

# Programming for SAS Viya Users

Iowa User Group

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SAS Institute Canada



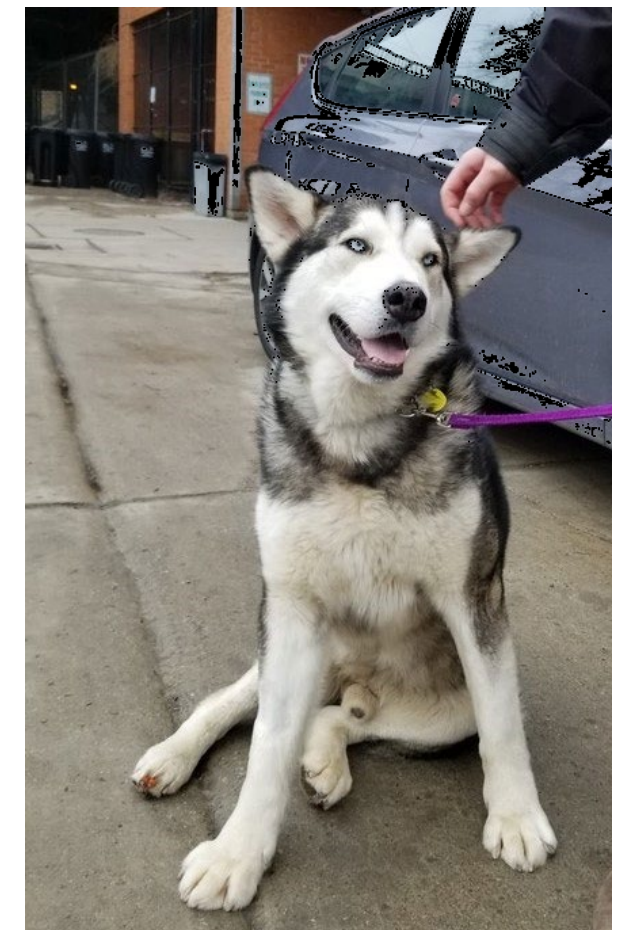
# Bio

With a background in computer systems management. SAS Instructor Charu Shankar engages with logic, visuals, and analogies to spark critical thinking.

A SAS Instructor since 2007, she curates and delivers unique content via the SAS YouTube channel, SAS global forum, SAS Ask the Expert Series, SAS Training Post Blog, etc.

Charu loves to support users by teaching at conferences on topics related to SAS, SQL, Efficiencies, PERL, Macros, Python, Viya, etc.

When she's not coding, Charu is A Yoga Instructor who loves to explore Canadian trails with her husky Miko.



# Agenda



What's SAS Viya - In Memory



Engines



Applications



Data – Types, Database Connections



Code

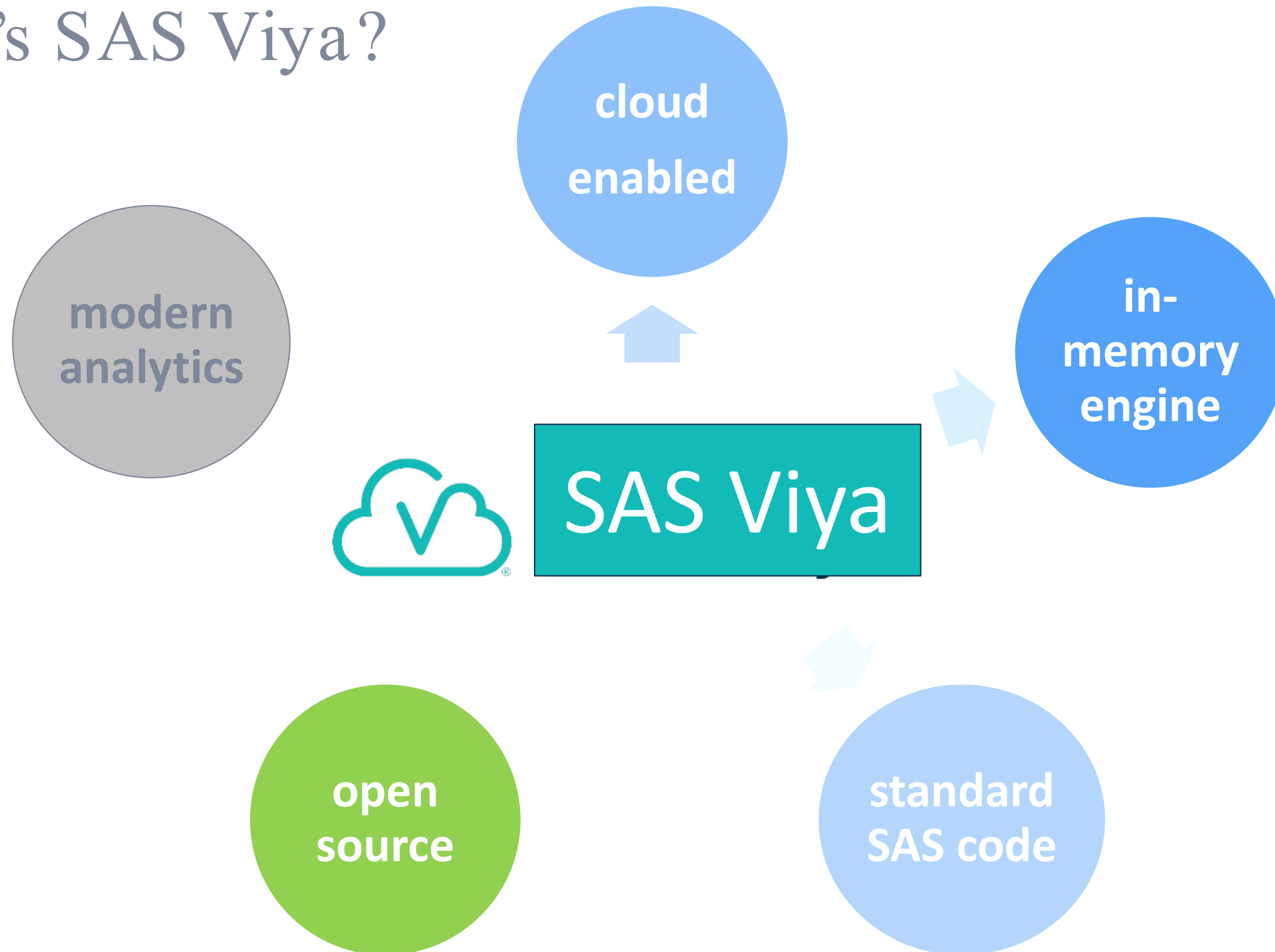


Playtime



Handy Links

# 1 What's SAS Viya?



# 2 SAS Viya Engines

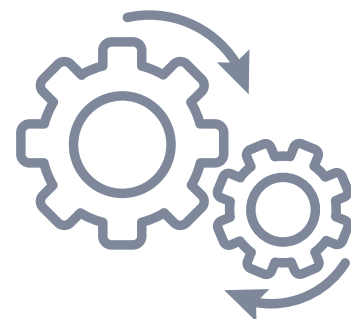
SAS Viya



Traditional SAS  
processing engine

Executes traditional  
SAS®9 code

SAS  
Compute  
Server



Next-gen SAS  
processing engine

SAS Cloud  
Analytic  
Services  
(CAS)

