

# Open APIs on the SAS Platform

OPEN.UNIFIED.POWERFUL.SCALABLE.





## SAS is a leader in:



Data science  
platforms



Customer  
analytics



Digital  
marketing  
analytics



Merchandise  
Assortment  
Planning &  
Sizing  
Optimization

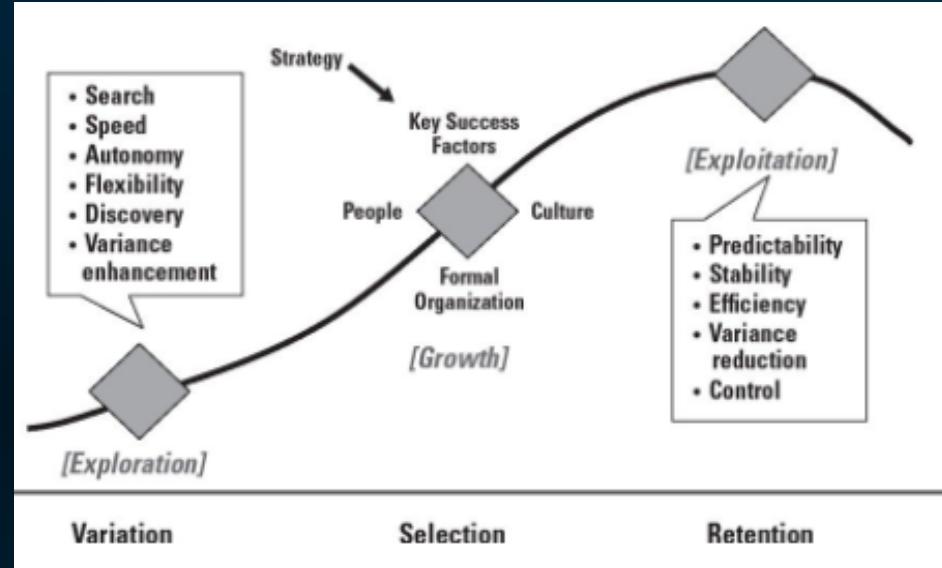
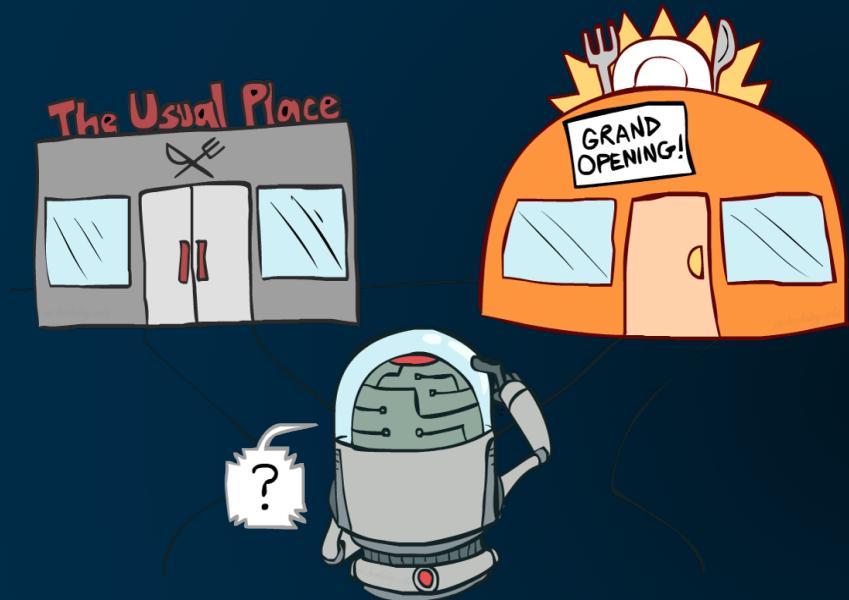


