



Pulse2011



Best Practices for Monitoring a Vmware Environment

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“Virtualization without Service Management is even more dangerous than not virtualizing in the first place”- Gartner



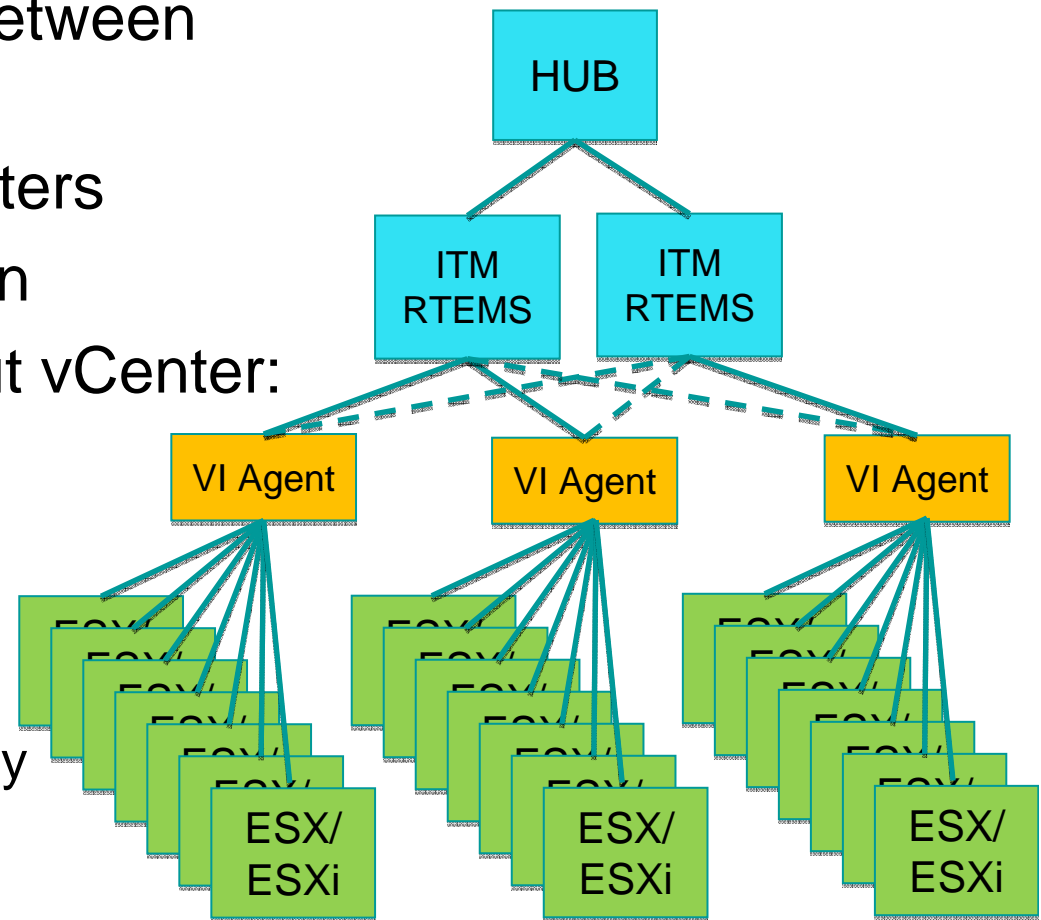
Agenda

- Deploying IBM Tivoli Monitoring w/without Virtual Center
- Deployment Considerations
- Monitoring Vmware
- Historical Collection
- Integration into Business Service Management Solutions
- Future directions



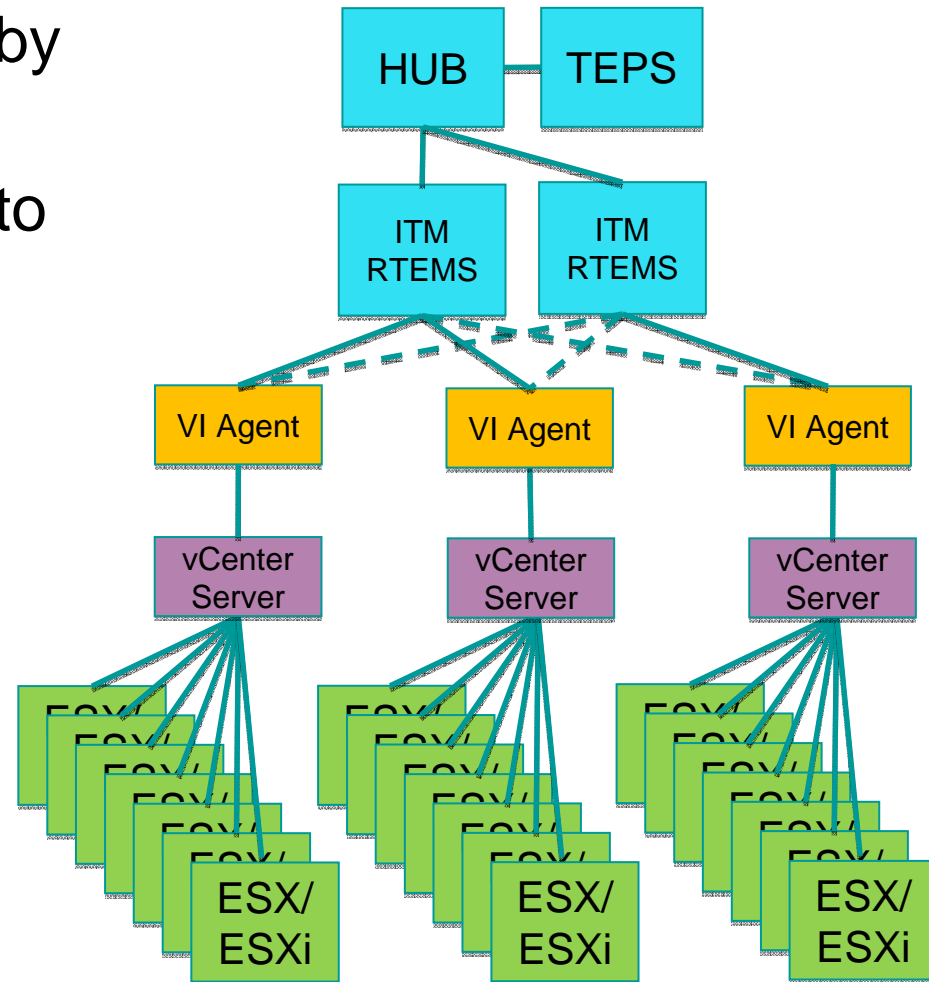
VMware Environment without Virtual Center