Executes CAS-enabled  
code in parallel on  
in-memory data



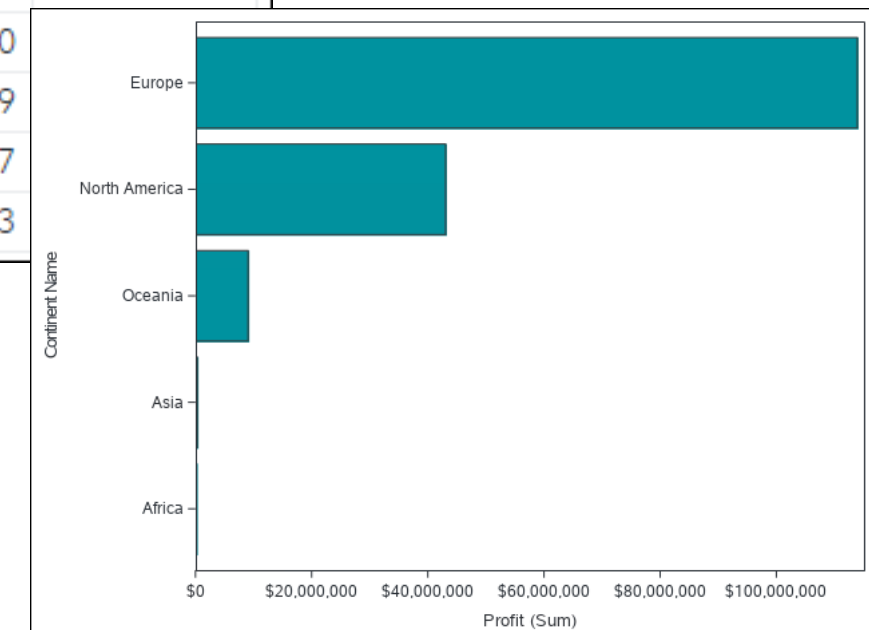
# SAS Viya Servers

SAS  
Compute  
Server

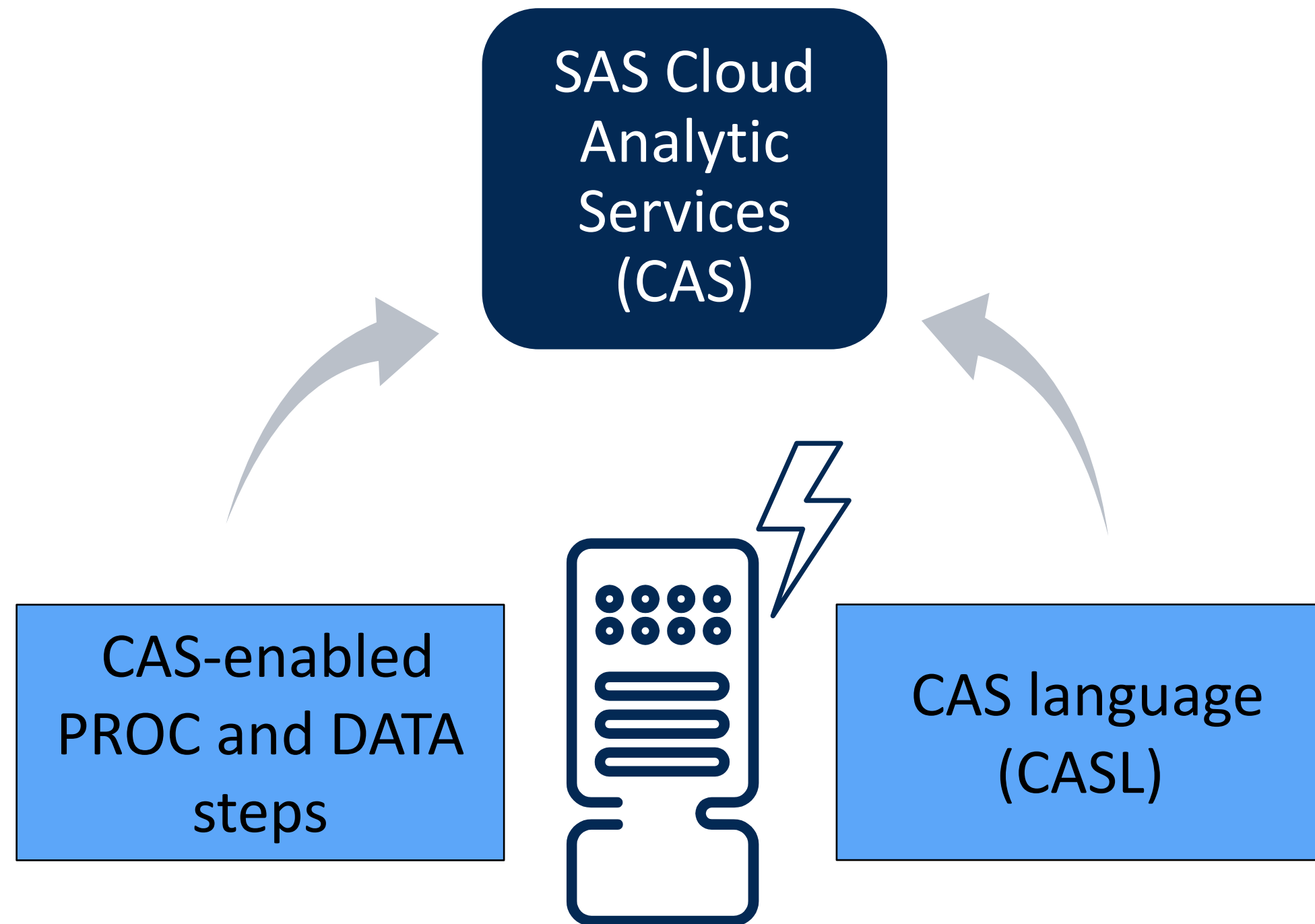
Standard SAS code  
executes on the SAS  
Compute Server.

```
libname pvbase "&path/data";  
  
data profit;  
    set pvbase.orders;  
    ...  
run;  
  
proc means data=profit;  
    ...  
run;
```

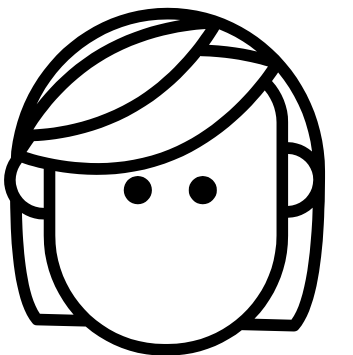
The MEANS Procedure			
Analysis Variable : Profit			
Continent Name	N Obs	Sum	Mean
Africa	770	-127.6800000	-0.1658182
Asia	1110	15503.70	
Europe	653684	5659450.59	
North America	235708	2121645.57	
Oceania	60397	462934.63	



