

>>> INNOVATE
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HTnM KT Session

RELIABLE TRUSTED CHANGE EXPERTISE AGILITY VALUE D
COMPETITIVE RESULTS INNOVATE INSIGHT CONNECTED
DATA INFORMATION GLOBAL UNSTRUCTURED UNIFIED E

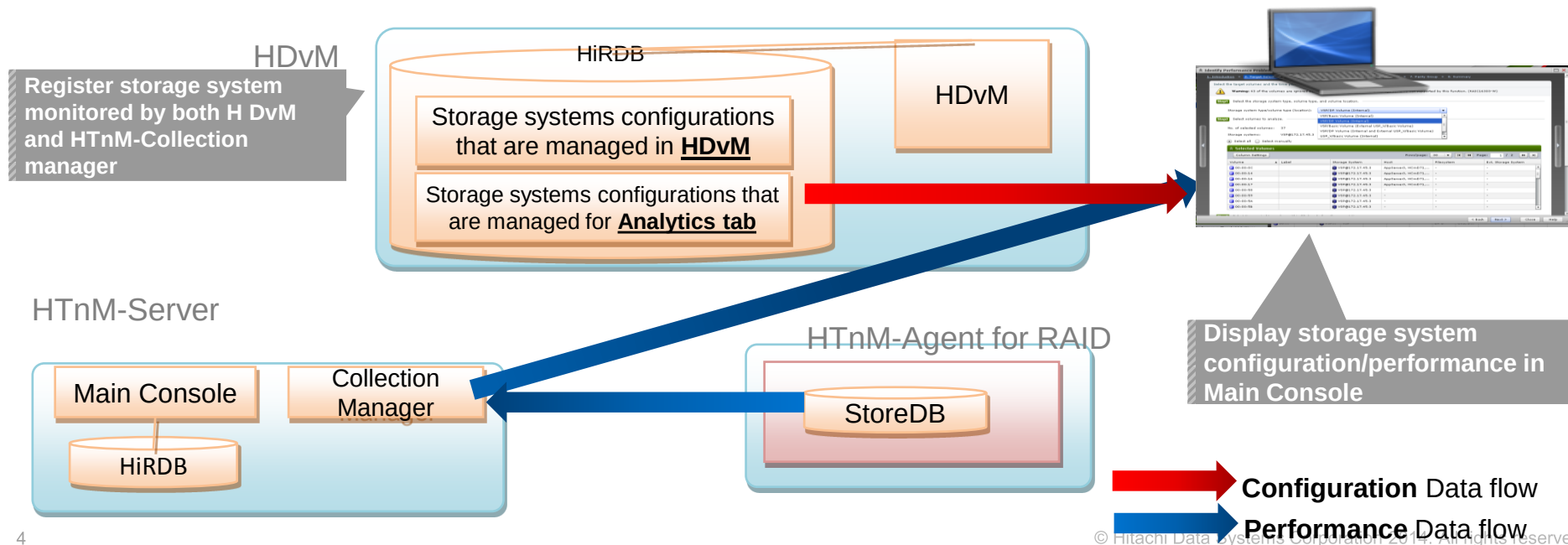
- Tuning Manager Overview (Architecture)
- Performance Basics
- Use Cases
- Walk thru HTnM Performance Reporter
- Walk thru Management Report Using Tuning Manager
- Discussions , Q & A

What Tuning Manager Can do for you?

- [HI Command Tuning Manager](#) , Hitachi Tuning Manager software allows storage administrators help to troubleshoot performance problems, allowing Customer to get the most out of their available storage Metrics and improved planning.
- Check Cache Utilization (Read Hit / write Pending)
- Check Front End Port Utilization (for perf capacity planning)
- Check VSD Processor Utilization (for perf capacity planning)
- Check Array Group Utilization (to check wide Striping)
- Check Pool Response Time (to check the overall health of the pool)
- Check IO Response Time for any given LDEV (to identify Hot Spots)
- Check Read/Write Ratio (Subsystem / Application Trend Analysis)
- Check Read/Write xfer Rate , etc...(Subsystem / Application Trend)
- 3 ➤ Centralized Performance Management Console for all Array Performance

