

# IEEE 802 Standardization: Past, Present and Future

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## IEEE802/IETF vs. 3GPP/3GPP2

### Protocol

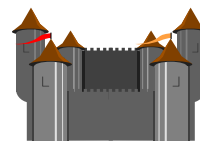
*IETF, IEEE802*



- General building blocks
- Single protocol functions
- Adoption open to market
- Contribution by individuals

### Architecture

*3GPP/3GPP2*



- Network architecture
- Specification of a network
- Often compulsory
- Corporate membership

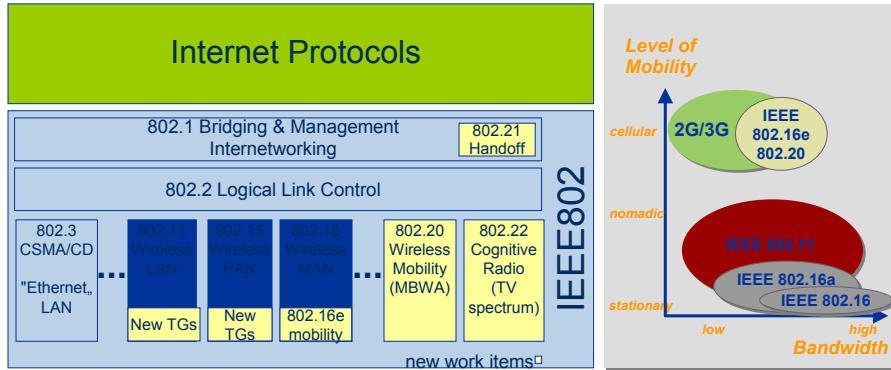
## The Beginning of IEEE 802

- **First meeting of the IEEE Computer Society “Local Network Standards Committee”, Project 802, in Feb. 1980.**
  - The project number 802 was simply the next number in the sequence.
  - Later renamed to “LMSC”: LAN/MAN Standardization Committee
- **Work was on one LAN standard, with 1 to 20 MHz, divided into:**
  - Higher Level Interface (HLI).
  - Media Access Control (MAC), and
  - Physical layer (PHY)
- **A year later three MACs: CSMA/CD, Token Bus, and Token Ring.**
- **Further MAC and PHY groups added**
  - 802.11, 802.15, 802.16, 802.20, 802.22
- **Unifying themes of IEEE P802**
  - Common upper interface to the Logical Link Control (LLC) sublayer,
  - Common data framing elements

## IEEE 802 Process

- **Membership**
  - Individual
  - Technical decisions (proposal selection, technical changes) require 75% approval
- **Process**
  - Formation of the new group via a study group
  - **Call for contributions**
  - Proposal presentation and discussions
    - Downselection
  - Creation of the draft document
  - **Working group letter ballot (and recirculations)**
    - Ballot responses: “Approve” or “Disapprove” with technical comments
    - Every comments need to be resolved
  - **Sponsor ballot (and recirculations)**
  - IEEE Standard publication

### IEEE 802 Wireless Groups

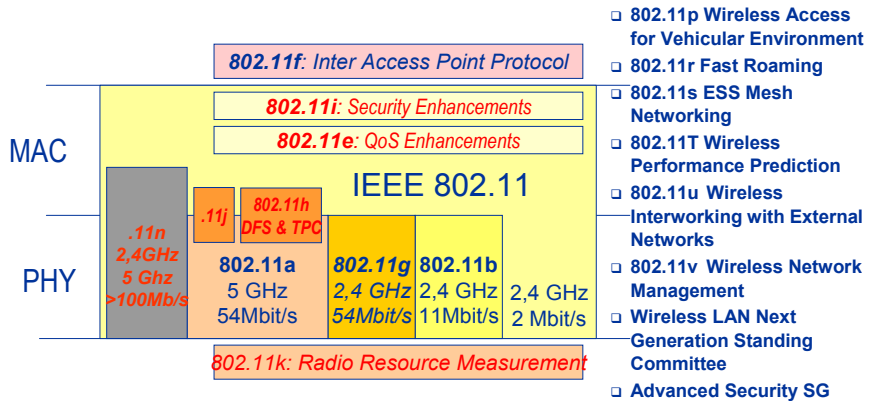


- IEEE802 provides a complete set of standards for carrying IP
- IEEE802 defines only the Physical and Link Layer of a network
- IEEE802 recently started activities for mobile internet access

