Large Scale Storage Monitoring at VW Group

Benjamin Tietz @ Check_MK Conference #5
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

1. Wal Mart - 2.3m.
2. China National Petroleum - 1.5m.
3. China Post Group - 0.94m.
4. State Grid - 0.92m.
5. Hon Hai Precision Industry - 0.72m.
6. Sinopec - 0.71m.
7. Tata Group - 0.66m.
8. Volkswagen - 0.66m.

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

Joint Central Organization
- Server, Storage and Backup resources across the group
  - Planning
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Me
- 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

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Expert Communities of Practice
- Transparency
- Strategy & Roadmap
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Expert Communities of Practice (ECoP) as driver of group synergies

Central Organization
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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...

... which happens to be ...

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

#### Capacity Management
- **Prediction:** Reaching limits?
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- **Reporting:** Excel, please...!

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

1 host $\approx 7000$ services!

- Volumes
- qtrees
- Aggregation (Pool)

1. New checks
- Deduplication,
- Compression,
- Snapshots
- Overprovisioning

Already operating more than 70(!) filestorage hosts
Example ‘File Storage Capacity Mgmt.’: Better understand complex hosts

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Better understand complex hosts

1 host ≈ 7000 services!

1. New checks
   - Deduplication,
   - Compression,
   - Snapshots
   - Overprovisioning

2. Service Relationships
   - qtrees: On which volumes?
   - Which volume services are related to this aggregate?

Filestorage XYZ

Already operating more than 70(!) filestorage hosts

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Example 'File Storage Capacity Mgmt.‘:
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<tr>
<td>OK</td>
<td>Aggregation AGGR1</td>
<td>OK - 24.9% used (352.00 GB of 1.38 TB), trend: -1.85 MB / 24 hours, [Show volumes]</td>
</tr>
<tr>
<td>OK</td>
<td>Qtree QT1 cloned</td>
<td>OK - Soft quota: 1.00 MB, No hard quota, Used: 2.27 GB, Volume: VOL01, VServer: VSERVER01</td>
</tr>
<tr>
<td>OK</td>
<td>Qtree QT1-A-BCD</td>
<td>OK - No soft quota, 30.7% used (314.47 GB of 1.00 TB), trend: 0.00 B / 24 hours, Volume: VOL02, VServer: VSERVER04</td>
</tr>
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Example 'File Storage Capacity Mgmt.‘: Understand the sum of all hosts at once!

**Aggregations (Pools)**

- **Vendor 1**
- **Vendor 2**
- **Vendor 3**
- **Vendor 4**

**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

**Used space**

![Graph showing used space for different time periods](image)

**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

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Example 'Operations Performance Mgmt.': Standard Monitoring Work

### Possibilities today

<table>
<thead>
<tr>
<th>Service</th>
<th>UP</th>
<th>NETAPP01</th>
<th>NETAPP02</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2798</td>
<td>6992</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
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### 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

'Classic' storage metrics: Bandwidth, IOPS, Read/Write latencies
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

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

- **Roll out PoC across group**
- **Decide**
- **Add all storage systems**
- **Servers**
- **Backup (Table Source)**
GitHub repositories:

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

Any Questions?
Thank you for your attention!