HPE Primera Storage
Mission-Critical neu definiert

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Intelligent Data Platform

App Workloads

Big Data / AI

Automation Connectors

Cloud Data Management

Global Intelligence Engine

Workload-Optimized Composable Systems

Any Cloud
Accelerate Apps Data Innovation
It’s impossible for IT to keep up

Complex Infrastructure  Constant Fire-Fighting  Fragmented Data Silos
Forced tradeoff between agility and resiliency

FAST & RELIABLE

High-End Storage

Public Cloud

AGILITY & SIMPLICITY
What if you could have both agility and resiliency for your mission critical apps?
HPE Primera Platform

On-Demand Experience

App-Aware Resiliency

Predictive Acceleration
Engineered to drive unique value in high-end storage

GLOBAL INTELLIGENCE
Powered with the most advanced AI for infrastructure

ALL-ACTIVE ARCHITECTURE
Multi-node architecture for higher resiliency and limitless parallelization

SERVICES-CENTRIC OS
An OS that eliminates risk and simplifies management

TIMELESS STORAGE
A new ownership experience that keeps getting better
HPE InfoSight Everywhere

Cloud

Data Center

Embedded

Global Learning To Real-time Analytics
Reactive, inefficient IT

1. Reacting to unexpected problems
2. Countless hours pouring over logs and files
3. Vendor support adds to frustration

Business risk

1. Delays, disruption to applications
2. Complexity of operations
3. Human error

Al-Driven operations are required to extract value from data across the infrastructure
“Predictive” vereinfacht den Betrieb von Storage radikal

Cloud-basierte Predictive Analytics

Vielfältige Sensoren
Globale Korrelation
Maschinelles Lernen
Globales Lernen

Cross-Stack Telemetrie

Millionen von Sensordaten werden permanent im kompletten Infrastruktur-Stack gesammelt und ausgewertet
HPE Primera App-aware Resiliency
See once, prevent for all

1. Data analysis
2. Case creation
3. Root cause analysis
4. Problem resolution
5. Install base prevention

Install base

Deep Sensors
Global Correlation
Machine Learning

HPE InfoSight

Host, VM, network
Interop
Config
Storage
Outside best practices
Messbare Ergebnisse aus InfoSight

