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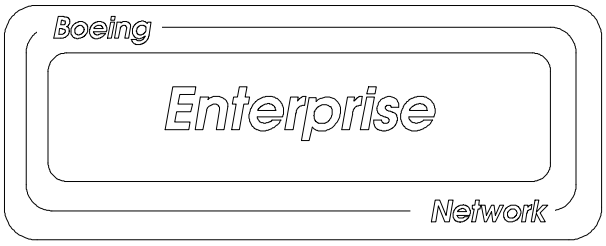
Background for IEEE 802 Standard at 5.1GHz



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Agenda

- FCC Release of 5.1GHz band for NII
- WATM Work at 5.1GHz
- Comparison of IEEE and ETSI Work
- Limitations of 802.11 at Higher Speeds
- Examination of the MAC Capabilities
- Proposal
- Statement of Work

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U-NII Bands

- Jan 9, 1997 FCC Released Freq
  - 5.15-5.35GHz (200MHz)
  - 5.75-5.85GHz (100Mhz)
- For use on campuses and LOS
- Available now
- Some vendors have 5.7 radios out now

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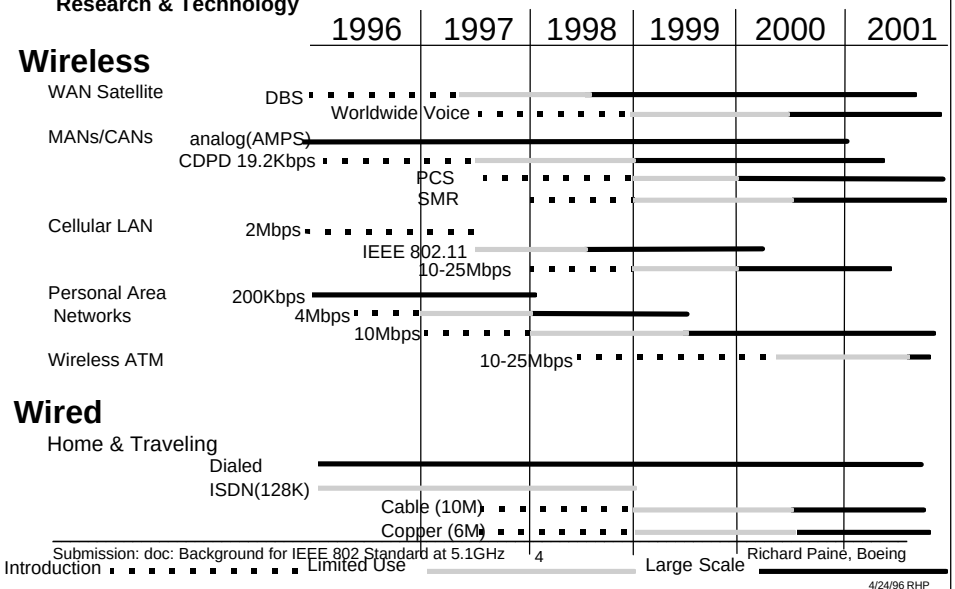
What is Going to Happen in Mobile Computing?



4/24/96 RHP

WATM Work at 5.1GHz

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- No work on MAC and PHY
- Following ETSI proposals for MAC and PHY
- Work includes:
  - Mobile ATM switches
  - Ad hoc networking
  - Wireless LANs
  - LOS
  - Interfacing with PCS
  - Interfacing with ethernet

WATM Reference Model

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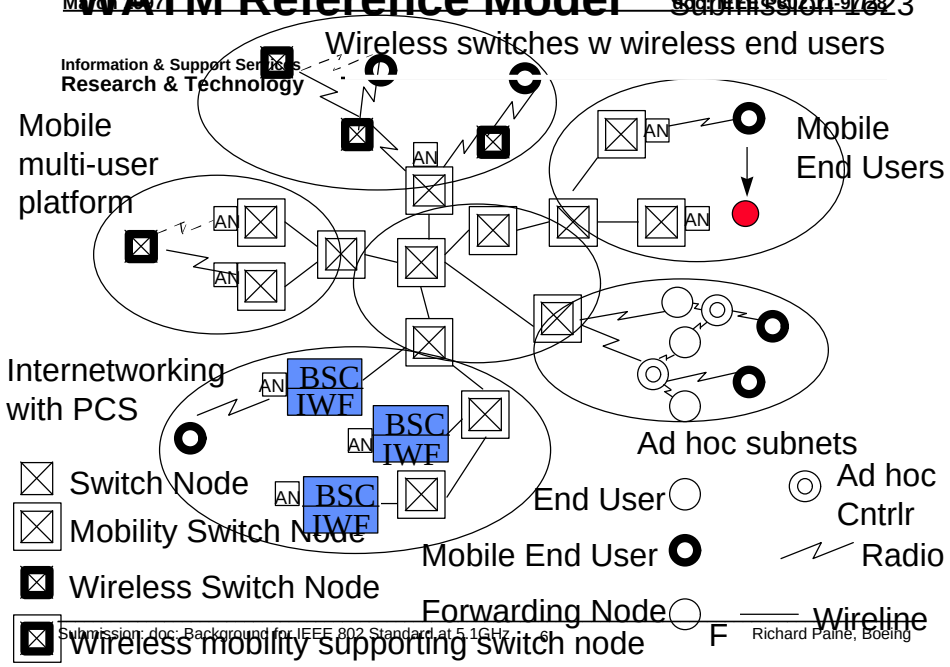

