Software Defined Storage
(Focus on Storage Management Analytics)

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A Software Defined Environment for Data Centers is an alignment of IT with business needs where the entire infrastructure (Compute, Storage and Network) is programmable for the workloads.
Software Defined Storage

**Dynamic**
Responsive to workloads and changing requirements

**Automated**
Policy based provisioning and optimization

**Efficient**
Cost-optimized Scaling of Capacity & Throughput
Software Defined Storage Delivery Models

Security and Availability
- Authentication/Auditing
- Encryption
- Mirroring/DR
- High Availability
- Backup & Recovery

Performance and Opt.
- Striping
- Clustering
- Compression
- Deduplication
- Tiering/ILM

IBM Storage Software Platform (Data Plane)

IBM SDS Virtual Controller (Control Plane)

Workload Optimized & Transaction Integrity

Agility & Rapid Scale

Systems of Record
- Data & Transactions
- App Infrastructure
- Virtualized Resources

New Modes of Engagement
- Expanding Interface Modes
- Big Data and Analytics
- Social Networking
SDS Data Plane Direction

- Workload aware; tops down
- Heterogeneous storage virtualization
- Managing pools of systems as a single system
- Managed by advanced programmed automation
- Start small and grow with seamless migration

IBM SDS data plane technology

- Storage Virtualization
  - Storwize platform

- File Optimization
  - GPFS based storage solutions

- Object Optimization
  - OpenStack Swift

- Optimized Storage systems
  - XIV, Flash, DS8K,..
SDS Control Plane Direction

IBM SDS Virtual Controller

Integration & API Services
Storage Virtualization
Policy Automation
Analytics & Optimization
Backup and Copy Management
Storage Cloud

Storage Integration
Advanced Management
UNIFIED RECOVERY
Self-Service Portal

Orchestrators - IaaS

Storage Admin
End User

openstack
vmware
REST/OSLC
TOSCA
Storage Management Analytics

Workload Description

- Performance Aware Storage Placement
- Storage Tiering (ILM) – Continuous Optimization
- Resiliency – Disaster Protection

(Cinder Filter Scheduler)
Cinder Volume Type Examples

PLATINUM
• Block Storage
• Workload Profile [ IO characteristics of active OLTP application]
• Storage Tiering Profile [ Pinned to Tier-1 (SSD)]
• Resiliency Profile [ RAID-5, RPO=0 Synchronous Replication (Metro Mirror / GPFS Replication) ]

GOLD
• Block Storage
• Workload Profile [ IO characteristics of active OLTP application]
• Storage Tiering Profile [ Tier-1 (SSD) / Tier-2 (HDD) based on IO-Density Policy]
• Resiliency Profile [ RAID-5 ]

BRONZE
• Block Storage
• Workload Profile [ Capacity based – NO performance awareness]
Performance Aware Storage Placement

### Workload Profiles

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Sequential</td>
<td>For batch applications involving large volumes</td>
</tr>
<tr>
<td>Data Warehouse</td>
<td>For applications with inquiries into large data</td>
</tr>
<tr>
<td>Document Archival</td>
<td>For document archival applications</td>
</tr>
<tr>
<td>OLTP High</td>
<td>For very active online transaction processing</td>
</tr>
<tr>
<td>OLTP Standard</td>
<td>For typical online transaction processing</td>
</tr>
<tr>
<td>Space Only</td>
<td>No Performance Data is Considered</td>
</tr>
</tbody>
</table>

### General

<table>
<thead>
<tr>
<th>I/O Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O rate per sec per GB: 2.5</td>
</tr>
<tr>
<td>Avg. transfer size (KB): 10</td>
</tr>
</tbody>
</table>

### Performance

#### Read/Write

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Sequential reads (%): 14</td>
<td></td>
</tr>
<tr>
<td>Sequential writes (%): 23</td>
<td></td>
</tr>
<tr>
<td>Random reads (%): 56</td>
<td></td>
</tr>
<tr>
<td>Random writes (%): 27</td>
<td></td>
</tr>
<tr>
<td>Total (%, must be 100): 100</td>
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</table>

#### Cache

<p>| |</p>
<table>
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<tbody>
<tr>
<td>Random read cache hits (%): 40</td>
</tr>
<tr>
<td>Random write destage (%): 33</td>
</tr>
</tbody>
</table>

### Activity

- IOPS, Response Time
- RAID, Disk Type
- Compression, Encryption...
Storage Tiering - ILM

- Allow applications to control storage lifecycle based on their unique needs
- Intelligence to make the right decisions for ALL kinds of enterprise storage – block, file or server virtualized
- Policy driven, application customizable lifecycle management of storage
Resiliency – Disaster Protection

RPO, RTO
Replication Session type
Fabric Zoning
Cluster Awareness
Volume Placement....

Configuration Analysis
Change in Connectivity
Application Consistency....

Volume Creation, Assignment
Zoning, Replication Session
Multi-path Configuration ....

Choose Location of Copy/Target

Choose Copy Technology

Point-in-time Copy
Continuous Copy

Choose Session Type

1. Point-in-time Flash Copy
2. vDisk Mirroring (SVC)
3. Synchronous MetroMirror Failover/Failback
4. Synchronous MetroMirror Failover/Failback w/ Practice
5. Synchronous MetroMirror Single Direction
6. Asynchronous GlobalMirror Either Direction w/ Two Site Practice
7. Asynchronous GlobalMirror Failover/Failback
8. Asynchronous GlobalMirror Failover/Failback w/ Practice
9. Asynchronous GlobalMirror Single Direction
10. Three Site Metro Global Mirror w/ Practice
11. Three Site Metro Global Mirror

Practise Volume Required
Analytics as a Service

- Systems Management for Cloud Service Provider – Big Data problem

- Elastic, automated hosting in the cloud
- Actionable insights, predictive
- Analytics ROI
Questions ?
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