

Ask the Expert

Why Do I Need SAS® Enterprise Session Monitor and Ecosystem Diagnostics?

Steven Sober

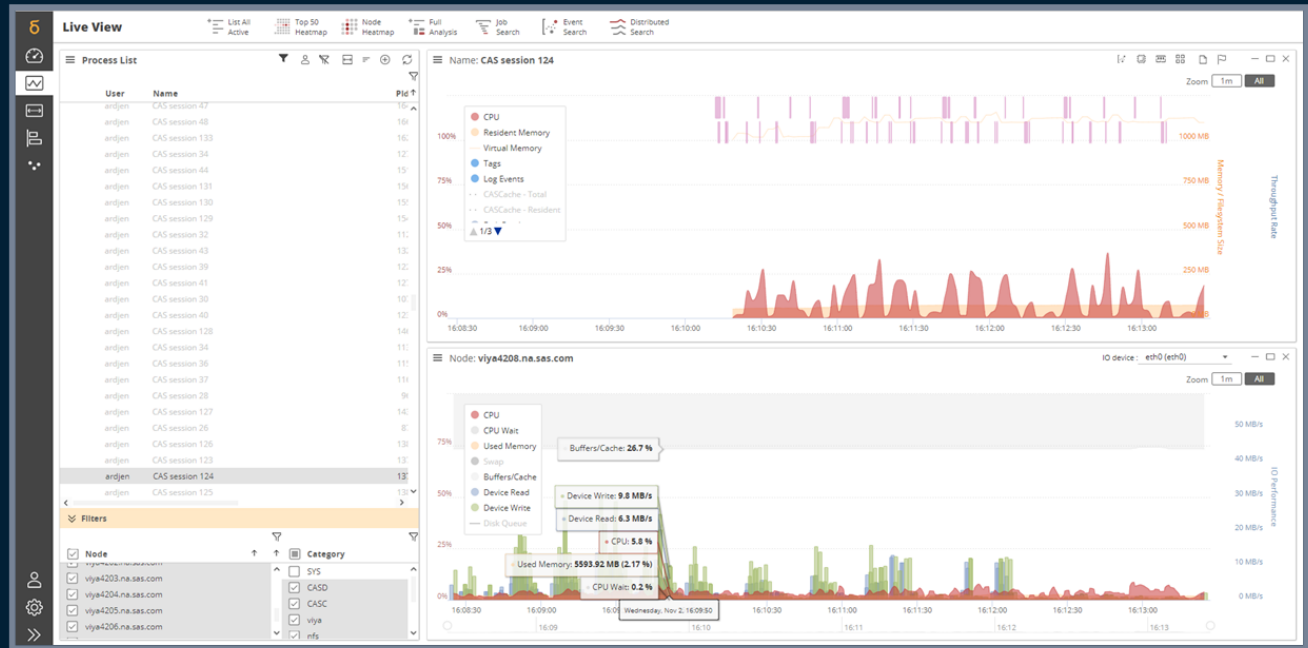
Advisory Solutions Architect

Customer Technology Adoption

SAS Enterprise Session Monitor

Who is it for?

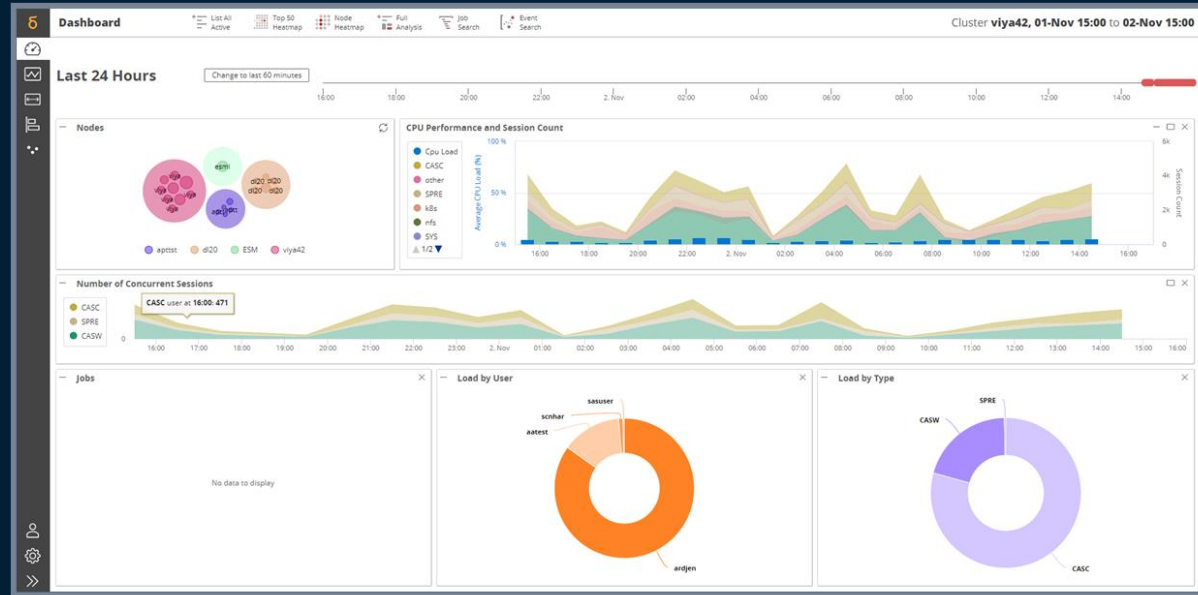
- Platforms:
 - SAS 9.x
 - Viya 3
 - SAS Viya 4
- Roles:
 - SAS Administrators
 - SAS Developers



SAS Enterprise Session Monitor

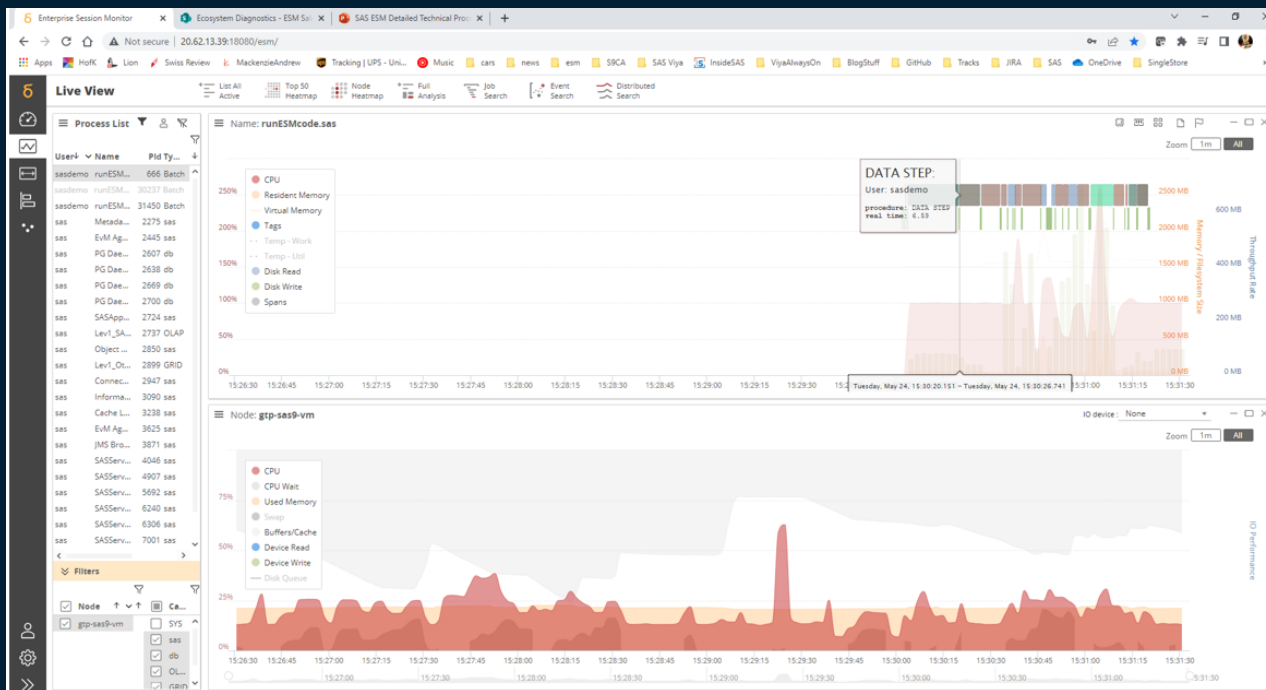
What is it?

- An *Observability* tool for Analytic workloads
- Get a holistic view of analytics consumption across the enterprise
- Provides real-time workload identification
- Enables self-service root cause analysis and event investigation



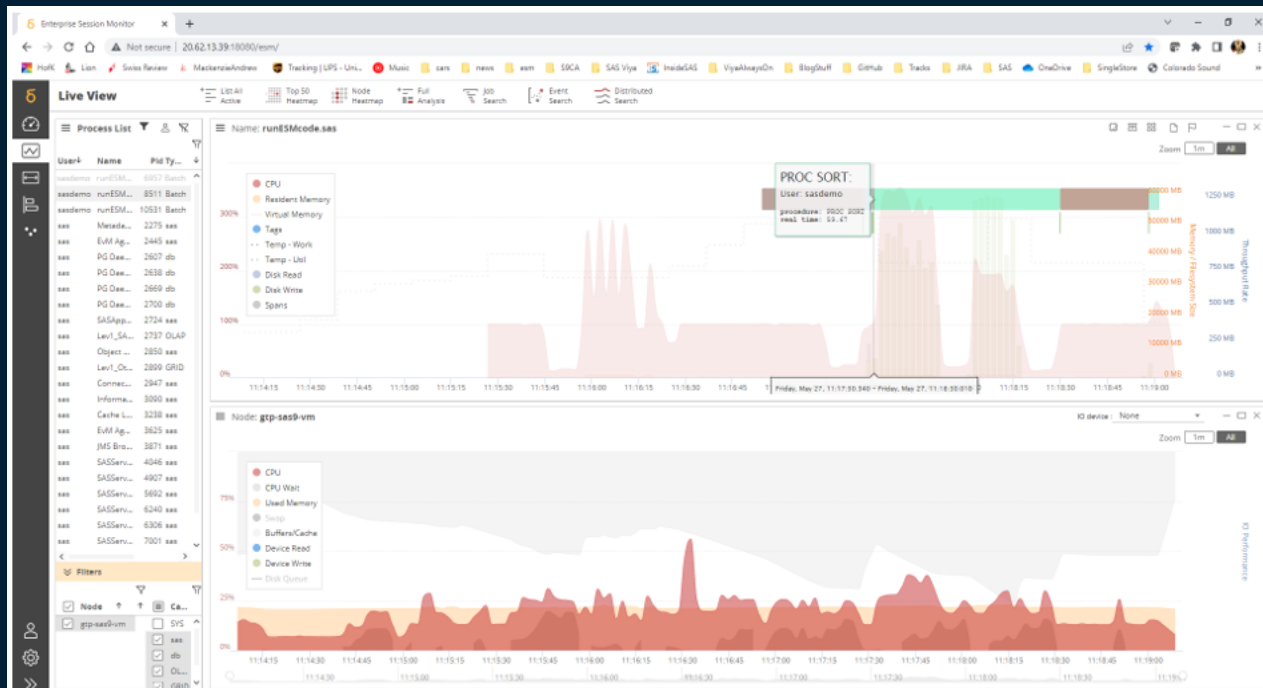
SAS Enterprise Session Monitor (ESM)

