

## Wide Open World – Tech Tip

### How performance craters when defective power supplies, power throttling and BIOS settings intersect!

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**BLUF:** Lenovo/IBM issued an Engineering Change Announcement, ECA-003, to replace defective power supply units (PSU). Server models in ECA-003 should be inspected. If defective PSUs are installed, then follow the instructions to replace them. Be prepared to provide the make, model, serial and IMM logs with screen captures of the PSU serial numbers to identify the defective PSUs.

**ECA quantity notice:** If more than forty (40) PSUs need replacing, customers should open a CRIT/CMT with their sales representative and provide the number of PSUs to be replaced.

**ECA-003** --> <https://support.lenovo.com/us/en/documents/ht116322>

ECA-003 is for Lenovo / IBM systems. Other server manufacturers may have defective power supplies and/or throttling options similar to those discussed below. Servers not listed may still be power-throttling workloads if they are using incorrect IMM Power Management settings!

#### Required actions:

1. Inspect, verify and replace all defective PSUs, even when the PSU appears to operating normally.
2. ECA-003 recommends a full system power down because the defective PSUs may not maintain the workload when hot-swapped.
3. Flash/update all FW/BIOS to current versions for system, IMM, PCIe cards, etc. Then remove all power for one minute and perform a full cold restart.
4. Verify system “Power Policies” are set appropriately. Review the screen captures and sections below for:
  1. **Power Module Redundancy without throttling.**
  2. **No Power Limiting**
5. Restart the system after completing the above steps.
6. Return all defective PSUs within 30 days or the customer will be billed for each PSU.

**Why?** These defective PSUs may **not** present the orange “!” server warning or insert entries into the IMM logs. In fact, the PSUs may appear to be operating normally when internally the PSUs may have throttled the system workloads. Usually, throttled workloads will be identified by the IMM log showing the machine being “powered throttled.” When a defective PSU is present, the pCPUs may be cycling between normal and degraded. Also, the

system workloads may show increasing latencies when examined using Foglight's or VMware's historical performance services.

**Indications?** For our x3750 M4 systems, at least one of the PSU had failed. We were **not** alerted by the IMM nor were ANY IMM log entries generated until the IMM was restarted. There were also no warnings on VMware's Hardware alerting tab. Overall, the system appeared "100% Normal".

It was from experience that we restarted the IMM. Once the IMM restarted, we immediately began receiving repeating log entries that the processors were cycling between normal and degraded states. The IMM also notified us that the workload had been power throttled.

**Multiple Impacts?** We experienced *severe* performance degradations once the defective PSUs had "failed." Foglight's performance / GUI transitioned from snappy and responsive to very sluggish. We opened service requests with Foglight support but no software or severe tuning problems were identified.

Upon further analysis, we saw steep latency increases reported by Foglight. We then confirmed similar increases using VMware. Since these latency measurements began increasing remarkably at the same time, that coincidence became a major red-flag for us to continue digging.

Our customer impacts were **dramatic**. We saw:

1. Foglight GUI responses increase from sub-second to multi-second.
2. Our Foglight Federator accumulate and amplify delays from **each** kid.
3. Increases in Foglight database latencies
  1. Before → sustained 140-400ms +peaks
  2. After → 200us - 3ms
4. Dramatic physical host increases for VM ready, latencies, and co-stop.
5. Higher than expected VMware Core Utilization
  1. Before → Peaking 60-82%
  2. After → Peaking 15-30%
6. Increases in MYSQL database backups (240+%) and multiple backup errors
  1. Before → ~ 12 hours (19:30 - 07:30)
  2. After → ~ 4 hours, 15 mins (19:30 - 23:45)

**Note:** The observed impacts from power throttling may be similar to the results seen when the BIOS is allowed to default into "Balanced Power" mode.

## Supporting materials

IMM log showing no events prior to restarting the IMM.

