

The
**Performance
people**

Storage

RAID

Systems

RM

PERIONICS

Clarion

FA

Perfmon

Disks

WLA

IOSTAT

SAR

SRDF

Symmetrix

TTP

**Interscape
Technologies Inc.**



Automated Methodology for Consolidation & Optimization of Large Storage Infrastructures

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- ❖ **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**

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)*

❖ 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**

- ❖ **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?

- ❖ **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 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)

❖ 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

Metric	Overall Array Level	Front-End Port/CPU/Adapter	Cache Level	Logical Device Level	Backend Port/CPU/Adapter	Storage Pools/RAID Groups	Physical Disks
Performance							
Read IO/sec	Measure & Aggregate	Measure & Aggregate		Measure & Aggregate	Derive & Aggregate	Derive & Aggregate	Derive & Aggregate
Write IO/sec	Measure & Aggregate	Measure & Aggregate		Measure & Aggregate	Derive & Aggregate	Derive & Aggregate	Derive & Aggregate
Read MB/sec	Measure & Aggregate	Measure & Aggregate		Measure & Aggregate	Derive & Aggregate	Derive & Aggregate	Derive & Aggregate
Write MB/sec	Measure & Aggregate	Measure & Aggregate		Measure & Aggregate	Derive & Aggregate	Derive & Aggregate	Derive & Aggregate
%Read Hits			Measure & Aggregate				
%Write Hits			Aggregate				
Capacity							
%Allocated	Measure & Aggregate						
%Consumed	Measure & Aggregate						
Configuration							
Fan-Out	Measure & Aggregate	Measure & Aggregate					
Device Count	Measure & Aggregate	Measure & Aggregate			Derive & Aggregate		

