

# VM Performance Monitoring/Logging

Do not excerpt or reproduce

Do not excerpt or reproduce

- Although VI3 works proactively to avoid resource contention, maximizing performance requires benchmarking, analysis, and ongoing monitoring
- Before you begin monitoring, you need to define a performance envelope for each VM
  - Performance envelopes will have resource dependencies
  - Performance graphs and esxtop are primary interfaces for monitoring VM resource consumption and availability
- **Virtualization assessments are critical to success!**

For personal informational use only!

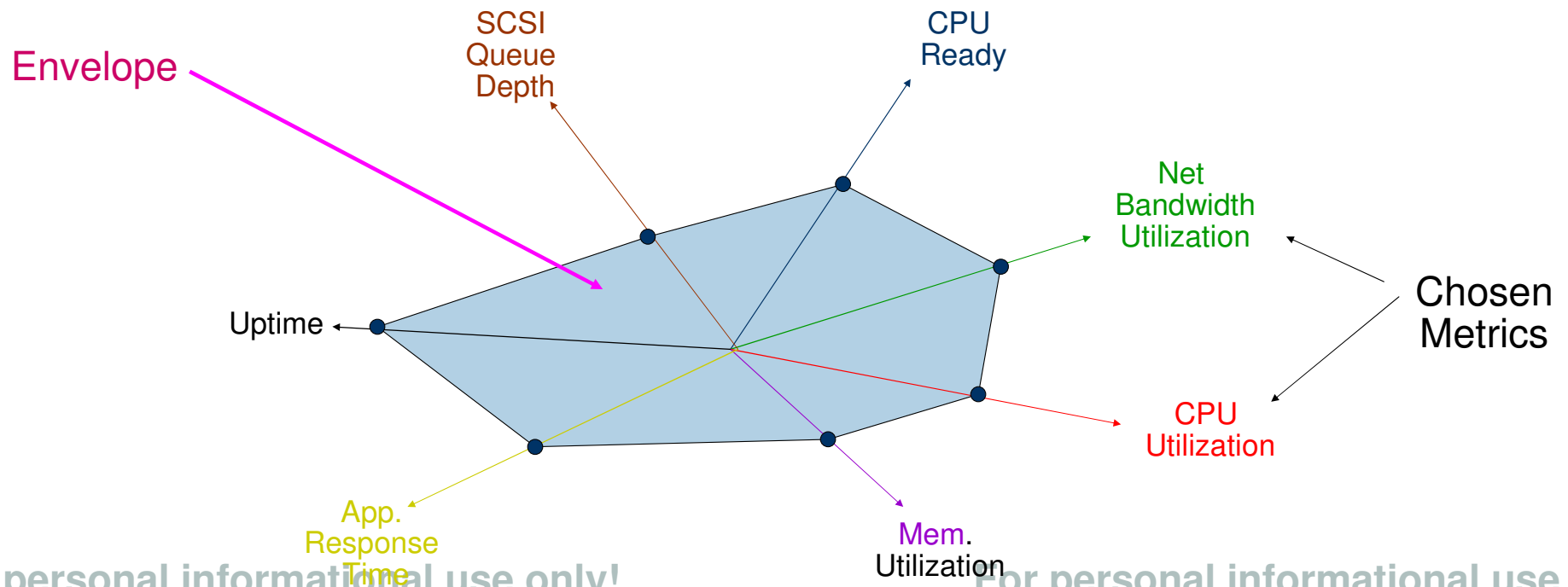
For personal informational use only!

# VM Performance envelope definition

Do not excerpt or reproduce

Do not excerpt or reproduce

- Document performance requirements per VM (your SLAs)
  - Identify metrics you will monitor to ensure SLA is being met
  - Identify an optimal numerical value for each metric
  - Combined metrics describe the optimal performance envelope for each VM



For personal informational use only!

For personal informational use only!

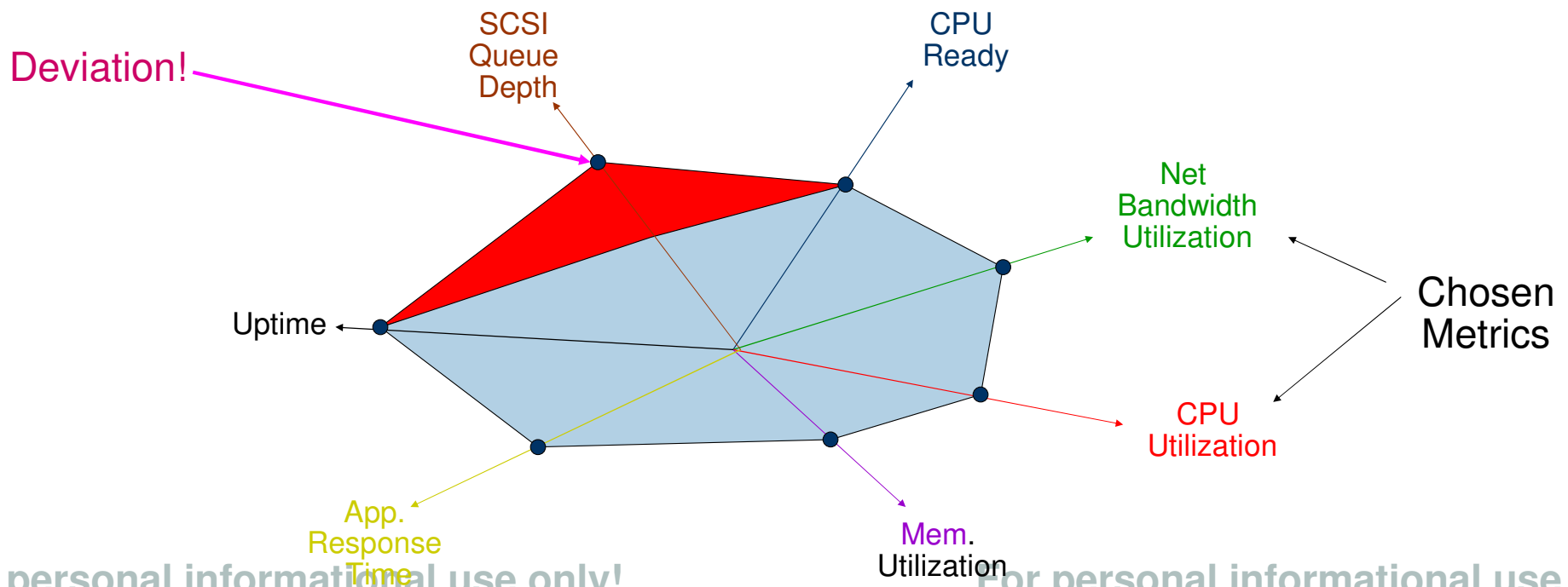
# VM Performance envelope (contd.)

Do not excerpt or reproduce

Do not excerpt or reproduce

## □ Monitor for trends which might threaten your SLAs

- Identify metrics which are deviating
- Take action to reverse trends
- Set alarms to notify of deviations which threaten envelope boundaries



For personal informational use only!

For personal informational use only!

# Tools for monitoring VM resource use - Graphs

Do not excerpt or reproduce

Do not excerpt or reproduce

*The target  
(host or VM)*

*Export to  
Excel*

*Units*

*Tear off  
this chart*

*Modify what  
is graphed*



*Items being  
graphed*

*Statistics for  
displayed  
range*

For personal informational use only!

For personal informational use only!

# Tools for monitoring VM resource use - esxtop

Do not excerpt or reproduce

Do not excerpt or reproduce

- Use esxtop to analyze ESX Server resource utilization
- Displays CPU utilization by default
- Can display memory, disk or network statistics
  - **c** Displays CPU statistics panel
  - **m** Displays memory statistics panel
  - **d** Displays disk statistics panel
  - **n** Displays network statistics panel
  - **o, O** Specify order of displayed fields
  - **f, F** Specify displayed statistics for panel
  - **<space>** Displays disk statistics
  - **e** expand/roll up ID - show World IDs

For personal informational use only!

For personal informational use only!

# Combining tools – esxtop and vm-support

Do not excerpt or reproduce

Do not excerpt or reproduce

- Use esxtop with vm-support together to capture and replay performance data while a problem is actually occurring
- Capture performance snapshots
  - `vm-support -S -i 10 -d 600`
  - `-i` Specifies an interval in seconds
  - `-S` Gather performance snapshots only
  - `-d` Specifies a duration in seconds
- Replay performance snapshots
  - `esxtop -R <vm-support-directory-path>`

For personal informational use only!

For personal informational use only!

# Systems for optimizing VM CPU resource use

Do not excerpt or reproduce

Do not excerpt or reproduce

- Automatically managed by VMkernel
  - Load Balancing
  - Hyperthreading
- Configured by VM Owner
  - Virtual SMP – up to 4 VCPUs
- Adjustable by Administrator
  - Limit
  - Reservation
  - Share Allocation
  - Processor Affinity

For personal informational use only!

For personal informational use only!

# VMkernel CPU load balancing

Do not excerpt or reproduce

Do not excerpt or reproduce

- A VM with 1 VCPU runs on only one physical CPU core at a time
- A 2-VCPU VM runs on two cores at a time, or none
- A 4-VCPU VM runs on four cores at a time, or none
- VMkernel dynamically schedules virtual machines and Service Console
  - Every 20 milliseconds, VMkernel looks for VMs to migrate
- Service Console always runs on CPU core 0

For personal informational use only!

For personal informational use only!

# VMkernel's use of Hyper-Threading

Do not excerpt or reproduce

Do not excerpt or reproduce

- Hyper-Threading allows one Xeon or P4 to execute two threads simultaneously
  - Each physical CPU presents two logical CPUs (“LCPUs”)
  - LCPUs are not as powerful as entire cores
- VMkernel will intelligently schedule VCPUs onto LCPUs
  - CPU-intensive VCPUs will automatically run in different PCPUs
    - The VMkernel refrains from using their PCPUs’ second LCPUs

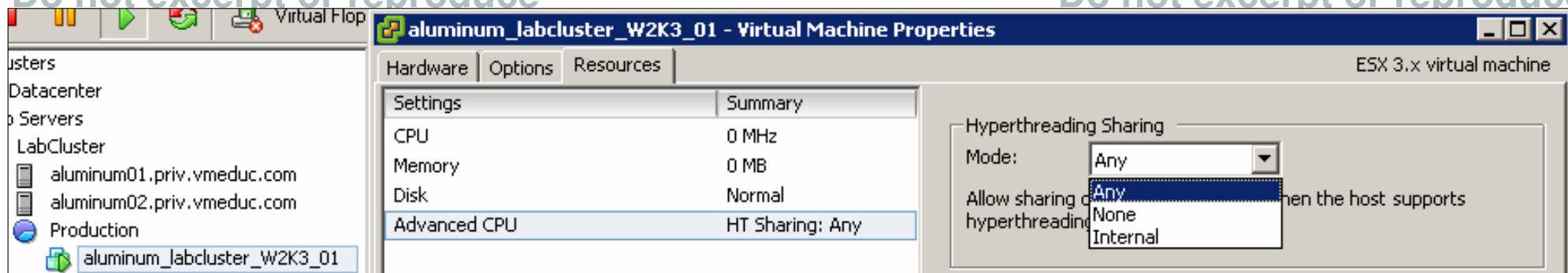
For personal informational use only!

