Paper SAS 4131-2020

SAS® Grid Manager: Inside Look into Grid Launched Servers Murali Srinivasan, SAS Institute Inc.

ABSTRACT

As a SAS[®] Grid Manager administrator, you might wonder whether you can improve utilization of compute resources so that your organization has better return on investment. You start SAS[®] server processes in your grid environment by running server start-up scripts and through application invocation. SAS server configuration in SAS metadata determines how a server is launched. This paper presents best practices for instantiating SAS servers within a grid environment. Grid-launched servers benefit from SAS Grid Manager features including workload balancing, parallel processing, high availability, and flexibility with scaling the architecture.

INTRODUCTION

SAS 9.2 introduced server-side load balancing for SAS workspace servers using SAS Grid Manager. When a client such as SAS[®] Enterprise Guide[®] that uses this server requests a workspace server to run a job, the object spawner launches the server process on the best host, as chosen by SAS Grid Manager. SAS Grid Manager uses Platform LSF as workload manager to make this decision. Support for grid load balancing for stored process servers, pooled workspace servers, and OLAP servers was included in SAS 9.3. Support for grid-launched servers was added starting with SAS 9.4.

With server-side load balancing through grid-launched SAS workspace servers, when a client requests a workspace server, the object spawner launches the server process in the grid on a host based on configured SAS Grid Manager policies [1]. Client code, which is running as a grid job, is invoked on the workspace server. Starting with the first maintenance release after SAS 9.4, stored process servers and pooled workspace servers can also be grid-launched.

In SAS 9.4M6, the product name for a grid using Platform LSF was changed to SAS Grid Manager for Platform. SAS Grid Manager product introduced a new grid provider, which consists of SAS[®] Workload Orchestrator for workload management and SAS[®] Job Flow Scheduler for enterprise scheduling. The object spawner uses SAS Workload Orchestrator instead of Platform LSF to start the server process. Grid-launched features are applicable to both SAS Grid Manager for Platform and SAS Grid Manager, and the configuration is identical. SAS code that runs in grid-launched servers remains unchanged with the introduction of SAS Grid Manager using SAS Workload Orchestrator [2].

CONFIGURING GRID-LAUNCHED SERVERS

If you are deploying SAS Grid Manager for Platform, you install Platform Suite for SAS, which includes Platform LSF as a workload manager, prior to installing SAS software. If you are deploying a SAS 9.4M6 Grid Manager environment, your SAS Grid Manager installation includes SAS Workload Orchestrator software. Configuring server-side load balancing using grid-launched servers is identical to both environments. You update server definitions in SAS Management Console to configure grid-launched servers.

LOGICAL WORKSPACE SERVER

Navigate to the Server Manager plug-in in SAS Management Console. Select a SAS Application Server context and convert the logical workspace server to load balancing. For load balancing options, specify Grid as the load balancing algorithm. Select the Launch Servers via Grid checkbox. This option is only applicable for workspace servers, stored process servers, and pooled workspace servers.

Figure 1 shows how the logical workspace server load balancing properties for the selected SAS Application Server context look.

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Figure 1: Logical Workspace Server Load Balancing Properties

If you are using SAS Grid Manager for Platform, add ENABLE_HOST_INTERSECTION=Y in the lsb.params LSF configuration file. This option prevents errors when a grid-launched workspace server is configured with more hosts than the HOSTS= specification in the LSF queue definition.

LOGICAL STORED PROCESS SERVER

Navigate to the Server Manager plug-in in SAS Management Console. Select a SAS Application Server context and select the logical stored process server. Select Properties from the Actions menu or the context menu. The Properties dialog box appears. Select the Load Balancing tab. For load balancing options, specify Grid as the load balancing algorithm. Select Launch Servers via Grid checkbox.

Figure 2 shows how the logical stored process server load balancing properties for the selected SAS Application Server context look.

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Figure 2: Logical Stored Process Server Load Balancing Properties

LOGICAL POOLED WORKSPACE SERVER

You configure the logical pooled workspace server by following the same steps as for the logical stored process server.

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Figure 3: Logical Pooled Workspace Server Load Balancing Properties

LOGICAL OLAP SERVER

Grid-launched features are not applicable for OLAP servers, so the Launch Servers via Grid checkbox option is not available.

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Figure 4: Logical OLAP Server Load Balancing Options

ALTERNATE CONFIGURATIONS USING LOGICAL GRID SERVER

Alternate configurations without using grid-launched features are available to grid-enable SAS Enterprise Guide and SAS[®] Add-In for Microsoft Office clients.

The following methods use a logical grid server definition in the server metadata to launch a grid server session. The object spawner starts the workspace server session. Jobs are submitted to the grid server session.

CLIENT-SIDE CONFIGURATION

SAS Enterprise Guide submits jobs to the grid if the Use grid if available option is selected on element properties or the project properties. To enable the grid at a project level, Select File -> Project Properties and click Code Submission. Select the Use grid if available option.

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Figure 5: SAS Enterprise Guide Project Properties

To enable the grid at an individual program or task level, select the properties for the program or task, and use the Code Submission page. Select the Use preferences from project properties radio button to show the current configuration from the project properties. Selecting Customize code submission options to override this at the element level.

