SAS® Viya™

THE FUTURE ROLE OF MICROSERVICES IN SAS® ARCHITECTURE

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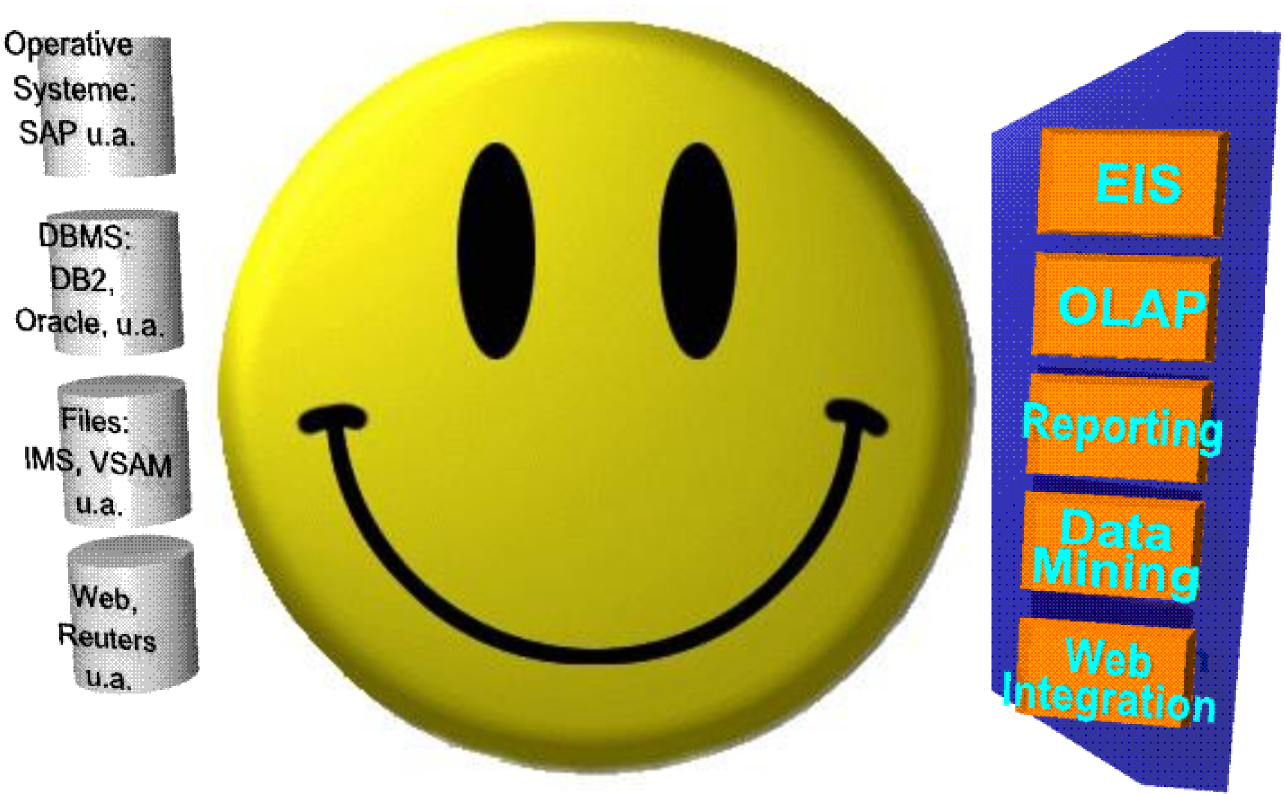
SAS® THE POWER TO KNOW®

