SAS GRID MANAGER FANS 08.09.2016

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What is SAS Grid

WHAT IS GRID?

- A SAS grid computing environment is one in which SAS computing tasks are distributed among multiple computers on a network, all under the control of SAS Grid Manager.

SAS® GRID MANAGER

KEY CAPABILITIES

Workload Management

- Provides job, host & user management
- Prioritize & schedule jobs using rules-based queues
- Identify, allocate and manage resources

High Availability

- Detect grid failure and recovers automatically
- Automatic restart of jobs from last successful checkpoint.

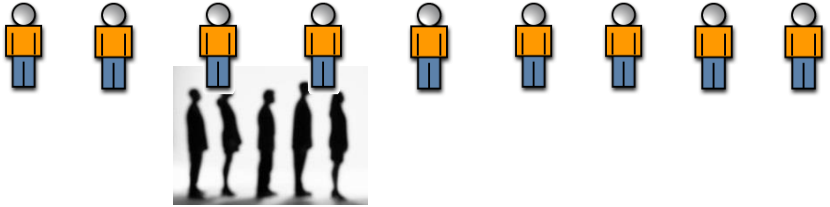
Performance

- Increase throughput of all SAS jobs
- Jobs are divided into subtasks for parallel execution
- Integrate and analyze large volumes of data

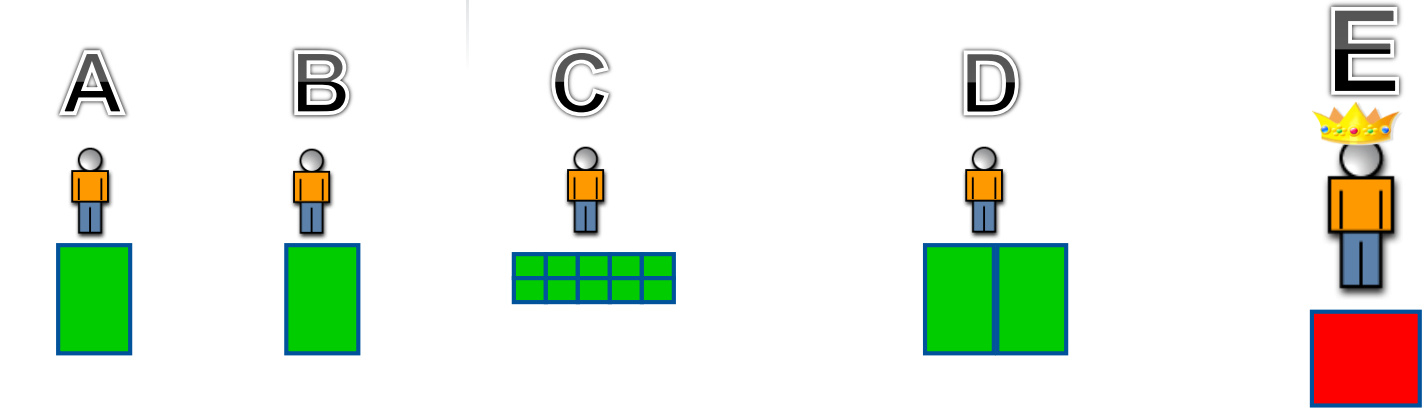
Grid-Enabled SAS Products and Solutions

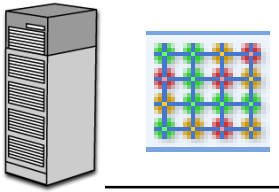
SAS

SAS with SAS Grid Manager

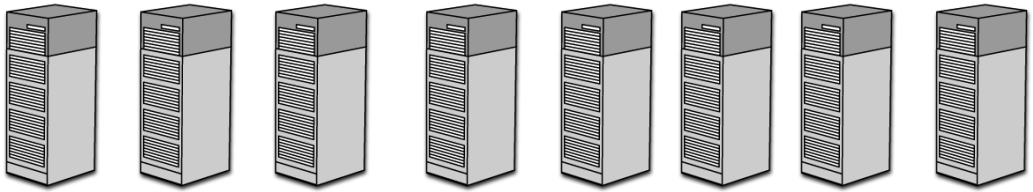


WHAT IS GRID? HIGH-LEVEL OVERVIEW





SAS Grid Manager
Control Server



SAS Grid Manager
Nodes

SAS® GRID MANAGER

MULTIPLE WAYS TO LEVERAGE GRID

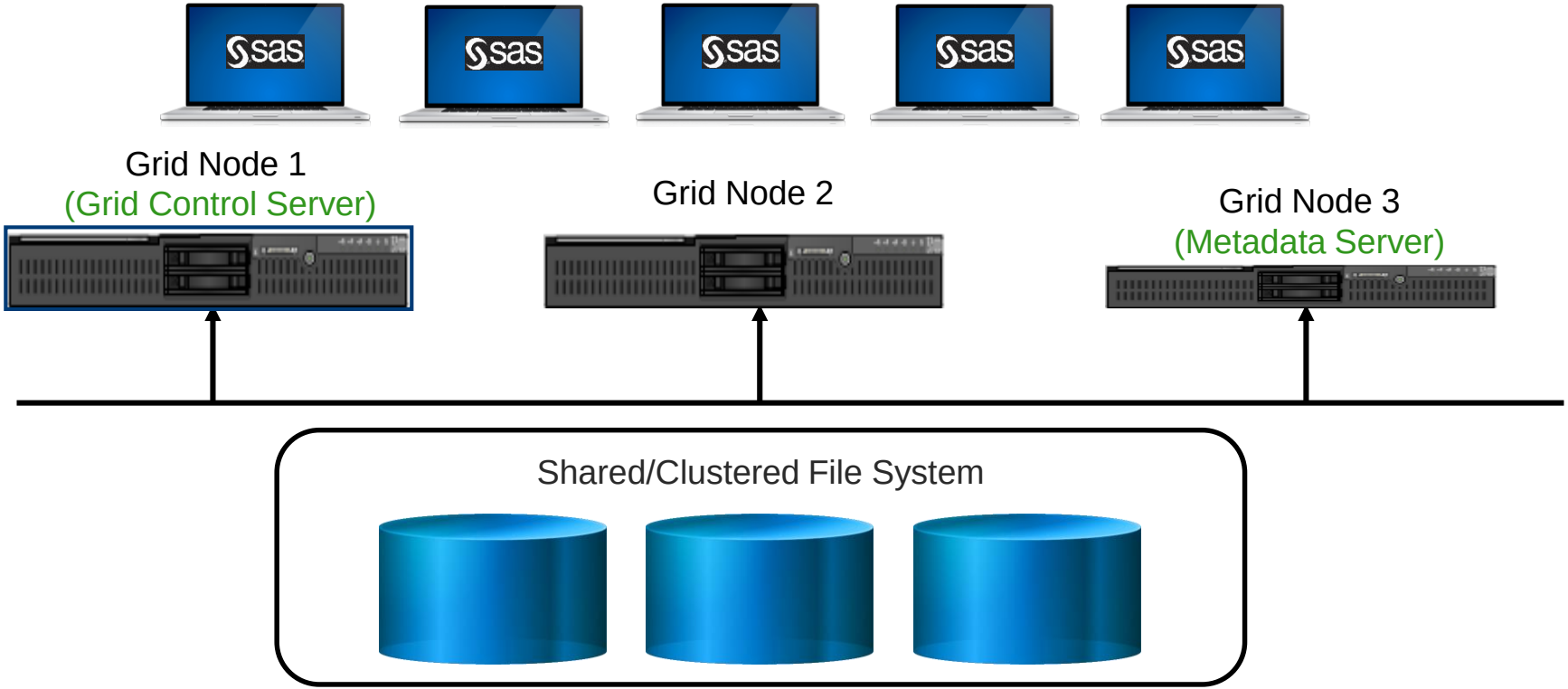
Products	Workload Management	Enterprise Scheduling	Parallelized Processing
Any SAS programs	✓	✓	✓
SAS Data Integration	✓	✓	✓
SAS Web Report Studio		✓	
SAS Marketing Automation		✓	
SAS Marketing Optimization		✓	
SAS Enterprise Miner	✓		✓
SAS Enterprise Guide	✓		✓
SAS Add-in for Microsoft Office	✓		✓
SAS Workspace Server	✓		
SAS Stored Process Server	✓		
SAS OLAP Server	✓		
SAS Stored Processes	✓		✓
SAS Risk Dimensions			✓
JMP Genomics			✓
SAS Demand Forecasting for Retail			✓
SAS for Customer Experience Analytics		✓	