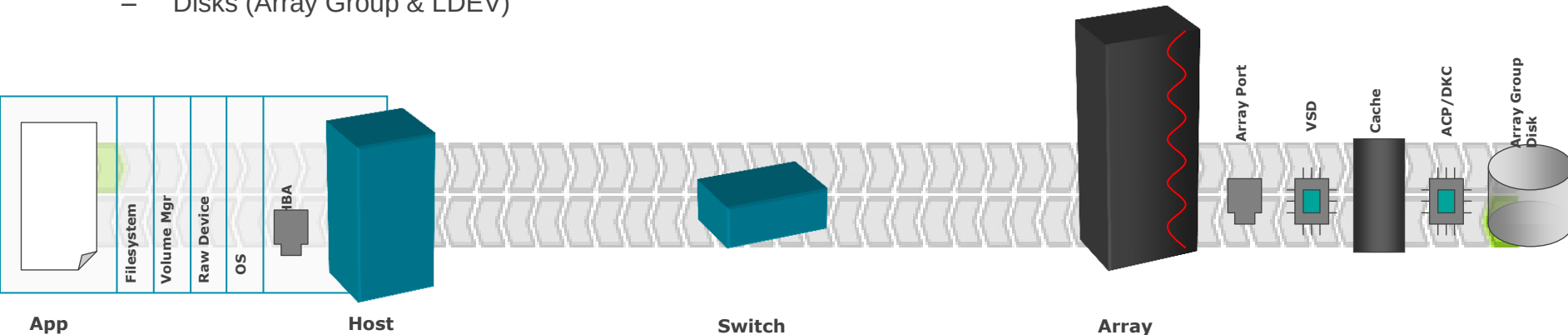
Architecture and Data Flow

HDvM + HTnM can be installed in the same Server



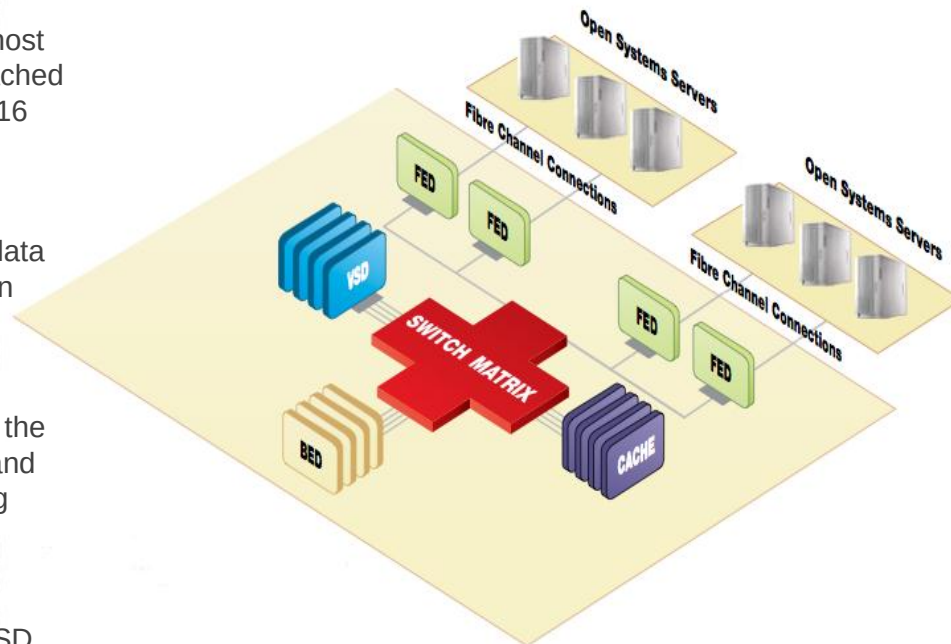
Storage Performance Basics

- The following are key components of an enterprise Hitachi Storage array that can cause performance bottlenecks:
 - Cache
 - FED
 - VSD
 - Pool
 - Disks (Array Group & LDEV)

