

3M Optical Systems Division

**How low power POE technology
powers next generation of zero computing**

HP t410 All-in-One Smart Zero Client delivers PC-like solution with energy savings

by: HP and 3M



**Vividly Display
Your Efficiency**



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Introduction

Energy efficiency and the associated financial and environmental benefits are of increasing concern to the IT industry. Expanding enterprises also continue to look for ways to reach areas underserved by traditional electrical connections.

Power over Ethernet (PoE) promises solutions to both. Unifying power and data transmission over one wire, PoE offers effective data transfer rates at dramatically lower energy costs. For example, a single device supporting desktop virtualization using PoE can deliver the computing power of a desktop at a fraction of the energy costs of non-PoE solutions. In addition, more versatile and affordable Ethernet cable can deliver both power and data on the same cable while reducing cable clutter.

Hewlett Packard's zero client solutions, already a worldwide market leader in providing flexible and reliable virtual computing, have taken the next step forward with the world's first Type 1 PoE All in One (AiO) solution. In a historic partnership with 3M, the HP t410 AiO now pairs the energy efficiency of Type 1 Power over Ethernet (PoE) with HP's robust zero client solution.



Innovation through cooperation

The HP t410 AiO achieves its energy efficiency by pairing its smart zero client with 3M's industry-leading display technology. The HP t410 AiO is the first zero client solution to integrate a display that optimizes efficiency with enhancement films and light recycling technology, resulting in a clear, bright display with lower power consumption. This game-changing all-in-one device draws as little as 13W of power, making it the most energy efficient AiO zero client available today.

Exciting innovation can occur from the combination of solutions at the boundary of what is common. The HP t410 AiO combines HP smart zero client simplicity with 3M display solutions to create an AiO solution that uses already widely deployed PoE ports. 3M display solutions enable the lowest power display by optimizing performance with a suite of enhancement films. Through cooperation concentrated on a system optimized solution, HP is able to deliver a new class of device well suited for the shift to cloud computing.

This paper provides IT administrators with a brief overview of Power over Ethernet as well as the energy saving features and key functionality of the HP t410 AiO Zero Client. It contains the following sections:

- Background
- About the product
- Calculating power requirements
- Conclusion



*HP and 3M combine forces
to offer a new solution*

Background

This section provides background on the technological issues driving the development of the HP t410 AiO.

Power over Ethernet (PoE)

PoE is a method of supplying power from power sourcing equipment (PSE) to powered devices (PDs) through the same cable that carries data. In use since the 1990s, PoE has traditionally been used to run Voice over Internet Protocol (VoIP) phones, Bluetooth and Wi-Fi access points, and web cameras. Commonly using Category 5 (Cat 5) network cable, PoE allows powered devices to receive power from the power sourcing equipment (switch or midspan) without the need to modify existing Ethernet layout or to add electrical wiring.

PoE offers significant advantages over either standard AC or USB connections, such as:

- Cat 5 cable is more economical than either AC or USB cable.
- Cat 5 cable supports higher data transfer rates than USB.
- Cat 5 cables can be much longer than USB cables, without costly repeaters.
- PoE is not restricted by localized AC power standards, enabling enterprise-wide use of PoE devices

The following sections provide a brief overview of PoE, including:

- PoE architecture
- IEEE standards for PoE

IEEE standards for PoE

PoE has evolved into two types of devices:

- Type 1 PoE
- Type 2 PoE

Type 1 PoE

Type 1 PoE, based on the original IEEE standard 802.3af-2003, provides up to 15.4 W of DC power to each connected PoE port. With correction for power loss in transmission, the standard calls for up to 12.95 watts of power available for each device

Note: A given Type 1 switch might not be capable of supplying full power to all PoE ports simultaneously. For more information, see [Calculating power requirements below](#).

Type 1 PoE makes it possible to connect a wide array of low-power devices, including VoIP phones, security cameras, and industrial devices, such as sensors or meters. The technology is widely proliferated, and is common in IT facilities worldwide.

Type 2 PoE

To permit the use of higher-powered devices, such as tablet computers, with PoE, a new standard emerged. PoE Plus (Type 2) is based on the IEEE 802.3at-2009 standard. Backwards compatible with devices using the Type 1 standard, Type 2 can provide up to 25.5 W of power to connected devices. Future PoE standards might permit higher power levels.

Until now, it was possible only to supply higher power devices, such as LCD displays and zero clients, with the higher output Type 2 PoE standard. With the development of the HP t410 AiO, that has changed.

LCD display

In an all-in-one zero client system, the LCD display is one of the highest energy consumers. The HP t410 AiO accomplishes reductions in power consumption mainly through the use of 3M's highly efficient LCD enhancement films. The following section provides a brief overview of the technology behind 3M's display solution.