THEMEN

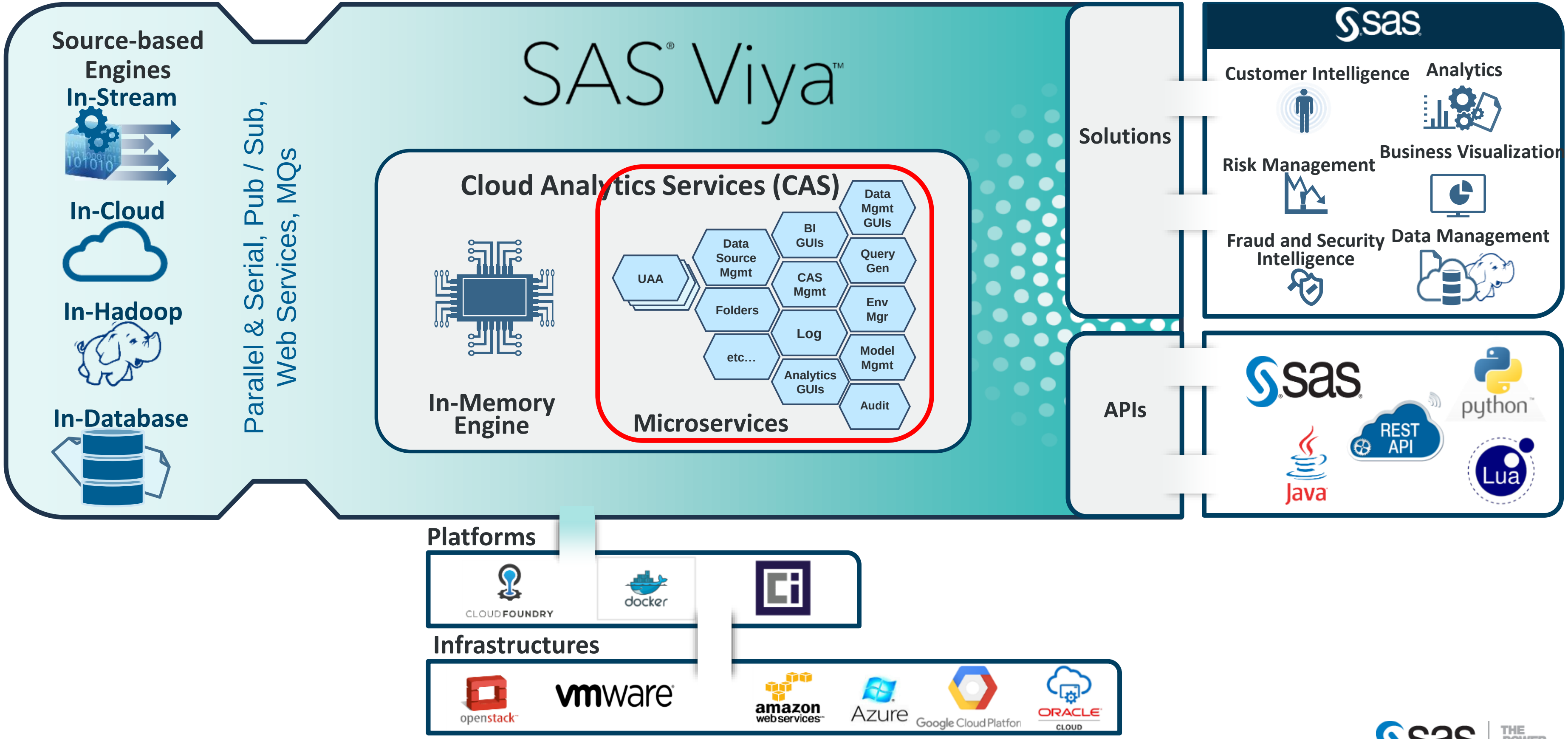
SAS® VIYA

- Overview
- Microservices
- SAS® In-Memory Engine
- SAS® Viya & Cloud
- Summary

THE NEW SAS® ARCHITECTURE

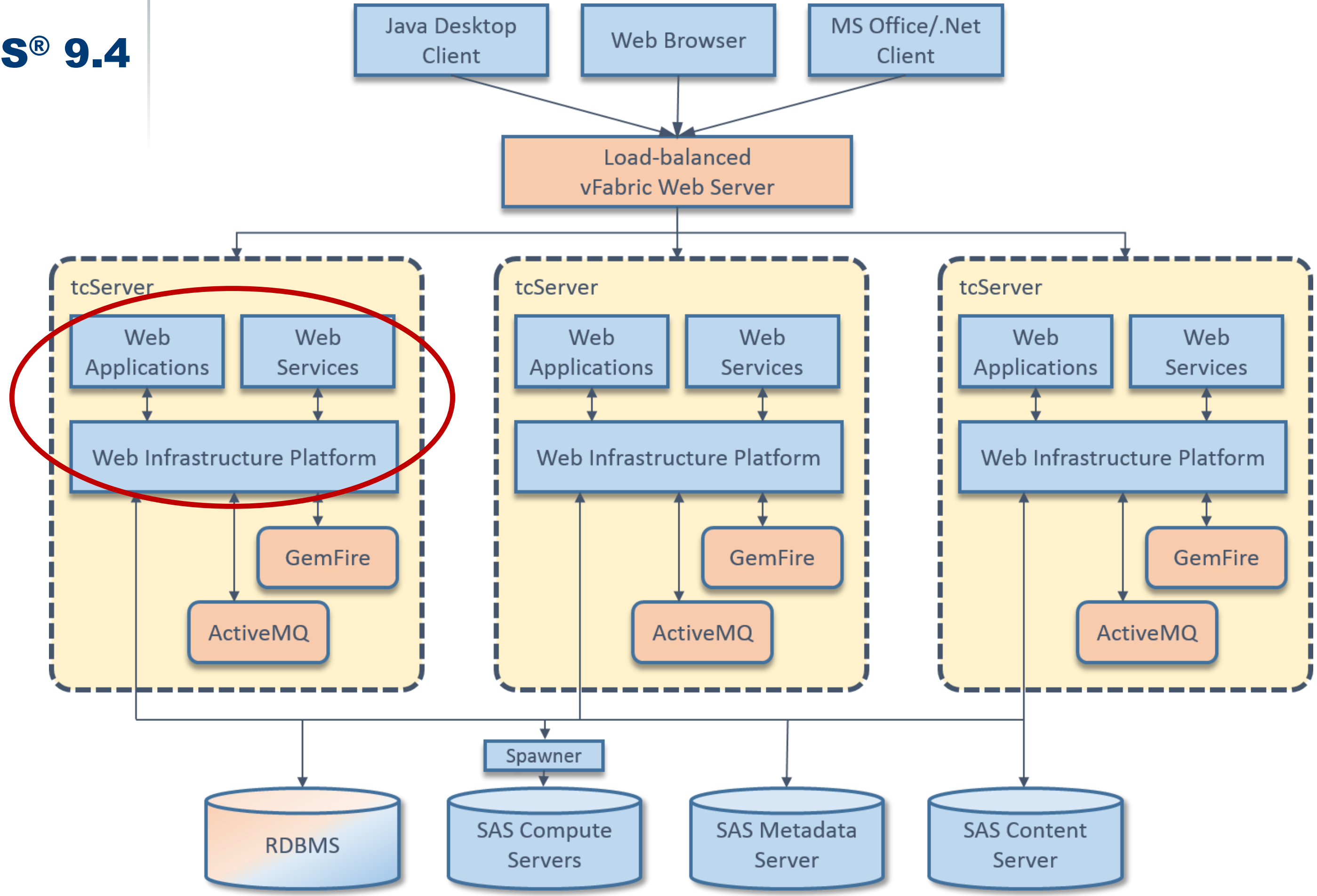


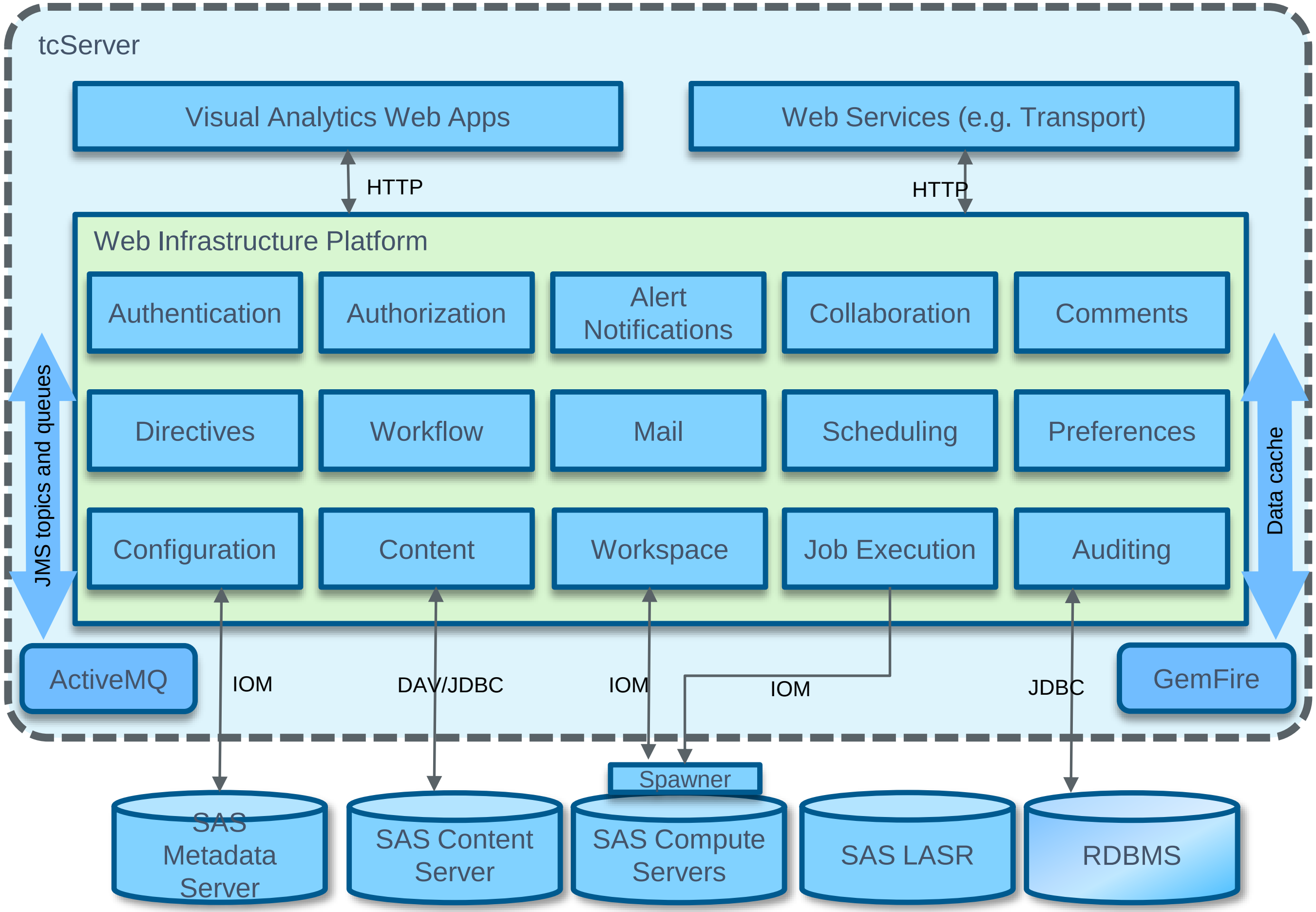
SAS® Viya™ CONCEPTUAL ARCHITECTURE



MICROSERVICES

REVIEW: SAS® 9.4




tcServer
Visual Analytics Web Apps
Web Services (e.g. Transport)
HTTP
HTTP
Web Infrastructure Platform
Authentication
Authorization
Alert Notifications
Collaboration
Comments
Directives
Workflow
Mail
Scheduling
Preferences
Configuration
Content
Workspace
Job Execution
Auditing
JMS topics and queues
Data cache
ActiveMQ
GemFire
IOM
DAV/JDBC
IOM
IOM
JDBC
Spawner
SAS Metadata Server
SAS Content Server
SAS Compute Servers
SAS LASR
RDBMS

