SAP Hana virtuos managen

NetApp Data Management Lösungen im Kontext HANA

Thomas Herrmann
Agenda

1) Collaboration with SAP
2) Solutions for SAP Hana
3) Customer Voices – References
4) Demo
Collaboration with SAP
Collaboration Milestones

Joint development of SAP Adaptive Computing with SAP and Fujitsu
2002

SAP CRM on Demand hosted on NetApp
2005

Pinnacle Award: FlexFrame

NetApp a founding member of SAP Co-Innovation Lab (COIL)
2007

Pinnacle Award Finalist

TDMS Integration
2009

SnapCreator and SSC

NetApp runs SAP HANA for High Speed Analytics
2012

SAP goes live on SAP Business ByDesign™ on NetApp
2006

NetApp launches SnapManager® for SAP

NetApp goes live on SAP CRM Certified for SAP ILM
2008

SAP FlexPod

SAP HANA for High Speed Analytics
2011

SAP HANA DR/Backup/Recovery
2013

SAP HANA TDI
2014

SGI HANA Appliance

SAP HEC

SAP LVM und AWS

15 Years of Innovation

2000
First NetApp deployment at SAP

2004
Pinnacle Award: SAP Business ByDesign™ on NetApp

2006
NetApp launches SnapManager® for SAP

2008
NetApp goes live on SAP CRM Certified for SAP ILM

2011
SAP FlexPod

SAP HANA Integration

2013
SAP HANA DR/Backup/Recovery

2015

➢ 45 PB of NetApp at SAP

➢ FFO cDOT support/MC

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SAP is a NetApp Reference Customer

- SAP provides over 30 SaaS Applications to thousands of customers based on NetApp
- Many HANA deployments in Partnership with Fujitsu and Cisco deployed globally
- SAP Center of Excellence (CoE) uses NetApp for customer PoCs, Value Prototyping, Virtual Appliance Factory
- Co-Innovation Labs (COILs): Co-founded and equipped by NetApp
- Deployed in 8 SAP HANA Enterprise Cloud (HEC) Locations
- Deployed in 5 SAP SaaS Cloud Locations (formerly: SuccessFactor and ByD)
Solutions for SAP
Today’s Customer Challenges

**SAP HANA**
- Database Strategy
- Upgrade and Migration
- New Application Platform
- Big Data

**Cloud**
- Backup, DR Service
- Dev/Test Systems
- Data Transport
- Data Ownership, Security

**SAP Lifecycle Management**
- Minimize risk and downtime
- SAP Integrated Solutions
- Backup & Recovery
- SAP System Copies
- SAP Upgrade

**Infrastructure and Operation**
- Non-disruptive Operation
- Scalability
- Flexibility
- Standardization
- Service Automation

+ SAP Lifecycle Management
+ SAP Lifecycle Management
NetApp Solutions for SAP HANA
Certified servers
Appliance certification required for single and multi-node as well as RHEL and SuSE

Storage connection options
SAN – Block device
SAN – distributed file system
NAS – shared file system

Certified enterprise storage systems
Storage certification Includes storage connection (SAN or NAS)
### NetApp Storage Certification for TDI

<table>
<thead>
<tr>
<th>Product Line</th>
<th>Model</th>
<th>Availability</th>
<th>Storage Connection</th>
<th>Value Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAS 7-mode and cDOT</td>
<td>FAS 3250</td>
<td>Nov 2013</td>
<td>NAS (NFS)</td>
<td>Manageability &amp; scalability</td>
</tr>
<tr>
<td></td>
<td>FAS 3270</td>
<td>Mar 2014</td>
<td>SAN (Fibre Channel)</td>
<td>Backup &amp; Recovery with storage-based Snapshots</td>
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<tr>
<td></td>
<td>FAS 62xx</td>
<td>Aug 2014</td>
<td></td>
<td>Synchronous and asynchronous mirroring</td>
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<td></td>
<td>FAS 8020</td>
<td>Jan 2015</td>
<td></td>
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<tr>
<td></td>
<td>FAS 8040</td>
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<td></td>
<td>FAS 8060</td>
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<td>FAS 8080</td>
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<tr>
<td>E-Series</td>
<td>E2700</td>
<td>Feb 2014</td>
<td>SAN (Fibre Channel)</td>
<td>Prize / Performance</td>
</tr>
<tr>
<td>EF-Series</td>
<td>E5400</td>
<td></td>
<td></td>
<td>Node density</td>
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<td></td>
<td>E5500</td>
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<td></td>
<td></td>
</tr>
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<td>EF540</td>
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<tr>
<td></td>
<td>EF550</td>
<td></td>
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</tr>
</tbody>
</table>