### Event Log

This page displays the contents of the IMM event log, and allows you to sort and filter the log. By default the log entries are displayed in reverse chronological order (most recent log entry first). For each log entry, the severity of the event is displayed along with a timestamp, source and a text mess. . . [more . . .](#)

Last Collected Time: Wed, 4 Jan 2017 18:21:00

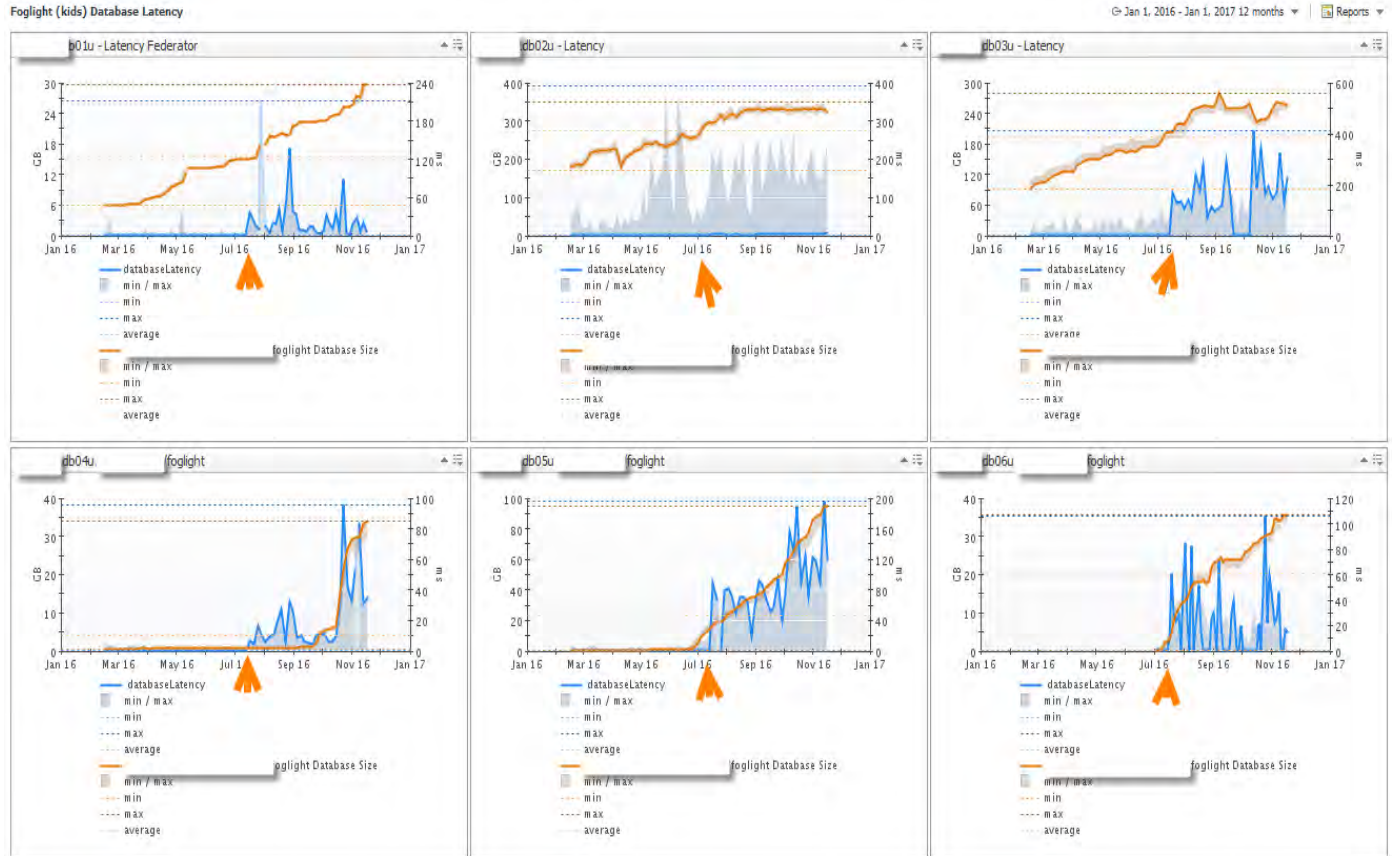
Severity	Source	Date	Event ID	Message
Total 1179 items. 0 items selected.				
Informational	System	16 Nov 2016, 01:34:42.753 PM	0x4000009d00000000	Login ID: s address 1
Informational	System	16 Nov 2016, 01:32:33.996 PM	0x4000002800000000	Managem ssoitlevtp
Informational	System	16 Nov 2016, 01:31:16.164 PM	0x4000000e00000000	Remote L ssoitlevtp 10.17.11.1
Informational	System	16 Nov 2016, 01:30:18.172 PM	0x4000001000000000	Security: U from WEB
Informational	System	16 Nov 2016, 01:30:07.665 PM	0x4000001000000000	Security: U from WEB
Informational	System	23 Nov 2015, 07:17:35.927 PM	0x4000009d00000000	Login ID: s address 1
Informational	System	23 Nov 2015, 07:17:35.927 PM	0x4000009d00000000	User _____ SNMPv3 set. AuthenticationProtocol=None, PrivacyProtocol=None, AccessType=Get, HostforTraps=.
Informational	System	23 Nov 2015, 07:17:35.927 PM	0x4000009d00000000	User _____ created.
Informational	System	23 Nov 2015, 06:58:09.587 PM	0x4000006900000000	User _____ SNMPv3 set. AuthenticationProtocol=None, PrivacyProtocol=None, AccessType=Get, HostforTraps=.
Informational	System	23 Nov 2015, 06:58:08.247 PM	0x4000006600000000	User _____ d.
Informational	System	23 Nov 2015, 06:58:08.247 PM	0x4000006600000000	User _____ set.