All SAS Solutions

SAS Grid Architecture

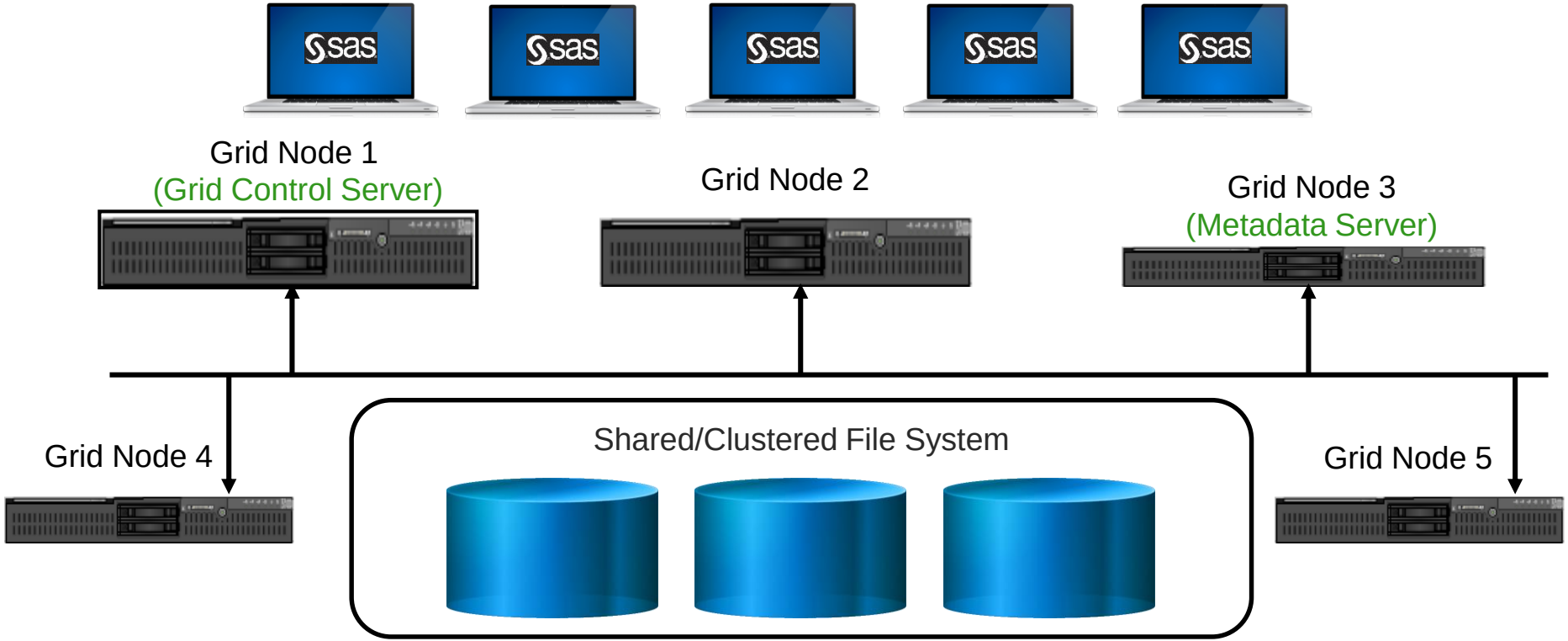
GRID ARCHITECTURE

ARCHITECTURE – CONCEPTUAL VIEW



GRID ARCHITECTURE

ARCHITECTURE – CONCEPTUAL VIEW



GRID ARCHITECTURE

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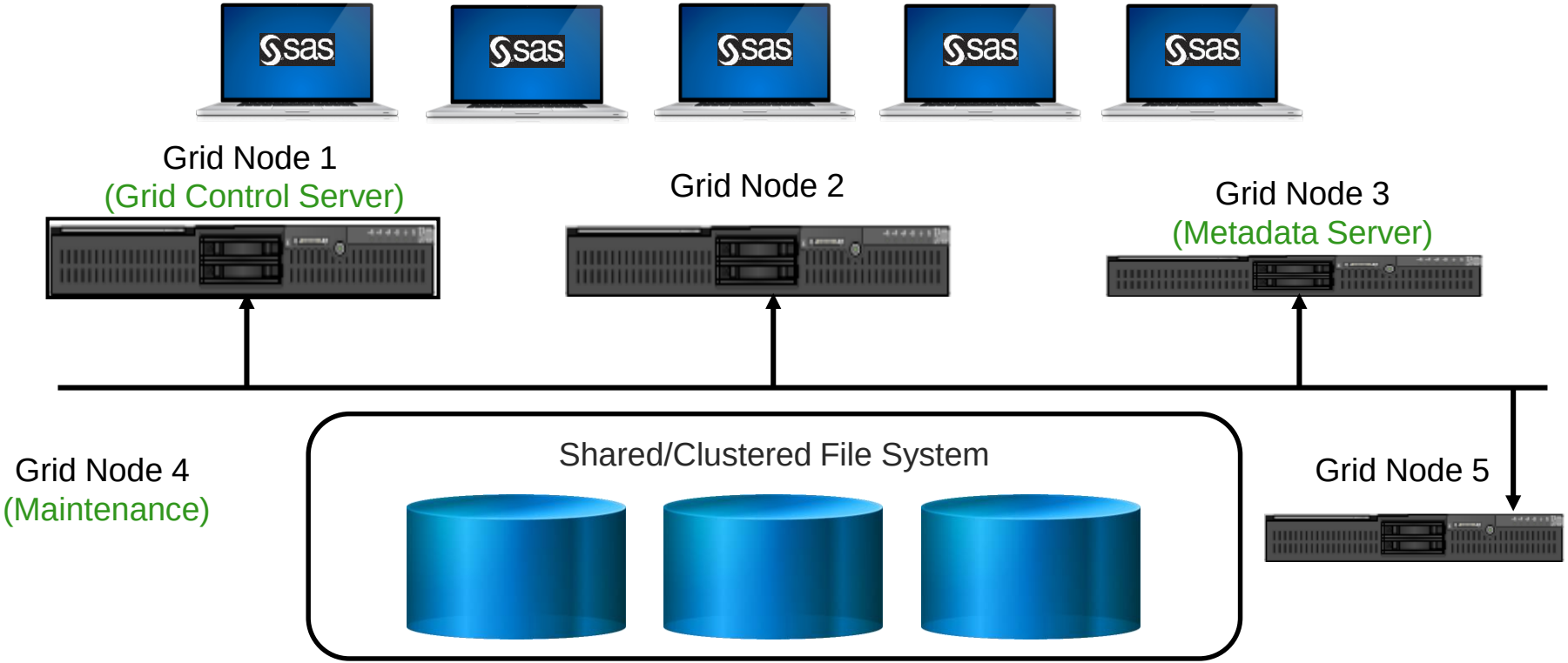


SAS® GRID MANAGER

WORKLOAD MANAGEMENT

Queuing for load balancing

Normal Queue

High Priority Queue

Overnight Queue

Testing Queue

Development Queue

Job slots to match capability

10 concurrent jobs

10 concurrent jobs

3 concurrent jobs

Utilization Thresholds

CPU < 80%
Mem < 90%

CPU < 75%
I/O < 75%

CPU < 50%
Mem < 75%
I/O < 80%

Advanced job scheduling

When file ABCD becomes available launch the reconciliation process

Execute the process on the first of each month starting at 10PM

When process XXXX complete successfully, launch process YYYY

How to run SAS code on the Grid

Base SAS

SAS Management Console

SAS Enterprise Guide

SAS Enterprise Miner

SAS Data Integration Studio

Batch Submission

INCREASED PERFORMANCE

Original Code

```
libname bin '/sasdata/sasss1/saslibrary';
title 'K';
proc means data=bin.large(where=(class='K'));
run;
```

```
title 'B';
proc means data=bin.large(where=(class='B'));
run;
```

```
title 'A';
proc means data=bin.large(where=(class='A'));
run;
```

```
title 'LARGE';
proc means data=bin.LARGE;
run;
```

INCREASED PERFORMANCE

Re-engineered code to run sections of code in parallel

```
options metaserver='precious';
options metaport=8561;
options metauser=sasss1;
options metapass='{SAS002}8791C14621D066064A494262536F57B7';

%let sasappsvr=SASAppGrid;

%let jovar=queue=priority;

%let gerc=%sysfunc(grdsvc_enable(_all_,resource=&sasappsvr;jobopts=jovar));
%put;%put Grid enable return code=&gerc (0 indicates grid was enabled);

%let nnodes=%sysfunc(grdsvc_nnodes(resource=&sasappsvr));

%put;%put Number of grid nodes=&nnodes;

signon grid1;
rsubmit grid1 wait=no;
libname bin '/sasdata/sasss1/saslibrary';
title 'K';
proc means data=bin.large(where=(class='K'));
run;
endrsubmit;
```

INCREASED PERFORMANCE

Re-engineered code to run sections of code in parallel

```
signon grid8;
rsubmit grid8 wait=no;
libname bin '/sasdata/sasss1/saslibrary';
title 'LARGE';
proc freq data=bin.large;
   table class;
run;
endrsubmit;
```

```
waitfor grid1 grid2 grid3 grid4 grid5 grid6 grid7 grid8;
rget grid1;
rget grid2;
rget grid3;
rget grid4;
rget grid5;
rget grid6;
rget grid7;
rget grid8;

signoff grid1;
signoff grid2;
signoff grid3;
signoff grid4;
signoff grid5;
signoff grid6;
signoff grid7;
signoff grid8;
```

INCREASED PERFORMANCE

Re-engineered code to run sections of code in parallel

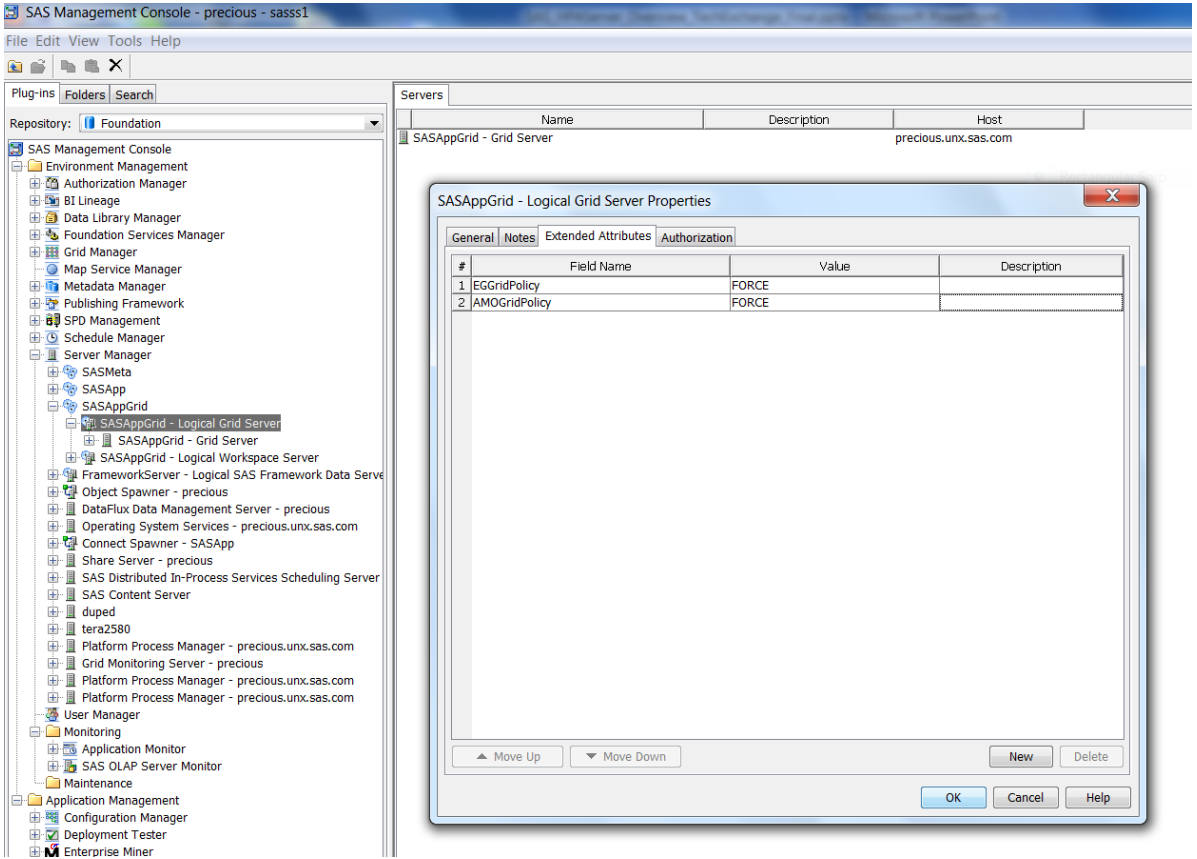
90% improvement in Run Time

```
NOTE: SAS Institute Inc., SAS Campus Drive, Cary, NC USA 27513-2414
NOTE: The SAS System used:
      real time           9:18.20
      cpu time            4:06.20
```

```
NOTE: Remote signoff from GRID8 complete.
NOTE: SAS Institute Inc., SAS Campus Drive, Cary, NC USA 27513-2414
NOTE: The SAS System used:
      real time           54.70 seconds
      cpu time            0.47 seconds
```