Multi-channel  
campaign  
management



Data quality /  
Data  
integration

# What Innovation Strategy Works...



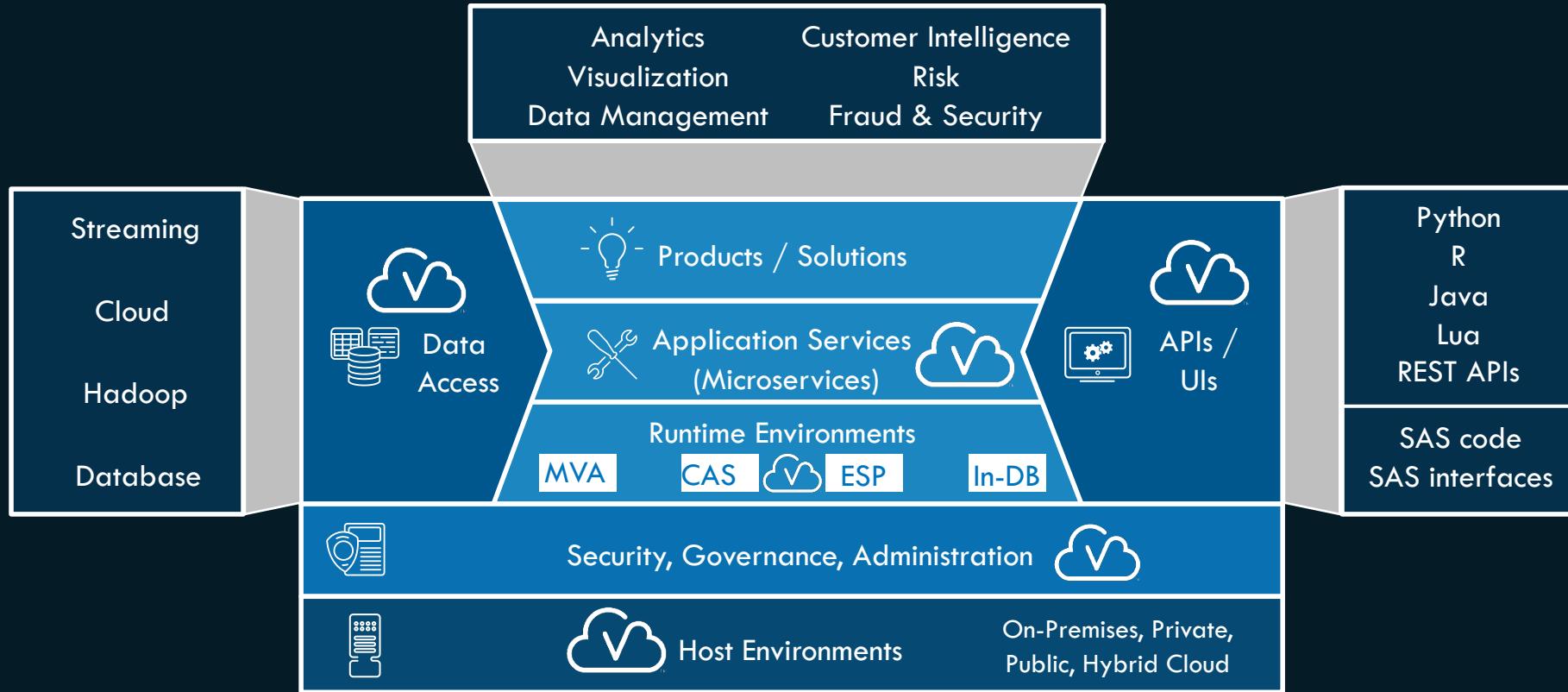
**Ambidextrous** Organizations stand the test of time.  
Explore & Exploit!  
~~Not Explore OR Exploit!!~~

Charles A. O'Reilly III  
Michael L. Tushman  
**LEAD**  
—and—  
**DISRUPT**  
  
How to solve the innovator's dilemma

# Platform for Industrialized Analytics



# SAS Viya – High Level View



# Technical Benefits

- ✓ Huge shared memory.
- ✓ Specially written multi-threaded software.
- ✓ Blazingly fast speeds.
- ✓ Amazing agility.
- ✓ Current machine learning techniques.
- ✓ Cloud-ready.
- ✓ Increased accessibility.



