Ethernet Alliance PoE Certification Program

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Executive Summary

Power over Ethernet (PoE) technology enables the delivery of power to Internet Protocol (IP) network devices via the same cables that provide IEEE Std 802.3™[1] Ethernet. The cost, efficiency and flexibility benefits to be realized by users are substantial, through reduction in need for separate electrical power cabling, simplified network installation and improved energy management. Consequently, diverse market interest is intensifying. Total PoE-enabled port and device shipments are projected to reach nearly 1 billion by 2021.[2]

The Ethernet Alliance has launched a PoE certification program to improve user experience by minimizing market confusion between standards-based and proprietary PoE solutions by validating interoperability among IEEE 802.3-based PoE solutions. The Ethernet Alliance PoE Certification Program will enable swift and easy recognition of interoperable products that are designed to the available IEEE 802.3 PoE standards, as well as provide the industry with a credible, easy-to-access and first-of-its-kind registry list of providers of such products.

About the Ethernet Alliance
The Ethernet Alliance is a global consortium that includes system and component vendors, industry experts and university and government professionals who are committed to the continued success and expansion of Ethernet technology. The Ethernet Alliance takes Ethernet standards to market by supporting activities that span from incubation of new Ethernet technologies to interoperability demonstrations and education. For more information about the Ethernet Alliance, please visit http://www.ethernetalliance.org, follow @EthernetAllianc on Twitter, visit its Facebook page, or join the EA LinkedIn group.

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[1] IEEE Std 802.3-2015, *IEEE Standard for Ethernet*
[2] Dell'Oro Group, Ethernet Alliance Analysts Hour, April 2016.

A Rapidly Expanding Application Base

PoE is a popular technology to supply low-voltage DC power to devices such as IEEE Std 802.11™[3] "Wi-Fi®" access points, IP phones, security cameras and light-emitting diode (LED) lighting, and deployment of PoE is rapidly spreading across markets. With the proliferation of home automation and the Internet of Things (IoT), PoE's application horizon is expanding beyond the information technology (IT) domain and into every-day life.

Solid-state lighting (SSL) using LEDs (rather than electrical filaments, gas or plasma for illumination) is a particularly robust application space for PoE, and market growth within that space illustrates PoE's tremendous potential footprint. A May 2015 report from Navigant Research forecasts worldwide shipments of LED lamps and modules to grow to 4.1 billion by 2024. "LED prices have declined to a point where this type of lighting is becoming the economical choice in almost every application. As such, the adoption of LED lighting is ramping up across all major end users: commercial buildings, residential buildings, industrial buildings, and outdoor applications."[4]

Furthermore, since 2003, there have been sales of more than 100 billion meters of cabling supporting PoE and BASE-T Ethernet, capable of data at rates of 1 Gigabit per second or higher. PoE is designed for use with BASE-T Ethernet, which delivers data over the commonly-known 4-pair structured Category 5e, 6 or 6a cabling using twisted-pair copper and the familiar RJ-45 connector. Ethernet speeds from 10Mb/s through 1 Gb/s are commonly found in access networks, and new IEEE Std 802.3bz™[5] (Multigigabit) speeds of 2.5Gb/s, 5 Gb/s and 10Gb/s, compatible with PoE, are gaining market traction.

The ubiquitous nature of BASE-T Ethernet means that there is a broad array of products that are potential candidates for PoE usage. Ultimately, PoE could provide power for *any* interconnected device, which is a stunning prospect given that we are only at the beginning of the deployment of the IoT globally. Indeed, PoE applications

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[3] *IEEE Std 802.11-2016, IEEE Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications*
[4] Navigant Research, retrieved July 7, 2017, from https://www.navigantresearch.com/newsroom/shipments-of-led-lighting-systems-are-expected-to-exceed-4-1-billion-a-year-by-2024.
[5] *IEEE Std 802.3bz-2016, IEEE Standard for Ethernet Amendment 7: Media Access Control Parameters, Physical Layers, and Management Parameters for 2.5 Gb/s and 5 Gb/s Operation, Types 2.5GBASE-T and 5GBASE-T*

stand to be limited only by engineers' imagination, as ongoing IEEE standardization efforts pave the way for broader PoE adoption across industries.

Realities of Today's PoE Market

PoE is standardized by the IEEE 802.3 Ethernet Working Group in Clause 33 of IEEE Std 802.3-2015, *IEEE Standard for Ethernet*. PoE solutions based on IEEE 802.3 deliver predictable power and excellent network safety, along with the high degrees of connectivity and interoperability for which Ethernet is globally renowned.