“THE FUTURE ROLE OF MICROSERVICES IN SAS® ARCHITECTURE”

- SAS® is rearchitecting its middle tier components and adopting a **microservice** model, replacing
  - SAS® Metadata Server,
  - Web Infrastructure Plarform (‘WIP’, SAS® Midtier services),
  - Integrated Object Model (‘IOM’, interface to Base SAS®),

MICROSERVICES | A DEFINITION

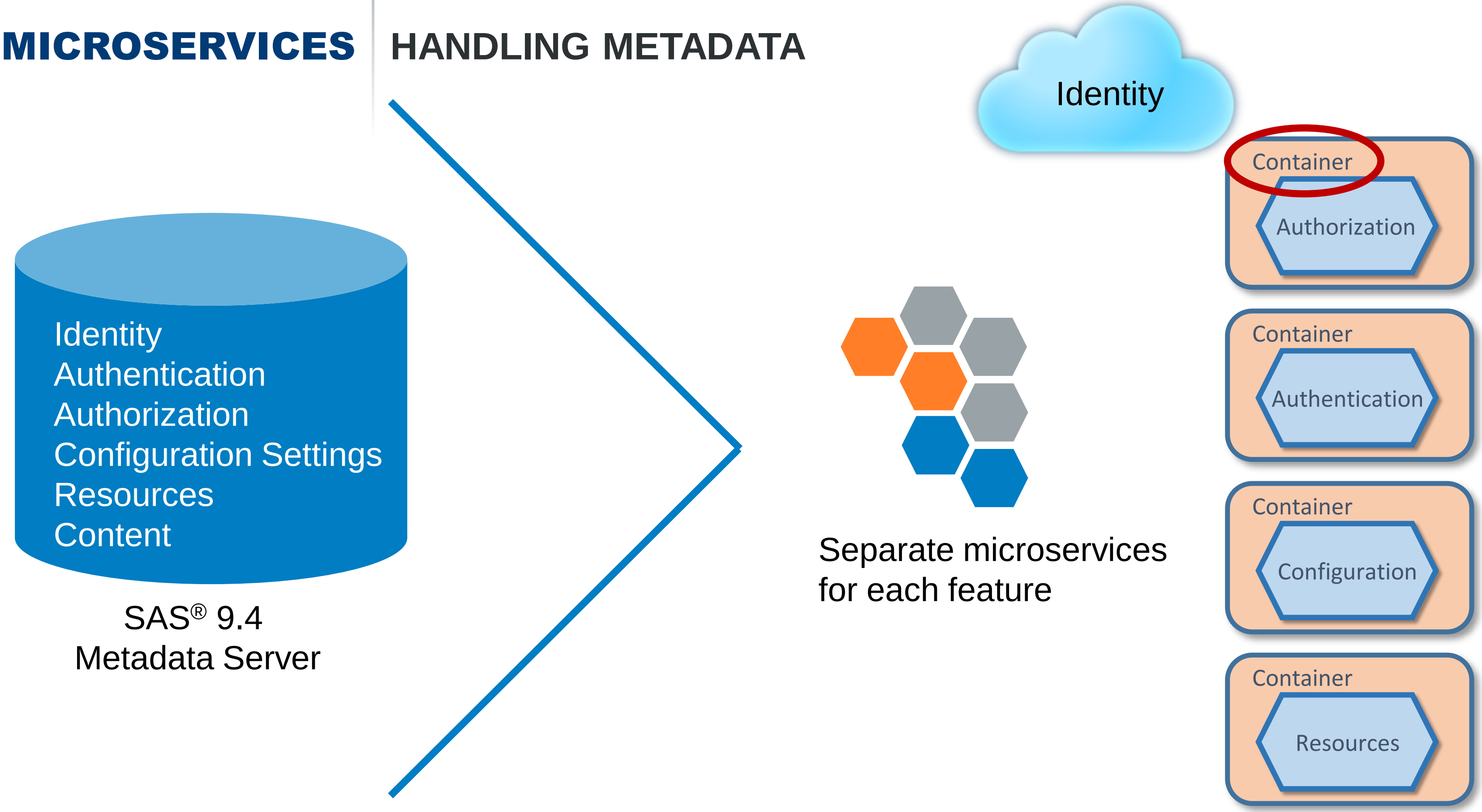
- *“… small,* ***independent*** *processes that communicate with each other to form complex applications which utilize* ***language-agnostic APIs****.*

- *These services are small building blocks, highly* ***decoupled*** *and focused on doing a* ***small task****, facilitating a* ***modular approach to system-building****.*

- *The microservices architectural style is* ***becoming the standard for building continuously deployed systems****.“*

https://en.wikipedia.org/wiki/Microservices

MICROSERVICES | HANDLING METADATA



Identity
Authentication
Authorization
Configuration Settings
Resources
Content

SAS® 9.4
Metadata Server

Separate microservices for each feature

Identity

Container
Authorization

Container
Authentication

Container
Configuration

Container
Resources

CONTAINER OPERATING-SYSTEM-LEVEL VIRTUALIZATION

- **"…** *server virtualization method in which the kernel of an operating system allows the existence of* ***multiple isolated user-space instances****, instead of just one.*

- *Such instances … may* ***look and feel like a real server*** *from the point of view of its owners and users.*

https://en.wikipedia.org/wiki/Operating-system-level_virtualization

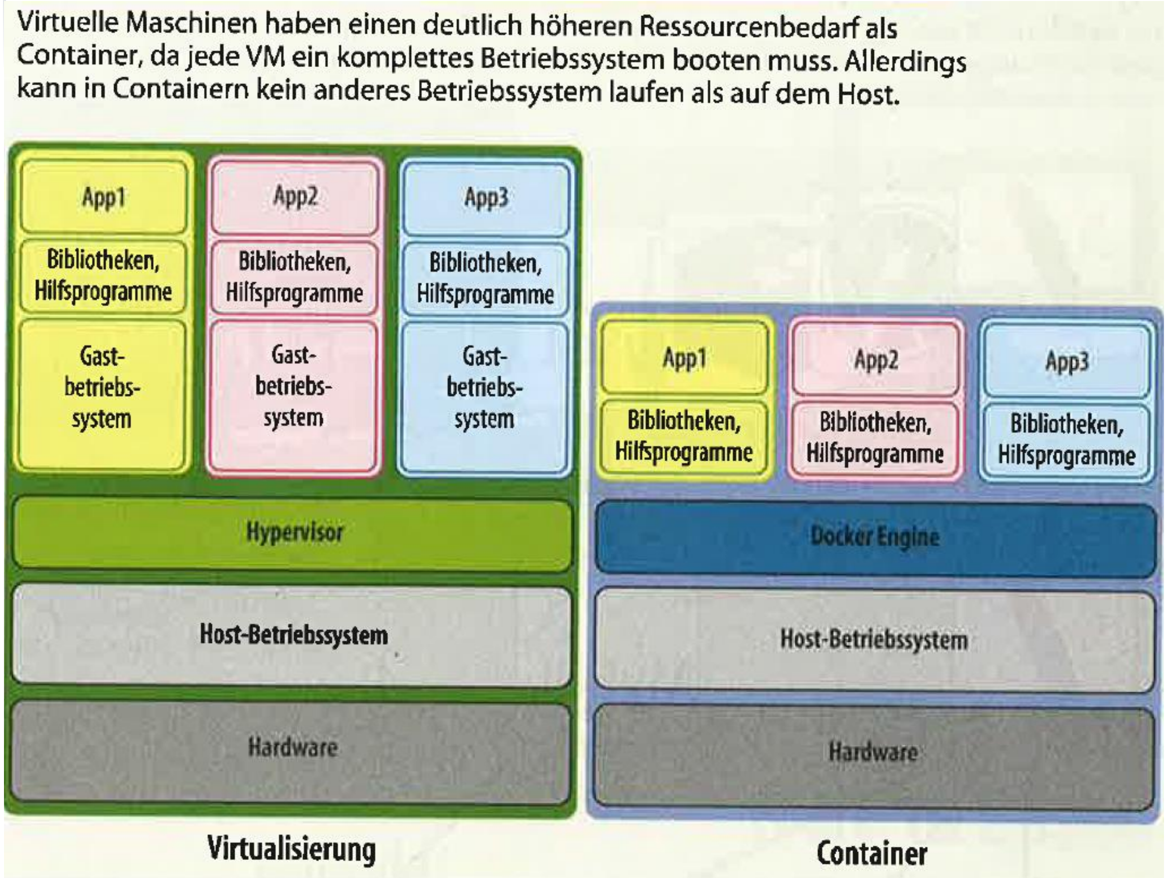
DOCKER „ AN OPEN-SOURCE PROJECT…“

- **“…** *that automates the* ***deployment of applications*** *inside software containers, by providing an additional layer of abstraction and automation of* ***operating-system-level virtualization on Linux****.*