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Figure 6: SAS Enterprise Guide Program Properties

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Figure 7: SAS Enterprise Guide Task Properties

SAS Add-In for Microsoft Office is a Component Object Model (COM) add-in to Microsoft Office. To grid-enable SAS Add-In for Microsoft Office, open the SAS tab from the Microsoft Office application on the desktop and select SAS -> Tools -> Options. In the SAS Options dialog box, click the Tasks tab and set the options illustrated in Figure 8.

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Figure 8: SAS Add-In for Microsoft Office Properties

To create a grid session for initial processing, in SAS Enterprise Guide select Tools -> Options -> SAS Programs. In the General group, select Initialize grid (if available) when connecting to a workspace. This option specifies that SAS Enterprise Guide connects to a workspace server. It also connects to and initializes a grid server session. However, this option does not cause SAS Enterprise Guide to submit to the grid. SAS Enterprise Guide submits jobs to the grid only by selecting the Use grid if available option in the element properties or project properties, or by overriding the option with the server metadata configuration.

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Figure 9: SAS Enterprise Guide Initialize Grid Properties

SERVER METADATA CONFIGURATION

You can override client-side configurations with server metadata settings if you do not want to allow end-user control of grid features from individual desktop applications.

To control grid usage from server metadata, use the EGGridPolicy and AMOGridPolicy extended attributes on the logical grid server definition. Set EGGridPolicy and AMOGridPolicy to Force to always send jobs to the grid using the logical grid server definition, regardless of whether the Use grid if available client-side configuration option is specified. If this attribute is set to Noforce, whether jobs are sent to the grid depends on the value of the Use grid if available client-side option. If this attribute is set to I gnore, jobs are never sent to the grid, regardless of the value of the Use grid if available option.

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Figure 10: Forcing Grid with Server Metadata

In this scenario, code from the client is shipped to SAS workspace server and automatically wrapped with RSUBMIT/ENDRSUBMIT statements. This results in a grid server session that runs SAS statements within the RSUBMIT/ENDRSUBMIT block.

IGNORING DIRECT GRID FEATURES

Grid enabling by using one of the alternate options along with the grid-launched server option results, in two grid sessions, a workspace server in the grid, and an additional grid server session using the logical grid server definition.

In this scenario, SASApp (the SAS Application Server context) is configured in the server metadata to use a grid-launched workspace server. The SASApp extended attribute EGGridPolicy is specified with a value of Force.

In SAS Enterprise Guide, select SASApp from the Servers pane. Right-click and then click Connect. Notice that there is a tick mark and a grid symbol next to SASApp.

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Figure 11: SAS Enterprise Guide Output

Figure 12 is the output of the bjobs command before connecting to grid from SAS Enterprise Guide. There are no grid jobs for the user.

[sas@eeclxvm228 ObjectSpawner]\$ bjobs -w -u sasmbs No unfinished job found [sas@eeclxvm228 ObjectSpawner]\$ [sas@eeclxvm228 ObjectSpawner]\$

Figure 12: Bjobs Output Before

Figure 13 is the output of the bjobs command after establishing a connection to grid from SAS Enterprise Guide. Notice there are two grid jobs. Job 2791 is a grid-launched workspace server for the user. Job 2792 is an additional grid server session for the user. This additional grid server session is redundant and not required. Because the workspace server is started as a grid job, user code can directly run on the grid-launched workspace server.

| [sas@eec | lxvm228 | Object | tSpawner]\$ | | | | | | | | | |
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| 2792 | sasmbs | RUN | normal | eeclxvm229 | .unx.sas.com | eeclxvm229. | unx.sas.co | m EG.s | asmbs.50704 | Feb 14 | 4 07:46 | |
| [sas@eec | lxvm228 | Object | tSpawner]\$ | | | | | | | | | |

Figure 13: Bjobs Output After

To safeguard from using both direct grid features and grid-launched features at the same time, you must set the EGGridPolicy and AMOGridPolicy extended attributes on the logical grid server definition to I gnore.

Setting these attributes prevents SAS Enterprise Guide and SAS Add-In for Microsoft office from using the direct grid features and starting an additional grid server session while using a grid-launched workspace server. An additional grid server session is not required, because the workspace server is running in the grid.

This server-side setting overrides SAS Enterprise Guide or SAS Add-In for Microsoft Office client-side options such as Use grid if available and Initialize grid (if available) when

connecting to a workspace. Jobs are always sent to the grid-launched workspace server regardless of the value of the option Use grid if available.

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Figure 14: Ignoring Direct Grid Features for Grid-Launched Servers

NEWER CLIENTS

SAS Enterprise Guide 8.2 and later and SAS Add-in for Microsoft Office 8.2 and later automatically ignore direct grid features when the Launch Servers via Grid checkbox is selected. For these clients, you do not have to set the EGGridPolicy and AMOGridPolicy attributes to I gnore.

Figure 15 illustrates a grid-launched workspace server specification in server metadata.