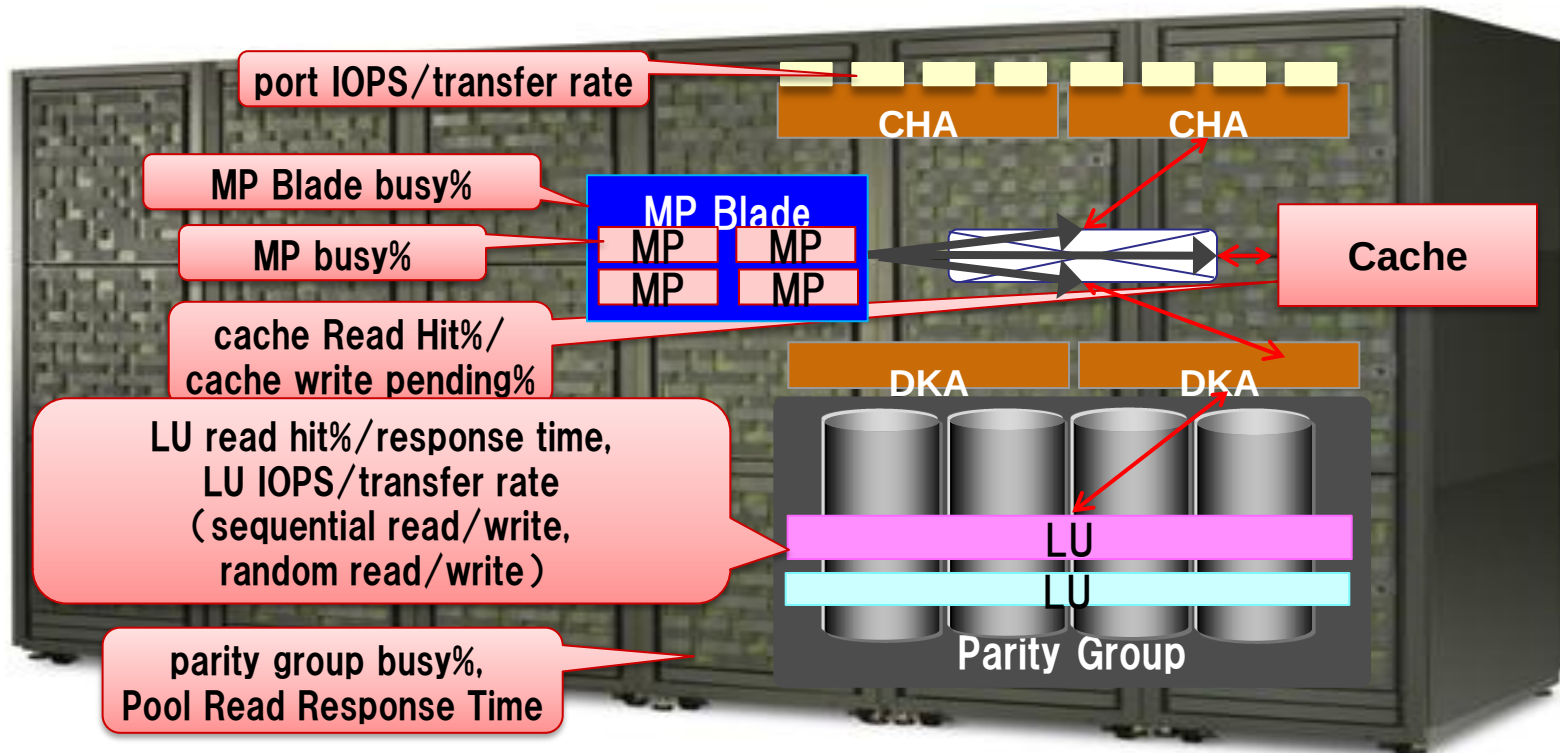


System Configuration Overview

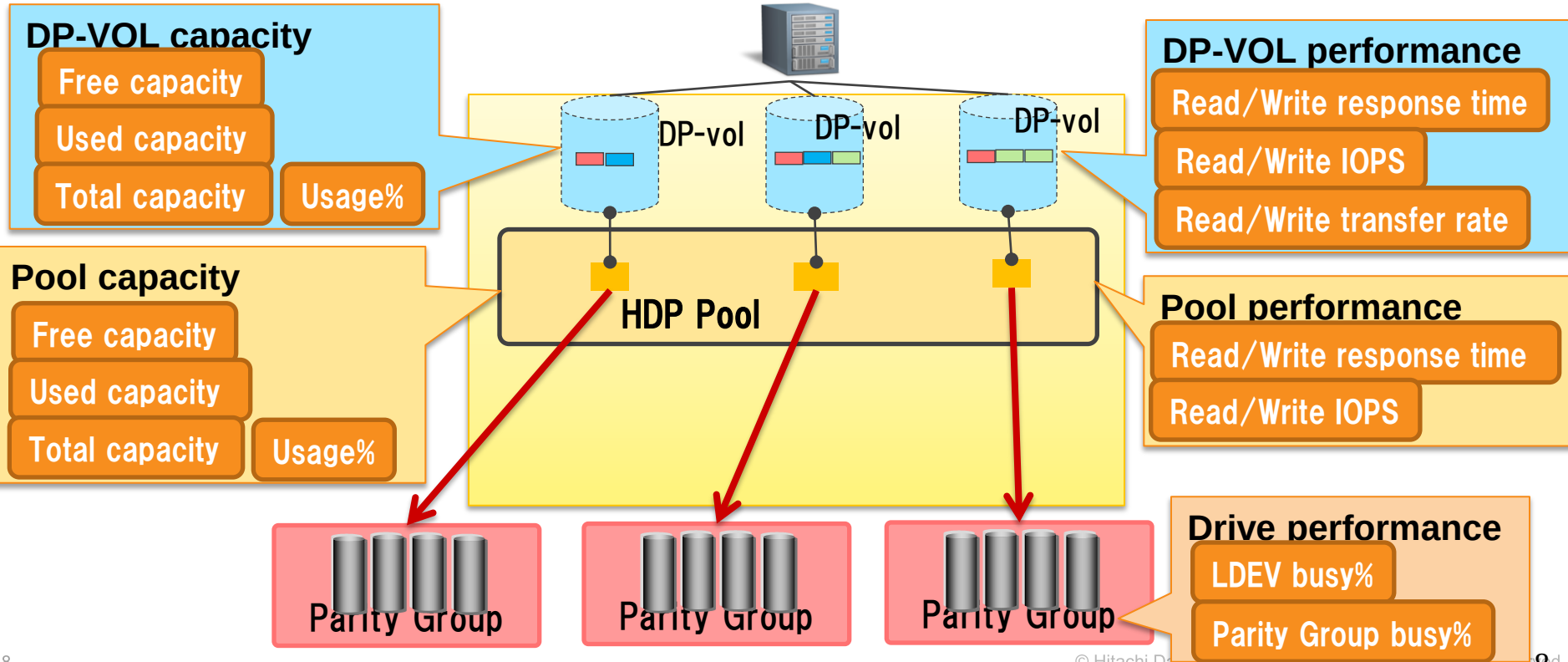
- **FED – Front End Directors**
 - The Front End Director boards provide the interface to host servers and also to any external storage that may be attached to the VSP. FEDs can be either 16 port 8Gb/s FICON or 16 port Fiber Channel
- **VSD – Virtual Storage Directors**
 - A Virtual Storage Director is the central processor and data movement engine. Either two or four VSDs are installed in each chassis, four are used for added performance.
- **Cache**
 - The Cache boards or DCAs (Data Cache Adapter) hold the system memory. This contains transient user IO activity and also configuration details like RAID setup, dynamic tiering status and remote copy operations
- **BED – Back End Director**
 - The Back end Director boards interface to the disk or SSD devices. Each chassis can hold two or four BED boards and BED has eight 6Gb/s SAS links



Key metrics of performance monitoring for VSP



Key metrics available in HDP for USP V/VM and VSP



■ VSP workflow – Metrics / Threshold

#	Resources to check	Metrics	Default threshold & condition	Note
1	Cache 	CWP(Cache Write Pending Usage %)	>30	TrueCopy Asynchronous is not available. This metrics can be ignored.