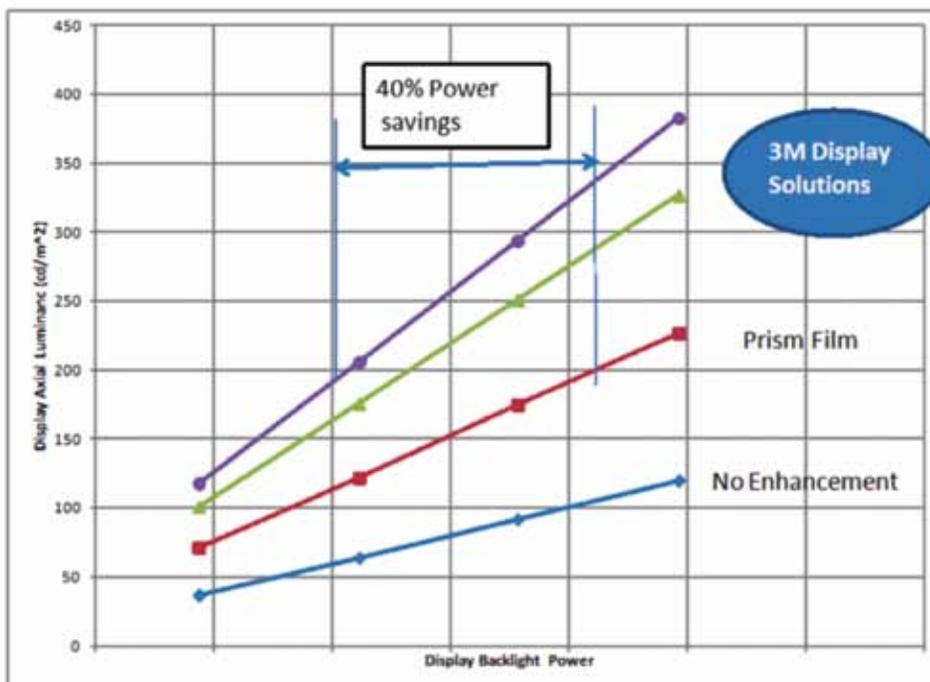
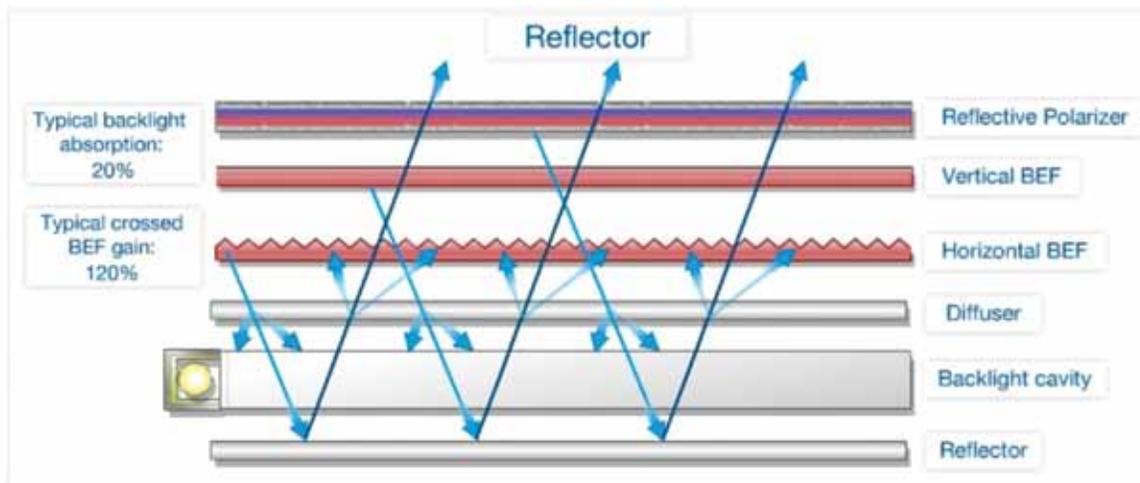
An LCD screen image is produced from light passing through millions of microscopic shutters. In the process of producing the image and colors, a great deal of light is lost. A typical LCD panel will pass only about 7% of backlight brightness. 3M display solutions improve efficiency of the HP t410 AiO through improvements in:

- Light angle
- Light polarization
- Light absorption

A prism film manages light angle by redirecting light towards the viewer that would normally shine on the ceiling or desk, and a reflective polarizer increases backlight efficiency by recycling light that would normally be absorbed in the LCD panel. The display efficiency can be doubled when these products are applied with attention to the total system.

In collaboration with HP engineers, 3M applied a reflective polarizer normally used to enhance brightness in televisions in the HP t410 AiO solution to minimize the power usage and also maintain a 200 nit brightness display. The result is a display that enables an All-in-One solution at the lowest PoE power standard (IEEE 802.3af).

The following graphic describes how the added reflective polarizer layer in the LCD monitor of the HP t410 AiO helps recover light normally lost, increasing efficiency and permitting the monitor to operate at a lower power level.