For personal informational use only!

# VM-Specific HT Settings

Do not excerpt or reproduce

Do not excerpt or reproduce



- Individual VMs usage of hyper-threading can be set
  - Any – default, VM can share cores with others
  - None – VM cannot share cores, halt state invoked
  - Internal – VM's LCPUs can share cores
- Non-default settings can have performance implications especially on low-CPU-count systems!
- ESX can quarantine “bad actors” by invoking none, or internal
  - Transparent to user disable by setting `Cpu.MachineClearThreshold = 0`

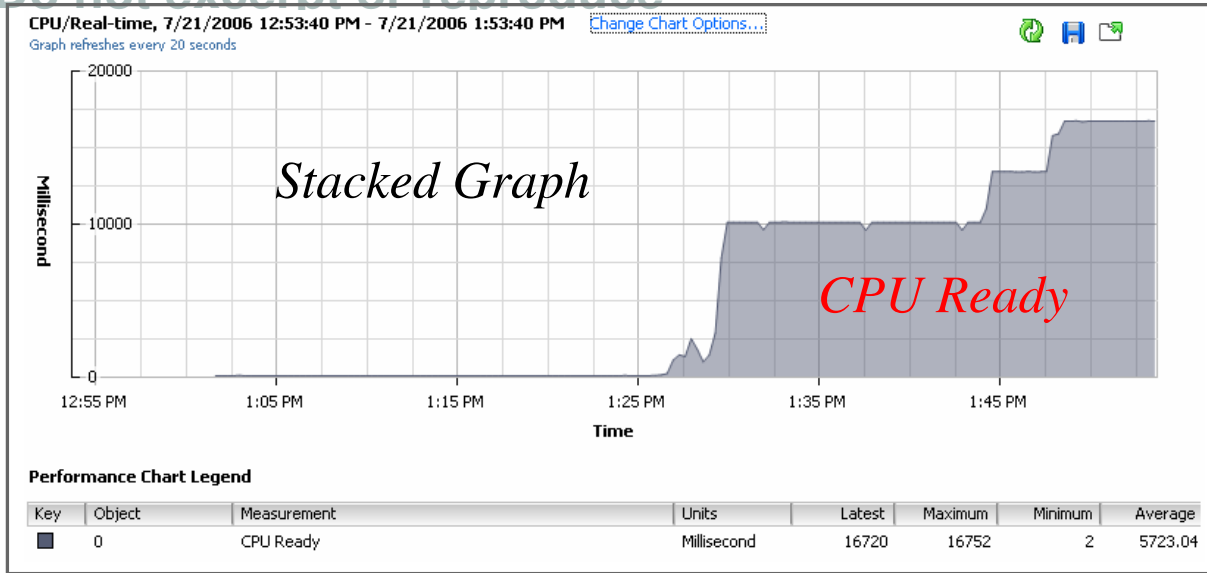
For personal informational use only!

For personal informational use only!

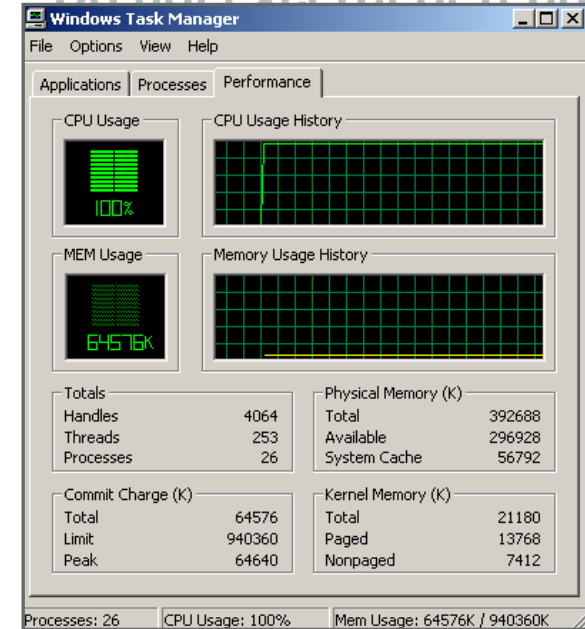
# Are VMs being CPU-constrained? - Graphs

Do not excerpt or reproduce

Do not excerpt or reproduce



*VM's CPU ready graph in VI Client*



*Task Manager inside VM*

- If VM is constrained by CPU
  - Add shares or increase CPU reservation
  - VMotion this virtual machine
  - Shut down, VMotion, or remove shares from other virtual machines

For personal informational use only!

For personal informational use only!

# Are VMs being CPU-constrained? - esxtop

Do not excerpt or reproduce

Do not excerpt or reproduce

- Use esxtop to analyze ESX Server/VM CPU utilization
  - Display can also be sorted by %Used or %Ready
    - %Used is the actual CPU usage of the VM + overhead
    - %Ready is the time spent in the processor queue (watch above 5%)

```
mark@aluminum01:/opt/LGTOaam512/log
5:46:52pm up 1 day, 4:42, 55 worlds; CPU load average: 1.53, 1.53, 1.53
PCPU(%): 99.24, 99.69 ; used total: 99.46
LCPU(%): 87.84, 11.40, 51.45, 48.24
CCPU(%): 1 us, 1 sy, 97 id, 0 wa ; cs/sec: 170
```

ID	%USED	%SYS	%OVRLP	%RUN	%WAIT	%BWAIT	%TWAIT	%CRUN	%CSTP	%IDLE	%RDY
1	0.92	0.00	0.02	103.93	0.00	0.00	0.00	0.28	0.00	0.00	200.00
19	57.82	0.00	0.01	58.11	570.62	1.17	571.78	0.00	0.00	0.00	69.45
18	52.76	0.00	0.02	53.17	578.05	20.23	598.28	0.00	0.00	0.00	47.91
20	86.68	0.00	0.03	86.92	530.57	67.46	598.03	0.00	0.00	0.00	14.39
6	1.67	0.00	0.00	1.63	88.63	6.96	95.59	0.00	0.00	95.59	2.68
7	0.01	0.00	0.00	0.01	1298.27	0.00	1298.27	0.00	0.00	0.00	0.50
8	0.00	0.00	0.00	0.01	899.12	0.00	899.12	0.00	0.00	0.00	0.02
2	0.00	0.00	0.00	0.00	499.49	0.00	499.49	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	99.91	0.00	99.91	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	99.91	0.00	99.91	0.00	0.00	0.00	0.00

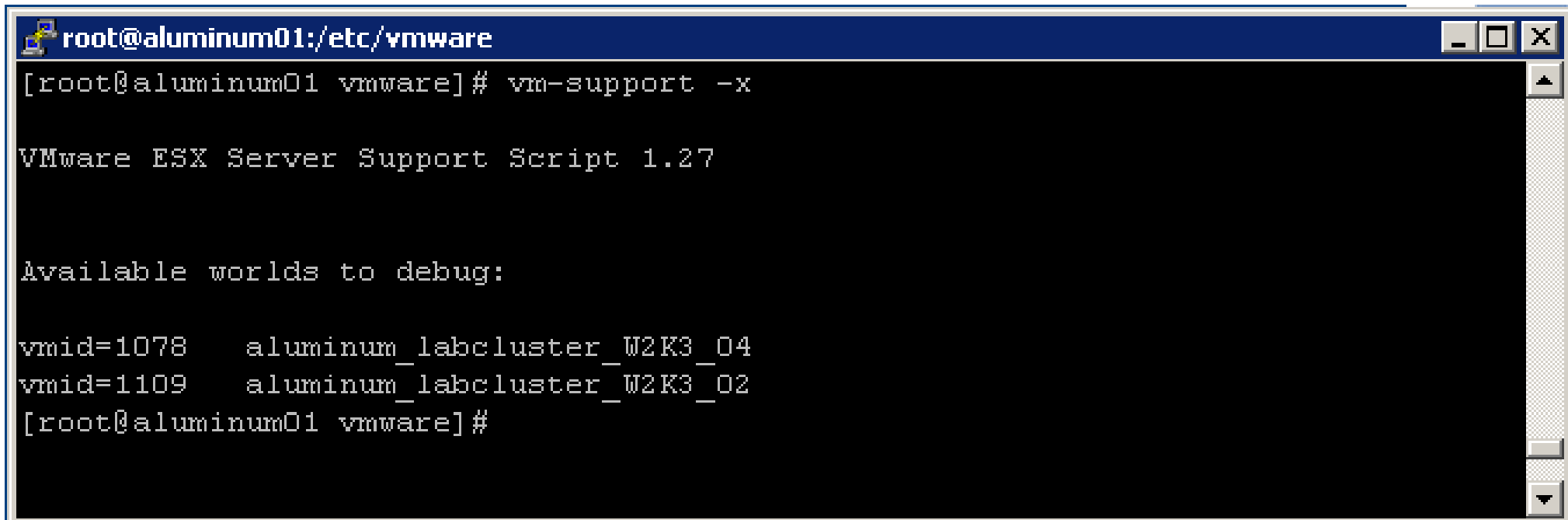
For personal informational use only!

For personal informational use only!

Do not excerpt or reproduce

Do not excerpt or reproduce

- Run `vm-support -x` to show VM World IDs



```
root@aluminum01:/etc/vmware
[root@aluminum01 vmware]# vm-support -x

VMware ESX Server Support Script 1.27

Available worlds to debug:

vmid=1078    aluminum_labcluster_W2K3_04
vmid=1109    aluminum_labcluster_W2K3_02
[root@aluminum01 vmware]#
```

For personal informational use only!

For personal informational use only!