System communications was unaware of the compromised PSU.  
Current FW/BIOS updates needed.

IMM log indicating “Power Throttling” and each pCPU bouncing from normal to degraded states. (Note: these entries were presented only AFTER the IMM was restarted.)

Informational	System	19 Nov 2016, 04:52:15.233 PM	0x4000001000000000	failures from WEB client at IP address
Informational	System	19 Nov 2016, 04:50:03.099 PM	0x4000007f00000000	Power cap throttling occurred.
Informational	Processors	19 Nov 2016, 04:37:54.346 PM	0x816f0a070304ffff	The Processor processor 4 is no longer operating in a Degraded State.
Informational	Processors	19 Nov 2016, 04:37:54.339 PM	0x816f0a070303ffff	The Processor processor 3 is no longer operating in a Degraded State.
Informational	Processors	19 Nov 2016, 04:37:54.308 PM	0x816f0a070302ffff	The Processor processor 2 is no longer operating in a Degraded State.
Informational	Processors	19 Nov 2016, 04:37:54.305 PM	0x816f0a070301ffff	The Processor processor 1 is no longer operating in a Degraded State.
Warning	Processors	19 Nov 2016, 04:37:44.291 PM	0x806f0a070304ffff	processor 4 is operating in a Degraded State.
Warning	Processors	19 Nov 2016, 04:37:44.289 PM	0x806f0a070303ffff	processor 3 is operating in a Degraded State.
Warning	Processors	19 Nov 2016, 04:37:44.097 PM	0x806f0a070302ffff	processor 2 is operating in a Degraded State.
Warning	Processors	19 Nov 2016, 04:37:44.094 PM	0x806f0a070301ffff	processor 1 is operating in a Degraded State.