Certified Storage for HANA TDI

SAP HANA
Single node and Multi-node

NAS - shared file system
10Gb Ethernet with NFS

SAN - block device
Fibre Channel with XFS

FAS Product Family
7-mode and cDOT

SAN - block device
Fibre Channel with XFS

E-Series
Product Family

FAS Product Family
7-mode and cDOT
HANA Storage Certification

- Storage certification is specific to
  - Enterprise storage product family
  - Storage connection (SAN, NAS)

- Requirements and tests
  - 2 + 1 HANA node landscape
  - Node failover tests (storage connector)
  - Performance tests with HWval tool
  - KPIs must be fulfilled for two nodes
  - Documentation of test landscape and best practices for tuning and scalability

- Certification doesn’t define how many HANA nodes can be used with the storage
Tailored Datacenter Integration

Nodes Count

**SAP Application**

**Business Warehouse on HANA**

<table>
<thead>
<tr>
<th></th>
<th>NFSv3</th>
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</thead>
<tbody>
<tr>
<td>FAS8040</td>
<td>8</td>
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<td>FAS8060</td>
<td>10</td>
</tr>
<tr>
<td>FAS8080</td>
<td>10</td>
</tr>
</tbody>
</table>
## SAP HANA - NetApp Product Integration

<table>
<thead>
<tr>
<th></th>
<th>Certified Storage for HANA TDI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Storage System</strong></td>
<td><strong>FAS Product Family NAS and SAN</strong></td>
</tr>
<tr>
<td></td>
<td>FAS3250, FAS3270, FAS62xx, FAS80xx</td>
</tr>
<tr>
<td><strong>Backup, Recovery</strong></td>
<td>Snap Creator plug-in for SAP HANA</td>
</tr>
<tr>
<td>with storage-based Snapshots</td>
<td></td>
</tr>
<tr>
<td><strong>Disaster Recovery</strong></td>
<td>Snap Creator plug-in for SAP HANA</td>
</tr>
<tr>
<td>with asynchronous storage</td>
<td></td>
</tr>
<tr>
<td>replication</td>
<td></td>
</tr>
<tr>
<td><strong>Disaster Recovery</strong></td>
<td>Fabric MetroCluster (currently 7-mode only)</td>
</tr>
<tr>
<td>with synchronous storage</td>
<td></td>
</tr>
<tr>
<td>replication</td>
<td></td>
</tr>
</tbody>
</table>
HANA Streamed Backup Approach

- HANA Studio triggers a “global synchronized backup save point”
- HANA Backup stream can be
  - directly written to disk
  - send to a backup server using SAP HANA “backint” interface
- Challenges
  - Long backup operation
  - Performance impact during backup operation
  - Slow restore and recovery
Rapid Backup and Recovery

- Challenges with traditional backup
  - Long backup operation
  - Performance impact
  - 24/7 operations and short backup windows
  - Slow restore and recovery

- Storage-based backup and restore
  - Backup in less than a minute
  - No performance impact
  - Restore in less than a minute
  - Multiple, space-efficient backup images for flexible and accelerated recovery
  - Integrated into Hana Studio
SAP HANA Landscape

Disaster Recovery
- SAP HANA System Replication
- Physical or virtual servers
- NAS
- SnapMirror®
- DR
- Prod

Production
- Physical or virtual servers
- NAS

Backup
- Physical or virtual servers
- NAS
- SnapVault®
- Backup Images
- FlexClone® Copies
- Dev / Test
- Repair System
- Recovery Test

Snapshot™, SnapRestore®
SAP HANA Backup

Disaster Recovery
- Physical or virtual servers
- SAP HANA System Replication
- SnapMirror®

Production
- Physical or virtual servers
- SAP Landscape Virtualization Management
- Database consistency
- Backup catalog management
- Schedule backups
- Snapshot™, SnapRestore®

Backup
- Physical or virtual servers
- SnapVault®
- Backup Images
- Schedule backups

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SAP HANA Development and Test

Disaster Recovery

- Physical or virtual servers
- NAS
- SAP HANA System Replication
- SnapMirror® (DR)