# esxtop <e>

Do not excerpt or reproduce

Do not excerpt or reproduce

- Invoke esxtop and hit the <e> key followed by one of the the ids presented to expand and show the world IDs of the running VMs

```
root@aluminum01:/etc/vmware
1:30:22pm up 3 days, 25 min, 46 worlds; CPU load average: 0.52, 0.52, 0.52
PCPU(%): 33.39, 72.57 ; used total: 52.98
LCPU(%): 32.87, 0.52, 71.08, 1.49
CCPU(%): 3 us, 2 sy, 92 id, 3 wa ; cs/sec: 152
```

ID	GID	NAME	NMEM	%USED	%SYS	%OVRLP	%RUN	%WAIT
1	1	idle	4	94.36	0.00	0.03	47.73	0.00
2	2	system	5	0.00	0.00	0.00	0.00	499.41
6	6	console	1	5.36	0.01	0.01	5.48	55.49
7	7	helper	13	0.00	0.00	0.00	0.01	1298.41
8	8	drivers	9	0.00	0.00	0.00	0.01	898.84
9	9	vmotion	1	0.00	0.00	0.00	0.00	99.88
12	12	vmware-vmkauthd	1	0.00	0.00	0.00	0.00	99.88
1077	20	vmware-vmx	1	0.07	0.00	0.00	0.09	92.04
1078	20	vmx0:aluminum_1	1	0.37	0.00	0.01	0.70	61.46
1079	20	vmware-vmx	1	0.00	0.00	0.00	0.00	99.72
1080	20	mks:aluminum_la	1	0.12	0.00	0.01	0.23	48.21
1081	20	vcpu-0:aluminum	1	0.00	0.00	0.00	0.01	99.69
1086	20	IO#0:aluminum_1	1	0.01	0.00	0.00	0.02	97.88
1087	20	IO#1:aluminum_1	1	0.01	0.00	0.00	0.02	95.72
29	29	aluminum_labclu	5	99.31	0.00	0.05	99.63	291.12

For personal

use only!

## vm-support -x, -X, -Z

Do not excerpt or reproduce

Do not excerpt or reproduce

- vmsupport -x lists the world IDs of the VMs currently running on a given host
- Vm-support -X <world ID> will do some “interesting” things:
  - Generate a series of snapshots (300 seconds worth)
  - Capture a screenshot of the VM
  - Dump the core files/Abort the VM
  - Create a .tar archive in the /home directory of the user
- vm-support -Z <world ID>
  - Similar to -X but suspends the VM and adds the memory state to the core files

For personal informational use only!

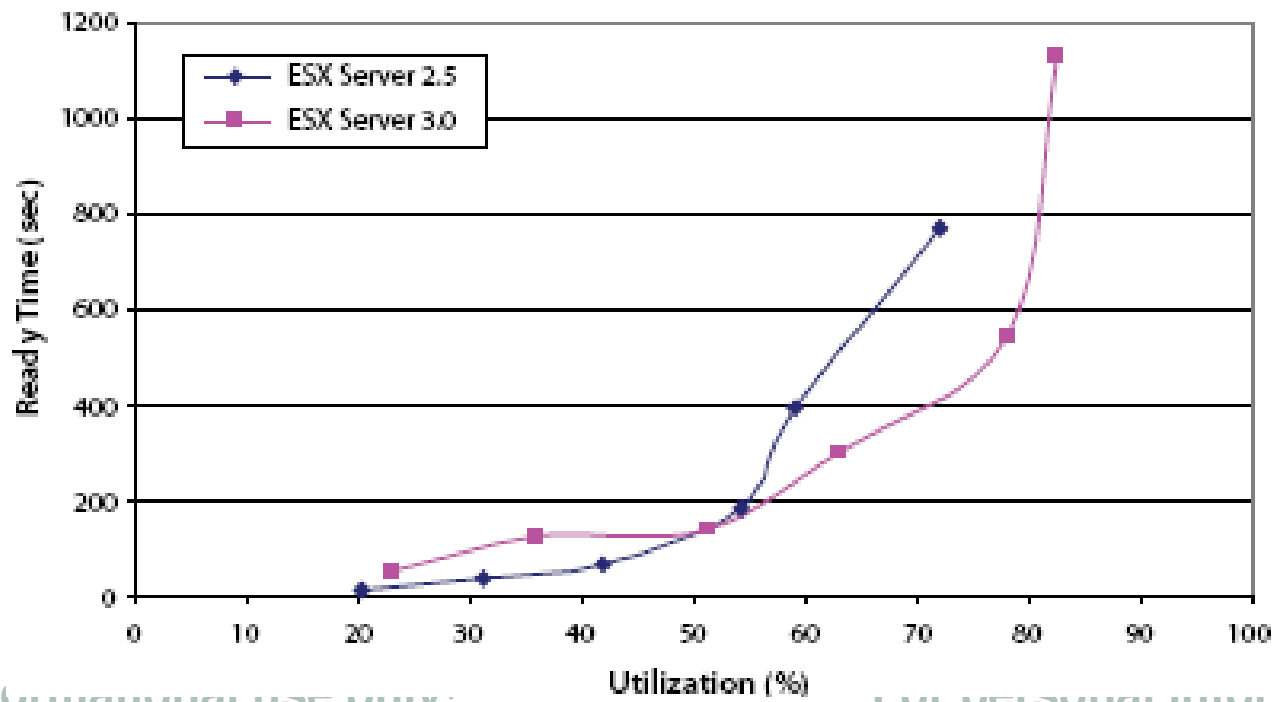
For personal informational use only!

# Other CPU - esxtop

Do not excerpt or reproduce

Do not excerpt or reproduce

- Watch for asymmetrical CPU utilization
- Watch for sustained CPU utilization > %80!
  - IN ESX 3.x CPU loads above 80% will dramatically increase CPU Ready values



For personal informational use only:

For personal informational use only!

# CPU Ready - caveats

Do not excerpt or reproduce

Do not excerpt or reproduce

- The objective of server consolidation is to drive CPU utilization higher.
  - With applications that are somewhat interactive, attempting to drive the utilization beyond 60 to 70 percent may result in a perceptible lag in user activities due to high induced ready time
- Ready time for a process in isolation cannot be identified as a problem.
  - It is normal for a system to accumulate some ready time even when overall CPU utilization is low.
- The best metrics for examining the health of a VM continue to be a combination of:
  - Ready time, CPU utilization, and application response time

For personal informational use only!

For personal informational use only!

# Systems for optimizing VM Memory resource use

Do not excerpt or reproduce

Do not excerpt or reproduce

- Automatically managed by VMkernel
  - Transparent Page Sharing
  - Vmmemctl (balloon driver)
  - Use of VMkernel swap
- Configured by VM Owner
  - Maximum Size
- Adjustable by Administrator
  - Limit
  - Reservation
  - Share Allocation

For personal informational use only!

For personal informational use only!

# Transparent memory page sharing

Do not excerpt or reproduce

Do not excerpt or reproduce

- VMkernel detects identical pages in VMs' memory and maps them to the same underlying physical page
  - *More than 30% shared w/ idle Win2K VMs*
- No changes to guest OS required
- VMkernel treats the shared pages as *copy-on-write*
  - Read-only when shared
  - Private copies after write
- Page sharing is always active unless administratively disabled

For personal informational use only!

For personal informational use only!

# vmmemctl: the balloon-driver mechanism

---

Do not excerpt or reproduce

Do not excerpt or reproduce

- Used to deallocate memory from selected virtual machines when RAM is scarce
- Not used unless there is competition for memory
- VMs with least shares are “ballooned” first and hardest
  - *guest is forced to page out to its own paging area*
  - *VMkernel reclaims memory and distributes it according to shares*
  - *When memory demand eases, balloon deflates, guests can page in*

For personal informational use only!

For personal informational use only!

# VMkernel swap

Do not excerpt or reproduce

Do not excerpt or reproduce

- Each powered-on VM needs its own VMkernel swap file
  - Automatically allocated on first power-on
  - Default location: same VMFS volume as virtual machine's boot disk
  - Size equal to the difference between the memory guaranteed to it, if any, and the maximum it can use
  - This file lets the VMkernel swap the VM out entirely if memory is scarce
- Use of VMkernel swap is a last resort
  - Performance will be noticeably slow

For personal informational use only!

For personal informational use only!

# Are VMs being memory-constrained? - graph

Do not excerpt or reproduce

Do not excerpt or reproduce

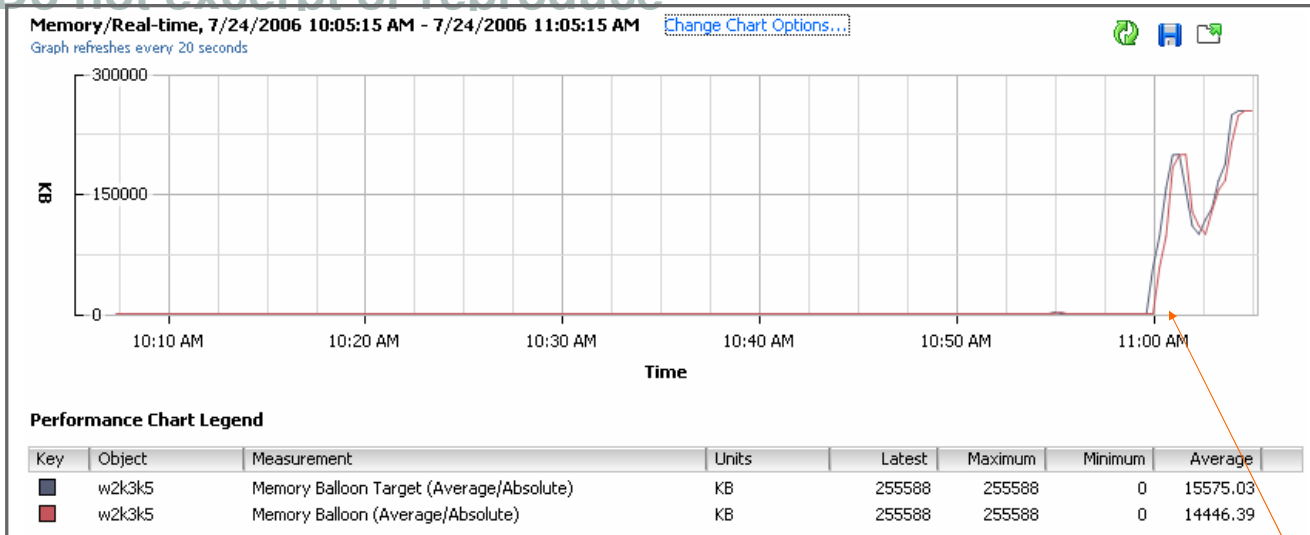


Image Name	PID	Mem Usage	Page Faults	I/O
winlogon.exe	184	1,796 K	3,969	
inetinfo.exe	884	9,044 K	2,531	
System	8	220 K	1,716	
explorer.exe	1076	5,028 K	1,588	
services.exe	236	4,864 K	1,523	
svchost.exe	632	4,876 K	1,482	
msdtc.exe	504	4,848 K	1,406	
lsass.exe	248	4,672 K	1,364	
SPOOLSV.EXE	476	3,764 K	1,301	
svchost.exe	776	4,624 K	1,176	
wuauclt.exe	1196	4,108 K	1,035	
svchost.exe	444	2,888 K	1,012	
mstask.exe	740	2,616 K	731	
VMwareService.e	800	2,180 K	596	
smss.exe	164	336 K	589	
taskmgr.exe	1080	1,896 K	487	
csrss.exe	188	1,216 K	438	
lsrv.exe	652	1,656 K	414	

*Task Manager inside VM*

- If VM is constrained by memory
  - Add shares or raise memory reservation
  - VMotion this virtual machine
  - Shut down, VMotion, or remove shares from other virtual machines

*Check for high ballooning activity*

For personal informational use only!