## Foglight showing step increases in multiple VM database latencies



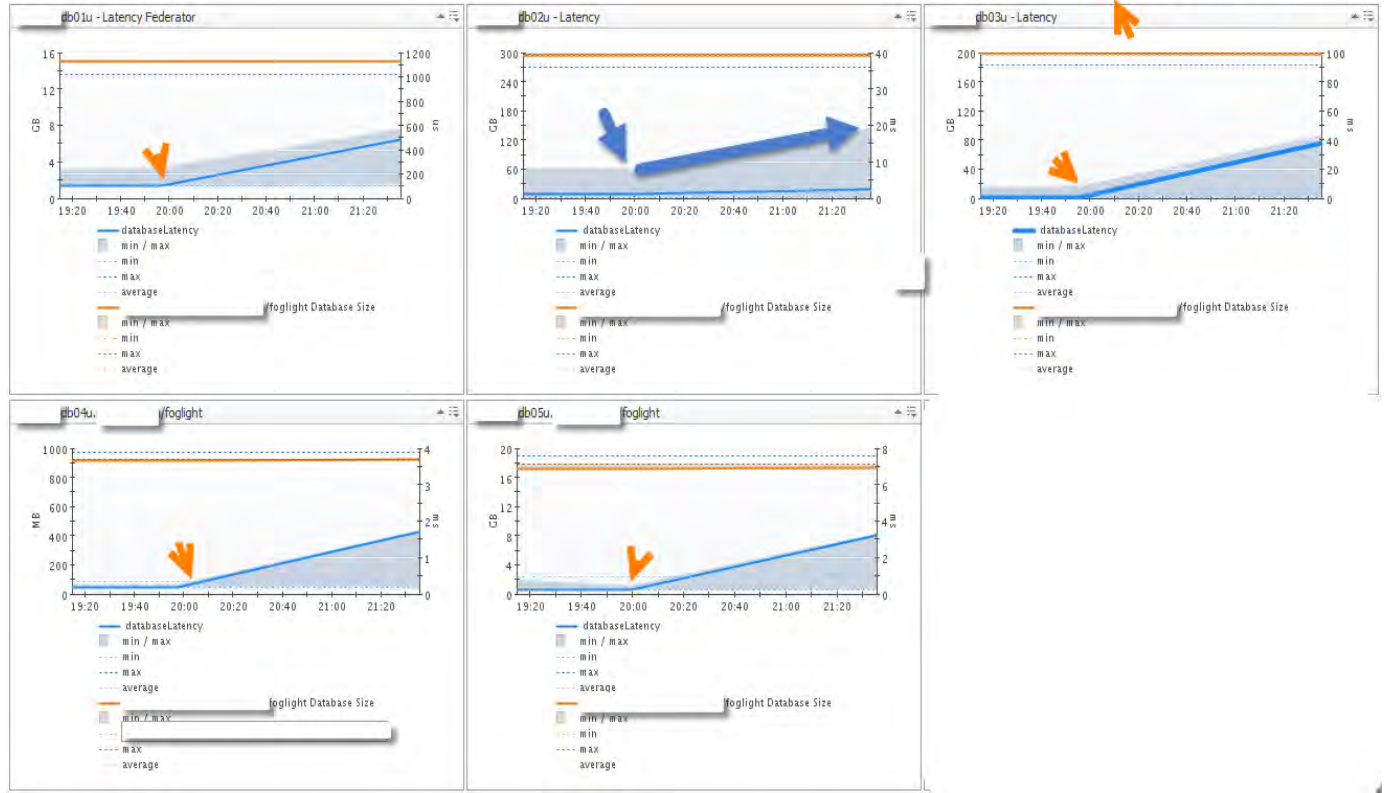
## Foglight showing a drill-in on VM DB03 database latency 20:00 13 Jun 2016