HOW TO RUN SAS CODE ON THE SAS GRID

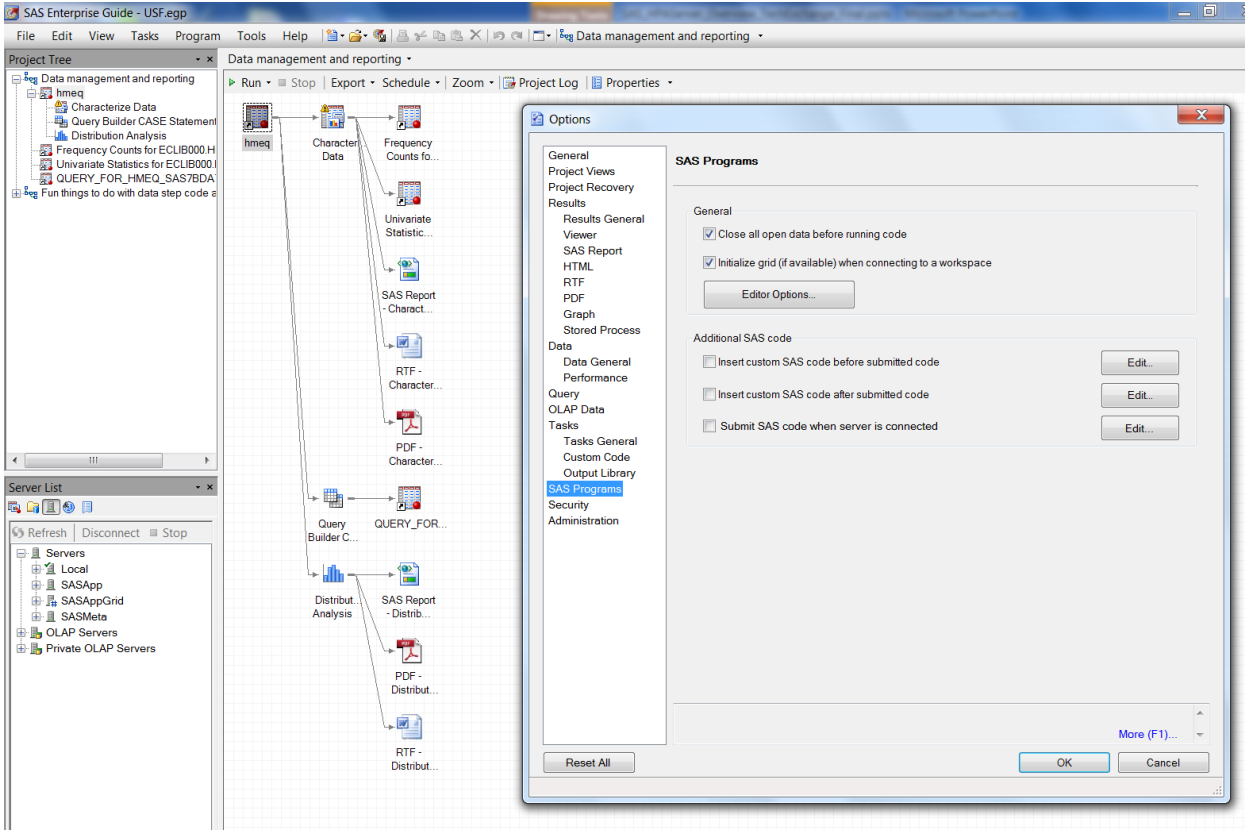
SAS® Management Console – SAS® Enterprise Guide and SAS® Add-in for Microsoft Office Setup



SAS® GRID MANAGER

HOW TO RUN SAS CODE ON THE SAS GRID

SAS® Enterprise Guide



SAS® GRID MANAGER

HOW TO RUN SAS CODE ON THE SAS GRID

SAS® Enterprise Guide

SAS Enterprise Guide - SASGrid.egp

File Edit View Tasks Program Tools Help Process Flow

Project Tree

- Process Flow
  - Programs
    - norsubmit
    - norsubmit_GridEnabled
    - norsubmit_GridEnabled_Re_Enginered
    - rsubmit

Process Flow

Run Stop Export Schedule

norsubmit → SAS Report - norsubm...

norsubmit... → SAS Report - norsubm...

norsubmit... → SAS Report - norsubm...

rsubmit → SAS Report - rsubmit

Server List

Refresh Disconnect Stop

- Servers
  - Local
  - SASApp
  - SASAppGrid
  - SASDI
  - SASEG
    - Libraries
    - Files
  - SASEM
  - SASMeta
- OLAP Servers
- Private OLAP Servers

Properties for SASGrid

Summary
Security
Project Log
Metadata
File References
Output Data Sets
Code Submission

Code Submission

☑ Use grid if available

☑ Allow parallel execution on the same server

More (F1)...

OK Cancel

Task Status

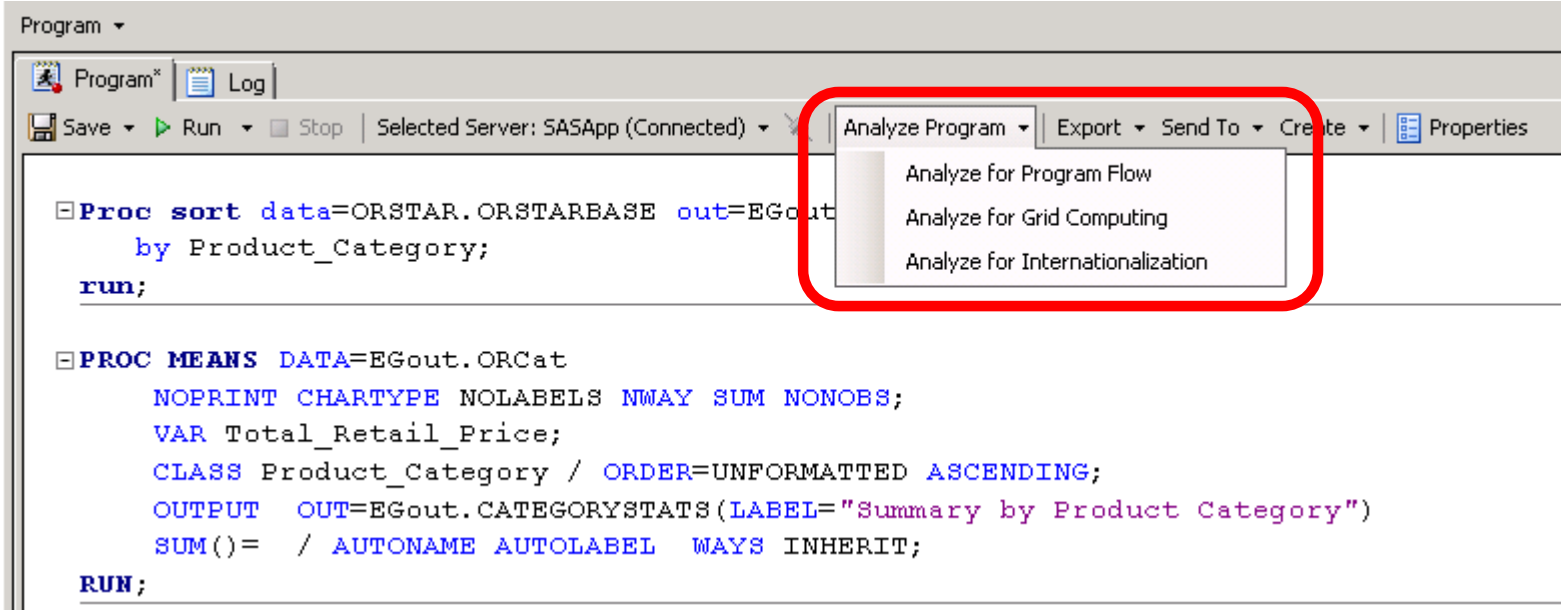
Task	Status	Queue	Server	Server Type
norsubmit	Running...		SASEG	Grid
norsubmit_GridEnabled	Running...		SASEG	Grid
norsubmit_GridEnabled_Re_Enginer...	Running...		SASEG	Grid
rsubmit	Running...		SASEG	Grid

(Details) 1 of 4 running items: norsubmit - Running...