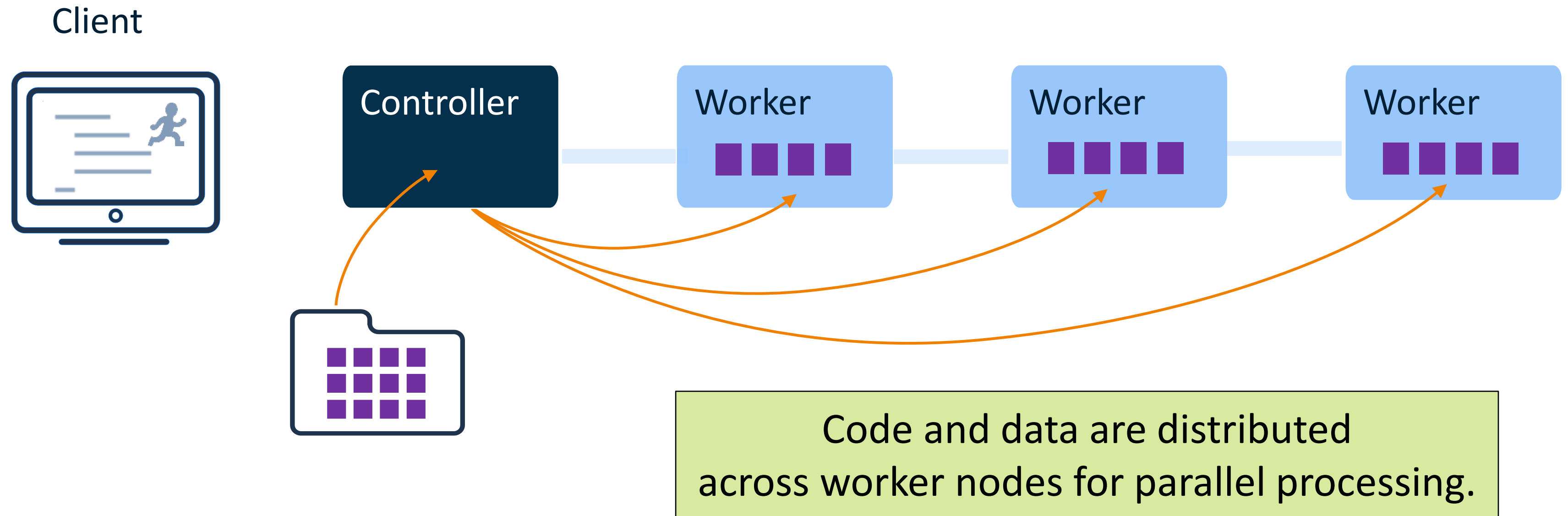
# SAS Viya Servers



There are different ways to execute code in CAS.



# Parallel Processing in CAS

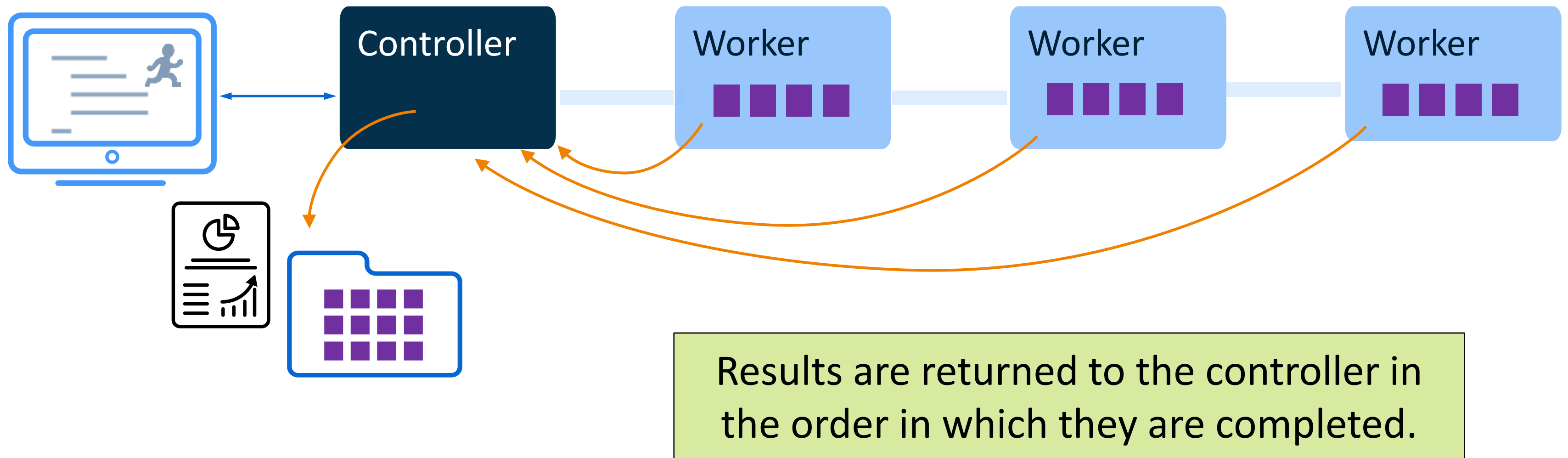




# Parallel Processing in the Real World



# Parallel Processing in CAS





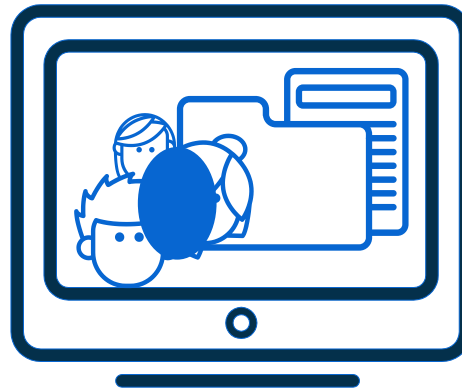
# Parallel Processing in the Real World





# 3 Applications

SAS Drive



SAS Visual Data Mining  
and Machine Learning



Applications

SAS Visual Analytics



SAS Studio



# SAS Viya Programming Interface

The screenshot displays the SAS Studio web interface. The top navigation bar includes 'New', 'Options', 'View', 'Open', and 'Save All'. The left sidebar shows a 'Libraries' pane with a tree view containing folders like 'MAPS', 'MAPSGFK', 'MAPSSAS', 'PV', 'ALLCOSTS', 'CLIENT\_...', 'COUNTR...', 'CUST\_SU...', 'CUSTOM...', 'EMPLOY...', 'ORGANI...', 'PRODUCTS', 'PRODUC...', 'PROFIT', 'SASHELP', 'SASUSER', and 'WORK'. The main area is divided into three panes: 'Code', 'Log', and 'Results'. The 'Code' pane shows a SAS program with 22 lines of code. The 'Results' pane displays a table titled 'The MEANS P' and a bar chart titled 'Analysis Variat'.

```
1 %let homedir=%sysget(HOME);
2 %let path=&homedir/Courses/PGVY35;
3
4 libname pv "&path/data";
5
6 data profit;
7   set pv.customers;
8   Profit=(RetailPrice-Cost)*Quantity;
9   format Profit dollar8.;
10 run;
11
12 ods excel file="&path/output/customers.xlsx";
13 proc means data=profit sum mean;
14   var Profit;
15   class Continent;
16 run;
17
18 proc sgplot data=profit;
19   hbar Continent / response=Profit stat=sum
20     categoryorder=respdesc;
21 run;
22 ods excel close;
```

Continent Name	N Obs	
Africa	770	
Asia	1110	
Europe	653684	
North America	235708	43
Oceania	60397	9

Analysis Variat

Continent Name

Europe

North America

Oceania

## SAS Studio

- web-based application
- access data and programs
- write new programs
- store code for common actions
- generate code with tasks