❖ Source array grouping

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

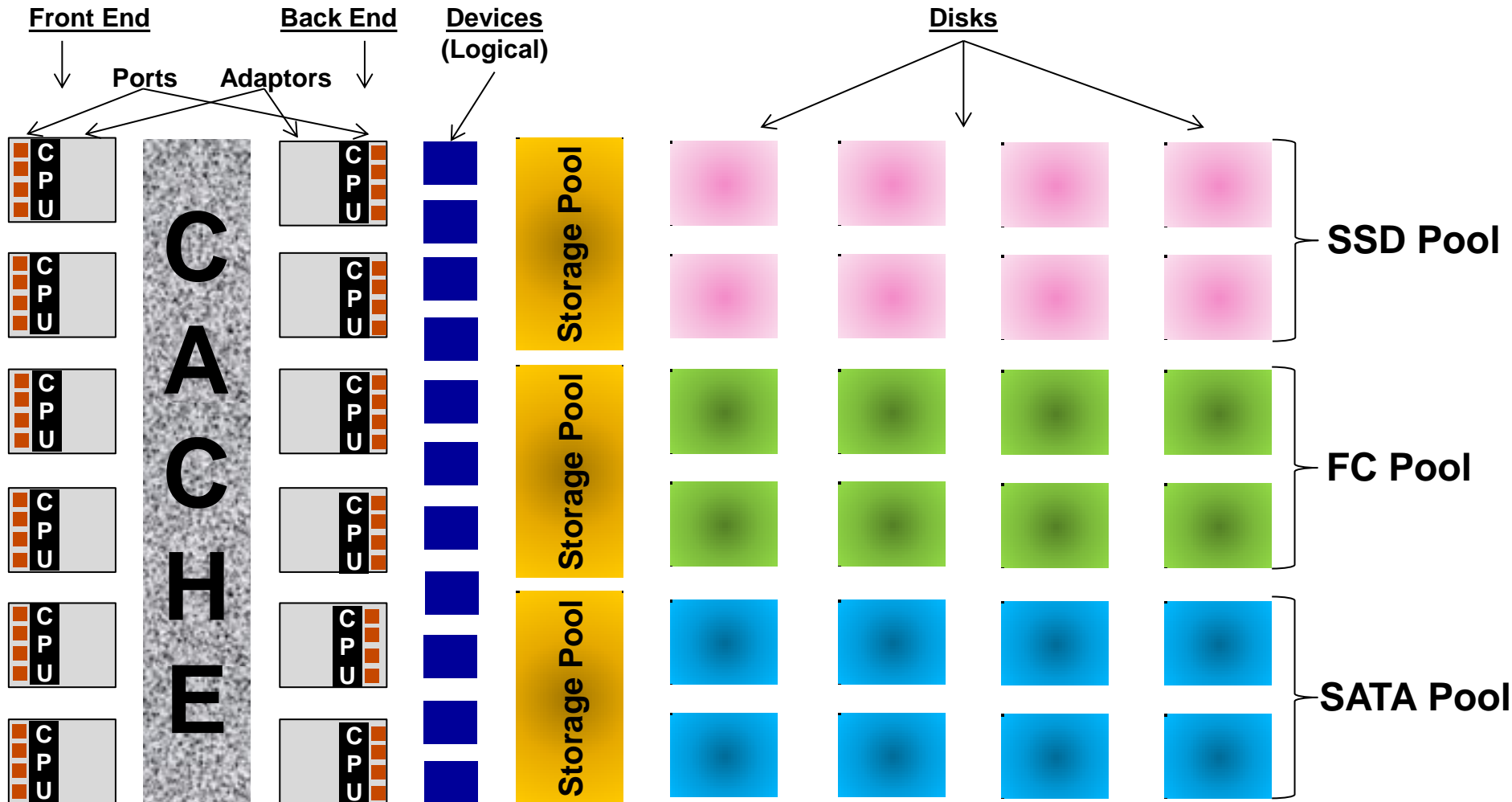
❖ Front-end port level groupings

- *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)



Consolidation Methodology 1

Source Array-Level Groupings

1

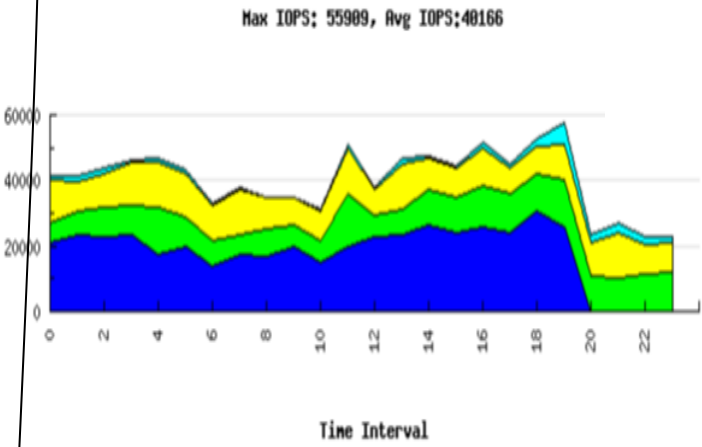
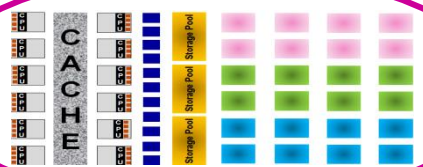
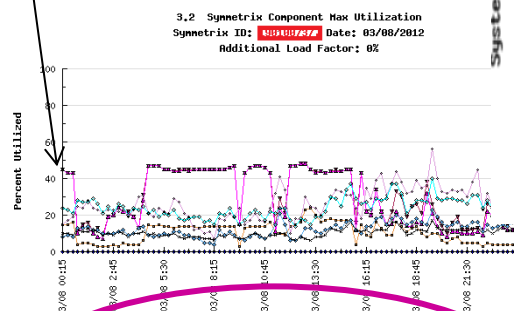
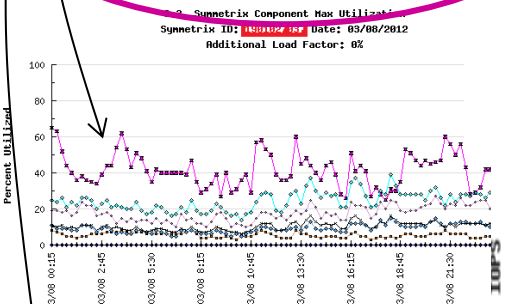
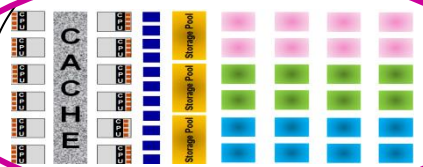
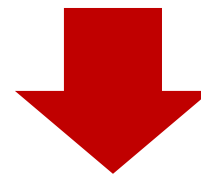
Create Source Array's IO Profiles