For personal informational use only!

# Are VMs being memory-constrained? - esxtop

Do not excerpt or reproduce

Do not excerpt or reproduce

- Use esxtop to analyze ESX Server/VM MEM utilization
  - Check the memory overcommitment values for the last 1-, 5-, and 15-minute intervals (Mem Overcommit average)
    - Value of 1.00 = 100% memory overcommitment
  - Check swap and ballooning activity
  - Paging > 200 – 300 I/O per second warrants investigation

```
mark@aluminum01:/home/mark
7:57:15pm up 1 day, 6:52, 55 worlds; MEM overcommit average: 0.00, 0.00, 0.00
PMEM (MB): 2047 total: 272 cos, 134 vmk, 396 other, 1245 free
VMKMEM (MB): 1724 managed: 103 minfree, 326 rsvd, 1313 ursvd, high state
COSMEM (MB): 16 free: 541 swap_t, 541 swap_f: 0.00 r/s, 0.00 w/s
PSHARE (MB): 557 shared, 93 common: 464 saving
SWAP (MB): 0 curr, 0 target: 0.00 r/s, 0.00 w/s
MEMCTL (MB): 0 curr, 0 target, 499 max
```

ID	GID	NAME	NMEM	MEMSZ	SZTGT	TCHD	%ACTV	%ACTVS	%ACTVF	%ACTVN	OVHDUW	OVHD	OVHDMA
12	12	vmware-vmkauthd	1	2.20	2.20	0.34	0	0	0	0	0.00	0.00	0.0
18	18	aluminum_labclu	7	256.00	174.64	10.24	5	2	4	3	16.91	26.89	72.9
19	19	aluminum_labclu	7	256.00	176.66	12.80	6	3	5	5	16.91	27.27	72.9
20	20	aluminum_labclu	7	256.00	177.55	10.24	5	2	4	1	16.91	25.76	72.9

For personal informational use only!

For personal informational use only!

# Systems for optimizing VM disk resource use

Do not excerpt or reproduce

Do not excerpt or reproduce

- Not Automatically managed by VMkernel
  - Configured by VM Owner
    - Distribution of VMDK files across SAN/VMFS infrastructure
  - Adjustable by Administrator
    - Share Allocation
    - Shares are per host per LUN!
- 
- Disk I/O is a big cause of VM performance problems
  - VMkernel has no dynamic load balancing for FC SAN
  - IP storage (iSCSI and NAS) complicates the picture
  - DRS does not consider Disk and Network for dynamic load balancing calculations, so you have to!

For personal informational use only!

For personal informational use only!

# Are VMs being disk-constrained? - graph

Do not excerpt or reproduce

- Disk-intensive applications can saturate the storage or the path
- If you suspect that a VM is constrained by disk access
  - Measure the effective bandwidth between VM and the storage
  - Measure the resource consumption using performance graphs
- To improve disk performance
  - Ensure VMware Tools is installed
  - Reduce competition
    - Move other VMs to other storage
    - Use other paths to storage
  - Reconfigure the storage
    - Ensure that the storage's RAID level and cache configuration suit the application

Do not excerpt or reproduce



For personal informational use only!

For personal informational use only!

# RAID attributes and LUNs/VMFS

Do not excerpt or reproduce

Do not excerpt or reproduce

- Capacity in storage subsystems is not simply a question of “space”
  - I/O intensive multi-threaded workloads love more disks
  - Random read-write workloads need more disks to scale well
- RAID-10 has ~50% more throughput than RAID-5 for random read/write workloads with a high % of writes
  - RAID-10 uses 2 physical disk I/O ops. per logical write request
  - RAID-5 uses 4 ops.
- Distribute VM’s .vmdk files accordingly
- Be careful using VMFS extents!

For personal informational use only!

For personal informational use only!

# Are VMs being disk-constrained? - esxtop

Do not excerpt or reproduce

Do not excerpt or reproduce

- Use esxtop to analyze ESX Server/VM disk utilization
- Check:
  - LOAD (Ratio of ESX Server VMKernel active commands plus ESX Server VMKernel queued commands to queue depth (adapter, LUN or world)).
  - ACTV (Number of commands in the ESX Server VMKernel that are currently active)
  - QUED (Number of commands in the ESX Server VMKernel that are currently queued) average >3 is worth investigating

```
mark@aluminum01:/home/mark
8:17:02pm up 1 day, 7:12, 55 worlds; CPU load average: 0.03, 0.03, 0.03
```

ADAPTR	CID	TID	LID	WID	NCHNS	NTGTS	NLUNS	NVMS	AQLEN	LQLEN	WQLEN	ACTV	QUED	%USD	LOAD	CMDS/s	READS/s	WRITES/s	MBREAD/s	MBWRTN/s
vmhba0	-	-	-	-	1	1	1	1	128	0	0	0	0	0	0.00	0.40	0.00	0.40	0.00	0.00
vmhba1	-	-	-	-	1	6	8	11	4096	0	0	0	0	0	0.00	0.40	0.00	0.40	0.00	0.00
vmhba2	-	-	-	-	1	0	0	0	4096	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00

For personal informational use only!

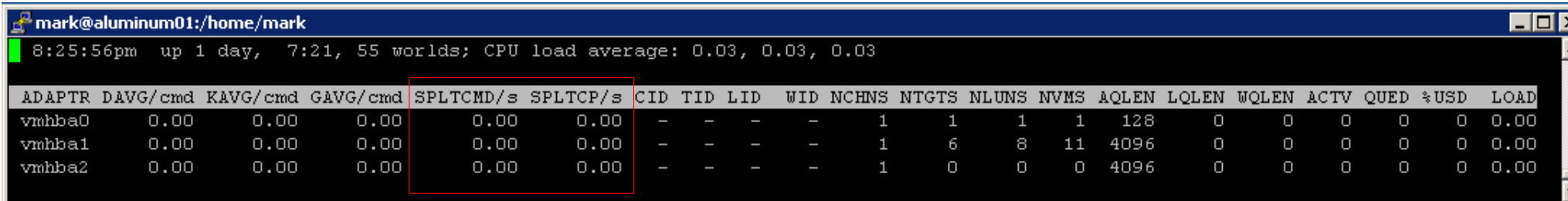
For personal informational use only!

# Are VMs being disk-constrained? – esxtop-1

Do not excerpt or reproduce

Do not excerpt or reproduce

- Use esxtop to analyze ESX Server/VM disk utilization
- Check:
  - Latency should be < 20ms transfer time for physical disk
  - Split I/Os should be < 1% of total disk I/O



```
mark@aluminum01:/home/mark
8:25:56pm up 1 day, 7:21, 55 worlds; CPU load average: 0.03, 0.03, 0.03
```

ADAPTR	DAVG/cmd	KAVG/cmd	GAVG/cmd	SPLTCMD/s	SPLTCP/s	CID	TID	LID	WID	NCHNS	NTGTS	NLUNS	NVMS	AQLEN	LQLEN	WQLEN	ACTV	QUED	%USD	LOAD
vmhba0	0.00	0.00	0.00	0.00	0.00	-	-	-	-	1	1	1	1	128	0	0	0	0	0	0.00
vmhba1	0.00	0.00	0.00	0.00	0.00	-	-	-	-	1	6	8	11	4096	0	0	0	0	0	0.00
vmhba2	0.00	0.00	0.00	0.00	0.00	-	-	-	-	1	0	0	0	4096	0	0	0	0	0	0.00

For personal informational use only!

For personal informational use only!

# Systems for optimizing VM network resource use

Do not excerpt or reproduce

Do not excerpt or reproduce

- Not Automatically managed by VMkernel
  - Configured by VM Owner
    - VMware Tools installed
    - Connected to vSwitch with adequate resources
  - Adjustable by Administrator
    - Traffic Shaping
- 
- Two possible choke points
    - Regular TCP/IP “talk path” issues
    - IP storage performance issues
  - IP storage resources are presented to the VM as local SCSI disk(s), same as FC storage resources.
    - Network resource saturation can have a “double whammy” effect

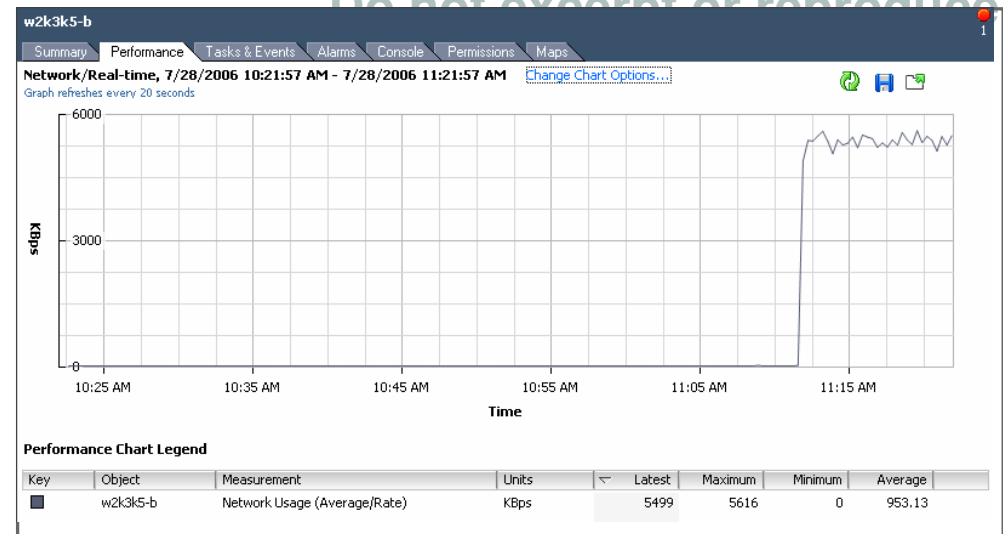
For personal informational use only!

