SAS Viya - Architecture

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30 minute Agenda..

• Architecture Considerations..
• Why Viya?
• Walkthrough of Viya, high level architecture
• SAS 9.4 and Viya what is the plan?
• Release roadmap 9.4 and Viya
Viya Architecture Introduction
Considerations - not going to speak about this detail!
The analytics economy
Our digital transformation to power the analytics economy
Prior to SAS Viya

- Support for any analytics use case
- Broad and extensive customer base in production
- Modernization needed to adapt to changing technology, business trends

SAS 9.4

- SAS 9.4 products and UIs
- Customer-written code

Metadata (WIP)-based mid-tier

SAS 9.4

- MVA runtime
- LASR and / or HPA runtimes
- Other runtimes (ESP, In-Database)
MULTIPLE INTERFACES, SINGLE CODE BASE

Visual Interfaces

Programming Interfaces

API Interfaces

Source: SAS Viya®
SAS Viya Products

SAS® Visual Data Mining and Machine Learning

Boost analytical productivity and solve complex problems faster with a single, integrated in-memory environment that's both open and scalable.

Learn more

SAS® Visual Investigator

Address all your intelligence analysis and investigation management needs with a single, cloud-based solution that uses advanced analytics and machine learning technology.

Learn more

SAS® Visual Analytics

Visually explore relationships and patterns in data – smartly, quickly and easily – using interactive data discovery. And illuminate critical insights with self-service analytics.

Learn more

SAS® Visual Statistics

Delve deeper into different types of data with a powerful, in-memory solution that lets you create, compare and refine descriptive and predictive models on the fly.

Learn more

SAS® Visual Forecasting

Manage organizational planning challenges and automate large-scale hierarchical forecasting with a solution that supports open source and SAS coding in a single environment.

Learn more

SAS® Optimization

Evaluate alternative actions and scenarios with a powerful array of optimization modeling capabilities and solution techniques.

Learn more

SAS® Econometrics

Analyze, describe and predict issues related to economic and financial systems by applying advanced mathematical and statistical methods.

Learn more

SAS® Event Stream Processing

Analyze high-velocity big data in event streams. Train models, score data and take immediate action on what's relevant.

Learn more
SAS® Viya™ Architecture - CAS
Evolution of Parallelized Analytics from SAS

2000
Threaded Kernel

2010
High-Performance Analytics - MPP (PROC interface)

2011
LASR Analytic Sever
In-Memory MPP
(Visual Analytics + SAS Language interface)

2013
Cloud Analytic Services
In-Memory Engine
(in SAS® Viya)
Cloud Analytic Services (CAS)
In-Memory Engine

The CAS in-memory engine is a fast, scalable, and resilient run-time environment for data management and analytics for the SAS® Viya™ platform.

**Fast**
- Multi-threaded
- Inter-node Communication
- Optimized Node Allocation

**Scalable**
- Single Machine to Distributed MPP
- Elastic Node Addition / Deletion
- Memory Spill-to-Disk as Necessary

**Resilient**
- Fault-tolerant to Node and Network Failures
- Controller and Worker Failover
- Session Independence
CAS Server
Distributed / Massively Parallel Processing (MPP)
CAS Server

Actions

- actions are sent to the CAS server by SAS procs, UIs or third-party languages like Python, Lua, R or Java

- Example action sets and actions:
  - Data Preprocess: binning, impute, outlier...
  - Decision Tree: dtreePrune, dtreeSplit, forestTrain...
  - Neural Network: annTrain, annScore, annCode
  - Regression Modeling: genmod, glm, logistic
  - Image: loadImages, processImages, compartImages, ...
  - Text Mining: tmSvd, tmMine, tmScore
CAS Server
SAS® Viya™ Architecture – Open APIs
Open Analytics Platform Providing Developers Access to SAS Services

Visual Interfaces

Programming Interfaces

API Interfaces

(web app / web service integration)
```
proc print data = hmeq (obs = 10);
run;
```

```
defCasTable(s, 'hmeq')
df.head(10)
```

```
df <- defCasTable(s, 'hmeq')
head(df, 10)
```

```
[table.fetch]
  table.name = "hmeq"
  from = 1 to = 10
```
# SAS Software

This page shows the repository for SAS Software on GitHub. It includes pinned repositories such as:

- **sas_kernel**: A Jupyter kernel for SAS. This opens up all the data manipulation and analytics capabilities of your SAS system within a notebook interface. Use the Jupyter Notebook interface to execute SAS code.

- **dm-flow**: Library of SAS Enterprise Miner process flow diagrams to help you learn by example about specific data mining topics.

- **sas-prog-for-r-users**: Teaching and lab materials for the "SAS Programming for R Users" course, including course notes, data, and code.

- **saspy**: A Python interface module to the SAS System. It works with Linux, Windows, and mainframe SAS. It supports the sas_kernel project (a Jupyter Notebook kernel for SAS) or can be used on its own.