2

**Consolidate Source Array IO Profiles
Create Target Array IO Profile**

3

Create Target Array's Heat Chart



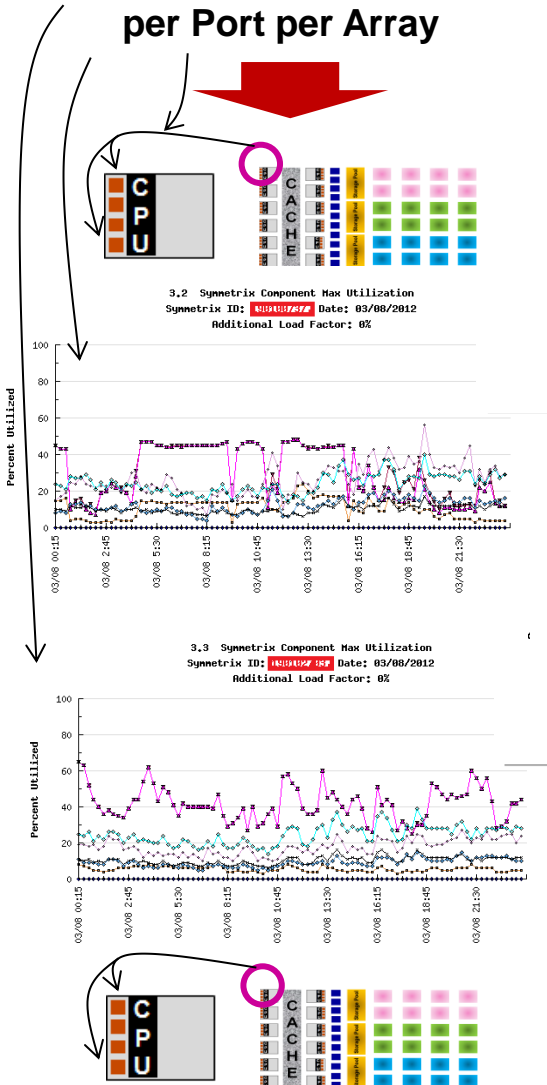
FA-3	Cache:008	DA-05	A	...
			B	...
			C	...
			D	...
FA-14	Cache:008	DA-06	A	...
			B	...
			C	...
			D	...
FA-4	Cache:008	DA-07	A	...
			B	...
			C	...
FA-13	Cache:008	DA-08	A	...
			B	...
			C	...
			D	...