Precious - sasss1

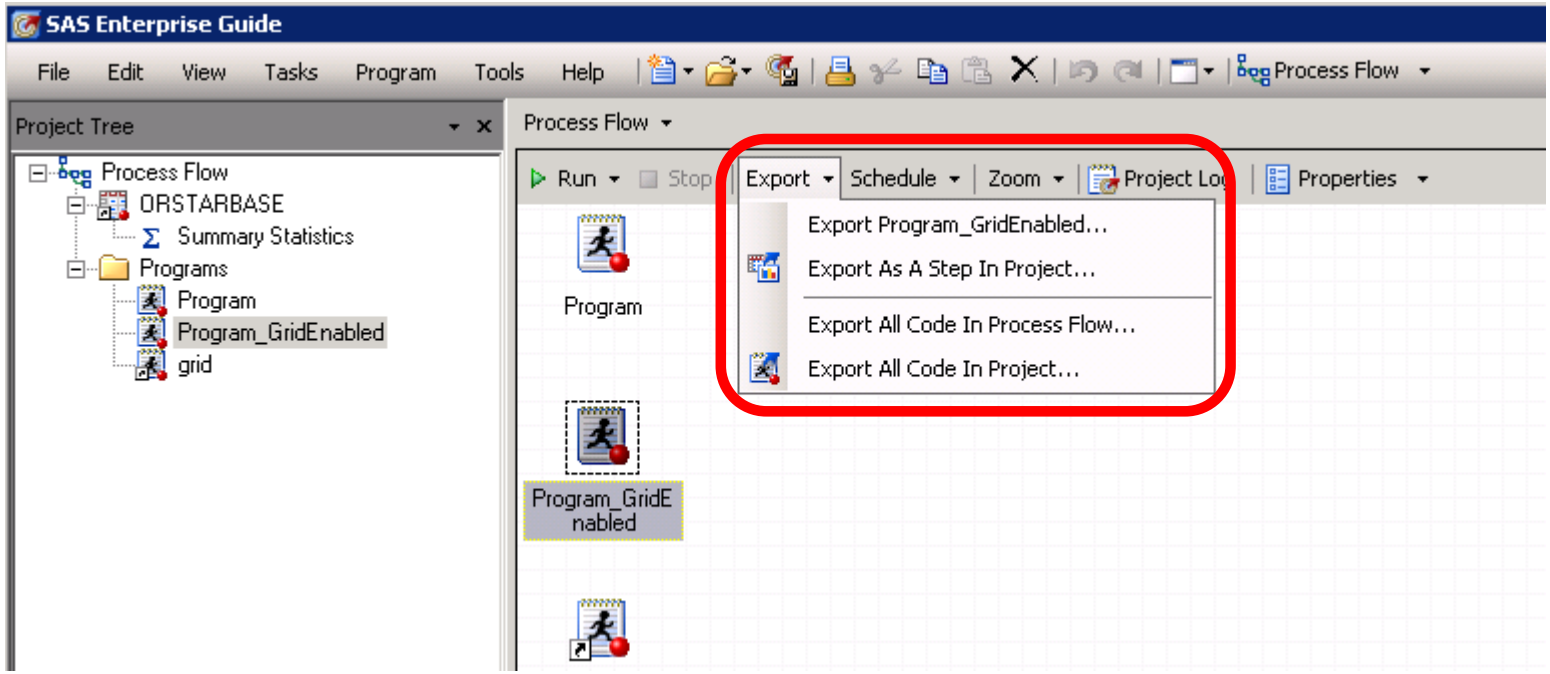
ENTERPRISE GUIDE | ANALYZE LEGACY CODE

- Analyze legacy code to generate Grid enable code



ENTERPRISE GUIDE | EXPORT GRID ENABLE PROGRAM

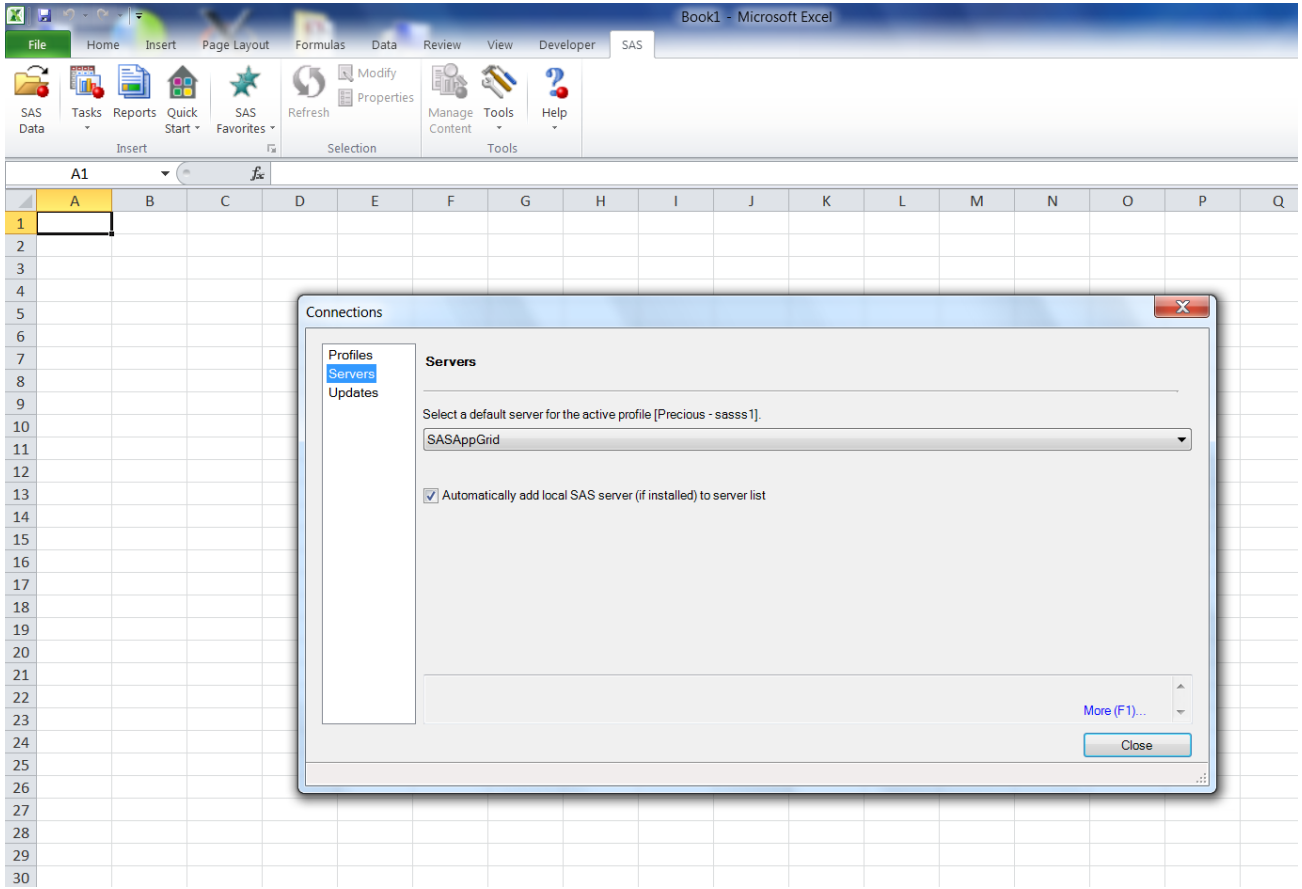
- Option to export grid enable code for batch job execution



SAS® GRID MANAGER

HOW TO RUN SAS CODE ON THE SAS GRID

SAS® Add-in for Microsoft Office



SAS® GRID MANAGER

HOW TO RUN SAS CODE ON THE SAS GRID

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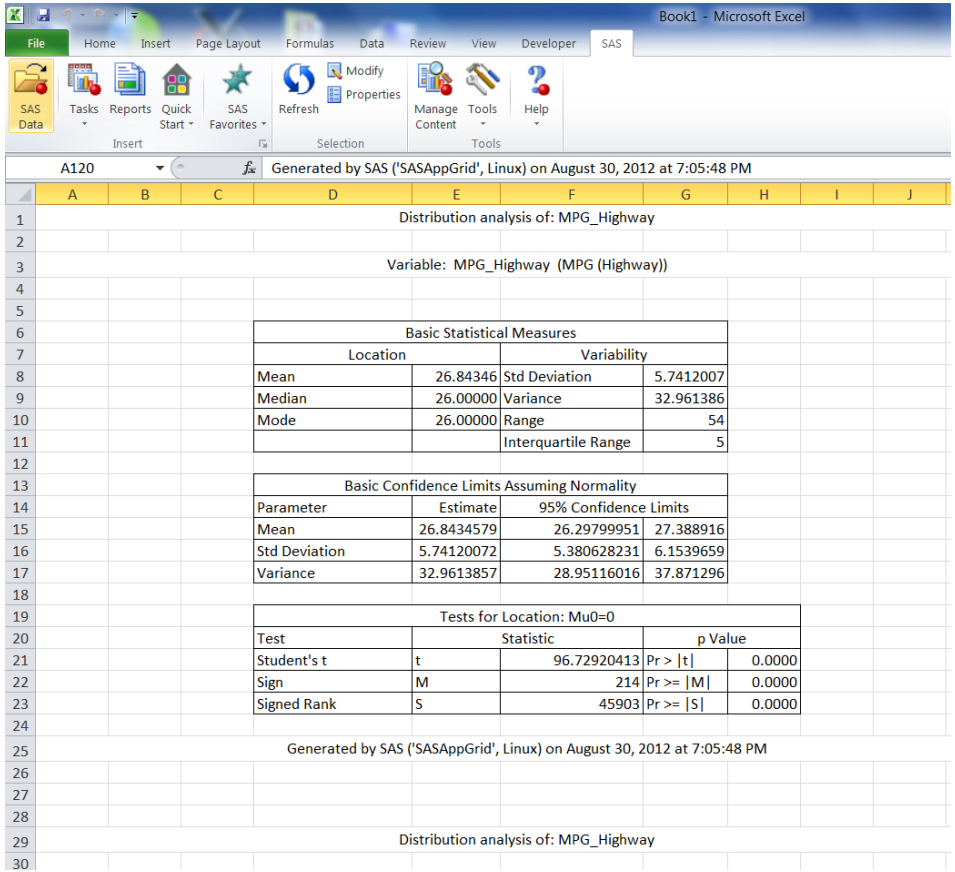


Distribution analysis of: MPG_Highway

Variable: MPG_Highway (MPG (Highway))

Basic Statistical Measures			
Location		Variability	
Mean	26.84346	Std Deviation	5.7412007
Median	26.00000	Variance	32.961386
Mode	26.00000	Range	54
		Interquartile Range	5

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	26.8434579	26.29799951	27.388916
Std Deviation	5.74120072	5.380628231	6.1539659
Variance	32.9613857	28.95116016	37.871296

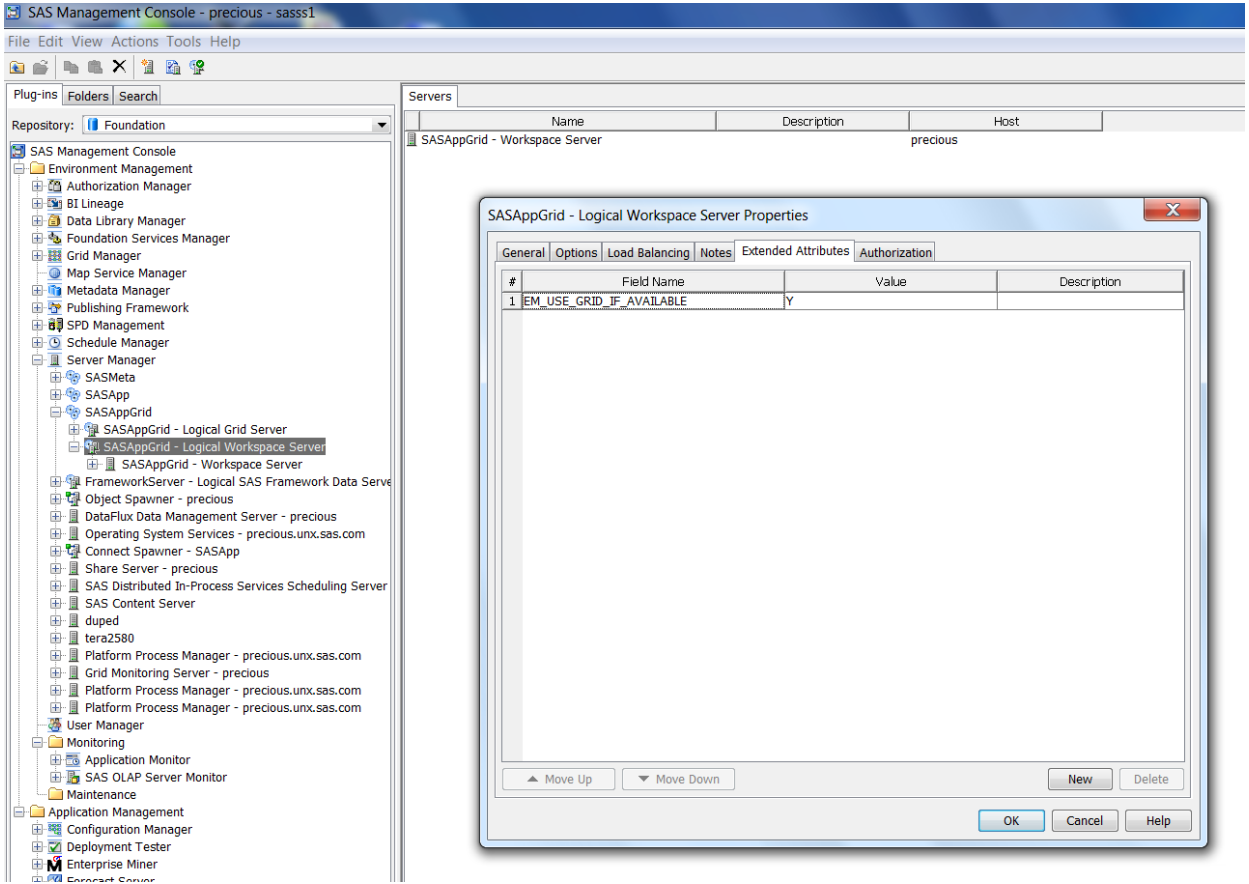
Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	96.72920413	Pr > |t|	0.0000
Sign	M	214	Pr >= |M|	0.0000
Signed Rank	S	45903	Pr >= |S|	0.0000