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ETSI

HIPERLAN Type 1	HIPERLAN Type 2	HIPERLAN Type 3	HIPERLAN Type 4
Wireless 8802 LAN	Wireless ATM Short Range	Wireless ATM Remote Access	Wireless ATM Interconnect
MAC	DLC	DLC	DLC
PHY 5GHZ (19Mbps)	PHY 5GHZ (20Mbps)	PHY 5GHZ (20Mbps)	PHY 17GHZ (155Mbps)

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IEEE and ETSI

	2.4FH	2.4DS	2.4 8802	5.15 8802	5.1 Shrt	5.1 Rmt	5.7 U-NII	17 Interc
IEEE	X	X	X	?			?	NA
ETSI				X	X	X	NA	X

ISO Model

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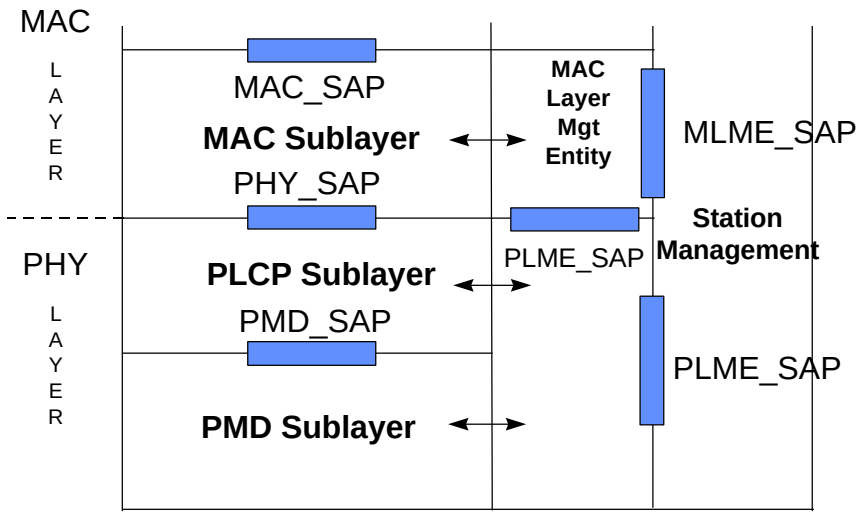

Limits on 802.11 at Higher Speeds

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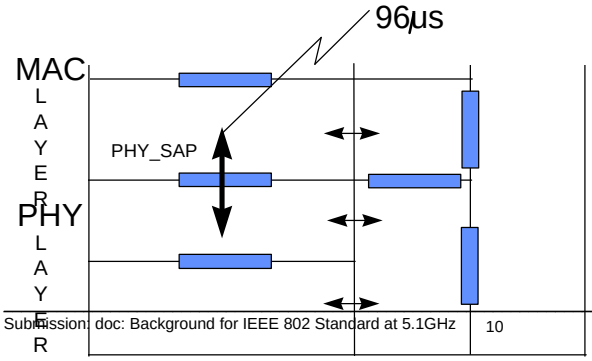
- Limit in the 96microsec preamble plus 32microsec header plus packet transmit state timing for the PHY_SAP
- At 25Mbps, 102791 bytes could conceivably be passed through the PHY_SAP. The largest size packet allowed through the present SAP is 4095 bytes.



