Agenda

- Origin Of This Automation Methodology
- What is Consolidation & Optimization? Challenges?
- Steps In A Large-scale Consolidation & Optimization
- Automation Methodology: Target, Metrics & Types
- Key Benefits Of Automations
- A Sample Use Case
Interscape Technologies

A Pro-active Performance and Capacity Planning Services Company
For Enterprise Storage Infrastructure
Multi-vendor Platforms • End to End • Vendor Independent

TOOL + TECH + TEAM

No Software to Buy, Maintain & Operate
(Cloud based)

Subject Matter Expert
(Recommendations Included)

Back-End R&D Team Support
(new platform integration included)
What is Consolidation & Optimization?

❖ Consolidation Centralizes Data Storage
  ➢ Less disparate systems - fewer, larger storage systems
  ➢ Lesser separate networking fabrics
  ➢ Reduces power consumption, heating/cooling & real-estate costs
  ➢ Simplifies Management --- Less cables, rack space & floor space

❖ Optimization Improves Efficiency
  ➢ Faster, efficient & compact technologies
  ➢ Minimizes time required to access & store data
  ➢ Facilitates data backup & archiving
  ➢ Centralized & efficient management

✔ Optimized resource utilization is a key goal of Consolidation
Challenges in Consolidation & Optimization

- Large Multi-petabyte, Multi-vendor, Multi-datacenter

No Single Tool For Large Infrastructures
- NO clear visibility from Application to Server/VM to LUNs
- NO easy way to get IO profiles for large number of servers
- Mapping capacity allocations across storage tiers & arrays

Aggregating & Summarizing Capacity & Performance Data

Creating Target Architectures To Support Business Requirements
- What-if analysis?
Steps in Good Consolidation & Optimization

- Discover Current Infrastructure
  - shows end to end connectivity, configurations and capacities

- Create IO Profiles for ALL provisioned servers on various storage platforms
  - IOPS, MBPS, Read/Write ratios, %Sequential/%Random, Block Sizes etc.

- Create Performance & Capacity based consolidation models
  - at Storage array levels, Front-end Port level and at the Server level

- Identify Storage Optimization opportunities during the migration phase
  - Offline storage, RAID levels, Host level utilizations, Thin provisioning etc.

- Aggregate Bandwidth across multiple storage arrays
  - Assess replication bandwidth requirements based on write traffic

- Create from-to migration maps
  - At the host level and at storage array front-end port level

- Create provisioning scripts to mass provision all migrating servers

- Post-Migration Performance Validations
  - Pre vs Post - Per Server IO Profile Comparisons
Target Architecture Requirements

- **Target Storage Architecture**
  - IOPS/MBPS requirements

- **Target Storage Configuration**
  - Front-end ports
    - How many
    - Maximum IOPS and MBPS at 100% utilization
  - Back-end Ports
    - How many
    - Maximum IOPS and MBPS at 100% utilization

- **Disk Technologies & RAID Configurations & Storage Pools**
  - Types of disks and RAID for each storage pool
  - Number of disks for each storage pool
  - Maximum IOPS & MBPS at 100% utilization for each disk

- **What-if Consolidation Models**
  - Target Array Utilizations based on consolidations (2 to 1, 3 to 1, 4 to 1)
Key Metrics to Analyze

❖ **Capacity Metrics**
  - Installed Storage (Raw/Usable)
  - Allocated Storage (Usable)
  - Over-subscription rates by storage pools
  - Actual storage consumed

❖ **Performance Metrics**
  - Service Times
  - Read IOPS, Write IOPS, Read MBPS, Write MBPS
  - %Cache Hits
  - Vendor specific metrics (e.g. Write Pending Limits for EMC)
  - Use percentile values such as 95th or 99th percentile

❖ **Environmental Metrics**
  - Power Consumption
  - Heating & Cooling
  - Footprint
# Metric/Component Matrix

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<tr>
<th>Metric</th>
<th>Overall Array Level</th>
<th>Front-End Port/CPU/Adapter</th>
<th>Cache Level</th>
<th>Logical Device Level</th>
<th>Backend Port/CPU/Adapter</th>
<th>Storage Pools/RAID Groups</th>
<th>Physical Disks</th>
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Consolidation Methodologies

- **Source array grouping**
  - Quickly gauges effort & optimization opportunities
  - Consolidation based on per array IO profile
  - Good for pre-sales

- **Front-end port level groupings**
  - A “per port IO profile” based consolidation model
  - Map multiple source ports to a target port based on aggregated port IO profile

- **Host level groupings**
  - A “per host IO profile” based consolidation model
  - Group multiple hosts to a target port based on aggregated port IO profile
Enterprise Array Architecture
(Vendor Agnostic)

Front End -> Ports -> Adaptors -> Devices (Logical) -> Disks

SSD Pool
FC Pool
SATA Pool
Consolidation Methodology 1
Source Array-Level Groupings

1. Create Source Array’s IO Profiles
2. Consolidate Source Array IO Profiles
   Create Target Array IO Profile
3. Create Target Array’s Heat Chart

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Consolidation Methodology 2
Front End Port-Level Groupings

1. Create Front End Port IO Profile per Port per Array

2. Create Target Array’s Consolidated & Grouped FE IO Profiles Per Port

3. Create Target Array’s Heat Chart
Consolidation Methodology 3
Host-Level Groupings

1. Create IO Profiles per Host per Array
2. Create Host-Level Groupings Map it to Ports based on IO Profile
3. Create Target Array’s Heat Chart
Benefits of Automation

- Consistent, Reliable, Repeatable & Fast
- Performs very complex analytics
- Customized to enterprise needs
- Processes large amounts of data
- Vendor agnostic
- Less dependence on expensive human resources
- At a ‘fraction of Cost & Time’
Use Case
Array Consolidation Map

A1 + A2

A3 + A4 + A5

A6 + A7 + A8 + A9

Hosts-100, IOPS-30K, TB-100
Hosts-150, IOPS-40K, TB-100
Hosts-100, IOPS-40K, TB-150
Hosts-150, IOPS-45K, TB-200

Hosts-500
IOPS-56K (Max at 95th percentile)
TB-425 130% thinpool over subscription
Use Case (contd.)
Model of Target Array’s Aggregated IOPS, MBPS, Heat Chart...

Aggregated System IOPS
Max IOPS: 55909, Avg IOPS: 40166

Aggregated System MBPS
Max MBPS: 1449, Avg MBPS: 909

Target Array at 50% resource utilization
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Storage Practice
Floor Discovery, Performance Analysis, Capacity Planning, Migration & Consolidation Planning