- Each ESX/ESXi server functions independently
- Guests/VM's do not move between ESX/ESXi Servers
- No concept of VMware Clusters
- No centralized administration
- IBM Tivoli Monitoring without vCenter:
 - An Agent is installed on Windows or Linux
 - The VMware VI Agent is configured to monitor multiple ESX and ESXi servers remotely
 - Multi-Instance Agent



Monitoring a Traditional VMware Environment

- ESX/ESXi servers managed by vCenter
- Best Practice Deployment is to deploy 1 Agent per vCenter
- Vmotion between similar hardware
- IBM Tivoli Monitoring with vCenter Server:
 - An Agent is installed on Windows or Linux
 - The VMware VI Agent is configured to monitor remotely through vCenter
 - Multi-Instance Agent



Deployment Scalability/Sizing

- Virtual Center
 - For Virtual Center 2.5 the maximums are 200 ESX hosts or 2000 virtual machines.
 - For vCenter 4.1 the maximums are 1000 ESX hosts or 10,000 virtual machines.
 - Agent will have some performance impact on vCenter as it gathers metrics
 - If vCenter has capacity, Agent can be run on vCenter
 - Disk Space...200 Meg for Agent
 - Short Term History Data:
 - 85 Meg for 10 ESX servers
 - 415 Meg for 50 ESX servers
 - 1.6 Gig for 200 ESX servers
 - 4 Gig for 500 ESX servers
- Unless vCenter environments are small, recommend 1 vCenter per VMware VI Agent instance
- Multiple VMware VI Agent instances may run on a server



Expected Utilization

- Small Environment:
 - Less than 15 ESX servers and 150 guests
 - 200 Meg of memory
 - 10% of a CPU (single core is fine)
- Medium Environment:
 - 16 to 50 ESX servers and 150 to 750 guests
 - 450 Meg of memory
 - 20% of a CPU (single core for smaller environments, but dual core might be necessary for larger environments or heavily utilized systems)
- Large Environment:
 - 50 to 200 ESX servers and 750 to 3000 guests
 - 750 Meg of memory
 - 30% to 50% of a CPU....dual core required for peak loads
- Extra Large Environments:
 - 200 + ESX servers and 3000+ guests
 - 1 Gig of memory
 - 50% to 100% of a CPU....dual core required for peak loads



Monitoring Recommendations

- Out-of-the-box Best Practice Situation to monitor
 - Resource Pool CPU and Memory utilization (> 90%)
 - Disk and Network I/O (use adaptive)
 - ESX/ESXi sustained CPU and memory utilization (>90%)
 - VM utilization including CPU Ready (CPU ready>20%)
 - Data Store utilization (>90%)
- Clone the out-of-the-box Situations
- In addition to the out-of the box Situations, monitor:
 - Cluster CPU and Memory utilization using Effective CPU and Memory utilization (>90%)
 - Monitor to ensure VM Tools are installed and up to date
 - Use TCR Reports or OMNibus to monitor high VMotion rates for specific servers and clusters
- Key workspaces include Top 5/Bottom 5 report shown
- TCR Reports



Other Monitoring Considerations

- Adaptive Monitoring for attributes that are difficult to predict:
 - Disk Read/Write and Number Read/Number Write
 - Network I/O
 - For uncapped Resource Pools, use Adaptive Monitoring to ensure normal behavior
- Other Key Attributes:
 - Percent Ready...should never be above 20%. Recommend WARNING at 10% and CRITICAL at 20% sustained utilization
 - Hyperthreading CPUs can drive Percent Ready higher...can be disabled in BIOS.
 - Disk Latency including queue, device, and kernel latency
 - Balloon Usage...should be near zero
 - ESX Swap Used should be near zero
 - Resource Pool Usage
 - Check if Resource Pool usage is greater than the Reservation
 - Percent Effective CPU and Memory Utilization for Clusters





TCR Reports

Tivoli Integrated Portal - Windows Internet Explorer
 https://absm-sun1:16316/ibm/console/login.do?action=secure

Tivoli Integrated Portal

View: All tasks Welcome tipadmin Help | Logout IBM

Common Repo... --- Select Action ---

Work with reports
 Cognos Viewer - VMware VI Number of Workloads for Clusters tipadmin