Die Vorteile radikaler Vereinfachung sind klar und messbar

Vorhersehbar und Vermeidung von Problemen

- 93% der Cases automatisch eröffnet

Schnelle Reaktionszeiten

- 86% der Cases automatisch gelöst

Zuverlässiger und schneller Support

- 54% der Cases außerhalb des Storage-Silos gelöst
### Primera – Systems View

#### Overview of selected systems

<table>
<thead>
<tr>
<th>WellScore</th>
<th>Company Name</th>
<th>Model</th>
<th>Serial Number</th>
<th>Version</th>
<th>Patches</th>
<th>System Status</th>
<th>Raw Size</th>
<th>Usable Space</th>
<th>Subscription Capability</th>
<th>Last Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1212</td>
<td></td>
<td>C630</td>
<td>04.0.120-201909</td>
<td></td>
<td></td>
<td></td>
<td>22.6 TiB</td>
<td>19.7 TiB</td>
<td>Not Capable</td>
<td>a month ago (US/CA)</td>
</tr>
<tr>
<td>7par</td>
<td></td>
<td>C650</td>
<td>04.0.120-201909</td>
<td></td>
<td></td>
<td></td>
<td>5.6 TiB</td>
<td>97.0 TiB</td>
<td>Not Capable</td>
<td>3 months ago (US/CA)</td>
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<tr>
<td></td>
<td></td>
<td>C670</td>
<td>04.0.131-002109</td>
<td></td>
<td></td>
<td></td>
<td>125.7 TiB</td>
<td>115.6 TiB</td>
<td>Not Capable</td>
<td>16 days ago (US/CA)</td>
</tr>
<tr>
<td>1213</td>
<td></td>
<td>C650</td>
<td>04.0.131-002109</td>
<td></td>
<td></td>
<td></td>
<td>125.7 TiB</td>
<td>112.9 TiB</td>
<td>Not Capable</td>
<td>21 days ago (US/CA)</td>
</tr>
<tr>
<td>1214</td>
<td></td>
<td>C650</td>
<td>04.0.131-002109</td>
<td></td>
<td></td>
<td></td>
<td>3.8 TiB</td>
<td>3.6 TiB</td>
<td>Not Capable</td>
<td>20 days ago (US/CA)</td>
</tr>
<tr>
<td>1215</td>
<td></td>
<td>C650</td>
<td>04.0.131-002109</td>
<td></td>
<td></td>
<td></td>
<td>27.9 TiB</td>
<td>20.3 TiB</td>
<td>Not Capable</td>
<td>21 days ago (US/CA)</td>
</tr>
<tr>
<td>1216</td>
<td></td>
<td>C650</td>
<td>04.0.131-002109</td>
<td></td>
<td></td>
<td></td>
<td>17.4 TiB</td>
<td>17.4 TiB</td>
<td>Not Capable</td>
<td>20 days ago (US/CA)</td>
</tr>
<tr>
<td>1217</td>
<td></td>
<td>C650</td>
<td>04.0.131-002109</td>
<td></td>
<td></td>
<td></td>
<td>5.3 TiB</td>
<td>5.3 TiB</td>
<td>Not Capable</td>
<td>29 days ago (US/CA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C650</td>
<td>04.0.131-002109</td>
<td></td>
<td></td>
<td></td>
<td>17.3 TiB</td>
<td>17.3 TiB</td>
<td>Not Capable</td>
<td>19 days ago (US/CA)</td>
</tr>
<tr>
<td>1218</td>
<td></td>
<td>C650</td>
<td>04.0.131-002109</td>
<td></td>
<td></td>
<td></td>
<td>3.3 TiB</td>
<td>3.3 TiB</td>
<td>Not Capable</td>
<td>24 days ago (US/CA)</td>
</tr>
</tbody>
</table>

**Note:** Only infrastructure metadata is transmitted and captured by HPE InfoSight. Access is restricted to qualified HPE personnel and registered customers for their systems.
HPE Infosight Value
Sees and predicts behind the scene

Customer Portal

AI for Infrastructure
- Storage
- Servers
- Networking
- Converged

- Advanced virtualizations
- Dashboards
- Blacklisting
- Machine learning
- Global learning
- Case automation
- Cloud-based analytics
- Pre-emptive recommendations
Der KI-basierte Ansatz zum managen Ihrer Infrastruktur

Verbesserung der Performance
Proaktiv

Beispiel:
Nutzung von QoS auf
vol1 zur Verbesserung
der Performance von
vol2

Optimierung
Vorhandener Ressourcen

Beispiel:
Verschiebe VM3 auf
Host2 da Host1
überlastet ist

Einfach
Infrastruktur Planung

Beispiel:
Die vorhandene
Kapazität wird am 15
Juli aufgebraucht sein

IT Infrastruktur Management ohne Rätselräten
Empfehlungen der KI

Analysis Results

System Status
The storage system is experiencing elevated random read and sequential read latency. Performance was analyzed between 2018-02-07 and 2018-02-14.

1st Priority Issue

2nd Priority Issue

Diagnosis
SSD bandwidth saturation is affecting random read performance.

How to Take Action

Recommendations
- Consider QoS limits on high SSD bandwidth volumes.
- Consider staggering workloads on high SSD bandwidth volumes.
- Increase system SSD bandwidth by adding SSDs.

Volume Details
The volumes below are ranked by the SSD bandwidth they consume during periods when latency is elevated. Those periods are highlighted in the charts on the left.