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| • 9 SASApp - Logical Grid Server | Fudian server a carettaine | The second secon | | |
| - SASApp - Grid Server | Algorithm properties | | | |
| ∽ ∰ SASApp - Logical OLAP Server | Cast nos dients | | | |
| • 🖤 SASApp - Logical Pooled Workspace ! | cust per client: | | | |
| 🗢 🎡 SASApp - Logical Stored Process Sen | Launch servers via Grid | | | |
| SASApp - Logical Workspace Server | | 12 | | |
| • 🖫 SASApp - Logical Connect Server | <u>G</u> rid server: | SASApp - Grid Server | | |
| • W SASApp - Logical SAS Java Batch Serv | | | | |
| Web Infrastructure Platform Data Serve | Grid server credentials: | (None) | 19 (F) | |
| Operation System Services - eachym226 | | | | |
| Platform Process Manager - eechom 228 | Grid server connect timeout: | | | |
| Grid Monitoring Server - eeckym228 | | | | |
| Connect Spawner - eeclxvm228 | | | | |
| - 🗍 Share Server - eedxvm228 | | | | |
| SAS Distributed In-Process Services Sch | | | | |
| SAS Content Server | | | | |
| 🗠 📗 dipnn01 | | | | |
| ≻ II spdslab | | | | |
| Oracle Server | | | | |
| - II SQL Server | | | | |
| Monitoring | | | | |
| Maintenance | | | | |
| polication Management | | | | |
| Configuration Manager | | | | |
| Deployment Tester | | | | |

Figure 15: Grid-Launched Workspace Server

Figure 16 illustrates the extended attributes for SASApp (the SAS Application Server logical grid server context). EGGridPolicy and AMOGridPolicy attributes are not specified.

| Plug-ins Folders Search | Server | | | | | |
|--|--------|---|---|------------------|---|--|
| Repository: I Foundation | T | Name | Description | Host | | |
| Repository: Foundation Assamption: Repository: Foundation Management Assamption: Safs Management Console Assamption: Safs Management Console Safs Management Safs I Lineage Safs I Lineage Safs I Lineage Safs Manager Matadata Manager Matadata Manager Matadata Manager Safs Matadata Matager Matadata Matager Safs Matadata Matager Safs Matadata Matager Safs Matadata Matager Matadata Matadata Matadata Matadata Matadata Matadata Matadata Matadata Mata | er | Name p - Logical Grid Server Prop. ral Notes Extend Field Name | Description rtiss ed Attributes Authorizat Value | Host Oescription | × | |
| SAS Distributed in-Process Services Schedulin SAS Content Server SAS dipnn01 | g 54 | | | | | |

Figure 16: Logical Grid Server Extended Attributes Properties

Figure 17 illustrates the client-side configuration. The Use grid if available project property is enabled in SAS Enterprise Guide 8.2.



Figure 17: SAS Enterprise Guide Use Grid if Available Project Property

Figure 18 illustrates the output of the bjobs command before establishing a grid connection from SAS Enterprise Guide. There are no grid jobs for the user.



Figure 18: Bjobs Output Before

Figure 19 illustrates the SAS Enterprise Guide output after running the SAS program. Notice a connection to SASApp with the green tick mark.

| G Pr | ogram - * Project - SAS Enterprise Guide | | — — × |
|---------|--|--|---|
| File | Edit View Program Tools Help [| 2 💼 🐨 I 🗑 🗇 · D | X SAS 9.4M5 PSD Lab |
| | Project * × | Image CC Process Flow Image Program x | • |
| | | 🖈 Run 🔳 Cancel 🗐 🔞 🛠 😘 🛱 🔿 🖓 🚟 < Share • 🏦 Debug | E SASApp • |
| P | | Code | * Log |
| | V 🗭 * Project | 1 | (R) Frrons (0) (1) Notes (2) |
| đ | CANADA | 3 run; | |
| | v TPrograms | 4 | Description Line Affected Code Log Line Program Lir |
| | | | 692 USERCONFIG Process .sasv9.cfg and sasv9.cfg configurat 693 NOVERBOSE Does not write start-up system options to t 694 WORKPERMS=700 Sets the permissions of the SAS Work librar 695 NOXCHD Disables the X command in SAS. 696 NOTE: FROCEDURE OFTIONS used (Total process time): |
| E | Servers * × | | 697 real time 0.00 seconds 698 cpu time 0.01 seconds |
| Ц Ф (1) | C and Servers C Local M SASApp S OLAP Servers Private OLAP Servers | | <pre>699 700 701 31 702 32 703 33 \$LET_CLIENTTASKLABEL=; 703 35 \$LET_CLIENTPROJECTEATH=; 706 36 \$LET_CLIENTPROJECTEATH=; 707 37 \$LET_CLIENTPROJECTEATH=; 708 38 \$LET_SASPROGRAMFILE=; 709 39 \$LET_SASPROGRAMFILE=; 710 40 711 41 ;*';*';*';v';uit;run; 712 42 ODS_ALL_CLOSE; 713 43 714 44 715 45 QUIT; RUN; 716 46</pre> |

Figure 19: SAS Enterprise Guide Output

Figure 20 illustrates the output of the bjobs command after running code from SAS Enterprise Guide. Notice that a single workspace server session has started in the grid. The additional, redundant, grid server session is not started. Direct grid features are automatically ignored while using a grid-launched workspace server.



Figure 20: Bjobs Output After

SAS CLIENTS AND GRID-LAUNCHED SERVERS

You can take advantage of grid capabilities by configuring SAS clients to run SAS programs on the grid. Only certain SAS clients support grid-launched servers, and not all SAS servers can be configured as grid-launched. There are performance considerations to configuring certain SAS clients to use grid-launched servers.