The result of improved efficiency is a lower power requirement for each display. The following graph shows a forty percent power savings in the backlight can be achieved with a 3M display solution without impacting the display brightness.

About the product

HP's zero client solutions improve manageability, security and reliability in virtual computing environments throughout the world. Now, the HP t410 AiO delivers HP's same great functionality along with Type 1 PoE compatibility for a solution that is both powerful and energy efficient.

This section outlines the features and key functionality of the HP t410 AiO. It includes the following topics:

- HP t410 AiO Type 1 PoE Zero Client
- 3M enabled LCD display

HP t410 AiO Type 1 PoE Zero Client

Zero clients are effective solutions for bringing affordable, low-maintenance computing power to multiple desktops. This section outlines the features that make the HP t410 AiO a sound choice for new or existing zero client deployments.

Plug and play compatibility with multiple processing environments

The HP t410 AiO automatically recognizes and reconfigures for any one of the leading protocols, which enables it to be installed quickly and easily:

- Microsoft RDP 7.1/RemoteFX
- Microsoft Remote Desktop Services (formerly known as Terminal Services)
- Citrix XenApp
- Citrix XenDesktop
- Citrix HDX
- VMware View 5.0
- PCoIP/Citrix HDX

Type 1 PoE compatible

Until now, zero client computing has relied either on conventional AC power or the higher-power Type 2 PoE to operate the system. Traditionally, LCDs have been one of the biggest consumers of power in a zero client system. With the addition of 3M's LCD technology, the HP t410 AiO now operates with the lower power levels of Type 1 PoE.

3M enabled LCD display

The LCD display for the HP t410 AiO employs a 3M display solution to provide wide-angle luminance and improve the efficiency of the LED backlight. The high definition (1366x768) 18.5" diagonal display offers dynamic brightness control that monitors power usage and adjusts brightness levels in high power situations. For example, if the system power levels go above 13W, the device can dynamically reduce brightness levels to attempt to remain under the 13W power limit.

Calculating power requirements

As with any implementation, careful planning is key. You must balance the power requirements of your zero clients with the power available at your planned or existing switches. This section will provide some guidelines for determining power requirements, and adjusting your switch capacity or the number of deployed zero clients.

In order to draw the full 13W for a Type 1 PoE device, power at the switch may appear as 15.4W due to power loss in transmission. Therefore, calculate the power requirements with the following formula:

Total PoE Power Required in the PSE = Number of clients * 15.4W

For example, four HP t410 AiO at maximum power will require 61.6W at the switch

Example

It is important to note that it is possible that the amount of power at the switch might not be sufficient to power all available ports. In the following example, an IT facility plans to install eight HP t410 AiO Smart Zero Clients using a single HP Pro-Curve E2520-8G-PoE (J9298A) switch:

Switch Model	Total PoE Ports	Total available PoE Power at ports
HP Pro-Curve E2520-8G-PoE (J9298A)	8/8	67.00W

As you can see from the table, the total available power at the ports is 67W, which is sufficient only to power four clients. Adding an excessive number of clients will cause the switch to cut power to one or more of the clients. In this example, eight clients would require an additional switch.

Switch capacity

In order to ensure that the available power at the switch will power all zero clients, an upgrade to your switch capacity might be necessary. The following table provides a sampling of the switches that are compatible with the HP t410 AiO:

Switch	Speed	Ports /PoE Ports	PoE Power	HP t410 AiOs supported	Cost (USD)	Functionality
HP Pro-Curve E2520-8G-PoE (J9298A)	10/100/1000	8/8	67.00W	4	\$500	Fully Managed Layer 2
HP Pro-Curve E2520-24G-PoE (J9299A)	10/100/1000	24/24	195.00W	12	\$1000	Fully Managed Layer 2
Cisco SG300-10MP (SRW2008MP-K9-NA)	10/100/1000	8	124.00W	8	\$450	Managed
Cisco SG300-28P (SRW2024P-K9-NA)	10/100/1000	26	180.00W	11	\$700	Managed

Conclusion

Type 1 PoE, while an effective method of powering a wide array of low power devices has not previously been adequate for the higher power requirements of zero clients and their LCD displays. Incorporating display solutions by 3M, the HP t410 AiO now brings the flexibility and efficiency of Type 1 PoE to the zero client market. The HP t410 AiO is ideal for deployment in new or existing Type 1 or Type 2 PoE environments.

In order to ensure adequate power for deployment of the HP t410 AiO in new or existing networks, administrators should carefully balance power output at the switches with the number of attached clients in order to meet the 13W minimum power requirement at each zero client.

For more information

To read more about HP zero client solutions, go to www.hp.com/go/onewire

For more information on Power over Ethernet, go to <http://www.poweroverethernet.com/>



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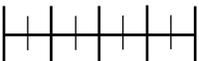


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