## Foglight showing multiple VM database latencies for ~ 20:00 13 Jul 2016

Foglight (kids) Database Latency

Wednesday, July 13, 2016 7:14 PM - 9:35 PM 2.3 hours Reports

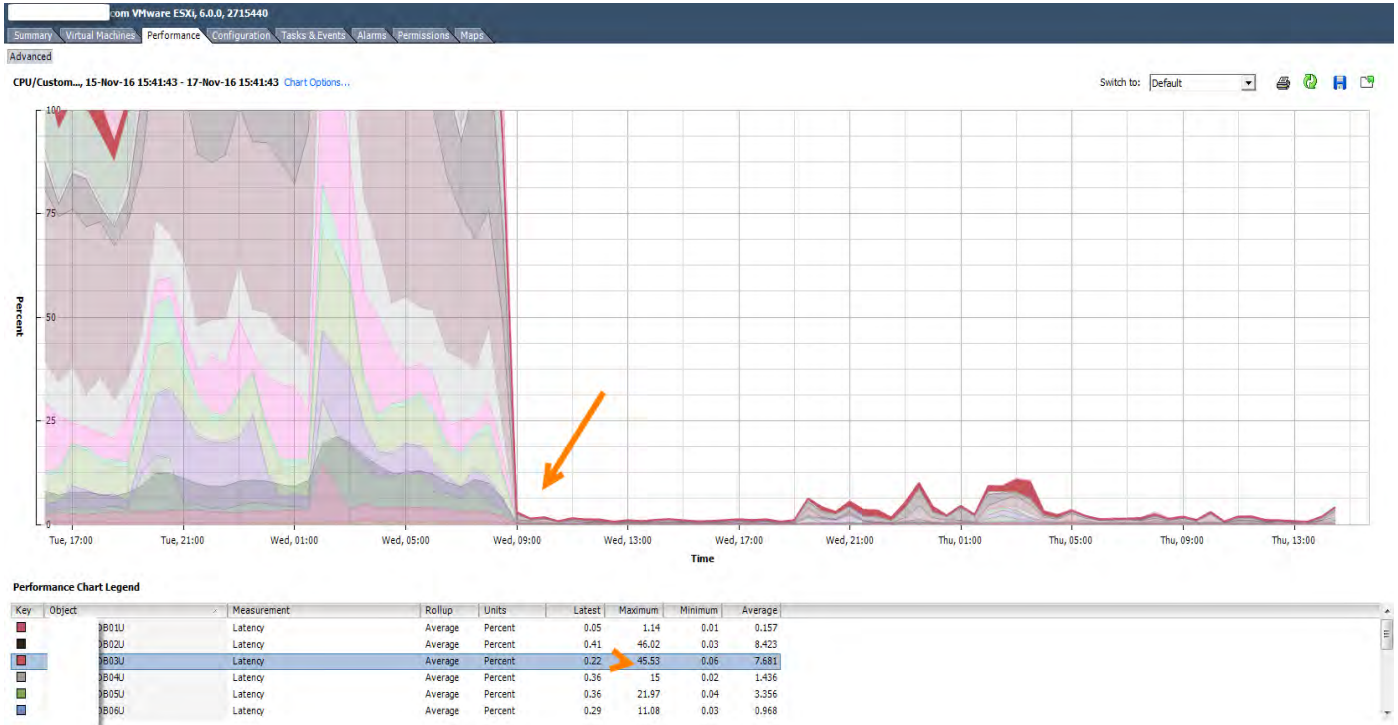


## VMware showing VM DB03 database latency + co-stop - increasing