SAS Enterprise Guide and SAS Add-In for Microsoft Office clients should be enabled with grid-launched workspace servers.

When you use server-side load balancing without selecting the Launch Servers via Grid option, the object spawner launches the workspace server instead of the workload manager (Platform LSF or SAS Workload Orchestrator). In this scenario, a grid job is not generated for the SAS program, and your SAS Grid Manager workload management policies such as job slots, queues, and CPU utilization thresholds are not in effect.

Alternate methods that are available to grid-enable SAS Enterprise Guide and SAS Add-In for Microsoft Office clients launch a grid server session as well as the workspace server session using the logical grid server.

In the case of grid-launched workspace server, client code runs on a SAS workspace server in the grid. An additional grid server session is not required. Hence, configuring and using grid-launched workspace servers is more efficient and is a best practice. Client options such as Use grid if available and Initialize grid (if available) when connecting to a workspace should be ignored. This is done by setting the EGGridPolicy and AMOGridPolicy extended attributes to a value of Ignore in server metadata.

It is a best practice to configure SAS[®] Studio Enterprise Edition to use grid launched workspace servers in the same way as SAS Enterprise Guide. SAS code runs on SAS workspace server in the grid. An alternate approach is to use SAS/CONNECT GRDSVC_ENABLE, SIGNON, and RSUBMIT functions in a SAS code to submit to the grid for processing. In this scenario, a SAS workspace server and an additional grid server session are required to run your SAS code on the grid. You can avoid the overhead of grid enabling your SAS code when using grid-launched workspace servers.

You can benefit from a grid-launched workspace server configuration for SAS[®] Enterprise Miner[™] 14.2 client. If you are using a version of SAS Enterprise Miner prior to 14.2, configure the object spawner instead of Platform LSF in order to start SAS workspace servers.

SAS Grid Manager Client Utility (SASGSUB) does not use grid-launched servers. When you submit a SAS program to the grid using SASGSUB, LSF runs a sasgrid script that starts SAS in batch mode. This grid command is defined in the Grid Server Properties dialog box in server metadata. Grid-launched servers are applicable only to SAS IOM servers such as SAS workspace servers, SAS stored process servers and SAS pooled workspace servers.

VALI DATI ONS

GRID-LAUNCHED WORKSPACE SERVER VALIDATION

Navigate to the Server Manager plug-in in SAS Management Console. Select a SAS Application Server context that is configured with grid-launched workspace server. Select the logical workspace server, right-click, and select Validate.

You should see the message box illustrated in Figure 21, with a Validation Successful message. Click the Details button to view more information about the validation.



Figure 21: Validate Grid-Launched Workspace Server

The validation action causes the object spawner to start a workspace server as a grid job using Platform LSF and the SAS Management Console Java client to establish a successful connection to the server. A PROC OPTIONS program is submitted to the workspace server session.

You can verify the grid job by using either the SAS Grid Manager for Platform module for SAS Environment Manager or a command-line interface. Figure 22 illustrates the bjobs output before the Validate action.

| [sas@eec | clxvm229 | Object | :Spawner]\$ b | ojobs -a -u a | all | | |
|----------|----------|--------|---------------|---------------|-------------|----------|--------------|
| JOBID | USER | STAT | QUEUE | FROM_HOST | EXEC_HOST | JOB_NAME | SUBMIT_TIME |
| 2763 | sas | RUN | normal | eeclxvm229. | eeclxvm228. | sleep 10 | Feb 11 11:52 |
| 2762 | sas | DONE | normal | eeclxvm229. | eeclxvm229. | sleep 10 | Feb 11 11:52 |

Figure 22: Bjobs Output Before Validate

Figure 23 illustrates the bjobs output after the Validate action. Notice the presence of a new job with a job id of 2764, a job name *_SASApp_WorkspaceServer_*, and a status of DONE for the user who ran the Validate action.

| [sas@eed | clxvm229 | Object | tSpawner]\$] | bjobs -a -w | -u all | | | | | | | |
|----------|-----------|--------|---------------|--------------|-------------|-------------|--------------|--------|-------|--------|--------|--------|
| JOBID | USER | STAT | QUEUE | FROM HOST | EXEC HOST | JOB NAME | SUBMIT_TIME | | | | | |
| 2762 | sas | DONE | normal | eeclxvm229. | unx.sas.com | eeclxvm229 | .unx.sas.com | sleep | 10 | Feb 11 | 11:52 | |
| 2763 | sas | DONE | normal | eeclxvm229. | unx.sas.com | eeclxvm228 | .unx.sas.com | sleep | 10 | Feb 11 | 11:52 | |
| 2764 | sasmbs | DONE | normal | eeclxvm229. | unx.sas.com | eeclxvm229 | .unx.sas.com | Connec | tions | ervice | 904500 | SASApp |
| - Works | pace Serv | ver_EA | 54B6E6-83CE | -5D42-8158-5 | 3A2C16F5245 | Feb 11 11:5 | 53 | | | | | |
| [sas@eed | clxvm229 | Object | tSpawner]\$ | | | | | | | | | |

Figure 23: Bjobs Output After Validate

A workspace server was started as a grid job to perform the validation. The grid job ends after validation.

