2011 C&C Prize Ceremony

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The 2011 C&C Prise were awarded to two groups, GroupA Akira Yoshino, and Group B Norman Abramson and Robert Metcalfe. The prize ceremony was held on 28 November 2011 at ANA InterContinental Hotel Tokyo. The C&C Prize was established in 1985. The NEC C&C Foundation presents the annual C&C prizes to recognized distinguished persons who made outstanding contributions to R&D activities in the area of the integration of computers and communications technologies.

The foundation cited Akira Yoshino for his pioneering contribution to the development and commercialization of the Lithium-ion battery. He played an extremely important role in realizing high power small re-chargeable Lithium-ion batteries (LIB) widely used today in mobile and personal information devices.

Yoshino started his research on LIB in 1981 to find suitable materials fo electrodes which was the most important development at that time.. He conceived the idea of new secondary battery using electroconductive polyacelerene as the negative electrode and $LiCoO_2$ as the positive one. The electroconductive polyacelerene had been developed by Hideki Shirakawa of Tsukuba University, a Nobel Prise winner in 2000. The $LiCoO_2$ was first reported by J. B. Goodenough in 1980 and was found to be solely applicable to the positive electrode at that time. He succeeded in making an operational test model of this new secondary battery, which was the world's first use of an LIB in a non-aqueous electrolyte showing high electromotive force of around 4V.

Then Yoshino studied the suitability of carbonaceous materials as the negative electrode. In 1985 he successfully fabricated the secondary battery based on the new combination of component materials enabled stable charging and discharging over many cycles for a long period for the first time in the world. Yoshino earned B.S. and M.S. Degree from Kyoto University in 1970 and 1972 respectively. He joined Asahi Kasei Corporation in 1972 and is currently Fellow of the corporation.

The foundation cited Norman Abramson and Robert M. Metcalfe for their outstanding leadership resulting in the invention, standardization, and commercialization of Internet packet access, beginning with ALOHANET and then Ethernet. Norman Abramson and Robert Metcalfe made decisive contributions to the development of ALOHANET, Ethernet, and related basic LAN technologies. Today, Ethernet is the most widely used LAN standard and has had immense impact on information technology since its initial appearance in the 1980s. The ALOHANET protocol adapted for the CSMA/CD Ethernet has had a significant impact on the use, progress, and dissemination of information technology since the 1970s.

In 1968, Abramson moved from Stanford University to the University of Hawaii, where he directed the development of the ALOHANET by an international team of university researchers. The

ALOHANET was a wireless data network connecting computer facilities on the Hawaiian islands using a newly developed random access technology, now known as an ALOHA channel. The ALOHA channel used a shared medium access communication method on a UHF wireless network. The shared medium access of the ALOHANET was designed with a simple but effective method for dealing with data packet collisions in the ALOHA channel. In addition, it led directly to carrier sense multiple access (CSMA), CSMA/CD (collision detection), and CSMA/CA (collision avoidance), which were later incorporated into various generations of standards for Ethernet and Wi-Fi.

At the end of 1970, the ALOHANET was complete and connected the Hawaiian islands with 9,600-b/s data signals. It was the world's first wireless packet data network. In 1972, the ALOHANET was connected to the ARPANET in North America using a 56,000-b/s digital satellite channel. In 1973, the first network to utilize random access packet transmission in a satellite channel was put into operation using the NASA ATS-1 satellite in an experimental network, called PacNet, operated at 9,600 b/s in an ALOHA channel using low-cost satellite earth stations.

The ALOHA protocol is part of the data link layer (OSI network layer 2) protocol, and is today classified as a Medium Access Control (MAC) network protocol using a shared medium. It is based on the arbitration technology connecting plural network terminals first implemented in the ALOHANET. Later, this protocol was optimized for wired systems and used for Ethernet by Metcalfe as CSMA/CD.

Ethernet was built upon Abramson's ALOHANET idea of wireless multiple access using randomized retransmissions and developed further as high-speed CSMA/CD for use in the local-area network, or LAN as it was later called by the IEEE. Early Ethernets were able to run much faster than the ALOHANET because they transmitted on copper cables instead of wirelessly. Decades later, Ethernet moved back to wireless and today again looks much like the ALOHANET, known as Wi-Fi. Ethernet in its many forms has now become the packet plumbing of the Internet.

While pursuing a doctorate in computer science at Harvard University, Metcalfe worked on MIT Project MAC (1970-1972) and then at the Xerox Palo Alto Research Center (PARC) in 1972, where he developed a coaxial cable LAN system. At that time, the Alto was under development at PARC, and Metcalfe was a team leader for networking Altos to an early laser printer and to the fledgling Internet. Metcalfe invented the networking system initially called the Alto ALOHANET. Ethernet randomized retransmission as in the ALOHANET, but improved packet throughputs under load with carrier sense and collision detection—carrier sense multi access with collision detection, or CSMA/CD. As for papers, Metcalfe, with David Boggs, published "Ethernet: Distributed Packet-Switching for Local Computer Networks" in the CACM in 1976.

Dr. Metcalfe put in an effort to encourage Xerox to freely license its Ethernet patents and to cooperate with Intel and DEC to create a standard LAN system through the IEEE. As a result, 10 Mbps Ethernet was submitted for the new IEEE Project 802 in 1980. IEEE subsequently standardized IEEE802.3 CSMA/CD in 1982. Afterwards, the 10-Mbps 10BASE-T Ethernet finally established its position as the global LAN standard.