Monitor Interactive SAS Users and SAS Batch Jobs



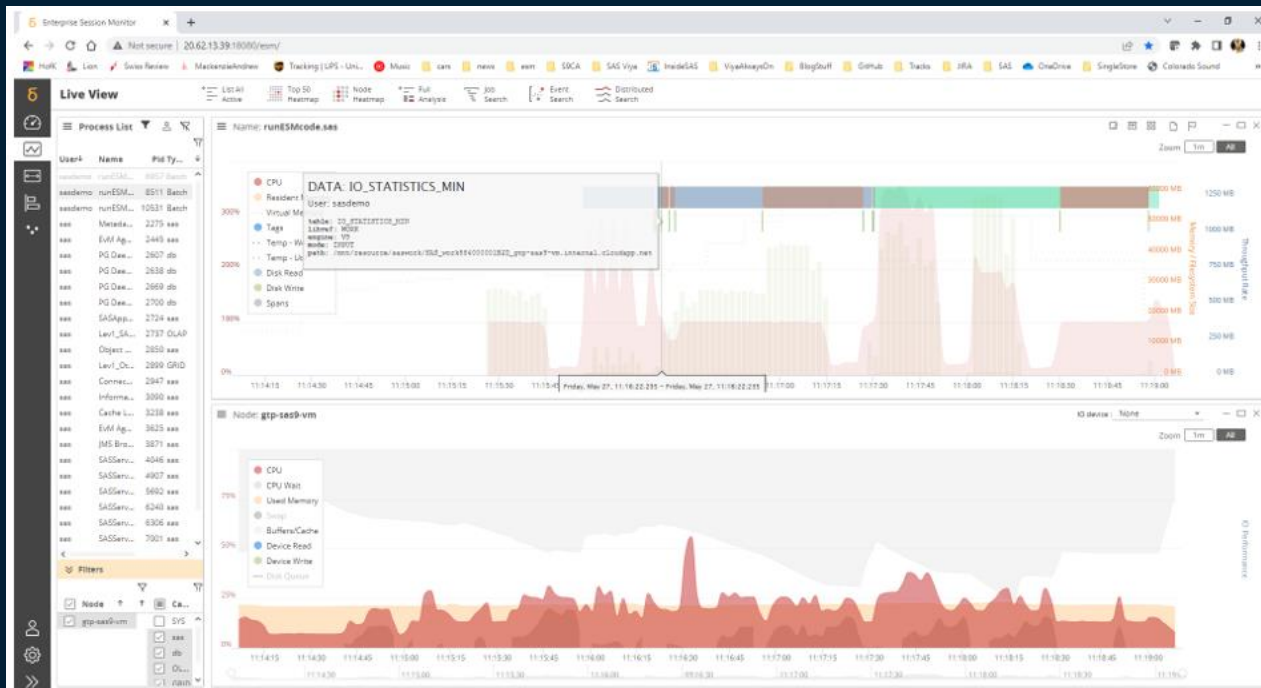
SAS Enterprise Session Monitor (ESM)

Monitor Interactive SAS Users and SAS Batch Jobs



SAS Enterprise Session Monitor (ESM)

Monitor Interactive SAS Users and SAS Batch Jobs



SAS Enterprise Session Monitor (ESM)

Monitor Interactive SAS Users and SAS Batch Jobs

The screenshot displays the SAS Enterprise Session Monitor (ESM) interface. The main window is titled "Events and Logs" and contains a search bar with the text "Tag events quicksearch". Below the search bar, there is a list of events and logs, each with a timestamp, a log file path, and a description of the event. The log file path is consistently "Log: /sas/sasconfig/compute/Lev1/SASApp/BatchServer/Logs/runESMcode2022.05.23_09.30.01.log from line: 0 to line: 6422 X". The events include various SAS processes such as "LIBREDFHORK Engine=V9 Member=ESM_PROCESS_STATS_AGG_MIN MemberType=DATA Openmode=OUTPUT Path=/mnt/resource/saswork/SAS_work92F50000614B_gtp-sas9-vm.internal.cloudapp.net", "PROCEDURE SORT", "PROCEDURE FREQ", "PROCEDURE NEANS", and "SAS Institute Inc., SAS Campus Drive, Cary, NC USA 27513-2414". The interface also shows a sidebar with navigation icons and a status bar at the bottom indicating "The SAS System" and "Monday, May 23, 2022 09:30:00 PM".

Event ID	Timestamp	Log File Path	Description
6361	2022-05-23T21:37:24,092	Log: /sas/sasconfig/compute/Lev1/SASApp/BatchServer/Logs/runESMcode2022.05.23_09.30.01.log from line: 0 to line: 6422 X	
6362	2022-05-23T21:37:24,093		LIBREDFHORK Engine=V9 Member=ESM_PROCESS_STATS_AGG_MIN MemberType=DATA Openmode=OUTPUT Path=/mnt/resource/saswork/SAS_work92F50000614B_gtp-sas9-vm.internal.cloudapp.net
6363	2022-05-23T21:37:42,432		NOTE: There were 58482388 observations read from the data set WORK.ESM_PROCESS_STATS_AGG_MIN.
6364	2022-05-23T21:38:10,195		NOTE: The data set WORK.ESM_PROCESS_STATS_AGG_MIN has 58482388 observations and 35 variables.
6365	2022-05-23T21:38:22,550		NOTE: PROCEDURE SORT used (Total process time): real time 58.45 seconds cpu time 1:38.05
6367	2022-05-23T21:38:22,550		
6368	2022-05-23T21:38:22,550		
6369	2022-05-23T21:38:22,550		
6370	2022-05-23T21:38:22,550		LIBREDFHORK Engine=V9 Member=ESM_PROCESS_STATS_AGG_MIN MemberType=DATA Openmode=INPUT Path=/mnt/resource/saswork/SAS_work92F50000614B_gtp-sas9-vm.internal.cloudapp.net
6371	2022-05-23T21:38:22,551		MPRINT(WORK2CAS): proc freq data=work.ESM_PROCESS_STATS_AGG_MIN noprint;
6372	2022-05-23T21:38:22,551		LIBREDFHORK Engine=V9 Member=FREQ MemberType=DATA Openmode=OUTPUT Path=/mnt/resource/saswork/SAS_work92F50000614B_gtp-sas9-vm.internal.cloudapp.net
6373	2022-05-23T21:38:22,551		MPRINT(WORK2CAS): tables esm_user*avg_memory / OUT=freq;
6374	2022-05-23T21:38:22,551		MPRINT(WORK2CAS): run;
6375	2022-05-23T21:38:22,551		
6376	2022-05-23T21:38:51,073		NOTE: There were 58482388 observations read from the data set WORK.ESM_PROCESS_STATS_AGG_MIN.
6377	2022-05-23T21:38:51,073		NOTE: The data set WORK.FREQ has 1311248 observations and 4 variables.
6378	2022-05-23T21:38:51,073		NOTE: PROCEDURE FREQ used (Total process time): real time 28.93 seconds cpu time 28.52 seconds
6379	2022-05-23T21:38:51,073		
6380	2022-05-23T21:38:51,073		
6381	2022-05-23T21:38:51,073		
6382	2022-05-23T21:38:51,073		
6383	2022-05-23T21:38:51,074		LIBREDFHORK Engine=V9 Member=ESM_PROCESS_STATS_AGG_MIN MemberType=DATA Openmode=INPUT Path=/mnt/resource/saswork/SAS_work92F50000614B_gtp-sas9-vm.internal.cloudapp.net
6384	2022-05-23T21:38:51,074		MPRINT(WORK2CAS): proc means data=work.ESM_PROCESS_STATS_AGG_MIN noprint;
6385	2022-05-23T21:38:51,074		MPRINT(WORK2CAS): var avg_memory;
6386	2022-05-23T21:38:51,074		LIBREDFHORK Engine=V9 Member=FREQ MemberType=DATA Openmode=OUTPUT Path=/mnt/resource/saswork/SAS_work92F50000614B_gtp-sas9-vm.internal.cloudapp.net
6387	2022-05-23T21:38:51,074		MPRINT(WORK2CAS): output out=freq MEAN=avg_memory SUM=sum_memory;
6388	2022-05-23T21:38:51,074		MPRINT(WORK2CAS): run;
6389	2022-05-23T21:38:51,074		
6390	2022-05-23T21:38:54,604		NOTE: There were 58482388 observations read from the data set WORK.ESM_PROCESS_STATS_AGG_MIN.
6391	2022-05-23T21:38:54,604		NOTE: The data set WORK.FREQ has 1 observations and 4 variables.
6392	2022-05-23T21:38:54,613		NOTE: PROCEDURE NEANS used (Total process time): real time 3.54 seconds cpu time 4.97 seconds
6393	2022-05-23T21:38:54,613		
6394	2022-05-23T21:38:54,613		
6395	2022-05-23T21:38:54,613		
6396	2022-05-23T21:38:54,613		
6397	2022-05-23T21:38:54,614		2497 +
6398	2022-05-23T21:38:54,614		2498 +
6399	2022-05-23T21:38:54,614		2499 +
6400	2022-05-23T21:38:54,614		NOTE: %INCLUDE (level 1) ending.
6401	2022-05-23T21:38:54,614		2500
6402	2022-05-23T21:38:54,614		2501
6403	2022-05-23T21:38:54,614		2502
6404	2022-05-23T21:38:54,614		2503
6405	2022-05-23T21:38:54,614		2504
6406	2022-05-23T21:38:54,614		2505
6407	2022-05-23T21:38:54,614		2506
6408	2022-05-23T21:38:54,614		2507
6409	2022-05-23T21:38:54,614		2508
6410	2022-05-23T21:38:54,614		2509
6411	2022-05-23T21:38:54,614		180
6412	2022-05-23T21:38:54,614		
6413	2022-05-23T21:38:54,614		2510
6414	2022-05-23T21:38:54,614		2511
6415	2022-05-23T21:38:54,614		2512
6416	2022-05-23T21:38:54,614		
6417	2022-05-23T21:38:54,614		NOTE: SAS Institute Inc., SAS Campus Drive, Cary, NC USA 27513-2414
6418	2022-05-23T21:38:54,614		NOTE: The SAS System used: real time 8:53.06 cpu time 9:57.06
6419	2022-05-23T21:38:54,614		
6420	2022-05-23T21:38:54,614		

SAS Enterprise Session Monitor as a Data Engine

Use Cases from other customers

- Zero Trust Architecture
- Chargeback
- Management reporting
- Modernization planning
- Software Development Lifecycle Management

SAS Enterprise Session Monitor

Key Features



Real-time workload identification

Detect all SAS executions. Allow users and administrators to instantly see whether their jobs and interactive sessions are behaving as expected and if any action is required.



Scheduled batch job flow analysis

Collect detailed performance data on all jobs, including return code, flow and queue information. Job and flow visualization features accelerate root-cause analysis to help prevent future exceptions.



Self-service administration

Provides users with a secure and audited way to terminate sessions and view logs.



Point-and-click chargeback

Present session performance data through a drag-and-drop interface that lets users generate cost allocation rules by classifying workload into different departments.



Top-down performance analysis

Narrow in on hot spots and drill through to individual jobs or users that may be causing undesired behavior.



SAS Enterprise Session Monitor Install/Config

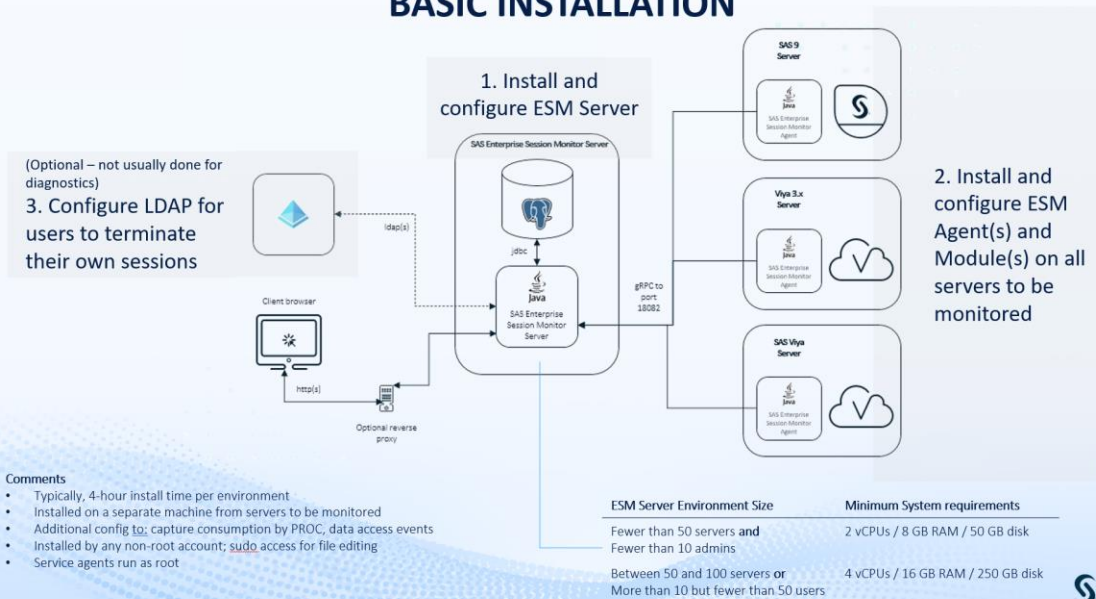
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SAS Enterprise Session Monitor (ESM)

Installation

BASIC INSTALLATION



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SAS Enterprise Session Monitor (ESM)

FAQ

TYPICAL FAQs FROM CUSTOMERS

Will ESM slow down the environments it monitors?