Keep this version Add this report

VMware VI Number of Workloads for Clusters

Data Center: RTP
 Clusters: Ben's_BladeCenter
 VM Profile: Average
 Date Range for computing VM Profile: Last 7 days
 Buffer: CPU(GHz) 2, Datastore Space(GB) 5, Memory(GB) 256

Go Show more parameters

WORKLOAD PLACEMENT FOR CLUSTERS - AVERAGE DEPLOYED VM PROFILE

Resource	VM Profile based on average resource used by all VMs on this cluster	Available Cluster Capacity(before applying Buffer)	Buffer	Available Cluster Capacity(after applying Buffer)	Number of VMs that can be placed on the cluster based on Average VM Profile
CPU (GHz)	0.513	23.12	2	21.12	41
Datastore Space Usage (GB)	0	1,148,244	5	1,143,244	999,999,999
Memory Usage (MB)	1,389,729	57,983,324	256	57,727,324	41
Number of VMs that can be added to this cluster					41

Capacity for VM's →

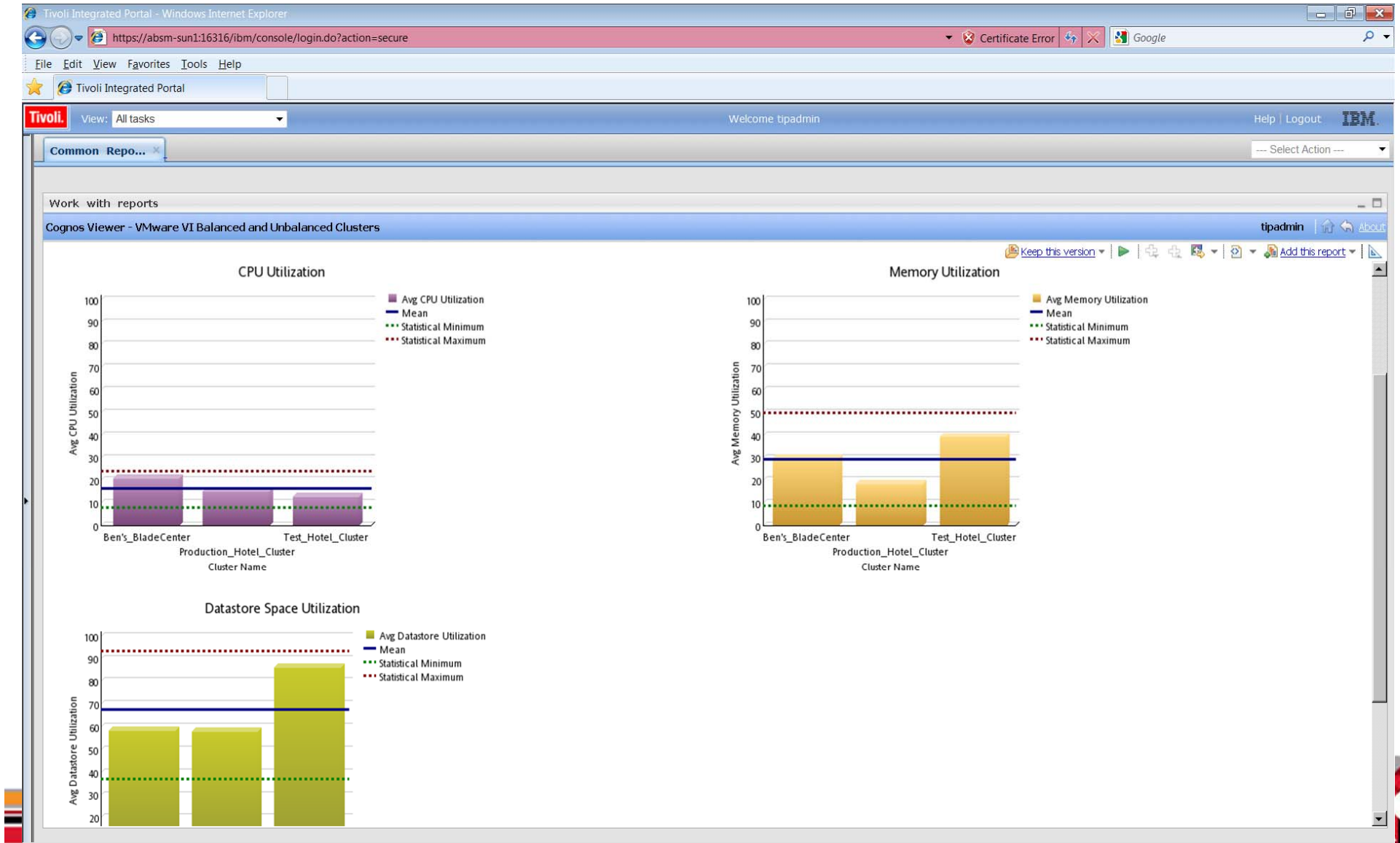
This report lets the user do what-if analysis to determine the number of additional virtual machines that can be placed on a cluster based on the average historical usage and other user inputs. VM Profile is the amount of resources that would be consumed by VMs in the cluster averaged for the Data Center and Cluster chosen. Available Cluster Capacity is the amount of resources available on a whole for the cluster after applying the Buffer value. Buffer is the amount of resources that cannot be allocated. Number of VMs = Available Capacity / VM Profile. Number of VMs that can be added to this cluster is the minimum of the values calculated for each resource. A value of 999,999,999 for Number of VMs indicate a division by zero condition. To eliminate or select specific servers on this cluster for this analysis, [click here](#).

