

# Introduction to BigData – Spark – Processing

## Part 2: OnPrem to Cloud Experience at SG

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# Outline

- What is BigData ?
  - Order of Magnitudes for « Big »
  - History
  - Evolution of Softwares, Spark
- Description of a Datalake
  - Content, data feeding
  - How it is organized
  - Who uses it
- Example of Data-Processing
  - RAW to LAKE, Reports
- Change Storage-Compute, Evolution to Cloud



# Fundamental Resources

## TradeOffs

Network (Bandwith, Latency)



Horizontal Scale



CPU (HOT, Watts)



Development price / Run cost

€€€€€€€€\$\$\$\$



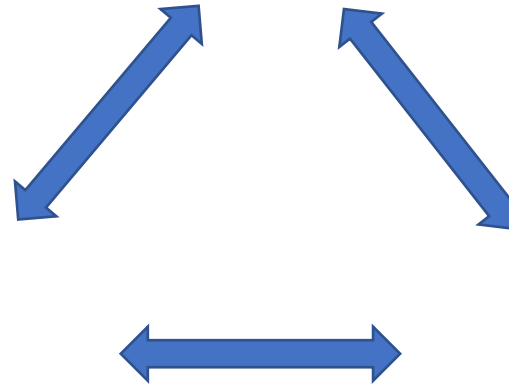
Cold Storage  
(SLOW)



Storage (~Small)



RAM (FAST .. Expensive)



# Historical Needs

## Data Locality

Resource WERE Collocated for Speed :

1 Blade = few Disks + few CPU + RAM

PROS:

- FAST local access
- OS Caching for re-using same files
- No need network shuffle when CO-LOCATING program on data
- Disk managed by softwares
- Easy plug

# Software / Hardware Evolutions..

Hard Disks -> SSD Disks (not in OnPrem yet)

HDI,Sata... PCI. disk can now be fast

Example on Microsoft Azure: ONLY SSD Disks

Network bandwidth + Latency ... now 1 Gb/s

=> Data Locality is NO MORE a requirement

# Not Enough Disk ... Too much/too Expensive « CPU »

Example at SG:

- Cost reduction plans... to reduce datacenters
- But still HUGE requirement to increase disk !!

Projects pretends they NEVER have enough cpu

BUT in reality ... too much CPU/RAM => Wasting is easier than Optimizing

Not even AWARE of consuming / wasting

# Splitting Storage / Compute

Solutions already existed, but historically not used in BigData Hadoop

Unix Network NFS



Disk SAN

Example: Databases  
For Oracle/PostgresQL/..

ObjectStorage  
(Appliance / API )

Example: Scality



Cloud Storage

Example:



Historically lot of  
confidentiality constraints

... NOW used

# Data Density



48 \* HDD disks in 2U blade



32 \* SSD (E.1 EDSFF) in 1U blade  
... 500 Tera / 1 Peta !! ... 200 000 euros



# Storage Price

1 Disk 4To = 100 euros  
x 10 ... 40To  
x 3 (replication) = 3000 euros  
+ Plug + Maintenance + ...

Appliance used ...  
License cost + Annual billing  
.. Cost re-dispatched internally  
= 17 000 euros for 40To/Year

Azure Cloud Storage  
« Pay as You Go »  
+ discount for reservations  
= 7000 euros for 40To/Year  
+ Costs per Read/Write Operations  
+ Network Bandwidth

## Seagate BarraCuda 4 To (ST4000DM004)

Disque dur 3.5" 4 To 5400 RPM 256 Mo Serial ATA 6 Gb/s (bulk)



★★★★★ 101 avis clients | 3 questions / réponses

Optez pour une grande capacité de stockage avec le disque dur Seagate BarraCuda 4 To. Cette gamme domine le marché en proposant les meilleures capacités pour les ordinateurs de bureau et périphériques mobiles. Ces disques conviennent parfaitement aux mises à niveau et à tous les budgets.