SAS® Viya™



# Capabilities Available on the SAS MPP Engine

## Supervised and Unsupervised Machine Learning:

- Logistic Regression
- Linear Regression
- Generalized Linear Models
- Nonlinear Regression
- Ordinary Least Squares Regression
- Decision Trees\*
- Partial Least Squares Regression
- Quantile Regression
- K-means and K-modes Clustering
- Principal Component Analysis
- Random Forest\*
- Gradient Boosting\*
- Neural Networks\*
- Support Vector Machines\*
- Factorization Machines\*
- Deep Learning\*
- Network Analytics/Community Detection
- Text Mining
- Boolean Rules
- Auto-tuned Hyper-parameters
- Assess Supervised Models

## Forecasting:

- ESM (Exponential smoothing)
- ARIMA
- UCM (Unobserved components)
- IDM (Intermittent demand)
- Automated hierarchical forecasting and reconciliation

## Econometrics:

- Copula functions
- Count Regression
- Panel Data
- Limited Dependent Variable Models
- Severity Distribution Models

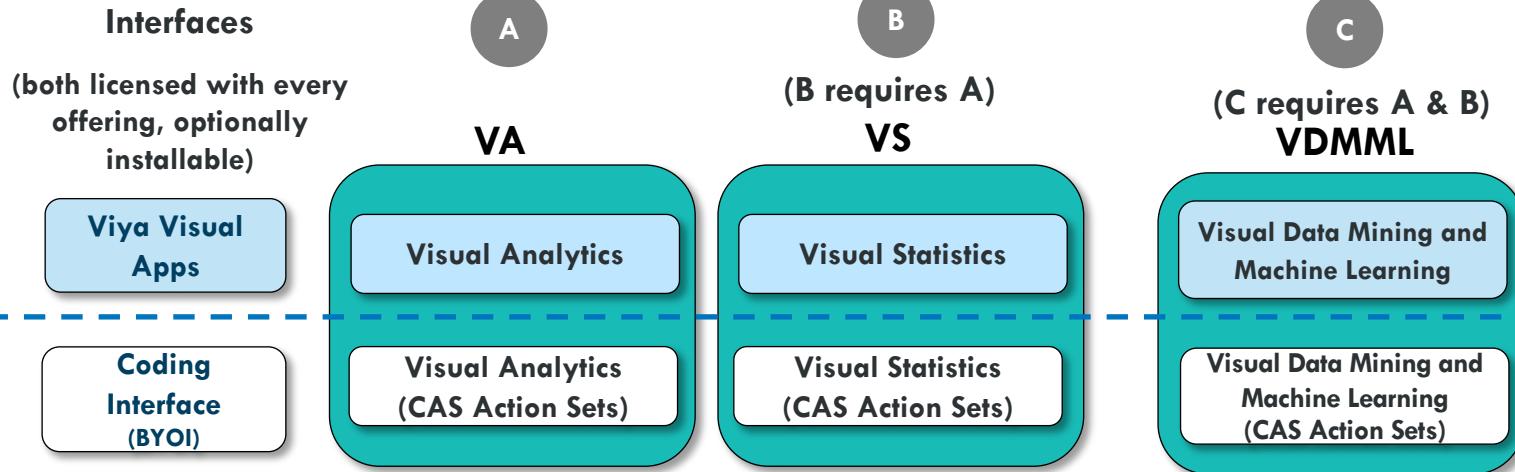
## Optimization Solvers:

- Linear Programming
- Mixed Integer Linear Programming
- Nonlinear Programming
- Quadratic Programming
- Network Solver

## Data Manipulation:

- Transpose
- SQL
- Variable Binning
- Variable Cardinality Analysis
- Sampling and Partitioning
- Missing Value Imputation
- Variable Selection
- In-Memory Data Step (SAS)