dramatically

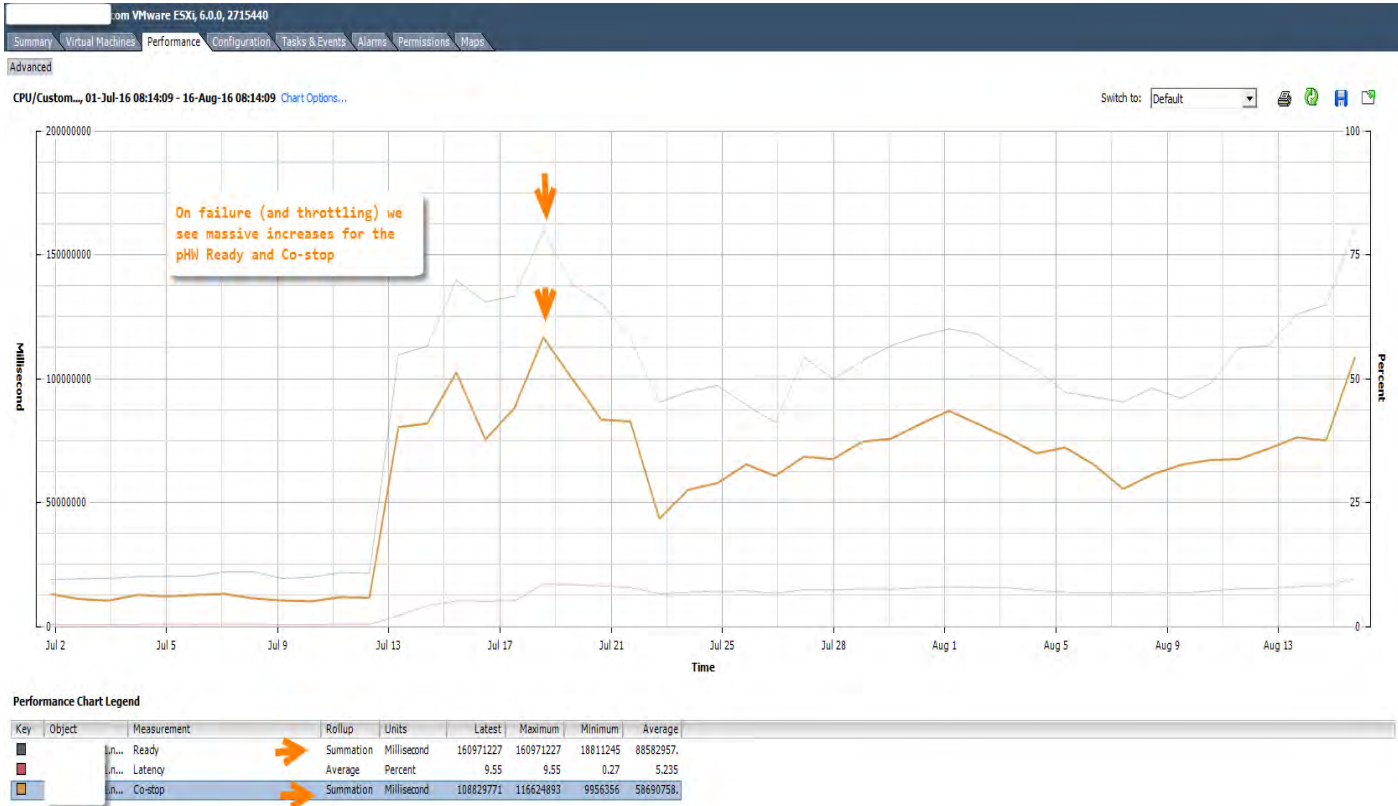




# VMware showing multiple VM database latencies while throttled vs. un-throttled with HOP BIOS settings



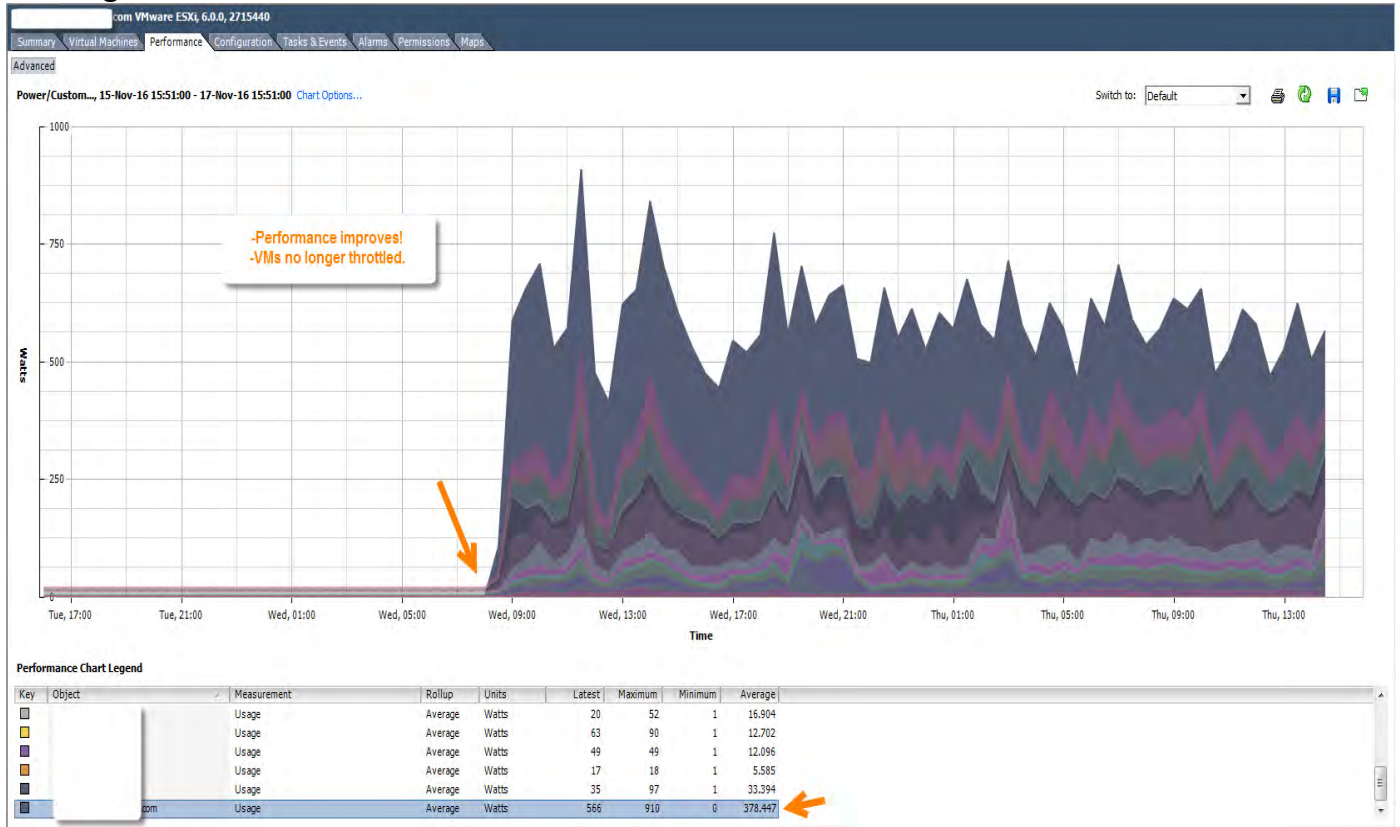
# VMware showing Ready, Latency and Co-stop increases during throttling