<table>
<thead>
<tr>
<th>Volume</th>
<th>SSD Bandwidth (%)</th>
<th>IOPS (Avg)</th>
<th>MBPS (Avg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nimble-CS-DevSQLServers</td>
<td>21.2</td>
<td>677.6</td>
<td>60.3</td>
</tr>
<tr>
<td>Nimble-CS-Servers03</td>
<td>14.7</td>
<td>753.6</td>
<td>49.1</td>
</tr>
</tbody>
</table>
Look beyond your storage infrastructure to gain the deepest insights

- Noisy Neighbor
- Host & Memory Analytics
- Latency Attribution
- Inactive VMs
- Top Performing VMs

HPE Primera App-aware Resiliency

See issues beyond storage
Cross-Stack-Analyse z.B. der Latenzen und ihrer Herkunft

VM SUMMARY

- CPU COUNT: 4
- MEMORY: 32.9 GB

CAPACITY

- USAGE: 232.6 GB
- ALLOCATED: 200.0 GB
- AVG IOPS: 0.01
- AVG LATENCY: 1.52 ms
- MAX LATENCY: 6.00 ms

Performance

Time Range: 20/02/2018 16:59 GMT to 27/02/2018 16:59 GMT

Latency

- Total Latency: 3.5 ms
- Host: 3.5 ms
- Network: 0 ms
- Storage: 0 ms

Average Host
0.33 ms

Average Network
0 ms

Average Storage
0 ms

Average Read
0 ms

Average Write
0.9 ms
Example of how machine learning has helped HPE customers

<table>
<thead>
<tr>
<th></th>
<th>Prediction</th>
<th>Diagnostics</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Data availability impact due to obscure memory leak</td>
<td>Signature matching memory allocation sensors forecasted over time, correlated across the installed base</td>
<td>45 Customers received an automatic case sent to apply non-disruptive update to avoid impact</td>
</tr>
</tbody>
</table>
Engineered to drive unique value in high-end storage

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**TIMELESS STORAGE**
A new ownership experience that keeps getting better
HPE Primera architecture is built for the NVMe era
Architecture has never been so important

Current ASIC architecture

Control Cache

Data Cache

Other Nodes

HPE Primera architecture

Unified cache

New ASIC

Unified cache
CPU and memory can evolve independently from the ASIC

Simpler node design
Fewer memory DIMMs, more space, better board density

Modular ASIC architecture
More parallelization and design flexibility
All-active symmetric architecture

Active/Active host connections
All host ports active for all volumes with no reliance on MPIO DSM or proprietary drivers and plugins

Active/Active controller architecture
All compute resources are evenly balanced for optimal performance with zero tuning required

Active/Active media access
All drives active for all volumes to drive performance and improve efficiency
HPE Primera Family

Three models to redefine Mission Critical

HPE Primera 630
2 Nodes and 24 drives in 2U
8 NVMe/SAS slots

HPE Primera 650
4 Nodes and 48 drives in 4U
16 NVMe/SAS slots

HPE Primera 670
4 Nodes and 48 drives in 4U
16 NVMe/SAS slots

Each model available as “all-flash” (A600) or “converged flash” (C600)
HPE Primera Performance

75,000 IOPs
HPE Primera 630
79% better than a 8200

235,000 IOPs
HPE Primera 650 4N
61% better than a 8450 4N

300,000 IOPs
HPE Primera 670 4N
20% better than a 9450 4N

Performance numbers are for DECO, RAID6, 16K 60/40 RW, node-distributed
The architecture is key

HPE Primera 2N vs. 8200

- Cores: 67%
- KIOps: 79%
- GB/s: 89%

KIOps based on DECO, RAID6, 16K 60/40, node-distributed
GB/s based on DECO, RAID6, 256KiB Sequential Reads
The architecture is key

KIOps

- Next Gen 4N: 300
- 20850 6N: 298
- 9450 4N: 249
- 20450 4N: 180

KIOps based on DECO, RAID6, 16K 60/40, node-distributed
SERVICES-CENTRIC OS AND FEATURES
PRIMERA STORAGE (R)EVOLUTION