- *Docker uses the resource isolation features of the Linux kernel such as* ***cgroups*** *and kernel* ***namespaces****, … to allow independent "containers" to run within a single Linux instance,* ***avoiding the overhead of starting and maintaining virtual machines****.*“

https://en.wikipedia.org/wiki/Docker_(software)

CONTAINER VS. VIRTUELLE MASCHINEN

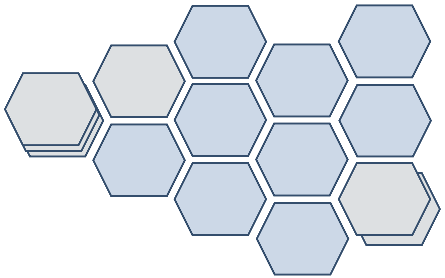


Virtuelle Maschinen haben einen deutlich höheren Ressourcenbedarf als Container, da jede VM ein komplettes Betriebssystem booten muss. Allerdings kann in Containern kein anderes Betriebssystem laufen als auf dem Host.

c't 2016/5, Knowhow-Container, p.108-124

SAS® MICROSERVICES AND PERSISTENCE

“Stateless” Services



Persistent Store

PostgreSQL

RabbitMQ™

CONSUL

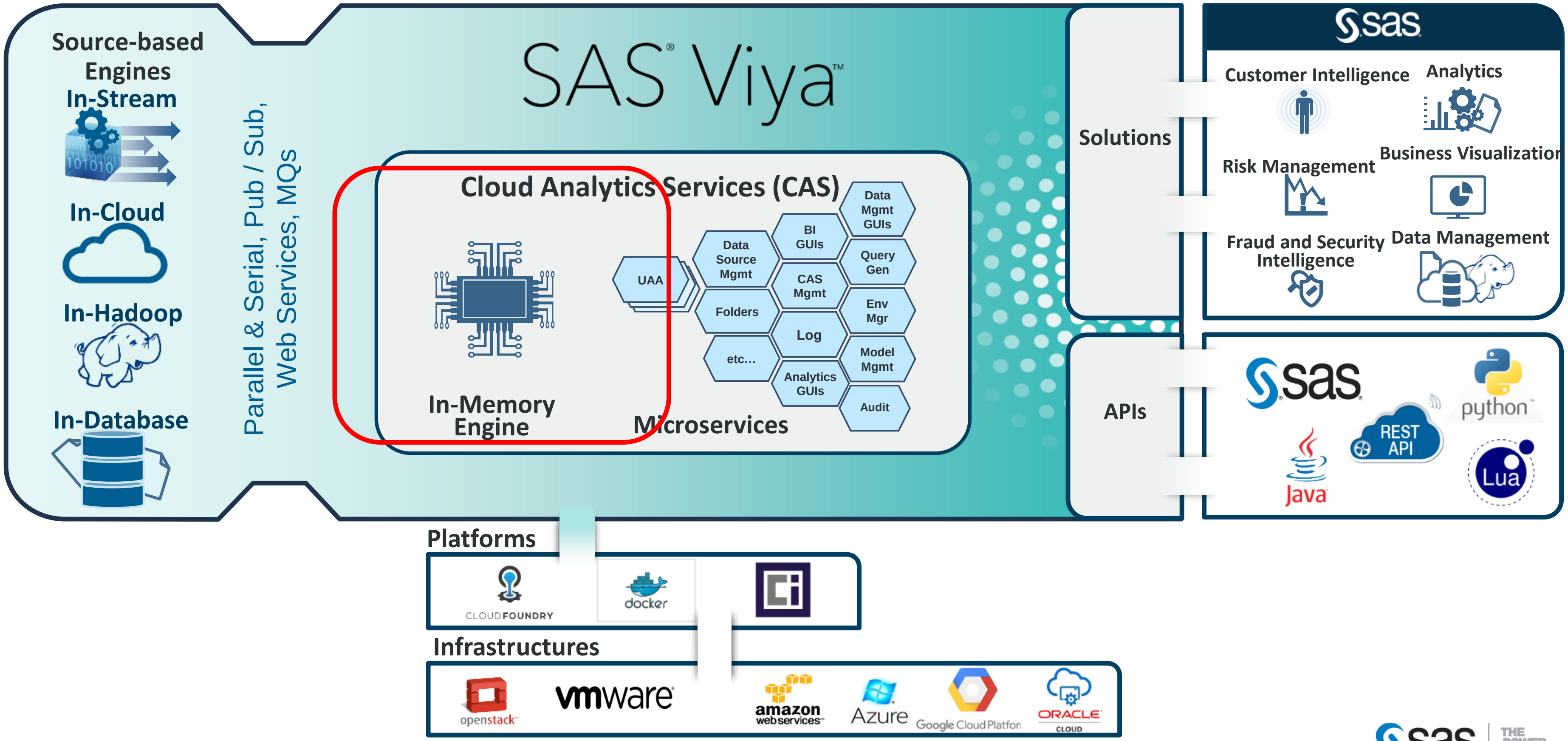
The stateless services are spun up, perform their service and typically terminate.

Data are stored in:

- **PostgreSQL**: user data like report descriptions; replaces content server.
- **RabbitMQ**: messaging queueing, and caching.
- **CONSUL**: configuration data.

IN-MEMORY ENGINE

SAS® Viya™ CONCEPTUAL ARCHITECTURE



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SAS® VIYA | CLOUD ANALYTICS SERVICES: IN-MEMORY ENGINE

SAS® Viya runtime environment:

- In-memory technology of LASR,
- merged with that of SAS® High-Performance Analytics,
- plus extended Enterprise / Cloud Capabilities.

To be distinguised from „source-based“ engines like:

- in-database, in-hadoop, in-stream.

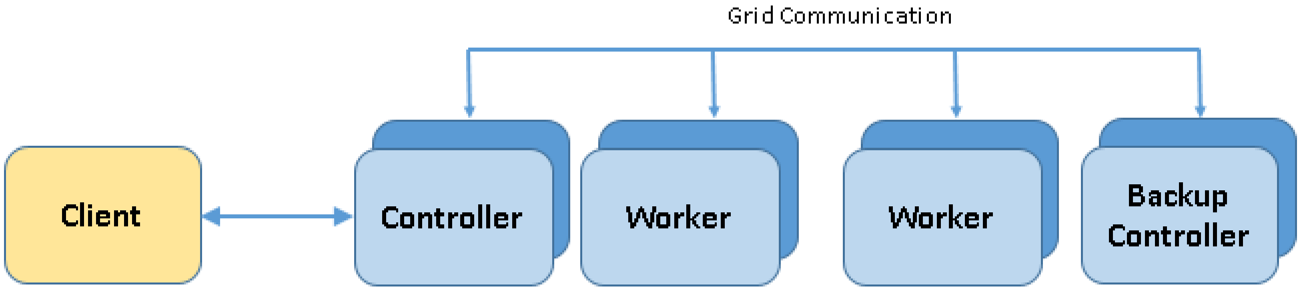
SAS® VIYA | IN-MEMORY GRID

Server:

- 1 - n Controller Nodes (vgl. Hadoop® head nodes).
- 0 - m Worker Nodes (vgl. Hadoop® data nodes).