From data collected of ESM monitoring itself:

- Basic config is 5%-10% of 1 core...
- Advanced config (PROC & data access tracking) up to 20% of 1 core
- Maps to the workload spikes/logging follows, averages are above
- Per server basis

Is ESM an enterprise-grade monitoring tool?

- 100s of customers installed, 10s of thousands of core monitored
- Largest customer is monitoring 1376 cores across numerous SAS, non-SAS, cloud & on-prem environments today

How is data sent to SAS for additional analysis?

- Secured SharePoint shared between SAS and customer
- Packaged utility to create summary tables shared on secured SharePoint
- By default, Host Name & User ID are obfuscated; others optional
- Customer retains key which can unmask data

How big is the data that is generated?

Customer example:

80GB uncompressed data collected

4 environments, ~150 cores

Combined 700-1600
concurrent sessions

60 days monitored

Data size driven by:

- Num. servers monitored
- Num. sessions per server
- Num. markers per day
- Durations of sessions
- Config (basic vs. advanced)

Data Collected

Data Retention (configurable)

Minute Aggregate Hourly Aggregate

Server CPU, memory, IO	Stored for 60 days	Stored for one year
Session Statistics (peak, etc.)		
Path, Program Name, Host Name, User ID		
Errors		
Warnings, Procs	Stored for 60 days	
Data Access Events	Stored for 60 days	



SAS Enterprise Session Monitor Maintenance Utility Data Extraction Utility

sas.com



SAS Enterprise Session Monitor Maintenance Utility

[Download Page](#)

Credentials:

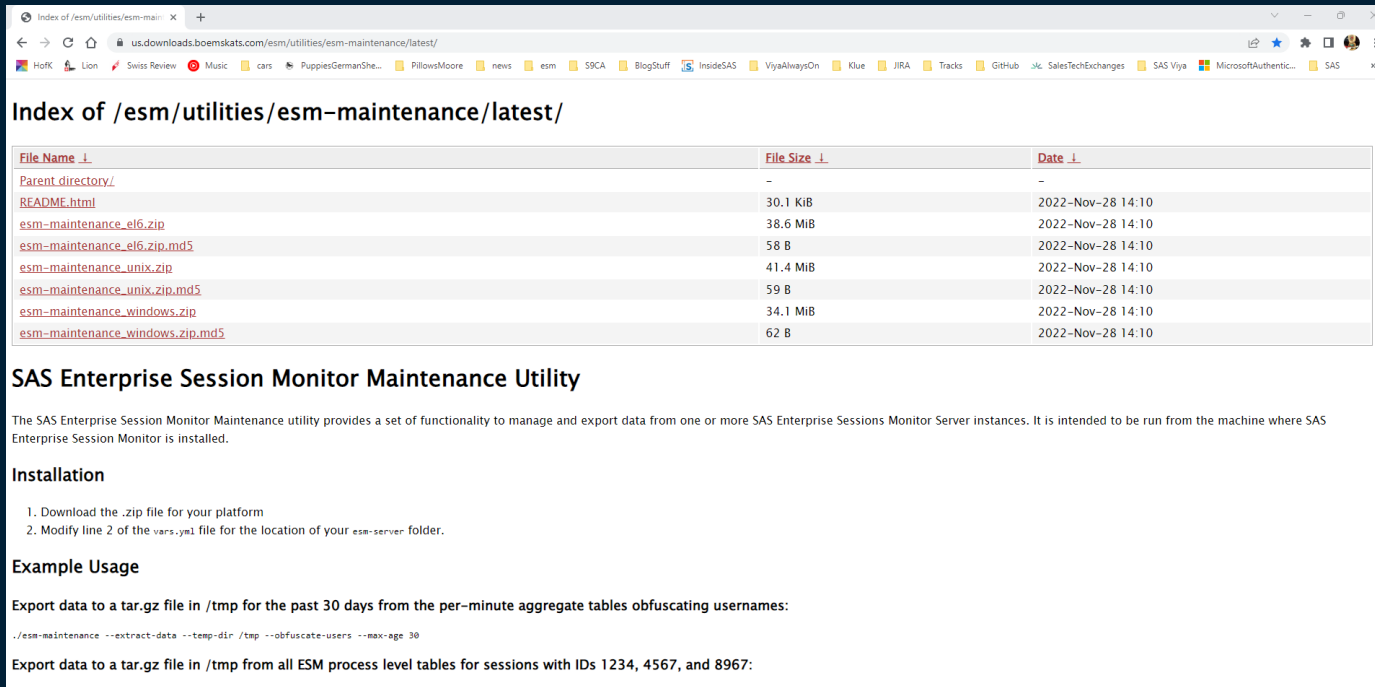
esm

BoemskaESM

SAS Enterprise Session Monitor Maintenance Utility

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Copy zip file to the ESM Server Instance and unzip it



Index of /esm/utilities/esm-maintenance/latest/

File Name	File Size	Date
Parent directory/	-	-
README.html	30.1 KiB	2022-Nov-28 14:10
esm-maintenance_el6.zip	38.6 MiB	2022-Nov-28 14:10
esm-maintenance_el6.zip.md5	58 B	2022-Nov-28 14:10
esm-maintenance_unix.zip	41.4 MiB	2022-Nov-28 14:10
esm-maintenance_unix.zip.md5	59 B	2022-Nov-28 14:10
esm-maintenance_windows.zip	34.1 MiB	2022-Nov-28 14:10
esm-maintenance_windows.zip.md5	62 B	2022-Nov-28 14:10

SAS Enterprise Session Monitor Maintenance Utility

The SAS Enterprise Session Monitor Maintenance utility provides a set of functionality to manage and export data from one or more SAS Enterprise Sessions Monitor Server instances. It is intended to be run from the machine where SAS Enterprise Session Monitor is installed.

Installation

1. Download the .zip file for your platform
2. Modify line 2 of the vars.yml file for the location of your esm-server folder.

Example Usage

Export data to a tar.gz file in /tmp for the past 30 days from the per-minute aggregate tables obfuscating usernames:

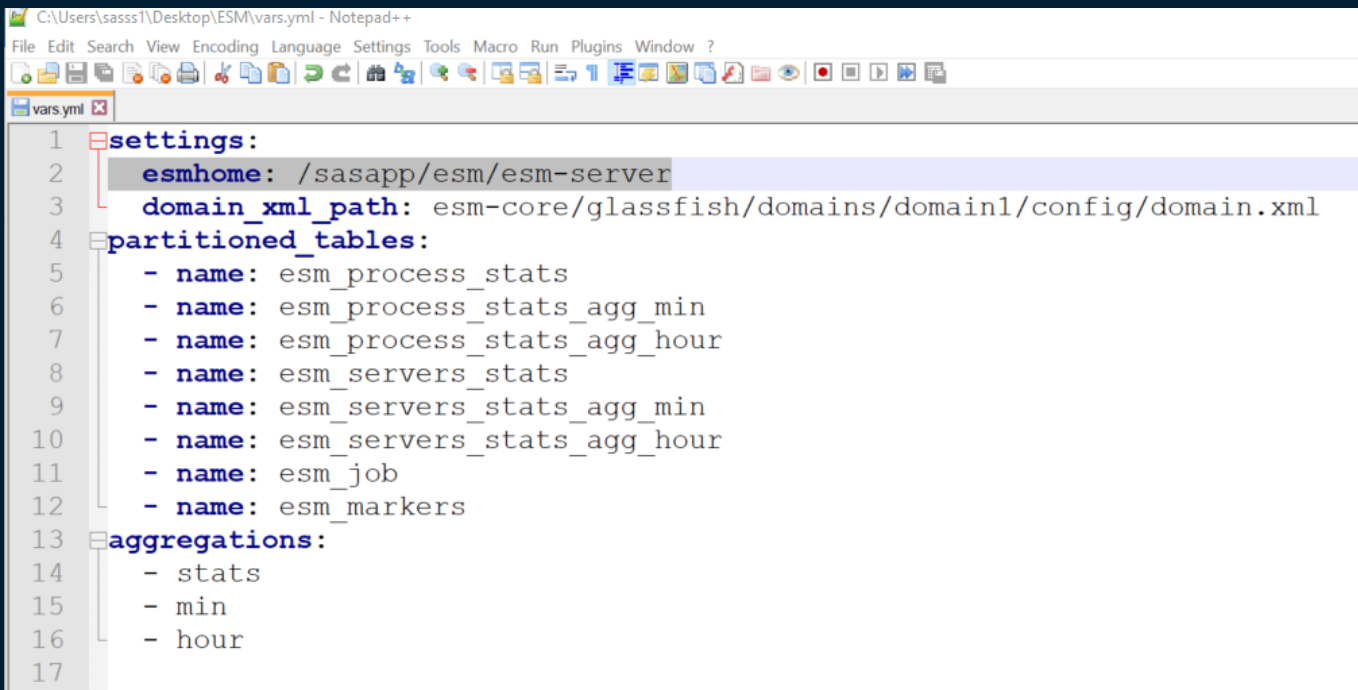
```
./esm-maintenance --extract-data --temp-dir /tmp --obfuscate-users --max-age 30
```

Export data to a tar.gz file in /tmp from all ESM process level tables for sessions with IDs 1234, 4567, and 8967:

SAS Enterprise Session Monitor Maintenance Utility

Modify the file vars.yml which is delivered with the utility

Modify line 2 to your esm-server folder & ensure the esm server is running



```
C:\Users\sasst\Desktop\ESM\vars.yml - Notepad++
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?
vars.yml
1 settings:
2   esmhome: /sasapp/esm/esm-server
3   domain_xml_path: esm-core/glassfish/domains/domain1/config/domain.xml
4 partitioned_tables:
5   - name: esm_process_stats
6   - name: esm_process_stats_agg_min
7   - name: esm_process_stats_agg_hour
8   - name: esm_servers_stats
9   - name: esm_servers_stats_agg_min
10  - name: esm_servers_stats_agg_hour
11  - name: esm_job
12  - name: esm_markers
13 aggregations:
14  - stats
15  - min
16  - hour
17
```


SAS Enterprise Session Monitor Maintenance Utility

[Download Page](#)

- Command

- Set max age to 95 even if there is less than 95 days' worth of data.

```
./esm-maintenance --extract-data --compress-data --temp-dir /tmp --obfuscate-users --obfuscate-hosts --max-age 95
```

SAS Enterprise Session Monitor Maintenance Utility

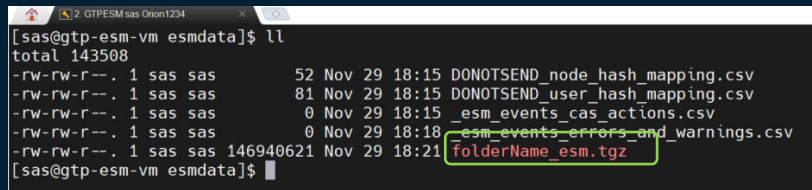
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- SAS Enterprise Session Monitor Maintenance Utility creates a zip/tarball containing the ESM data the customer shares with SAS

This screenshot is an example of the tarball that is copied to the SAS Secure SharePoint folder created using this [ServiceNow form](#).

Note: modify `folderName_esm.tgz/zip` to the actual folder name specified when you filled in the [ServiceNow form](#).

