Technology, Standards and Business
...a complex relationship

IEEE 802 LAN/MAN as an example
February 2004
Outline

• IEEE Standards Association standards primer
  – Organization and process

• IEEE 802 case study
  – Review of commercial successes and failures

• Discussion
  – This session is meant to be interactive—please ask questions during the presentation!
Imperative Principles of the Standards Process

• Due Process (fairness)

• Openness (anyone can participate)

• Consensus (need a 75% majority)

• Balance (users, producers, general interest)

• Right of Appeal (ability to contest decisions)
LMSC Process

• 3 plenary sessions per year
  – Entire LMSC holds meetings (~1200 attendees)
    – approximately 40 simultaneous projects
  – March, July, November

• 3 interim sessions per year
  – Typically among related working groups
    • 802.11, 802.15, 802.18, 802.19  600 attendees
    • 802.16; 802.20               250 attendees
    • 802.1, 802.3, 802.17        300 attendees
Relationships
Key Elements of Technology Success

• Functionality
  – It works
  – (WLAN MAC, PHY and RF)

• Ease of implementation
  – May be internally complex, but simple to build into systems
  – (Silicon, Software, Reference designs)

• Mass producible
  – Low cost
Key Elements of Standards Success

• Existing implementations
  – Proven technology

• Significant demand
  – Encourages competitors to work together

• Good leadership
  – Building consensus in a highly competitive atmosphere
Key Elements of Business Success

• Timing
  – Unsatisfied intrinsic demand

• Low cost
  – Competition

• Execution
  – Hard working, focused ‘A+’ team
Value of Standards

• High quality specifications
  – Broad industry review by experts

• Intellectual property is shared
  – Reasonable and non-discriminatory licensing terms

• Cost of technology is driven down
  • Higher volume
  • Multiple suppliers
OSI: Failure (vs TCP/IP)
The Apocalypse of the Two Elephants

Time

Activity

Research

TCP substantial deployments win

OSI Standards (too late to be widely deployed)

Source: Dr. David Clark, head of Advanced Network Architecture research group, MIT’s Laboratory for Computer Science
802.11: Success!

- 1990-1995 Research
- 1996-1999 Standards
- 2000 Billion dollar investments
802 based technology successes rating

• Wide deployment
  – 802.3 Ethernet & 802.1 Bridging
  – 802.11 Wireless LAN
• Moderate deployment
  – 802.5 Token Ring
• Limited deployment
  – 802.4, 802.6, 802.9, 802.10, 802.12, 802.14
• To be determined…
  – 802.15 Wireless PAN
  – 802.16 Fixed Wireless Access
  – 802.20 Mobile Broadband Wireless Access
Non-wireless activities

- 802.1 Overview and architecture
  - Bridging, architecture, addressing, security
    - Upper layers, liaison with IETF

- 802.3 Ethernet
  - LANs: faster, faster, faster – 10/100/1,000/10,000Mbps fiber and copper
  - Access Networks -- Ethernet in the First Mile
  - Smaller—backplane ethernet
  - Synchronous—preliminary studies

- 802.17 Resilient Packet Ring
  - Metropolitan Area Networking
Wireless Activities

• **802.11 Wireless Local Area Networks**
  – 100+ meters coverage
  – Unlicensed in 2.4GHz and 5GHz bands

• **802.15 Wireless Personal Area Networks**
  – 10+ meters coverage
  – Unlicensed in 2.4GHz and 5GHz bands

• **802.16 Fixed Broadband Wireless Access**
  – 1000+ meters coverage
  – Unlicensed and licensed frequencies
  – 2-11GHz and 10-66GHz bands
Wireless Activities

• 802.18 Radio Regulatory Technical Advisory Group
  – Regulatory support (FCC, ITU-R)

• 802.19 Coexistence Technical Advisory Group
  – Develop policy and procedure to coordinate sharing of unlicensed spectrum by 802 Data Links

• 802.20 Mobile Broadband Wireless Access WG
  – 1000+ meter coverage
  – Licensed frequencies, under 3.5 GHz
Possible Future Directions

• Wireless
  – WLAN Enhancements
    • Mesh networking, fast roaming, vehicular apps
  – Unlicensed 54-60 GHz—lots of bandwidth
    • LAN and PAN applications
  – 70 GHz point to point wireless PHYs

• Wireline
  – Backplane Ethernet
  – Synchronous Ethernet
URLs

• IEEE 802 home page
  – www.ieee802.org

• Working Groups home pages
  – www.ieee802.org/dots.html
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- Goals for IEEE 802 – 2002-2004
  - Encourage the development of new standards work
  - Maintain IEEE802’s outstanding track record of developing data communications standards that benefit society.
  - Ensure the imperative principals of due process, consensus, openness, balance and rights of appeal are implemented.
  - Increase the efficiency of the standards development process