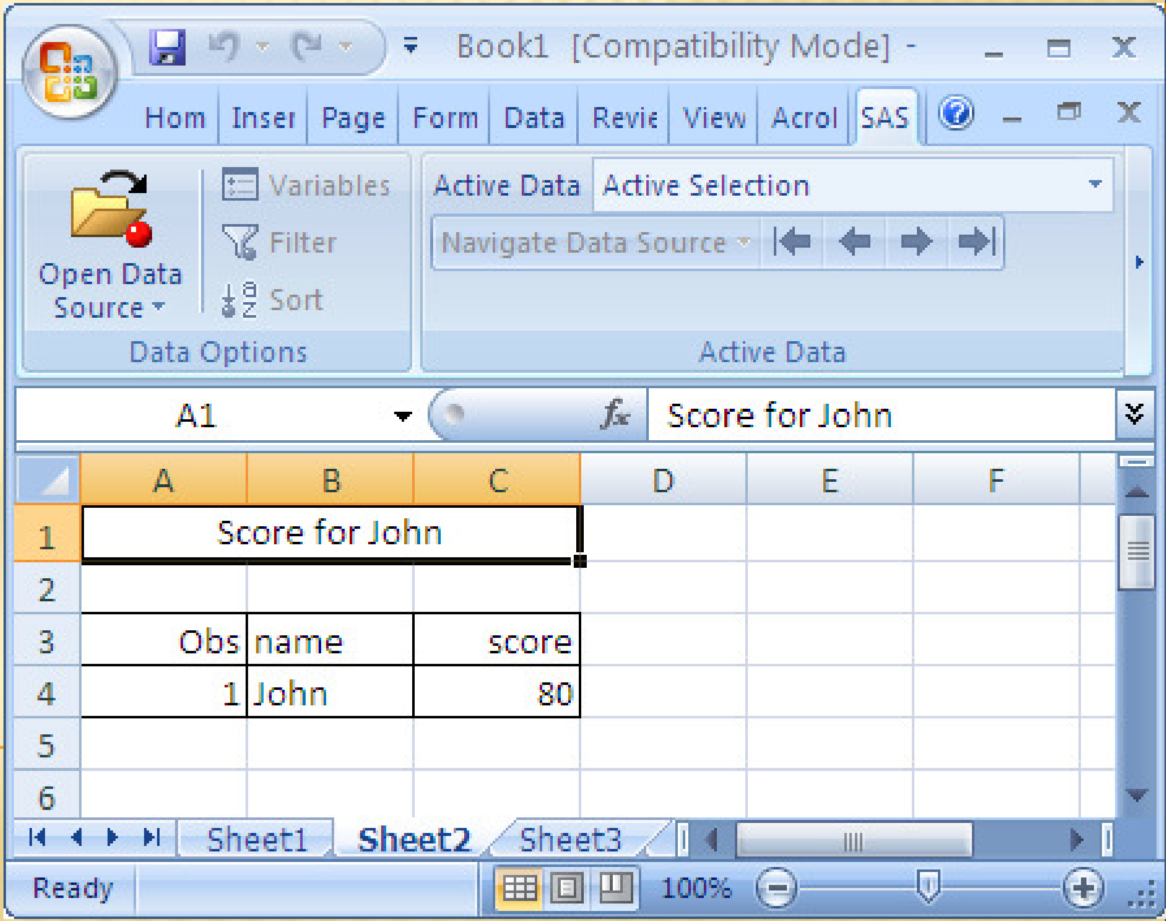
(Examples: A1 or A1)

○ New worksheet

Named: Score Report

○ New workbook

Why can't I specify the location by clicking in a worksheet?



A1 | fx | Score for John

	A	B	C	D	E	F
1	Score for John					
2						
3	Obs	name	score			
4	1	John	80			
5						
6						

Part II: Development Issues & Solution

Requirements:

- User level security
- Avoid duplicate requests
- Big job handling
- Need for a job queue
- Limited the total number of the jobs.
- Allow High Priority job
- Allow Nightly job
- Surpport Development/Testing/UAT/Production.

Design: Application in 3 Parts

(1) Stored process for application parameter creation. Collect user inputs, validate it and save it to a SAS dataset on server. A parameter Report is generated for user review.

(2) A Stored process to submit job or check job status.

(3) A KSH program on server that running on the background. It will wake up once per minute (Or at any desired time interval) to check if there is any new job in the queue.

Design: Development Life Cycle Support

(1) Data is saved in the common directory.

(2) Directories for Development, Testing, UAT, and Production are created to store corresponding SAS codes.

(3) Stored Process GUI provides selection of Development, Testing, UAT, and Production by end user.

(4) User access is controlled by a SAS data set on the server. If user does not have proper access right, it is defaulted to Production.

Sample KSH Code

```
while true
do
   dat=$(date +"%Y-%m-%d:%H:%M")
   hour=`date +"%H"`
   hour=$(( $hour - $night_start ))
   if  [[ $hour -le 0 ]]; then
      hour=$(( $hour + 24  ))
   fi

   if [[ -r $lckfile ]]; then

     job_count=`ps -ef |grep "title XXXXXX__ui" |wc -l`
     job_count=$(( job_count-1 ))
```

Sample KSH code

```
if [[ $job_count -ge $maxjob ]]; then
    echo  "There are $job_count XXXXXX jobs running. Server
busy at $dat."
   else
    job_id=`cat $lckfile`
    echo "Starting XXXXXX Job at $dat for job_id=$job_id   ....."
    sas $proj_dir/code/hz_main.sas -title XXXXXX__ui \
     -log $proj_dir/work/hz_main.log -set job_id $job_id  &
   fi
 else
   echo "No Horizon job to run at $dat"
 fi

 sleep 60
done
```

Questions?

Contact Information:

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Thanks!