Jan 24, 2011 1 9:11:19 PM

Top Page up Page down Bottom



Balanced Clusters



Have there been significant (20%) changes in performance in the last week?

Viewer - VMware VI Host Servers Weekly Comparison tipadmin

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Tivoli software **IBM**

VMware VI: Weekly Comparison of Key Metrics for Host Servers

Data Center: Cluster: Date Range: Percent Change:

Cluster A

itm6-tvm1.tivlab.raleigh.ibm.com

Month	Week of Month	Avg Number of VMs	Avg Number of VMs ON	Avg Overall CPU Utilization (%)	Avg VM CPU Percent Ready (%)	CPU Usage (GHz)	Avg Overall Memory Utilization (%)	Avg Network I/O (KBps)	Avg Datastore Space Used (GB)	Avg Datastore Space Used (%)
January	1	17	2	3.29	0	0.7690375	26.37	37.15	136.38475586	32.49
	2	17	2	2.7	0	0.631125	27	32.53	136.43254883	32.5

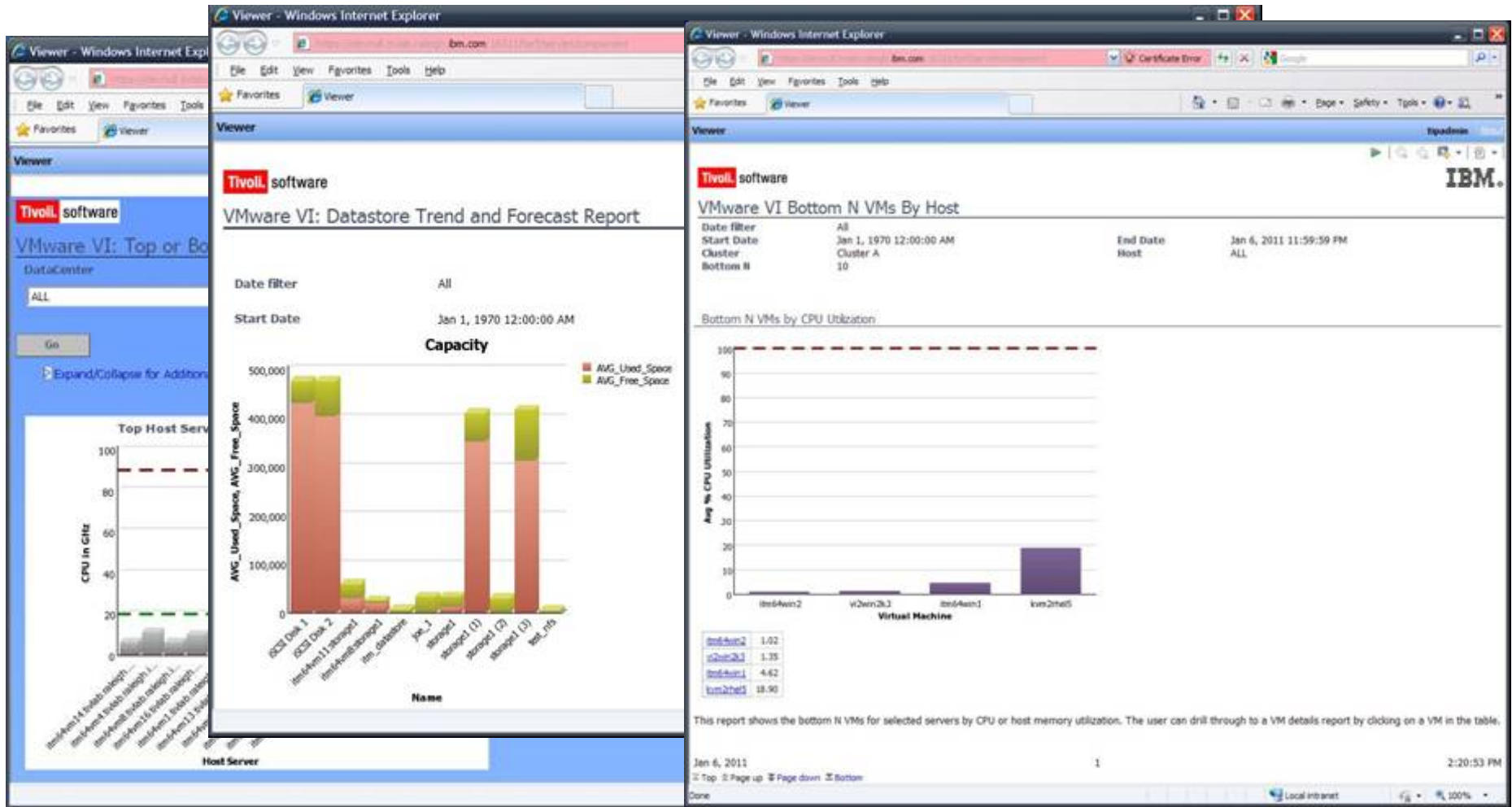
itm6-tvm2.tivlab.raleigh.ibm.com

Month	Week of Month	Avg Number of VMs	Avg Number of VMs ON	Avg Overall CPU Utilization (%)	Avg VM CPU Percent Ready (%)	CPU Usage (GHz)	Avg Overall Memory Utilization (%)	Avg Network I/O (KBps)	Avg Datastore Space Used (GB)	Avg Datastore Space Used (%)
January	1	18	2	1.51	0	0.3529625	43.78	19.06	276.62758789	72.33
	2	18	2	1.4	0	0.32725	43.12	23.82	276.72317383	72.33

This report compares key metrics of host servers from week to week. If there is a significant change in value from one week to another, that field is highlighted.