\*Represents the ML techniques where auto-tuning is supported



*Only a handful of products shown for illustration purposes*

# Viya is Language Agnostic, Interface Agnostic

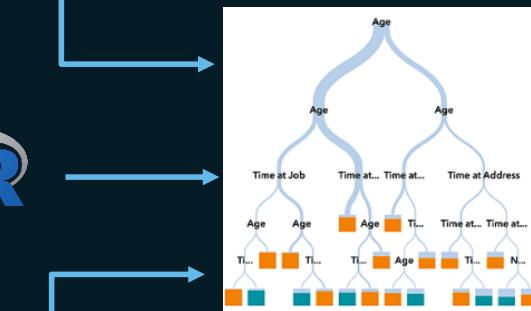
## Visual Interfaces



## Programming Interfaces



## API Interfaces





# Core Analytics: Value Prop Highlights

**Engines** exist for data prep, discovery and deployment

**Objects** created by discovery processes

**Core Methods** use optimized **tech** for interacting with engines.

**'Open' Wrappers** for accessing core tech

**Python**

**Pandas Data Frame**    **Data Frame**

**describe()**

**Pandas**

**R**

**Data Frame**

**summarize()**

**dplyr**

**CAS**

**CAS Table**

**summary()**

**swat**

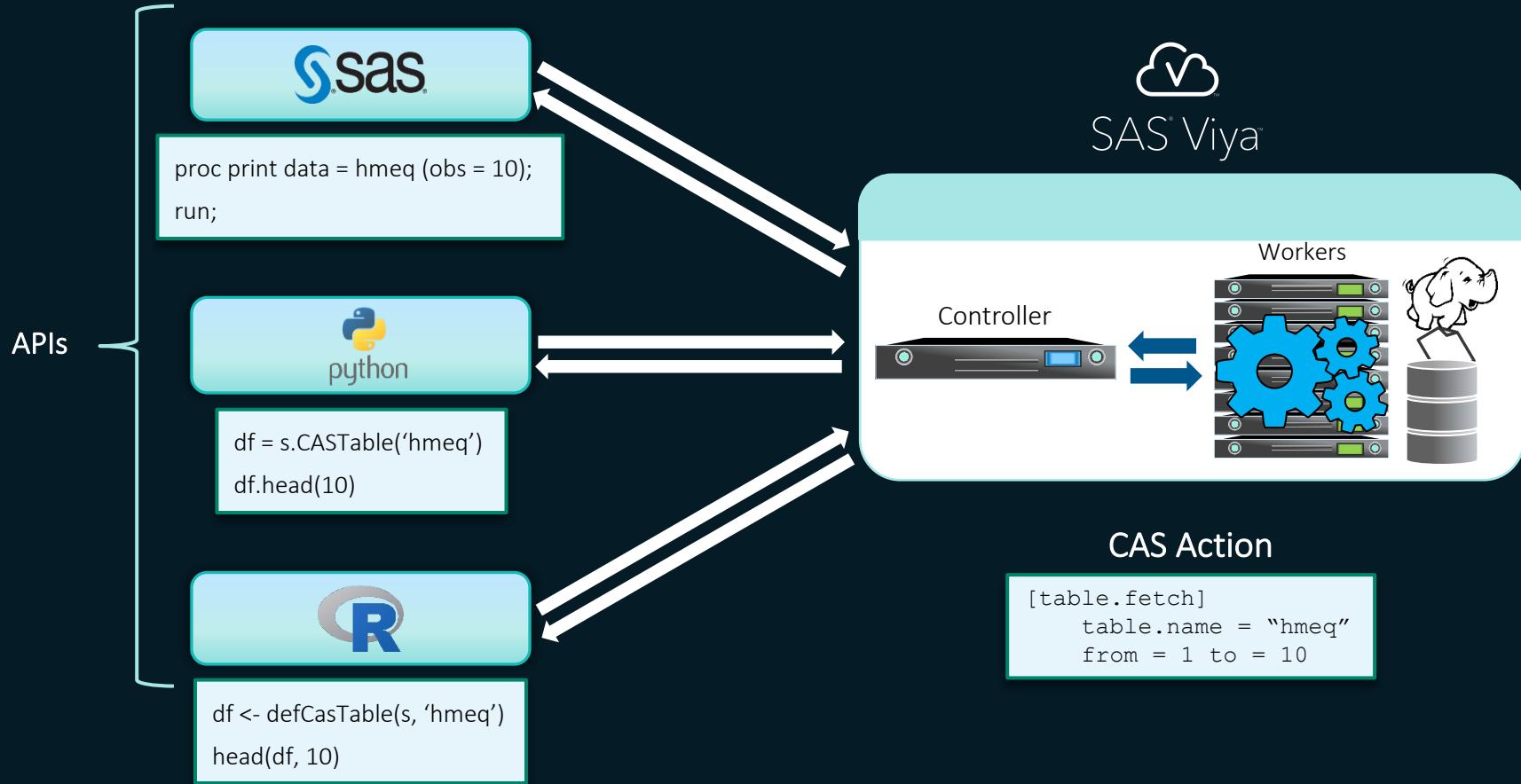
✓ **Scalable**

✓ **Distributed & Fault Tolerant**

✓ **Parallel, Multi-Threaded\***

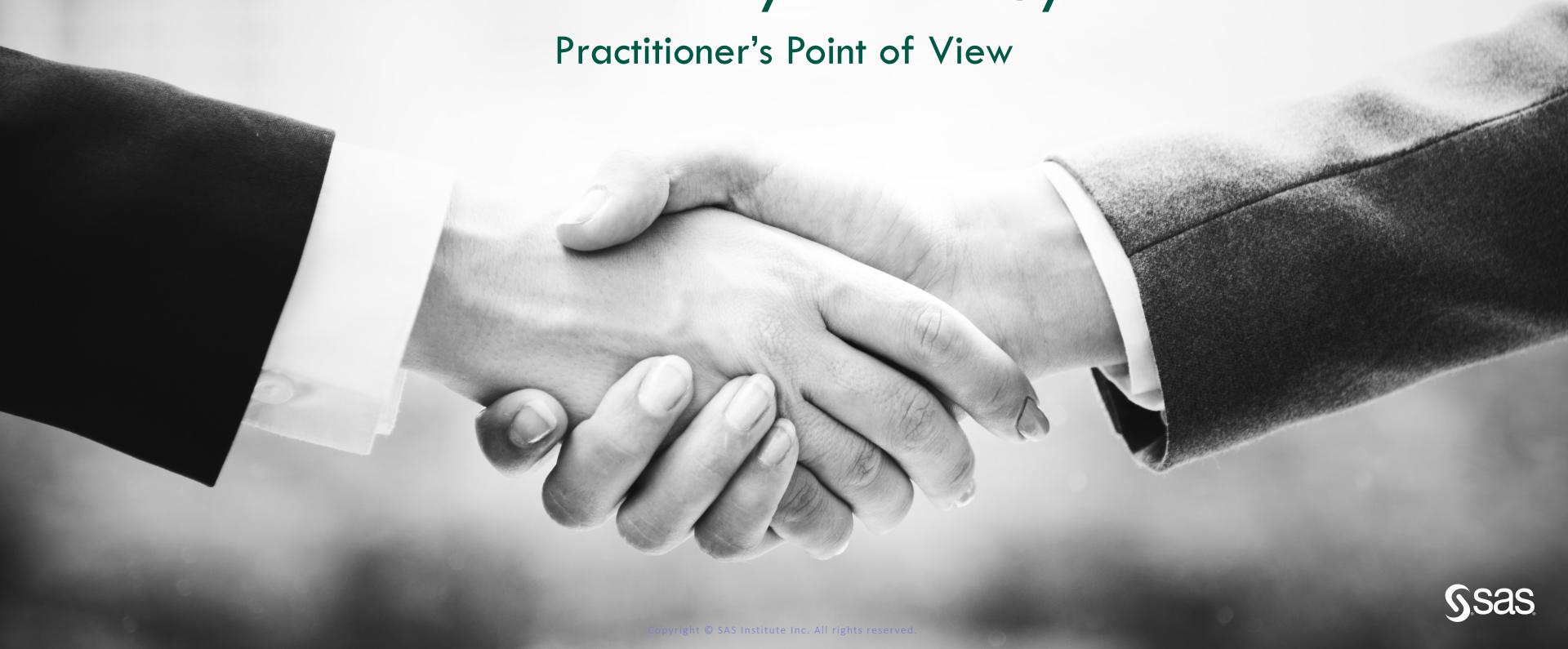