Production

- Physical or virtual servers
- NAS
- Storage cloning request
- SAP Landscape Virtualization Management
- System Clone/Copy/Refresh
- Storage operations
- SAP Landscape Virtualization Management

Backup

- Physical or virtual servers
- NAS
- Backup Images
- FlexClone® Copies
- SnapVault® (Backup)
- Snapshot™, SnapRestore®
- • Dev / Test
  • Repair System
  • Recovery Test

FFO
SAP HANA Disaster Recovery

Disaster Recovery

Production

Backup

SAP HANA System Replication

SnapMirror®

SnapMirror®, SnapRestore®

SnapVault®

Physical or virtual servers

Physical or virtual servers

Physical or virtual servers

NAS

NAS

NAS

FFO

SAP Landscape Virtualization Management

NetApp Snap Creator HANA plug-in

SAP HANA Studio

Automate failover workflow

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Backup and/or DR Services in the Cloud
and run development and/or test in the cloud

Disaster Recovery

- Cloud Providers
  - NetApp Private Storage

- Asynchronous mirror for Disaster Recovery
  - NetApp Private Storage

- SnapMirror®

Production

- Physical or virtual servers
- SAN or NAS

- SnapMirror®, SnapRestore®

Backup

- Cloud Providers
  - NetApp Private Storage

- Block-incremental replication of backup images
  - SnapVault®

- Rapid backup and restore

SAP Landscape Virtualization Management

- SAP Landscape Virtualization Management

- SnapManager, Snap Creator

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Customer Voices - References
http://success-is-built-on-netapp.de

SAP
Demo
Thank you
Backup
Today’s Customer Challenges

**SAP HANA**
- Database Strategy
- Upgrade and Migration
- New Application Platform
- Big Data

**Cloud**
- Backup, DR Service
- Dev/Test Systems
- Data Transport
- Data Ownership, Security

**SAP Lifecycle Management**
- Minimize risk and downtime
- SAP Integrated Solutions
- Backup & Recovery
- SAP System Copies
- SAP Upgrade

**Infrastructure and Operation**
- Non-disruptive Operation
- Scalability
- Flexibility
- Standardization
- Service Automation
Customer Example
SAP HANA Landscape
Customer Example: Business Requirements and Challenges

- Decision to use SAP HANA as the strategic platform for SAP applications as well as for non-SAP custom developments
  - Performance benefit for BW on HANA
  - Performance benefit for own application development on SAP HANA
  - Suite on HANA decision only made based on single database platform strategy

- Migration of 180 (30 production) SAP systems to SAP HANA within the next 2 years

- Difficulty to get precise sizing of target SAP HANA systems

- Flexibility to choose server, network and storage vendor
  - Tailored datacenter integration
Customer Example: Infrastructure and operational Requirements

- Secondary datacenter for disaster recovery
  - Synchronous mirroring
  - Fast failover – RTO < 10 minutes

- Standard SAP HANA full backup approach (dump to disk or backint) is not acceptable
  - Huge performance impact proofed within a POC
  - Customer statement: “Backup approach for an in-memory database is like going back to Stone Age”

- Manageability and process automation
  - SAP Landscape Virtualization Management (LVM) as central management platform
  - Automated SAP System Copies

- Virtualization with VMware for dev/test as well as production systems where applicable
Backup Slides
Non-disruptive Operation, Scalability and Flexibility

Clustered Data ONTAP Overview

- Storage virtual machine (SVM)
  - Consumes resources from the storage cluster
  - Separates virtual resources and administration
  - Provides Multitenancy

- Non-disruptive operation
  - Scale storage cluster
  - Migrate and rebalance workload

- Data tiering
  - Different storage models and disk technology can be mixed within the storage cluster

Scale cluster and rebalance workload
NetApp Solutions for SAP Applications

January 2015
Today’s Customer Challenges

- **SAP HANA**
  - Database Strategy
  - Upgrade and Migration
  - New Application Platform
  - Big Data

- **Cloud**
  - Backup, DR Service
  - Dev/Test Systems
  - Data Transport
  - Data Ownership, Security

- **SAP Lifecycle Management**
  - Minimize risk and downtime
  - SAP Integrated Solutions
  - Backup & Recovery
  - SAP System Copies
  - SAP Upgrade

- **Infrastructure and Operation**
  - Non-disruptive Operation
  - Scalability
  - Flexibility
  - Standardization
  - Service Automation
Solution Overview
Rapid Backup and Recovery
Flexible Retention for primary and secondary Backups