- **python-swat**: The SAS Scripting Wrapper for Analytics Transfer (SWAT) package is the Python client to SAS Cloud Analytic Services (CAS). It allows users to execute CAS actions and process the results all from Python.

You can find more information and resources on the SAS Software page at [https://github.com/sassoftware](https://github.com/sassoftware).
SAS® Viya™ Architecture - Microservices
Microservices

Definition

• What?
  - Loosely coupled services.
  - Do exactly *one* thing well

• Why?
  - Micro Updates → continuous delivery
  - Horizontal scale → multi-tenancy
  - Continuous delivery / faster innovation
  - Mix and match
  - Customer/partner developer friendly
Microservices

Architecture

• Small in focus, if not in size

• Independently updatable

• Replaces v9 Middle Tier and Metadata Server

• 122+
Microservices
Architecture

- RESTful APIs

Language of choice
Cloud Foundry
What is it?

• An open source cloud platform as a service (PaaS) on which developers can build, deploy, run and scale applications on public and private cloud models

• Originally created by VMware, it is now part of Pivotal Software (EMC/VMWare/GE) which open sourced it

• Competitors to Cloud Foundry include Red Hat OpenShift, Google App Engine and Heroku (a Salesforce company) and other supporting tech like Kubernetes

• In February 2014, Pivotal, EMC, IBM, Rackspace and VMware formed the Cloud Foundry Foundation, which currently has 60+ members including SAS

• The Cloud Foundry Foundation's goal is to use the innovations of the community to create an agile platform for cloud-native applications
SAS platform strategy

9.4 & SAS Viya

SAS 9

one SAS platform
Today’s architecture

- **SAS 9.4 M4 products and UIs**
  - Customer-written code
  - Metadata (WIP)-based mid-tier

- **CAS runtime**
  - Viya MVA runtime (minimal functionality)

- **SAS Viya**
  - Customer-written code
  - Microservices-based mid-tier
  - Other runtimes (ESP, In-Database)

- **SAS/CONNECT**

- **MVA runtime (full functionality)**
- **LASR and / or HPA runtimes**

“bridge” to SAS Viya
One SAS platform projected architecture

- Supports for any pre-existing 9.4, Viya-based code
- Single deployment
- Support for single, multi-user scenarios
- Elastic, fault-tolerant
- Cognitive

SAS platform

- SAS products and UIs
- Customer-written code
- Microservices-based mid-tier
- MVA runtime
- CAS runtime
- Other runtimes (ESP, In-Database)
What Does This Mean To You?

It means:

• Code is designed for parallel, distributed processing – FAST
• Direct support for SAS, Python, R, Java, Lua
• Access to new machine learning algorithms
• SAS programs available as REST APIs

...so you can:

• Scale methods without redefining code
• Enable & collaborate with new colleagues
• Expand your analytic toolkit
• Make your code portable
SAS Platform Roadmap Highlights

**SAS Viya 3.2 (March)**
- SAS Visual Forecasting (New)
- SAS Econometrics (New)
- SAS Optimization (New)
- SAS Visual Analytics 8.1
- SAS Visual Statistics 8.1
- SAS Visual Data Mining & Machine Learning 8.1
- SAS Event Stream Processing 4.3
- SAS Visual Investigator 10.2
- In-Database Technologies
- Pipefitter for Python (New) (March)
- R interface (New) (April)
- Cloud Foundry deployments (June):
  - SAS Visual Analytics 8.1
  - SAS Visual Statistics 8.1
  - SAS Visual Data Mining & Machine Learning 8.1

**SAS Viya 3.3 (Nov)**
- SAS Data Preparation (New)
- SAS Data Quality (New)
- SAS Visual Text Analytics (New)
- SAS Decision Manager (New)
- SAS Model Manager (New)
- SAS Visual Scenario Designer 10.3 (New)
- SAS analytical product line 8.2
- SAS Event Stream Processing 5.1
- SAS Visual Investigator 10.3
- Cognitively enabled products (New)
- Software-as-a-Service (tentative)
- Windows SMP deployment (New)

**SAS platform release**
- One order, one set of clients
- Deploys SAS 9.4M5 or SAS Viya runtime and services as needed
- Existing SAS code will still run
- SAS Data Discovery (New)
- SAS Data Integration (New)
- SAS analytical product line
- SAS Visual Investigator 10.4
- SAS Visual Scenario Designer 10.4
- Software-as-a-Service REST APIs
- ... And more

**Available on SAS 9.4M4**
- SAS Visual Analytics 7.4
- SAS Visual Statistics 7.4
- SAS Data Management 2.7

**SAS 9.4M5 (Sept)**
- SAS Event Stream Processing 4.3
- Pipefitter for Python (New) (March)
- SAS Studio 3.7
- SAS Environment Manager 2.6
- Support Advanced Analytics 14.3
- SAS Event Stream Processing 5.1
For information on SAS Viya

www.sas.com/viya