✓ **Fast & Easy**

# How does it work

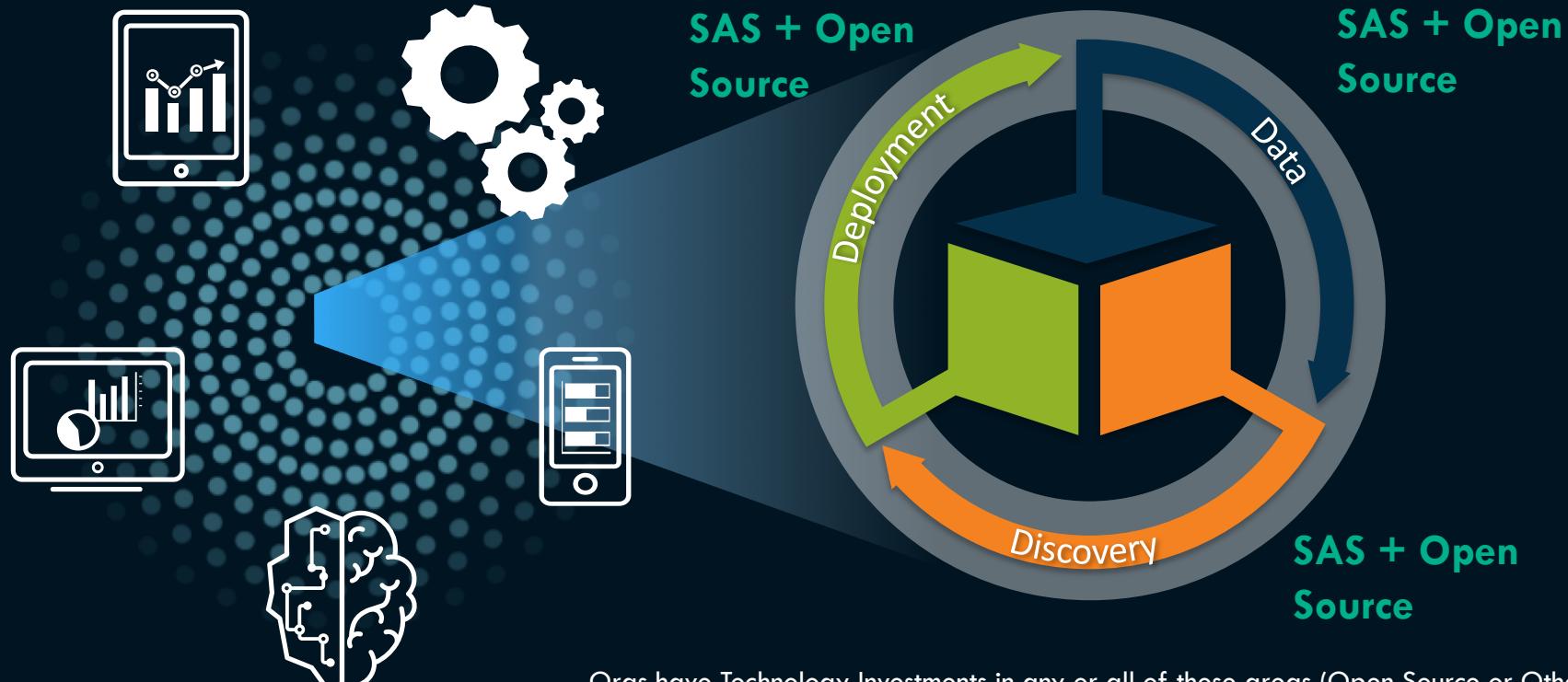


# Strategic Value of SAS + Open Source In The Analytics LifeCycle

Practitioner's Point of View



# The Analytics Life Cycle



Orgs have Technology Investments in any or all of these areas (Open Source or Otherwise)

**Better, Faster - Together.**

# Summary

- Use Native Client Libraries to Build Your Own ML Pipelines, App Integrations or Custom Work Flows with SAS

