IEEE 802.11 activity

IEEE 802.11 standardization work
and how it affects Linux

Linux wireless summit / Berlin 2009

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Published standard

- Base standard
  - IEEE Std 802.11-2007
- Amendments
  - IEEE Std 802.11k-2008
  - IEEE Std 802.11r-2008
  - IEEE Std 802.11y-2008

Work in progress

- TGw
- TGn
- TGz
- TGp
- TGv
- TGu
- TGs
- TGmb

- TGaa
- TGac
- TGad

IEEE 802.11 process

- Study group

- Task group

  - Call for proposals

  - Downselect process

  - Working group letter ballots and recirculations

- IEEE-SA Comment resolution committee

  - usually same set of people as the task group

  - IEEE-SA letter ballot and recirculations

- Publication

IEEE Std 802.11-2007

- Current base standard
  - IEEE Std 802.11 (original, reaffirmed edition)
  - IEEE Std 802.11b-1999
  - IEEE 802.11d-2001
  - IEEE 802.11g-2003
  - IEEE 802.11h-2003
  - IEEE 802.11i-2004
  - IEEE 802.11j-2004
  - IEEE 802.11e-2005

IEEE 802.11-2007 and Linux

- most of useful functionality already implemented

- some missing areas

  - 802.11h, radar detection/DFS for AP and IBSS

  - 10 MHz channels

IEEE Std 802.11k-2008

- Radio Resource Measurement

- not yet deployed in large scale

  - some similar functionality in Cisco CCX program

- mostly unimplemented in Linux

  - station side: mac80211 and/or user space

    - process action frames

    - perform measurements

  - AP side: hostapd

    - - measurement requests; use values for something (e.g., neighborhood reports)

IEEE Std 802.11r-2008

- Fast Roaming / Fast BSS Transition (FT)

- not yet deployed

- mostly implemented in mac80211/hostapd/wpa_supplicant

- missing parts

  - station side roaming operations mostly untested and expected to not work correctly in all cases

  - FT resource reservation protocol (unlikely to be needed)

IEEE Std 802.11y-2008

- 3600-3700 MHz Operation in USA

- new channels

- enablement / enabling device required

- not yet implemented

- hostapd: enabling mechanism, advertisement

- mac80211: station side enablement processing (action frames)

TGw

- Protected Management Frames

- 802.11w/D11.0 in sponsor ballot recirculation (likely the final or second to final)

- expected publication after July 2009 meeting

- complete implementation in mac80211, hostapd, wpa_supplicant

TGn

- High Throughput

- 802.11n/D11.0 in final steps of sponsor ballot, expected publication after July 2009 meeting

- main parts of 802.11n/D2.0 implemented in mac80211/hostapd

- updates between D2.0 and final version not fully implemented

  - 20/40 MHz switches and some coex rules (hostapd)

  - IEEE 802.11 QoS vs. WMM

  - IBSS (if enough interest..)

TGz

- Extensions to Direct Link Setup

  - tunneled setup (no AP support required)

  - power saving, can use other another channel

- 802.11z/D5.0 in working group recirculation; estimated completion January 2010

- not yet implemented

  - mac80211: DLS and processing of negotiation messages (action frames encapsulated as data)

  - wpa_supplicant: security setup

  - when to setup links? automatic? application API?

TGp

- Wireless Access for the Vehicular Environment

  - operation outside the context of BSS; no authentication or association; new channels

- 802.11p/D7.0 in working group recirculation; estimated completion June 2010

- not yet implemented

  - would require changes in mac80211 to allow new operation mode

  - specific use casel; enough interest for supporting this in mac80211 or Linux open source in general?

TGv

- Wireless Network Management

  - diagnostics

  - event reporting

  - multiple BSSID advertisement (single beacon)

  - flexible multicast, directed multicast

  - proxy ARP

  - TIM broadcast

  - WNM-Sleep mode

  - traffic filtering

  - location tracking

TGv (continued)

- 802.11v/D6.0 in working group recirculation; estimated completion June 2010

- not yet implemented

  - not all values yet assigned in the draft

  - should be possible to implement functionality one-by-one (negotiated support for many features)

  - requires changes in mac80211, hostapd, wpa_supplicant (and additional nl80211/cfg80211 functionality, too)

TGu

- InterWorking with External Networks

  - E911 emergency services, emergency alert system

  - QoS mapping

  - media independent handover

  - network advertisement/discovery/selection (hotspots, etc.)

  - generic advertisement service (pre- and post-association)

TGu (continued)

- 802.11u/D7.0 in working group recirculation; estimated completion September 2010

- not yet implemented

  - requires changes in mac80211, hostapd, wpa_supplicant and likely some additional components

  - functionality can be added in parts depending on interest

  - number of new action frames

TGs

- Mesh Networking

- 802.11s/D3.0 in comment resolution; estimated completion September 2010

- partial mac80211 implementation of an older draft
  - need to be updated to later draft
  - security implementation still missing (and open question in the draft)

TGmb

- Maintenance

  - merge published amendments into 802.11-2007 (current goal: k r y w n z p v u s)

  - fix issues, some cleanup

  - publish new base standard, 802.11-2011 (March 2011 or so)

- 802.11REVmb/D1.0 in WG letter ballot

- not expected to require implementation changes

TGaa

- Video Transport Streams

  - enhancements for robust audio video streaming

  - more reliable groupcast; BlockAck extensions

- initial draft (802.11aa/D0.01) being worked on by the task group (not yet in letter ballot); estimated completion June 2011

- at least mac80211 and likely driver (or maybe even firmware/hardware) changes expected

TGac

- Very High Throughput <6 GHz
    - at least 500 Mbps
    - below 6 GHz, excluding 2.4 GHz
- in initial phases of development, requirements specification; no initial draft or proposals selected yet
- estimated completion December 2012
- new hardware needed
    - driver, mac80211, .. changes expected

TGad

- Very High Throughput 60 GHz

  - at least 1 Gbps

  - typically 57-66 GHz

- in initial phases of development, requirements specification; no initial draft or proposals selected yet

- estimated completion December 2012

- new hardware needed

  - driver, mac80211, .. changes expected

Wi-Fi Alliance

- mainly marketing and certification for IEEE 802.11 -based products

- some standardization work

  - Wi-Fi Protected Access (WPA)

  - Wi-Fi Multimedia (WMM)

  - WPA2 (IEEE 802.11i-2004 / RSN)

  - Wi-Fi Protected Setup (WPS)

  - Draft TGn (IEEE 802.11n/D2.0)

  - couple of ongoing projects