VOLKSWAGEN

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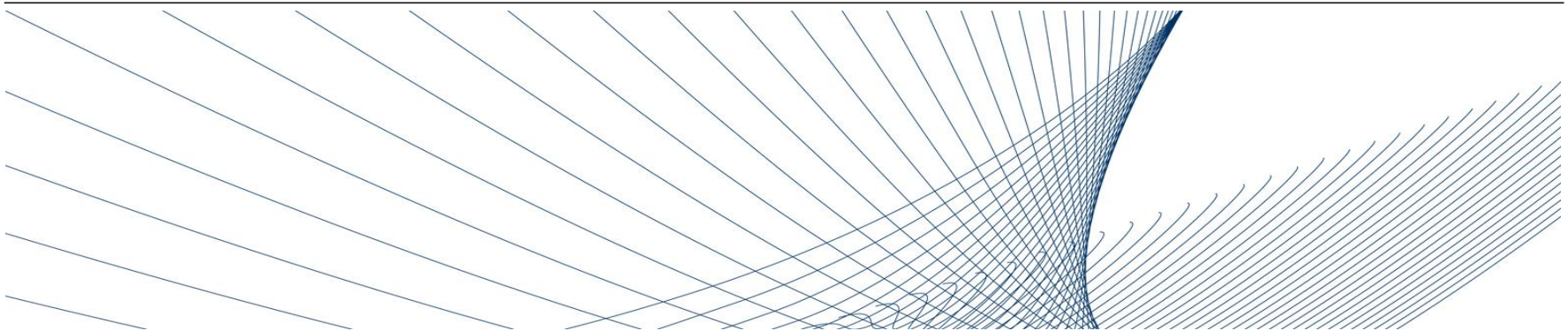


Large Scale Storage Monitoring at VW Group

Benjamin Tietz @ Check_MK Conference #5

leadIT

The Volkswagen Group — Facts and Figures (Dec. 2018)

