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Optimize hardware BIOS

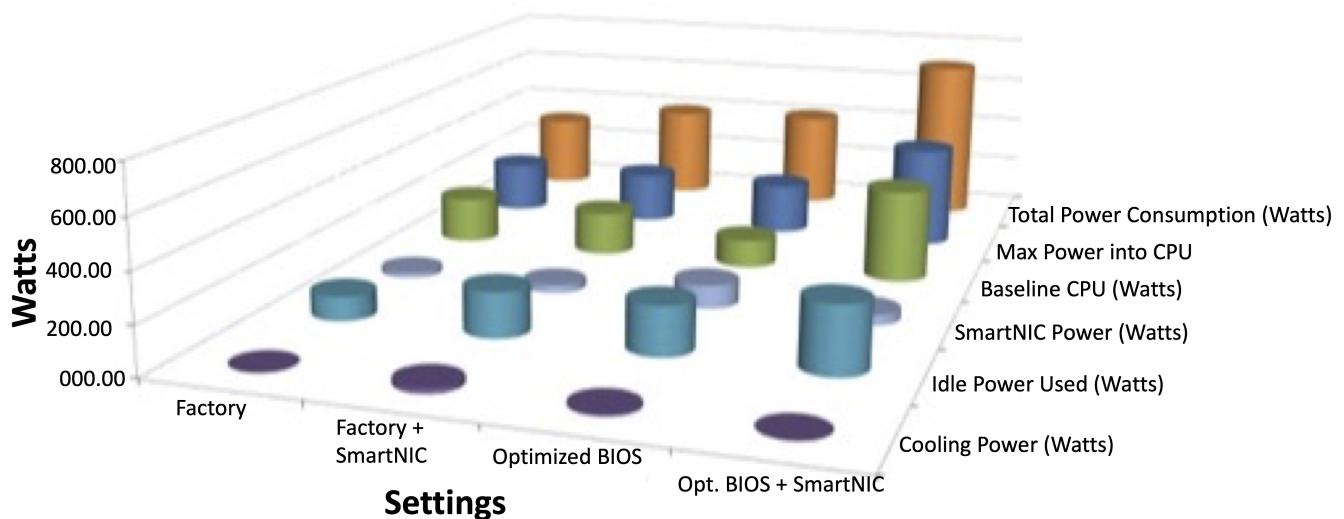
This topic discusses commercial off-the-shelf (COTS) hardware and software performance optimizations that you can do for BIG-IP VE running in on-prem hypervisors.

COTS servers come optimized for energy efficiency by default. However, when emulating F5 appliances on virtual platforms, these default settings are detrimental to performance. Change the following settings in the individual servers' BIOS, manually or for Redfish-compliant servers, you can push these BIOS changes using an API. The following procedures use the Redfish-compliant HPE DL 380 Gen 10 server as an example.

Note

Applying these changes can increase the power consumption at baseline idle; however, the average power usage over time typically remains within 20% of stock settings. At scale these settings will usually reduce the global power usage and HVAC thermal load, because you will require less servers and waste less power. For example, one server takes 200-Watts to run at idle. This is considered “wasted power” lost to heat. In the case of ten servers, a 30% reduction produces a 600-Watt reduction of net power consumption, and a more consistent BTU output from the remaining servers.

The following diagram illustrates a graph of power usage utilizing a high-powered SmartNIC.



The *Optimized BIOS* section of the graph shows an example running a typical low power NIC, such as the Mellanox CX4 or CX5. You will notice the increase in the *Cooling Power* as we adjust the fan speed to maximum and uncap the *Baseline CPU* frequency, which enables the CPU to run at a faster rate. Also, turning off the *Speed Stepping* negates a response lag.

- Adjusting the fan speed enables the CPUs to run at a higher base frequency rate, normally limited by thermal throttling and power management.

- Raising the upper power limit that you can apply to the CPUs, also increases the available compute power without increasing the *Idle Power* used, because the power required to increase the fan speed is minimal.

The following screenshot displays a **non-optimized** system.