Copy the zip/tarball file to SAS Secure SharePoint site folder



```
[sas@gtp-esm-vm esmdata]$ ll
total 143508
-rw-rw-r--. 1 sas sas      52 Nov 29 18:15 DONOTSEND_node_hash_mapping.csv
-rw-rw-r--. 1 sas sas     81 Nov 29 18:15 DONOTSEND_user_hash_mapping.csv
-rw-rw-r--. 1 sas sas       0 Nov 29 18:15 _esm_events_cas_actions.csv
-rw-rw-r--. 1 sas sas       0 Nov 29 18:18 _esm_events_errors_and_warnings.csv
-rw-rw-r--. 1 sas sas 146940621 Nov 29 18:21 FolderName_esm.tgz
[sas@gtp-esm-vm esmdata]$
```



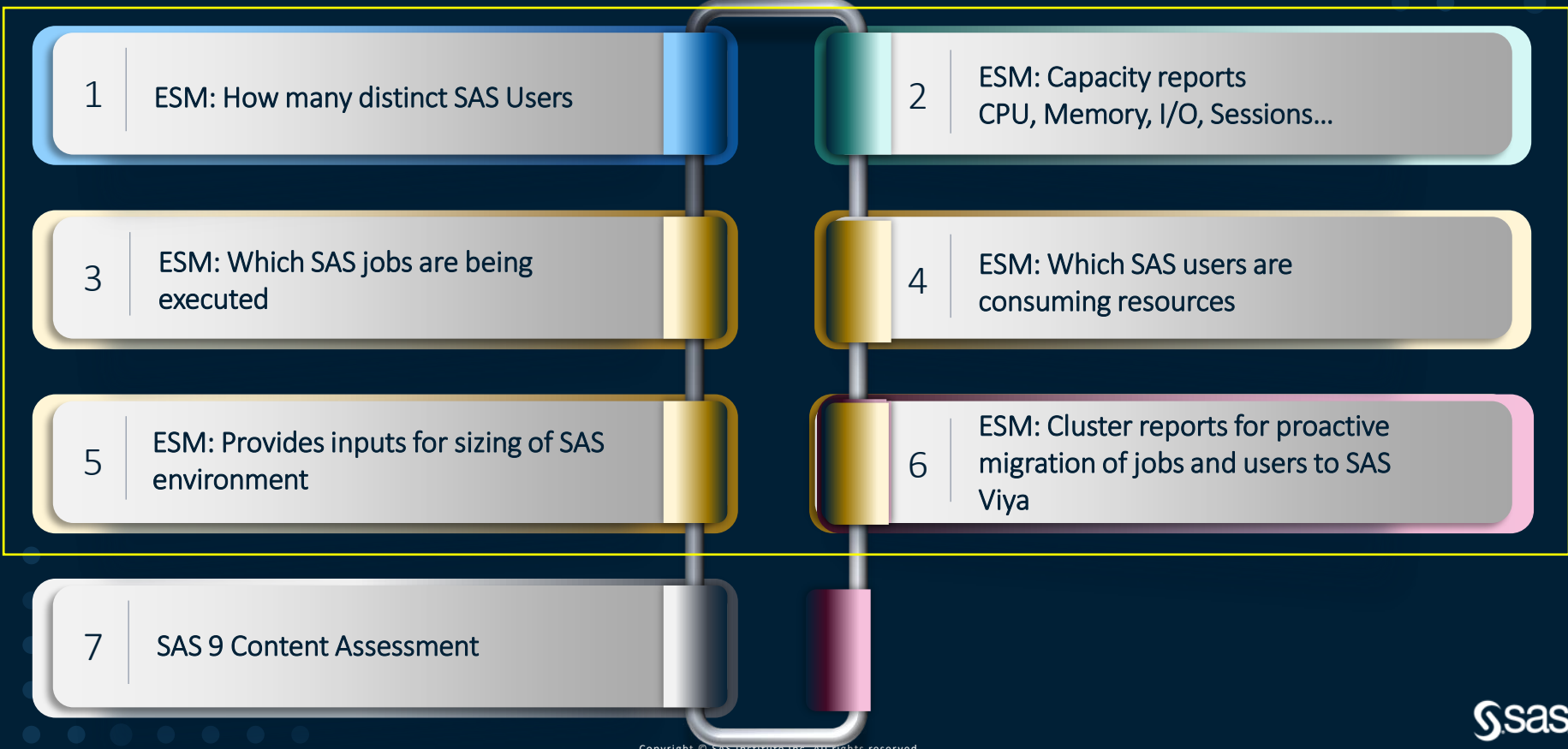
Ecosystem Diagnostics - SAS Enterprise Session Monitor Reports

Requires SAS Viya 2021.2.5 or Higher

sas.com

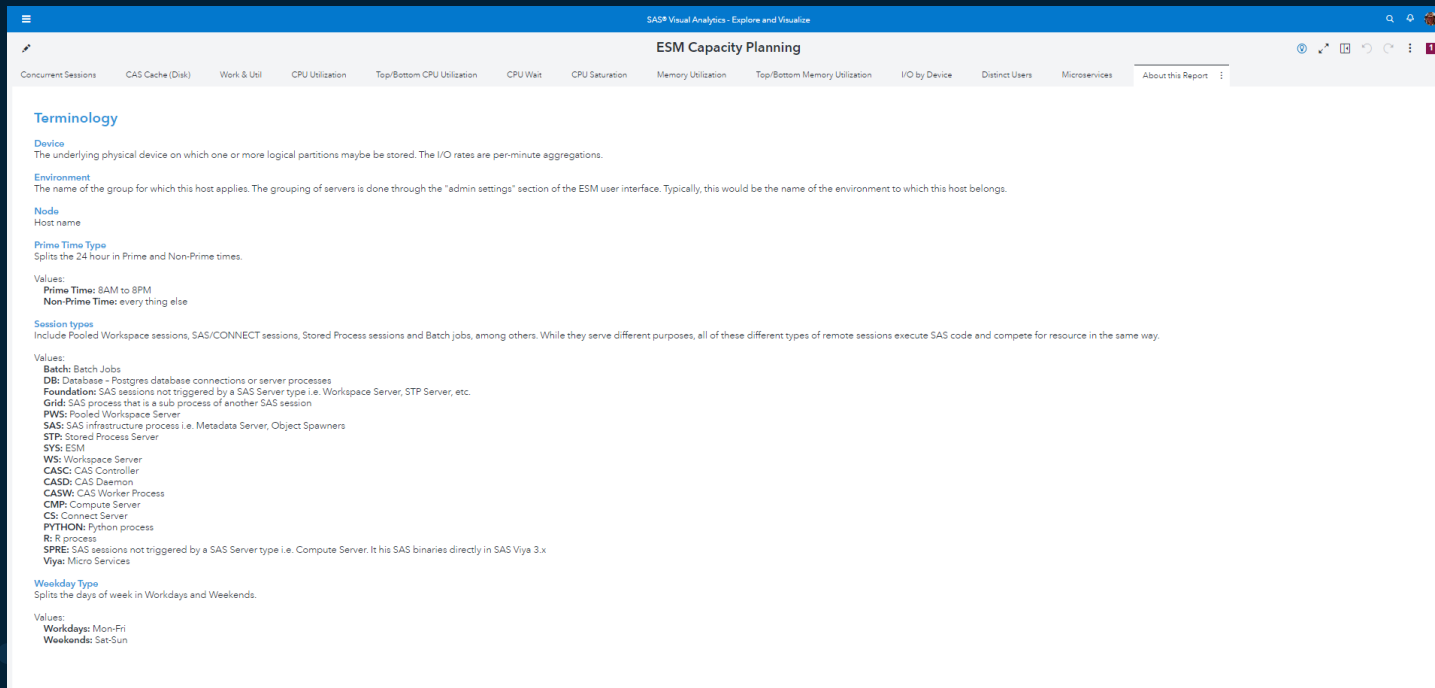


The Ecosystem Diagnostics helps organizations understand the impact of SAS on their environment



Ecosystem Diagnostics - SAS Enterprise Session Monitor

About this Report

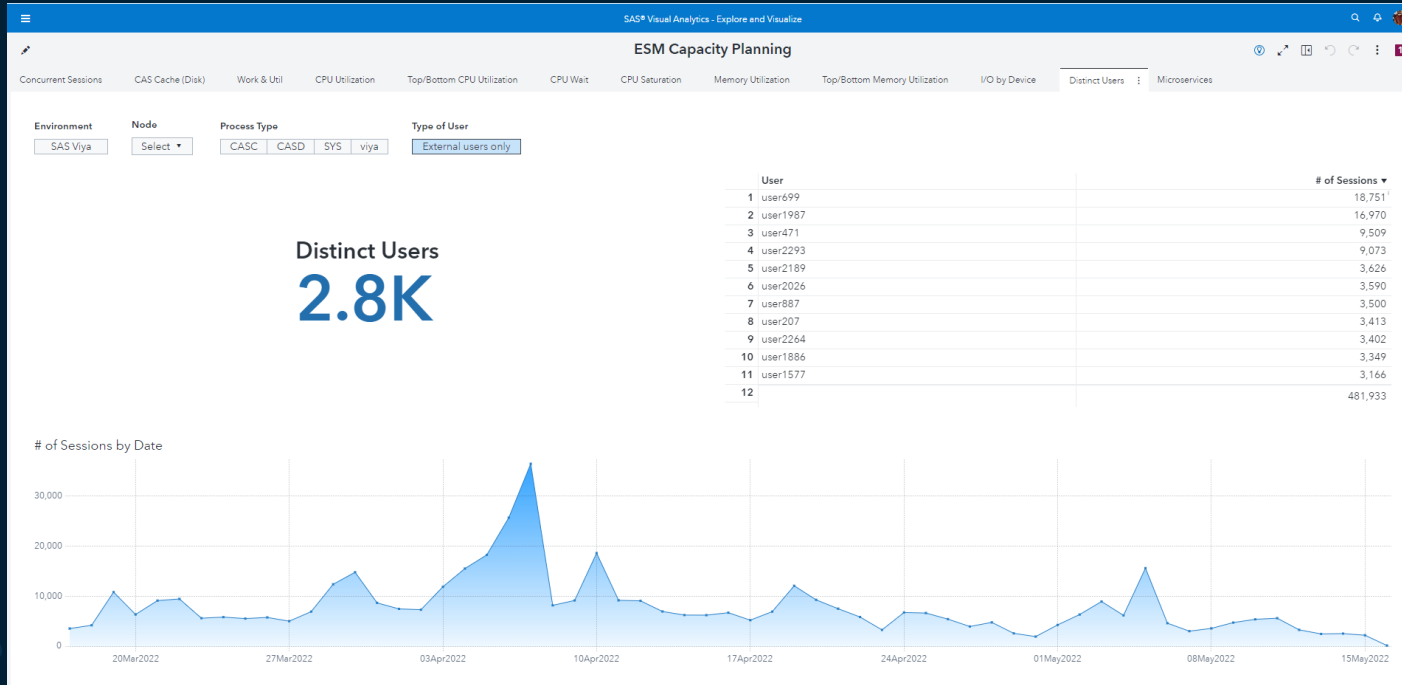


The screenshot displays the SAS Visual Analytics interface. The top navigation bar includes 'SAS Visual Analytics - Explore and Visualize' and a search icon. The main title is 'ESM Capacity Planning'. Below the title is a horizontal menu with various report categories: Concurrent Sessions, CAS Cache (Disk), Work & Util, CPU Utilization, Top/Bottom CPU Utilization, CPU Wait, CPU Saturation, Memory Utilization, Top/Bottom Memory Utilization, I/O by Device, Distinct Users, Microservices, and 'About this Report' (which is currently selected). The content area is titled 'Terminology' and contains several sections:

- Device**: The underlying physical device on which one or more logical partitions may be stored. The I/O rates are per-minute aggregations.
- Environment**: The name of the group for which this host applies. The grouping of servers is done through the "admin settings" section of the ESM user interface. Typically, this would be the name of the environment to which this host belongs.
- Node**: Host name
- Prime Time Type**: Splits the 24 hour in Prime and Non-Prime times.
 - Values:
 - Prime Time**: 8AM to 6PM
 - Non-Prime Time**: everything else
- Session types**: Include Pooled Workspace sessions, SAS/CONNECT sessions, Stored Process sessions and Batch jobs, among others. While they serve different purposes, all of these different types of remote sessions execute SAS code and compete for resource in the same way.
 - Values:
 - Batch**: Batch Jobs
 - DB**: Database - Postgres database connections or server processes
 - Foundation**: SAS sessions not triggered by a SAS Server type i.e. Workspace Server, STP Server, etc.
 - Grid**: SAS process that is a sub process of another SAS session
 - PWS**: Pooled Workspace Server
 - SAS**: SAS infrastructure process i.e. Metadata Server, Object Spawners
 - STP**: Stored Process Server
 - SVS**: ESM
 - WS**: Workspace Server
 - CASC**: CAS Controller
 - CASD**: CAS Daemon
 - CASW**: CAS Worker Process
 - CMP**: Compute Server
 - CS**: Connect Server
 - PYTHON**: Python process
 - R**: R process
 - SPRE**: SAS sessions not triggered by a SAS Server type i.e. Compute Server. It has SAS binaries directly in SAS Viya 3.x
 - Viya**: Micro Services
- Weekday Type**: Splits the days of week in Workdays and Weekends.
 - Values:
 - Workdays**: Mon-Fri
 - Weekends**: Sat-Sun