Finance

Sales revenue: 235.8 billion €

Employees

> 664.000 incl. Joint Ventures

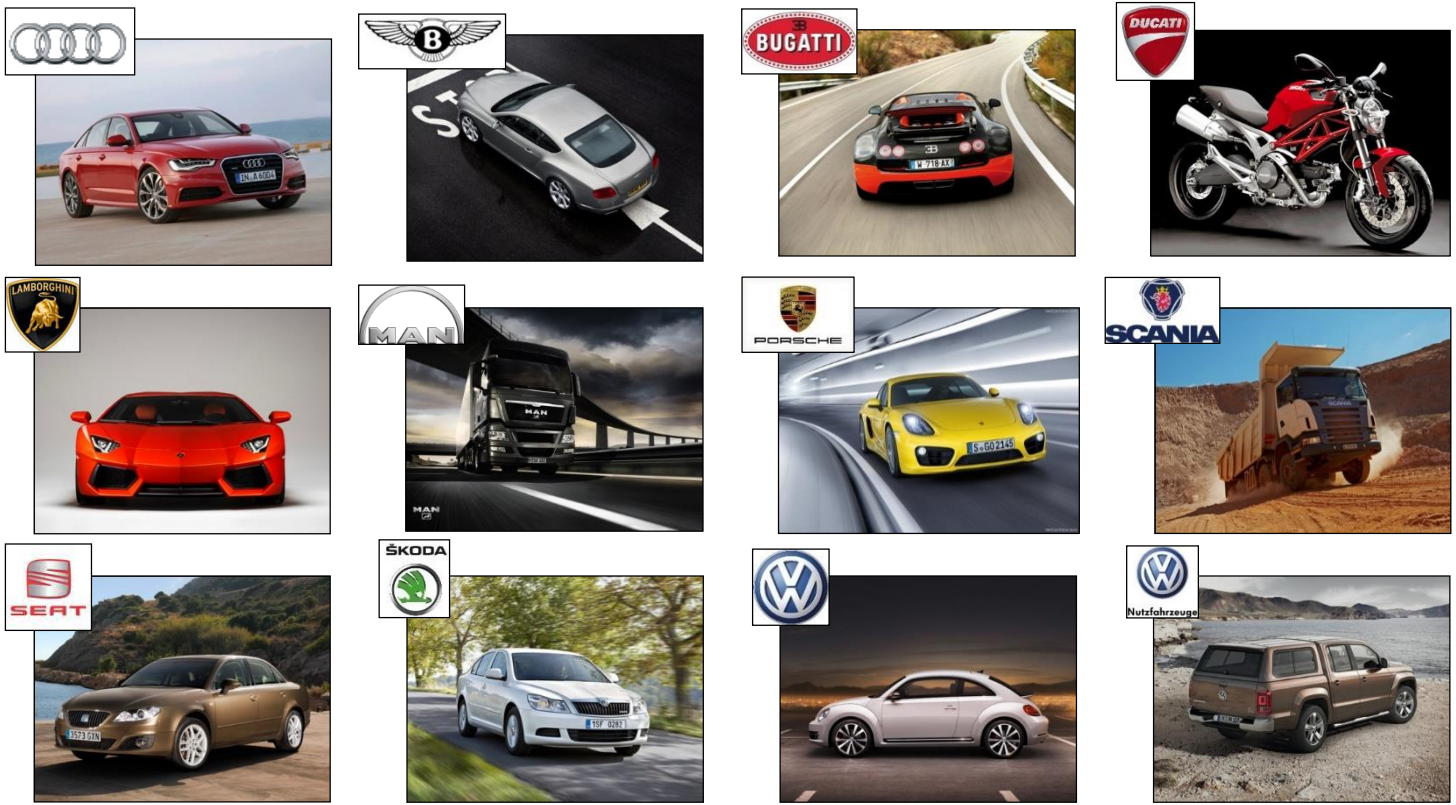
Production

11.018 million vehicles

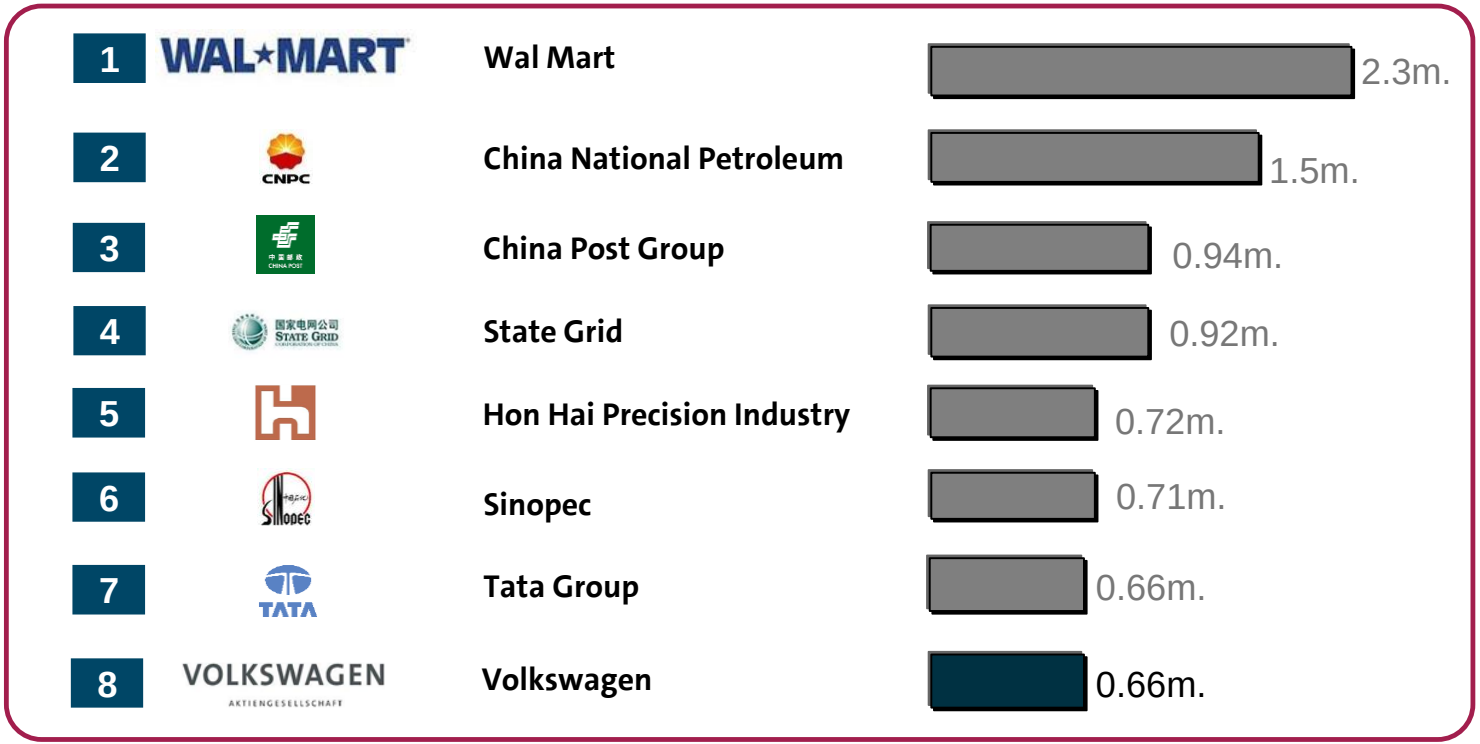
Production plants

120 worldwide

Model Diversity in the Volkswagen Group: 12 brands, >355 models



One of the World's Largest Companies by # of employees



Version: May 2018

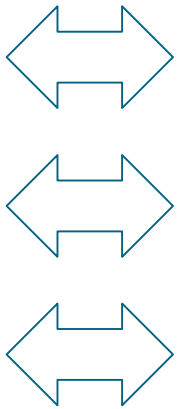
We are responsible for server-, storage-, backup-resources across the group

Central Organization

- Server-, storage-, backup-resources across group
  - Planning
  - Build
  - Operations

Me

- Storage Planning
- Monitoring Project Lead



Local Team

Local Team

Local Team

...etc.

Currently, VW group IT largely organized in local teams for each brand

Local Team

Local Team

PORSCHE

Local Team

ŠKODA

...etc.

SCANIA

SEAT

MAN

Joint Central Organization

- Server, Storage and Backup resources across the group
  - Planning
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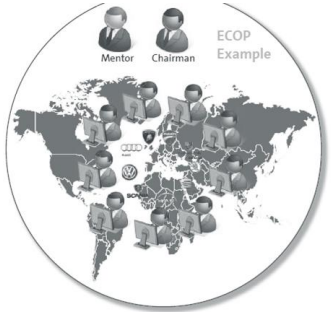
- NAS Storage Planning