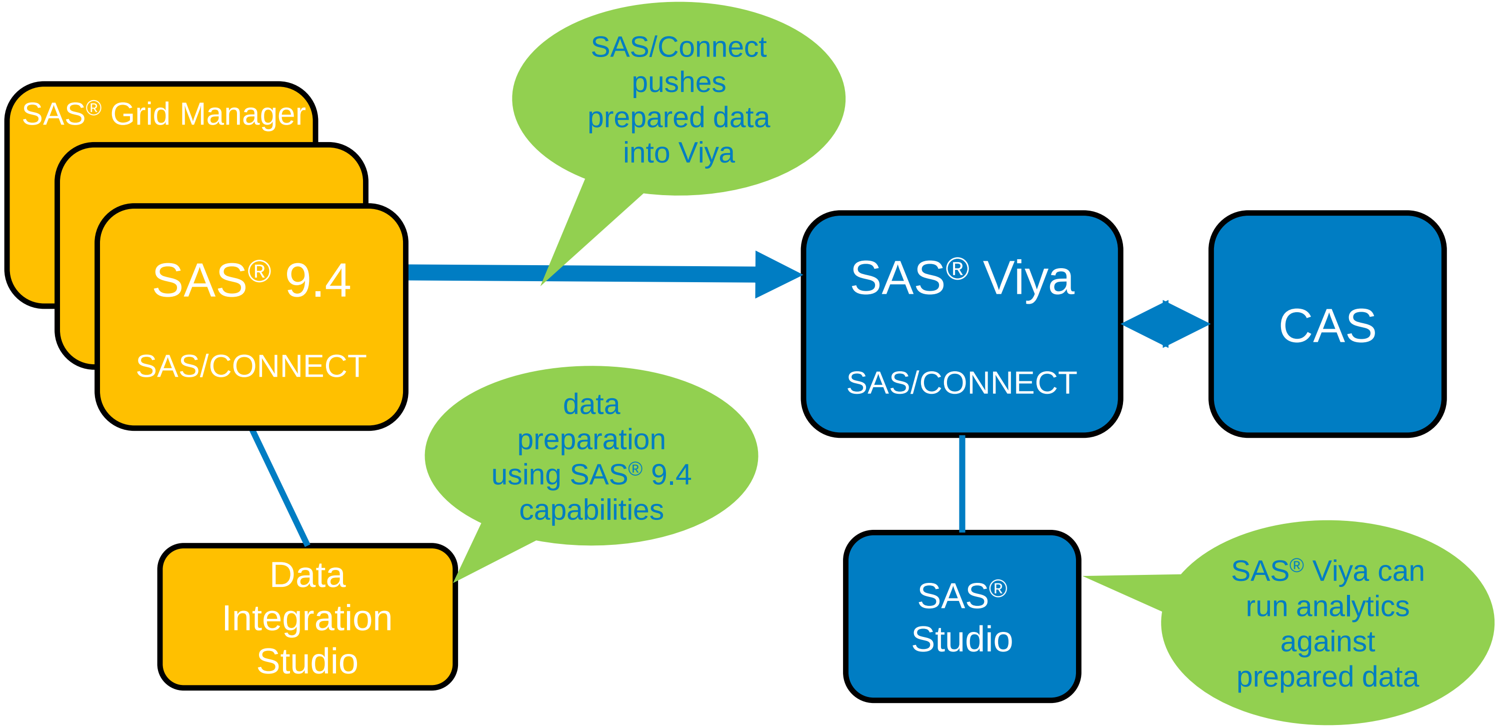
Clients:

- Scripting languages like Lua, Python, Perl, R, MATLAB.
- Public APIs for Java und C.
- Also: DATA Step and MVA SAS®!



SAS® VIYA

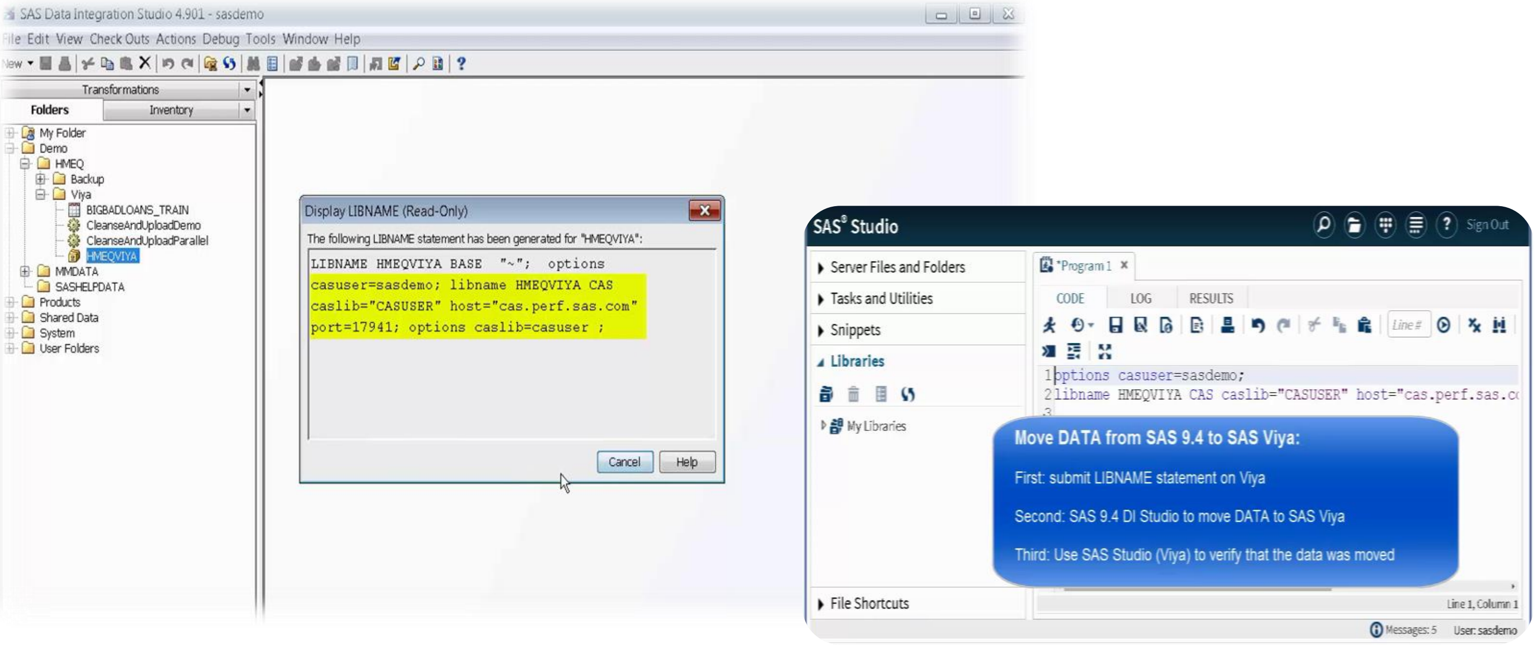
BRIDGING VIYA AND 9.4 USING SAS® CONNECT



SAS® Grid Manager
SAS® 9.4
SAS/CONNECT
SAS/Connect pushes prepared data into Viya
SAS® Viya
SAS/CONNECT
CAS
data preparation using SAS® 9.4 capabilities
Data Integration Studio
SAS® Studio
SAS® Viya can run analytics against prepared data

SAS® VIYA

BRIDGING VIYA AND 9.4 USING SAS® CONNECT



The following LIBNAME statement has been generated for "HMEQVIYA":

```
LIBNAME HMEQVIYA BASE  "~";  options
casuser=sasdemo; libname HMEQVIYA CAS
caslib="CASUSER" host="cas.perf.sas.com"
port=17941; options caslib=casuser ;
```

```
options casuser=sasdemo;
libname HMEQVIYA CAS caslib="CASUSER" host="cas.perf.sas.co
```