Capacité : 4000 Go

500 Go 1000 Go 2000 Go 3000 Go 4000 Go

Vitesse de rotation : 5400 RPM

5400 RPM 5900 RPM 7200 RPM

Taille du cache : 256 Mo

32 Mo 64 Mo 256 Mo

96€<sup>95</sup>

Quantité 1

AJOUTER AU PANIER

ACHETER CET ARTICLE

Être informé d'une baisse de prix

DISPO WEB : EN STOCK

DISPO BOUTIQUE : Dispo dans 47 boutiques



# Migration to Cloud

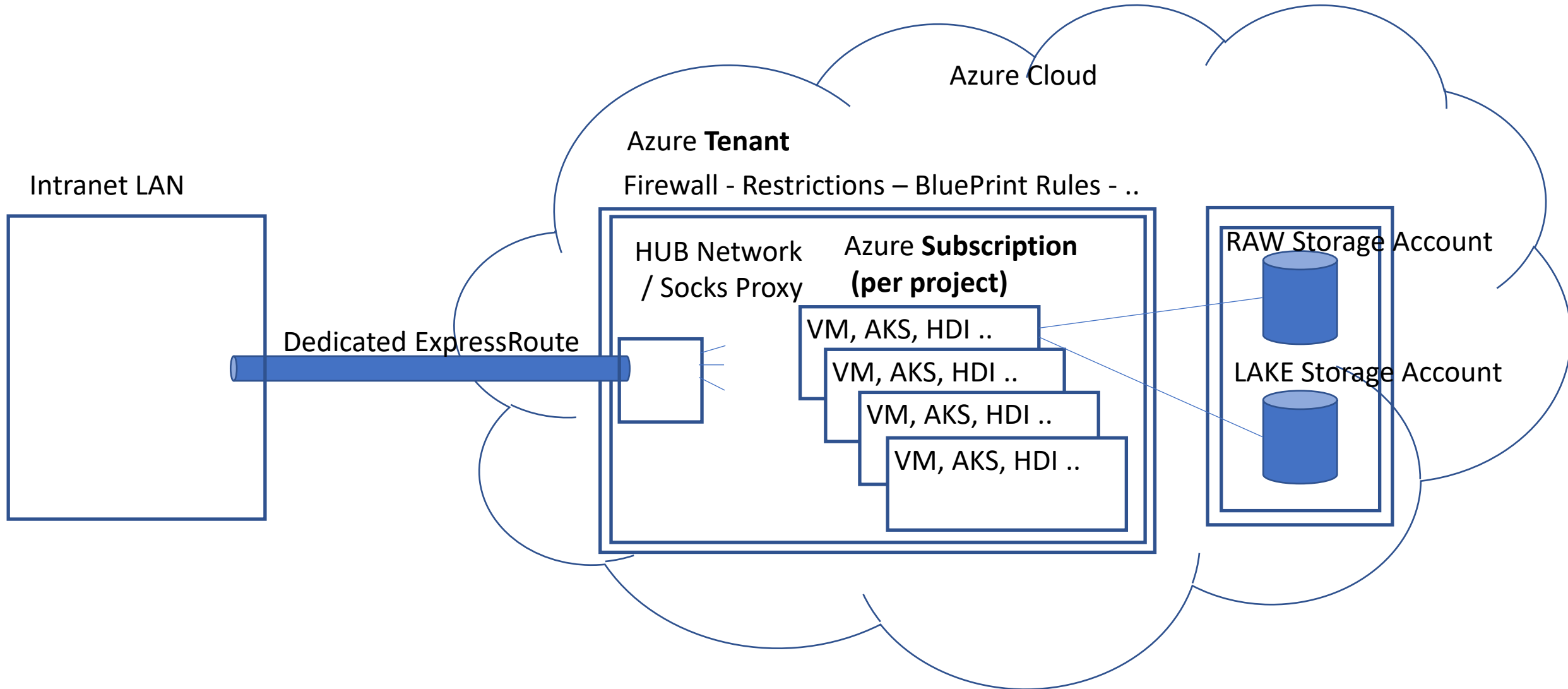
## Azure - AWS - Google

### Goals:

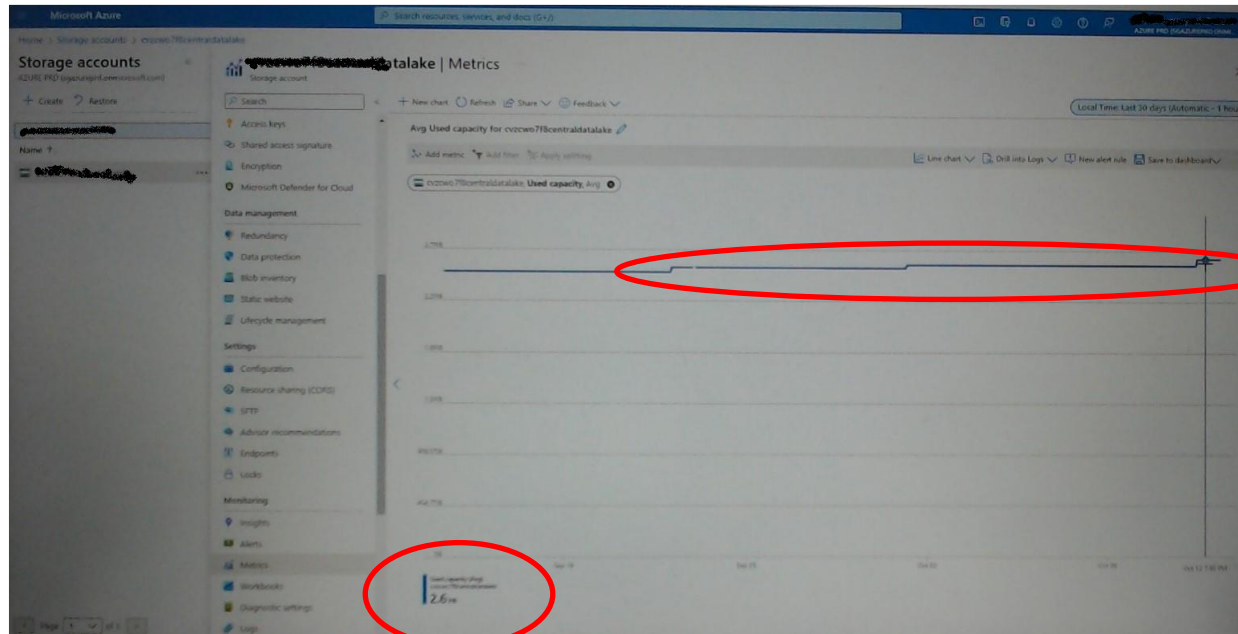
- Elasticity of Storage  
(No more fear of HDFS FileSystem Full)
- Elasticity of Compute  