Ecosystem Diagnostics - SAS Enterprise Session Monitor

Distinct Users



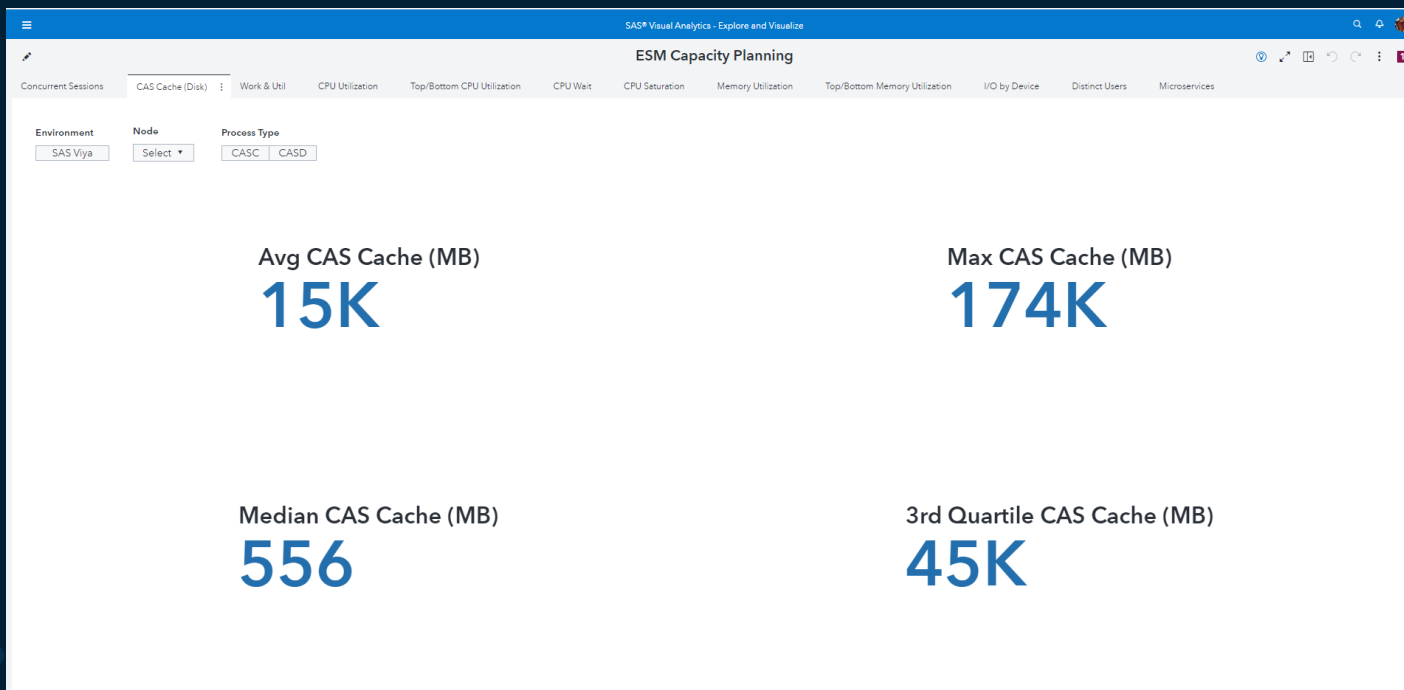
Ecosystem Diagnostics - SAS Enterprise Session Monitor

Concurrent Sessions



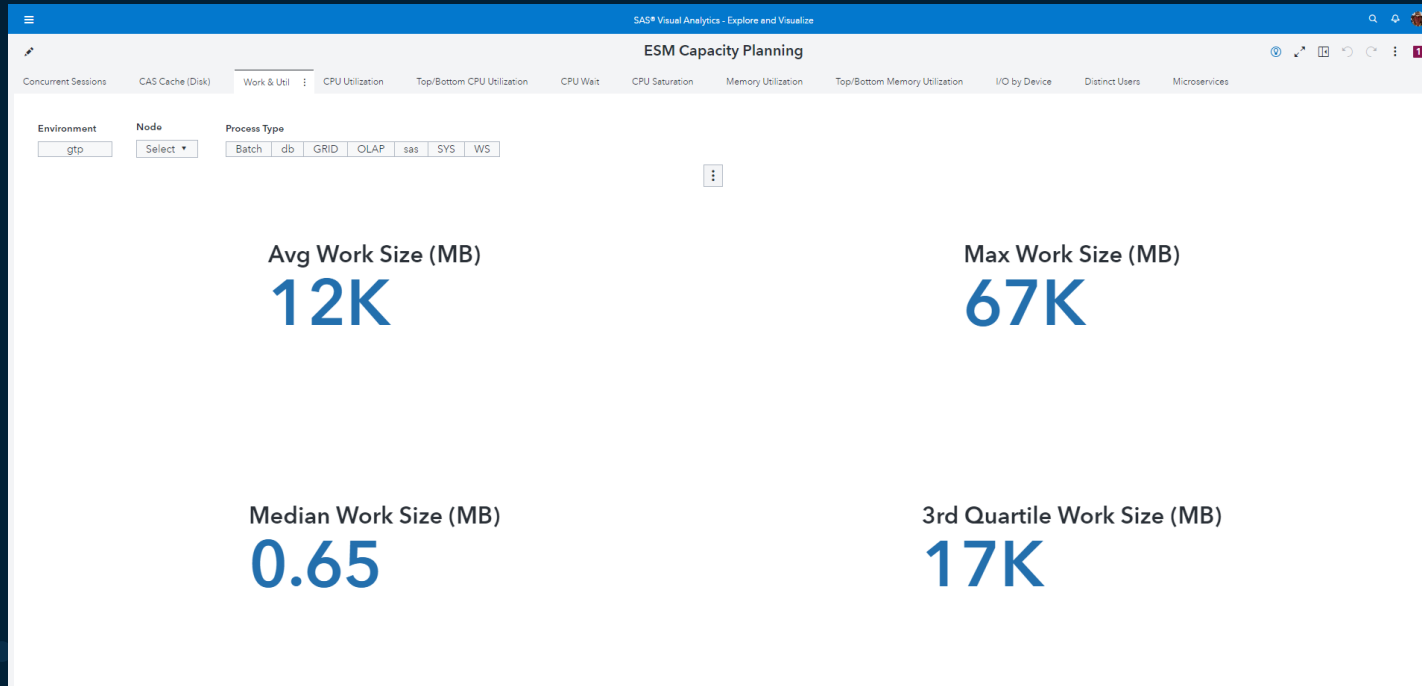
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CAS Cache



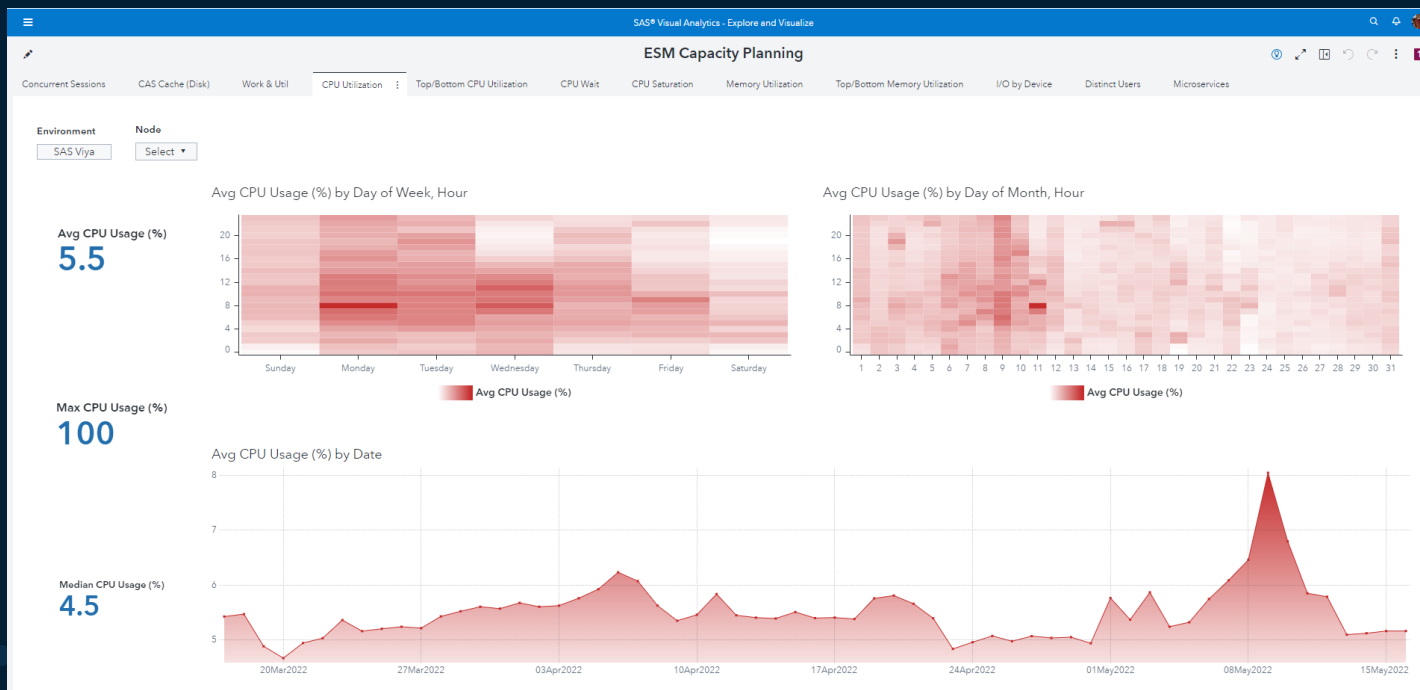
Ecosystem Diagnostics - SAS Enterprise Session Monitor

SAS WORK and SAS UTIL



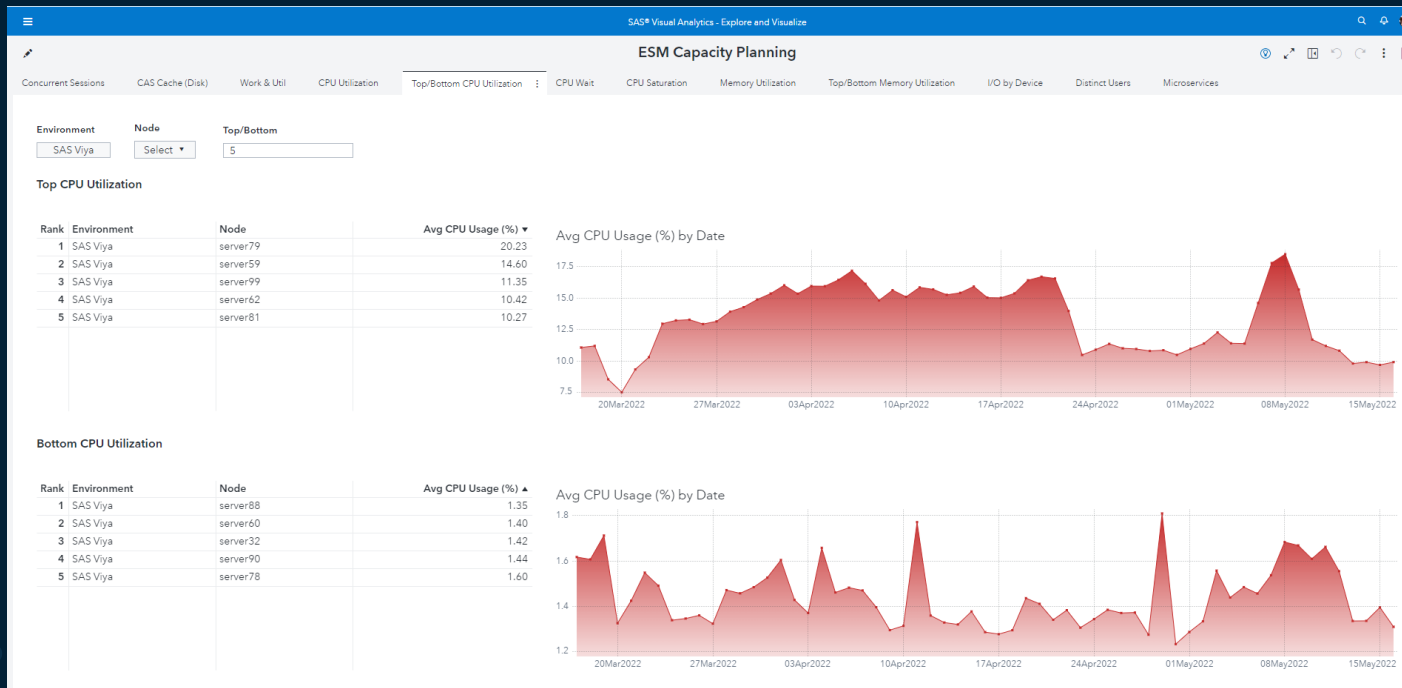
Ecosystem Diagnostics - SAS Enterprise Session Monitor