Move DATA from SAS 9.4 to SAS Viya:

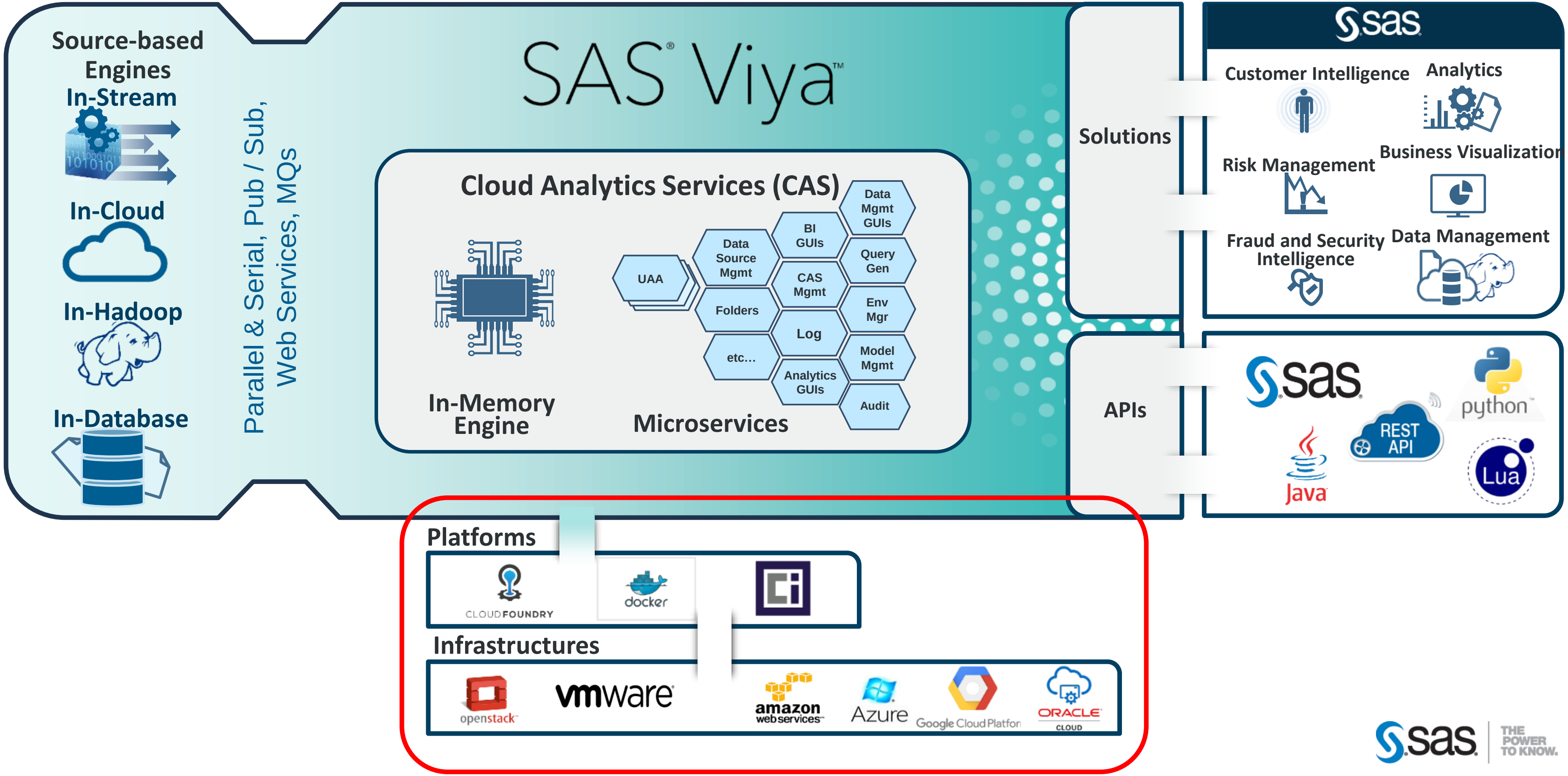
First: submit LIBNAME statement on Viya

Second: SAS 9.4 DI Studio to move DATA to SAS Viya

Third: Use SAS Studio (Viya) to verify that the data was moved

SAS® VIYA & CLOUD

SAS® Viya™ CONCEPTUAL ARCHITECTURE



SAS® Viya™

Source-based Engines

In-Stream

In-Cloud

In-Hadoop

In-Database

Parallel & Serial, Pub / Sub, Web Services, MQs

Cloud Analytics Services (CAS)