25Mbps

96X10-6s preamble+
32X10-6s header+
max 32760X10-6sX
25X106bps = 822328b
102791 octets

10Mbps

96X10-6s preamble+
32X10-6s header+
max 32760X10-6sX
10X106bps = 328880b
41110 octets

Limits on 2.4GHz at 10Mbps

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1. 80Mhz-wide band

   79 hops at 2Mbps (1MHz/channel), 16 hops at 10Mbps (5MHz/channel)

2. Channel Diversity

   Decreasing number of channels increases interference

3. FCC Power Flux Density

   Can't cross the FCC power flux density requirements

4. Preamble Clock discovery

   Above 2Mbps there could be clock jitter problems

Limits on U-NII at 25Mbps

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1. 300Mhz-wide band (5.15-5.35GHz and 5.725-5.825GHz)

   70 hops at 25Mbps (5MHz channels)

2. Channel Diversity

   Still greater chance of interference at 70 vs 79 hops @ 1Mbps and 2Mbps

3. FCC Power Flux Density

   From the NII/Supernet

4. Preamble Clock discovery

   Much higher clocking speed

Other Standards Activities

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ETSI and Hiperlan

- Hiperlan 1,2,3,&4
- Hiperlan 1 is 5.1GHz
- Hiperlan 2 is 5.1GHz
- Hiperlan 3 is 5.1GHz
- Hiperlan 4 is 17GHz
- ece.wpi.edu for Hiperlan information
- Vic mentioned that ETSI did not go to the ITU and so the ITU is upset with ETSI and is refusing to do business with them since they have not worked with the ITU.

Boeing Wireless Mobility Model

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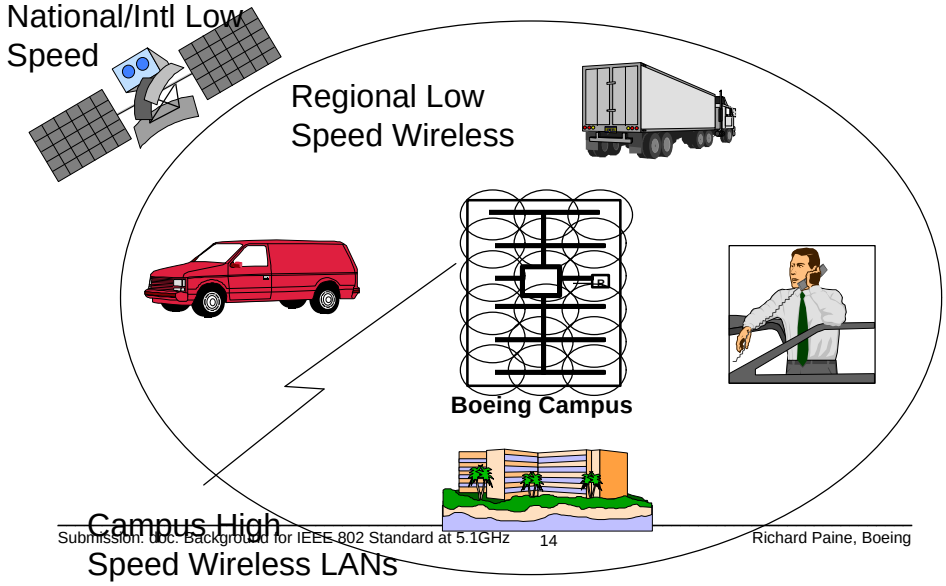

Requirements for Higher Speed

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Requirements/Objectives

- Interoperability - preferred but not required (with 802.11 specification)
- U-NII - higher speeds in the 5.1GHZ band
- Start with 150MHZ covered by both U-NII and HIPERLAN
- Data rate - 25Mbps, consider fallback
- Sensitivity (Range) - study will be conducted on spectral efficiency vs sensitivity vs range vs immunity etc.
- Transmit power - regulatory under U-NII rules
- Overlapping networks capability
- Power consumption
- Multipath immunity - methods more immune to multipath, ie work will be conducted on channel models and immunity to multipath
- Interference immunity - (modulation, protocol)
- Economics (complex/efficient vs low cost) - complex/efficient vs low cost
- Power consumption - mechanisms for power conservation (sleep modes)

Action Items

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Required Actions:

Consider a range including U-NII and HIPERLAN frequencies

Consider a project for the 5.15GHz and 5.725 MAC and PHY now.

Allow ATM compatibility with 802.2 MAC networks

Develop relationships with ETSI and ITU for 5.15GHz standards

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PAR Requirements

There are five criteria for a PAR:

- Broad market potential
- Compatibility
- Distinct Identity
- Technical Feasibility
- Economic Feasibility

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Proposal

- Create a new 802.11 PHY operating up to 25Mbps per channel based on the U-NII rule-making
- Motion to submit the PAR without addressing specific modulation types except only as it regards technical feasibility

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Liaison Issues

- Give recognition to WINForum (liaison to IEEE for fair-share rules)
- Sychronize timing with PAR
- Liaison with WATM