Subsystem	Current	Average	Maximum	Minimum	Timestamp	Period
Entire platform	227	296	366	21	Thu Dec 3 19:57:12 2020	210 days 13 hours 20 minutes 9 seconds
CPU	60	60	165	44	Thu Dec 3 19:57:12 2020	16 days 21 hours 41 minutes 18 seconds
Memory	14	14	20	3	Thu Dec 3 19:57:12 2020	16 days 21 hours 40 minutes 56 seconds

The following screenshot displays an **optimized** system with no CPU cap.

Subsystem	Current	Average	Maximum	Minimum	Timestamp	Period
Entire platform	303	294	555	8	Thu Dec 3 19:57:09 2020	62 days 22 hours 47 minutes 10 seconds
CPU	155	155	195	100	Thu Dec 3 19:57:09 2020	13 days 17 hours 50 minutes 51 seconds
Memory	15	15	20	14	Thu Dec 3 19:57:09 2020	13 days 17 hours 50 minutes 29 seconds

A typical energy efficient capped CPU only provides 60 Watts to the CPUs, whereas an uncapped system can supply up to the Thermal Design Power (TPD) limit. The optimized system shows 155 Watts supplied to the CPUs instead of 60 Watts, which represents a significant increase in compute power. The average power used over time averaged 2 Watts less (296 Watts versus 294 Watts) on the optimized system.

Use Redfish API to push BIOS setting changes¶

This example uses the HPE DL 380 Gen 10 server.

1. Load the HPE RESTful Interface Tool on a Windows workstation that has access to the HPE server iLO management interface: https://support.hpe.com/hpsc/swd/public/detail?swItemld=MTX_d1c19551ffbb4b1b8f94587e22 (https://support.hpe.com/hpsc/swd/public/detail?swItemld=MTX_d1c19551ffbb4b1b8f94587e22).
2. Copy the `HPE_DL380G10_Perf.json` file to a local workstation directory.
3. Run the HPE RESTful Interface tool.
4. Change directories to the `.json` file.
5. Back up the existing BIOS settings, use:

```
iloctl save --selector=Bios. -f HPE_DL380G10_Perf.json --url <iLO IP> -u <iLO
```



For example:

```
iloctl save --selector=Bios. -f HPE_DL380G10_Perf.json --url 10.10.195.230 -u
```



6. Run the following command to push the new configuration:

```
iloctl load -f HPE_DL380G10_Perf.json --url <iLO IP> -u <iLO username> -p <iL
```



For example:

```
iloctl load -f HPE_DL380G10_Perf.json --url 10.10.195.230 -u admin -p admin
```

