



ethernet alliance

# Commitment to Ethernet Interoperability

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## Executive Summary

Ensuring multi-vendor interoperability in Ethernet demands industry commitment from the very start of any development in the IEEE 802.3™ Ethernet standards family. In fact, the effort to extend Ethernet's hallmark interoperability is evident earlier and earlier in the process of growing the technology to support new markets, applications and speeds.

As the global information technology (IT) community is challenged to move more quickly than ever to introduce new capabilities, the global Ethernet ecosystem also must move faster to ensure multi-vendor interoperability as standards and technologies evolve. Recent Ethernet Alliance activities around 25 Gigabit, 40 Gigabit and 100 Gigabit Ethernet (25GbE, 40GbE and 100GbE) underscore this point.

## No Overnight Success

There are many attributes in Ethernet's favor, but perhaps the singular key to Ethernet's phenomenal success globally is that it works—and, more precisely, that it works together with other Ethernet speeds, types and vendors. A well-founded expectation has gathered over decades among diverse users worldwide, that when one Ethernet-based device is connected with others, data transmission is going to happen—seamlessly, at the performance levels stated, and in a cost-effective manner. You plug it in, and it works—that's Ethernet.

In a constantly evolving technology space, even one that is as established as Ethernet, innovation in application demands, features and capabilities render the job of ensuring interoperability a never-ending task. Standards-based interoperability has to be constantly and consistently shown, and that's one of the Ethernet Alliance's most valuable roles for the global Ethernet ecosystem. Real-world interoperability demands a lot of intentional work and keen, ongoing vigilance as the space evolves, and it certainly doesn't happen overnight—even in Ethernet.

As amendments to and extensions of the IEEE 802.3 Ethernet family of standards are crafted, interoperability remains a point of constant focus throughout the open-development process. Additionally, the substantial post-standard development work,



performed by the industry and the Ethernet Alliance, is all about ensuring the technology's multi-vendor interoperability.

The footprint of Ethernet end users overlays almost every industry and every market around the world. It's a very diverse group of individuals with unique needs, goals and challenges. However, they are united in one very important way: no matter which vendor's Ethernet switches and servers they deploy, regardless of whether they change connection medium, switch cable lengths, etc., what all Ethernet users most want and need is assurance that, when they use Ethernet, it's going to work.

And it does.

The privilege of being able to make just that simple statement—*"you plug it in, and it works"*—demands a massive investment and effort among the Ethernet ecosystem globally, throughout innovation in IEEE 802.3 standards and Ethernet technology.

## Bringing Together the Global Ecosystem

The Ethernet Alliance is a global consortium dedicated to the continued success and advancement of Ethernet technologies. Its largest-ever multi-vendor "plugfest" took place in June 2015 at the University of New Hampshire InterOperability Laboratory (UNH-IOL), a 32,000-square-foot, state-of-the-art network and data communications testing facility in Durham, New Hampshire, United States.

During the event hosted by the Ethernet Alliance at the UNH-IOL, a complete testing ecosystem was staged for a 40GbE and 100GbE plugfest. This plugfest brought together all of the components in the Ethernet ecosystem to test the interoperability between 40GbE and 100GbE solutions. Additionally, a technical feasibility event on 25 Gigabit per second (25Gb/s) technologies was held to assess the state of these technologies and provide input into the IEEE P802.3by™ Task Force, which is currently working on defining the 25GbE standard. This early testing will help to optimize future interoperability of 25 Gigabit Ethernet (25GbE).

Plugfests are a relative representation of interoperability in the larger global market. Stakeholders, including competitors, from across the Ethernet ecosystem convene to connect equipment from different vendors, testing whether traffic is exchanged as intended. Given the breadth of participation, it is an environment that cannot be easily created in a single company's lab. However, the Ethernet Alliance, the premier global champion for all things Ethernet, and the UNH-IOL, globally recognized for Ethernet testing excellence for more than 25 years, are positioned to provide a fertile

ground to test and verify interoperability between Ethernet's tremendous array of vendors. Issues can sometimes be corrected as they arise, and, even if they cannot be resolved during the plugfest itself, the vendors return to their laboratories with information to more quickly eliminate problems than would've been possible working in isolation from one another.