In-Memory Engine

Microservices

UAA

Data Source Mgmt

Folders

etc…

BI GUIs

CAS Mgmt

Log

Analytics GUIs

Data Mgmt GUIs

Query Gen

Env Mgr

Model Mgmt

Audit

Solutions

Customer Intelligence

Analytics

Risk Management

Business Visualization

Fraud and Security Intelligence

Data Management

APIs

Platforms

Infrastructures

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TODAY'S PORTABILITY

MULTI-VENDOR ARCHITECTURE

MVS

OS/2

IRIX

Solaris

Windows

Tru64

AIX

HP-UX

SunOS

Linux

TOMORROW'S PORTABILITY

MULTI-CLOUD ARCHITECTURE

OS/2

Google Cloud Platform

IRIX

MVS

vmware

aris

Windows

amazon web services™

AIX

HP-UX

openstack CLOUD SOFTWARE

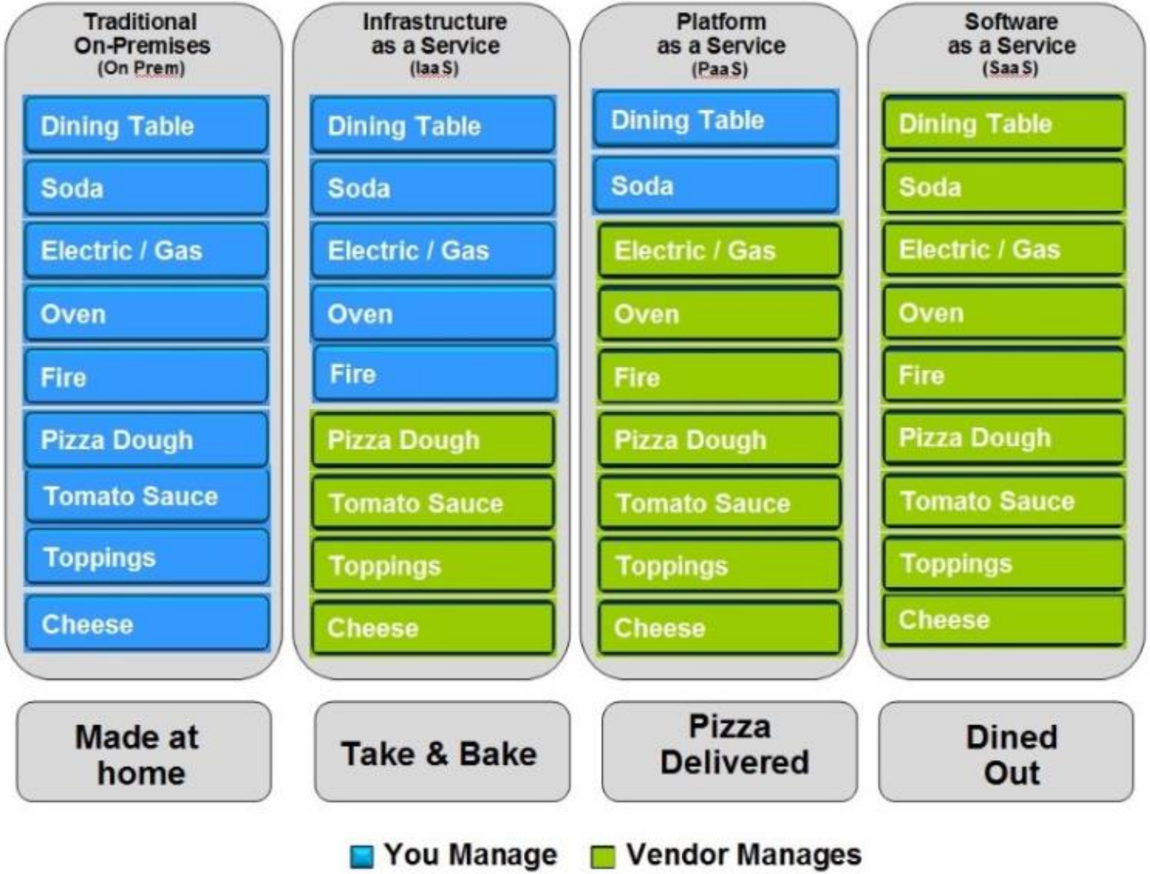
Azure

St S

Linux

SERVICE LAYERS

„PIZZA-AS-A-SERVICE“ ☺

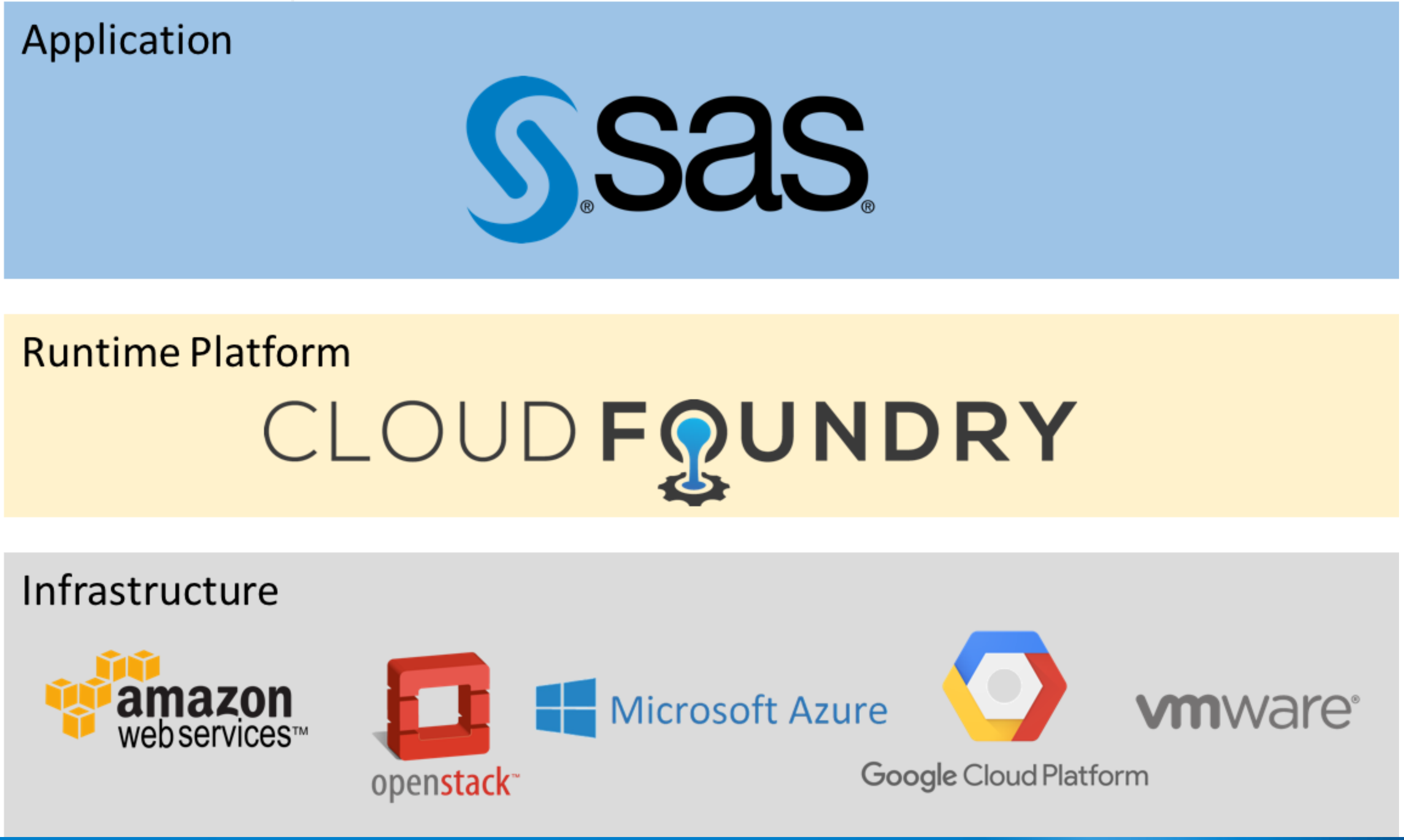


Traditional On-Premises (On Prem)	Infrastructure as a Service (Iaa S)	Platform as a Service (Paa S)	Software as a Service (Saa S)
🟦 Dining Table	🟦 Dining Table	🟦 Dining Table	🟩 Dining Table
🟦 Soda	🟦 Soda	🟦 Soda	🟩 Soda
🟦 Electric / Gas	🟦 Electric / Gas	🟩 Electric / Gas	🟩 Electric / Gas
🟦 Oven	🟦 Oven	🟩 Oven	🟩 Oven
🟦 Fire	🟦 Fire	🟩 Fire	🟩 Fire
🟦 Pizza Dough	🟩 Pizza Dough	🟩 Pizza Dough	🟩 Pizza Dough
🟦 Tomato Sauce	🟩 Tomato Sauce	🟩 Tomato Sauce	🟩 Tomato Sauce
🟦 Toppings	🟩 Toppings	🟩 Toppings	🟩 Toppings
🟦 Cheese	🟩 Cheese	🟩 Cheese	🟩 Cheese
Made at home	Take & Bake	Pizza Delivered	Dined Out