Ensure Application Availability

How well used are resources in the environment?



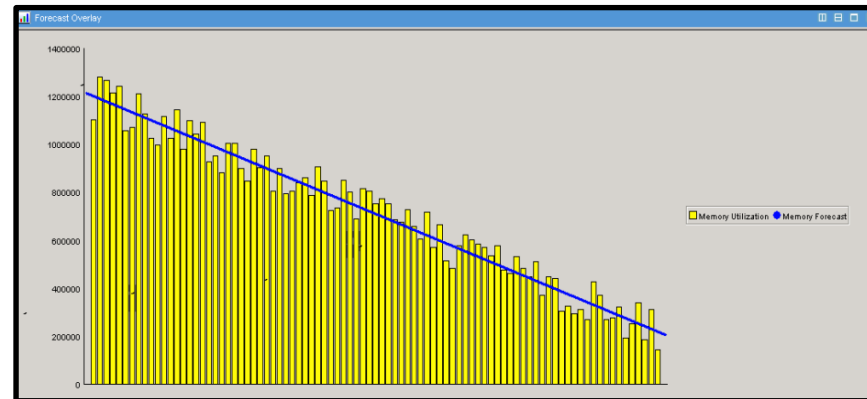
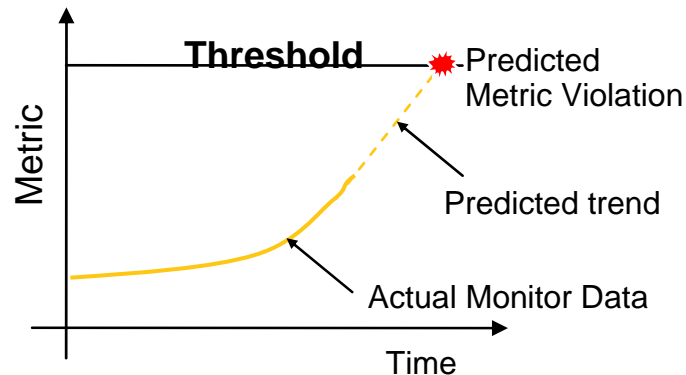
Optimize Resource Utilization



Predictive Trending for VMWare data

Leverage collected data to spot trends and highlight emerging concerns

- Hands off capacity monitoring
 - Automates performance analysis and reporting
 - Prediction of application bottlenecks
 - Creation of alerts for potential service threats.
- “What will my resources look like tomorrow, next week, next month or next year?”
 - “What IT Resources should I worry about next?”
 - “Will I have enough capacity to get me through Monday?”



Forecast Status					7 Day Forecast		30 Day Forecast		90 Day Forecast	
System Name	Confidence	Strength	Number Of Samples		System Name	Data	System Name	Data	System Name	Data
TestWinXP-7	48	1	89		TestWinXP-7	829	TestWinXP-7	987	TestWinXP-7	1398
TestWinXP-8	83	3	89		TestWinXP-8	3400	TestWinXP-8	4231	TestWinXP-8	6397
TestWinXP-9	87	3	89		TestWinXP-9	3642	TestWinXP-9	4484	TestWinXP-9	6682
TestWinXP-10	90	3	89		TestWinXP-10	4370	TestWinXP-10	5395	TestWinXP-10	8068
TestWinXP-4	100	3	89		TestWinXP-4	2318	TestWinXP-4	2870	TestWinXP-4	4310
TestWinXP-5	89	3	89		TestWinXP-5	2206	TestWinXP-5	2718	TestWinXP-5	4054
TestWinXP-6	86	3	89		TestWinXP-6	925	TestWinXP-6	1151	TestWinXP-6	1741
TestWin2003-2	82	3	89		TestWin2003-2	5094	TestWin2003-2	6185	TestWin2003-2	9032
TestWin2003-3	89	3	89		TestWin2003-3	3430	TestWin2003-3	4229	TestWin2003-3	6311
TestWin2003-4	73	3	89		TestWin2003-4	2519	TestWin2003-4	3135	TestWin2003-4	4740



Performance Analyzer for:

- CPU Trends
- Memory Utilization
- Disk Utilization
- Network Utilization

The screenshot displays the IBM Performance Analyzer interface for Physical Server CPU Utilization Forecast. The main window shows an overview table with columns for VM Agent Node, Server Name, Confidence, Strength, Number Of Samples, Time To Warning Threshold, and Time To Critical Threshold. Below this are three forecast panels: 7 Day Forecast, 30 Day Forecast, and 90 Day Forecast, each with its own data table.