Consolidation Methodology 2

Front End Port-Level Groupings

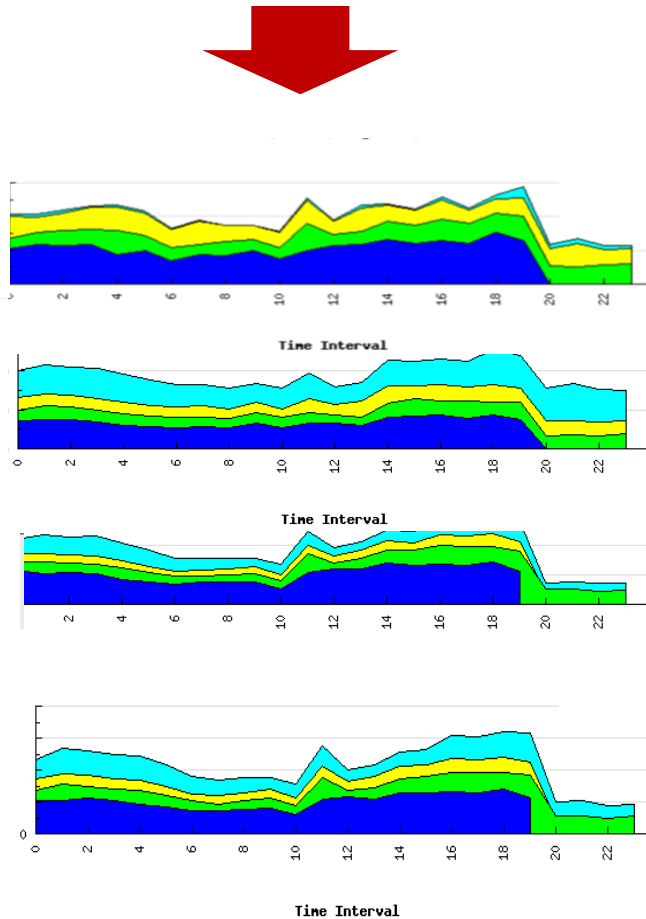
1

Create Front End Port IO Profile per Port per Array



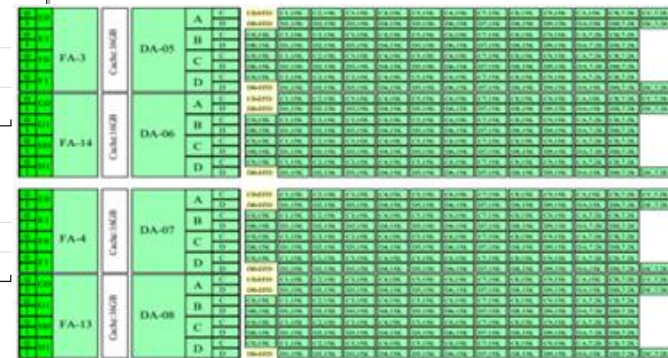
2

Create Target Array's Consolidated & Grouped FE IO Profiles Per Port



3

Create Target Array's Heat Chart

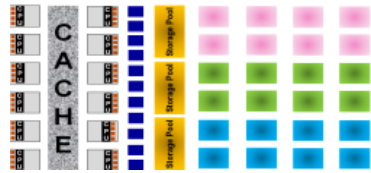


Consolidation Methodology 3

Host-Level Groupings

1

Create IO Profiles per Host per Array



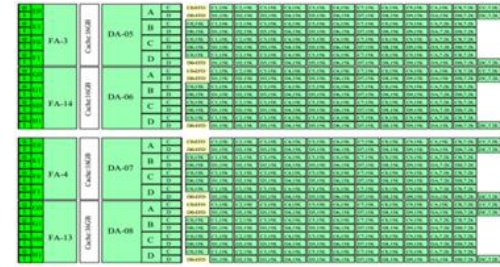
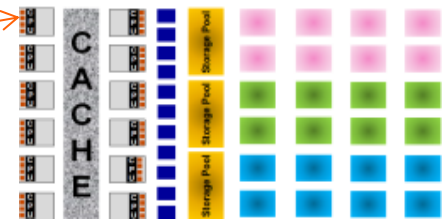
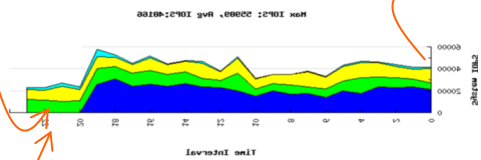
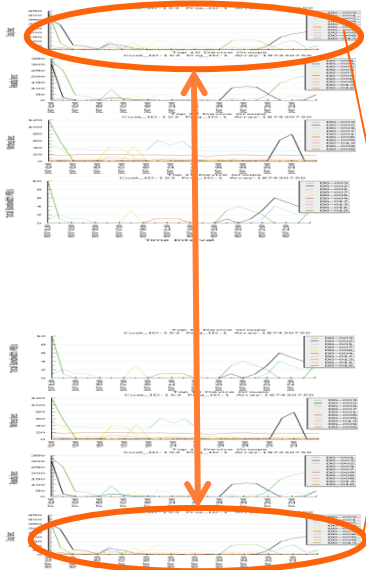
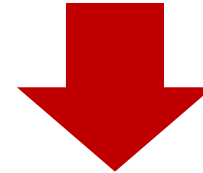
2