- Monitoring Project Lead

Expert Communities of Practice



Transparency

Strategy & Roadmap

Service & Delivery Models

Technical decisions

Goal to jointly work together in centralizing resources and processes

Local Team

Local Team

PORSCHE

Local Team

ŠKODA

...etc.

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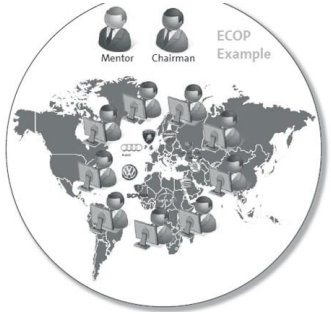

Transparency

Strategy & Roadmap

Service & Delivery Models

Technical decisions

Expert Communities of Practice (ECoP) as driver of group synergies

Local Team

Local Team

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...etc.

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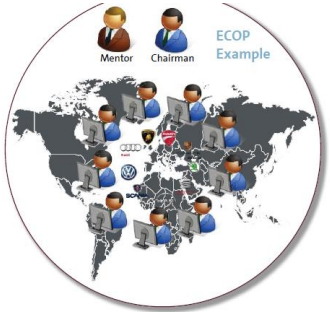
Expert Communities of Practice



Transparency

Strategy & Roadmap

Service & Delivery Models

Technical decisions

Storage Strategy developed by ECoP

Three Step Program

1. Support for the Group-wide standardization of storage environments based on global RfP

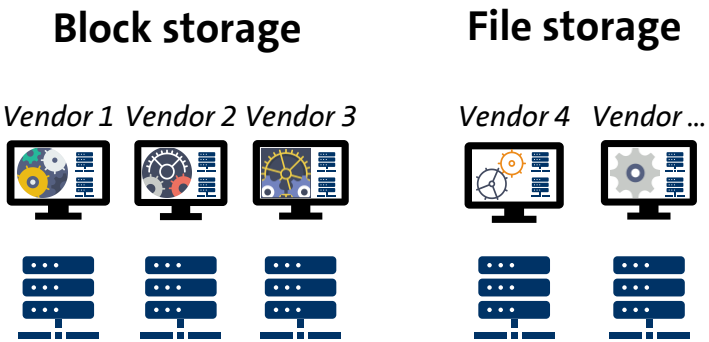
2. Harmonization of operating models including consideration for new operating models.