VM Agent Node	Server Name	Confidence	Strength	Number Of Samples	Time To Warning Threshold	Time To Critical Threshold
VM.absm-vc-absm-255a.tivlab:ESX	absm-255a.tivlab.raleigh.ibm.com	18	1	45	84	105
VM.absm-vc-benblade13.tivlab:ESX	benblade13.tivlab.raleigh.ibm.com	62	2	45	120	140
VM.absm-vc-absm-445a.tivlab:ESX	absm-445a.tivlab.raleigh.ibm.com	41	1	45	258	295
VM.absm-vc-benblade03.tivlab:ESX	benblade03.tivlab.raleigh.ibm.com	8	1	45	3311	3745
VM.absm-vc-absm-365b.tivlab:ESX	absm-365b.tivlab.raleigh.ibm.com	28	1	45	517	587
VM.absm-vc-benblade12.tivlab:ESX	benblade12.tivlab.raleigh.ibm.com	36	1	45	50	60
VM.absm-vc-absm-366a.tivlab:ESX	absm-366a.tivlab.raleigh.ibm.com	13	1	45	NEVER	NEVER
VM.absm-vc-benblade02.tivlab:ESX	benblade02.tivlab.raleigh.ibm.com	43	1	45	NEVER	NEVER
VM.absm-vc-benblade04.tivlab:ESX	benblade04.tivlab.raleigh.ibm.com	62	2	45	NEVER	NEVER
VM.absm-vc-benblade05.tivlab:ESX	benblade05.tivlab.raleigh.ibm.com	63	2	45	NEVER	NEVER
VM.absm-vc-benblade06.tivlab:ESX	benblade06.tivlab.raleigh.ibm.com	70	3	45	NEVER	NEVER
VM.absm-vc-benblade07.tivlab:ESX	benblade07.tivlab.raleigh.ibm.com	62	2	45	NEVER	NEVER
VM.absm-vc-benblade08.tivlab:ESX	benblade08.tivlab.raleigh.ibm.com	11	1	45	NEVER	NEVER
VM.absm-vc-benblade09.tivlab:ESX	benblade09.tivlab.raleigh.ibm.com	79	3	45	NEVER	NEVER
VM.absm-vc-benblade10.tivlab:ESX	benblade10.tivlab.raleigh.ibm.com	61	2	45	NEVER	NEVER
VM.absm-vc-benblade11.tivlab:ESX	benblade11.tivlab.raleigh.ibm.com	48	1	45	NEVER	NEVER
VM.absm-vc-absm-365a.tivlab:ESX	absm-365a.tivlab.raleigh.ibm.com	60	2	45	NEVER	NEVER

VM Agent Node	Server Name	Data
VM.absm-vc-absm-255a.tivlab:ESX	absm-255a.tivlab.raleigh.ibm.com	55
VM.absm-vc-absm-365a.tivlab:ESX	absm-365a.tivlab.raleigh.ibm.com	-50
VM.absm-vc-absm-365b.tivlab:ESX	absm-365b.tivlab.raleigh.ibm.com	11
VM.absm-vc-absm-366a.tivlab:ESX	absm-366a.tivlab.raleigh.ibm.com	11
VM.absm-vc-absm-445a.tivlab:ESX	absm-445a.tivlab.raleigh.ibm.com	18
VM.absm-vc-benblade02.tivlab:ESX	benblade02.tivlab.raleigh.ibm.com	-18
VM.absm-vc-benblade03.tivlab:ESX	benblade03.tivlab.raleigh.ibm.com	4
VM.absm-vc-benblade04.tivlab:ESX	benblade04.tivlab.raleigh.ibm.com	-47
VM.absm-vc-benblade05.tivlab:ESX	benblade05.tivlab.raleigh.ibm.com	-57
VM.absm-vc-benblade06.tivlab:ESX	benblade06.tivlab.raleigh.ibm.com	-1
VM.absm-vc-benblade07.tivlab:ESX	benblade07.tivlab.raleigh.ibm.com	-13
VM.absm-vc-benblade08.tivlab:ESX	benblade08.tivlab.raleigh.ibm.com	0
VM.absm-vc-benblade09.tivlab:ESX	benblade09.tivlab.raleigh.ibm.com	-40
VM.absm-vc-benblade10.tivlab:ESX	benblade10.tivlab.raleigh.ibm.com	-20
VM.absm-vc-benblade11.tivlab:ESX	benblade11.tivlab.raleigh.ibm.com	-7
VM.absm-vc-benblade12.tivlab:ESX	benblade12.tivlab.raleigh.ibm.com	62
VM.absm-vc-benblade13.tivlab:ESX	benblade13.tivlab.raleigh.ibm.com	33

VM Agent Node	Server Name	Data
VM.absm-vc-absm-255a.tivlab:ESX	absm-255a.tivlab.raleigh.ibm.com	83
VM.absm-vc-absm-365a.tivlab:ESX	absm-365a.tivlab.raleigh.ibm.com	-130
VM.absm-vc-absm-365b.tivlab:ESX	absm-365b.tivlab.raleigh.ibm.com	19
VM.absm-vc-absm-366a.tivlab:ESX	absm-366a.tivlab.raleigh.ibm.com	11
VM.absm-vc-absm-445a.tivlab:ESX	absm-445a.tivlab.raleigh.ibm.com	34
VM.absm-vc-benblade02.tivlab:ESX	benblade02.tivlab.raleigh.ibm.com	-106
VM.absm-vc-benblade03.tivlab:ESX	benblade03.tivlab.raleigh.ibm.com	6
VM.absm-vc-benblade04.tivlab:ESX	benblade04.tivlab.raleigh.ibm.com	-183
VM.absm-vc-benblade05.tivlab:ESX	benblade05.tivlab.raleigh.ibm.com	-203
VM.absm-vc-benblade06.tivlab:ESX	benblade06.tivlab.raleigh.ibm.com	-37
VM.absm-vc-benblade07.tivlab:ESX	benblade07.tivlab.raleigh.ibm.com	-116
VM.absm-vc-benblade08.tivlab:ESX	benblade08.tivlab.raleigh.ibm.com	-8
VM.absm-vc-benblade09.tivlab:ESX	benblade09.tivlab.raleigh.ibm.com	-120
VM.absm-vc-benblade10.tivlab:ESX	benblade10.tivlab.raleigh.ibm.com	-85
VM.absm-vc-benblade11.tivlab:ESX	benblade11.tivlab.raleigh.ibm.com	-32
VM.absm-vc-benblade12.tivlab:ESX	benblade12.tivlab.raleigh.ibm.com	118
VM.absm-vc-benblade13.tivlab:ESX	benblade13.tivlab.raleigh.ibm.com	64