Production

Physical or virtual servers

SAN or NAS

Backup

Block-incremental replication of backup images

SnapVault®

Rapid backup and restore

Snapshot™, SnapRestore®
Application integrated Backup Services
Available for SAP on DB2, Oracle, MaxDB, MSSQL, Sybase ASE and HANA

- Physical or virtual servers
- SAN or NAS
- Application integration
  - SnapManager, Snap Creator
- Production
- Block-incremental replication of backup images
- SnapVault®
- Rapid backup and restore
- Backup
- Storage operations
- Backup Images
Active Usage of Backup Images
for Development and Test Systems, Repair Systems and Recovery Tests

- Dev / Test
- Repair System
- Recovery Test

Production
- Physical or virtual servers
- FlexClone® Copies
- Rapid backup and restore
- Block-incremental replication of backup images
- SnapVault®

Backup
- Physical or virtual servers
- FlexClone® Copies
- Backup Images
- SAN or NAS

SAN or NAS

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End-to-end Provisioning of Test Systems

Available for SAP on DB2, Oracle, MaxDB, MSSQL, Sybase ASE and HANA

- Dev / Test
- Repair System
- Recovery Test

Physical or virtual servers

SAN or NAS

Block-incremental replication of backup images

Rapid backup and restore

FlexClone® Copies

SnapVault®

SSC for SAP LVM

SAP Landscape Virtualization Management

Storage operations

System Clone/Copy/Refresh

Production

Backup

Physical or virtual servers

SAN or NAS

FlexClone® Copies

SnapShot™, SnapRestore®

Backup Images

NetApp®

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Storage-based Replication for Disaster Recovery

Disaster Recovery
- Dev / Test
- Repair System
- Recovery Test

Production
- Dev / Test
- Repair System
- Recovery Test

Backup
- Dev / Test
- Repair System
- Recovery Test

Asynchronous mirror for Disaster Recovery
- SnapMirror®

SAN or NAS
- Block-incremental replication of backup images
- SnapVault®

Rapid backup and restore
- SnapMirror™, SnapRestore®

Physical or virtual servers
- FlexClone® Copies

Application integration
- SnapManager, Snap Creator
Active Usage of Disaster Recovery Images
for Development and Test Systems, Repair Systems and DR Tests

Disaster Recovery
- Dev / Test
- Repair System
- DR Test

Production
- Dev / Test
- Repair System
- Recovery Test

Backup
- Dev / Test
- Repair System
- Recovery Test

SAN or NAS

Physical or virtual servers

Asynchronous mirror for Disaster Recovery

Block-incremental replication of backup images

SnapMirror®, SnapVault®, SnapMirror™, SnapRestore®

Rapid backup and restore

Physical or virtual servers

SAN or NAS

Physical or virtual servers

SAN or NAS
End-to-end Provisioning of Test Systems

Disaster Recovery
- Dev / Test
- Repair System
- DR Test

Production
- Dev / Test
- Repair System
- Recovery Test

Backup
- Dev / Test
- Repair System
- Recovery Test

- Physical or virtual servers

SAN or NAS

- FlexClone® Copies
- DR Images
- SnapMirror®

- Physical or virtual servers

SAN or NAS

- SnapVault®

Block-incremental replication of backup images

Rapid backup and restore

Asynchronous mirror for Disaster Recovery

NetApp®
SSC for SAP LVM

Cloning request

SAP Landscape Virtualization Management

NetApp®
SnapManager, Snap Creator

System Clone/Copy/Refresh

SnapMirror™, SnapRestore®
Backup and/or DR Services in the Cloud
and run development and/or test in the cloud

Disaster Recovery

NetApp Private Storage

Cloud Providers

NetApp Private Storage

or

NetApp Private Storage

Cloud Providers

SAN or NAS

Prod

Physical or virtual servers

DR Images

Asynchronous mirror for Disaster Recovery

FlexClone®

Copies

SnapMirror®

Production

Block-incremental replication of backup images

Backup

Block-incremental replication of backup images

SnapVault®

Rapid backup and restore

Rapid backup and restore

SAP Landscape Virtualization Management

NetApp SnapManager, Snap Creator

Prod

SnapMirror™, SnapRestore®

FlexClone®

Copies

FlexClone®

Copies

Backup Images

FlexClone®

Copies

FlexClone®

Copies

Cloud Providers

SAP Landscape Virtualization Management

NetApp SnapManager, Snap Creator

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Customer Example
SAP HANA Landscape
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Customer Example Challenges