Create Host-Level Groupings
Map it to Ports based on IO Profile



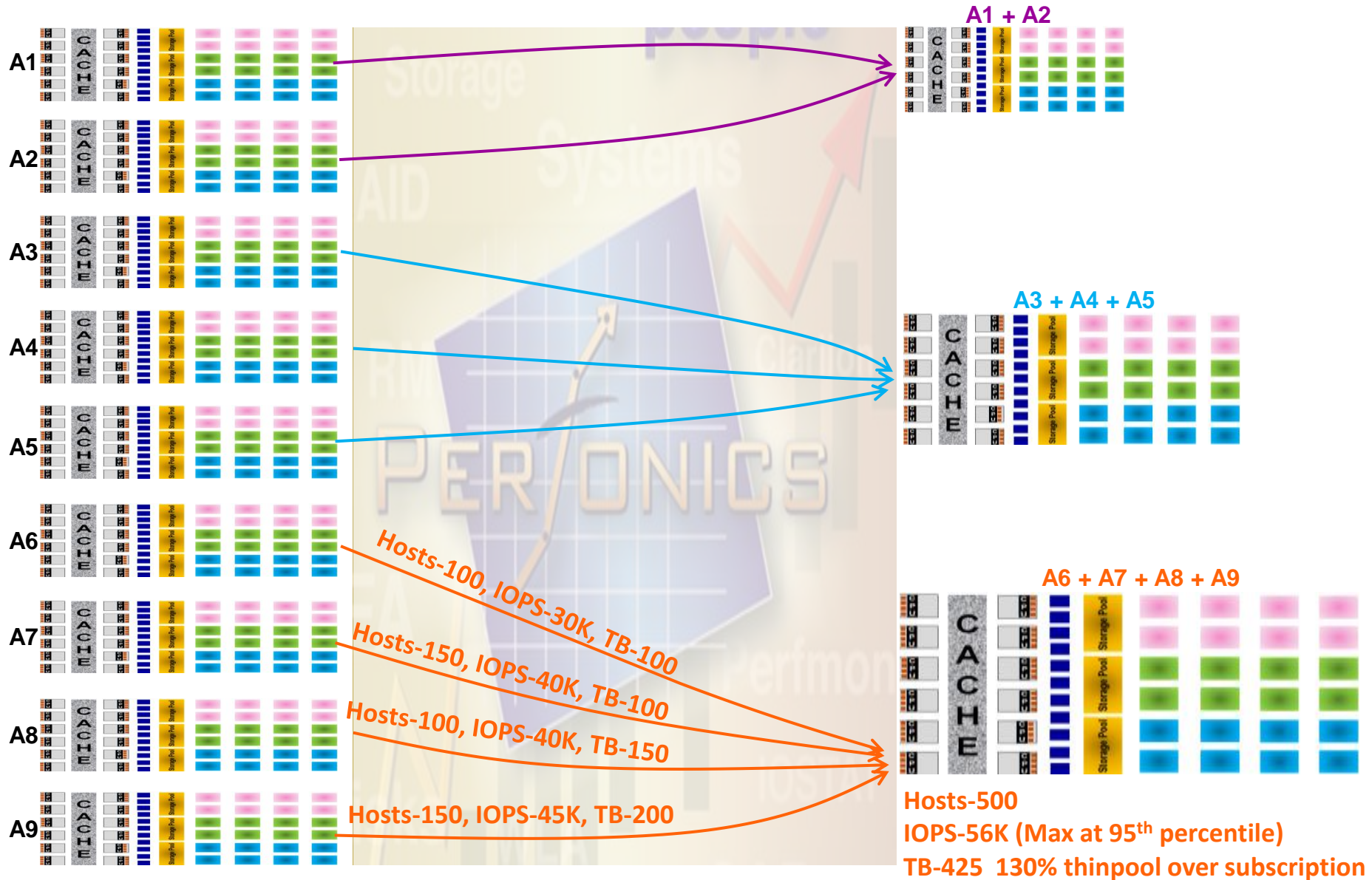
3

Create Target Array's Heat Chart



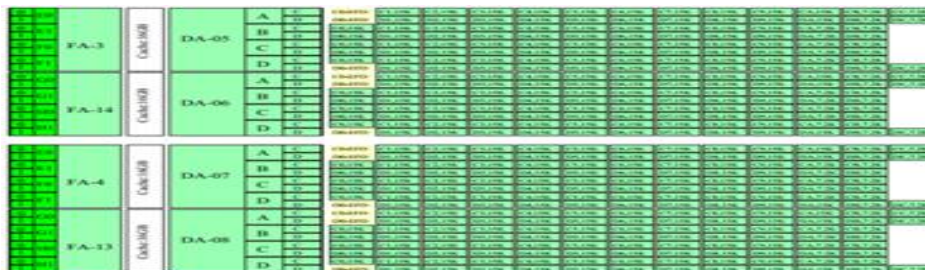
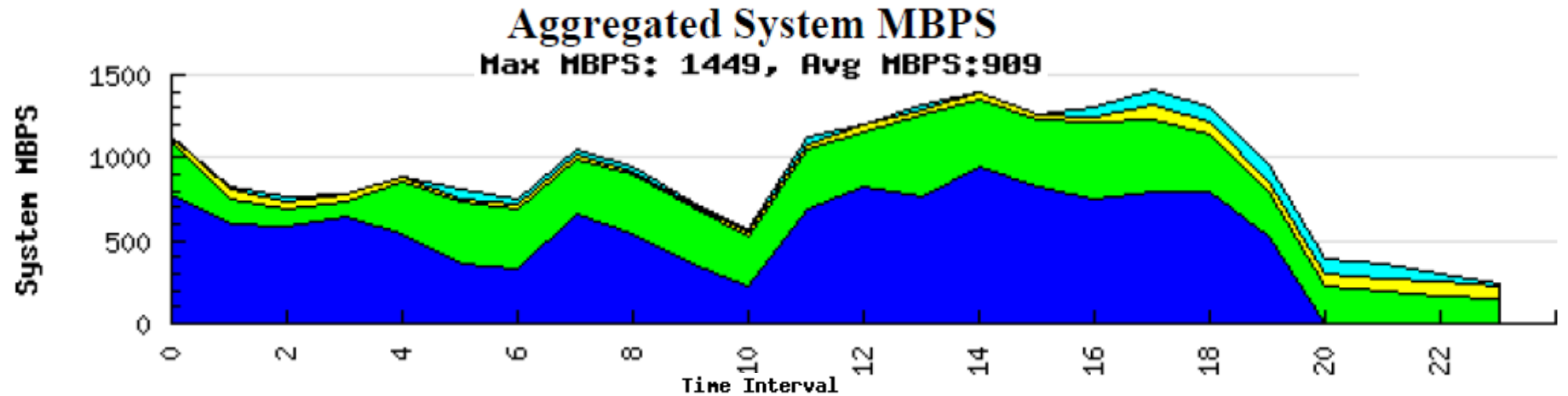
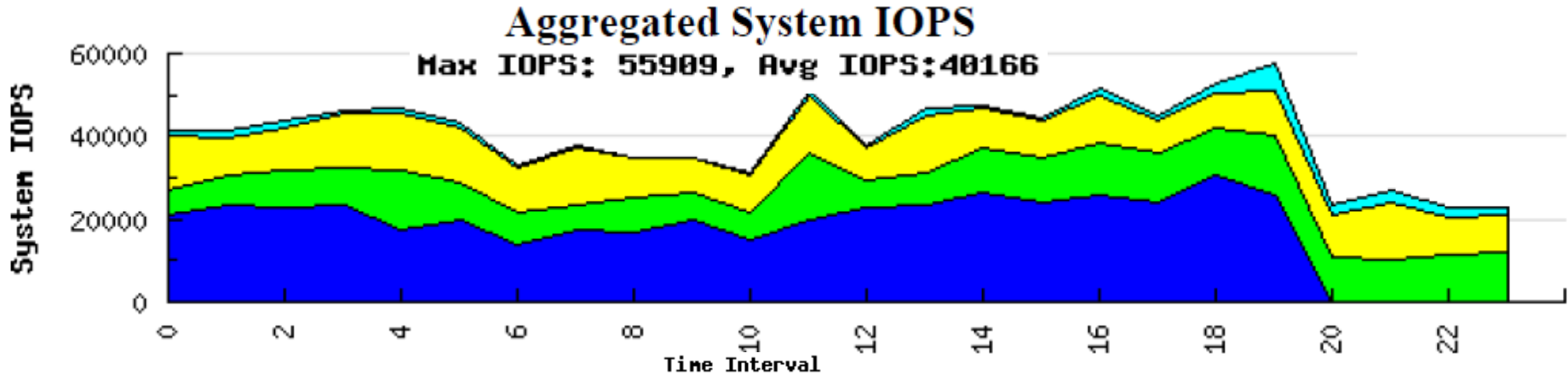
- ❖ **Consistent, Reliable, Repeatable & Fast**
- ❖ **Performs very complex analytics**
- ❖ **Customized to enterprise needs**
- ❖ **Processes large amounts of data**
- ❖ **Vendor agnostic**
- ❖ **Less dependence on expensive human resources**
- ❖ **At a 'fraction of Cost & Time'**

Use Case Array Consolidation Map



Use Case (contd.)

Model of Target Array's Aggregated IOPS, MBPS, Heat Chart...



← Target Array at 50% resource utilization

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Storage Practice

*Floor Discovery, Performance Analysis,
Capacity Planning, Migration &
Consolidation Planning*