Hub Time: Mon, 01/24/2011 09:03 PM Server Available Physical Server CPU Utilization Forecast - itmx24.tivlab.raleigh.ibm.com - SYSADMIN *ADMIN MODE*



Historical Collection Recommendations

- **Historical Collection Best Practices paper:**
<https://www.ibm.com/developerworks/wikis/display/tivolimonitoring/Historical+Collections+Best+Practices+in+Tivoli+Monitoring+6.2.2>
- **VMware VI Reports:**
 - <http://www-01.ibm.com/software/brandcatalog/portal/opal/details?catalog.label=1TW10TM7I>
- **Always consider data use before enabling historical collection**
- **Complete Warehouse Planning Spreadsheet:**
 - <http://www-01.ibm.com/software/brandcatalog/ismlibrary/details?catalog.label=1TW10TM1Y>
- **6.2.2 Offers Granular Warehousing (configuration per Agent)**
 - Filter out CD/DVD and Floppy Drive Data....see next slide
 - If Data Stores are shared across multiple ESX servers, consider filtering
- **Performance Analyzer uses Summarized Data**
- **Adaptive Monitoring/Dynamic Thresholding uses detailed data**
- **Out of the box TCR reports are written for Summarized data**



Historical Collection Filtering

VM Name	VM HostName	Connected	Description	Access	Capacity	Removable
absm-win32d	Unavailable	No	Floppy Drive 1	Read/Write	Unavailable	removable
absm-win32d	Unavailable	Yes	CD/DVD Drive 1	ReadOnly	Unavailable	removable
absm-win32d	Unavailable	Yes	Hard Disk 1	Read/Write	20480	non-removable
absm-rhx32o (ITM sandbox)	Unavailable	No	Floppy Drive 1	Read/Write	Unavailable	removable
absm-rhx32o (ITM sandbox)	Unavailable	No	CD/DVD Drive 1	ReadOnly	Unavailable	removable
absm-rhx32o (ITM sandbox)	Unavailable	Yes	Hard Disk 1	Read/Write	25600	non-removable

Filter out Removable Storage

The screenshot shows the 'History Collection Configuration' dialog box with the 'Filter' tab selected. The 'Formula' field contains the expression 'removable'. Below the formula field, a list of filter rules is visible, with the first rule being '1 | v | != removable'. A blue arrow points from the text 'Filter out Removable Storage' to this rule. At the bottom of the dialog, the 'Formula Capacity' is displayed as 24% with a green progress bar. The 'OK' button is highlighted.

Historical Collection Recommendations

■ Setup the following historical collections for TCR:

Hourly and Daily Summarization for:

- KVM SERVER CPU
- KVM SERVER
- KVM SERVER MEMORY
- KVM SERVER DATASTORE
- KVM SERVER DISK
- KVM SERVER NETWORK
- KVM VM CPU
- KVM VM DISK Filter out Floppy and CD/DVD data
- KVM VM MEMORY
- KVM VM NETWORK
- KVM VM PARTITION
- KVM VIRTUAL MACHINES
- KVM VM DATASTORE UTILIZATION
- KVM VIRTUAL MACHINES
- KVM CLUSTERS
- KVM CLUSTERED SERVERS
- KVM CLUSTERED VIRTUAL MACHINES
- KVM CLUSTERED RESOURCE POOLS
- KVM CLUSTERED VIRTUAL MACHINES
- KVM RESOURCE POOL CPU
- KVM RESOURCE POOL GENERAL
- KVM RESOURCE POOL MEMORY
- KVM DATASTORES