# Other SAS Viya Programming Interfaces

## Open-Source Applications

- Jupyter Notebook
- R Studio

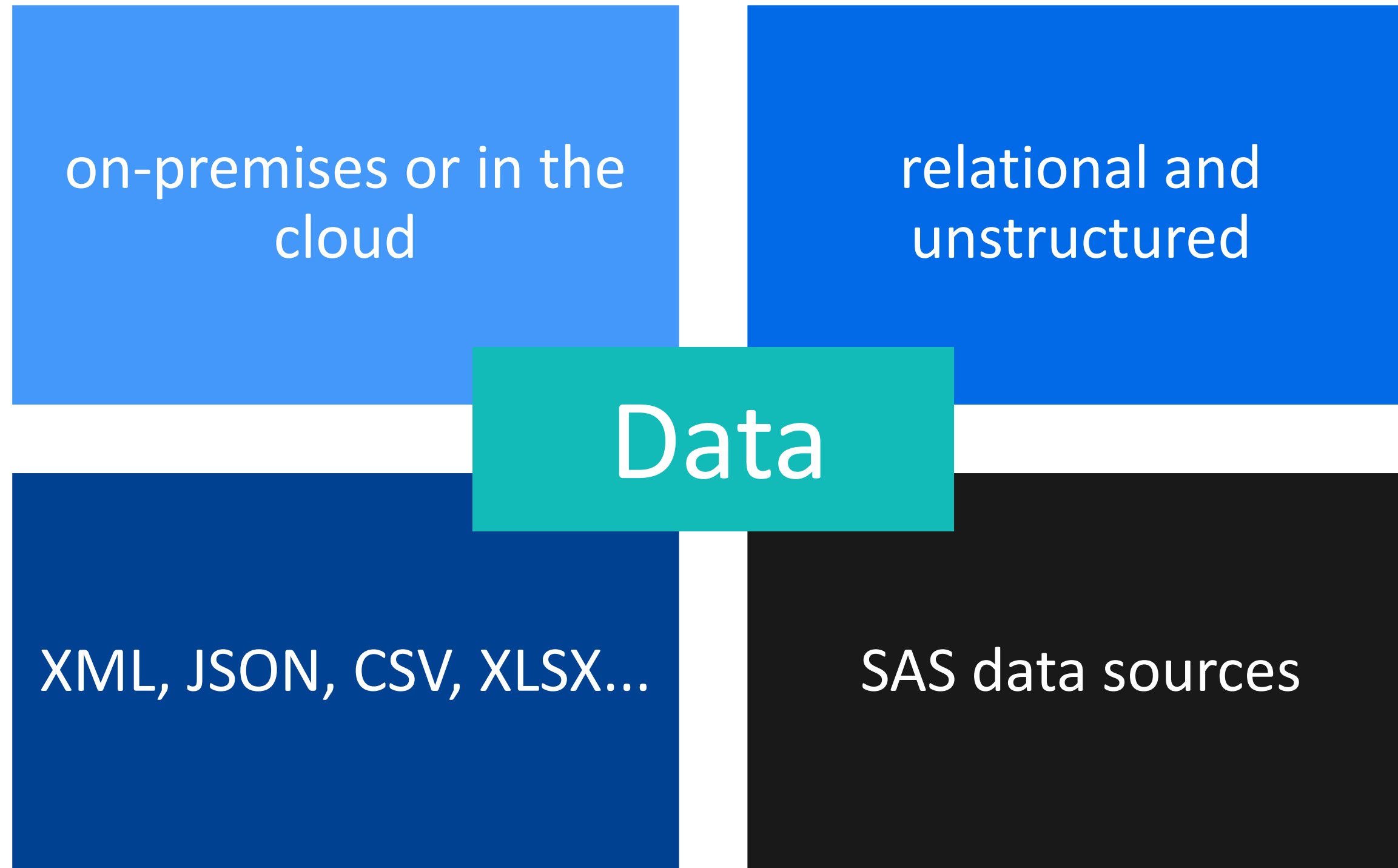
## SAS® Applications

- SAS Studio (3.x)
- SAS Enterprise Guide
- SAS windowing environment

Other familiar applications can also be used to develop and submit code to SAS Viya.