IEEE Std 802.3-2015, Clause 33, is titled "Data Terminal Equipment (DTE) Power via Media Dependent Interface (MDI)," but PoE has naturally developed into the generic term for equipment designed to comply with Clause 33. Other than as a searchable keyword, the terms "PoE" and "Power over Ethernet" do not show up in the IEEE Std 802.3-2015 document. The reality of today's PoE market, however, is that nobody owns the term PoE and the term can mean anything to anyone. Both standardized and non-standardized implementations are available—and, to more precisely define the problem, there are fully standardized and somewhat-standardized versions of products available in the market.

Proprietary versions may not deliver all of the features and power specifications of IEEE 802.3 standardized PoE. Furthermore, there are manufacturers who design to compatibility with portions of the IEEE 802.3 PoE standards but do not fully implement the standard. This may result in a situation where a device might appear to interoperate enough to function but with fewer features or at lower performance quality than advertised. Additionally, there are products in the market that provide power over the cables used for Ethernet that are not designed at all to IEEE 802.3 specifications but represent themselves as "PoE" and "compatible" with standards-based products in their marketing. Some of these products bypass important protections in the IEEE standard, such as detection or current-limiting, while others may have more basic differences, such as different supply voltages.

While it is possible that non-IEEE 802.3 standardized PoE devices could actually damage infrastructure, the primary issue is that they hinder innovation and adoption by causing market confusion and distrust. A quick scan of online comments forums

show the guilt by association that non-IEEE 802.3 standardized PoE products are bringing to the entire ecosystem.

The Ethernet Alliance PoE Certification Program is intended to clear market confusion and improve the ecosystem experience by providing an easy way to identify products tested for compatibility with IEEE 802.3 standards.

How Certification Works

There are two categories of PoE devices:

- power sourcing equipment (PSE), covering devices which can inject power onto Ethernet lines, such as Ethernet switches or mid-span power injectors, and

- powered devices (PD), covering a multitude of devices which receive power and data. These could be virtually anything with an Ethernet port and today include wireless access points, network bridges, small Ethernet switches, internet phones, cameras, terminals, digital signs, sensors, access controls and monitoring, lighting and home/office automation systems.

The Ethernet Alliance PoE Certification Program will provide vendors a credible list of the viable partners with interoperable, fully standardized PoE products.

The Ethernet Alliance's PoE certification program has attracted strong interest from stakeholders across the growing Ethernet ecosystem. Ninety percent of the PSE switching industry today is covered by Ethernet Alliance members in this certification program.

The Ethernet Alliance PoE Certification Program is open to members and non-members of the Ethernet Alliance alike. Participation is simple.

Vendors complete a Certificate Mark License Agreement (CMLA), which covers PoE solutions as currently defined in the ratified IEEE 802.3 Ethernet standard, as well as a certification application with relevant product information. Certification may be at either the system or component level.

Testing for the Ethernet Alliance PoE Certification Program is available at the University of New Hampshire InterOperability Laboratory (UNH-IOL), or member

companies can perform testing themselves using commercially available equipment that has been approved by the Ethernet Alliance. UNH-IOL acts as the data warehouse for all certification test results, forwarding certification applications of any devices meeting the Ethernet Alliance Certification Test Plan to the alliance, which awards program logos.

The presence of the Ethernet Alliance logo will clearly identify PoE products that are both IEEE 802.3-based and provide the performance and interoperability assurance that end users require.

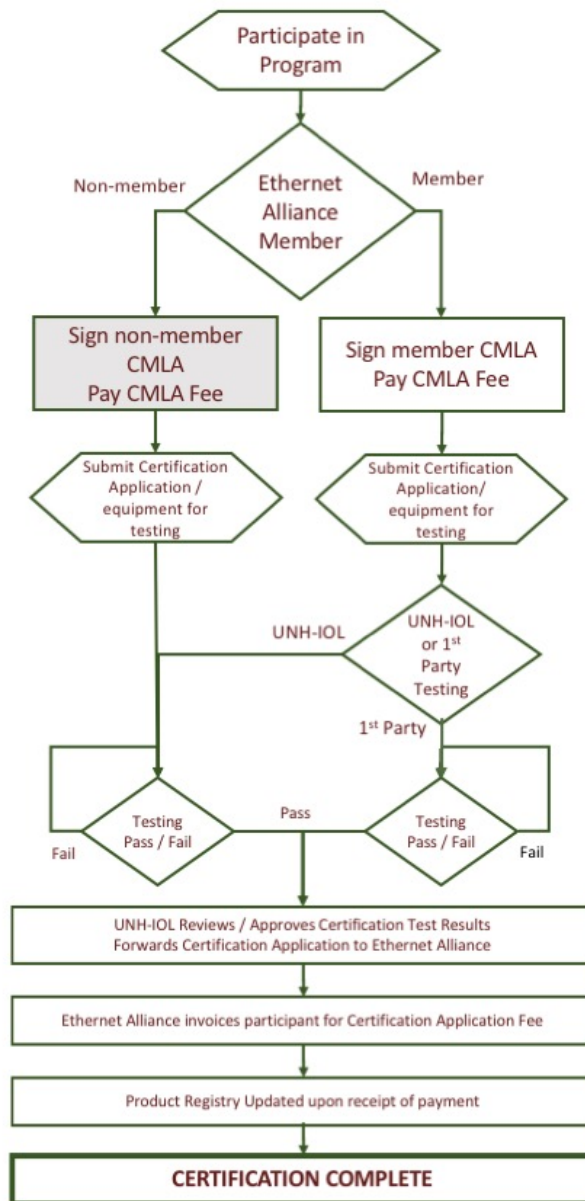The Ethernet Alliance program participation and CMLAs are available at http://ethernetalliance.org/poecert/membership/.