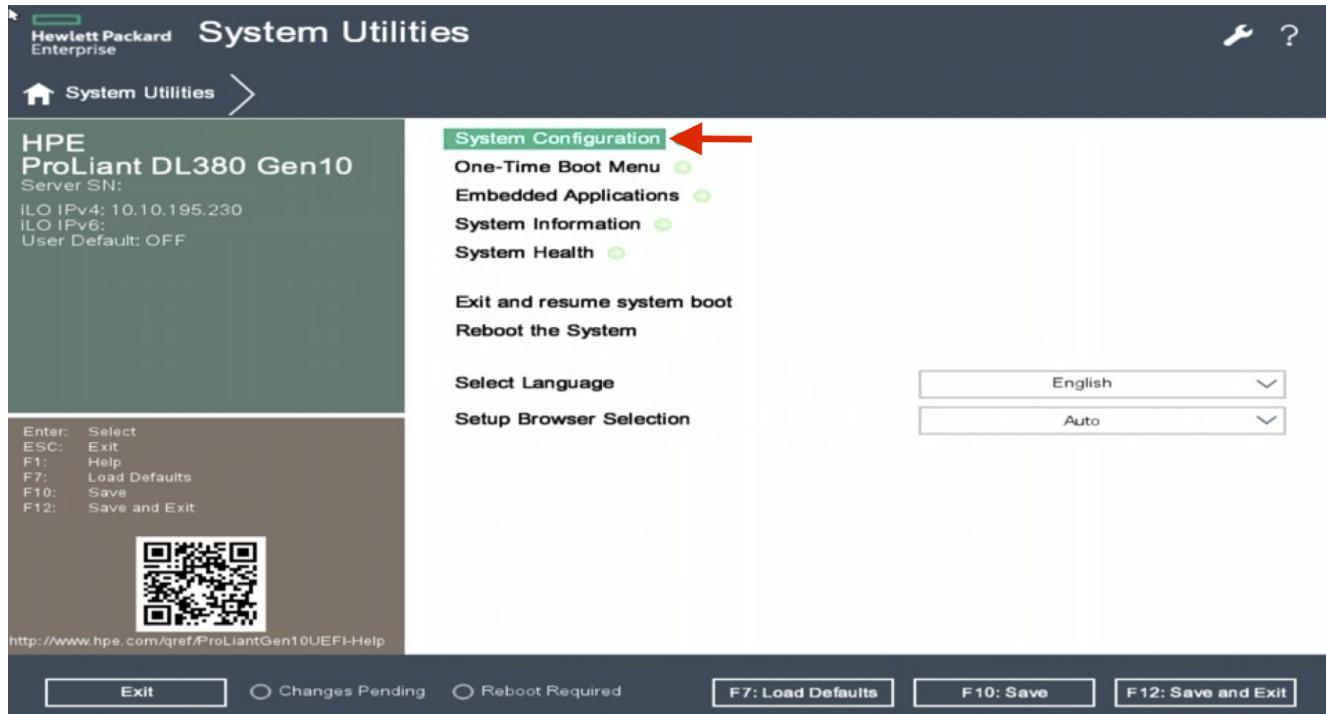


Manually change BIOS settings

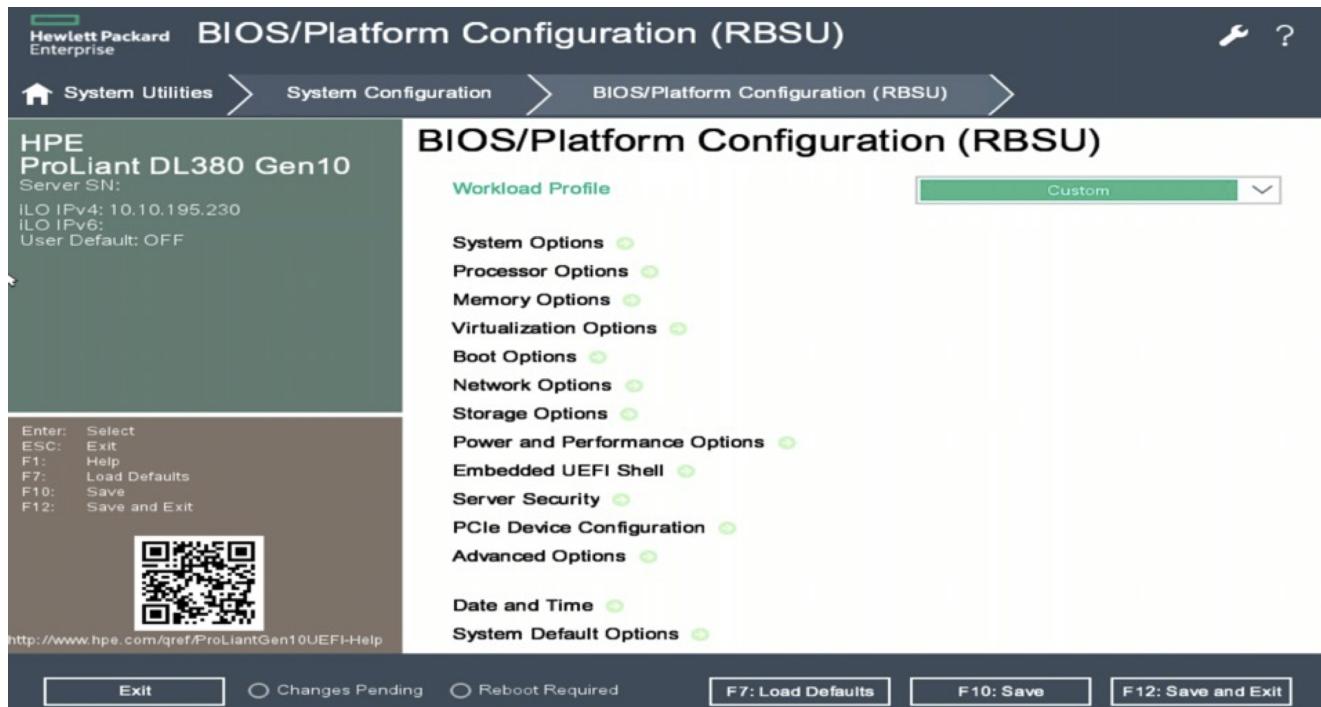
This example uses the HPE 380 Gen 10 server.

