The History of the IEEE 802 Standard
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This issue of IEEE Communications Standards Magazine has a number of articles about Time Sensitive Networking (TSN), especially as it is related to IEEE Std. 802.1. While many readers are familiar with the IEEE 802 family of standards, few are fully aware of the long history of 802. In the late 1970s, there was considerable discussion at conferences and elsewhere about the topic of computer communications. It is well known that in the early 1970s, Bob Metcalfe, while at Xerox PARC, developed the idea for Ethernet based on his Ph.D. dissertation and ALOHAnet. Coincidently, on August 25, 1979, a proposal was submitted to the IEEE Standards Board for the development of standards entitled “Local Network for Computer Interconnection” and was assigned the next number in the sequence of IEEE standards: 802. The scope and purpose of the proposed standard was:

“The proposed standards will apply to Data Processing devices which need to communicate with each other at a moderate data rate (1 M bit/sec) and with a local area (physical data path up to 4 km). The purpose of the proposed standard is to provide compatibility between devices of different manufacture so that hardware and software customization necessary for effective communication is minimized or eliminated.”

At about the same time, Metcalfe left Xerox PARC and started 3Com. He worked with Digital Equipment Corporation (DEC), Intel, and Xerox to create an industry standard known as “DIX” Ethernet operating at 10 MHz (up from Metcalfe’s original 2.94 MHz) and with 48-bit source and destination addressing. This was published as “The Ethernet: A Local Area Network - Data Link Layer and Physical Layer Specifications.” Version 2 of this document was published in November 1982 and went on to be submitted to the IEEE 802 committee and eventually became IEEE Std 802.3 in June 1983.

Other companies had interest in creating competing computer networking standards, and the 802 Committee decided on a standards structure that we are familiar with today where alternative physical layer standards exist (or existed), including 802.3 (Ethernet), 802.4 (Token Bus), 802.5 (Token Ring), and eventually 802.11 (Wireless Local Area Networks). Many of those have since been disbanded as market support for them dwindled.

Today, Time Sensitive Networking is one of the core activities of the IEEE 802.1 Working Group. As stated on its web site:

“The IEEE 802.1 Working Group is chartered to concern itself with and develop standards and recommended practices in the following areas: 802 LAN/MAN architecture, internetworking among 802 LANs, MANs and other wide area networks, 802 Security, 802 overall network management, and protocol layers above the MAC & LLC layers.”

The Time Sensitive Networking Working Group strives to provide deterministic services through the various IEEE 802 networks. This work was originally focused on audio/video bridging, but has since expanded to cover other areas.

Today, the IEEE 802 Committee provides an outstanding environment for the development of computer networking standards. I believe the growth, breadth and engagement of the 802 committee was likely not anticipated when it was originally started. The advancement of the technologies in terms of speed, distance, and reliability was also not anticipated. Why has IEEE 802 been so successful? I think this is best summed up by Paul Nikolich in an article he wrote in 2014:

“A global community of technical and market experts, researchers, manufacturers, services providers, and business strategists supply the raw materials and know-how to create 802 products. These individuals have the skill necessary to crisply define market needs and the technical expertise to decompose complex functionality into a set of basic elements with well-defined interfaces. They achieve this by contributing their intellectual property to community and sharing it on a fair and reasonable basis. Furthermore, 802 standards developers have become skilled at reaching consensus among competitive peers to make progress. They recognize that, once achieved, agreement on a standard benefits the entire community technically, economically, and socially.

Computer networking, whether over powerlines, twisted pair, optical fiber or wirelessly, continues to be a hotbed of innovation and market excitement. I am confident this issue’s content on Time Sensitive Networking will enlighten and engage.