WPAN Study Group
Is 802.11 the Answer?

Topics for Discussion

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Introduction / Overview

• Statement of perceived WPAN requirements
• Summary of requirements clearly / easily satisfied by the 802.11 standard
• Summary of 802.11 capabilities simply not required by the WPAN technology
• Discussion of the overlap
  – Is the basic 802.11 MAC/PHY appropriate for WPAN?
  – Are there parts that should be exploited? Avoided?
    –
Technical Guidelines

From April 8-9, 1998 Cambridge, MA meeting:
• Mobility: 0-10 mph (no handoff required)
• Range: 0-10 meters
• Data rate at MAC SAP: 19.2 - 100 kbps
• WPAN Coexistence: 20 within 400 square feet
• Coexistence with other wireless systems (e.g., 802.11)
• Networking support for minimum 16 devices
• Bridge or Gateway connectivity to other networks

Additional Guidelines

Other requirements we know we must satisfy:
• Very low power solutions feasible
• Very small solutions feasible
• Low c--- solutions feasible (can I use the “c” word?)
• Solutions with minimal interfaces feasible
  – simple hardware and software interface assumptions
  – necessary to interface to the simplest peripherals and sensors
• Not infrastructure-based networks


802.11 and Technical Guidelines

Can 802.11 satisfy the 4/8-9/98 guidelines?

- Mobility: 0-10 mph (no handoff required) **YES**
- Range: 0-10 meters **YES**
- Data rate at MAC SAP: 19.2 - 100 kbps **YES**
- WPAN Coexistence: 20 within 400 square feet **?????**
  *PHY dependent, FHSS more likely, with minimal transmit power*
- Coexistence with other wireless systems **YES**
- Networking support for minimum 16 devices **YES**
- Bridge or Gateway connectivity to other networks **YES**

802.11 and Additional Guidelines

Can 802.11 satisfy our additional guidelines?

- Very low power solutions feasible **DEPENDS**
- Very small solutions feasible **DEPENDS**
- Low c--- solutions feasible **DEPENDS**
- Solutions with minimal interfaces feasible **NOT YET**
- Not infrastructure-based networks **YES**

It’s the **DEPENDS** items that are the issue. Today solutions don’t satisfy what many want, ultimately the could. But of course, simpler solutions would be even better by then.
“Extra” 802.11 Requirements

802.11 meets requirements WPANs do not have:

• Roaming
• WEP (Wired Equivalent Privacy) hooks
  *might be nice*
• MAC-level fragmentation?
  *might be nice, but as a requirement could be unwise*

802.11 and WPAN

*If we were to use 802.11 for a WPAN, we’d need:*

• Hidden node mechanisms, since CSMA based MAC makes this critical for basic operation.
• Synchronization mechanisms (TSF Timers, beacons)
• Power management (TIM, DTIM, sleep, etc.)
• Independent BSS support for distributed power management, since WPAN has no infrastructure
• Association / Scanning mechanisms for IBSS (network) formation and management


Observations

- Power control is absolutely critical to WPAN
- 802.11 does power control via beacons, coordinated sleep, and TIM/DTIM messages layered on top of base CSMA/CA protocol.
- **This is TDMA on top of CSMA.**
- In fact, time-bounded services (CFS) and many of the performance optimizations in the standard are based on the use of TDMA-like structures layered on top of the CSMA foundation.
- **Argument:** This TDMA-on-CSMA is one of the reasons 802.11 is considered complex by many.

Opinion to Start Discussion

- 802.11 could certainly be used to satisfy the base technical requirements for WPAN identified at 4/8-9/98 Cambridge meeting.
- Technology will drive down power, size, c--- of 802.11 products. **BUT …**
- Much simpler approaches can be applied to the specific WPAN requirements to directly attack the problem.
- Technology will drive down the power, size, c--- of those solutions as well, to even lower points.
Final Comment

Remember:

_The fact that I can build a calculator with a Pentium and Windows 95 doesn’t mean that I should._

_Even if the power consumption of Pentiums is coming down every year._