1. To open the BIOS settings, press the **F9** key at post (see the HPE ProLiant Gen9 and Gen10 Servers - How to Enter System Utilities (BIOS) (https://support.hpe.com/hpsc/public/docDisplay?docId=sf000042070en_us&docLocale=en_US) topic for complete details).

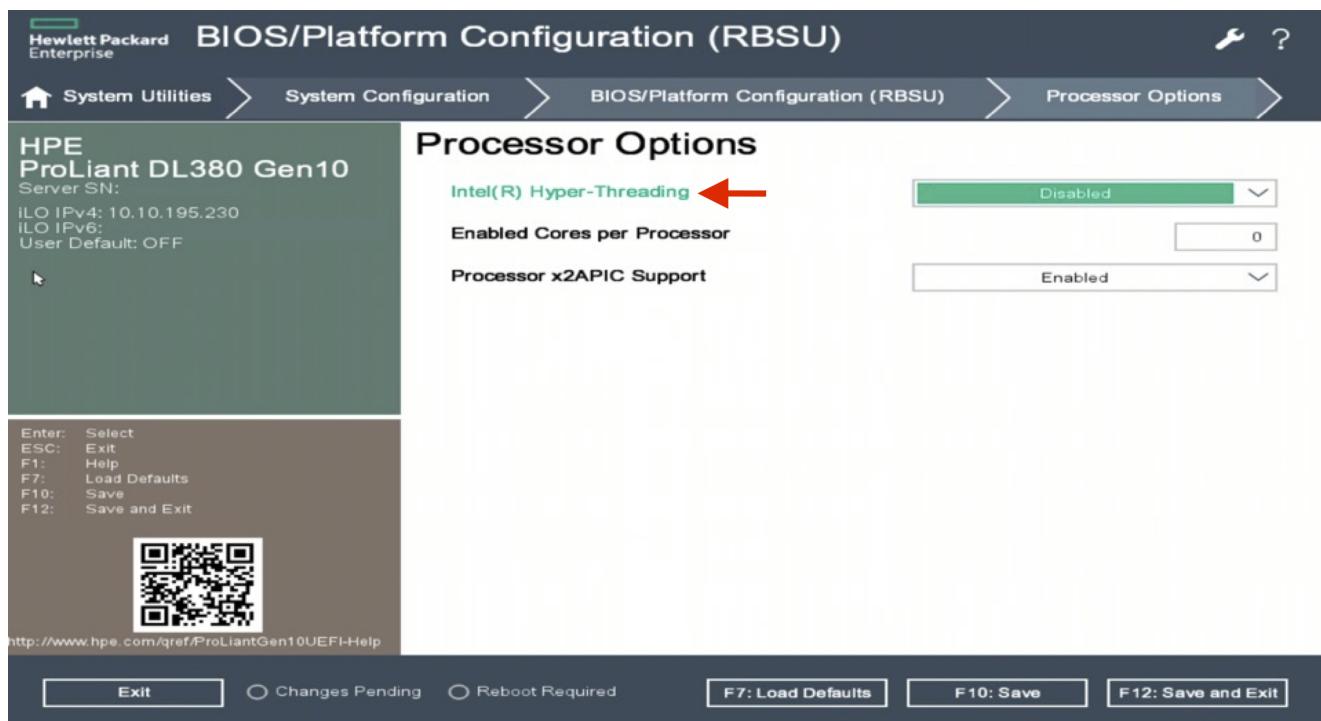
2. Select System Configuration:



3. Select BIOS/Platform Configuration (RBSU):



4. In the Processor Options menu, set Hyperthreading to Disabled.



Note

This will reduce the available thread count (vCPUs) in half, but will save 5%-15% overhead and simplify core pinning in the hypervisor.

5. In the Virtualization Options menu, select Enabled for all Intel Virtul Technology, Intel VT-d , and :guilabel:`SR-IOV options.