GRID-LAUNCHED STORED PROCESS SERVER VALIDATION

Navigate to the Server Manager plug-in in SAS Management Console. Select a SAS Application Server context that is configured with a grid-launched stored process server. Select the logical stored process server, right-click, and the select Validate.

You should see the message box in Figure 24 with a Validation Successful message. Click the Details button for more information about the validation.



Figure 24: Validate Grid-Launched Stored Process Server

You can verify the grid job using either the SAS Grid Manager for Platform module for SAS Environment Manager or a command-line interface. Figure 25 illustrates the bjobs output before the Validate action. Notice there are no stored process server grid jobs.

| [sas@eed | :lxvm229 | Object | [\$]Spawner] | bjobs -a -w | -u all | | | | | | |
|----------|----------|--------|--------------|--------------|--------------|-------------|--------------|-----------|-----------|--------|--------|
| JOBID | USER | STAT | QUEUE | FROM_HOST | EXEC_HOST | JOB_NAME | SUBMIT_TIME | | | | |
| 2762 | sas | DONE | normal | eeclxvm229. | unx.sas.com | eeclxvm229. | .unx.sas.com | sleep 10 | Feb 11 | 11:52 | |
| 2763 | sas | DONE | normal | eeclxvm229. | unx.sas.com | eeclxvm228. | .unx.sas.com | sleep 10 | Feb 11 | 11:52 | |
| 2764 | sasmbs | DONE | normal | eeclxvm229. | unx.sas.com | eeclxvm229. | .unx.sas.com | Connectio | onService | 904500 | SASApp |
| - Worksp | ace Serv | ver_EA | 54B6E6-83CE | -5D42-8158-5 | 53A2C16F5245 | Feb 11 11:5 | 53 | | | | |
| [sas@eed | :lxvm229 | Object | :Spawner]\$ | | | | | | | | |
| | | | | | | | | | | | |

Figure 25: Bjobs Output Before Validate

Figure 26 illustrates the bjobs output after the Validate action. Notice the presence of a new job with job id of 2765, a job name of *_SASApp – Stored Process Server_*, and a status of RUN for the sassrv user. The stored process server runs under the sassrv user account.

| - | | | | | |
|----------|-----------|--------|-------------|---|-----|
| [sas@eed | clxvm229 | Object | tSpawner]\$ | bjobs -a -w -u all | |
| JOBID | USER | STAT | QUEUE | FROM HOST EXEC HOST JOB NAME SUBMIT TIME | |
| 2765 | sassrv | RUN | normal | eeclxvm228.unx.sas.com eeclxvm228.unx.sas.com SASApp - Stored Process Serve | r 6 |
| F042120 | -1C3C-C54 | 45-A10 |)-CFD307923 | 625 Feb 11 12:04 | |
| 2762 | sas | DONE | normal | eeclxvm229.unx.sas.com eeclxvm229.unx.sas.com sleep 10 Feb 11 11:52 | |
| 2763 | sas | DONE | normal | eeclxvm229.unx.sas.com eeclxvm228.unx.sas.com sleep 10 Feb 11 11:52 | |
| 2764 | sasmbs | DONE | normal | eeclxvm229.unx.sas.com eeclxvm229.unx.sas.com ConnectionService 904500_SASA | pp |
| - Works | pace Serv | ver_EA | 54B6E6-83CE | -5D42-8158-53A2C16F5245 Feb 11 11:53 | |
| [sas@eed | clxvm229 | Object | tSpawner]\$ | | |
| | | | | | |

Figure 26: Bjobs Output After Validate

A stored process server was started as a grid job to perform the validation. The grid job continues to RUN to process subsequent stored process server client requests after validation. If required, additional stored process server grid jobs are launched based on load balancing properties and the number of client requests.

GRID-LAUNCHED POOLED WORKSPACE SERVER VALIDATION

Navigate to the Server Manager plug-in in SAS Management Console. Select a SAS Application Server context configured with a grid-launched stored process server. Select the logical pooled workspace server, right-click, and select Validate.

You should see the message box illustrated in Figure 27 with a Validation Successful message. Click the Details button.



Figure 27: Validate Grid-Launched Pooled Workspace Server

You can verify the grid job using either the SAS Grid Manager for Platform module for SAS Environment Manager or a command-line interface. Figure 28 illustrates the bjobs output before the Validate action. Notice there are no pooled workspace server grid jobs.

| [sas@eec | clxvm229 | Object | [\$] Spawner] | bjobs –a –w | -u all | | | | | | |
|----------|-----------|--------|---------------|--------------|-------------|-------------|-------------|----------|----------|----------|----------|
| JOBID | USER | STAT | QUEUE | FROM HOST | EXEC HOST | JOB NAME | SUBMIT TIME | | | | |
| 2765 | sassrv | RUN | normal | eeclxvm228. | unx.sas.com | eeclxvm228. | unx.sas.com | SASApp - | Stored | Process | Server_6 |
| F042120- | -1C3C-C54 | 5-A10 |)-CFD307923 | 625 Feb 11 1 | 2:04 | | | | | | |
| 2762 | sas | DONE | normal | eeclxvm229. | unx.sas.com | eeclxvm229. | unx.sas.com | sleep 10 | Feb 1 | 1 11:52 | |
| 2763 | sas | DONE | normal | eeclxvm229. | unx.sas.com | eeclxvm228. | unx.sas.com | sleep 10 | Feb 1 | 1 11:52 | |
| 2764 | sasmbs | DONE | normal | eeclxvm229. | unx.sas.com | eeclxvm229. | unx.sas.com | Connecti | onServic | e 904500 | SASApp |
| - Worksp | ace Serv | rer_EA | 54B6E6-83CE | -5D42-8158-5 | 3A2C16F5245 | Feb 11 11:5 | 53 | | | | |
| [sas@eec | :lxvm229 | Object | tSpawner]\$ | | | | | | | | |
| [sas@eec | :lxvm229 | Object | [Spawner]\$ | | | | | | | | |
| | | | | | | | | | | | |