🟦 You Manage 🟩 Vendor Manages

https://www.linkedin.com/pulse/20140730172610-9679881-pizza-as-a-service

CLOUD FOUNDRY | EXAMPLE OF PAAS SUPPORT

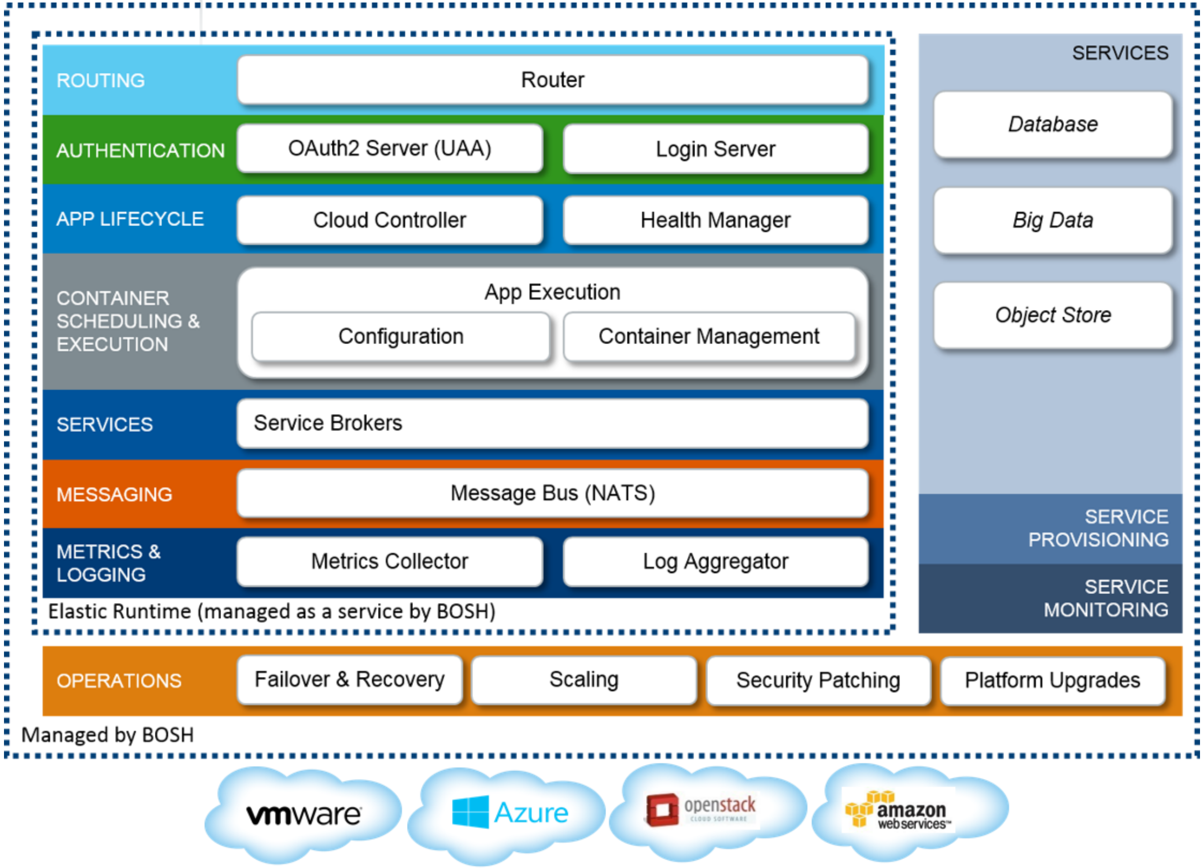


Application

Runtime Platform

Infrastructure

CLOUD FOUNDRY OPEN SOURCE CLOUD COMPUTING PAAS



ROUTING	Router	
AUTHENTICATION	OAuth2 Server (UAA)	Login Server
APP LIFECYCLE	Cloud Controller	Health Manager
CONTAINER SCHEDULING & EXECUTION	App Execution Configuration	Container Management
SERVICES	Service Brokers	
MESSAGING	Message Bus (NATS)	
METRICS & LOGGING	Metrics Collector	Log Aggregator

Elastic Runtime (managed as a service by BOSH)

SERVICES

- *Database*
- *Big Data*
- *Object Store*

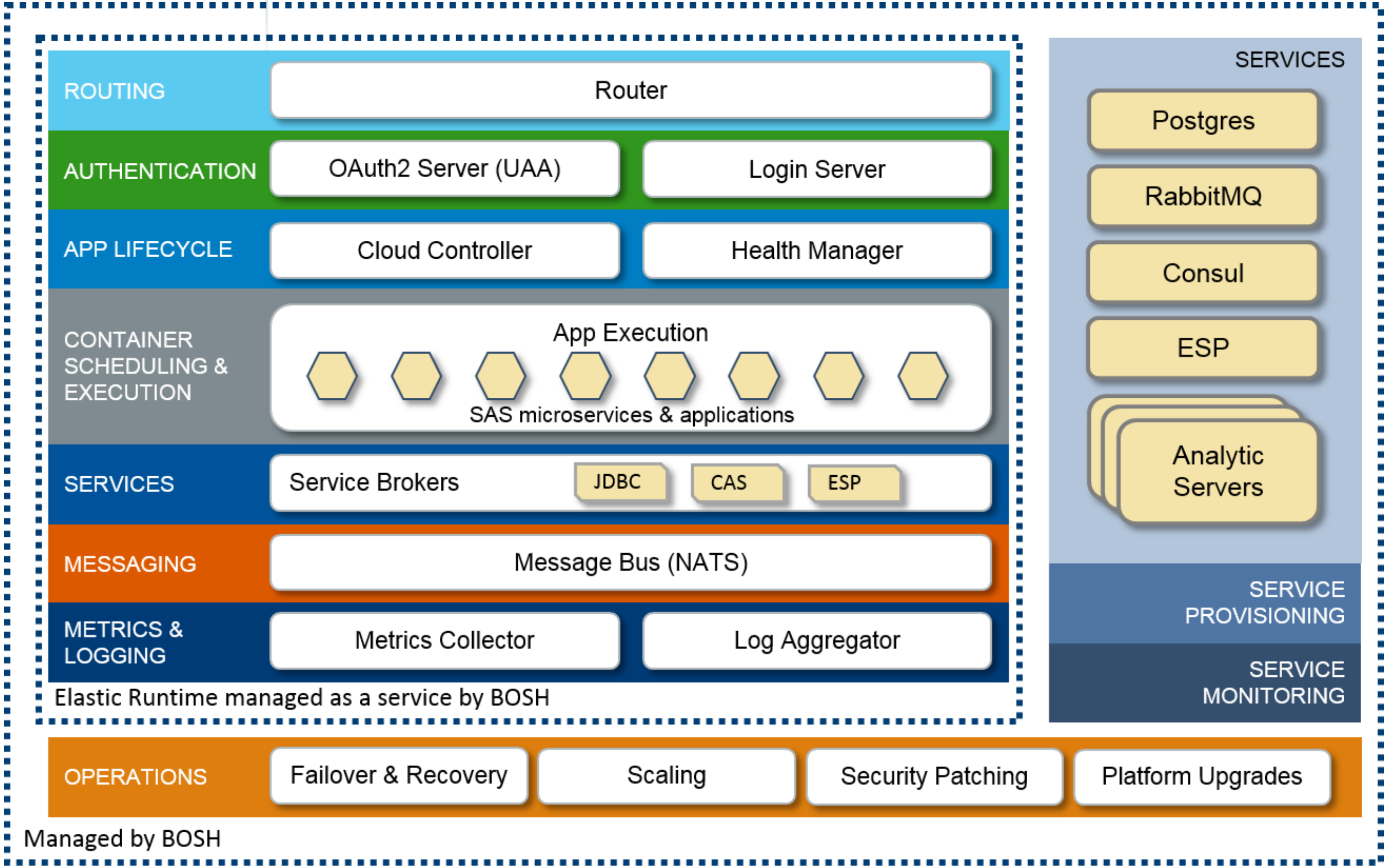
SERVICE PROVISIONING

SERVICE MONITORING

OPERATIONS	Failover & Recovery	Scaling	Security Patching	Platform Upgrades

Managed by BOSH

CLOUD FOUNDRY | SAS® NEXT ON CLOUD FOUNDRY



SUMMARY

SUMMARY - TECHNOLOGY

- Microservices are the fundamental functional building blocks of the SAS® Viya Architecture, replacing
  - SAS® Metadata Server,
  - Web Infrastructure Platform (WIP),
  - Integrated Object Model (IOM).
- SAS® Viya solutions and applications are themselves written as collections of microservices.
- REST is the new communication standard (http; statelessness ⇨ independence ⇨ elasticity).
- New in-memory engine:
  - replacing and enhancing the in-memory technology of LASR and SAS® High-Performance Analytics,
  - Cloud-ready,
  - Open to non-SAS® clients.
- Support of HTML5 Web clients and mobile clients:
  - no more Java desktop clients (nor Java Web Start).
- Deployment formats:
  - Cloud-ready formats like Docker containers,
  - „bare OS“ (directly on top of an operating system either in a physical or virtual machine).

SAS® VIYA SUMMARY - BENEFITS

- Intrinsic support of Cloud properties like
  - Resilience (Ausfallsicherheit),
  - Scalability,
  - Performance,
  - **Elasticity**.
- Largly simplified deployment and maintenance of SAS® environments:
  - **Scripted Deployment**,
  - **Rolling Updates; a running system doesn't have to come down to be updated**.
- Unified user experience in the SAS® world (SAS® Home', HTML5).
- Openness to non-SAS® clients (programming languages, public API).

- Big Data Analytics with SAS® for many more use cases!

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