Moving from the past to the future

**GEN 2**
E-Class
F-Class

**GEN 3**
F-Class
T-Class

**GEN 4**
7000
10000

**GEN 5**
8000
9000
20000

**GEN 6**
Primera

Hewlett Packard Enterprise
**Moving beyond monolithic**

**Monolithic**
- Complex, tightly coupled
- Upgrades can be complex
- Forklift for new features
- Slow release cycles

**Services-centric**
- Independent data services
- Updates without reboots
- Investment protection
- Faster access to innovation
ALL-INCLUSIVE LICENSING

ENCRYPTION WILL STILL BE A SEPARATE SKU
Summary

- On-node management
- Enhanced data protection
- Automated provisioning
- Self-serviceability
- Faster, less disruptive updates
- Data in place upgrades
Systems automatically create one CPG per tier out of the box, defining set size and other characteristics to suit the system.

For set size, the following rules are used:

- RAID 6 -> HA Cage -> Set size 12
- Set size 10
- Set size 8
- Set size 6
- HA Mag -> Set size 12
- Set size 10
- Set size 8

The same rules are now used during the creation of additional CPGs, with all RAID characteristics defined by the system.

CPGs can now be created by simply selecting a drive tier and name!
**PRIMERA STORAGE FEATURES**

**Understanding provisioning**

**RAID 6 ONLY**
RAID 6 offers the best level of protection for all workloads while maintaining a great capacity/performance balance.

**NO RAID 5**
RAID 5 offers low protection levels, especially with large drives (like SSDs and NL).

**NO RAID 1**
RAID 1 doesn't offer higher protection than RAID; multiple drive failures still result in unrecoverable data loss.

Enabled by default **DATA PROTECTION**

There are no commands to enable these options.

**WE ARE NOT IN THE BUSINESS OF DATA LOSS!**

Having a single RAID level makes sizing easier, makes arrays more predictable and allows us to focus on optimizing for one RAID level.
Understanding provisioning

**DATA REDUCTION**

Data Reduction (DECO) volumes have both dedup and compression enabled. They offer the best cost, sacrificing performance.

**THIN PROVISIONED**

TPVV (thin volumes) have both dedup and compression disabled. They offer the best performance, sacrificing cost.

Dedup and compression are enabled together rather than separately. This enables easier sizing and deployment for customers. Selection is per volume.
Replication options in 4.0

- **Secure Quorum Witness**
- **Peer Persistence (Windows / VMware)**
  - HPE Primera
  - **Sync**: IP replication (built-in 10GbE)
  - **Periodic Async**
  - HPE Primera

**Synchronous**
- Zero RPO
- RTT Latency < 5ms

**Periodic Sync**
- 5+ Min Interval
- RTT Latency < 5s
Replication options in 4.0

- **Peer Persistence** (Windows / VMware)
  - HPE Primera
  - 3PAR StoreServ
  - IP replication (built-in 10GbE)
  - Periodic Async

- **Synchronous**
  - Zero RPO
  - RTT Latency < 5ms

- **Periodic Sync**
  - 5+ min interval
  - RTT Latency < 5s

Secure Quorum Witness
Think ‘IP first’ for replication

8K RANDOM WRITE

<table>
<thead>
<tr>
<th>IP REPLICATION IS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5x MORE CPU EFFICIENT</td>
</tr>
<tr>
<td>AND</td>
</tr>
<tr>
<td>2x MORE PORT EFFICIENT</td>
</tr>
</tbody>
</table>

- 2 RCFC per Node
- 1 RCIP per Node
App-aware data protection extended to the cloud

Primera Storage  RMC  StoreOnce  Cloud Bank Storage

23x Faster backup\(^3\)
15x Faster restore\(^3\)

Automated self-service with intelligent, policy-based copy automation
Flash speed with minimal app impact
Eliminates cost and complexity of traditional backup
Simple cloud backup for long term retention, archive and DR

1 RMC 6.2 will be available from August 2019
2 RMC 6.2 will be available as standard with every 3PAR & Nimble system as part of the array all-inclusive license
3 For VMware environments compared to traditional backup environments