**SAP HANA**
- Database Strategy
- Upgrade and Migration
- New Application Platform
- Big Data

**Cloud**
- Backup, DR Service
- Dev/Test Systems
- Data Transport
- Data Ownership, Security

**SAP Lifecycle Management**
- Minimize risk and downtime
- SAP Integrated Solutions
- Backup & Recovery
- SAP System Copies
- SAP Upgrade

**Infrastructure and Operation**
- Non-disruptive Operation
- Scalability
- Flexibility
- Standardization
- Service Automation

SAP Lifecycle Management + SAP Lifecycle Management

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Customer Example: SAP HANA Landscape

Disaster Recovery

Production

SAP HANA System Replication

Physical or virtual servers

Physical or virtual servers

Physical or virtual servers

NAS

SAP Landscape Virtualization Management

NetApp®

SSC for SAP LVM

NetApp®

Snap Creator HANA plug-in

SAP

HANA Studio

Backup

• Dev / Test
• Repair System
• Recovery Test

• SnapVault®, FlexClone®

• Backup Images

Physical or virtual servers

NAS

NAS

NAS

Snapshot™, SnapRestore®
Customer Example: SAP HANA Backup

Disaster Recovery
- SAP HANA System Replication
- Physical or virtual servers
- NAS
- DR

Production
- SAP Landscape Virtualization Management
- Schedule backups
- Physical or virtual servers
- NAS
- Prod
- Snapshot™, SnapRestore®

Backup
- NetApp Snap Creator HANA plug-in
- Storage operations
- Backup catalog management
- Physical or virtual servers
- NAS
- Backup Images

- SnapVault®
Customer Example: SAP HANA Disaster Recovery

- SAP HANA System Replication
  - Physical or virtual servers
  - NAS
  - SAP Landscape Virtualization Management
  - Automate failover workflow

- Disaster Recovery
- Production
- Backup

- SnapVault®
- SnapShot™, SnapRestore®

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Customer Example: SAP HANA Development and Test

Disaster Recovery
- Physical or virtual servers
- SAP HANA System Replication
- Storage cloning request

Production
- Physical or virtual servers
- SAP Landscape Virtualization Management
- Storage operations

Backup
- Physical or virtual servers
- SnapVault®
- FlexClone®
- Backup Images
- System Clone/Copy/Refresh
- Dev / Test
- Repair System
- Recovery Test

SAP HANA Development and Test
- SnapShot™, SnapRestore®
Backup Slides
Non-disruptive Operation, Scalability and Flexibility

Clustered Data ONTAP Overview

- **Storage virtual machine (SVM)**
  - Consumes resources from the storage cluster
  - Separates virtual resources and administration
  - Provides Multitenancy

- **Non-disruptive operation**
  - Scale storage cluster
  - Migrate and rebalance workload

- **Data tiering**
  - Different storage models and disk technology can be mixed within the storage cluster
Solution Overview (with text)
Rapid Backup and Recovery

- **Challenges with traditional backup**
  - Long backup operation
  - Performance impact
  - 24/7 operations and short backup windows
  - Slow restore and recovery

- **Storage-based backup and restore**
  - Backup in less than a minute
  - No performance impact
  - Restore in less than a minute
  - Multiple, space-efficient backup images for flexible and accelerated recovery

Production

- Physical or virtual servers
- SAN or NAS

Snapshot™, SnapRestore®

Rapid backup and restore
Flexible Retention for primary and secondary Backups

- Space-efficient block-incremental backups
- Different retention policies for primary and secondary backups
- E.g. two days at primary and four weeks at secondary storage
Application integrated Backup Services
Available for SAP on DB2, Oracle, MaxDB, MSSQL, Sybase ASE and HANA

- Backup and Restore process managed by SnapManager or Snap Creator
  - Database consistency
  - Storage operations for backup, restore and replication to secondary storage
  - Management of primary and secondary backup retention policies
  - Integration into SAPs or database vendors backup tools like BR*Tools or SAP HANA studio

[Diagram showing production and backup processes with SnapManager and Snap Creator integration]

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Active Usage of Backup Images
for Development and Test Systems, Repair Systems and Recovery Tests

- Space-efficient usage of backup images for development and test scenarios
  - Flexible selection of any backup image at primary or secondary storage
  - Refresh of Dev / Test systems with production data
  - Provisioning of new test systems with production data
  - Provisioning of production clones to address logical errors (repair system)