2		SF(Cache Side File Usage %)	>=10	
3		CWP + SF	>=70	
4	MP Blade 	Processor Busy %	>=40	
5	Parity Group	Busy %	>=50	
6		Read Hit %	<=25	

■ USP, USP V/VM workflow – Metrics / Threshold

#	Resources to check	Metrics	Default threshold & condition
1	Cache 	CWP(Cache Write Pending Usage %)	>30
2		SF(Cache Side File Usage %)	>=10
3		CWP + SF	>=70
4	CHP 	Processor Busy %	>=45
5	Parity Group	Busy %	>=50
6		Read Hit %	<=25
7	DKP 	Processor Busy%	>=40

- ❑ Rules of Thumb are guidelines that can be used to perform initial system tuning
- ❑ These ROTs are intended to be used to identify components that are likely bottlenecks and potential sources of contention
 - ❑ Cache write Pending should be less than 30%
 - ❑ Cache Read hit % should be greater than 25%
 - ❑ VSD Processor Busy % should be less than 40%
 - ❑ Array Group utilization should be less than 50%
 - ❑ Pool Read Response Time should be less than 10 ms (just a guideline . It is average of all LDEV's in the pool)
 - ❑ LDEV utilization depends on the response time requirements of the application
 - ❑ Front End Port xfer rate should less than 800 MB/s
- ❑ These figures may be exceeded during short spikes and performance may still be acceptable, depending on the application, how critical it is etc...

