



Technical Service Bulletin TSB-2025-001

VP2440 ASPM Network Interface Performance Degradation

Issue Date	November 21, 2025
Last Updated	February 18, 2026
Version	2.0.0
Severity	MEDIUM
Affected Product	Protectli VP2440
Affected Firmware	coreboot v0.9.0
Affected Components	Intel i226-V Network Interfaces (both ports)
Status	RESOLVED Firmware Update Available (v0.9.1-rc3)

Changelog

Version	Date	Changes
2.0.0	February 18, 2026	Status updated to Resolved. Added firmware v0.9.1-rc3 permanent resolution section, including full technical explanation of the CLKREQ/Clock PM/PCH Clock Gating fix and its functional implications. Updated FAQ. OS workarounds retained for reference.
1.1.0	December 10, 2025	Reworded FreeBSD tunable section to clarify it may not fully resolve the issue. Clarified that power increase from disabling ASPM is more substantial than previously noted.
1.0.0	November 21, 2025	Initial release

Executive Summary

Under certain conditions, VP2440 units running coreboot firmware v0.9.0 may experience intermittent network performance degradation on the Intel i226-V Ethernet ports. This issue is related to Active State Power Management (ASPM) states and can cause network throughput to drop significantly below the expected 2.5 Gbps link speed. This issue does not occur with the default AMI BIOS firmware.

A permanent firmware fix is now available as coreboot v0.9.1-rc3. Users who applied the OS-level ASPM workaround described in this bulletin may upgrade their firmware and optionally remove the workaround. OS-level

workarounds remain documented below for users who have not yet upgraded.

This firmware version is designated as a release candidate (rc) as it is an intermediary release made specifically to address this issue. A full release will follow at a later time when additional features are implemented. Despite the rc designation, this firmware has undergone the same rigorous in-house verification and qualification process as any full release, ensuring that no new issues have been introduced.

Affected Systems

Hardware

- **Model:** Protectli VP2440
- **Firmware Version:** coreboot v0.9.0
- **Network Controllers:** Intel i226-V revision 4 (both Ethernet ports)
- **Scope:** All VP2440 units with coreboot v0.9.0 firmware are believed to be affected

Operating Systems

This issue affects any operating system that implements ASPM power management, including but not limited to:

- Linux distributions (Ubuntu, Debian, CentOS, etc.)
- FreeBSD-based systems (OPNsense, pfSense)
- Windows
- Other Unix-like operating systems with ASPM support

Problem Description

Technical Background

Active State Power Management (ASPM) is a PCI Express power management feature that allows devices to enter low-power states during periods of inactivity. The VP2440's coreboot firmware enables ASPM by default across all devices, and this setting cannot be toggled in the BIOS.

When the operating system detects that ASPM is available, it typically enables the feature automatically. However, in the affected firmware version, an issue with ASPM state transitions causes the Intel i226-V network interfaces to experience degraded performance.

Symptoms

Users experiencing this issue may observe one or more of the following:

- **Inconsistent network throughput:** Performance varies unpredictably between tests, even under identical conditions
- **Significant speed degradation:** Throughput drops from the expected 2.5 Gbps to anywhere between 150 Mbps and 600 Mbps, with highly inconsistent results between tests
- **Port-specific impact:** Only the two Intel i226-V Ethernet ports are affected

Detection Method

To verify if your system is experiencing this issue:

1. Perform network throughput testing using tools such as iPerf3 or similar network benchmarking utilities
2. Test traffic passing through one or both i226-V Ethernet ports
3. Run multiple tests to observe inconsistent performance patterns
4. Compare results against the expected 2.5 Gbps link speed

```
# Example iPerf3 test command
iperf3 -c [destination_ip] -t 30 -i 5
```

Permanent Resolution — Firmware Update v0.9.1-rc3

Overview

coreboot firmware v0.9.1-rc3 resolves this issue at the firmware level. No OS-level workarounds are required after updating. The fix targets only the Intel i226-V LAN ports (LAN1 and LAN2) and does not affect other interfaces.

Technical Details of the Fix

The root cause was identified as an interaction between ASPM state transitions and the CLKREQ (clock request) signal behavior on the Intel i226-V controllers under the v0.9.0 coreboot implementation. This change has the following functional consequences:

- **ASPM remains functional** — the PCIe link can still enter idle/low-power states normally
- **Clock Power Management (Clock PM) is disabled** — the PCIe reference clock is no longer gated off during idle periods
- **PCH Clock Gating is disabled for these ports** — the Platform Control Hub (PCH) no longer performs additional clock gating based on CLKREQ de-assertion from LAN1/LAN2
- **ASPM L1.1 and L1.2 substates are not functional** on these ports, as these substates depend on CLKREQ

This change was applied only to the i226-V LAN1 and LAN2 ports and does not affect other PCIe devices or interfaces.

Background: ASPM, CLKREQ, and Clock Gating

ASPM (Active State Power Management) is a PCI Express feature that allows a device's link to enter a low-power idle state during periods of inactivity.