For personal informational use only!

# Are VMs being network-constrained? - graph

Do not excerpt or reproduce

- Network-intensive applications will often bottleneck on path segments outside ESX Server
  - Example: WAN links between server and client
- If you suspect that a VM is constrained by the network
  - Confirm VMware Tools is installed
  - Measure the effective bandwidth between VM and its peer system
  - Examine performance graphs
- To improve network performance
  - Move VMs to another physical NIC
  - Traffic-shape other VMs
  - Reduce overall CPU utilization



For personal informational use only!

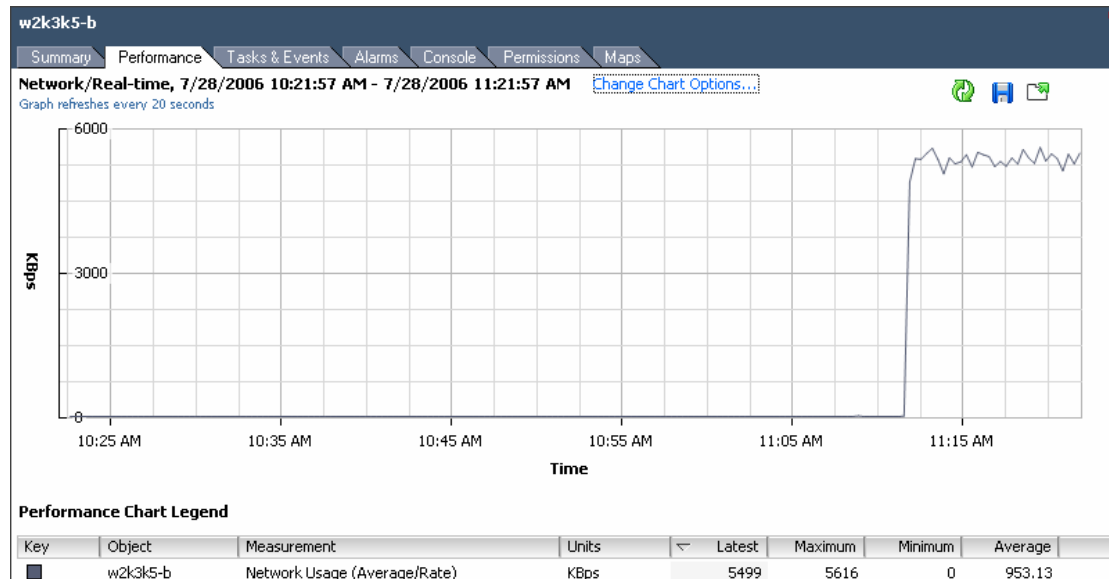
For personal informational use only!

# Are VMs being network-constrained? – 1

Do not excerpt or reproduce

Do not excerpt or reproduce

- Investigate network spikes
  - Keep a “penalty box” traffic shaped port group for bad actors
- Heavy network I/O can saturate CPU
  - CPU saturation can affect network performance too
- If you see network saturation – do something!
  - Add NICs to the team
  - Traffic shape less important VMs



For personal informational use only:

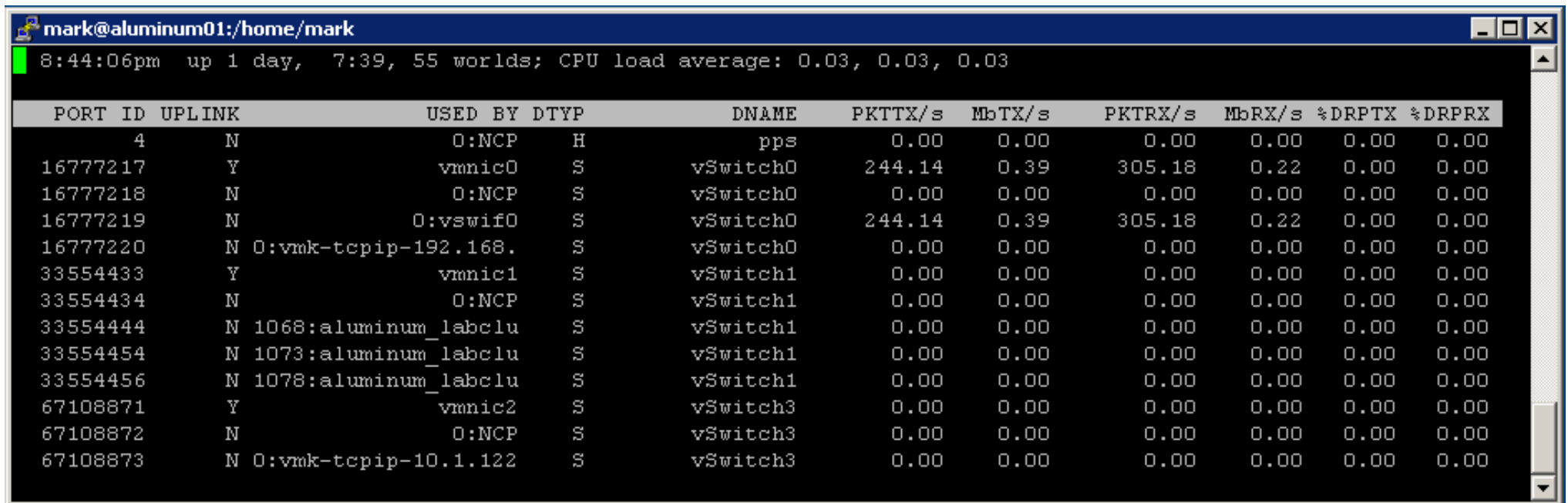
For personal informational use only!

# Are VMs being network-constrained? - esxtop

Do not excerpt or reproduce

Do not excerpt or reproduce

- Use esxtop to analyze ESX Server/VM Network utilization
- Check:
  - %DRPTX Percentage of transmit packets dropped.
  - %DRPRX Percentage of receive packets dropped



The screenshot shows a terminal window titled 'mark@aluminum01:/home/mark'. The status bar at the top indicates the time is 8:44:06pm, the system is up for 1 day, 7:39, with 55 worlds and a CPU load average of 0.03, 0.03, 0.03. The main display shows a table of network interface statistics.

PORT ID	UPLINK	USED BY	DTYP	DNAME	PKTTX/s	MbTX/s	PKTRX/s	MbRX/s	%DRPTX	%DRPRX
4	N	0:NCP	H	pps	0.00	0.00	0.00	0.00	0.00	0.00
16777217	Y	vmnic0	S	vSwitch0	244.14	0.39	305.18	0.22	0.00	0.00
16777218	N	0:NCP	S	vSwitch0	0.00	0.00	0.00	0.00	0.00	0.00
16777219	N	0:vswif0	S	vSwitch0	244.14	0.39	305.18	0.22	0.00	0.00
16777220	N	0:vmk-tcpip-192.168.	S	vSwitch0	0.00	0.00	0.00	0.00	0.00	0.00
33554433	Y	vmnic1	S	vSwitch1	0.00	0.00	0.00	0.00	0.00	0.00
33554434	N	0:NCP	S	vSwitch1	0.00	0.00	0.00	0.00	0.00	0.00
33554444	N	1068:aluminum_labclu	S	vSwitch1	0.00	0.00	0.00	0.00	0.00	0.00
33554454	N	1073:aluminum_labclu	S	vSwitch1	0.00	0.00	0.00	0.00	0.00	0.00
33554456	N	1078:aluminum_labclu	S	vSwitch1	0.00	0.00	0.00	0.00	0.00	0.00
67108871	Y	vmnic2	S	vSwitch3	0.00	0.00	0.00	0.00	0.00	0.00
67108872	N	0:NCP	S	vSwitch3	0.00	0.00	0.00	0.00	0.00	0.00
67108873	N	0:vmk-tcpip-10.1.122	S	vSwitch3	0.00	0.00	0.00	0.00	0.00	0.00

For personal informational use only!

For personal informational use only!

# Using alarms

Do not excerpt or reproduce

Do not excerpt or reproduce

- VirtualCenter alarms report changes in host or VM state
- But, they need thresholds that **mean something!**

The screenshot shows the VMware vSphere interface for a host named 'kentfield06.priv.vmeduc.com'. The left pane shows a tree view of hosts and clusters, with 'kentfield06.priv.vmeduc.com' selected. The main pane shows a table of virtual machines with columns for Name, State, Status, Host CPU - MHz, Host Mem - MB, Guest Mem - %, and Notes. The table contains four rows of VMs: w2k3k5, rhel-1, w2k3k5-a, and w2k3k5-b. The 'w2k3k5-b' VM has a red status indicator and high guest memory usage (92%).

Name	State	Status	Host CPU - MHz	Host Mem - MB	Guest Mem - %	Notes
w2k3k5	Powered On	○○●	28	185	2	
rhel-1	Powered On	○○●	65	540	0	
w2k3k5-a	Powered On	○○●	51	221	6	
w2k3k5-b	Powered On	●○○	64	409	92	

*Alarms are indicated in the inventory*

*Status determined by threshold levels in alarm definition*

*View of VMs' CPU and memory utilization on selected host*

For personal informational use only!

For personal informational use only!