(adapt CPU to workload... Pay only what you use)
- Clear visibility of cost per Projects / internal refacturation
- By-Pass internal IT department
- Easier (?) Self-Service API for Provisionning
- No More Multi-tenant (no risk of 1 project crashing/consuming whole cluster)

Since 2020 SGCIB is moving its Datalake to Azure

# Architecture of Datalake on Clouds



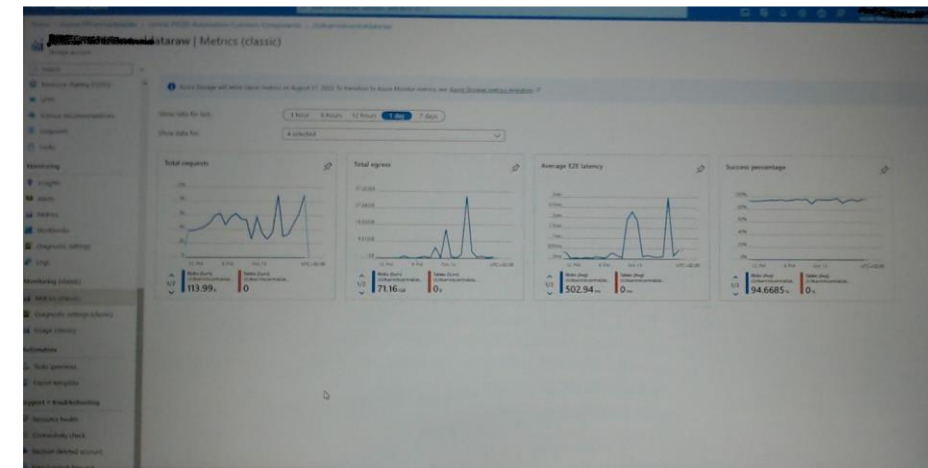
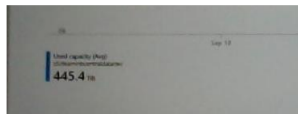
# Screenshot Azure Storage



increasing  
on last 30 days

2.6 Peta on LAKE ...

+ 400 Tera on RAW + APP + ...