Overall Health of the Subsystem

The screenshot displays the Hitachi Command Suite 7 web interface. The top navigation bar includes tabs for Dashboard, Resources, Analytics (selected), Mobility, Replication, Tasks & Alerts, and Administration. The left sidebar shows a tree view under 'Analytics' with 'Storage Systems' selected. The main content area is titled 'All Storage Systems' and features a 'Summary' section with the following data:

Summary	
No. of Storage Systems	7
No. of Storage Systems with Warnings	0
No. of Storage Systems with OK	0
No. of Storage Systems with Cautions	0
No. of Storage Systems with Unknown	7

Below the summary is a table titled 'Storage Systems' with columns: Storage System, Model, Health Status, Analysis Start Time, Analysis End Time, Health Check viable?, No. of Volumes, Schedule, and No. of Reports. The table contains 7 rows of data:

Storage System	Model	Health Status	Analysis Start Time	Analysis End Time	Health Check viable?	No. of Volumes	Schedule	No. of Reports
VSP@172.17.45.30	VSP	Partially Unknown [View Report]	2014-02-05 21:0...	2014-02-12 20:5...	Green circle icon	1599		3
VSP@172.17.45.35	VSP	n/a	-	-	Green circle icon	1187		0
USP_V@172.17.4...	USP_V	Partially Unknown [View Report]	2013-07-02 21:0...	2013-07-09 20:5...	Green circle icon	1187		1
HUS150@172.17...	HUS150	n/a	-	-	Red triangle icon	66		0
HUS150@172.17...	HUS150	n/a	-	-	Red triangle icon	65		0
HUS130@172.17...	HUS130	n/a	-	-	Red triangle icon	36		0
HUS130@172.17...	HUS130	n/a	-	-	Red triangle icon	34		0

- ❑ The above need to setup once and can be scheduled to report once a week

Overall Health of the Subsystem

Performance Threshold Settings

Select the storage system type, and change the thresholds. The thresholds are saved for each storage system type separately.

Storage system type:

Thresholds for the selected storage system type:

Used by:

Category	Metric	⚠ Caution		⚠ Warning	
		Current Value	Default Value	Current Value	Default Value
Cache Total	Write Pending Rate (%)	30	30	60	60
Cache	Write Pending Rate + Side File Usage Rate (%)	70	70		
	Write Pending Rate (%)	30	30	60	60
	Side File Usage Rate (%)	10	10		
MP Blade	Busy Rate (%)	40	40	80	80
Parity Group	Read Hit (%)	25	25		
	Busy Rate (%)	50	50		

OK Cancel Help

❑ Factory set default thresholds.

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How to Handle Production Problems

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- Last night the Job took too long to complete
- Application is crawling or slow
- Database response time is bad
- How to Balance the VSD's
- How to Balance the Front End Ports
- IOSTAT showing Disk is 100% Busy
- IOSTAT showing the response time is 100 ms and file system is slow
- Etc...

What to ask the end user?

1. Brief Description and Timeline of the Performance Problem

Description. This is very important. Please remember, we do not know your server naming conventions nor which servers are connected to which ports. **Please answer all these questions:**

1. What are the customer's concerns?
2. What server(s) are affected (single or multiple)
3. What are the OS?
4. If the OS is Windows, specify the LUN-to-Drive Letter relationship.
5. Are you in a cluster configuration?
6. Which Ports, Host Storage Domains, LUNs, Array Groups, LDEVs, and/or Pools are having performance issues?
7. What types of applications are affected?
8. Is replication used - TC, TCA, UR, COW, SI?
9. Is there HDS external storage that could be affected by this problem? If yes, provide model-serial number and see [Step 7](#).

Timeline. Sometimes performance is good at certain times of the day - and bad at other times. We need to know the exact times at which it was good - as well as the exact times at which it was bad. **Please answer all these questions:**

1. Does the problem only occur at certain times or days of the week/month?
2. At what time(s) does the problem start?
3. At what time(s) does the problem go away?
4. Detail the exact timeline of all events before, during and after the event

Please be as specific as possible.

9. OS Performance Information

For UNIX hosts, we need:

- iostat
- vxstat (if VxVM is used)
- 'sar -d' output at 15 sec interval for a couple of hours.
 - Note: preferred iostat option for Solaris is: **iostat -xnzC -Td 15**
 - z - Suppresses output for disks without I/O activity
 - C - Includes a line summarising the I/O stats for each controller id

AIX 5.3 or above:

- iostat -dDmT *interval iteration*
- sar -du *interval iteration*

For Windows hosts, we need:

- Windows Performance Monitor data output of all objects of **Physical Disk**. The recommended way to do this is to install [Performance Wizard 1.1.3](#) to collect the Windows performance data. If you use this utility, select the default profile, which is called "Standard Perfmon".