Clock PM (Clock Power Management) is an enhancement enabled by the CLKREQ signal that allows the PCIe reference clock to be disabled while the link is idle, providing additional power savings on top of ASPM.

PCH Clock Gating is a chipset-level feature that enables further power savings in the Platform Control Hub when no devices are requesting a clock. It requires all relevant devices to have an active CLKREQ signal to function.

With the fix applied, Clock PM and PCH Clock Gating are disabled on the i226-V ports, and ASPM L1.1 and L1.2 substates are not functional on those ports as they depend on CLKREQ. ASPM itself remains active.

Power Consumption Impact

Testing on Ubuntu 24 shows that the power consumption difference between v0.9.0 and v0.9.1-rc3 is minimal, less

than one watt at idle, with comparable results under full NIC saturation. Overall power consumption on coreboot v0.9.1-rc3 remains lower than on the AMI BIOS firmware.

How to Update

The firmware update is distributed through **Flashli**, Protectli's firmware update utility:

1. Download the latest Flashli script from: <https://github.com/protectli-root/protectli-firmware-updater>
2. Follow the instructions provided in the repository to update your VP2440 to coreboot v0.9.1-rc3
3. For additional guidance, see the KB article: [How to Use Flashli](#)

After updating, OS-level workarounds are no longer required and may optionally be removed.

OS-Level Workarounds (v0.9.0 Only)

The following workarounds remain documented for users who have not yet upgraded to v0.9.1-rc3. They resolve the performance issue by disabling ASPM at the OS level. Note that disabling ASPM at the OS level will increase power consumption.

Linux-Based Systems

For most Linux distributions using the GRUB bootloader:

1. Edit the GRUB configuration file:

```
sudo nano /etc/default/grub
```

2. Locate the line beginning with `GRUB_CMDLINE_LINUX_DEFAULT` or `GRUB_CMDLINE_LINUX`

3. Add `pcie_aspm=off` to the kernel parameters:

```
GRUB_CMDLINE_LINUX_DEFAULT="quiet splash pcie_aspm=off"
```

4. Save the file and update GRUB:

```
sudo update-grub
```

Note: On CentOS, RHEL, and Fedora, use: `sudo grub2-mkconfig -o /boot/grub2/grub.cfg`

5. Reboot the system for changes to take effect

OPNsense / pfSense Systems

1. Log into the web interface
2. Navigate to **System** → **Settings** → **Tunables**
3. Click the **+** button to add a new tunable
4. Configure the tunable:
 - **Name:** `hw.pci.enable_aspm`
 - **Value:** `0`

5. Click **Save** and reboot

Note: The effectiveness of this tunable has not been confirmed to work 100% of the time, or confirmed to fully solve the issue. While this setting should generally improve performance, your results may vary. We recommend monitoring network performance after applying this change.

Root Cause Analysis

Initial investigation indicates that the issue stems from ASPM state transitions in the v0.9.0 coreboot firmware causing inconsistent power delivery to the Intel i226-V network controllers. The problem manifests most clearly during idle-to-active transitions when the system experiences sudden high network load.

This issue is related to ASPM substates, specifically the behavior of CLKREQ signaling for these particular network interfaces.

Impact on System Operation

- **Functionality:** All other system functions operate normally; only network throughput on i226-V ports is affected
- **Data Integrity:** No data corruption or packet loss beyond what would be expected from reduced bandwidth
- **System Stability:** No system crashes, freezes, or instability observed

Frequently Asked Questions

Q: Does this affect all network ports on the VP2440?

A: No. Only the two Intel i226-V Ethernet ports are affected. The SFP+ interfaces are unaffected.

Q: Will disabling ASPM at the OS level cause any problems?

A: No significant negative effects are expected. The primary trade-off is an increase in power consumption. Network performance and system stability will improve.

Q: Does the v0.9.1-rc3 firmware update fully disable ASPM?

A: No. ASPM remains functional. ASPM substates L1.1 and L1.2 are not functional on the i226-V ports.

Q: Do I need to remove the OS-level workaround after updating to v0.9.1-rc3?

A: It is not required. Keeping ASPM disabled at the OS level after updating will not cause problems. However, since v0.9.1-rc3 resolves the underlying issue, you may remove the workaround if you wish to allow ASPM to operate normally.

Q: Will power consumption change after updating to v0.9.1-rc3?

A: The difference compared to v0.9.0 is minimal — less than one watt at idle. Overall power consumption remains lower than on the AMI BIOS firmware.

Support and Contact Information

If you have questions about this issue, need assistance applying the workaround or firmware update, or wish to report related symptoms:

- **Email Support:** support@protectli.com
- **Support Portal:** Open a ticket through your Protectli account
- **Additional Contact Options:** <https://protectli.com/contact/>

Please report your experience even if the workaround successfully resolves your issue, to help us track the scope and ensure you receive notification when the firmware fix is available.

Document Information

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