3. Support for the implementation of automation and self-services. Optimize the utilization of the storage systems.

Starting point Q1/18: Heterogenous storage landscape across group

Pain points across VW group

- No common system; different experiences between brands
- Heterogenous vendor landscape
- Some vendor tools are powerful – but require A LOT of effort
- Limited view across all storage of one category (e.g. block storage)
- Important KPIs missing (e.g. overprovisioning)



Decision to start Group-wide PoC with checkmk

Only one brand is satisfied with their solution...

PORSCHE

... which happens to be ...

checkmk

- Vendor-independent tool for file and block storage
- Beyond storage, used for overall IT infrastructure
- Easy to set up and maintain
- Can extend to provide missing features

- **Step towards standard KPIs across group → ultimately standardize build and run processes**

Two use cases : Capacity Mgmt. and Operations Performance Mgmt.

Capacity Management

Prediction:
Reaching limits?

Volume Planning:
How much to order?

Reporting:
Excel, please...!

Operations Performance Mgmt

Root cause analysis:
WTF is happening!?

Dashboarding:
Status & metrics

Offloading: Running full,
where to migrate data?

Overarching Goal

Speed & Efficiency:
Faster decisions, less time collecting data, more actionable insights

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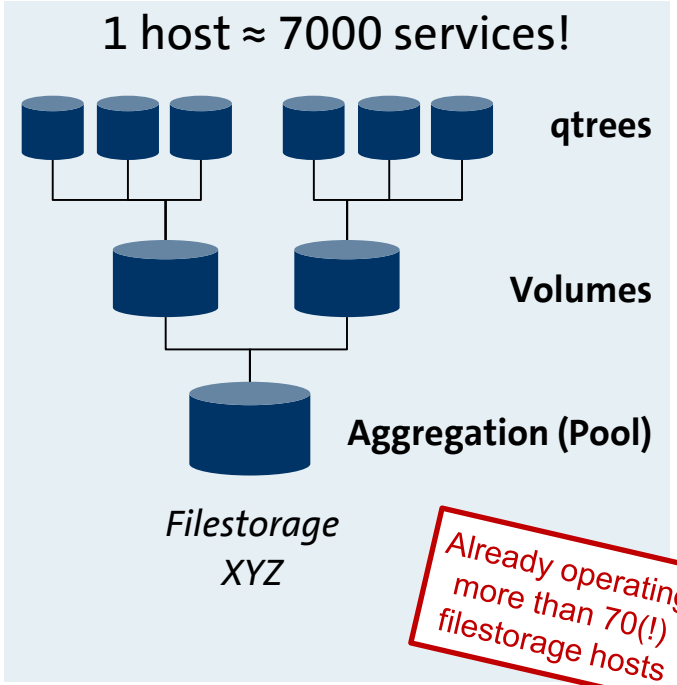
Example: ‚File Storage Capacity Mgmt.‘: Better understand complex hosts



1. New checks

Deduplication, Compression, Snapshots

Overprovisioning

Example ‚File Storage Capacity Mgmt.‘: Better understand complex hosts

OK	Node NODE01	OK - Location: Building 123 Rack 086, Uptime: 354 days, Version: NetApp Release XYZ, Serial no.: 1234567890
OK	Aggregation Provisioning AGGR1	OK - Provisioning: 23.49%, Aggregation total: 1.38 TB, Aggregation available: 1.04 TB, Volumes total: 332.50 GB, Volumes available: 33.17 GB
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OK	Volume VSERVER01.VOL06	OK - 1.66% used (21.72 GB of 1.28 TB), trend: +81.56 MB / 24 hours - time left until disk full: more than a year, inodes available: 21057k/99.09%, Saved with compression: 1001.03 MB, Saved with dedup: 17.70 GB, 21.42 GB used by 29 snapshots, Node: NODE01, VServer: VSERVER01, Aggregation: AGGR1