Generated by SAS ('SASAppGrid', Linux) on August 30, 2012 at 7:05:48 PM

Distribution analysis of: MPG_Highway

HOW TO RUN SAS CODE ON THE SAS GRID

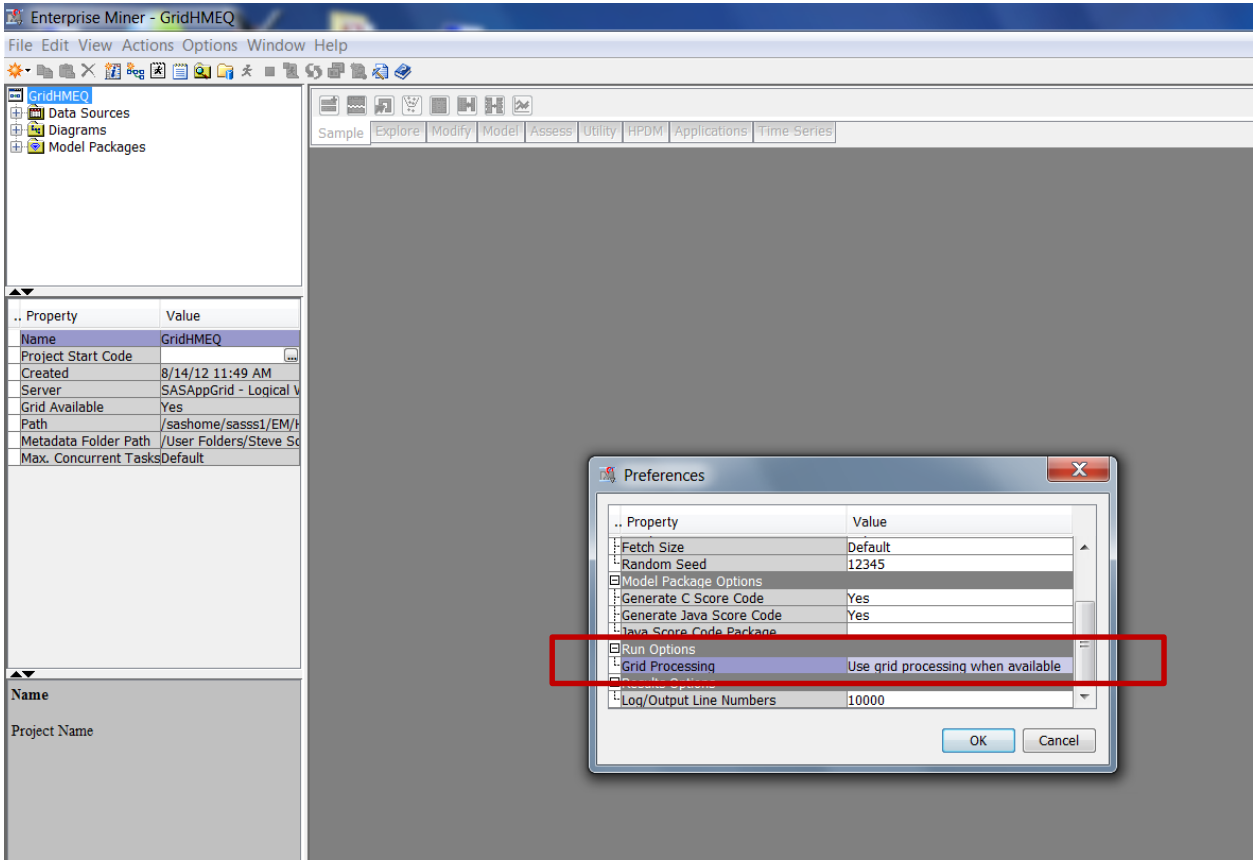
SAS® Management Console – SAS® Enterprise Miner Setup