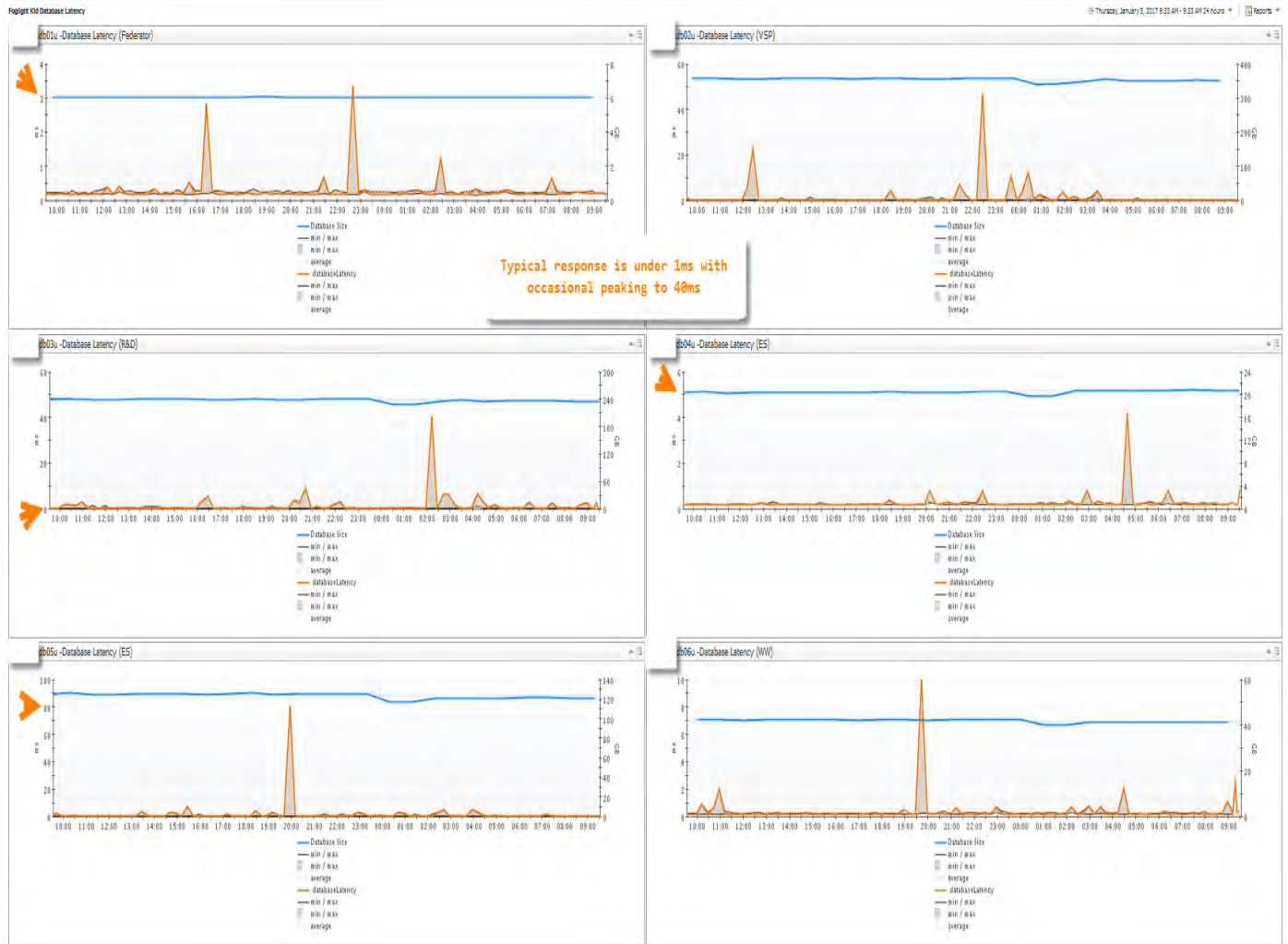




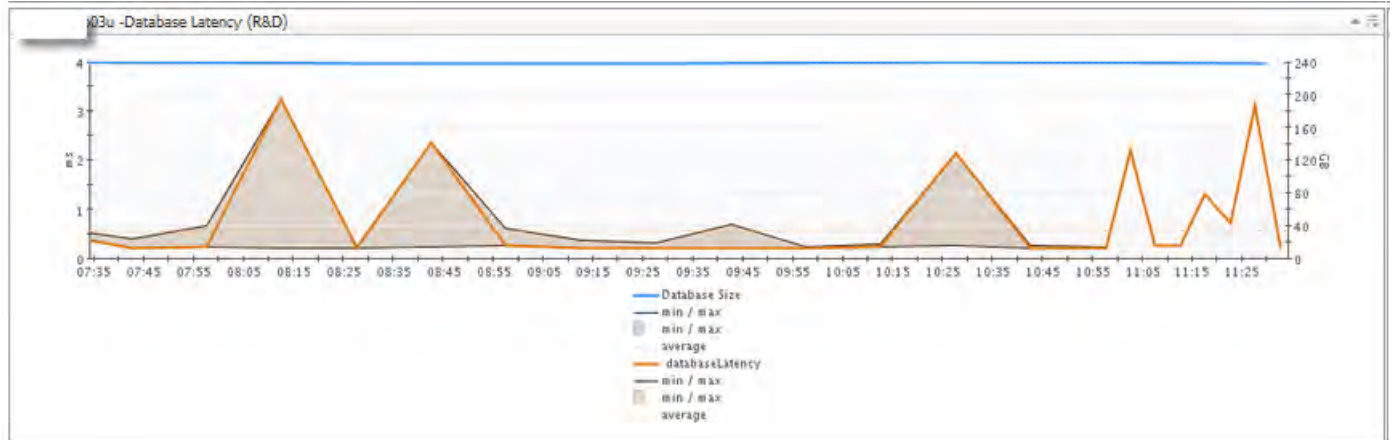
# VMware showing VMs power-throttled vs. VMs not power-throttled with HOP BIOS settings



Foglight showing multiple VM database latencies with no throttling and HOP BIOS settings fully engaged.



Today our Foglight database latencies range from 400us - 3ms (4hr view)



## Lenovo Power Policies

“Power Policies” are features which may be available from many hardware manufacturers. Often, the Power Policy defaults to allow power throttling. These policies should be changed in the IMM Power Management section. The policies and defaults may not update when redundant power supplies are installed. Do not assume, verify your system settings!

## Server Power Management

Manage power related policies and hardware

**Power Policies**

**Redundant without Throttling**  
Set policies for how or if you wish to protect your system in the case of potential power module failure.  
Current Policy: **Power Module Redundancy without Throttling Allowed** [Change](#)

**Power Limiting/Capping Policy**  
Set policies for how or if you wish to limit the total amount of power that the system overall is allowed to consume.  
Current Policy: **No Power Limiting** [Change](#)

### Select “Redundant without Throttling”

	Power Supply Failure Limit <sup>†</sup>	Maximum Power Limit (Watts)	Estimated Usage <sup>††</sup>