## The 40GbE and 100GbE Plugfest

The Ethernet Alliance 40GbE and 100GbE Plugfest at UNH-IOL in June 2015 provided a rigorous environment enabling the testing of 40GbE and 100GbE operation over scenarios including the various optical and copper solutions that define these two families. Literally thousands of tests were performed.

Imagine an end station in a typical Ethernet infrastructure and all of the elements between it and another end station somewhere across the cloud. Now imagine 10 such end stations, A through J, and all of the different ways to interconnect over different cable lengths. It's a huge number of variables, considering the different types of fiber, different cable lengths and different regions that might be involved. The network very quickly becomes a huge testing matrix that the plugfest seeks to capture for the Ethernet ecosystem. This is the complex reality on which the testing in an Ethernet Alliance plugfest is predicated.

Twenty-two companies representing a large, diverse array of technology—cabling, chip, connector, optics, system and test equipment—participated in the testing for



40GbE/100GbE. Among the many companies and organizations taking part were Amphenol Corporation; Arista Networks, Inc.; Avago Technologies Ltd.; Cisco Systems, Inc.; Cube Optics AG; Dell, Inc.; FCI; Hitachi, Ltd.; Intel Corporation; Ixia; JDS Uniphase Corp. (JDSU); LUXSHARE-ICT; Marvell Technology Group Ltd.; Mellanox Technologies Ltd.; Molex Incorporated; Oclaro, Inc.; QLogic Corporation; Semtech Corporation; Spirent Communications Plc.; TE Connectivity Ltd.; Teledyne LeCroy, Inc., and Xilinx, Inc.

While 40GbE has been adopted globally after its ratification five years ago, its users have been primarily mega-scale data centers. But with 40GbE and 100GbE set for a move from mega-scale data centers to the broad market, Ethernet users want the flexibility to pick among a broader range of vendors. With such multi-vendor interoperability demonstrated, the end user can be assured that Ethernet products will work together. Competition usually forces costs to come down and lead toward wider adoption.

## 25Gb/s Technical Feasibility

The Ethernet Alliance 25Gb/s technical feasibility event took place concurrently, in a separate room at the UNH-IOL. With the IEEE 802.3 25GbE standards-development project rapidly progressing through its stages, the broad testing at the Ethernet Alliance event provides valuable input from vendors to inform the IEEE P802.3by Task Force's effort.

In the case of 25GbE, the signaling technology is mature—having been developed as a building block for enabling 100GbE networking. The task now is to undertake all of the due diligence to make it interoperable across multiple vendors. With the 25GbE standard not yet in the working-group ballot stage, it is impressive to see this style of testing so early in the development process, which says a lot of about industry's commitment to interoperability.

Participating companies included Amphenol Corporation; Arista Networks, Inc.; Cisco Systems, Inc.; Dell, Inc.; FCI; Hitachi, Ltd.; Intel Corporation; Ixia; LUXSHARE-ICT; Marvell Technology Group Ltd.; Mellanox Technologies Ltd.; Molex Incorporated; QLogic Corporation; Spirent Communications Plc.; TE Connectivity Ltd.; and Xilinx, Inc. The fact that the Ethernet Alliance 25 GbE technical feasibility testing at UNH-IOL drew so many companies is a strong indicator of the high level of market interest in multi-vendor interoperability.

## Conclusion

Interoperability is an especially key concern in Ethernet networking because of the number and breadth of products that are available in the market. The technology's constant innovation also leads to breakthroughs and unintended consequences. Multiple vendors supply the core and edge switches, network interface cards (NICs), physical media, routers and storage for Ethernet networks, and Ethernet and the physical layers that it supports are undergoing continuous change.

Testing such as that undertaken in the Ethernet Alliance Event at UNH-IOL in June 2015 is one crucial element of a commitment to fostering the multi-vendor interoperability that drives Ethernet's continued growth and expansion. With the IEEE 802.3 Ethernet standards family expanding rapidly based on industry interest into new markets and applications, such events will grow only more frequent and important.



Look to the Ethernet Alliance in the coming months for further data on 25GbE, 40GbE and 100GbE interoperability and more opportunities to engage in building multi-vendor interoperability in Ethernet. The Ethernet Alliance has the membership breadth across the Ethernet ecosystem and the singular focus to bring together such a diversity of stakeholders in a vendor-neutral environment to advance real-world interoperability.

For more information about the Ethernet Alliance, please



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