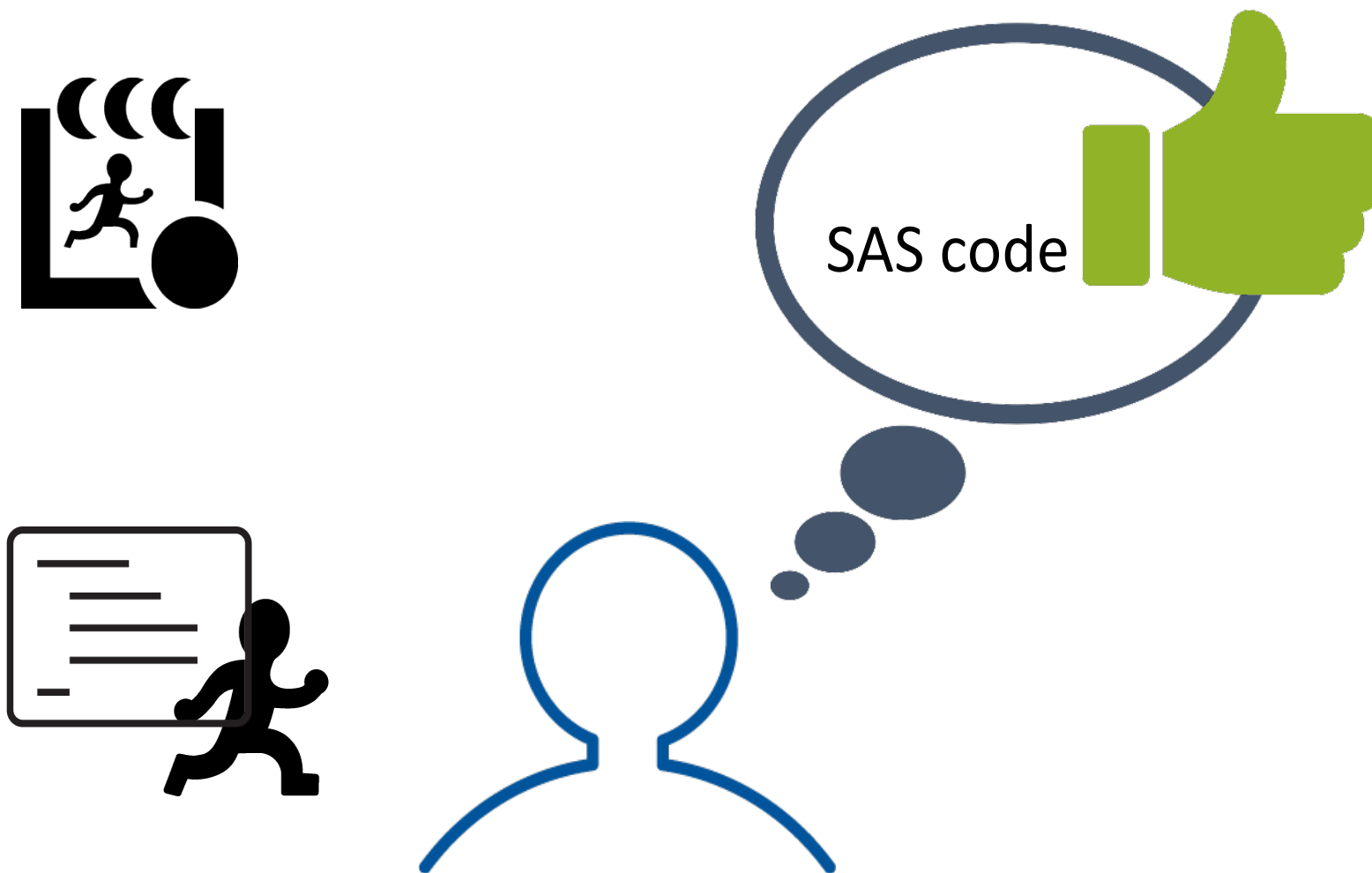
Open Source

# 4 Data



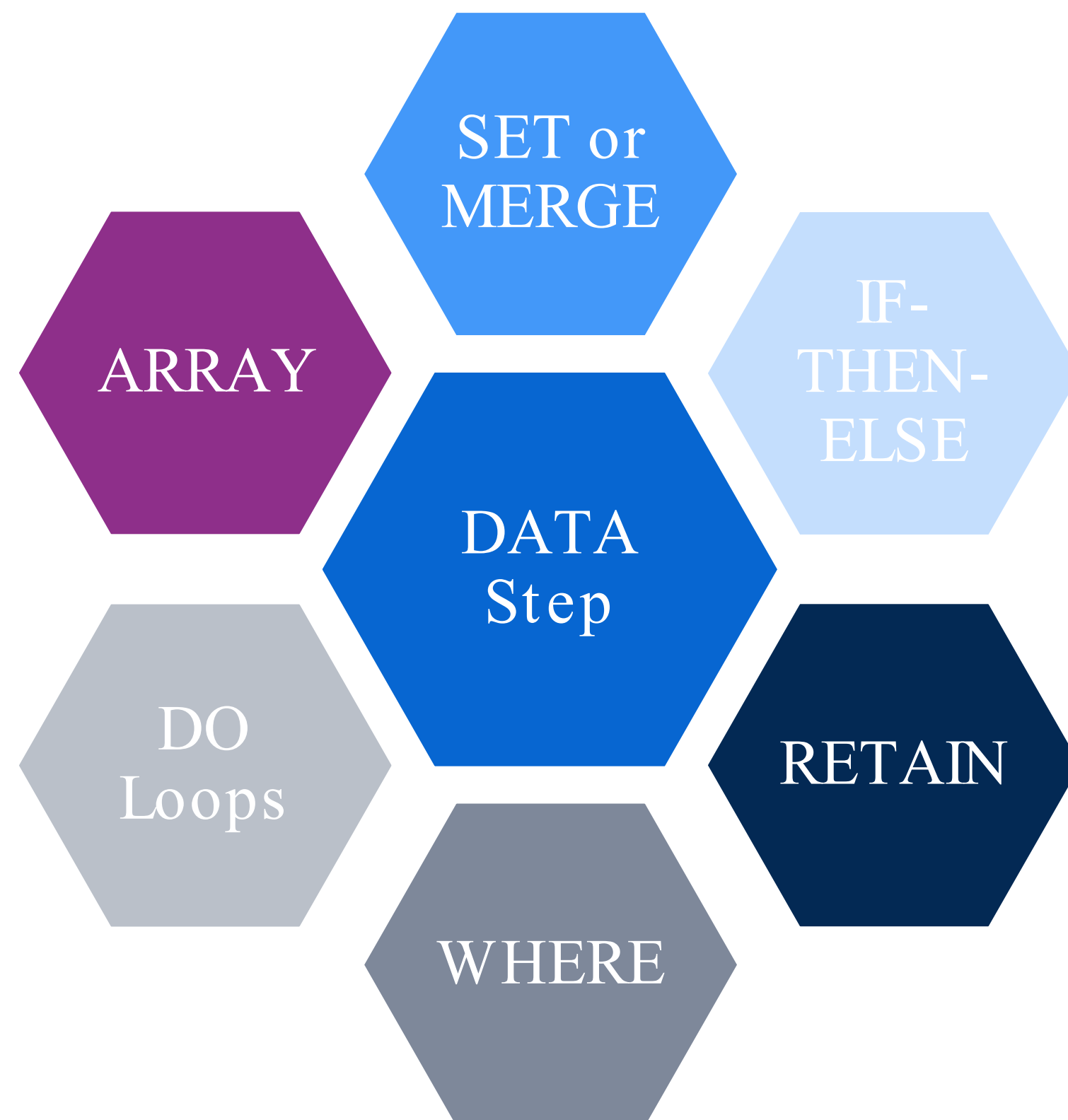
# 5 Code

## SAS Viya Programming Process Use the SAS Code That You Are Familiar with





# SAS Data Step



Does the same data step syntax work for in-memory data in CAS?

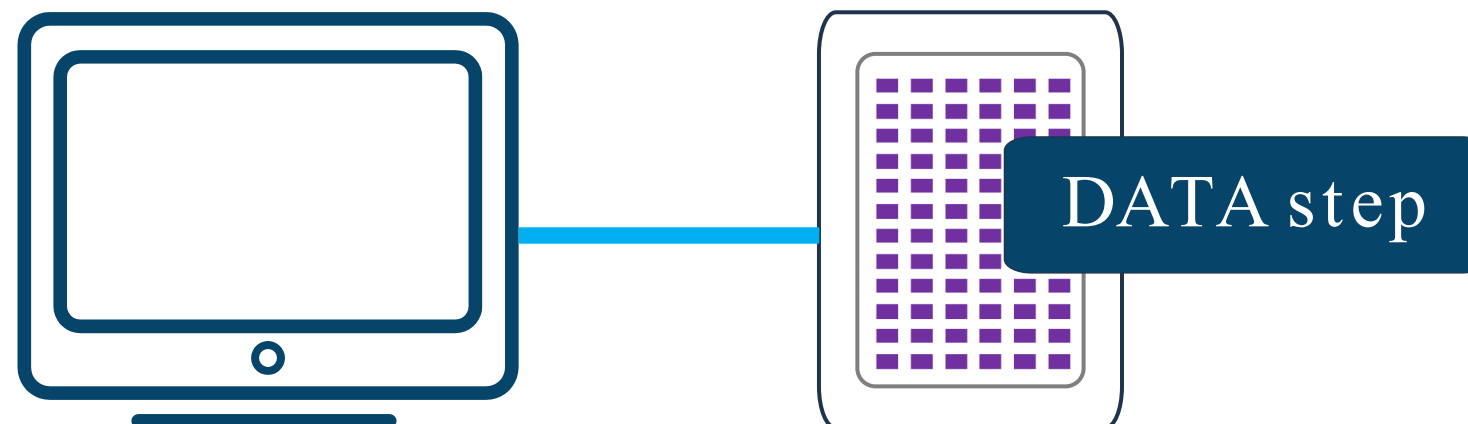
Yes, we just need to consider how the data is processed, in either a single thread or multiple threads.

# Base SAS DATA Step Processing

## Single-Threaded Processing



Single-threaded processing reads data sequentially, one row at a time.



# SAS Viya DATA Step Processing

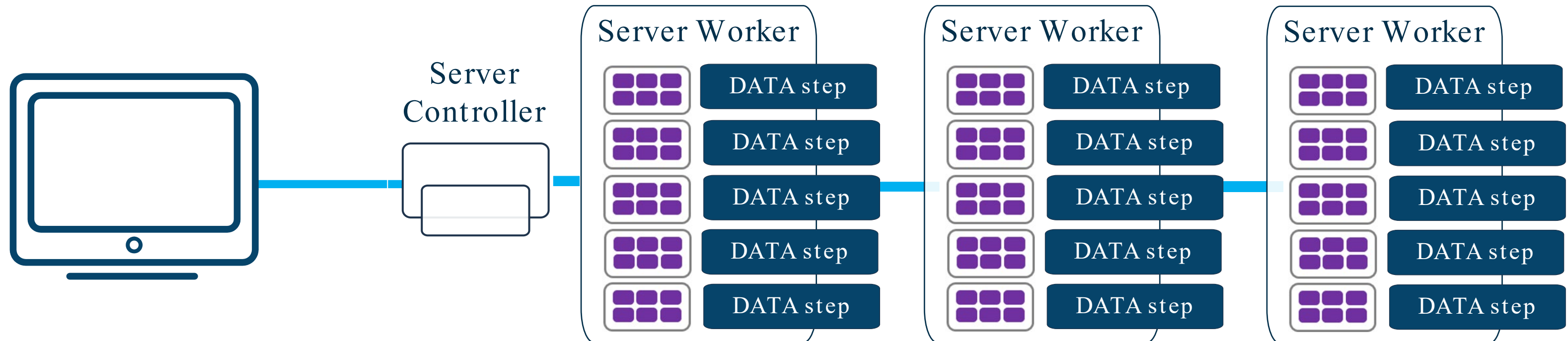
## Massively Parallel Processing (MPP)



SAS Viya enables data to be divided and processed simultaneously on multiple threads.