# HDInsight ... = HDP (HortonWorks) on Azure

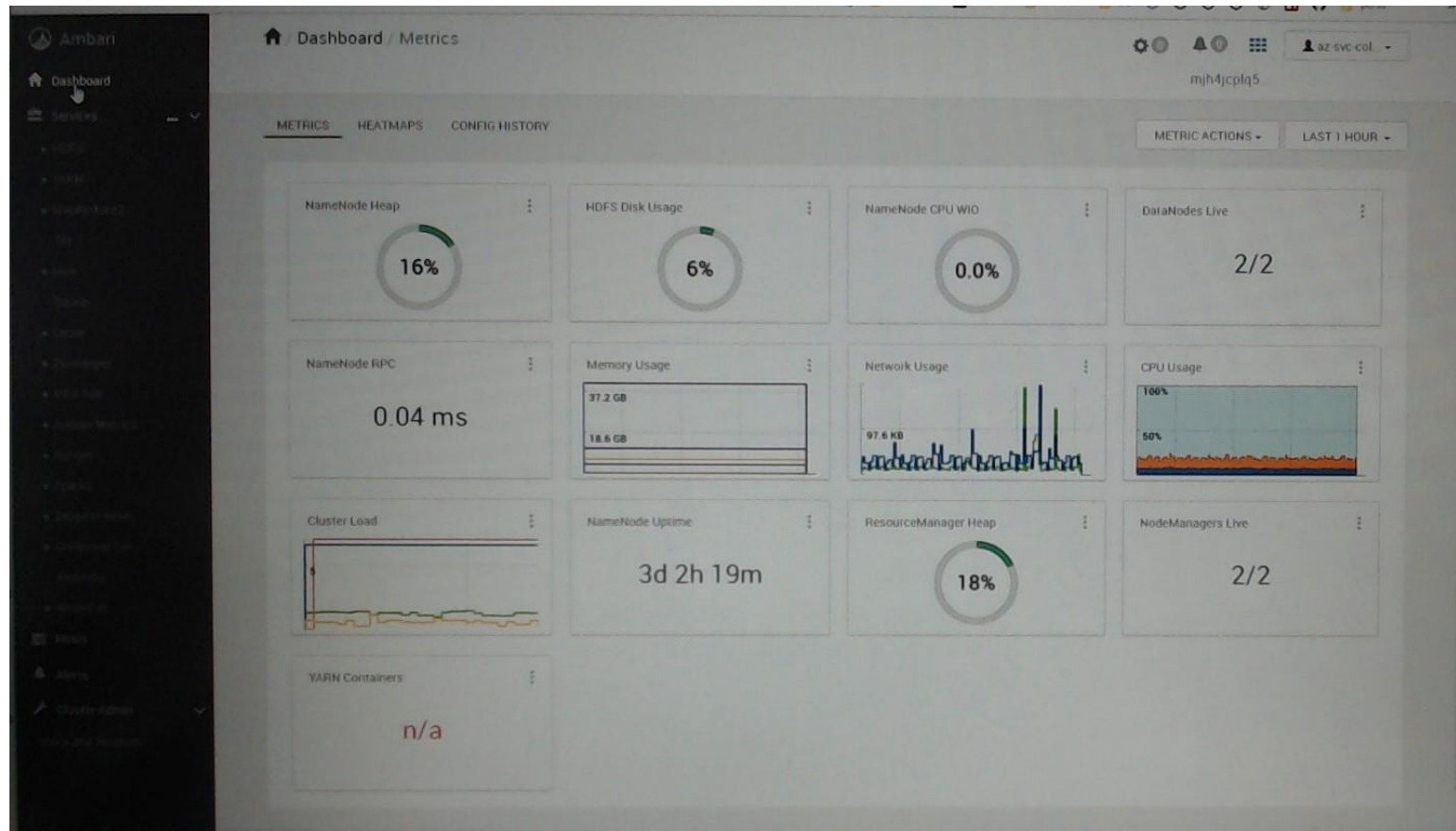


**Same HADOOP Ecosystem** : Ambari, Yarn, Oozie, Spark, Zeppelin, ...

Kerberos security... with Azure integration (Azure AD)