SAS® GRID MANAGER

HOW TO RUN SAS CODE ON THE SAS GRID

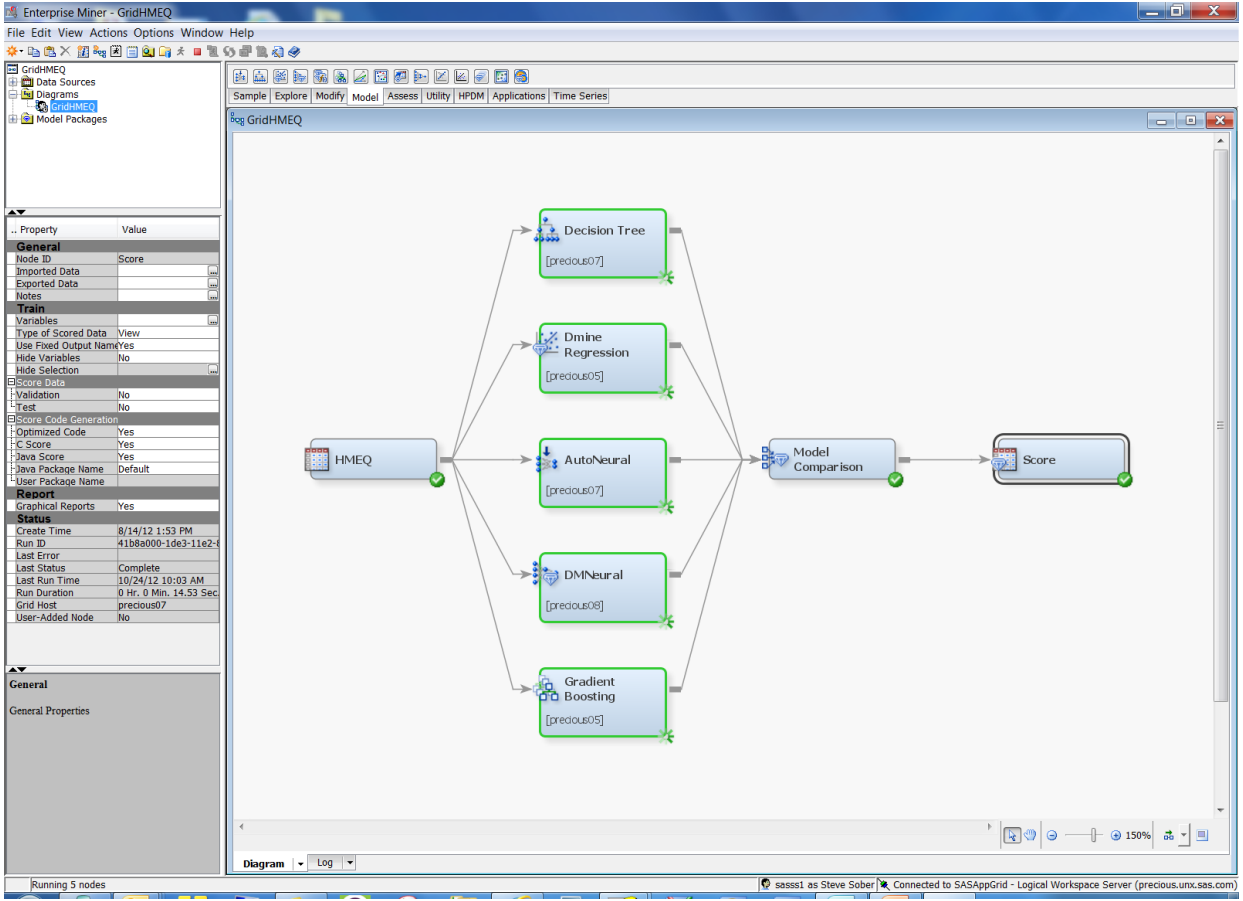
SAS® Enterprise Miner



SAS® GRID MANAGER

HOW TO RUN SAS CODE ON THE SAS GRID

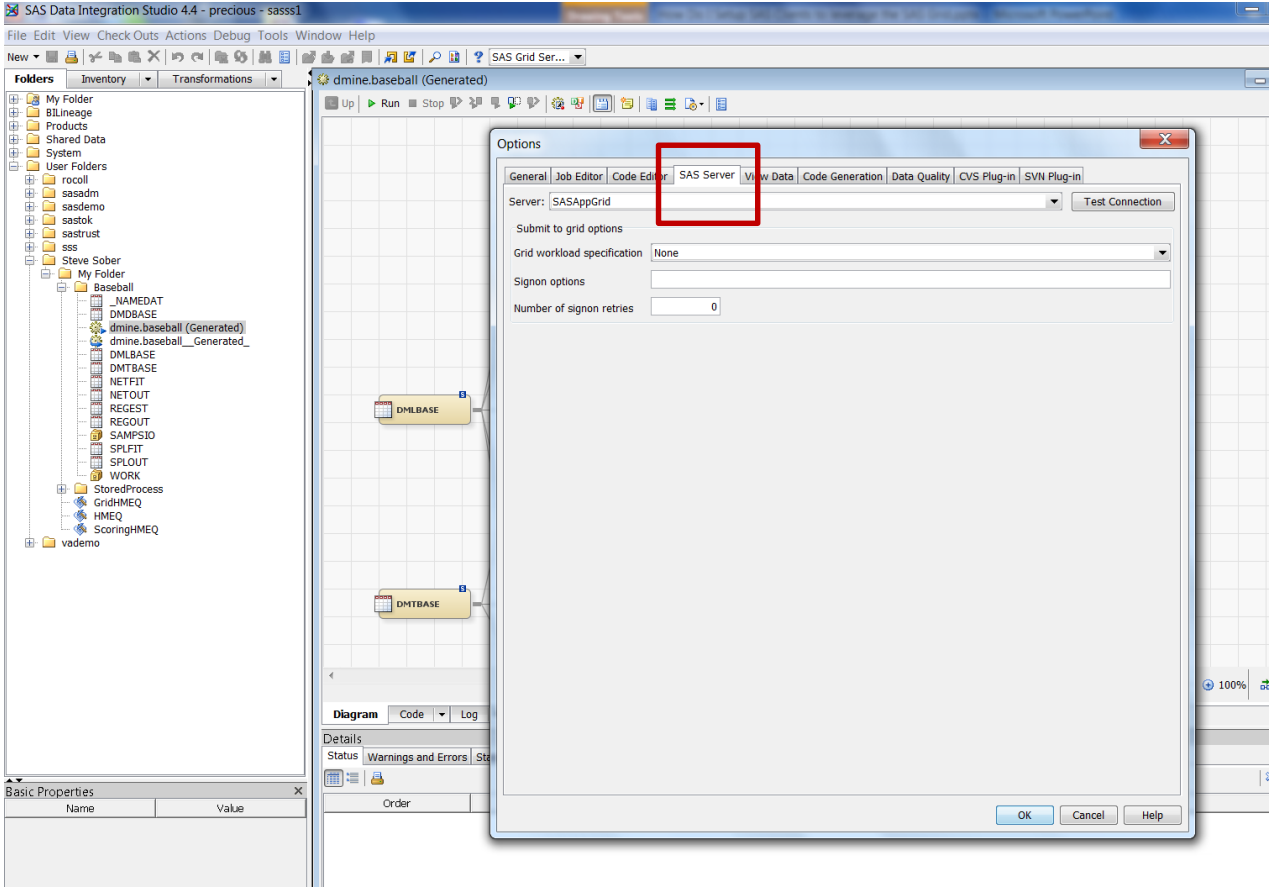
SAS® Enterprise Miner



SAS® GRID MANAGER

HOW TO RUN SAS CODE ON THE SAS GRID

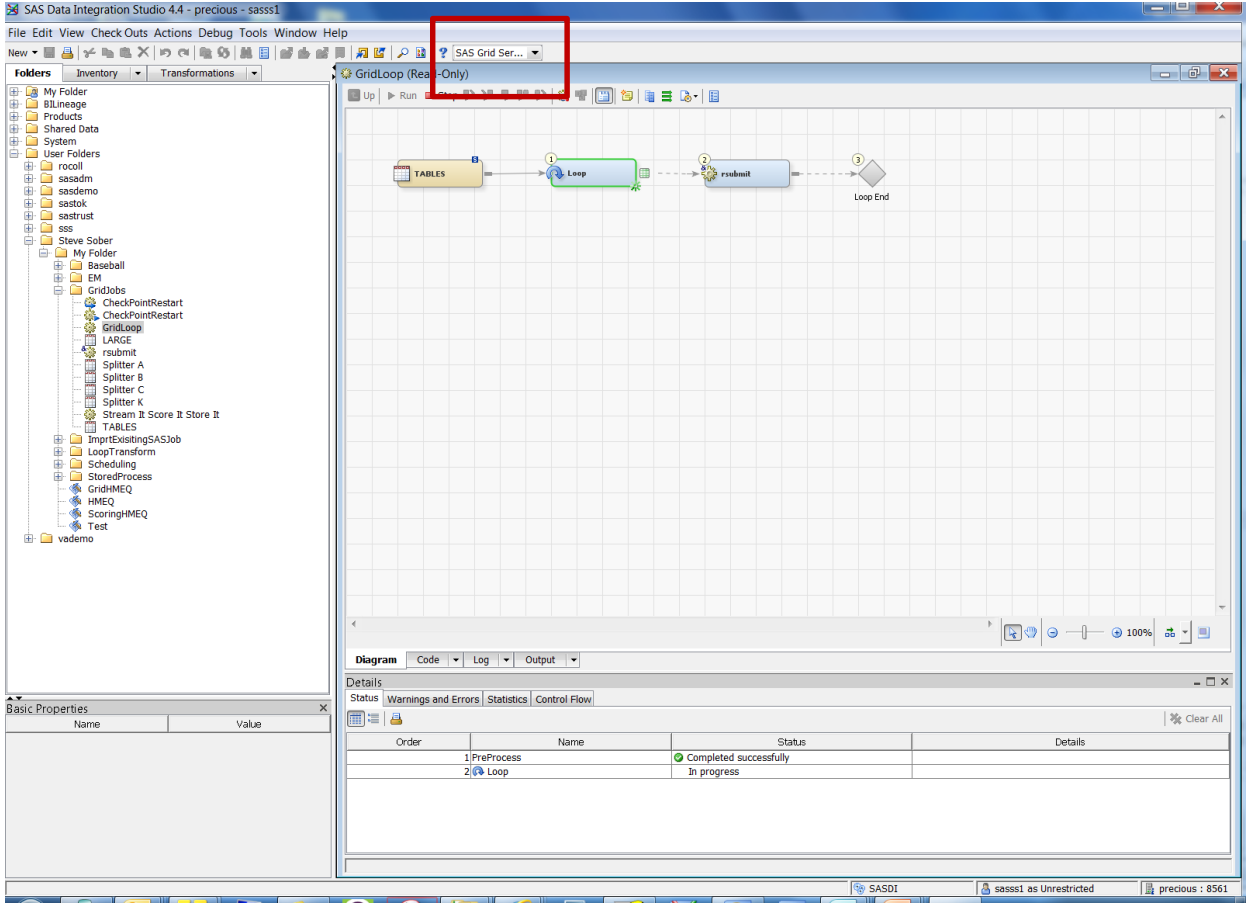
SAS® Data Integration Studio



SAS® GRID MANAGER

HOW TO RUN SAS CODE ON THE SAS GRID

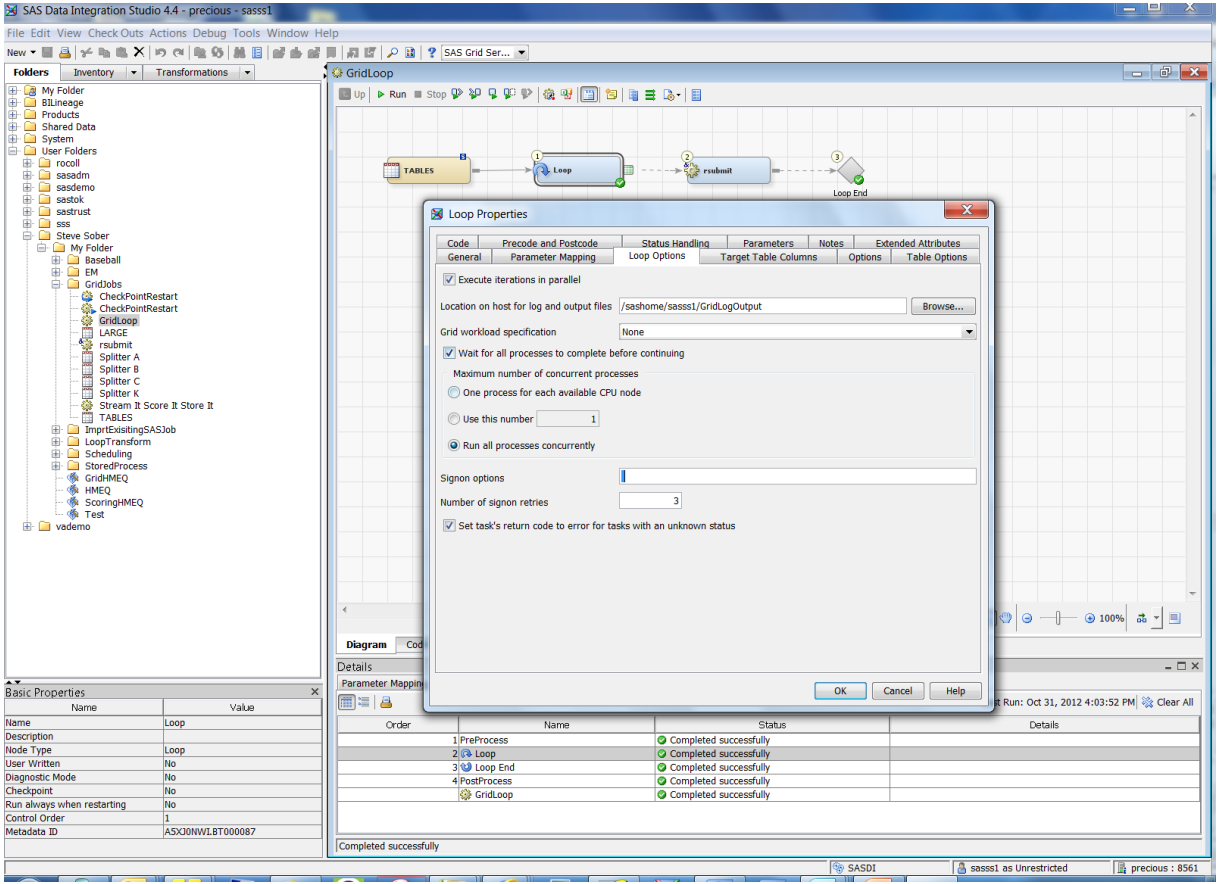
SAS® Data Integration Studio



SAS® GRID MANAGER

HOW TO RUN SAS CODE ON THE SAS GRID

SAS® Data Integration Studio



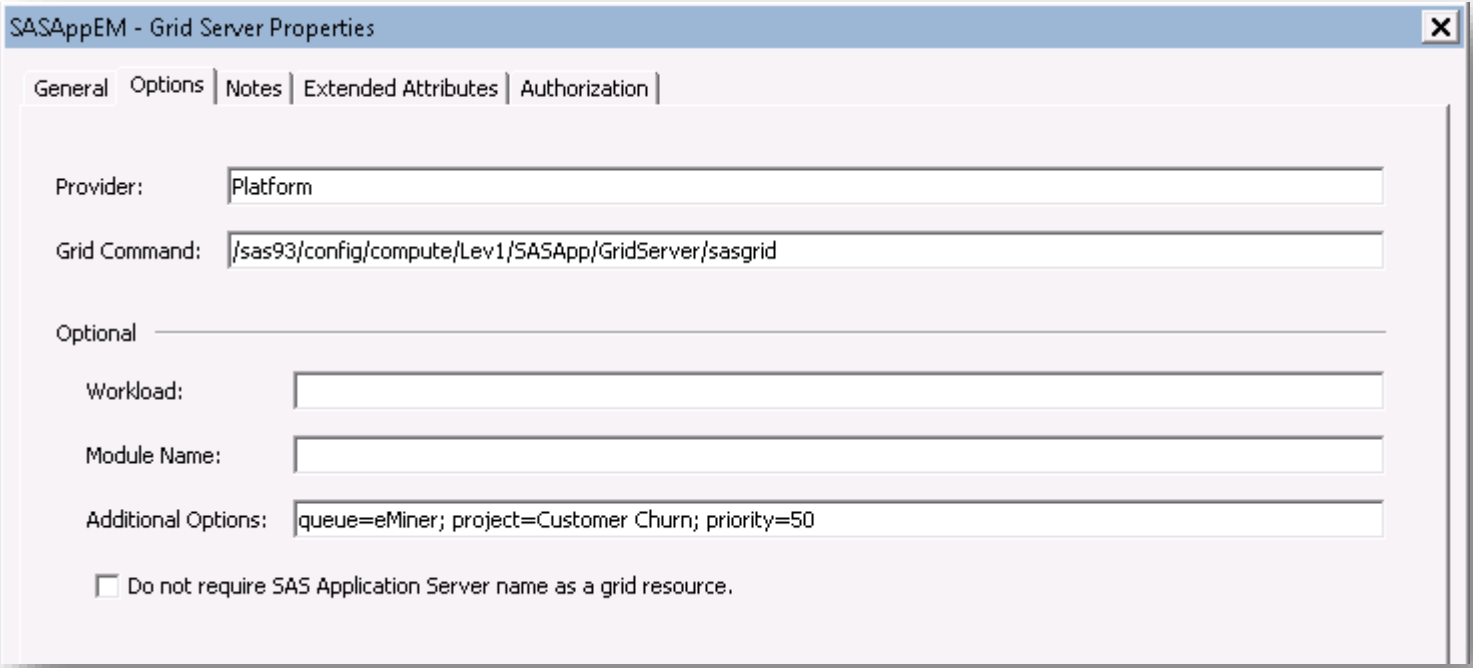
BATCH SUBMIT | SASGSUB

- SASGSUB Batch Submit

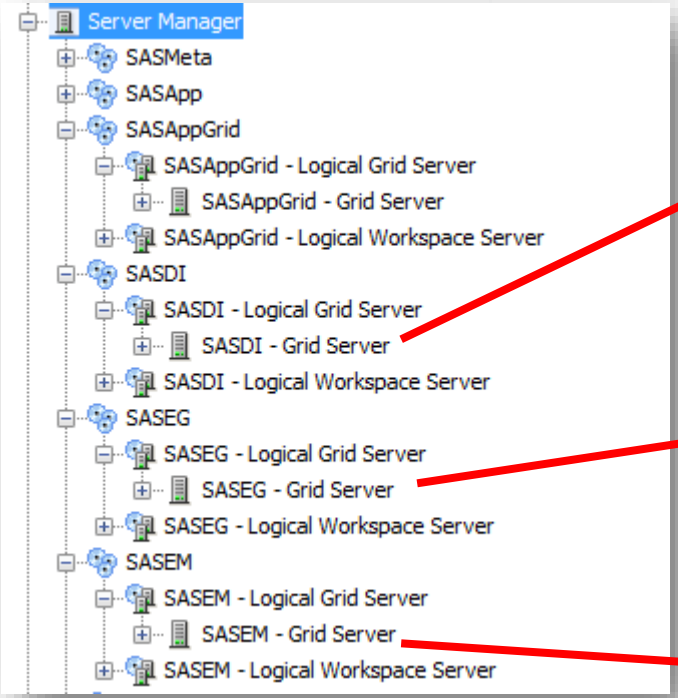
```
sasgsub -gridsubmitpgm MyProgram.sas
        -gridwaitresults
        -gridwaittimeout 3600
rc=$?
```

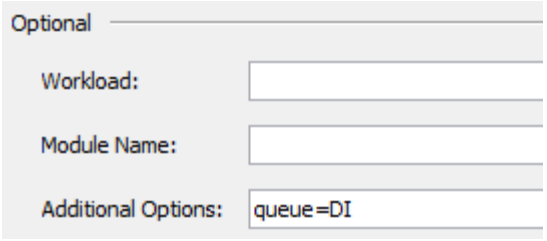
Grid option sets

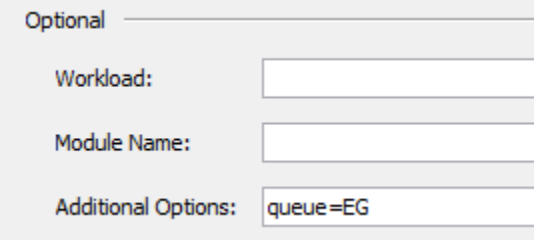
GRID OPTIONS IN 9.3 METADATA

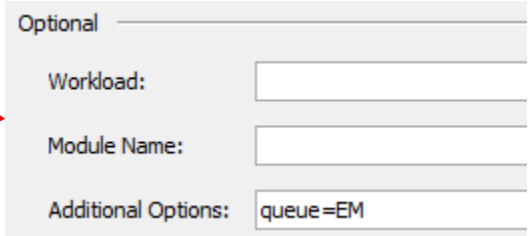


SAS 9.3 : MULTIPLE GRID SERVER DEFINITIONS

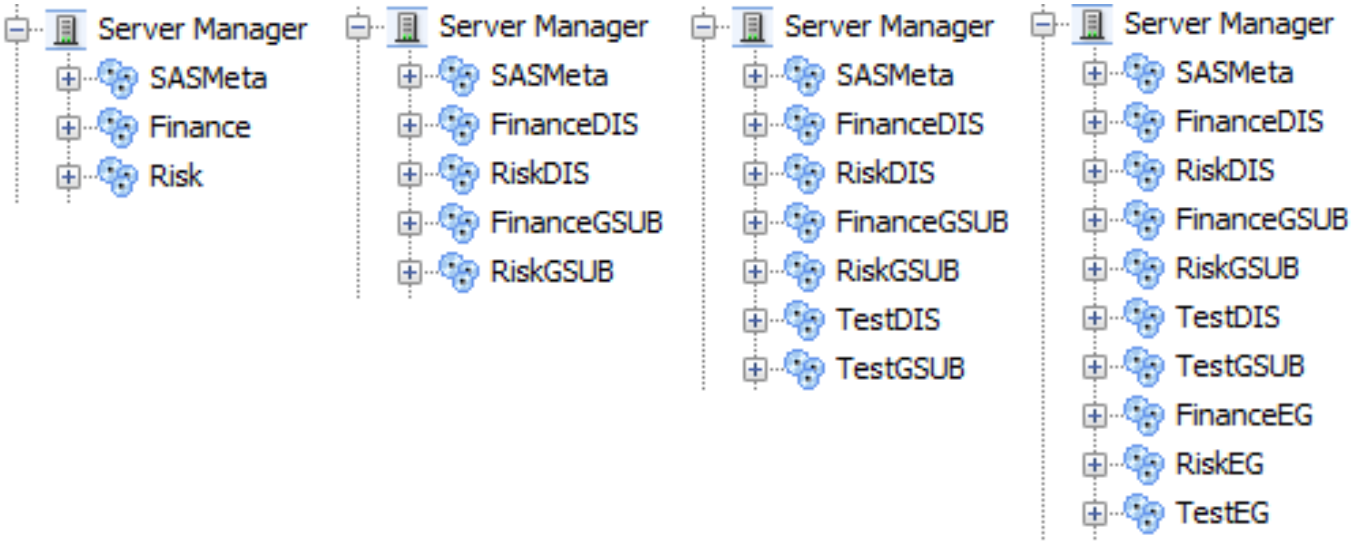




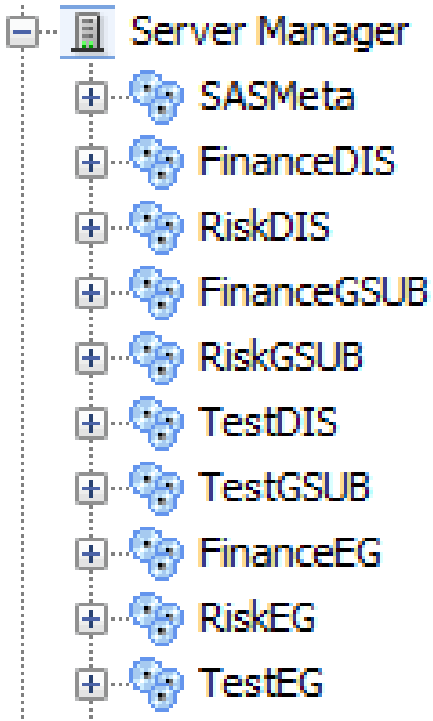