Quick Health Check Table – applies to any escalation

Array Component	Metrics	Lower threshold	Upper threshold
1. Cache	Read Hit %	25%	75%
	Write Pending %	30%	60%
2. FED	IOPS	NA	NA
	Xfer Rate	~800MB/s	~1000MB
3. VSD	MBP Busy %	40%	70%
	MP Busy %	40%	70%
4. Pool	Pool Read Response Time	NA	NA
5. Raid Group	RG Max Busy %	50%	70%
6. LDEV	Response Time	NA	NA
7. Total IOPS	Read + Write IOPS Read + Write MBPS	NA	NA

Note: General purpose only. Actual mileage may vary.

To find a bottleneck and its cause:

1. Identify server and device files based on the application name or database name.
2. Check the I/O performance of the device files, especially the I/O response time.
3. Determine whether the problem exists in a server, switch, or in storage.
4. Check the I/O performance of the storage ports for the device files.
5. Check the I/O performance of other servers connected to the same storage ports.
6. Determine which server is affecting the performance of the storage ports.
7. Check the I/O performance of the parity group for the LDEV.
8. Check the I/O performance of other servers connected to the same parity group.
9. Determine which server is affecting performance of the parity group.
10. Check the I/O performance of the switch ports connected to the server.

Note: General purpose only. Actual mileage may vary.

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Tuning Manager Report Templates Quick View

RELIABLE TRUSTED CHANGE EXPERTISE AGILITY VALUE D
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Templates – Cont...

The screenshot displays the Hitachi Tuning Manager web interface. The top navigation bar includes 'Agents', 'Reports', 'Bookmarks', 'Refresh', 'Alarms', and 'Services'. The left sidebar shows a tree view under 'Products' with 'HealthCheck' and 'RAID' categories. The 'RAID' category is expanded, showing three devices: DA1HDS1200[SVW0153] (selected), DA1HDS1221[SVW0153], and DA1HDS1222[SVW0153]. The main content area is titled 'Hitachi Tuning Manager' and 'HITACHI'. It features a sub-navigation bar with 'Event Monitor', 'Environment Settings', 'Exit', and 'Help'. Below this, a breadcrumb trail shows 'Agents > DA1HDS1200[SVW0153]'. A table of actions is displayed: 'Display Reports', 'Display Alarm Status', 'Properties', 'Event History', 'Bind Alarm Table', 'UnBind Alarm Table', 'Register Bookmark'. The 'Display Reports' section is active, showing a 'Select Report' dialog. The 'Tree type' is set to 'Reports'. A 'Multiselect' checkbox is present. The tree structure is as follows: 'User Reports' (expanded) contains 'ERCOT AMS2000 Reports', 'ERCOT Fabric Reports', and 'ERCOT VSP Reports' (expanded). 'ERCOT VSP Reports' contains '1. Cache' (expanded), which includes 'Cache Read Hit %', 'Cache Usage %', and 'Max Write Pending Usage %'. Other items under 'User Reports' are '2. Front End Port', '3. VSD Reports', '4. RAID Group', '5. LDEV', '6. Subsystem Metrics', '7. HDT Reports', and '8. TC/HUR Reports'. 'System Reports' contains 'RAID'.

Hitachi Tuning Manager

HITACHI

Agents | Reports | Bookmarks | Refresh
Alarms | Services

☐ Multiselect ☒ Update automatically

Products

- HealthCheck
- RAID
 - DA1HDS1200[SVW0153]
 - DA1HDS1221[SVW0153]
 - DA1HDS1222[SVW0153]

Agents > DA1HDS1200[SVW0153]

Display Reports	Display Alarm Status	Properties	Event History
Bind Alarm Table	UnBind Alarm Table	Register Bookmark	

Display Reports > Select Report Refresh

Tree type: Reports

☐ Multiselect

- User Reports
 - ERCOT AMS2000 Reports
 - ERCOT Fabric Reports
 - ERCOT VSP Reports
 - 1. Cache
 - Cache Read Hit %
 - Cache Usage %
 - Max Write Pending Usage %
 - 2. Front End Port
 - 3. VSD Reports
 - 4. RAID Group
 - 5. LDEV
 - 6. Subsystem Metrics
 - 7. HDT Reports
 - 8. TC/HUR Reports
- System Reports
 - RAID

Templates – cont..