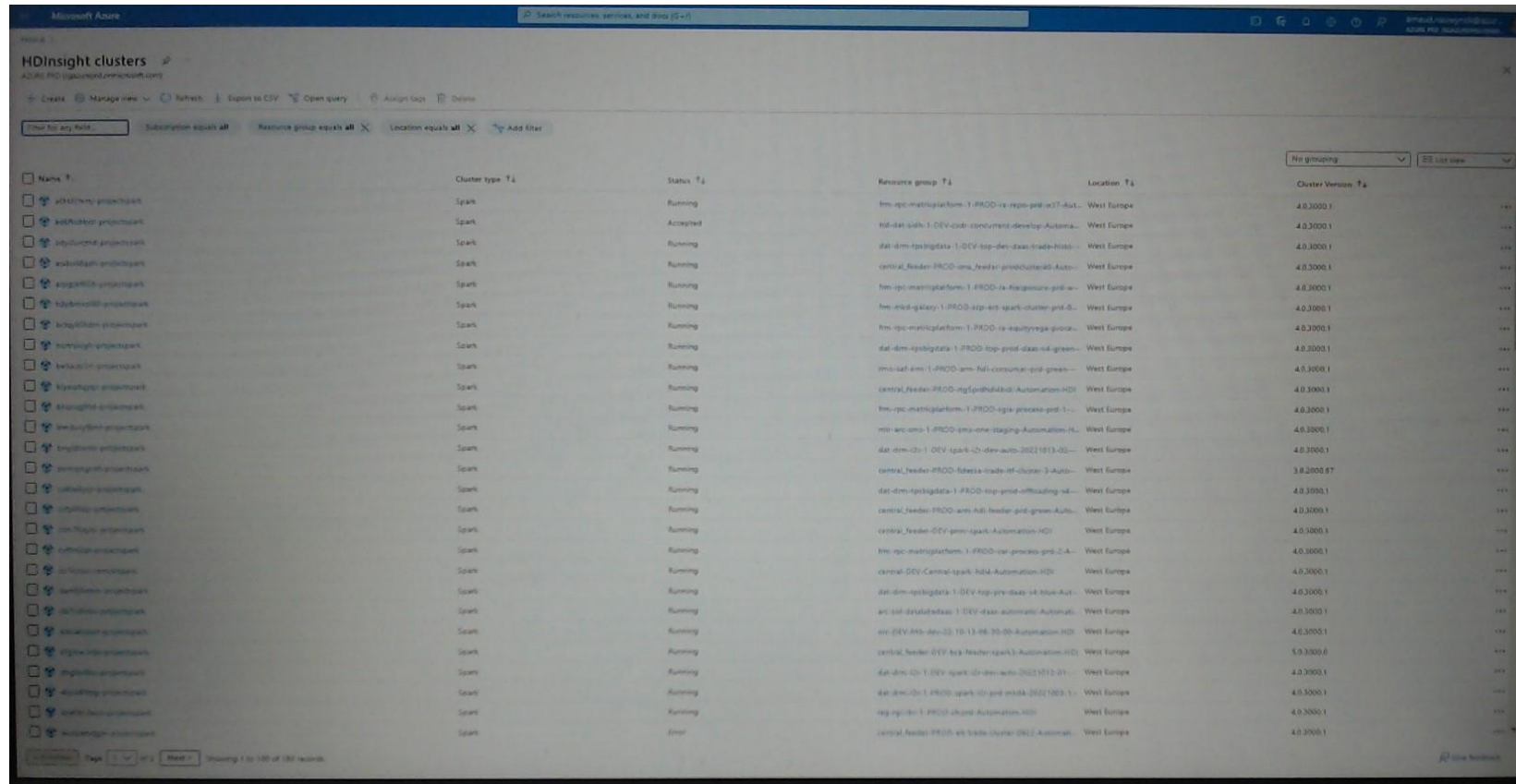
No More HDFS: No more NameNode maintenance / errors  
replaced by « Azure Storage »  
Elastic storage - but no more Ranger for permission

# Screenshot HDI Ambari ... ~Like OnPrem



# Screenshots

## .. Hundreds of HDI



Microsoft Azure

HDInsight clusters

ADAMS HD (gaumont.umc.micromed.com)

Create Manage view Refresh Export to CSV Open query Assign tags Delete

Filter for any field Subscription equals all Resource group equals all Location equals all Add filter

