Advances in Wireless Local Area Networks

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Wi-Fi applications have blossomed tremendously over the last few years. What started out as cable replacement for static desktops in indoor networks has been extended to fully mobile broadband applications involving wide-area outdoor community networks, moving vehicles, high-speed trains, and even airplanes. Wi-Fi data rates have also continued to increase from 2 to 54 Mbit/s with current 802.11n proposals topping 500 Mbit/s. This development may eventually render wired Ethernet redundant in the local network.

When wireless LANs were first deployed, they give laptop and PDA users the same freedom with data that cellphones provide for voice. However, a wireless LAN need not transfer purely data traffic. It can also support packetized voice and video transmission. People today are spending huge amounts of money, even from office to office, calling by cellphones. With a wireless LAN infrastructure, it costs them a fraction of what it will cost them using cellphones or any other equipment. Thus, voice telephony products based on wireless LAN standards have recently emerged. A more compelling use of wireless LANs is in overcoming the inherent limitations of wireless wide area networks (WANs). Current third-generation (3G) mobile telephony data rates have the potential to increase up to 2 Mbit/s whereas wireless LANs already offer data rates of up to 54 Mbit/s and unlike 3G, operate on unlicensed frequency bands. This has led some technologists to predict that eventually we are more likely to see dense urban broadband wireless LANs that are linked together into one network rather than widespread use of high-powered WAN handsets cramming many bits into expensive and narrow slices of radio spectrum.

This tutorial provides a concise discussion on current and emerging wireless LAN technologies, emphasizing key concepts and underlying principles rather than factual descriptions. In addition, many carefully prepared illustrations are used throughout the tutorial to enhance the textual explanations. By distilling details down to the basic issues needed for intuitive understanding, both serious and novice tutorial participants are able to gain valuable insights into the exciting field of high-speed wireless communications and mobile computing. To encourage tutorial participants to fully explore the topics covered, useful Internet resources and references have been included.

- Topic 1 (Introduction) provides an introduction to wireless LANs, including its evolution, standards and evolving technologies.
- Topic 2 (Fundamentals of Wireless LAN Design and Deployment) covers wireless LAN design and deployment. It will discuss radio spectrum trends, different classifications of wireless LANs, the physical layer transmission, MAC protocols, network topologies, security, switches, and deployment considerations (e.g., office, home, public hotspots/hotzones).
- Topic 3 (802.11 Wireless LAN Standards) describes key 802.11 wireless LAN standards, with emphasis on the physical and MAC layers (802.11b/a/g) as well as advanced security (802.11i) and QoS support for multimedia home networks (802.11e).
- Topic 4 (Performance Evaluation of Wireless LANs) covers the main issues for evaluating 802.11 wireless LANs, including key QoS parameters such as throughput, delay, and prioritization.
- Topic 5 (Emerging Research, Technologies, and 802.11 Standards) discusses emerging research and wireless LAN technologies, including high-speed MIMO systems, intelligent wireless systems, and new 802.11 initiatives focusing on the areas mentioned above.

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