HPE & Partner Confidential
USER EXPERIENCE
HPE Primera On-demand Experience
Radically simple all of the time

- **Automated setup** with streamlined workflows
- **No separate tools** needed with built-in management
- **No tuning** with all-active, always-on data reduction and RAID6
- **Prescriptive OS updates** transparent to applications
- **API-driven** for infrastructure as code

**up to 93%**
reduction in time spent to deploy, manage, and scale storage

1. Based on HPE internal testing of a leading Tier-1 storage system versus HPE Primera
What makes it so special?

- **FAST**
- **SIMPLE**
- **TOOL-FREE**
ON-ARRAY MANAGEMENT

RADICAL SIMPLICITY

DASHBOARD

VOLUMES

SYSTEM
LET'S TALK ABOUT

UPDATING THE OS
LET'S TALK ABOUT

UPDATING THE OS
LET'S TALK ABOUT

UPDATING THE OS
LET'S TALK ABOUT
UPDATING THE OS
PRIMERA STORAGE MANAGEMENT
Unique in the high-end space

20m
PLUG-IN TO PROVISION

ZERO
INFRASTRUCTURE NEEDS

NO
SPECIALIZED CABLES
### Timeless Storage for HPE Primera

**HPE Technology Refresh Service**

- Optional service added to existing support levels
- Receive tech refresh* every 3 years at no additional cost
- Pricing never goes up, no matter how many times you refresh your storage

### Contract duration

- 3-year up-front commitment and 3 year renewal

### Eligible support levels

- Proactive Care
- Proactive Care Advanced
- Datacenter Care

### Customer options

- Early exercise (after 12 months)
- Alternate hardware (customer pays difference)
- Media trade-in credits of up to 85%**

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* Includes new controller nodes and any additional hardware necessary, such as a new base enclosure and adapters.

** With NVMe Assurance option. Rules and restrictions apply.
Serviceability (CSx)

Customer Self Install (CSI)

HPE Primera is **optional CSI**

<table>
<thead>
<tr>
<th>Model</th>
<th>CTO</th>
<th>BTO / sCTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPE Primera 630</td>
<td>Single rack</td>
<td>All configurations</td>
</tr>
<tr>
<td>HPE Primera 650</td>
<td>Single rack</td>
<td>Max 7 drive enclosures, no SAS HBA</td>
</tr>
<tr>
<td>HPE Primera 670</td>
<td>Single rack</td>
<td>Max 14 drive enclosures, no SAS HBA</td>
</tr>
</tbody>
</table>

Customer Self Repair (CSR)

Most components are **CSR** *(all except the chassis midplane)*

- Nodes
- Adapters / SFPs
- PCBM
- Drives
- Drive Enclosures
- I/O Module
- Cables

Customer Self Upgrade (CSU-HW)

Most components are **optional CSU**

- Nodes, host adapters, SFPs, drives, I/O Module

* HPE Primera has 3-years parts only warranty *(7 years for SSDs)*
Data-in-Place Upgrade (DIPU)

Scenario 1
(2N in 2U)

HPE Primera 630 in 2U -> HPE Primera 650/670 in 2U
Controller Conversion
Not possible to upgrade to 4N

Scenario 2
(2N in 4U)

HPE Primera 630 in 4U -> HPE Primera 650/670
Controller Conversion
Node pair upgrade
HPE Primera 650/670

Scenario 3
(4N in 4U)

HPE Primera 650 -> HPE Primera 670
Controller Conversion
HPE Primera 650/670

Online Non-disruptive
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**TIMELESS STORAGE**
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100% Availability Guarantee

Standard for Everyone.

No special contract. No restrictive terms. No more downtime.
Unsere Vision ist die autonome Infrastruktur
HPE InfoSight für das gesamte HPE Portfolio

HPE InfoSight: AI for the Data Center
Self-Managing, Self-Healing, Self-Optimizing
Vielen Dank