CPU Utilization



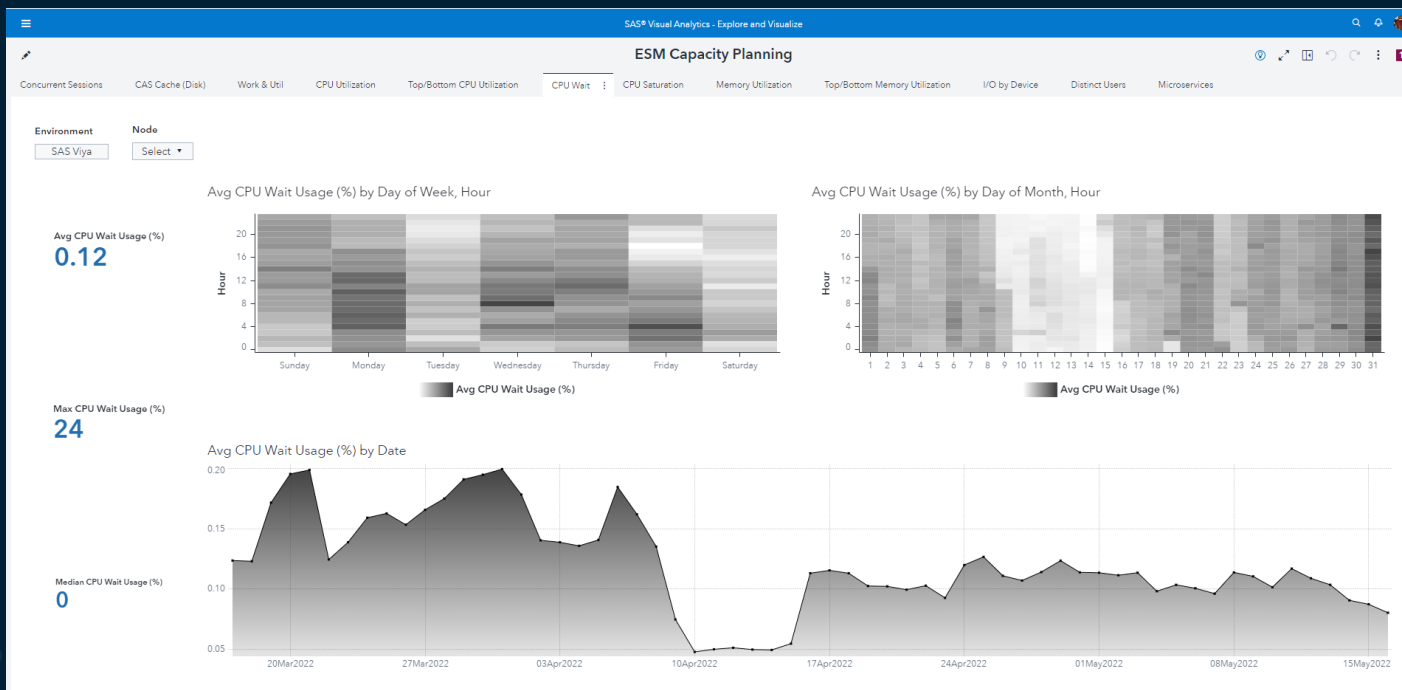
Ecosystem Diagnostics - SAS Enterprise Session Monitor

Top/Bottom CPU Utilization



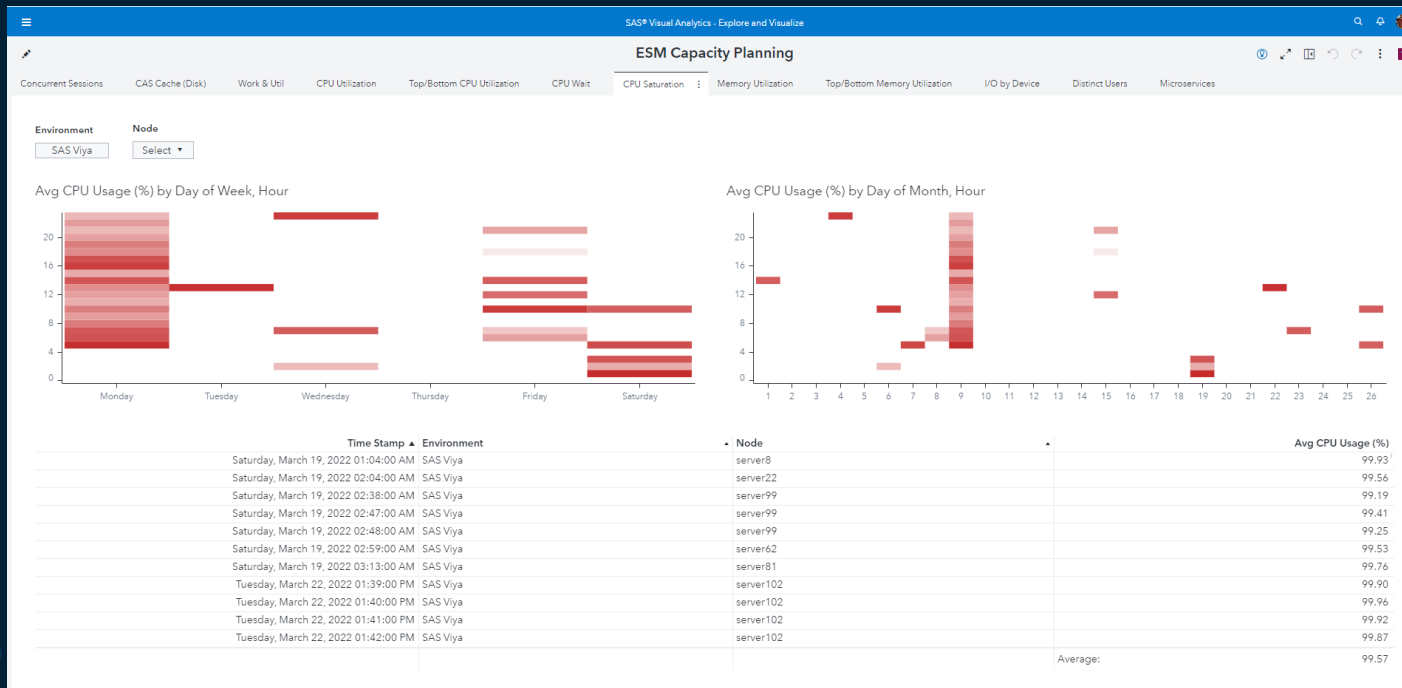
Ecosystem Diagnostics - SAS Enterprise Session Monitor

CPU Wait



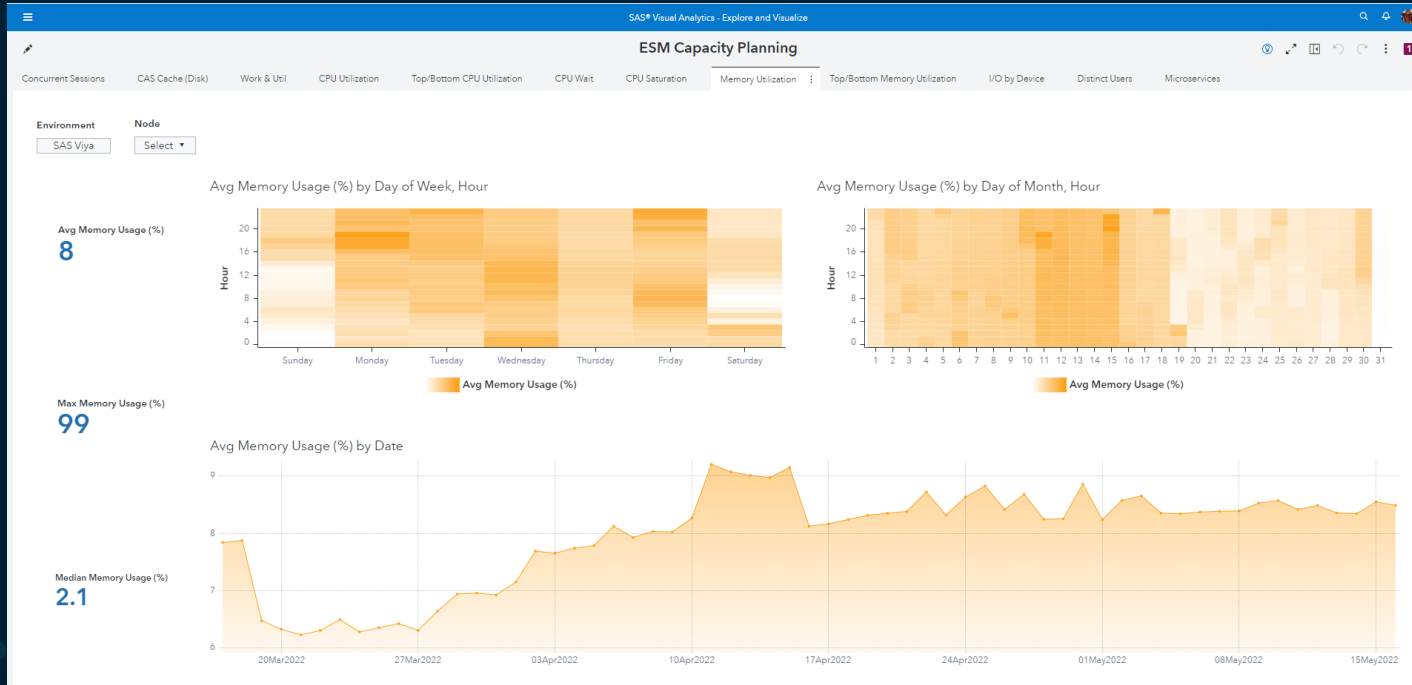
Ecosystem Diagnostics - SAS Enterprise Session Monitor

CPU Saturation



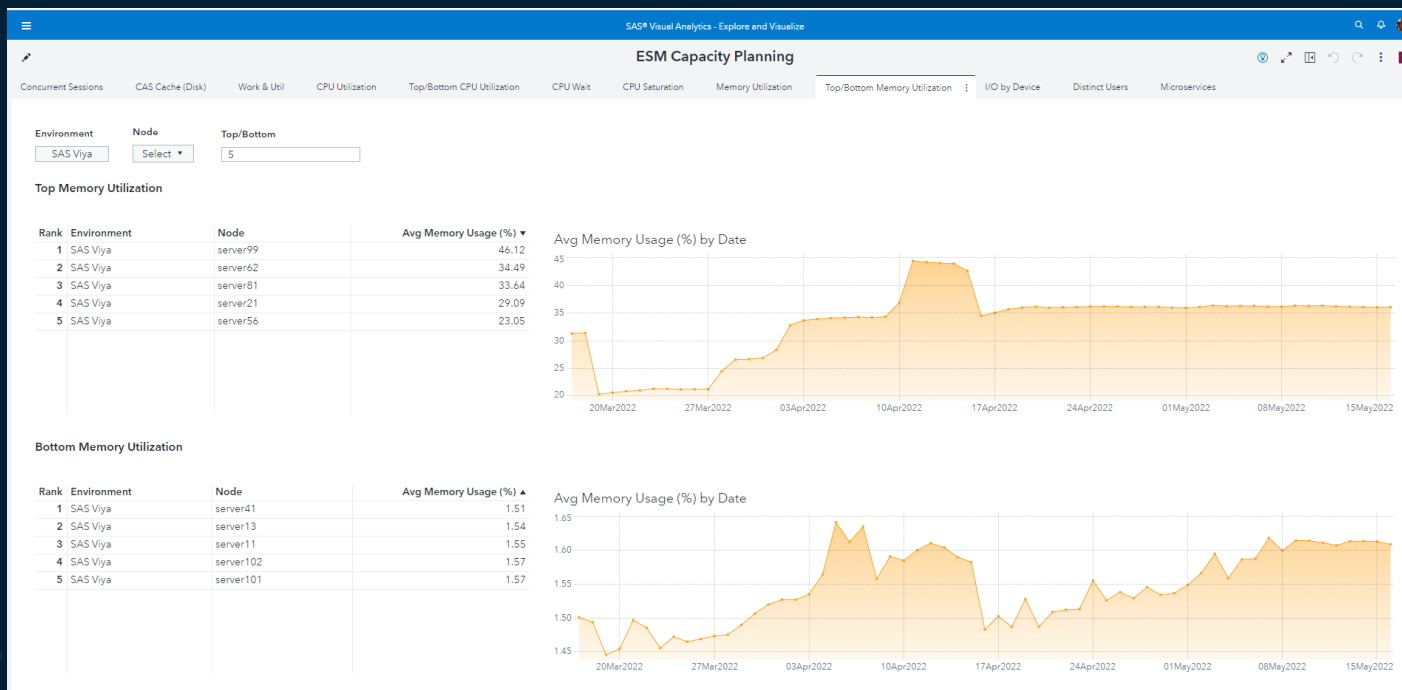
Ecosystem Diagnostics - SAS Enterprise Session Monitor