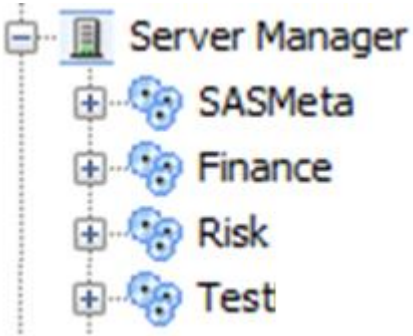
SAS 9.3 : MULTIPLE USERS WITH MULTIPLE GRID CLIENTS



MANAGING USERS AND GRID APPLICATIONS IN 9.4

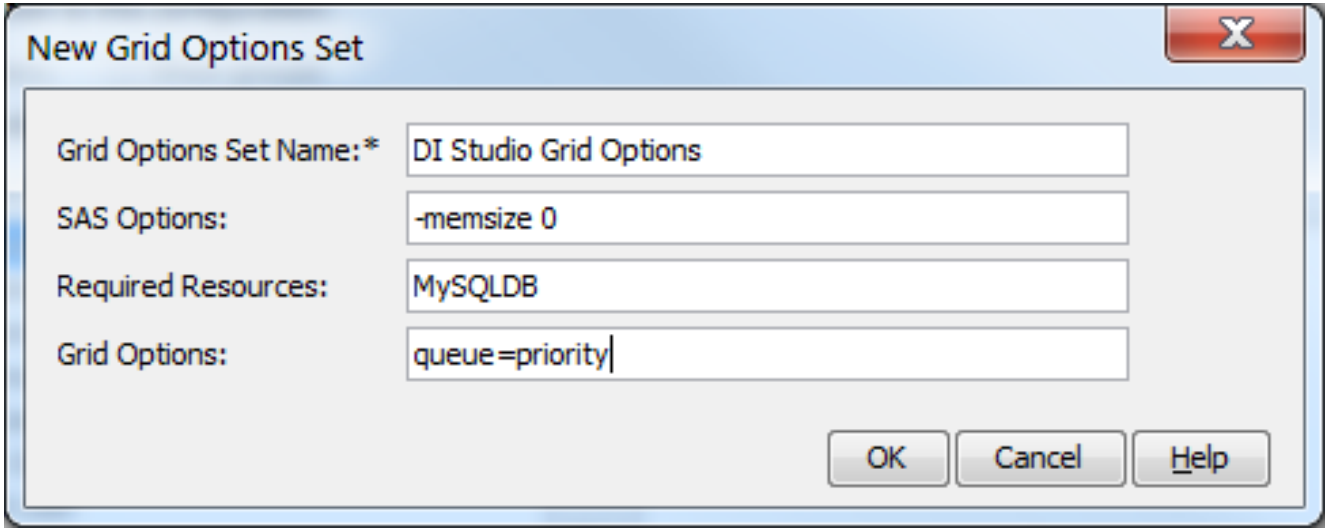


Using Grid Options Sets



GRID OPTIONS SETS

- Grouping of options commonly used by grid



GRID OPTIONS SETS

- Mapped in a grid server to a grid application for a user/group
- Can be mapped multiple times
- Override default options

SAS Options: -memsize 256

Required Resources: SASApp

Grid Options: queue=normal

Default options

Grid Options Set Mappings:

#	SAS Application	Mapped Identities	Grid Options Set
1	SAS Data Integration Studio	Risk; Finance	DI Studio Grid Options
2	SAS Enterprise Guide	EG Users	EG Grid Options
3	SAS Grid Manager Client Utility	Finance; Risk	GSUB Grid Options

MULTIPLE OPTIONS ARE MERGED

Default Values

SAS Options	-memsize 256M -DBCS
Required Resources	SASApp
Grid Options	queue=normal

Options Set Values

SAS Options	-memsize 0
Required Resources	Teradata
Grid Options	queue=priority

Merged Option Values

SAS Options	-memsize 256M -DBCS -memsize 0
Required Resources	SASApp Teradata
Grid Options	queue=normal queue=priority