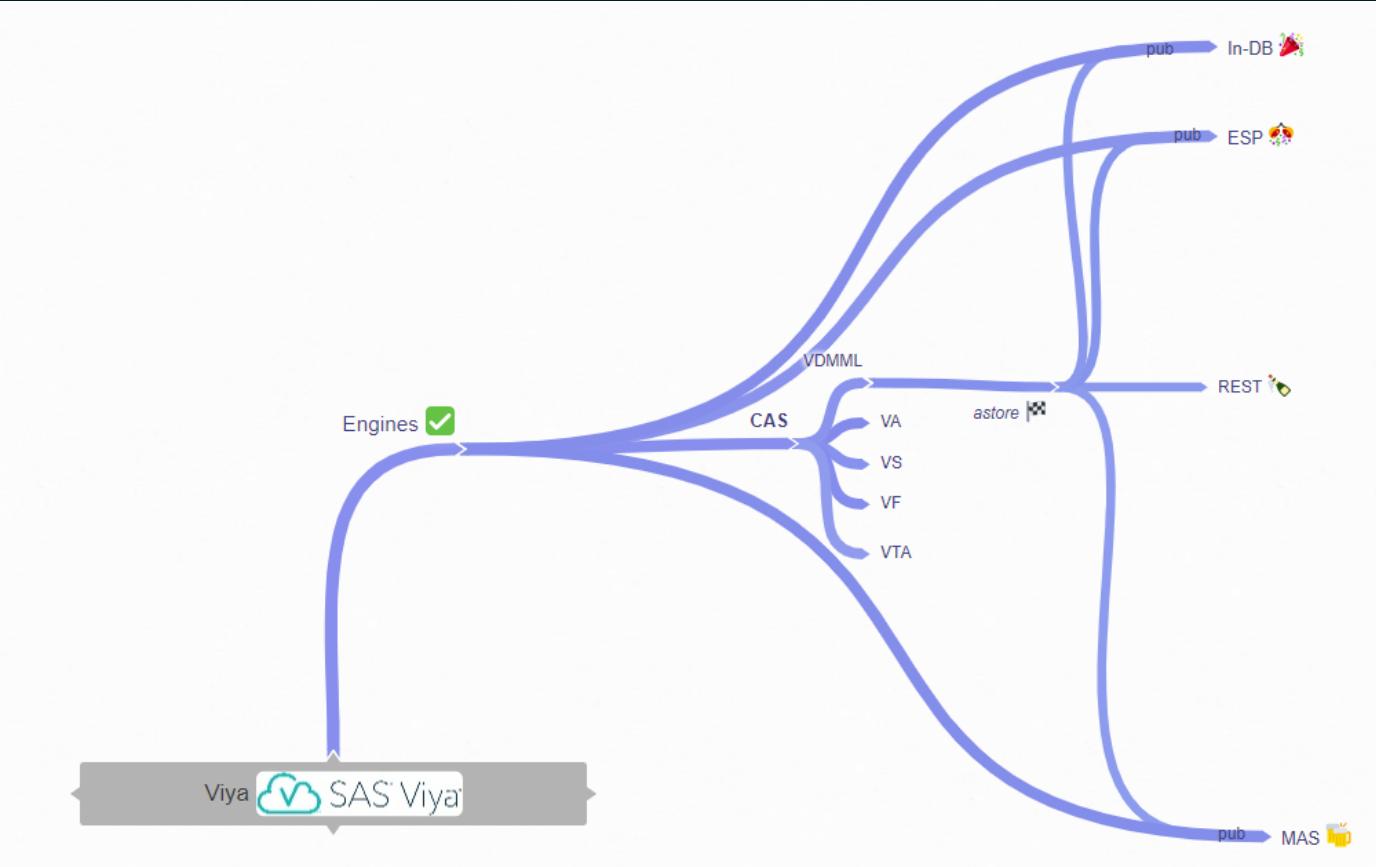
- ✓ PySWAT - Python API for Viya
- ✓ R-SWAT - R API for Viya
- ✓ DLPy - Keras Like API for DL on Viya
- ✓ ESPPy – For Real Time Streaming Projects
- ✓ REST APIs - For Web Apps
- ✓ Others – [developer.sas.com](http://developer.sas.com)



- Integrate Open Source Models with Viya to compare, manage, validate and govern models deployment in SAS
  - ✓ Integration of Python and R Models Through SAS Model Manager for Deployment
  - ✓ Score Python Models with SAS Event Stream Processing
  - ✓ Write your own models Open Source Models in Model Studio



# Create and Deploy :- Tying it all together!



Build Once,  
Deploy  
Anywhere!

# Value Prop Summary

- ✓ Workload Optimized Runtime Environments
  - Eliminate low level engineering for analytic workloads
  - Derive efficiencies from Platform Integrations and capabilities
- ✓ Deployment Focused Development
- ✓ Fosters easy collaboration
  - Language Agnostic – Familiar language choice is ok
  - Interface Agnostic - Bring your own Interface
- ✓ “Fit for problem” solutioning mentality
  - True Champion wins across SAS or pure python or R models
  - Bring Model Governance, Versioning if needed
- ✓ Easy to Learn Open APIs
  - Publicly documented, Easy to contribute to and raise issues
- ✓ Easy to incorporate into existing development and deployment practices

