

REMARKS OF VICTOR HAYES FOR
THE IEEE STANDARDS PROJECT 802
FOR PRESENTATION TO THE
FEDERAL COMMUNICATIONS COMMISSION'S
EN BANC HEARING IN DOCKET 90-314

My name is Victor Hayes and I am representing the IEEE Standards Project 802. I am a 1961 graduate of the College for Electrical and Electronic Engineering "HTS Amsterdam", Amsterdam, the Netherlands. I am currently employed by NCR Systems Engineering, B.V., in Nieuwegein, the Netherlands. I have been active in the efforts of IEEE Project 802 since 1988.

As you may know, the Institute of Electrical and Electronics Engineers, Inc. is a United States-based international professional organization recognized throughout the world for its standards making efforts. IEEE Standards Project 802 is chartered by the IEEE to produce standards for Local, Metropolitan and Integrated Voice/Digital communications networks. The IEEE 802.11 working group that I currently chair is only one part of the IEEE Standards Project 802. 802.11 has focused specifically on standards for high speed, on-premises Personal Communications Services for the radio transmission of digital information, so-called wireless local area networks, because they are among the most visible, immediate and rapidly emerging wireless digital applications. This will also be the focus of my testimony. The interest in this area is shown by the high level of interest and participation by the working group, which consists of more than seventy active members, and involves marketing and technical experts from most major

computer, computer component and network equipment suppliers, governmental and non-government user organizations, and research institutes. I should note that the IEEE Standards Project has supported the computer industry's efforts to obtain spectrum for a "Data PCS"-like radio service, as stated in the IEEE 802 comments on the Petition of Apple Computer, Inc. (RM-7618).

All local area networks, or LANs, whether wire-based or wireless, permit the sharing of data or resources (or both) among the LAN users. Shared data can be combinations of database information, text, image, video, recorded (and digitized) voice or electronic mail, to name but a few well known applications. Shared resources can be high speed printers, disk storage files, or just raw computing power. While LANs are traditionally departmental, they can provide connectivity among a population as large as that spread out throughout a university or other campus-type office environment, or as small as just a few users sharing common resources.

Wireless LANs can provide two unique capabilities that justify the dedication of resources necessary to assure their development: a potential for portable, tetherless connectivity to shared data and resources AND a potential complement to and economic alternative for existing and future wired LANs.

Given the explosive growth of the portable, tetherless computer in today's society, Wireless LANs will allow users who wish to share data or resources, or both, to do so free of

specific physical locations or fixed desktop terminals from which to access the resources they need. Instead, Wireless LANs will allow users with portable computing devices to access data or resources from wherever the user happens to be, for example while in meetings within the office but away from the user's desk, or even while attending meetings and conferences in a distant location. Future Wireless LANs may provide tetherless connectivity to data or shared resources to a group of users working within public buildings, e.g., in a convention center, airport or hotel complex. The increased productivity from such flexibility and freedom from wires will be substantial.

Wireless LANs can also be expected to provide high speed, reliable communications as a complement and alternative to wired LANs within commonly controlled user environments. Such wireless alternatives will allow commercial and educational enterprises to avoid the high cost of rewiring LANs upon moves and additions to the network; they can also provide complex wireless solutions to the control of large factories operating with robots and unmanned, guided vehicles, where cabling would be grossly inefficient or uneconomical.

As the use of computing technology develops and computing devices become more ubiquitous to everyday business and family life, Wireless LANs will open the potential for new markets, applications and services. Indeed, Wireless LANs will be as important in the development of high-speed data communications services meeting the demands for low cost, high

volume personal data devices, as PCS will be in meeting the demand for low cost, high volume voice services and products.

Most important to your consideration, the demand for spectrum and regulatory needs of Wireless LANs is quite distinct from the demands of the voice PCS concepts about which you are likely to hear a great deal during the en banc sessions. Wireless LANs require a spectrum allocation and regulatory structure that is conducive to the reliable high speed, high capacity transmission of data between computing devices with very low error rates at very high signalling rates. Just as wired networks for data transmission have developed distinct from the voice infrastructure, the Commission must develop policies under the rubric of PCS and take the steps necessary to encourage the development of high speed, reliable Wireless LANs, and such policies and steps must recognize these distinctions.

To that end, and assuming the continued explosive growth of portable, tetherless computing devices available to the mass market, IEEE Standards Project 802 has forecast that it can be reasonably expected that an allocation from 70-140 MHz will be needed to satisfy the foreseeable demand for Wireless LAN services. Certainly, at least 40 MHz will be required to meet the immediate demands for Wireless LANs in the initial allocation which the Commission intends to make during the next year.

Wireless LANs operate in a restricted geographical scope, using comparatively little transmission power. The

consistent low transmitted power enables substantial geographical reuse of Wireless LAN radio frequencies. Because discrete LAN systems will share radio channels by dividing their transmission into many small data packets of brief duration, these frequencies can accommodate a substantial number of users. However, without an adequate allocation for these systems, it will be impossible to accommodate low error rates and high transmission speeds of up to 20 Mbits/s. Through the efforts of the IEEE 802 project, voluntary protocol standards are being developed to insure interoperability of devices and systems to further optimize the collective use of radio channels allocated for this purpose.

It is also essential to the full development of Wireless LANs that a distinct regulatory environment be adopted for these systems. Unlike the voice PCS networks, that will require the imposition of a licensed service in which the number of systems operated in any given market is controlled, the geographical and power limitations of Wireless LANs will allow them to operate on an unlicensed basis, similar to the fashion in which Part 15 networks operate. The Wireless LAN protocols being developed by the IEEE 802.11 working group will encourage interoperability on a non-interfering basis.

We believe that the Commission should focus primarily on the technical standards dealing with the use of the spectrum, e.g., bandwidth, authorized power levels, modulation techniques, which are required to allow ubiquitous demand for, and use of, Wireless LANs on a non-interference basis. The

agency should leave to voluntary standards the issue of efficient interoperability of system components. In so doing, the Commission can substantially simplify -- and hopefully expedite -- its rulemaking processes. IEEE Standards Project 802 has an 11 year history of successfully developing voluntary standards for achieving such interoperability among communicating products designed and sold by many different, and highly diverse manufacturers. Its efforts with regard to wired LANs have generally been adopted by the International Standards Organization, benefitting users worldwide in meeting the need for wired LAN interoperability.

Finally, let me note that provisions for privacy and security in Wireless LANs are inherent in the 802 architecture being developed by the Standards Project, which already anticipates security by encryption of the content exchanged between end stations. When coupled with further security controls that prevent unauthorized access to users application programs and data, Wireless LANs can be made as secure in the PCS environment as existing private data networks are in the wired environment.

I greatly appreciate the opportunity to discuss the need to accommodate the development of Wireless LANs in the overall strategy for achieving under the rubric of PCS the full range of potential benefits for the American consumer. I look forward to answering any questions you may have.