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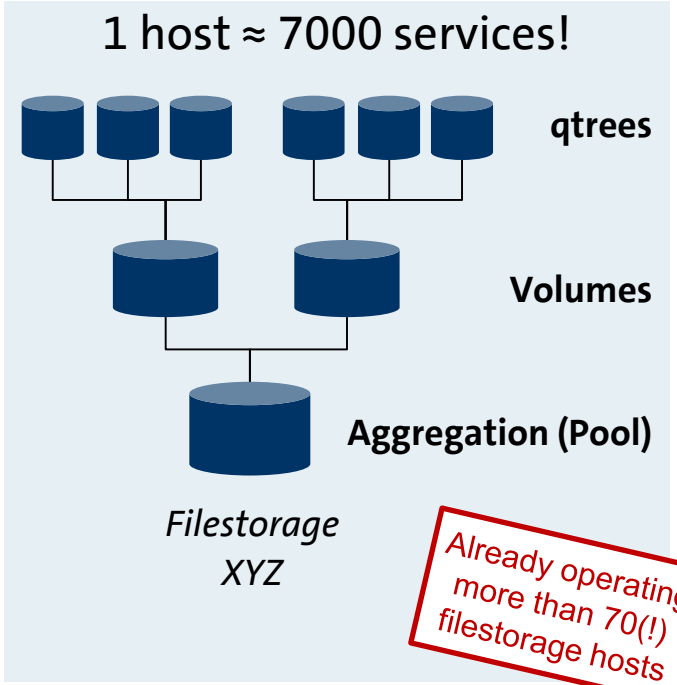


1. New checks

Deduplication, Compression, Snapshots

Overprovisioning

2. Service Relationships

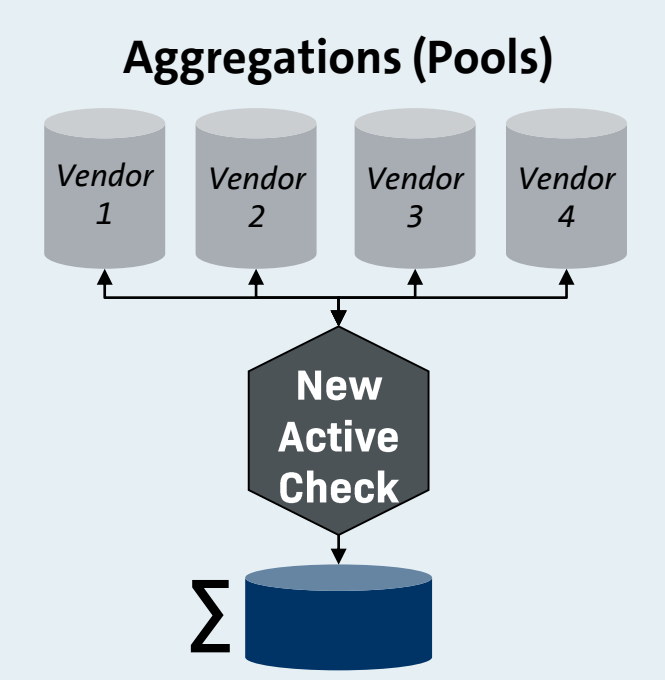
qtrees: On which volumes?

Which volume services are related to this aggregate?

Example ‚File Storage Capacity Mgmt.‘: Better understand complex hosts

OK	Aggregation AGGR1	OK - 24.9% used (352.00 GB of 1.38 TB), trend: -1.85 MB / 24 hours, [Show volumes]
▼ Qtrees Projektverzeichnisse (2)		
OK	Qtree QT1 cloned	OK - Soft quota: 1.00 MB, No hard quota, Used: 2.27 GB, Volume: VOL01, VServer: VSERVER01
OK	Qtree QT1-A-BCD	OK - No soft quota, 30.7% used (314.47 GB of 1.00 TB), trend: 0.00 B / 24 hours, Volume: VOL02, VServer: VSERVER04
OK	Volume VSERVER01.VOL06	OK - 1.66% used (21.72 GB of 1.28 TB), trend: +81.56 MB / 24 hours - time left until disk full: more than a year, inodes available: 21057k/99.09%, Saved with compression: 1001.03 MB, Saved with dedup: 17.70 GB, 21.42 GB used by 29 snapshots, Node: NODE01, VServer: VSERVER01, Aggregation: AGGR1

Example ‚File Storage Capacity Mgmt.‘: Understand the sum of all hosts at once!