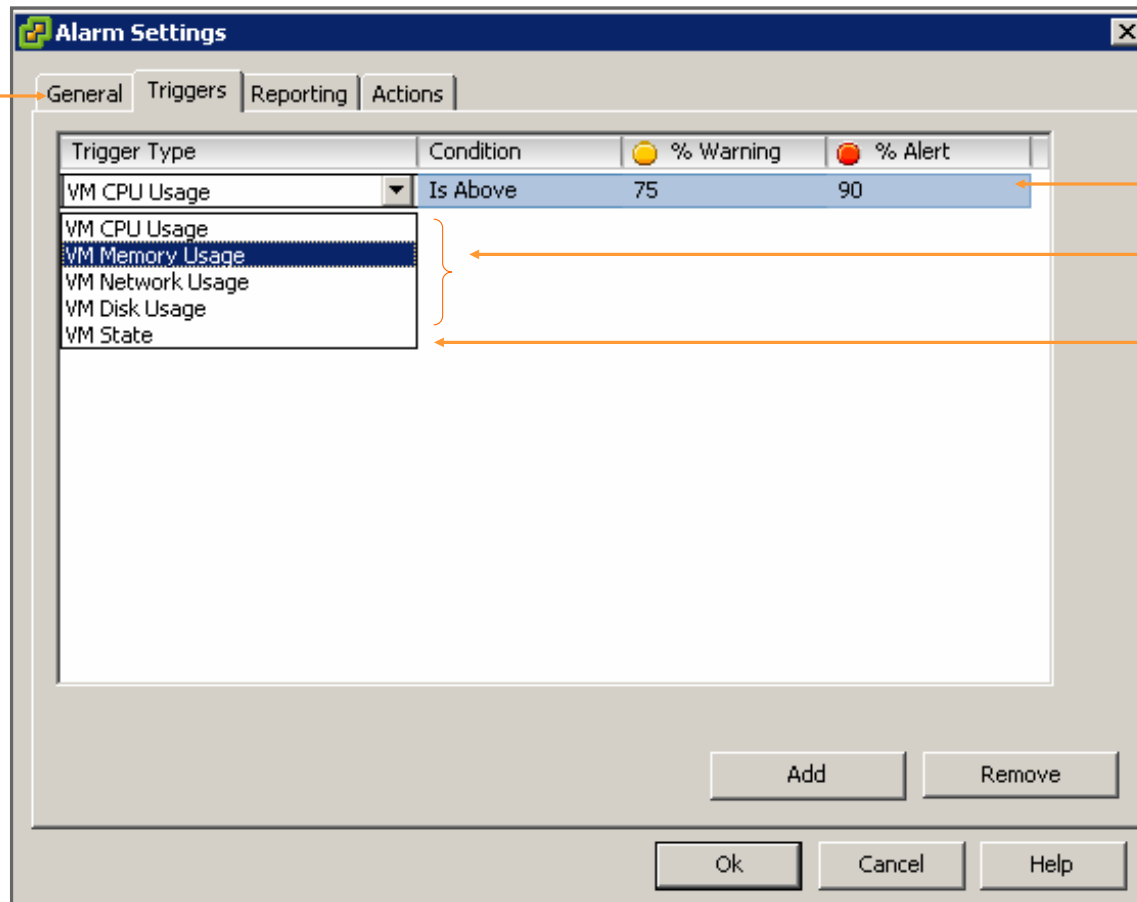
# Creating a VM-based alarm

Do not excerpt or reproduce

Do not excerpt or reproduce

- Right-click on a VM and choose “Add Alarm...”

*Name and describe the new alarm*



*Click any field to modify*

*Percentages*

*Powered on, powered off, suspended*

For personal informational use only!

For personal informational use only!

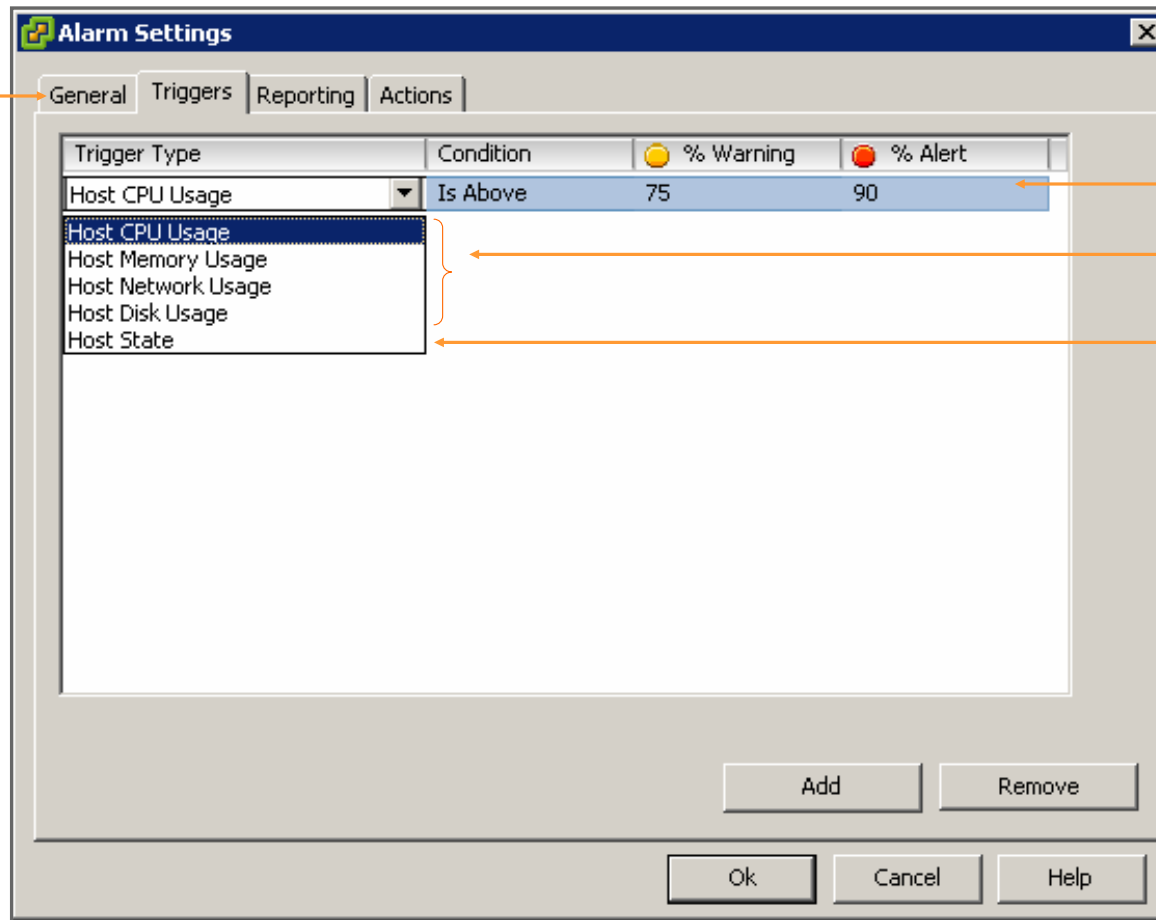
# Creating a host-based alarm

Do not excerpt or reproduce

Do not excerpt or reproduce

- Right-click on a host and choose “Add Alarm...”

*Name and describe the new alarm*



*Click any field to modify*

*Percentages*

*Connected, disconnected, not responding*

For personal informational use only!

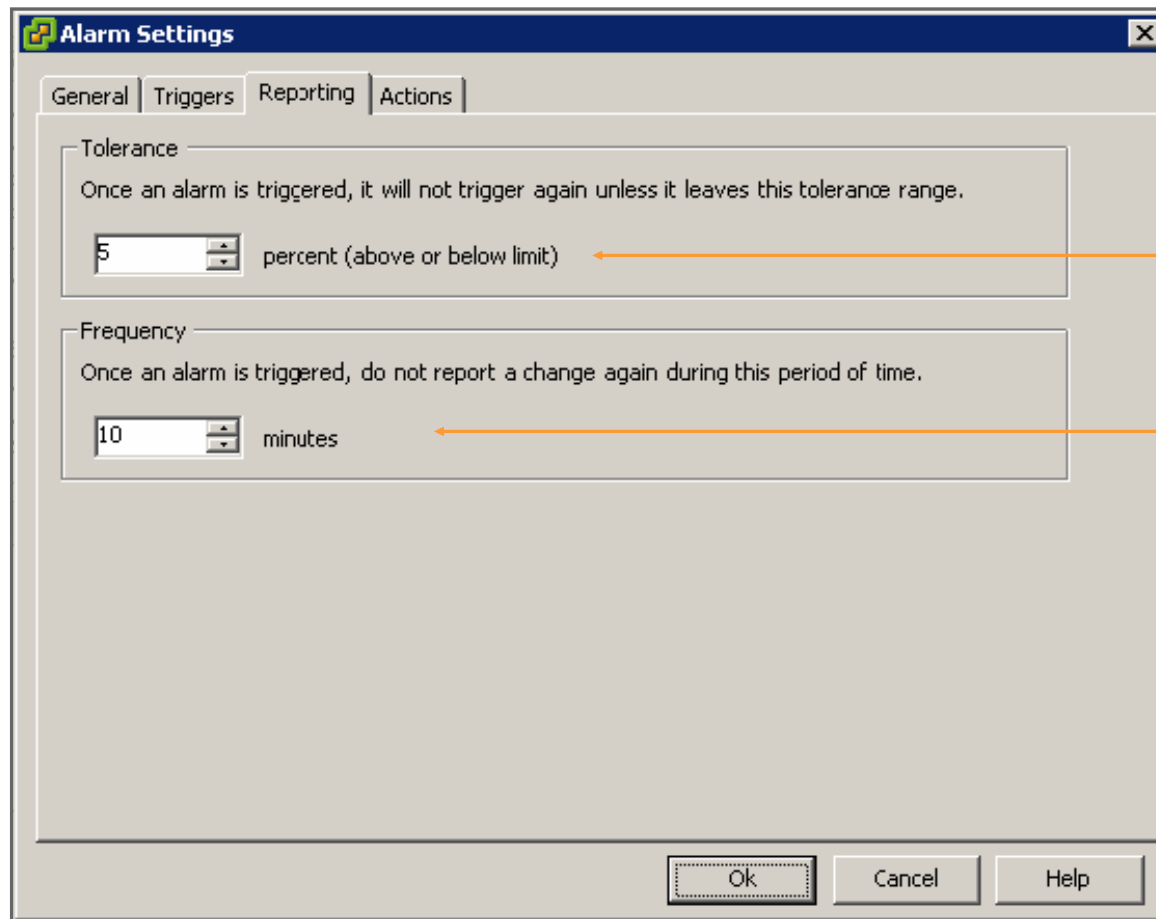
For personal informational use only!

# Alarm reporting options

Do not excerpt or reproduce

Do not excerpt or reproduce

- Use the **Reporting** pane to avoid needless re-alarms



*Avoid  
small  
fluctuations*

*Avoid  
repeats*

For personal informational use only!