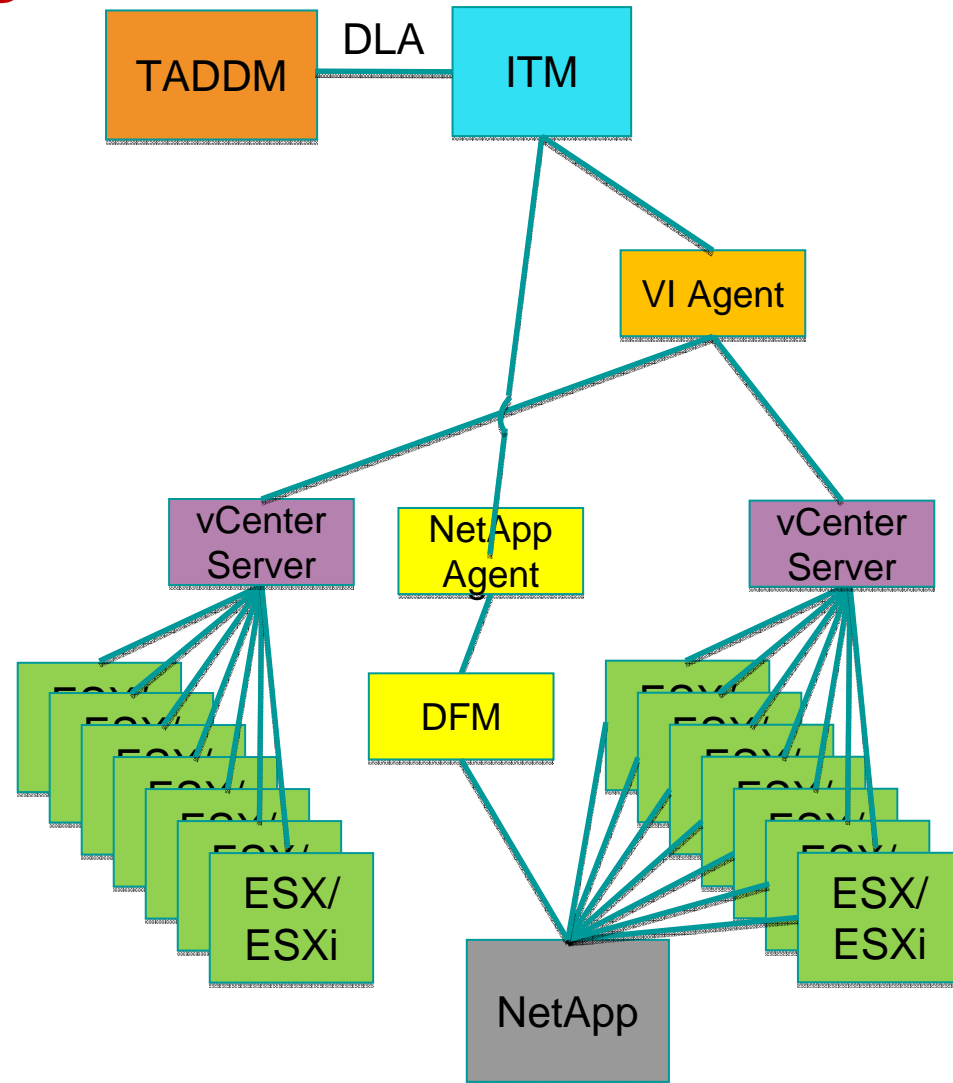
Warehouse Sizing

- Using the following retention settings:
 - Event data kept for 5 days
 - Other attributes, keep detailed data for 7 days, Hourly for 14 days, and Daily for 60 days
- Small: 15 ESX servers, 150 Guests
 - 650 Meg
- Medium Environment: 50 ESX servers, 500 guests
 - 3.2 Gig
- Large Environment: 200 ESX servers and 2000 guests
 - 13 Gig
- Extra Large Environments: 500 ESX servers and 5000 guests
 - 33 Gig
- Attached Warehouse Planning spreadsheet allows you to adjust the number of ESX servers using cell B16. Spreadsheet is based on 10 Virtual Machines per ESX/ESXi server, but can be adjusted:



Additional Integrations

- NetApp Storage Agent
- TotalStorage Productivity Center
- ITM O/S agent or agentless
- ITCAM
- TADDM Discovery
 - TADDM DLA discovers the vCenter environment/topology
- IBM Director Integration
 - ITM Agent provides integration with the Director Server
 - Allows for Management of VMware resources
 - Historical Collection of HW data



Future Directions

- TIP Dashboards
- Storage, Network and Server data integration
- Consolidation/migration analytics

The information is not a commitment, promise, or legal obligation to deliver any material, code or functionality. The development, release, and timing of any features or functionality described for our products remains at our sole discretion





Tivoli Integrated Portal - Mozilla Firefox: IBM Edition

File Edit View History Bookmarks Tools Help

https://itmx21a.tivlab.raleigh.ibm.com:16311/ibm/console/login.do?action=secure

Tivoli Integrated Portal

View: All tasks Welcome cesar

Cluster Dashboard Storage Details

Datstores

Resource View

Name	Status	Used(GB)	Used Space(%)
absmfastt	✗	591.19	87%
itmx33	✓	104.72	39%
sapm-netapp2_nfs	✓	77.84	13%
sapm-netapp1a_nfs	✗	72.81	92%
sapm-netapp1	✗	164.8	95%

12 items

Situation Event List

Resource View

Severity	Situation Name	Display Item	DateTime
CRITICAL	KVM_Datastore_Usage_ sapm-netapp		02/23/11 09:39:50

1 items

Volumes

Resource View

Name	Size(GB)	Status	Used Space(%)	Used(GB)
sapm-netapp1a:/vol1	100.0	2.6	91%	72.8

1 items

Capacity

Chart Options

sapm-netapp1a_nfs

Percent Space Used

Change History

Type	Created
VMWareDataStore sapm-netapp1a_nfs	Created

Feb 21, 2011 8:56 AM

Volume Metrics

Chart Options

sapm-netapp2:/vol2

Percent Space Used

List of datastores of Austin_Prod Cluster

List of storage problems (situations) associated with sapm-netapp1a_nfs datastore.

Netapp NAS volume associated with sapm-netapp1a_nfs datastore

Real-time or historical graph for selected sapm-netapp1a_nfs datastore performance or capacity metrics. In this example graph of Space Used for sapm-netapp1a_nfs

List of changes associated with sapm-netapp1a_nfs datastore

Real-time or historical graph for Netapp volume associated with sapm-netapp1a_nfs datastore

start

demo Cesar Araujo - Inb... http://itmx13.tivlab... Lotus Sametime... Microsoft Office... TEP links.doc - Mic... Tivoli Integrated Po...

100%

1:41 PM Wednesday 2/23/2011



QUESTIONS?



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