Figure 28: Bjobs Output Before Validate

Figure 29 illustrates the **bjobs** output after the Validate action. Notice the presence of a new job with job id of 2766, a job name of *_SASApp – Pooled Workspace Server_*, and a status of RUN for the sassrv user. The pooled workspace server runs under the sassrv user account.

| [sas@eed | clxvm229 | Object | tSpawner]\$ | bjobs –a –w | -u all | | | | | | |
|----------|-----------|--------|-------------|--------------|--------------|-------------|--------------|----------|----------|------------|---------|
| JOBID | USER | STAT | QUEUE | FROM HOST | EXEC HOST | JOB NAME | SUBMIT TIME | | | | |
| 2765 | sassrv | RUN | normal | eeclxvm228. | unx.sas.com | eeclxvm228 | .unx.sas.com | SASApp - | Stored | Process Se | erver 6 |
| F042120- | -1C3C-C54 | 45-A10 | 0-CFD307923 | 625 Feb 11 1 | 2:04 | | | | | | |
| 2766 | sassrv | RUN | normal | eeclxvm228. | unx.sas.com | eeclxvm228 | .unx.sas.com | SASApp - | Pooled | Workspace | Server |
| 5904E74 | AB-F1E0-A | A24E-B | 765-F712CCA | 99EB3 Feb 11 | 12:08 | | | | | | |
| 2762 | sas | DONE | normal | eeclxvm229. | unx.sas.com | eeclxvm229 | .unx.sas.com | sleep 10 | Feb 1 | .1 11:52 | |
| 2763 | sas | DONE | normal | eeclxvm229. | unx.sas.com | eeclxvm228 | .unx.sas.com | sleep 10 | Feb 1 | .1 11:52 | |
| 2764 | sasmbs | DONE | normal | eeclxvm229. | unx.sas.com | eeclxvm229 | .unx.sas.com | Connecti | onServic | e 904500 s | SASApp |
| - Worksp | pace Ser | ver EA | 54B6E6-83CE | -5D42-8158-5 | 53A2C16F5245 | Feb 11 11:5 | 53 | | | | |
| [sas@eed | clxvm229 | Object | tSpawner]\$ | | | | | | | | |
| | | | | | | | | | | | |

Figure 29: Bjobs Output After Validate

A pooled workspace server was started as a grid job to perform the validation. The grid job continues to RUN to process subsequent pooled workspace server client requests after validation. Creation of subsequent grid jobs is dependent on server-side pooling properties and the number of client requests.

SAS ENTERPRISE GUI DE VALI DATI ON

Launch SAS Enterprise Guide and check the bjobs output. Notice there are no grid jobs, as shown in Figure 30.

| [sas@eeclxvm228 Lev1]\$ bjobs -u sasmbs | |
|---|--|
| No unfinished job found | |
| [sas@eeclxvm228 Lev1]\$ bjobs -u sasmbs | |
| No unfinished job found | |

Figure 30: Bjobs Output Before Validate

Navigate to the Servers pane, right-click SASApp (the SAS Application Server context) and click Connect.



Figure 31: SAS Enterprise Guide SASApp Connect

You can verify the grid job using either the SAS Grid Manager module for SAS Environment Manager or a command-line interface. Figure 32 illustrates the bjobs output after the Connect action. A workspace server is started as a grid job on behalf of the user. The grid job continues to RUN to process subsequent requests from the connected SAS Enterprise Guide client. Any SAS program or task invoked from the same client application runs on the same workspace server session in the grid.

| [sas@eed | clxvm228 | Lev1]\$ | Ş bjobs −w - | -u sasmbs | | | | | | |
|----------|-----------|---------|--------------|--------------|---------------|------------|------------------|------------|--------------|-----------|
| JOBID | USER | STAT | QUEUE | FROM_HOST | EXEC_HOST | JOB_NAME | SUBMIT_TIME | | | |
| 2781 | sasmbs | RUN | qeg | eeclxvm228 | .unx.sas.com | eeclxvm229 | .unx.sas.com SAS | Enterprise | Guide SASApp | - Workspa |
| ce Serve | er_2F4081 | FA0-013 | 36-3340-8B2 | 7-7563933D5I | EF7 Feb 13 12 | 2:28 | | | | |
| [sas@eed | clxvm228 | Lev1] | Ş 📘 | | | | | | | |