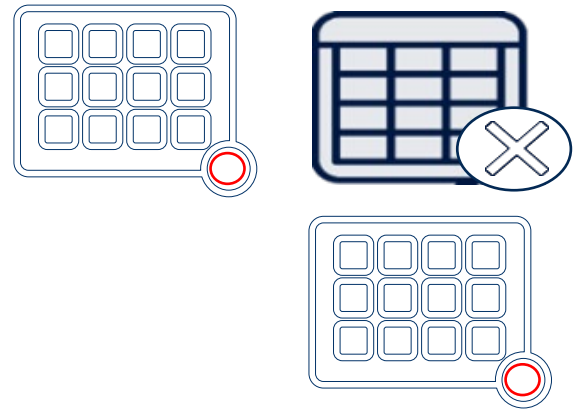


SAS Cloud Analytic Services (CAS)

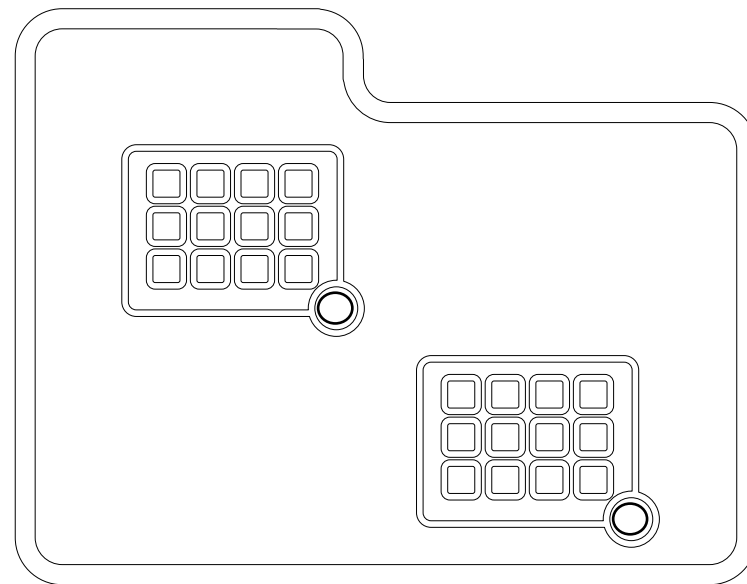


# Let's Start With What We Know

```
LIBNAME libref engine "path";
```



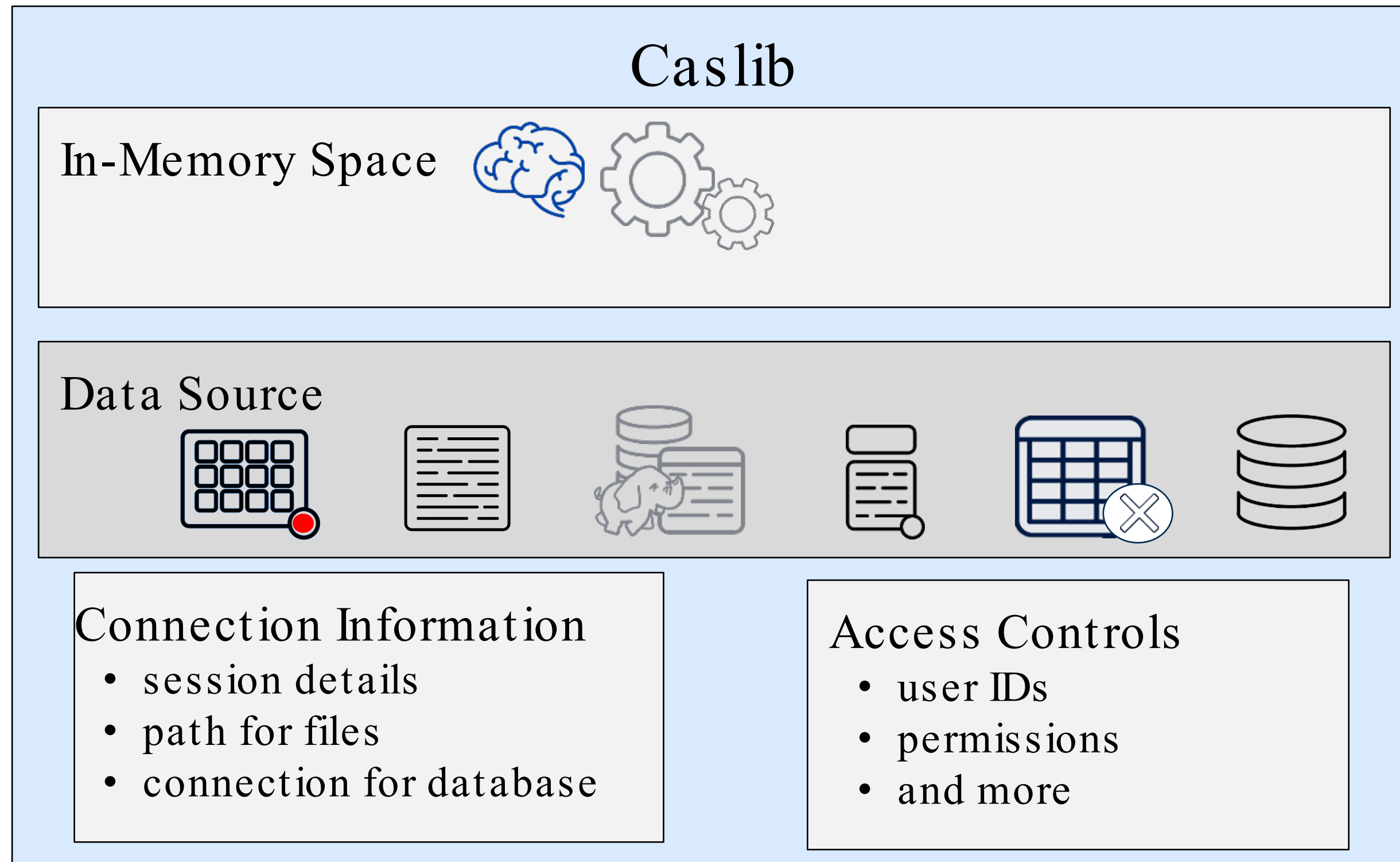
```
libname mysas "/workshop/pgvy34/data";
```