Figure 1: Participation in the Ethernet Alliance PoE Certification Program is simple.

What Certification Means

Earning an Ethernet Alliance logo means that a product has been validated to conform to the Ethernet Alliance Certification Test Plan, which is based on IEEE 802.3 PoE standards. It indicates whether the product is PSE (source) or PD (load) and shows the product's highest power classification.

Vendors successfully completing testing are authorized to use the Ethernet Alliance logo on conforming products, and those products are added to the Ethernet Alliance PoE Certified Products Registry online. The public registry will facilitate users' quickly researching and identifying IEEE 802.3 PoE products that best suit their emerging needs.

PD   PSE

Figure 2: The EA CERTIFIED logo on the left indicates a Class 1 PD, and the logo on the right indicates a Class 3 PSE. The classification number makes it easy to see when a PSE will fully power a PD (if PSE class is greater than or equal to the PD class).

The Ethernet Alliance logo will afford users the confidence that PSE and PD devices from different manufacturers will work together. By streamlining the identification process for IEEE 802.3-standardized PoE products, the Ethernet Alliance's certification program will foster better, more productive user experiences by minimizing interoperability issues and market confusion. In turn, the program will generate

tangible benefits for participants. It will help companies that have their products certified reduce support issues and associated costs.

Finally, the program will allow participants to effortlessly find and make connections with potential partners, enabling delivery of total solutions to the industry that include a higher level of confidence in product interoperability.

For the growing Ethernet ecosystem, the Ethernet Alliance PoE Certification Program's primary benefit will be to generate market confidence in IEEE 802.3 PoE (accelerating deployment in existing markets and opening new ones) and protect the Ethernet brand.

Looking Ahead

The Ethernet Alliance PoE Certification Program is intended, over time, to maintain user experience in light of the growing array of features, options and power levels that are introduced with future standardized versions of IEEE 802.3 PoE.

Since ratification of IEEE Std 802.3af™[6] more than 14 years ago, and IEEE Std 802.3at™[7] more than seven years ago, significant market demand has emerged for more efficient power delivery and for applications with greater power levels. Example applications include thin clients, multi-radio wireless access points, pan/tilt/zoom cameras, digital signage, building automation, industrial sensors/actuators, etc. This market need precipitated the development of the latest PoE standard, IEEE P802.3bt™[8], which builds on the foundation of IEEE 802.3at and is scheduled to be completed in 2018.

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[6] IEEE Std 802.3af-2003, *IEEE Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications - Data Terminal Equipment (DTE) Power Via Media Dependent Interface (MDI)*
[7] IEEE Std 802.3at-2009, *IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 3: CSMA/CD Access Method and Physical Layer Specifications Amendment 3: Data Terminal Equipment (DTE) Power via the Media Dependent Interface (MDI) Enhancements*
[8] IEEE P802.3bt, *Draft IEEE Standard for Ethernet Amendment: Physical Layer and Management Parameters for DTE Power via MDI over 4-Pair*

Ethernet Alliance members are among the working group developing IEEE P802.3bt, helping to align the certification program with the forthcoming standard to ensure a quick time to market for next-generation implementations. While some PoE users will continue to use IEEE 802.3af- and IEEE802.3at-based devices, the certification program will help smooth the introduction of IEEE P802.3bt-based products once that standard is ratified. PoE buyers in the market already will know to look for the Ethernet Alliance certification as a mark for optimal user experience and confidence in interoperability.

Getting Started

With the next Ethernet era underway, a tremendous variety of next-generation Ethernet innovation is emerging from the equipment manufacturers, system and component vendors, test and measurement providers and other varied Ethernet stakeholders that the Ethernet Alliance serves. IEEE 802.3 PoE is a prime area of innovation, and the Ethernet Alliance PoE Certification Program is poised to spur additional deployment and development.

For more information on the program, including how to get your products on to the EA PoE Certified Products Registry, please see http://ethernetalliance.org/poecert/or contact the Ethernet Alliance at PoE_Certification@ethernetalliance.org.