The screenshot displays the Hitachi Data Systems management console interface. The top navigation bar includes 'Event Monitor', 'Environment Settings', 'Exit', and 'Help'. The left sidebar contains tabs for 'Agents', 'Reports', 'Bookmarks', 'Alarms', and 'Services', with a 'Refresh' button. Below these tabs, there are checkboxes for 'Multiselect' and 'Update automatically'. The 'Products' section is expanded, showing a tree structure with 'HealthCheck' and 'RAID'. Under 'RAID', three RAID templates are listed: 'DA1HDS1200[SVW0153]', 'DA1HDS1221[SVW0153]', and 'DA1HDS1222[SVW0153]'. The 'DA1HDS1200[SVW0153]' template is selected. The main content area shows the 'Display Reports' tab for the selected template. It includes a sub-tab 'Select Report' and a 'Refresh' button. The 'Tree type' is set to 'Reports'. Below this, there are checkboxes for 'Multiselect' and a tree view of reports. The 'User Reports' section is expanded, showing a list of reports: 'ERCOT AMS2000 Reports', 'ERCOT Fabric Reports', 'ERCOT VSP Reports', '1. Cache', '2. Front End Port', 'FED Details (Tabular)', 'FED Port Details (Tabular)', 'Port IOPS', 'Port Transfer', '3. VSD Reports', '4. RAID Group', '5. LDEV', '6. Subsystem Metrics', '7. HDT Reports', and '8. TC/HUR Reports'. The 'System Reports' section is also expanded, showing 'RAID'.

Agents | Reports | Bookmarks | Refresh
Alarms | Services

☐ Multiselect ☒ Update automatically

Products

- HealthCheck
- RAID
 - DA1HDS1200[SVW0153]
 - DA1HDS1221[SVW0153]
 - DA1HDS1222[SVW0153]

Event Monitor | Environment Settings | Exit | Help

Agents > DA1HDS1200[SVW0153]

Display Reports	Display Alarm Status	Properties	Event History
Bind Alarm Table	UnBind Alarm Table	Register Bookmark	

Display Reports > Select Report Refresh

Tree type: Reports

☐ Multiselect

User Reports

- ERCOT AMS2000 Reports
- ERCOT Fabric Reports
- ERCOT VSP Reports
 - 1. Cache
 - 2. Front End Port
 - FED Details (Tabular)
 - FED Port Details (Tabular)
 - Port IOPS
 - Port Transfer
 - 3. VSD Reports
 - 4. RAID Group
 - 5. LDEV
 - 6. Subsystem Metrics
 - 7. HDT Reports
 - 8. TC/HUR Reports

System Reports

- RAID

Templates – Cont...

The screenshot displays the Hitachi Tuning Manager web interface. The top navigation bar includes 'Event Monitor', 'Environment Settings', 'Exit', and 'Help'. The left sidebar shows a tree view under 'Products' with 'HealthCheck' and 'RAID' categories. The 'RAID' category is expanded, showing three agents: 'DA1HDS1200[SVW0153]', 'DA1HDS1221[SVW0153]', and 'DA1HDS1222[SVW0153]'. The 'DA1HDS1200[SVW0153]' agent is selected. The main content area shows the 'Display Reports' section for this agent. It includes a sub-header 'Agents > DA1HDS1200[SVW0153]' and a table of actions: 'Display Reports', 'Display Alarm Status', 'Properties', 'Event History', 'Bind Alarm Table', 'UnBind Alarm Table', and 'Register Bookmark'. Below this is a 'Display Reports > Select Report' section with a 'Tree type: Reports' dropdown and a 'Multiselect' checkbox. The tree view shows 'User Reports' (ERCOT AMS2000 Reports, ERCOT Fabric Reports, ERCOT VSP Reports) and 'System Reports' (RAID). The 'ERCOT VSP Reports' category is expanded, showing sub-reports: '1. Cache', '2. Front End Port', '3. VSD Reports' (VSD Busy % by MPB, VSD Busy % by Processor ID), '4. RAID Group', '5. LDEV', '6. Subsystem Metrics', '7. HDT Reports', and '8. TC/HUR Reports'.

Hitachi Tuning Manager

Agents | Reports | Bookmarks | Refresh
Alarms | Services

☐ Multiselect ☒ Update automatically

Products

- HealthCheck
- RAID
 - DA1HDS1200[SVW0153]
 - DA1HDS1221[SVW0153]
 - DA1HDS1222[SVW0153]

Agents > DA1HDS1200[SVW0153]

Display Reports	Display Alarm Status	Properties	Event History
Bind Alarm Table	UnBind Alarm Table	Register Bookmark	

Display Reports > Select Report Refresh

Tree type: Reports

☐ Multiselect

User Reports

- ERCOT AMS2000 Reports
- ERCOT Fabric Reports
- ERCOT VSP Reports
 - 1. Cache
 - 2. Front End Port
 - 3. VSD Reports
 - VSD Busy % by MPB
 - VSD Busy % by Processor ID
 - 4. RAID Group
 - 5. LDEV
 - 6. Subsystem Metrics
 - 7. HDT Reports
 - 8. TC/HUR Reports

System Reports

- RAID

Templates – Cont...