➡ **Aggregation check**

Active Check **aggregates across all file systems**

- Summary clones
- Summary snapshots

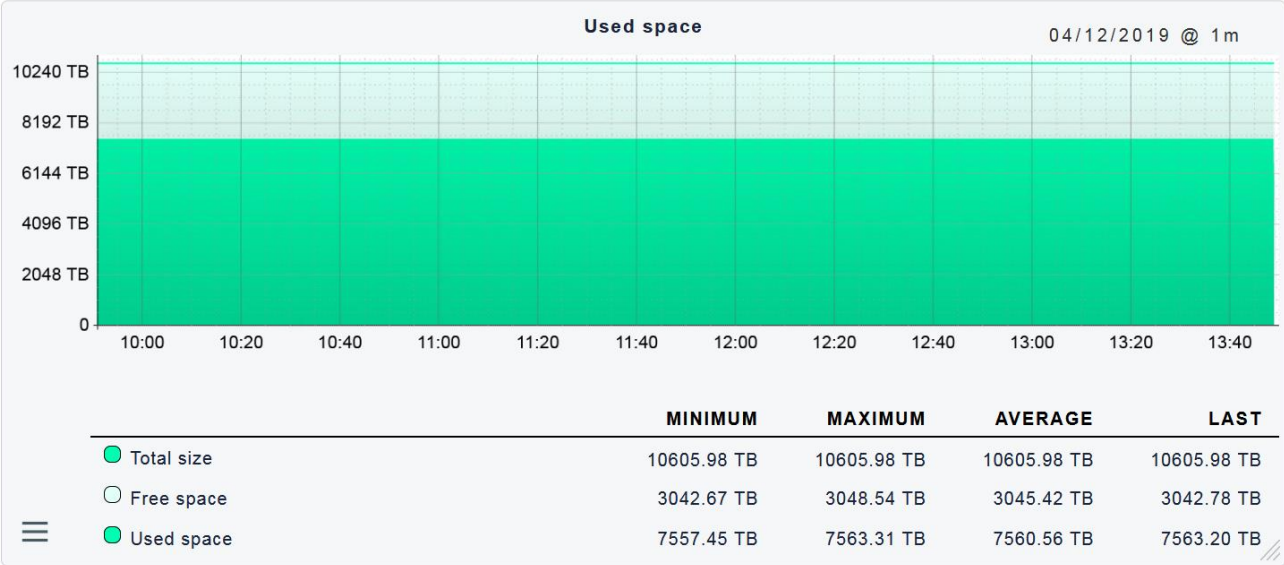
(could also be used for other systems e.g. CPU/ memory across ESXs)

➡ **Simple reporting**

CSV export to Excel – a planner‘s dream

Example ‚File Storage Capacity Mgmt.‘: Understand all hosts at once!

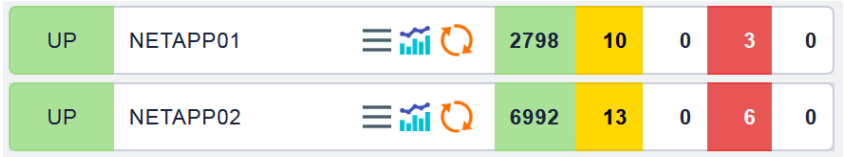
OK	Total Aggregates	OK - Total size: 10605.97 TB, Used space: 7563.21 TB