Name	Cluster type	Status	Resource group	Location	Cluster version
adams-hdi-prod-spark	Spark	Running	hms-ipc-multiplatform-1-PROD-va-regio-prod-w7-dut-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Accepted	ad-das-path-1-DEV-cidr-concurrent-develop-Automat-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	ad-dim-ipcbigdata-1-DEV-top-dev-das-trade-hubs-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	central-feeder-PROD-ams-feeder-prod-cluster-05-Auto-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	hms-ipc-multiplatform-1-PROD-va-figapocore-prod-w-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	hms-ipc-galaxy-1-PROD-azp-azp-spark-cluster-prod-6-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	hms-ipc-multiplatform-1-PROD-va-equityregio-prod-w-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	ad-dim-ipcbigdata-1-PROD-azp-prod-das-w4-green-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	hms-ipc-ams-1-PROD-ams-hdi-consumer-prod-green-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	central-feeder-PROD-mgtprodhub-Automation-HDI	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	hms-ipc-multiplatform-1-PROD-azp-prod-prod-1-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	hms-ipc-ams-1-PROD-ams-prod-staging-Automation-H-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	ad-dim-azp-1-DEV-spark-azp-dev-auto-20221013-02-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	central-feeder-PROD-fidex-trade-hd-cluster-3-Auto-	West Europe	3.0.2000.87
adams-hdi-prod-spark	Spark	Running	ad-dim-ipcbigdata-1-PROD-azp-prod-offloading-hd-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	central-feeder-PROD-ams-hdi-feeder-prod-green-Auto-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	central-feeder-DEV-prod-spark-Automation-HDI	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	hms-ipc-multiplatform-1-PROD-va-prod-prod-2-A-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	central-DEV-Central-spark-hdi-Automation-HDI	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	ad-dim-ipcbigdata-1-DEV-azp-prod-das-w4-blue-Aut-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	ad-dim-azp-1-DEV-azp-prod-das-w4-blue-Aut-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	hms-ipc-ams-1-PROD-ams-hdi-consumer-prod-green-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	central-feeder-DEV-azp-feeder-spark-Automation-HDI	West Europe	5.0.3000.6
adams-hdi-prod-spark	Spark	Running	ad-dim-azp-1-DEV-spark-azp-dev-auto-20221013-01-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	ad-dim-azp-1-PROD-spark-azp-prod-20221013-01-	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Running	reg-ipc-ams-1-PROD-azp-prod-Automation-HDI	West Europe	4.0.3000.1
adams-hdi-prod-spark	Spark	Error	central-feeder-PROD-ams-hdi-feeder-prod-green-Auto-	West Europe	4.0.3000.1

Showing 1 to 100 of 100 records

# BigData Engineering from OnPrem to Azure



Lot of User permissions/quota management  
Development of custom Yarn/Oozie/Ranger tools

1 Huge cluster, used as Multi-tenant (several users)

Used at 100%

Almost Disk-Full  
Many report on disk usage / data purges

Clear view of all Running workloads  
(1 Ambari screen)



Lot of Network & Security  
Development of Provisionning « sudo » tools

NO more multi-tenant system... but LOT of small clusters

Hundred of clusters, each used at 5% !!!  
COST COST COST  
Necessity to Optimize Performance  
( batches too long... 100x slower / too expensive)

No more Disk worry  
... data is growing (no more purges?)  
NO admin central view  
NO Orchestration of workloads