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### IEEE 802.11 Wireless LAN Standardization



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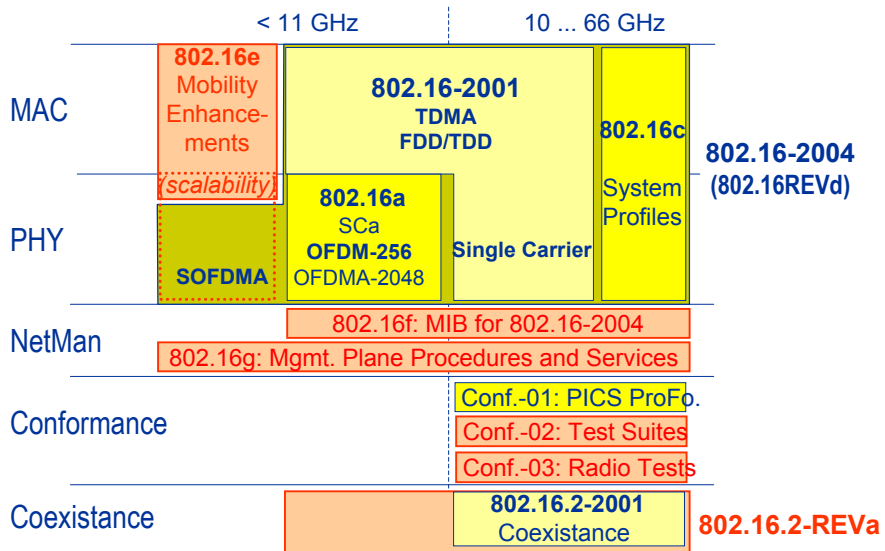
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## IEEE 802.15 Wireless PAN Standardization

### Active Projects:

- TG 1a - WPAN 15.1 Revisions to Bluetooth® v1.2
- TG 3a - WPAN Alt High Rate PHY
- TG 4a - WPAN Alt Low Rate PHY
- TG 5 - WPAN Mesh Networking
- Publicity Committee
- mmWave Interest Group

## IEEE 802.16 Wireless MAN Standardization



## IEEE 802.16 in Progress

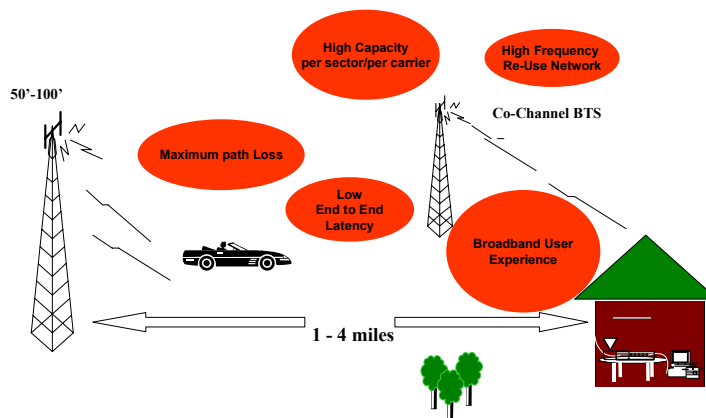
- **802.16 Maintenance Task Group**
  - Creating corrigendum document to fix errors and inconsistencies contained in IEEE 802.16-2004
- **802.16e: Mobility Enhancement**
  - PHY: Scalability of OFDMA, new FEC (LDPC), H-ARQ, MIMO enhancement, STC, Pilot, Preamble structure
  - MAC: Handover, Sleep mode, Paging
  - Currently in Sponsor Ballot comments' resolution with 5<sup>th</sup> draft
    - ~ 2000 comments with ~ 120 technical contributions
- **802.16f: Management Information Base for fixed services**
  - Currently in Letter Ballot recirculation with 2<sup>nd</sup> draft
- **802.16g: Management Procedures and Services**
  - Call for contributions
  - Baseline document available
- **802.16h: License-exempt coexistence**
  - Task group officially approved in Dec'04