<input checked="" type="radio"/> <b>Redundant without Throttling</b> System will be allowed to boot only if it is guaranteed to survive the loss of a power supply and continue to run without throttling.	1	1400	86%
<input type="radio"/> <b>Redundant with Throttling</b> System will be allowed to boot only if it is guaranteed to survive the loss of a power supply, though it may need to throttle to continue running.	1	1680	71%
<input type="radio"/> <b>Non-Redundant</b> System will be allowed to boot provided that it is guaranteed to stay up and running without throttling and both power supplies operational. The system will throttle if a power supply fails in an attempt to stay up and running, but there is no guarantee.	0	2660	45%

<sup>†</sup> This is the maximum number of power supplies that can fail while still guaranteeing the operation of the selected policy.  
<sup>††</sup> The estimated usage is based on the maximum power limit allowed in this policy and the current aggregated power in use of all components in the chassis.

[Ok](#) [Cancel](#)

## Select "No Power Limiting"

Change Power Capping Policy ✕

**No Power Limiting**  
The maximum power limit will be determined by the active Power Redundancy policy.

**Power Capping**  
Sets the overall system power limit. In a situation where powering on a component would cause the limit to be exceeded, the component would not be permitted to power on.

NaN NaN

NaN Watts (Range NaN - NaN)  
DC ▾

Ok Cancel Refresh

<EOF>