The screenshot displays the Hitachi Tuning Manager application. The main window is titled "Hitachi Tuning Manager" and features a top navigation bar with "Event Monitor", "Environment Settings", "Exit", and "Help". Below this, a sub-header shows "Agents > DA1HDS1200[SVW0153]".

On the left side, there is a sidebar with tabs for "Agents", "Reports", "Bookmarks", and "Refresh". Under "Agents", there are sub-tabs for "Alarms" and "Services". A "Multiselect" checkbox is unchecked, and "Update automatically" is checked. The "Products" tree shows "HealthCheck" and "RAID". Under "RAID", three agents are listed: "DA1HDS1200[SVW0153]" (selected), "DA1HDS1221[SVW0153]", and "DA1HDS1222[SVW0153]".

The main content area on the right shows a tree view of reports for the selected agent. The tree is expanded to show "ERCOT VSP Reports" and "RAID Group". The "RAID Group" is further expanded to show a list of metrics:

- 1. Cache
- 2. Front End Port
- 3. VSD Reports
- 4. RAID Group
 - RAID Group (Tabular)
 - RG Max Busy %
 - RG Random Read IOPS
 - RG Random Read Transfer
 - RG Random Write IOPS
 - RG Random Write Transfer
 - RG Read Hit %
 - RG Sequential Read IOPS
 - RG Sequential Read Transfer
 - RG Sequential Write IOPS
 - RG Sequential Write Transfer
- 5. LDEV
- 6. Subsystem Metrics
- 7. HDT Reports
- 8. TC/HUR Reports

Below the tree view, there is a "System Reports" section with a "RAID" sub-item.

Templates – Cont...

Hitachi Tuning Manager

Agents | **Reports** | **Bookmarks** | **Refresh**
Alarms | **Services**

☐ Multiselect ☒ Update automatically

Products

- HealthCheck
- RAID
 - DA1HDS1200[SVW0153]
 - DA1HDS1221[SVW0153]
 - DA1HDS1222[SVW0153]

Agents > DA1HDS1200[SVW0153]

Display Reports	Display Alarm Status	Properties	Event History
Bind Alarm Table	UnBind Alarm Table	Register Bookmark	

ERCOT VSP Reports

- 1. Cache
- 2. Front End Port
- 3. VSD Reports
- 4. RAID Group
- 5. LDEV
 - LDEV (Tabular)
 - LDEV Average Response Time
 - LDEV Performance Summary Report
 - LDEV Random IOPS
 - LDEV Random Transfer
 - LDEV Read Hit %
 - LDEV Read IOPS
 - LDEV Read Response Time
 - LDEV Read Transfer
 - LDEV Sequential IOPS
 - LDEV Sequential Transfer
 - LDEV Write IOPS
 - LDEV Write Response Time
 - LDEV Write Transfer
 - TOP 10 LDEV by Read IOPS
 - TOP 10 LDEV by Write IOPS
- 6. Subsystem Metrics

Templates – Cont...

Hitachi Tuning Manager

[Agents](#) | [Reports](#) | [Bookmarks](#) | [Refresh](#)
[Alarms](#) | [Services](#)

☐ Multiselect ☒ Update automatically

Products

HealthCheck

RAID

DA1HDS1200[SVW0153]

DA1HDS1221[SVW0153]

DA1HDS1222[SVW0153]

[Agents > DA1HDS1200\[SVW0153\]](#)

Display Reports	Display Alarm Status	Properties	Event Histor
Bind Alarm Table	UnBind Alarm Table	Register Bookmark	

Tree type: Reports

☐ Multiselect

User Reports

ERCOT AMS2000 Reports

ERCOT Fabric Reports

ERCOT VSP Reports

1. Cache

2. Front End Port

3. VSD Reports

4. RAID Group

5. LDEV

6. Subsystem Metrics

Total IOPS

Total Read IOPS

Total Read Transfer

Total Transfer

Total Write IOPS

Total Write Transfer

7. HDT Reports

8. TC/HUR Reports

System Reports

RAID

Questions / Discussions

Thank You