Figure 32: Bjobs Output After Validate

| G P | rogram - * Project - SAS Enterprise Guide | | - 0 | × | |
|------------|---|--|---|-------------------|--|
| File | File Edit View Program Tools Help 💽 🏲 🚯 🕼 💭 | | | PSD Lab | |
| 4 8 | Project • × • • • • • • • • • • • • • • • • • • • | ♂ Start Page 😤 Process Flow Program × | | * | |
| | | ★ Run ■ Concei 图 図 米 B G つ C 語 く Share・ 意 Debug 图 图 SASApp ・ : Code | | | |
| | | 1 2 Eproc options; 3 run; 4 | Second Line Affected Code Log Line Program Line | ^ | |
| | | | 683 target host name is used. 684 NOSTDIO SAS does not use the standard streams st. 685 STIMEFMT=(NLDATM2. HMS TIMEAMFM KB MEMFULL TSTULL NC) 686 Specifies the format that is used to disj 687 elapsed time statistics. 688 STIME | stdir displa | |
| <u>[</u>] | Servers * × | | 689 SYSIN= Specifies the SAS program to execute | in bat | |
| 6 | 0 @ @ | | 690 SISPELNT [®] Specifies the destination for printed 691 TAPECLOSE=REREAD CLOSE disposition for a library on ta 692 USERCONFIG Process .sav9.cf and sav9.cf onf | ipe. | |
| \$ | B Local SASApp | | 693 NOVERBOSE Does not write start-up system option 694 WORKPERMS=700 Sets the permissions of the SAS Work 605 NOVEMO Distance of the SAS | is to t librar | |
| d⊐ | Constant Constan | | 656 NOTE: FROCEDURE OFTIONS used (Total process time): 657 real time 0.00 seconds 658 cpu time 0.01 seconds 699 700 31 | | |
| | | | 702 32 703 33 %LET _CLIENTTRAKLABEL=; 704 34 %LET _CLIENTPROJECTRATH=; 705 35 %LET _CLIENTPROJECTRATH=; 706 36 %LET _CLIENTPROJECTRATH=; 707 37 %LET _CLIENTPROJECTRAME=; | | |

Figure 33: SAS Enterprise Guide PROC OPTIONS Output

GRID-LAUNCHED VS NO GRID-LAUNCHED

You can use SAS Enterprise Guide to compare the results from running with a grid-launched workspace server configuration to an alternate configuration that does not use a grid-launched workspace server.

Figure 34 illustrates the detailed bjobs output when using a grid-launched workspace server. Job 2777 is a workspace server session started by the object spawner, using LSF for the user. Code submitted from SAS Enterprise Guide runs directly on this session as a grid job.

| [sas@eeclxvm229 Obj | ectSpawner]\$ |
|-----------------------|---|
| [sas@eeclxvm229 Obj | ectSpawner]\$ bjobs -w -u all |
| JOBID USER STA | T QUEUE FROM HOST EXEC HOST JOB NAME SUBMIT TIME |
| 2777 sasmbs RUN | <pre>qeq eeclxvm228.unx.sas.com eeclxvm228.unx.sas.com SAS Enterprise Guide SASApp - Workspa</pre> |
| ce Server 567D67E8- | AF17-2549-B279-47B00FAABD18 Feb 11 13:24 |
| [sas@eeclxvm229 Obj | ectSpawner] \$ |
| [sas@eeclxvm229 Obj | ectSpawner]\$ bjobs -1 2777 |
| | |
| Job <2777>, Job Nam | e <sas -="" 567d67e8-a<="" enterprise="" guide="" sasapp="" server="" td="" workspace=""></sas> |
| | F17-2549-B279-47B00FAABD18>, User <sasmbs>, Project <defau< td=""></defau<></sasmbs> |
| | lt>, Status <run>, Queue <qeq>, Command </qeq></run> |
| | f17w38/Lev1/SASApp/WorkspaceServer/WorkspaceServer.sh -not |
| | erminal -noxcmd -netencryptalgorithm SASProprietary -metas |
| | erver eeclxvm228.unx.sas.com -metaport 8561 -metarepositor |
| | v Foundation -locale en US -objectserver -objectserverparm |
| | s "delayconn sph=eeclyym228.uny,sas.com protocol=bridge sp |
| | awned spp=38302 cid=0 pb classfactory=440196D4-90F0-11D0-9 |
| | F41-00A024BB830C_server=OMSOBJ:SERVERCOMPONENT/A57XK4M3.AY |
| | 00000C cel=credentials lb recon grid" -METAUSER !"sasmbs@! |
| | *(generatedpassworddomain)*!": -METAPASS b5ca7d6F5010b66A9 |
| | 2947316DF43f1a > |
| Tue Feb 11 13·24·57 | Submitted from host <pre>ceclxym228 upx sas comb. CWD <shome>.</shome></pre> |
| 140 100 11 15.24.37 | Specified Hosts <eeclxvm228.unx.sas.com>, <eeclxvm229.unx< td=""></eeclxvm229.unx<></eeclxvm228.unx.sas.com> |
| Tue Feb 11 13.24.57 | Started 1 Task(s) on Host(s) ceclyum 228 uny sas comb All |
| 140 100 11 15.24.57 | cated 1 Slot(s) on Host(s) <colymn220 comp="" frac<="" sas="" td="" unv=""></colymn220> |
| | ution Home //home/samhes Every in //home/samhes. |
| Tue Feb 11 13.25.03 | action incle scheducts a collected |
| 140 100 11 13.23.03 | MEN: 20 Moutes - SWAD: 0 Moutes - NUMPEAD: 27 |
| | DCTD-12026- DTD-22026- 12026- |
| | FGLD. 13030, FLDS. 13030 13040 13103 |
| | |
| MEMORY HEACE . | |
| MEMORI USAGE: | · AVC NEW, 25 Montos |
| MAX MEM. 30 MDyces | , AVG MEM. 20 MDyles |
| SCHEDIII INC. DADAMER | |
| SCHEDULING PARAMET | DKD: In alfan ut na io lo it tan an aon |
| IIJS I | in fish ut pg to is it the swp mem |
| loadSched - | |
| roadstop - | |
| DECOUDCE DECUTDEME | |
| RESOURCE REQUIREME | |
| Combined: select[t | ype == any order(riss:pg) |
| Lilective: select[| cype == any] order[riss.pd] |
| [sas@eec]xvm229 Obj | |
| | |