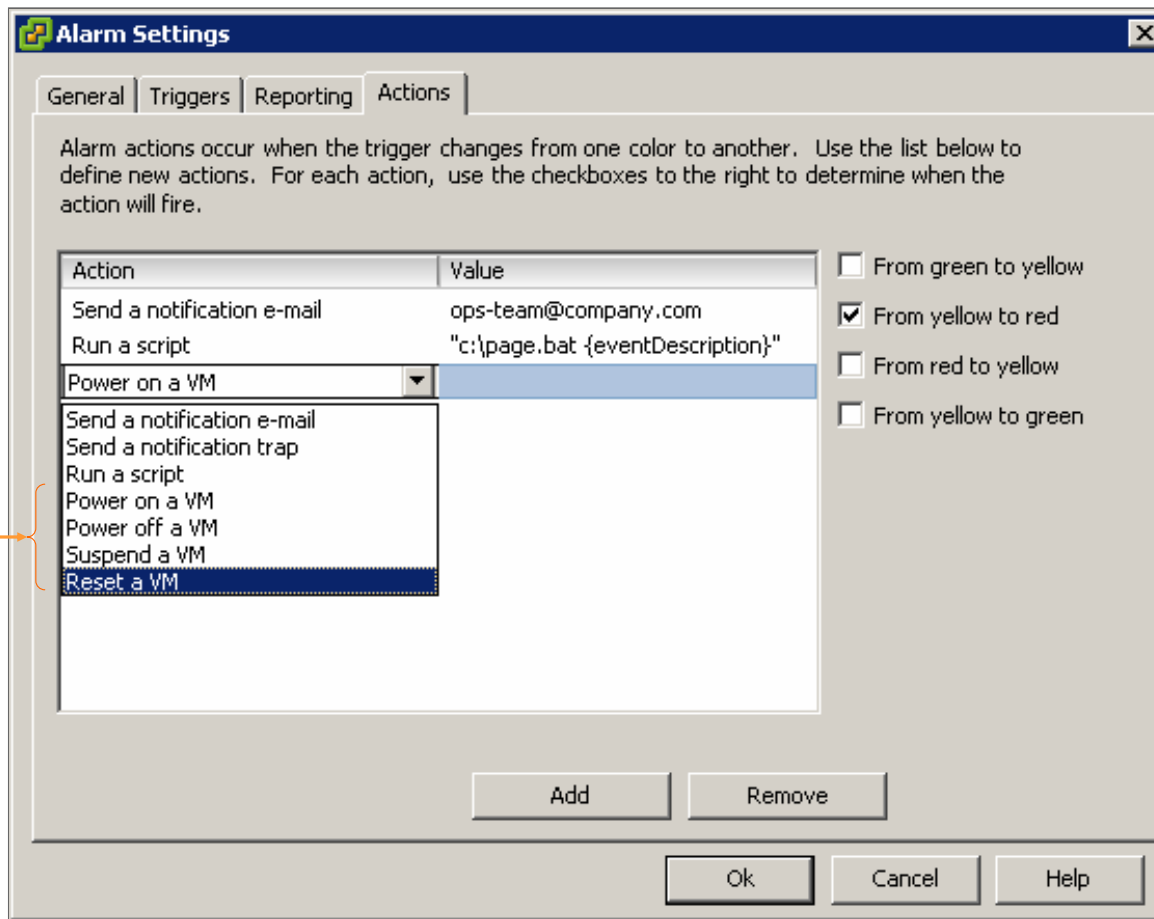
For personal informational use only!

# Actions to take when an alarm is triggered

Do not excerpt or reproduce

Do not excerpt or reproduce

- Use the **Actions** pane to send external messages or to respond to problems proactively



*Only available for VM-based alarms*

For personal informational use only!

For personal informational use only!

# Using alarms to monitor CPU and memory usage

Do not excerpt or reproduce

Do not excerpt or reproduce

- Default alarms, defined at the top of the inventory

The screenshot displays the VMware vSphere interface. On the left, a tree view shows the inventory structure: Hosts & Clusters > Americas > Los Angeles > Intel > Lab Cluster. Under Lab Cluster, several objects are listed: kentfield03.p, kentfield04.p, Database01, Database02, Database03, FilePrint01, FilePrint02, and FilePrint03. The main pane shows the 'Hosts & Clusters' view with the 'Alarms' tab selected. A table lists default alarms:

Name	Defined In	Description
Host connection state	This object	Default alarm to monitor host connection state
Host CPU Usage	This object	Default alarm to monitor host CPU usage
Host Memory Usage	This object	Default alarm to monitor host memory usage
Virtual Machine CPU Usage	This object	Default alarm to monitor Virtual machine CPU usage
Virtual Machine Memory Usage	This object	Default alarm to monitor Virtual machine memory usage

An 'Alarm Settings' dialog box is open, showing the 'Triggers' tab. It contains a table with the following data:

Trigger Type	Condition	% Warning	% Alert
VM Memory Usage	Is Above	75	90

- Add custom alarms anywhere in the inventory

For personal informational use only!

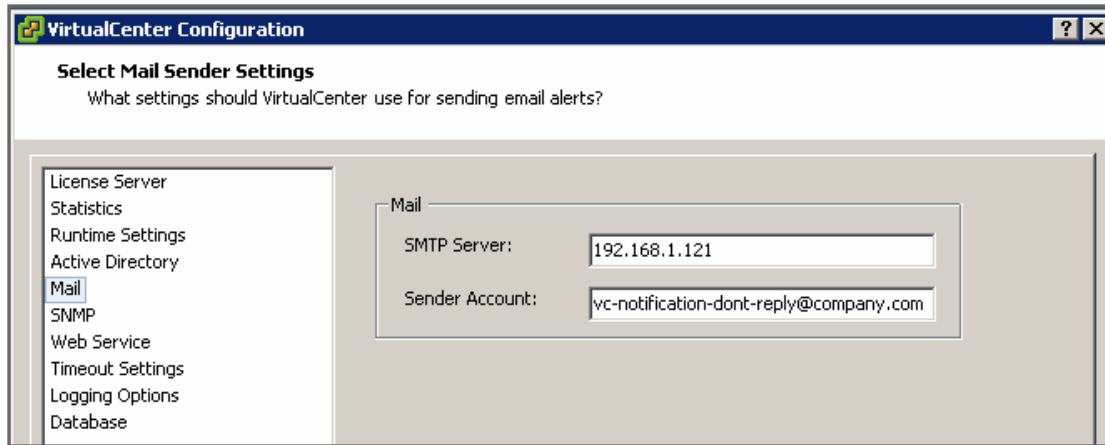
For personal informational use only!

# Configure VC notifications

Do not excerpt or reproduce

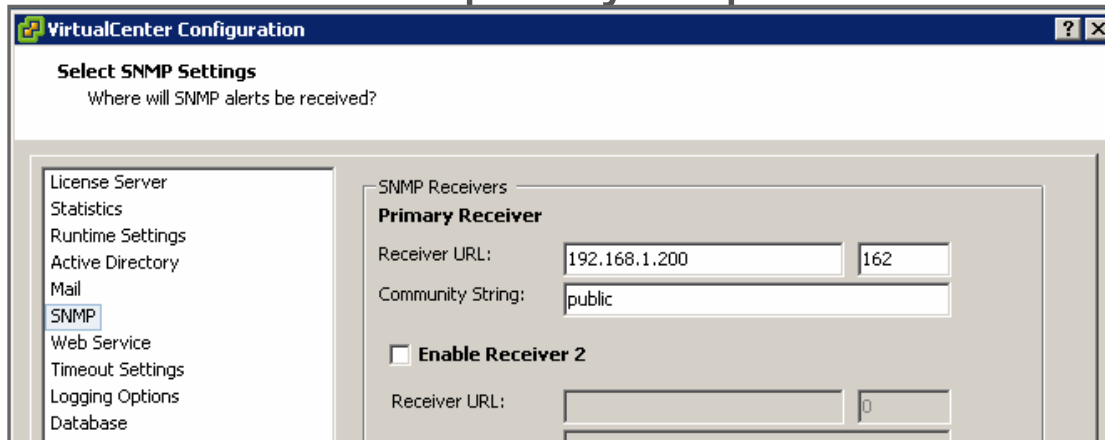
Do not excerpt or reproduce

- Choose **Administration** → **Server Settings**
- Click **Mail** to set SMTP parameters



The screenshot shows the 'VirtualCenter Configuration' window with the 'Mail' tab selected. The window title is 'VirtualCenter Configuration'. The main heading is 'Select Mail Sender Settings' with the question 'What settings should VirtualCenter use for sending email alerts?'. On the left is a navigation pane with options: License Server, Statistics, Runtime Settings, Active Directory, Mail (selected), SNMP, Web Service, Timeout Settings, Logging Options, and Database. The main area contains a 'Mail' section with two input fields: 'SMTP Server:' with the value '192.168.1.121' and 'Sender Account:' with the value 'vc-notification-dont-reply@company.com'.

- Click **SNMP** to specify trap destinations



The screenshot shows the 'VirtualCenter Configuration' window with the 'SNMP' tab selected. The window title is 'VirtualCenter Configuration'. The main heading is 'Select SNMP Settings' with the question 'Where will SNMP alerts be received?'. On the left is a navigation pane with options: License Server, Statistics, Runtime Settings, Active Directory, Mail, SNMP (selected), Web Service, Timeout Settings, Logging Options, and Database. The main area contains an 'SNMP Receivers' section with a 'Primary Receiver' sub-section. It has three input fields: 'Receiver URL:' with '192.168.1.200' and '162', 'Community String:' with 'public', and 'Enable Receiver 2' which is unchecked. Below this is another 'Receiver URL:' field with an empty input and '0'.

For personal informational use only!

For personal informational use only!

# Collecting Log Files

Do not excerpt or reproduce

Do not excerpt or reproduce

- Recommended processes
  - Use “Export Diagnostics Data” via VI Client
  - Can be used when logged into VC or an individual ESX host
  - Browse to place the vcsupport-date-time.zip file
- Use the Generate VirtualCenter Server log bundle program
  - The result vcsupport-date-time.zip file is placed on the VC Server desktop
  - All Programs -> VMware -> Generate VirtualCenter log bundle
- If this way fails to transfer the dumps the dump files are located in
  - /var/lib/vmware/hostd/docroot/downloads
  - Archive name: esxsupport-\*.tgz

For personal informational use only!

For personal informational use only!

# Collecting Log Files

Do not excerpt or reproduce

Do not excerpt or reproduce

- Alternative methods
  - Manually execute `vm-support` on the ESX Server host
    - Gathers individual ESX host logs and config. Information
    - -w sets the working directory for vm-support
    - -f can force it to be a VMFS!
  - Manually execute `vc-support.wsf` on VirtualCenter Management Server
    - Gathers VMware Registry keys
    - vpxd.cfg file
    - Windows event logs
    - Crash dumps, DRS dumps
    - Installation/upgrade logs, database logs and VI client logs

For personal informational use only!

For personal informational use only!

# Controlling VM Logs

**Configuration Parameters**

Modify or add configuration parameters as needed for experimental features or as instructed by technical support. Entries cannot be removed.