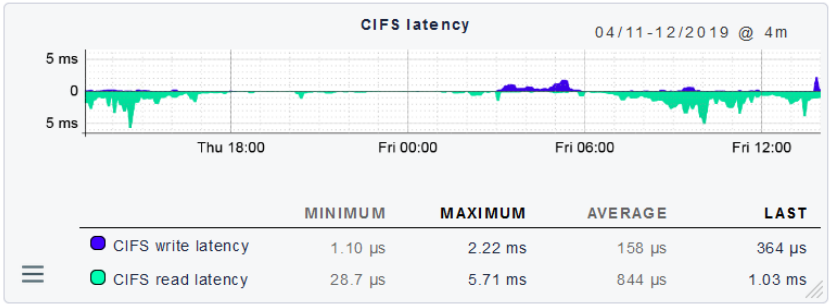


	MINIMUM	MAXIMUM	AVERAGE	LAST
Total size	10605.98 TB	10605.98 TB	10605.98 TB	10605.98 TB
Free space	3042.67 TB	3048.54 TB	3045.42 TB	3042.78 TB
Used space	7557.45 TB	7563.31 TB	7560.56 TB	7563.20 TB

Example ‚Operations Performance Mgmt.‘: Standard Monitoring Work

Possibilities today



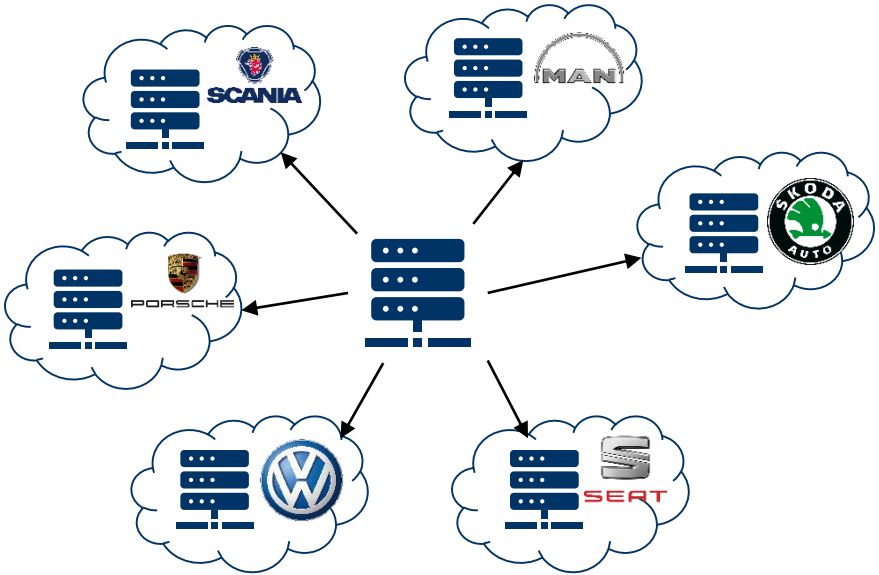


‚Classic‘ storage metrics: Bandwidth, IOPS, Read/Write latencies

Future improvements

- Differentiate check interval according to service type
  - Ops Data: slower
  - Performance Metrics: faster
- Build ‚real-time‘ checks to enable ‚one-click‘ real-time data