Figure 34: SAS Enterprise Guide Bjobs Detailed Output with Grid-Launched Server

Figure 35 illustrates the detailed bjobs output from using the Use grid if available clientside configuration while not using grid-launched server features in server metadata. The object spawner starts a workspace server session that is not a grid job. Job 2774 is a grid server session for the user started by LSF using the sasgrid script. Code submitted from SAS Enterprise Guide runs on this session as a grid job.

| [Sas@eecixvm229 Objectsp | bawner] \$ |
|---|---|
| [sas@eeclxvm229 ObjectSp | pawner]\$ |
| [sas@eeclxvm229 ObjectSp | pawner]\$ bjobs -w -u all |
| JOBID USER STAT QU | JEUE FROM_HOST EXEC_HOST JOB_NAME SUBMIT_TIME |
| 2774 sasmbs RUN no | prmal eeclxvm228.unx.sas.com eeclxvm228.unx.sas.com EG.sasmbs.56321 Feb 11 13:02 |
| [sas@eeclxvm229 ObjectSp | pawner]\$ |
| [sas@eeclxvm229 ObjectSp | bawner]\$ |
| [sas@eeclxvm229 ObjectSp | pawner]\$ bjobs -1 2774 |
| | |
| Job <2774>, Job Name <ec< td=""><td>G.sasmbs.56321>, User <sasmbs>, Project <default>, Statu</default></sasmbs></td></ec<> | G.sasmbs.56321>, User <sasmbs>, Project <default>, Statu</default></sasmbs> |
| s < | <pre>KRUN>, Queue <normal>, Command </normal></pre> |
| Lev | v1/SASApp/GridServer/sasgrid SASDAEMONHOST:eeclxvm228.un |
| х. : | 5as.com SASDAEMONPORT:45034 SASCLIENTPORT:1 "SASARM4CORL |
| 8R: | ACj/ADQ0MjBGM0MzLT1EOUUtMTA0RC05NThBLTNBMjUyQUNDMDNFNA= |
| ="> | >, Share group charged |
| Tue Feb 11 13:02:41: Sub | mitted from host <eeclxvm228.unx.sas.com>, CWD <\$HOME>,</eeclxvm228.unx.sas.com> |
| Re | equested Resources <sasapp>;</sasapp> |
| fue Feb 11 13:02:42: Sta | arted 1 Task(s) on Host(s) <eeclxvm228.unx.sas.com>, All</eeclxvm228.unx.sas.com> |
| oca | ated 1 Slot(s) on Host(s) <eeclxvm228.unx.sas.com>, Exec</eeclxvm228.unx.sas.com> |
| uti | ion Home , Execution CWD ; |
| rue Feb 11 13:03:38: Res | source usage collected. |
| MEN | M: 37 Mbytes; SWAP: 0 Mbytes; NTHREAD: 31 |
| PG | TD: 56623: PIDs: 56623 56625 56627 56731 56768 |
| | |
| | |
| MEMORY USAGE: | |
| MAX MEM: 37 Mbytes: AV | VG MEM: 34 Mbytes |
| | |
| SCHEDULING PARAMETERS: | |
| r15s r1m v | r15m ut par io 1s it tmp swp mem |
| loadSched | |
| loadStop | |
| Toughtop | |
| RESOURCE REQUIREMENT DE | STATLS. |
| Combined: select[(SASAr | b) && (type == any)] order[r]5s:pg] |
| Effective: select[(SASA | a_{pp} (a (a_{pp} = a_{pp})] order[r15:pg] |
| Borroot (ous | |
| [sas@eeclxvm229 ObjectSr | bawner18 |
| | |
| | |



CONCLUSION

There is a cost associated with starting a workspace server and a grid server for every user request to run a grid job. Grid-launched servers start server sessions in the grid. An additional grid server session is not required. It is efficient to run code directly on the grid-launched workspace server. There are cases when you do not want to use grid-launched server features. For example, some SAS web applications might perform better using server-side grid load balancing and enabling the object spawner instead of the workload manager to start the SAS server. In this scenario, LSF is used to select the best host to start the SAS session, but the workload is not managed by LSF policies, because there is no grid job.

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CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the author at:

Murali Srinivasan SAS Institute Inc murali.srinivasan@sas.com

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