Memory Utilization



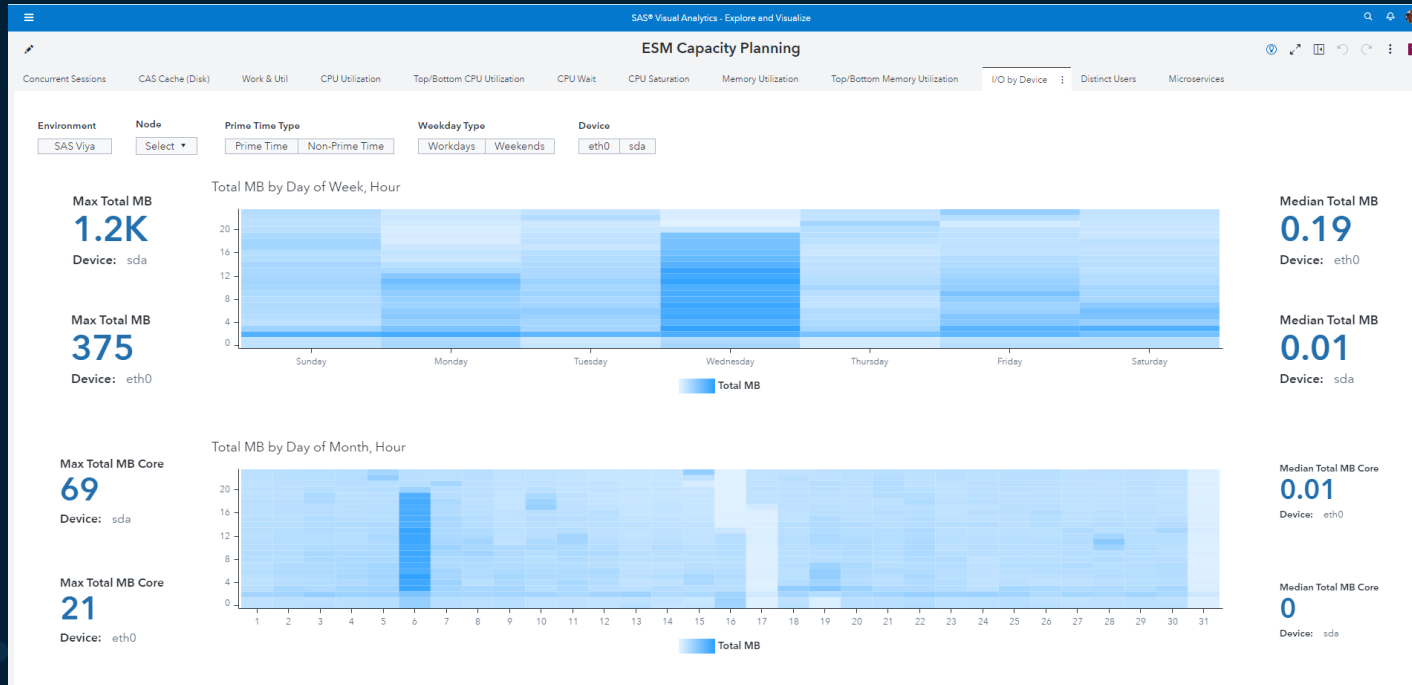
Ecosystem Diagnostics - SAS Enterprise Session Monitor

Top/Bottom Memory Utilization



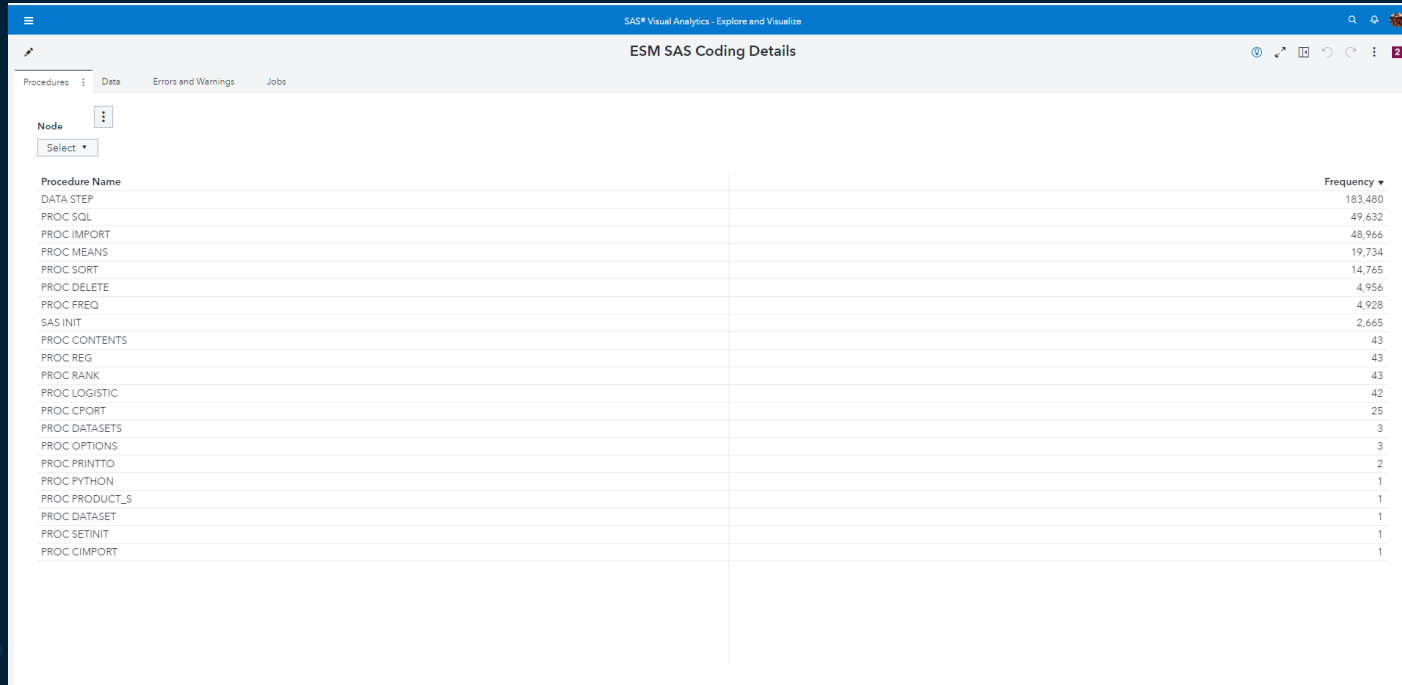
Ecosystem Diagnostics - SAS Enterprise Session Monitor

IO by Device



Ecosystem Diagnostics - SAS Enterprise Session Monitor

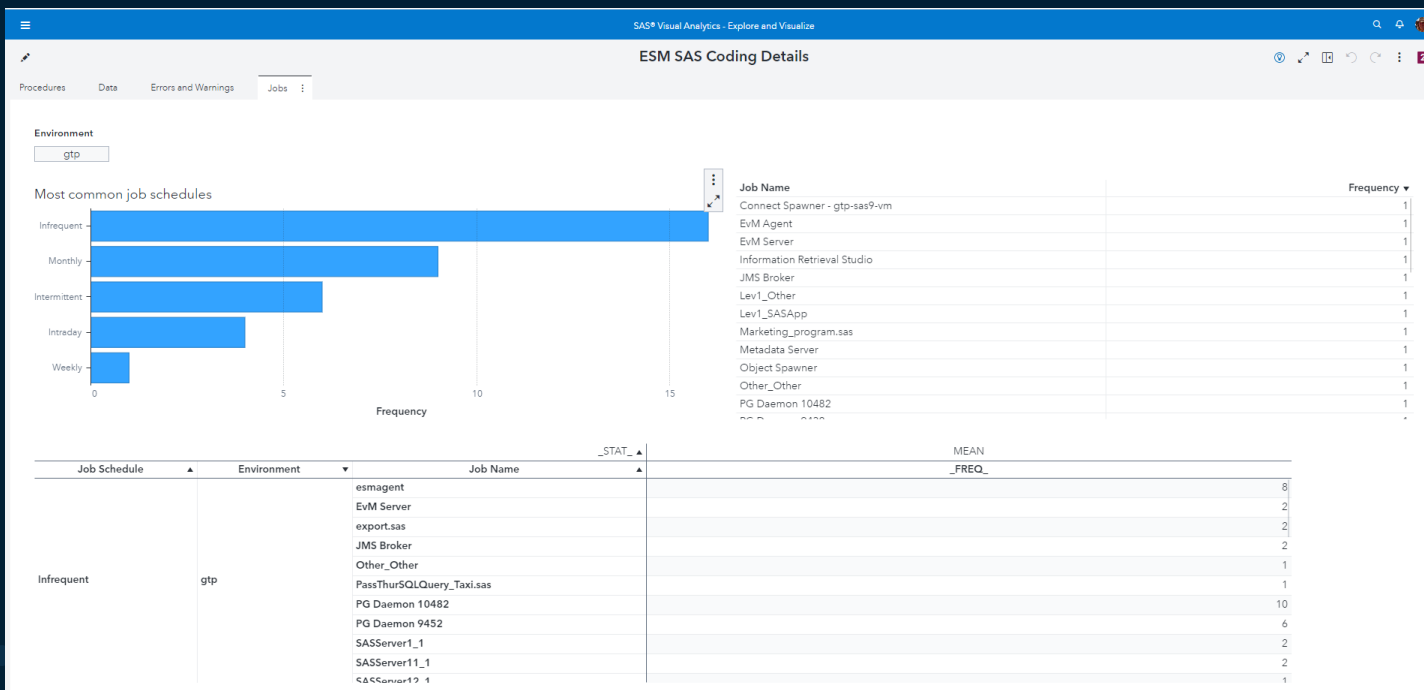
SAS Steps



Procedure Name	Frequency
DATA STEP	183,480
PROC SQL	49,632
PROC IMPORT	48,966
PROC MEANS	19,734
PROC SORT	14,765
PROC DELETE	4,956
PROC FREQ	4,928
SAS INIT	2,665
PROC CONTENTS	43
PROC REG	43
PROC RANK	43
PROC LOGISTIC	42
PROC CPORT	25
PROC DATASETS	3
PROC OPTIONS	3
PROC PRINTTO	2
PROC PYTHON	1
PROC PRODUCT_S	1
PROC DATASET	1
PROC SETINIT	1
PROC CIMPORT	1

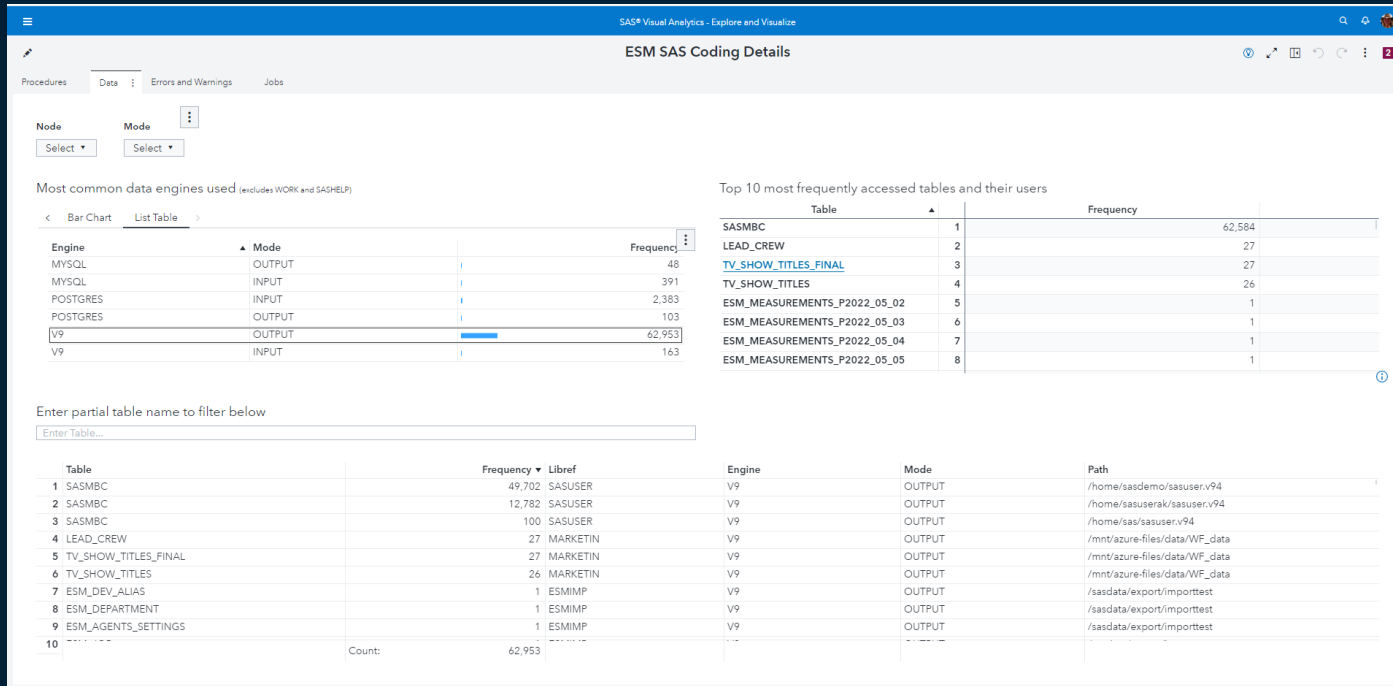
Ecosystem Diagnostics - SAS Enterprise Session Monitor