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## IEEE 802.20 Mobile Broadband Wireless Access

- **Develop air interface specification for operation in the licensed spectrum below 3.5 GHz and supporting vehicular speed up to 250 km/h**



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## IEEE 802.20 from Project Authorization Request

<i>Characteristic</i>	<i>Target Value</i>
<i>Mobility</i>	<i>Vehicular mobility classes up to 250 km/hr (as defined in ITU-R M.1034-1)</i>
<i>Sustained spectral efficiency</i>	<i>&gt; 1 b/s/Hz/cell</i>
<i>Peak user data rate (Downlink (DL))</i>	<i>&gt; 1 Mbps*</i>
<i>Peak user data rate (Uplink (UL))</i>	<i>&gt; 300 kbps*</i>
<i>Peak aggregate data rate per cell (DL)</i>	<i>&gt; 4 Mbps*</i>
<i>Peak aggregate data rate per cell (UL)</i>	<i>&gt; 800 kbps*</i>
<i>Airlink MAC frame RTT</i>	<i>&lt; 10 ms</i>
<i>Bandwidth</i>	<i>e.g., 1.25 MHz, 5 MHz</i>
<i>Cell Sizes</i>	<i>Appropriate for ubiquitous metropolitan area networks and capable of reusing existing infrastructure.</i>
<i>Spectrum (Maximum operating frequency)</i>	<i>&lt; 3.5 GHz</i>
<i>Spectrum (Frequency Arrangements)</i>	<i>Supports FDD (Frequency Division Duplexing) and TDD (Time Division Duplexing) frequency arrangements</i>
<i>Spectrum Allocations</i>	<i>Licensed spectrum allocated to the mobile service</i>
<i>Security Support</i>	<i>AES (Advanced Encryption Standard)</i>

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## IEEE 802.20 Development Timeline

- Stage Setting
  - Initial Membership Meeting Mar, 03
  - Closure on Requirements July 04
  - Closure on Channel Models Jan 05
  - Closure on Evaluation Criteria Jan 05
  - Procedure for proposal selection and merging (“Down select”) Jan 05
- Proposal Selection
  - **Call for Proposals** Jan 05
  - **Proposal Presentations, Simulation Results, and Mergers** Mar - May 05
  - Final Selections July 05
- Standard Development
  - Drafting the Standard July-Sept 05
  - **First WG Letter Ballot** Oct 05
  - Second WG Ballot Feb 06
  - **Sponsor Ballot** June 06
  - Sponsor Recirculation Sept 06
- IEEE-SA Approval
  - Submission to Rev. Com Nov 06
  - **SA Approval** Dec 06

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## IEEE 802.22 Cognitive Wireless Regional Area Network (WRAN) Standardization

- **New working group created in November 2004**
  - Create air interface (MAC and PHY) to provide broadband wireless access in diverse geographic areas including sparsely populated rural area
- **In response to FCC's rules allowing the secondary use of TV spectrum between 54 and 862 MHz**
- **Fixed, point to multi-point air interface**
- **Must include interference protection mechanism**

## Participation in IEEE 802 Wireless

- **Voter status obtained after two consecutive plenary attendance**
- **Huge participation in all wireless groups**
  - 802.11: 500+ participants with ~400 voters
  - 802.15: 200+ participants with ~200 voters
  - 802.16: 300+ participants with ~200 voters
    - Triple over last year
  - 802.20: ~50 participants with ~150 voters
  - 802.22: 100+ participants with ~100 voters

## Summary

- **Building small blocks to fit big pictures**
  - IEEE/IETF =? 3GPP
- **Past, present and future**
  - 80's:
    - ✓ **Wired network 802.1, 802.3 (Ethernet)**
  - 90's:
    - ✓ **Wireless network 802.11 (Wi-Fi)**
  - 00's:
    - ✓ **Next generation 802.11 (Wi-Fi), 802.15 (UWB)**
    - ✓ **Mobile wireless 802.16 (WiMax), 802.20**
    - ✓ **Cognitive radio 802.22**
  - 10's:
    - ✓ **WINNER??**