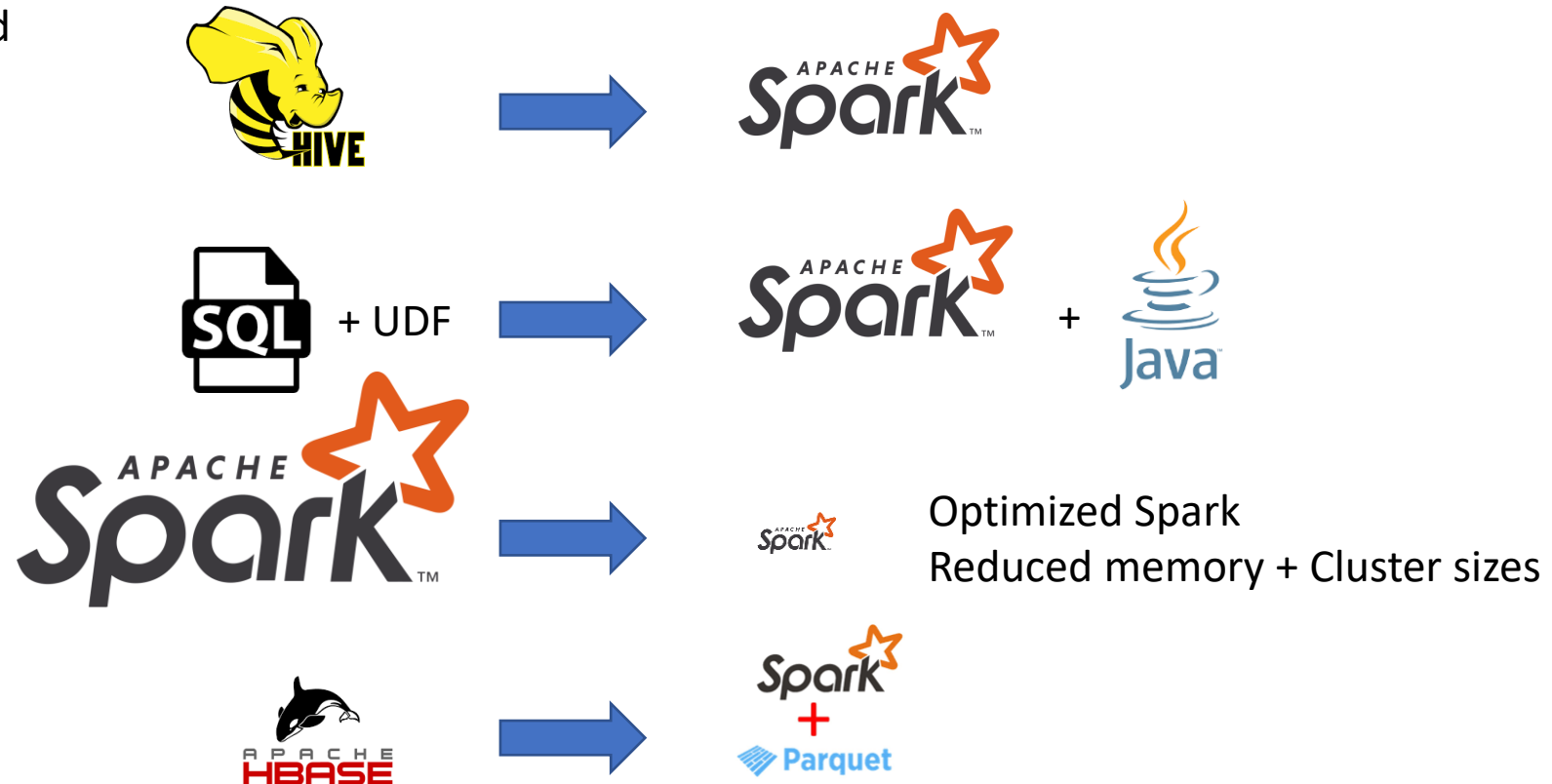
# What About Spark in Azure Migration?

COST COST COST

## Necessity to Optimize Performance

( batches too long... 100x slower / too expensive)

=> Many projects have  
migrated + optimized



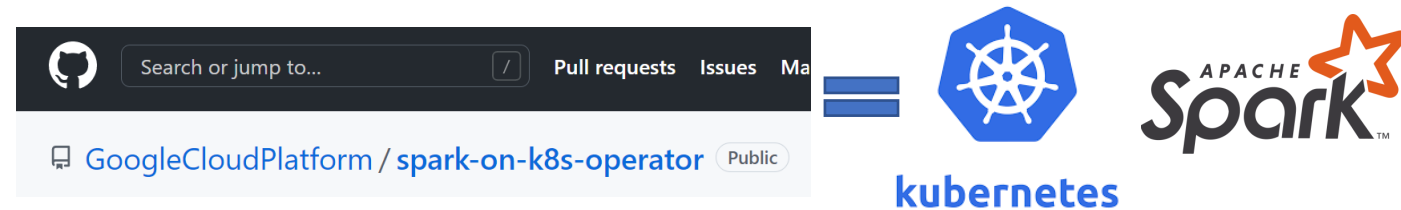
# Managed Spark ?

## Goals: Autoscaling / « serverless »

Managed by Azure :



Managed via Kubernetes



databricks



AWS : EMR

GCP : BigQuery

Questions?

# Take Away

What is BigData ?   Horizontal Scaling

compute: cluster with Tera of RAM used by Spark apps

storage: Petas of Files, in parquet

What is Spark ?

Simple unified Sql/Java engine

for distributed compute (Yarn/Kube)

distributed storage (HDFS/cloud)

What is Processing ?

mostly spark batches

Feeding RAW

Transforming RAW to LAKE

Consuming SQL analytics

Hadoop ecosystem is complex, Spark brings simplicity

Ecosystem is evolving (Cloud, Kubernetes)