Jobs



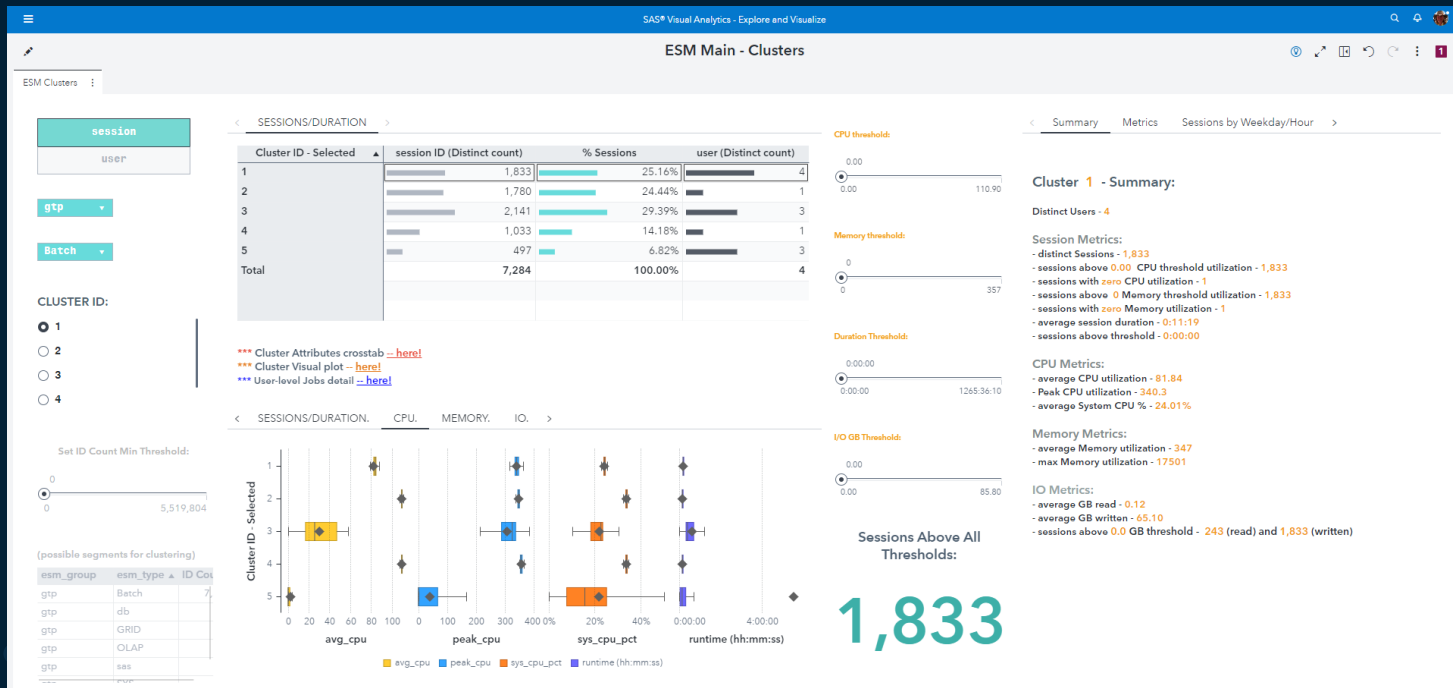
Ecosystem Diagnostics - SAS Enterprise Session Monitor

Tables Processed



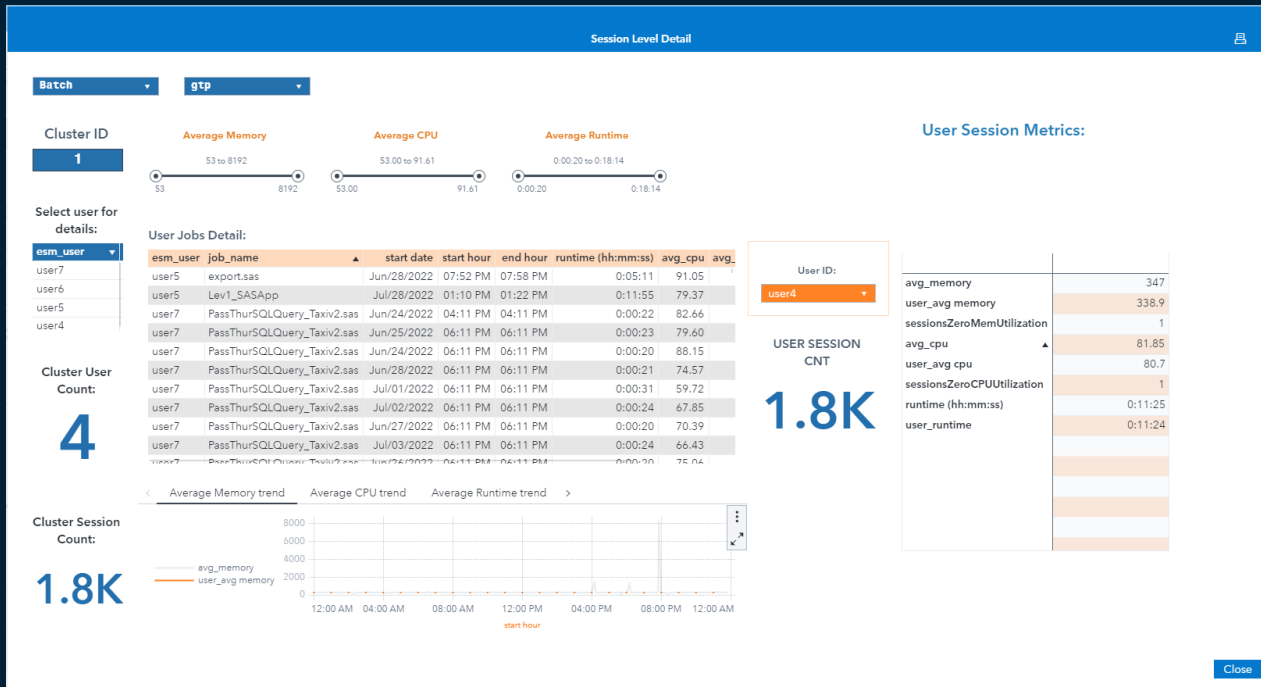
Ecosystem Diagnostics - SAS Enterprise Session Monitor

Session Level Cluster Analysis



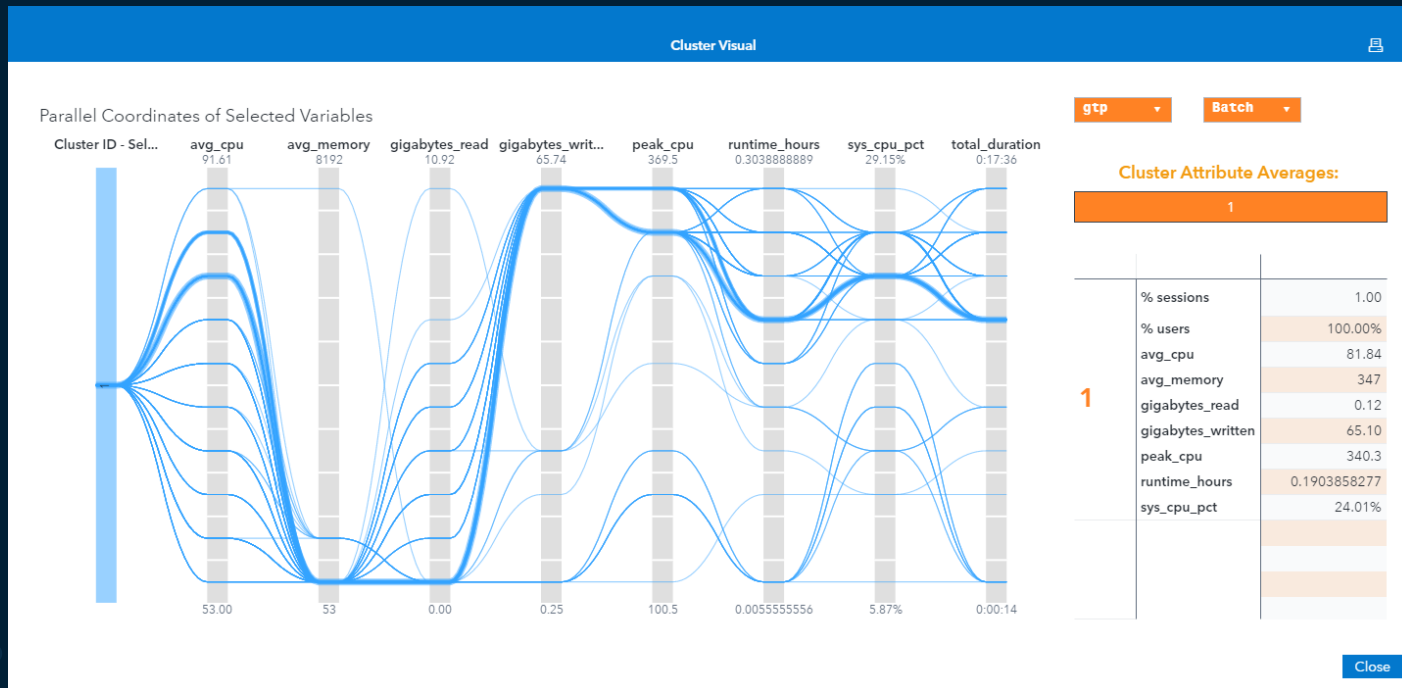
Ecosystem Diagnostics - SAS Enterprise Session Monitor

Session Level Cluster Analysis



Ecosystem Diagnostics - SAS Enterprise Session Monitor

Session Level Cluster Analysis



Ecosystem Diagnostics - SAS Enterprise Session Monitor

Session Level Cluster Analysis

Cluster Attributes Crosstab

	user (Distinct count)	session ID (Distinct count)	% Sessions	total_duration	avg_cpu	peak_cpu	sys_cpu_pct	max_mem	avg_memory
Total	4	7,284	100.00%	0:14:35	71.64	314.2	26.95%	17501	219
1	4	1,833	25.16%	0:11:19	81.84	340.3	24.01%	17501	347
2	1	1,780	24.44%	0:09:05	108.90	347.5	33.65%	1078	175
3	3	2,141	29.39%	0:27:16	30.01	307.2	21.89%	2357	211
4	1	1,033	14.18%	0:09:05	108.95	357.1	33.62%	1081	174
5	3	497	6.82%	0:03:14	2.30	39.3	21.73%	2877	37

Close

Ecosystem Diagnostics - SAS Enterprise Session Monitor Reports


VA reports Require SAS Viya 2021.2.5 or Higher

- If you do not have a SAS Viya environment
 - SAS Secure SharePoint site to upload zip/tar file to
 - SAS Viya environment for SAS account team to review reports for read back to their customer

SAS Enterprise Session Monitor

Next Steps

- If interested in learning more let us know in the survey or contact your SAS account team
- Check out the resource list
 - In the follow up email
 - [Posted to the Ask the Expert board on SAS Communities](#)



SAS Enterprise Session Monitor (ESM) Ecosystem Diagnostics Q&A

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