**mysas**

# Caslibs

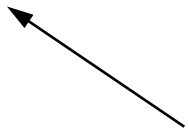
Used to Access Data in SAS Viya



# Start A Session Via Code



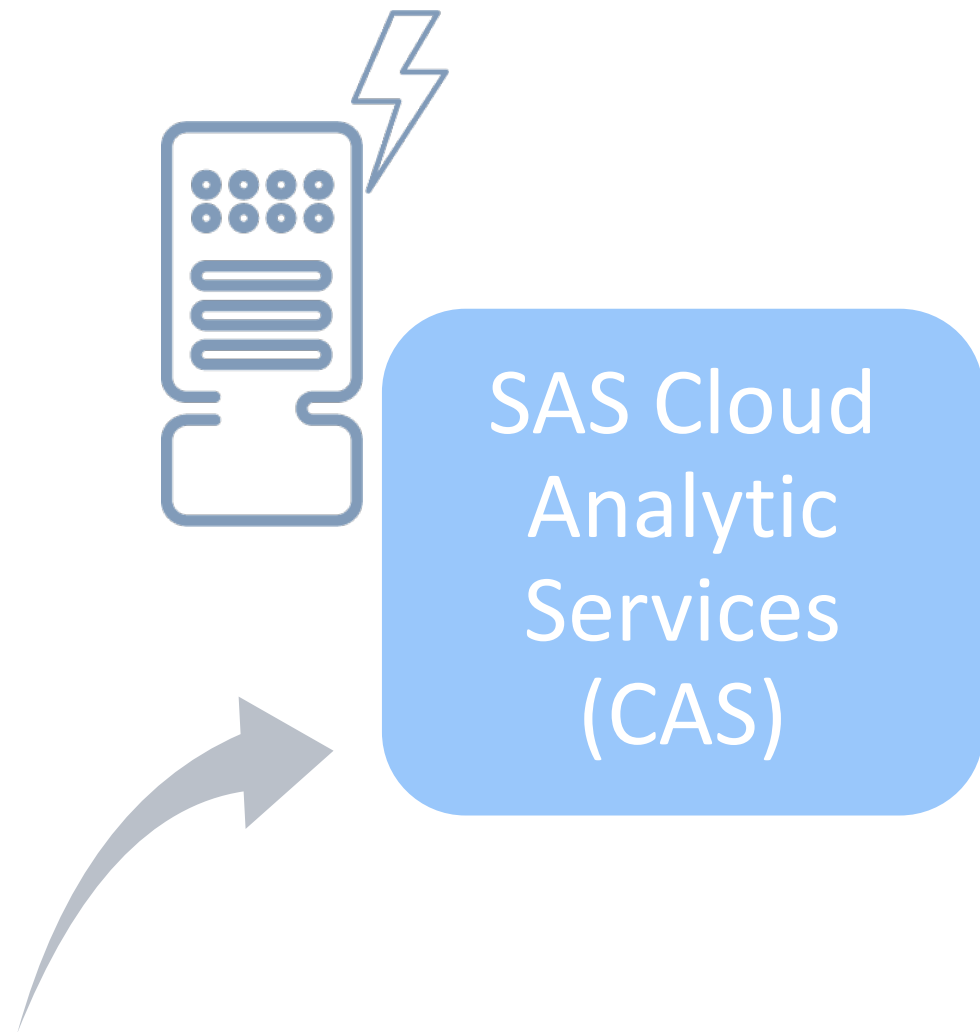
```
cas mySession sessopts=( caslib=casuser timeout=1800 locale="en_US");
```



CAS session created is *mySession*

Sub option	Purpose
CASLIB=caslib	Specifies the name of the Caslib where the table is saved.
TIMEOUT=	Specifies the SAS Cloud Analytic Services session time-out in seconds for a new or existing session.
LOCALE=	Specifies a set of attributes in a SAS session that reflect the language, local conventions, and culture for a geographical region.

# CAS-Enabled Steps



Data and Proc steps that are not CAS-enabled will automatically run on the Compute Server.

CAS-enabled steps are automatically converted to CAS actions behind the scenes. meaning SAS translated BASE SAS compliant code into CAS actions so your code can run in CAS/Viya)

```
proc casutil;  
    ...  
quit;  
  
data casuser.profit;  
    set casuser.orders;  
    ...  
run;  
  
proc means data=casuser.profit;  
    ...  
run;
```

# DATA Step

```
DATA output-table;  
    . . .  
RUN;
```

modify existing values

compute new variables

conditionally process

combine tables

The DATA step is  
used to manage  
and manipulate  
tables in  
preparation for  
analysis.

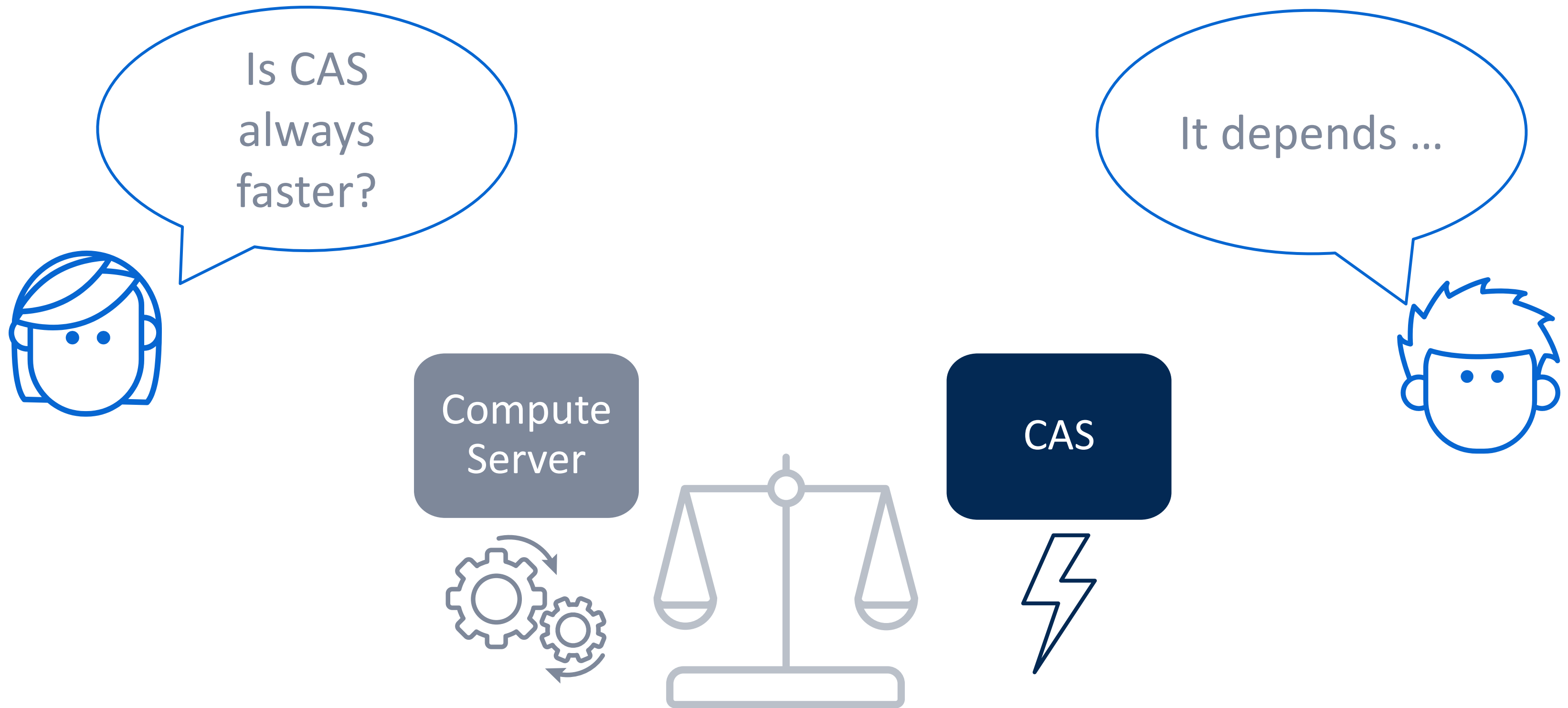


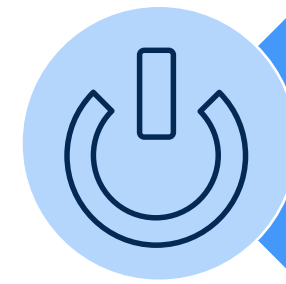
# Modifying the DATA Step to Run in CAS

```
data casuser.Departments;  
  set casuser.mycustomers end=eof;  
  select(Continent);  
    when ('Africa', 'Asia')  
      Department="General Shoes";  
    when ("Oceania")  
      Department="Men's Shoes";  
    when ("North America", "Europe")  
      Department="Women's Shoes";  
    otherwise Department='Unknown';  
  end;  
  keep City Continent Department;  
  if eof then put _threadid_ _N_ =;  
run;
```

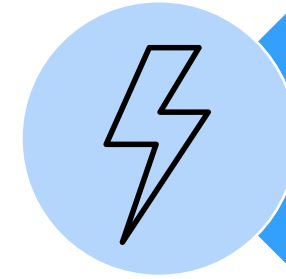
If the output table and input table use a caslib library reference, the DATA step runs in CAS.