Name	Value
log.keepOld	3
nvram	aluminum_labcluster_W2K3_03.nvram
sched.swap.d...	/vmfs/volumes/469adffb-5b392ef7-5050-0017a48ed720/aluminum_labcluster_W2K3_03/alu...
scsi0:0.redo	
tools.syncTime	FALSE
vmware.tools...	7201
vmware.tools...	7201
vmware.tools...	7201
vmware.tools...	none
vmware.tools...	unknown
log.rotateSize	500000

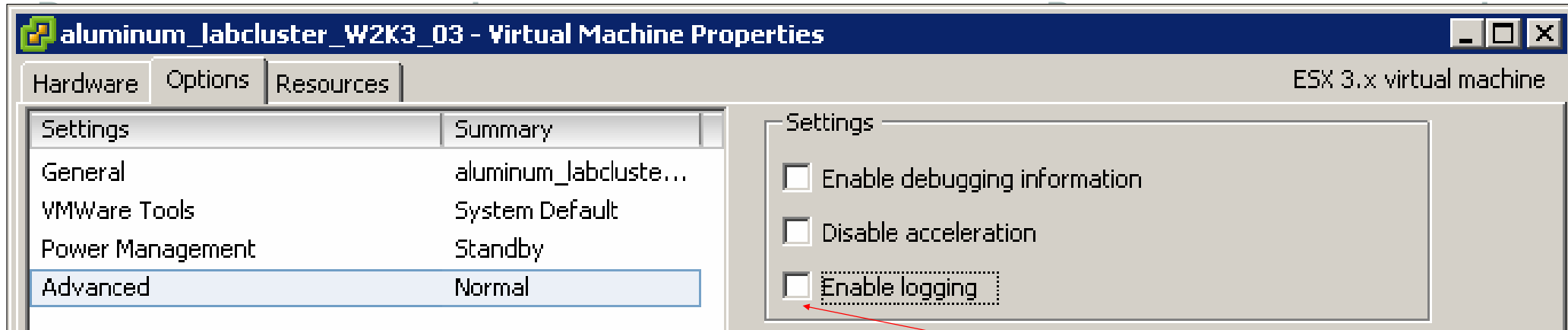
Number of log files kept

Max log file size

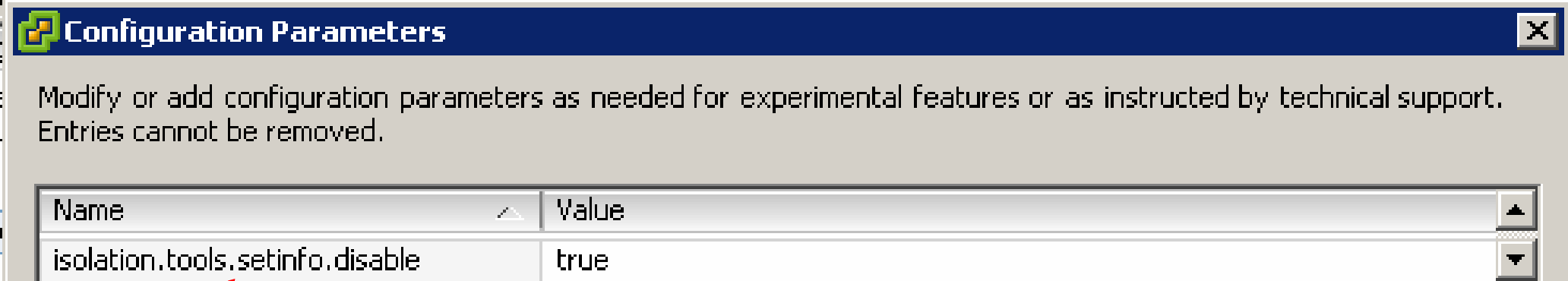
Add Row

OK Cancel Help

# Stopping VM Logging



Uncheck



Disable VMware Tools logging

For personal informational use only!

For personal informational use only!

# VirtualCenter Installation Logs

Do not excerpt or reproduce

Do not excerpt or reproduce

- Install logs are located in the %TEMP% directory of the user that installed software
  - vmlic.log - test results for served license file during install
  - redist.log - MDAC and QFE rollup install results
  - vmmsde.log - MSDE installation log
  - vmls.log - License server installation log
  - vmosql.log - Creation of database/trans logs for VCDB
  - vminst.log - Log of VC server installation and subtasks
  - VCDatabaseUpgrade.log - Details of upgrading from VC 1.x DB
  - vmmsi.log - VI client installation log

For personal informational use only!

For personal informational use only!

# VirtualCenter Log File Locations - vpxd Logs

Do not excerpt or reproduce

Do not excerpt or reproduce

- Location: %TEMP%\vpx
  - %USERPROFILE%\Local Settings\TEMP\#
  - %USERPROFILE%\Local Settings\TEMP
  - %SystemRoot%\Temp
- Naming: vpxd-#.log (# is one digit, 0-9)
- vpxd-index contains the # of the currently active log file
- Logs rotate each time vpxd is started, and also when it reaches **5 MB** in size

For personal informational use only!

For personal informational use only!

# VirtualCenter Log File Locations - vpxa Logs

Do not excerpt or reproduce

Do not excerpt or reproduce

- VC agent on ESX host
- Location: **`/var/log/vmware/vpx`**
- Naming: `vpxa-#.log` (# is one digit, 0-9)
- `vpxa.cfg` can be used to modify logging behavior

For personal informational use only!

For personal informational use only!

# Log Options for vpxd & vpxa

Do not excerpt or reproduce

Do not excerpt or reproduce

- Modify the vpxa and vpxd configuration files to control logging
  - C:\D and S\All Users\Application Data\VMware\VMware VirtualCenter\vpxd.cfg
  - etc/vmware/vpxa.cfg files to enhance logging
  - Parameters:
    - Level - Can be trivia, verbose, info, warning, error, or none
    - maxFileSize - Maximum log file size in bytes
    - maxFileNum - Number of log files held

For personal informational use only!

For personal informational use only!

# Miscellaneous VirtualCenter Log File Locations

Do not excerpt or reproduce

- Core dumps
  - %USERPROFILE%\Application\Data\VMware
- License Server
  - %ALLUSERSPROFILE%\Application Data\VMware\VMware License Server\ Imgrd.log
  - Resets each time the service starts;  
no rotation
- DRS
  - %TMP%\vpx\drmdump\cluster#
  - 20MB or up to 200 log files “#purposeActions.dump”
- Remote Console
  - %TEMP%\vmware-%USERNAME%\ vmware-%USERNAME%-pid.log
- Web Access
  - C:\Program Files\VMware\VMware VirtualCenter 2.0\tomcat\logs

Do not excerpt or reproduce

For personal informational use only!

For personal informational use only!

# VI Client Log File Locations - VI Client Logs

Do not excerpt or reproduce

Do not excerpt or reproduce

- Location: %TEMP%\vpx
- Naming: viclient-#.log (# is one digit, 0-9)
- Logs rotate each time VI Client is started

For personal informational use only!

For personal informational use only!

# VMotion Errors

Do not excerpt or reproduce

Do not excerpt or reproduce

- VMotion errors in the vpxd and vpxa logs are tagged with “[MIGRATE]”. For example:

***[2006-06-07 16:11:17.627 'App' 1864 error] [MIGRATE] (474991424) VMotion failed:***

- Migration ID appears in parenthesis after [MIGRATE]
- log messages found in vpxd, vpxa, hostagent and VMX logs
- Migration ID is also used to identify VMotions in
  - /proc/vmware/migration/history

For personal informational use only!

For personal informational use only!

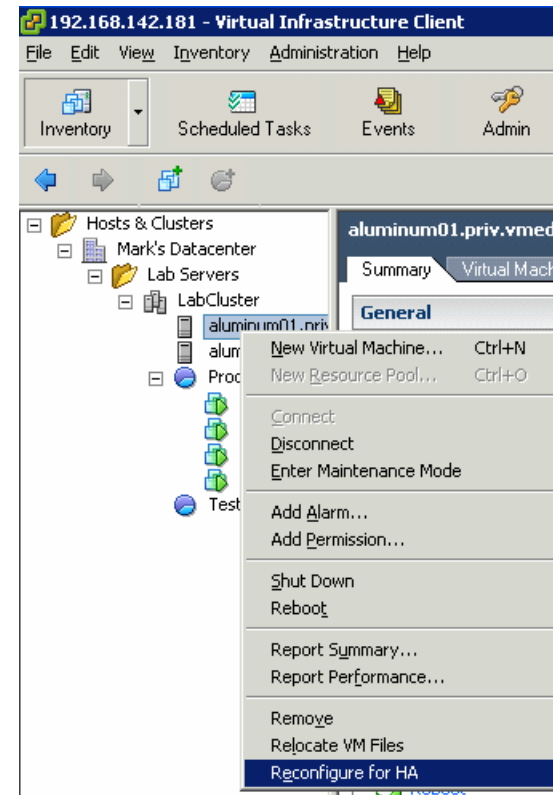
- Check logs:
  - `/opt/LGTOaam512/log/*`
  - Some HA cluster information is logged to the vpxd log file (on the VirtualCenter Management server)
  - Check the `/var/log/vmware/vpx/vpxa.log` file on the ESX Server host
- Command-line tools may also be helpful
  - `tail -f <log_file>`

# VMware HA Host Naming and Addressing

Do not excerpt or reproduce

Do not excerpt or reproduce

- A list of hosts that exist in the cluster can be found in /opt/LGTOaam512/config/vmware-sites
- AAM creates a cached copy of the /etc/hosts file called /etc/FT\_HOSTS
  - It may be necessary to delete this file and click “Reconfigure for HA”



For personal informational use only!

For personal informational use only!

# License Server logs

Do not excerpt or reproduce

- Check the log file in:
  - `%ALLUSERSPROFILE%\Application Data\VMware\VMware License Server\lmgrd.log`
- Log viewer is also available in LMTOOLS under the “Config Services” tab
- Check the log under:
  - `%ALLUSERSPROFILE%\Application Data\Macrovision\FLEXIm`
- Check the “Server Diags” tab in LMTOOLS. Click on “Perform Diagnostics” to see all licensed features and details

Do not excerpt or reproduce

For personal informational use only!

For personal informational use only!

# ESX Server 3.x License Configuration

Do not excerpt or reproduce

Do not excerpt or reproduce

- /etc/vmware/license.cfg
  - Contains host license configuration
  
- /etc/vmware/vmware.lic
  - Contains the unserved license file as uploaded by the VI Client
  - This file is a zero-byte file when licenses are obtained using a license server only

For personal informational use only!

For personal informational use only!