BIOS/Platform Configuration (RBSU)

System Utilities > System Configuration > BIOS/Platform Configuration (RBSU) > Virtualization Options

HPE ProLiant DL380 Gen10

Server SN: ILO IPv4: 10.10.195.230
ILO IPv6: User Default: OFF

Virtualization Options

Intel(R) Virtualization Technology (Intel VT): Enabled

Intel(R) VT-d: Enabled

SR-IOV: Enabled

Enter: Select
ESC: Exit
F1: Help
F7: Load Defaults
F10: Save
F12: Save and Exit

http://www.hpe.com/qref/ProLiantGen10UEFI-Help

Exit Changes Pending Reboot Required F7: Load Defaults F10: Save F12: Save and Exit

6. Under Power and Performance Options change the setting(s) to match the following:

BIOS/Platform Configuration (RBSU)

More Forms > BIOS/Platform Configuration (RBSU) > Power and Performance Options

HPE ProLiant DL380 Gen10

Server SN: ILO IPv4: 10.10.195.230
ILO IPv6: User Default: OFF

Power and Performance Options

Power Regulator: Static High Performance Mode

Minimum Processor Idle Power Core C-State: No C-states

Minimum Processor Idle Power Package C-State: No Package State

Intel(R) Turbo Boost Technology: Enabled

Energy/Performance Bias: Maximum Performance

Collaborative Power Control: Enabled

Intel DMI Link Frequency: Auto

NUMA Group Size Optimization: Flat

Intel Performance Monitoring Support: Disabled

Uncore Frequency Scaling: Auto

Sub-NUMA Clustering: Disabled

Energy Efficient Turbo: Disabled

Local/Remote Threshold: Auto

Enter: Select
ESC: Exit
F1: Help
F7: Load Defaults
F10: Save
F12: Save and Exit

http://www.hpe.com/qref/ProLiantGen10UEFI-Help

Exit Changes Pending Reboot Required F7: Load Defaults F10: Save F12: Save and Exit

Collaborative Power Control

- Enabled
- Auto
- Flat
- Disabled

Uncore Frequency Scaling

- Auto
- Disabled
- Disabled
- Auto
- Enabled
- Disabled

Processor Prefetcher Options

I/O Options

Advanced Performance Tuning Options

Advanced Power Options

7. Select the **Advanced Performance Tuning Options** subsection, and then under **Power and Performance**, change the settings to match the following:

Processor Jitter Control

- Disabled
- 0

Processor Jitter Control Optimization

- Zero Latency
- Disabled
- Level 2
- Disabled
- Auto
- Enabled

8. Select the **BIOS/Platform Configuration** menu again, and then select **Advanced**.

HPE ProLiant DL380 Gen10
Server SN:
ILO IPv4: 10.10.195.230
ILO IPv6:
User Default: OFF

Enter: Select
ESC: Exit
F1: Help
F7: Load Defaults
F10: Save
F12: Save and Exit

http://www.hpe.com/qref/ProLiantGen10UEFI-Help

Advanced Options

ROM Selection

- Use Current ROM
- Auto
- CDN Support for LOMs and Slots
- Enabled
- Enabled

Embedded Video Connection

Consistent Device Naming

Mixed Power Supply Reporting

High Precision Event Timer (HPET) ACPI Support

Fan and Thermal Options

Advanced Service Options

Advanced Debug Options

Exit Changes Pending Reboot Required F7: Load Defaults F10: Save F12: Save and Exit

9. Select Fan and Thermal Options menu, and choose the Maximum Cooling profile:

HPE ProLiant DL380 Gen10
Server SN:
ILO IPv4: 10.10.195.230
ILO IPv6:
User Default: OFF

Enter: Select
ESC: Exit
F1: Help
F7: Load Defaults
F10: Save
F12: Save and Exit

http://www.hpe.com/qref/ProLiantGen10UEFI-Help

Fan and Thermal Options

Thermal Configuration

- Maximum Cooling
- Enabled
- Enable Messaging
- Shutdown/Halt on Critical Fan Failures
- Disabled

Thermal Shutdown

Fan Installation Requirements

Fan Failure Policy

Extended Ambient Temperature Support

Exit Changes Pending Reboot Required F7: Load Defaults F10: Save F12: Save and Exit

10. Select Save and Exit. The system is now optimized.