Global administration via a central master server and team – local sites

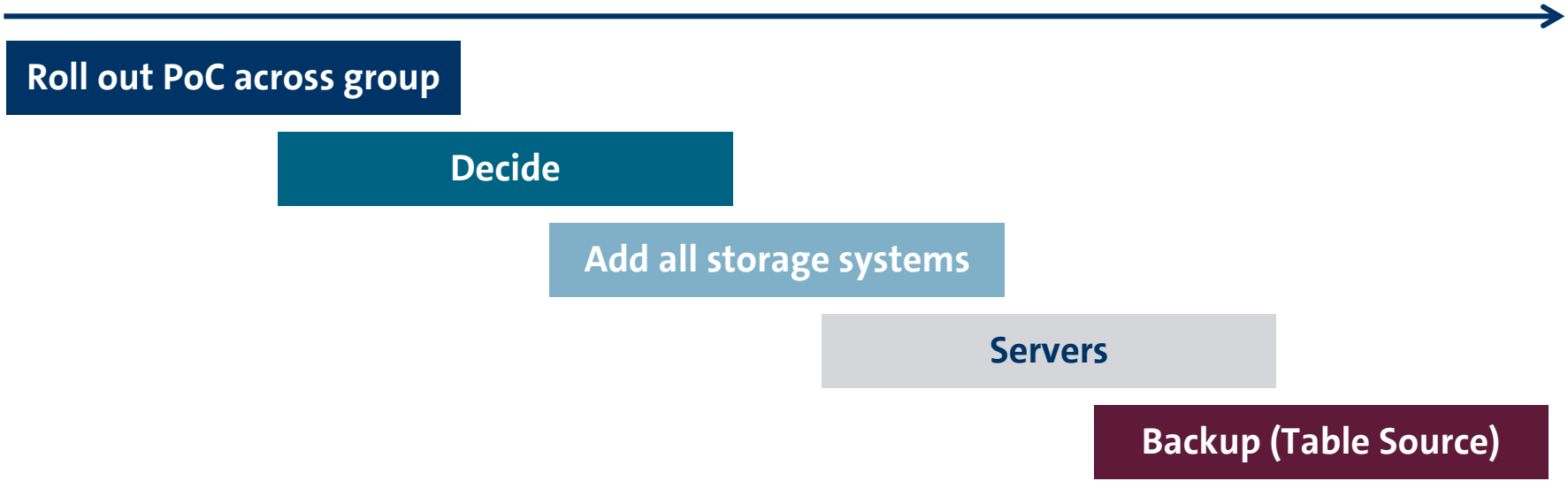


- Lean central team
- Central configuration for all brands
- Visibility of all data of all brands in master
- Every brand will have their own site
- Single visibility in the slave sites
- Connectivity of all servers necessary
- 1st / 2nd level support by Comnet

Planning a roll-out across one of the largest firms globally: Lessons learned on challenges

	Key Challenges	Lessons Learned
Technology	• Check_MK requires root access, which is a no-go at VW IT	• Get every unit virtual appliance to avoid root access problem
	• Ensure connectivity to master site in Wolfsburg through firewalls	• Patience... Plan with sufficient buffer
Project Management	• Convince multiple stakeholders in complex corporate environment	• Show that results justify initial extra work and cooperation
	• No direct governance over other units	• Provide as much support for other units as possible

Going forward: Our monitoring roadmap

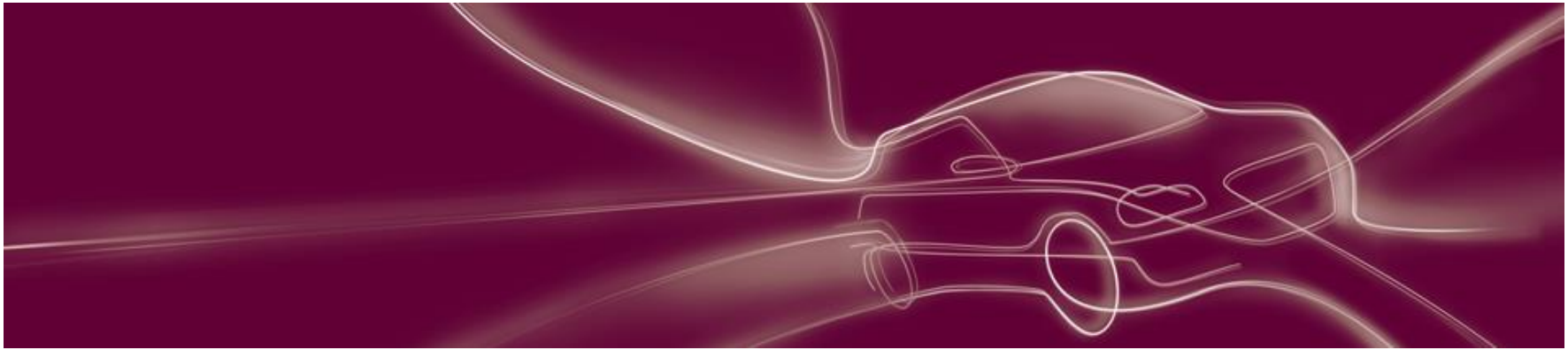


GitHub repositories:

- Performance Metric Aggregation: https://github.com/comnetgmbh/aggregate_perfdata
- Reporting CSV Export: https://github.com/comnetgmbh/csv_export_perfdata

VOLKSWAGEN

AKTIENGESELLSCHAFT



Thank you for your attention!