**Production**
- Dev / Test
- Repair System
- Recovery Test

**Backup**
- Dev / Test
- Repair System
- Recovery Test

NetApp
SnapManager, Snap Creator

- SnapVault®
- FlexClone®
- SnapRestore®, Snapshot™
- Block-incremental replication of backup images
- Rapid backup and restore
- Space-efficient usage of backup images for development and test scenarios
- Flexible selection of any backup image at primary or secondary storage
- Refresh of Dev / Test systems with production data
- Provisioning of new test systems with production data
- Provisioning of production clones to address logical errors (repair system)
End-to-end Provisioning of Test Systems
Available for SAP on DB2, Oracle, MaxDB, MSSQL, Sybase ASE and HANA

- End-to-end workflow automation with
  - SAP Landscape Virtualization Management (LVM) and NetApp Storage Services Connector (SSC)
  - SAP system copy – provisioning of new test system with production data
  - SAP system refresh – refresh of existing test system with production data
  - SAP system clone – Provisioning of fenced production clone

- NetApp SSC
  - Creation of FlexClone copies at primary or secondary storage based on existing backups
Storage-based Replication for Disaster Recovery

Available for SAP on DB2, Oracle, MaxDB, MSSQL, Sybase ASE and HANA

- Data replication for Disaster Recovery managed by SnapManager or Snap Creator
  - Database consistency
  - Storage operations replication to DR storage

Disaster Recovery

Production

Backup

- Dev / Test
- Repair System
- Recovery Test

Physical or virtual servers

SAN or NAS

Application integration

Storage operations

NetApp
SnapManager, Snap Creator

Asynchronous mirror for Disaster Recovery

SnapMirror®

Block-incremental replication of backup images

SnapVault®

Rapid backup and restore

FlexClone® Copies

Snapshot™, SnapRestore®

Rapid backup

SnapManager, Snap Creator

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Active Usage of Disaster Recovery Images
for Development and Test Systems, Repair Systems and DR Tests

- Space-efficient usage of DR images for development and test scenarios
  - Flexible selection of any DR image
  - Refresh of Dev / Test systems with production data
  - Setup of DR test scenarios without interrupting DR replication

Disaster Recovery
- Dev / Test
- Repair System
- DR Test

Production
- Dev / Test
- Repair System
- Recovery Test

Backup
- Dev / Test
- Repair System
- Recovery Test

FlexClone® Copies
SAN or NAS
DR Images

Asynchronous mirror for Disaster Recovery
SnapMirror®

Block-incremental replication of backup images
SnapVault®

Rapid backup and restore
Snapshot™, SnapRestore®

Setup of DR test scenarios without interrupting DR replication
End-to-end Provisioning of Test Systems

Available for SAP on DB2, Oracle, MaxDB, MSSQL, Sybase ASE and HANA

- **End-to-end workflow automation with SAP LVM and NetApp SSC**
  - SAP system copy – provisioning of new test system with production data
  - SAP system refresh – refresh of existing test system with production data
  - SAP system clone – Provisioning of fenced production clone

- **NetApp SSC**
  - Creation of FlexClone copies at DR storage

---

**Disaster Recovery**
- Dev / Test
- Repair System
- DR Test

**Production**
- Dev / Test
- Repair System
- Recovery Test

**Backup**
- Dev / Test
- Repair System
- Recovery Test
Backup and/or DR Services in the Cloud
and run development and/or test in the cloud

- NetApp Private Storage or Cloud ONTAP for Backup, DR services in the Cloud
  - Same replication technique as with on premise storage
  - Managed by SnapManager, Snap Creator products

- Active usage of backup and/or DR images for development and test scenarios
  - Test system provisioning with SAP LVM and NetApp SSC

- FlexClone® Copies
- SnapMirror®
- SnapVault®
- SnapManager, Snap Creator products

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>10 Jahre mit vollem Erfolg

**Erster Prototyp**

**Erste Kunden Projekte**

**SAP ACC**
- Orlando SAPPhire
- Pinnacle Award AC

**FF 3.1**
- NAS only

**FF 4.0**
- EMC/SAN

**FF 5.0**
- Kein EMC, Kein FC, Kein SPARC, NetApp/Suse/NFS only

**HANA und FF Orchestrator**
- LVM integration, Heterogenouse Server Support,
  290 Kunden WW

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- 2001
- 2004
- 2007
- 2010
- 2013