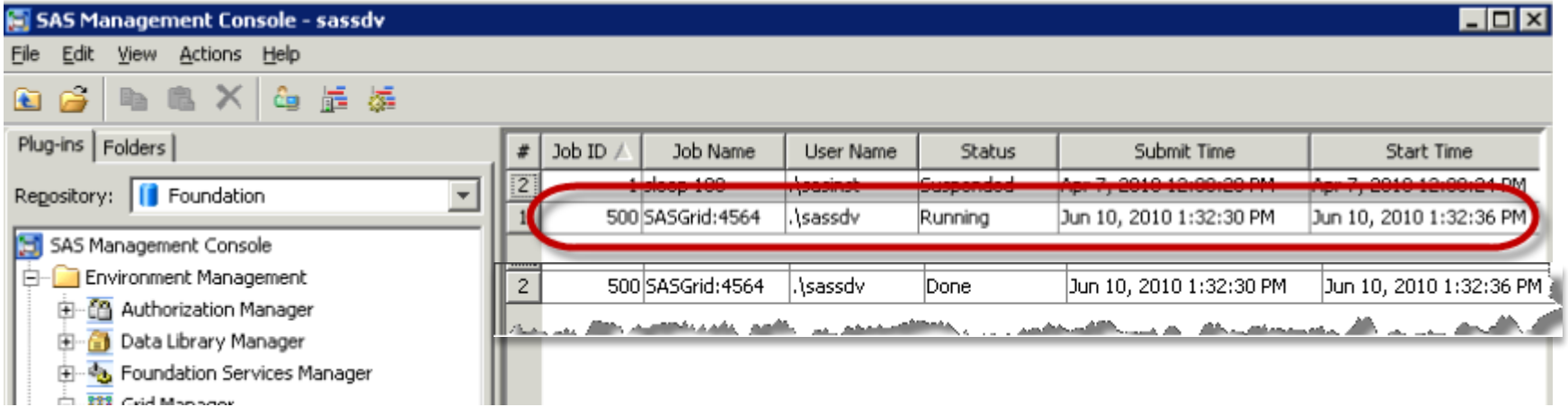
Resulting Option Values

SAS Options	-DBCS -memsize 0
Required Resources	SASApp Teradata
Grid Options	queue=priority

Monitoring

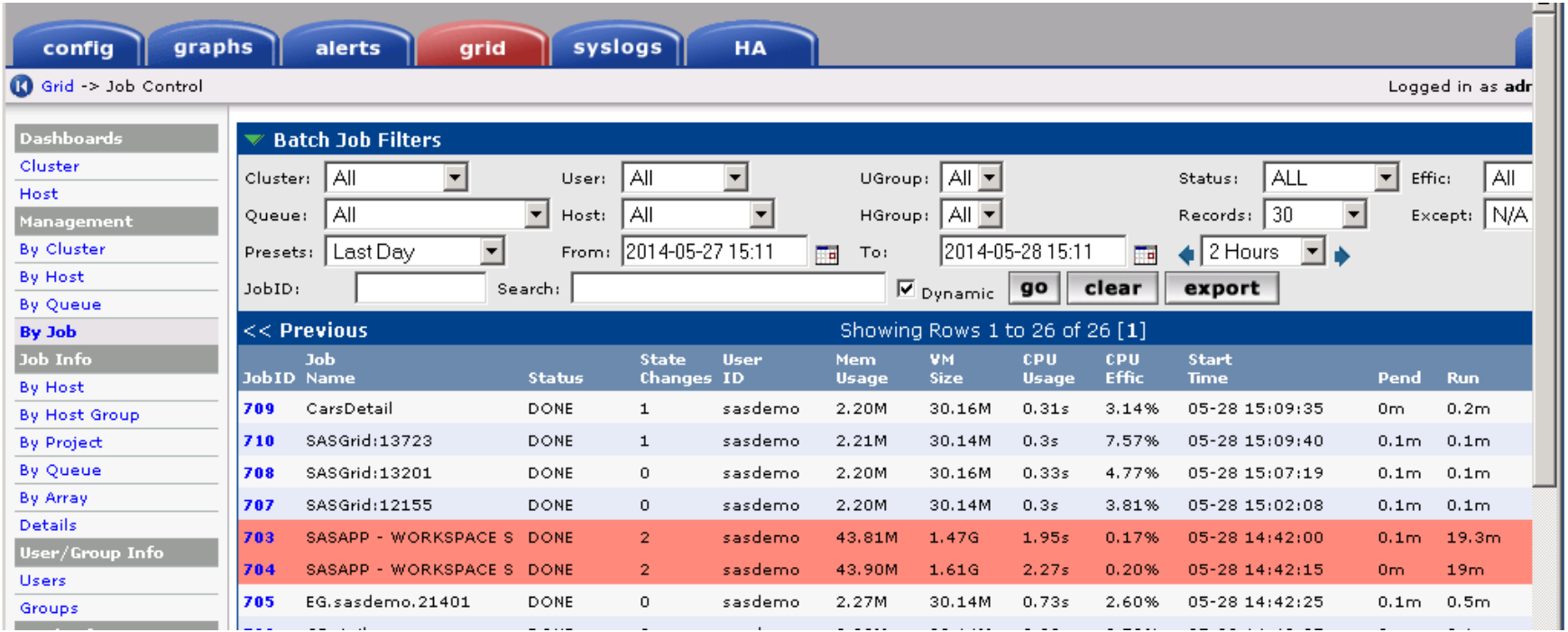
MONITORING | SAS PROGRAM JOB STATUS ON GRID

- Check job status via RTM or SAS Management Console Grid Manager Plug-in



MONITORING | SAS PROGRAM JOB STATUS ON GRID

- Check job status via RTM or SAS Management Console Grid Manager Plug-in



JobID	Job Name	Status	State Changes	User ID	Mem Usage	VM Size	CPU Usage	CPU Effic	Start Time	Pend	Run
709	CarsDetail	DONE	1	sasdemo	2.20M	30.16M	0.31s	3.14%	05-28 15:09:35	0m	0.2m
710	SASGrid:13723	DONE	1	sasdemo	2.21M	30.14M	0.3s	7.57%	05-28 15:09:40	0.1m	0.1m
708	SASGrid:13201	DONE	0	sasdemo	2.20M	30.16M	0.33s	4.77%	05-28 15:07:19	0.1m	0.1m
707	SASGrid:12155	DONE	0	sasdemo	2.20M	30.14M	0.3s	3.81%	05-28 15:02:08	0.1m	0.1m
703	SASAPP - WORKSPACE S	DONE	2	sasdemo	43.81M	1.47G	1.95s	0.17%	05-28 14:42:00	0.1m	19.3m
704	SASAPP - WORKSPACE S	DONE	2	sasdemo	43.90M	1.61G	2.27s	0.20%	05-28 14:42:15	0m	19m
705	EG.sasdemo.21401	DONE	0	sasdemo	2.27M	30.14M	0.73s	2.60%	05-28 14:42:25	0.1m	0.5m

MONITORING

RTM – DASHBOARD

http://precious/rtm/plugins/grid/grid_summary.php

Platform RTM - Hos...

File Edit View Favorites Tools Help

Share Browser WebEx

Google (2) FTP directory -teradata-tt... MakeOrder V3 Usage Doc... MakeOrder - saspedia Secure Access SSL VPN GridDeployment Home - Global STIC Archi...

Page Safety Tools

config graphs alerts grid syslogs HA settings

Grid -> Host Dashboard

Logged in as **admin** (Logout)

Dashboards
- Cluster
- Host

Management
- By Cluster
- By Host
- By Queue
- By Job

Job Info
- By Host
- By Host Group
- By Project
- By Queue
- By Array
- Details

User/Group Info
- Users
- Groups

Load Info
- Host

Cluster Filter Options

Cluster:	All	Group:	N/A	Cacti:	All	go	clear
Thresholds:	All	Type:	All	Model:	All	☑ Apply Exclusion Filter	
Load Stat:	All	Batch Stat:	All	Refresh:	1 Minute		

Host Status

Cluster: gpsas

precious06 precious01 precious05 precious04 precious08 precious03 precious07 precious02 precious

Host Status Legend

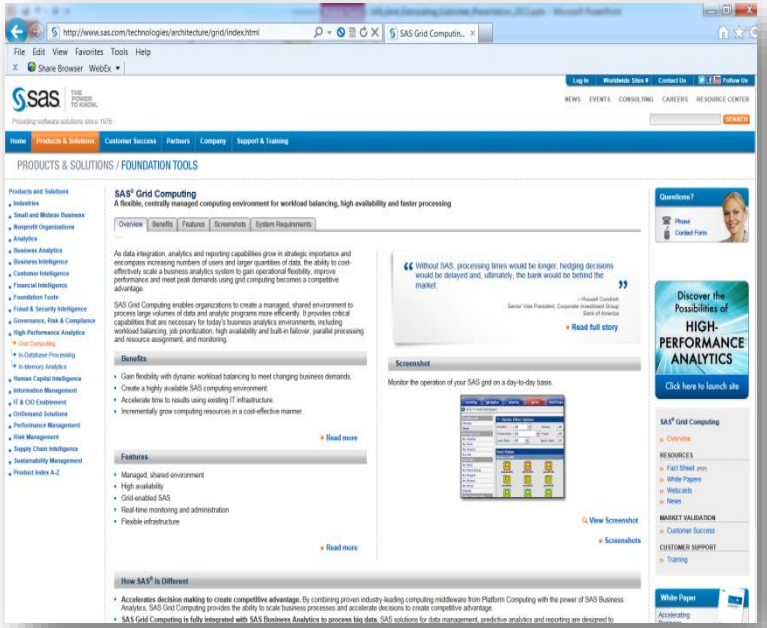
Unavailable Busy/Closed Idle/Closed Low Resources Busy Idle w/Jobs Idle Starved Admin Down

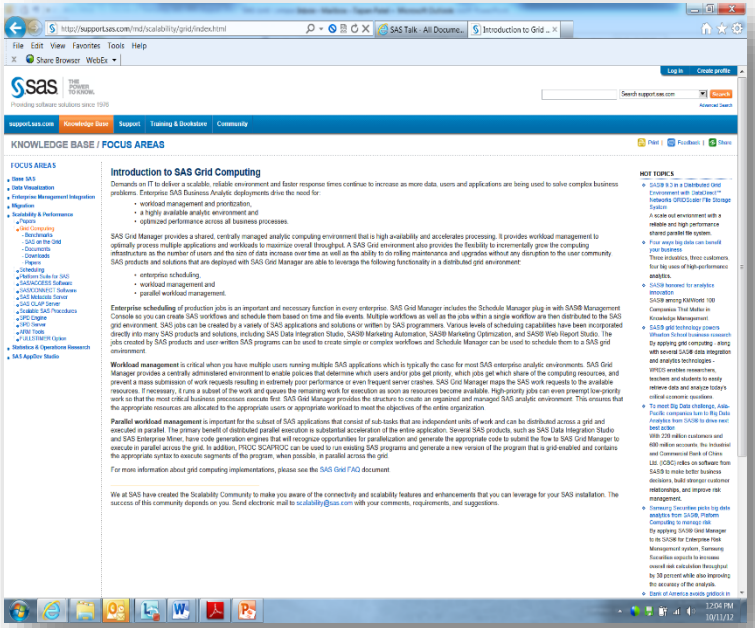
Last Refresh: 11:50:31 pm

Status Last Updated: 11:50:03 pm

Stats: Replaces: 0 seconds, **THolds:** 0 seconds, **Audible:** 0 seconds, **Get:** 0 seconds

RESOURCES | WWW.SAS.COM/GRID





THANK YOU

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