# Compute Server or CAS?

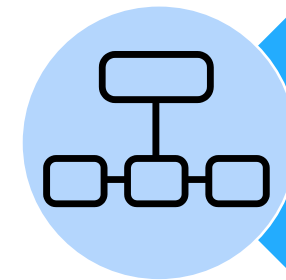




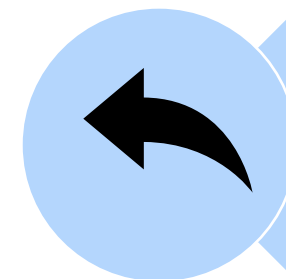
Start services



Load data into memory



Distribute data and processing  
among worker nodes



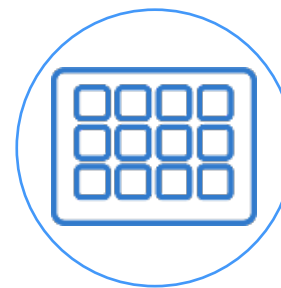
Return results to controller



Deliver combined results to the client



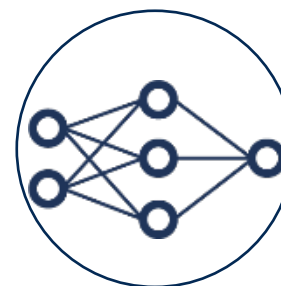
Which steps  
should I  
modify to run  
in CAS?



steps using data sources  
larger than 50 GB



long-running steps (30 minutes+)



computationally demanding PROCs



DATA steps with many computations,  
functions, or conditional logic

# Handy Resources

[SAS Viya Programming](#)

[SAS Viya Learning Path](#)

[Data Step Processing in CAS](#)

[SAS Education Resources for Viya](#)

[SAS 9 and SAS Viya Functional Comparison](#)

[SAS Global Forum Tutorial - Coding in SAS Viya](#)

[Understanding SAS: The Different Processing Engines](#)

[Seriously Serial or Perfectly Parallel Data Transfer with SAS Viya](#)

# Playtime

# Quiz Question 1

Programs written for SAS 9 must be modified before they can run in Viya.

TRUE/ FALSE

# Quiz Answer 1

Programs written for SAS 9 must be modified before they can run in Viya.

**FALSE**

*The SAS Viya Compute Server runs programs written for SAS 9.*



# Quiz Question 2

SAS Viya includes two compute engines called the Compute Server and \_\_\_\_\_.

# Quiz Answer 2

SAS Viya includes two compute engines called the Compute Server and Cloud Analytic Services.

*The Cloud Analytic Services massively parallel in-memory compute engine is often referred to as CAS.*

# Quiz Question 3

Which application enables you to prepare CAS tables and create CAS tables using transforms?

- a. SAS Studio
- b. SAS Data Explorer
- c. SAS Data Studio
- d. SAS Prepare Data

# Quiz Answer 3

Which application enables you to prepare CAS tables and create CAS tables using transforms?

- a. SAS Studio
- b. SAS Data Explorer
- c. SAS Data Studio
- d. SAS Prepare Data

# Quiz Question 4

What is the name of the high-performance, in-memory analytics engine used in SAS Viya?

- a. BAS (Business Analytic Services)
- b. CAS (Cloud Analytic Services)
- c. LAS (LASR Analytic Services)
- d. SAS (Statistic Analytic Services)

# Quiz Answer 4

What is the name of the high-performance, in-memory analytics engine used in SAS Viya?

- a. BAS (Business Analytic Services)
- b. CAS (Cloud Analytic Services)
- c. LAS (LASR Analytic Services)
- d. SAS (Statistic Analytic Services)

# Quiz Question 5

Which application enables users to create reports?

- a. SAS Report Creator
- b. SAS Visual Analytics
- c. SAS Report Viewer
- d. SAS Visual Analytics App

# Quiz Answer 5

Which application enables users to create reports?

- a. SAS Report Creator
- b. SAS Visual Analytics
- c. SAS Report Viewer
- d. SAS Visual Analytics App



# Quiz Question 6

What applications are new in the SAS Viya platform?

- a. SAS Studio
- b. SAS Metadata Server
- c. SAS Business Intelligence Platform
- d. SAS Access to PC Files

# Quiz Answer 6

What applications are new in the SAS Viya platform?

- a. SAS Studio
- b. SAS Metadata Server
- c. SAS Business Intelligence Platform
- d. SAS Access to PC Files

*For purposes of pure coding in SAS Viya, SAS Studio is a new application. SAS Metadata Server, SAS BI, SAS Access to PC Files are not new to SAS Viya*

# Quiz Question 7

What is the SAS compute server?

- a. The Base SAS 9 Engine with mostly single-threaded processing
- b. Cloud Analytics Server
- c. Multithreaded processing
- d. Massive parallel processing environment

# Quiz Answer 7

What is the SAS compute server?

- a. The Base SAS 9 Engine with mostly single-threaded processing
- b. Cloud Analytics Server
- c. Multithreaded processing
- d. Massive parallel processing environment

*The SAS Compute Server is the traditional SAS 9 engine that we are used to working with. Single-threaded processing for the most part, with a few thread enabled PROCs that support multithreaded processing Eg. MEANS, REPORT, SORT, SUMMARY, TABULATE, SQL*

# Quiz Question 8

You have been given the SAS Viya environment to work with. What happens to all the base SAS 9 data step code that you and your team spent months developing?

- a. With a few tweaks to your code, you can reuse your base SAS 9 code
- b. You have to rewrite all your code from scratch to make it SAS Viya compatible

# Quiz Answer 8

You have been given the SAS Viya environment to work with. What happens to all the base SAS 9 data step code that you and your team spent months developing?

- a. With a few tweaks to your code, you can reuse your SAS 9 code
- b. You have to rewrite all your code from scratch to make it SAS Viya compatible

*With just a few tweaks, to your Base SAS 9 code you can advantage of all the advantages of speed, in memory engines, multithreaded capacity and so much more in SAS Viya*

# Quiz Question 9

Which step should you modify to run in CAS?

- a. computationally demanding PROCs
- b. steps using data sources < 50 GB
- c. Short steps under 30 minutes
- d. simple data steps

# Quiz Answer 9

Which step should you modify to run in CAS?

- a. computationally demanding PROCS
- b. steps using data sources < 50 GB
- c. Short steps under 30 minutes
- d. simple data steps

*As you work in your Viya environment and consider writing or modifying programs to run in CAS, there are a few best practices to consider. CAS generally outperforms the Compute Server if you have data sources larger than 50 GB, steps that run for 30 minutes or longer, PROCs that are computationally demanding, or DATA steps with extremely long or complex logic.*



# Thank You

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✓ Did you  
enjoy this  
session, Let us  
know in the  
[evaluation](#)

