IEEE STANDARDS ASSOCIATION

IEEE

IEEE 802.22 Status for IEEE TCCN at IEEE ICC 2019

May 2019

Oliver Holland

IEEE 802.22 Working Group Vice-Chair

Apurva Mody

IEEE 802.22 Working Group Chair

802.22 Completed Projects

802.22-2011- Flagship Standard on Cognitive Wireless Regional Area Networks – Commercial Name Wi-FAR®, Uses Television Band unused channels, so called WhiteSpaces to provide long and short distance broadband connectivity

802.22.1-2010 – Standard on Beaconing for co-existence. Uses beaconing technology from the primary users to alert the secondary users that the channel is being used

802.22.2 – Recommended practice for installation and deployment of IEEE 802.22 Networks

802.22a-2014 – Amendment to the IEEE 802.22 Standard on Management Information Base (MIB)s and Management Plane procedures

802.22b-2015 – Amendment to the IEEE 802.22 Standard for Enhancement for Broadband Enhancements for the Broadband Services and Monitoring Applications

802.22 Ongoing Projects

IEEE 802.22 Revision:

- Merges in the 802.22a-2014 and 802.22b-2015 amendments
- Generally revises standard, e.g., corrections, inconsistencies, etc
- New content, e.g., capturing new national TV white space regulations developed since baseline standard 802.22 standard published (e.g., UK, Singapore, South Africa, Colombia, others…)
- PAR extended until end of 2019; has undergone fifth internal Letter Ballot, comments resolved and a revised draft produced
- In the final stages of completion—in process of being submitted to Sponsor Ballot. Complete by the end of year
- It seems that there will be no more work necessary in IEEE 802.22, aside from maintaining the published standards. WG could go into hibernation given this

802.22 Ongoing Projects

IEEE 802.22.3 Spectrum Characterization and Occupancy Sensing:

- Creates a new standard for spectrum sensing
- Applications include spectrum management, spectrum de-confliction, interference monitoring and awareness, on-demand spectrum survey and reporting, coverage analysis, shadowing and fading analysis, spectrum mapping and spectrum planning
- Undergone five internal Letter Ballots; comments resolved and close to being submitted to Sponsor Ballot
- Again, likely to complete by the end of this year or early next year
- Has expanded in scope; initially sensing for opportunity detection but now a far bigger range of use cases, involving NTIA and others for regulatory monitoring applications
  - Has decided to move to be under IEEE 802.15 as IEEE 802.15.22 given this

IEEE 802.22 Revision

Example of updates to consider new international regulatory administrations' TV white space rules

Regulatory domain	Regulatory class and profile	
	Fixed	Personal portable
USA	Fixed	Mode I & II[a]
CAN	Fixed	N/A
GBR	Fixed, Type A	Non-fixed, Type B
European Union	Fixed, Type A	Non-fixed, Type B
SGP	Fixed	Mode I & II[b]
COL	Fixed	Mode I & II[a]
ZAF	Fixed	Nomadic
—	—	—

[a] The behavioral limits sets for Modes I and II are defined in the FCC Report and Order. However, IEEE Std 802.22 will only operate in portable nomadic Mode II.
[b] The behavioral limits sets for Modes I and II in the case of Singapore are defined in: IMDA, "Telecommunications Standards Advisory Committee (TSAC)— Technical Specification—Television White Space Devices", October 2016

Regulatory domain	Regulatory class	Maximum BS EIRP /Maximum antenna height	Maximum CPE EIRP/Maximum antenna height	Polarization
USA	Stationary fixed	4 W / 30 m AGL,[a] 76 m GHAAT[b]	4 W / 30 m AGL, 76 m GHAAT	Any
USA	Personal Portable (Modes I & II)	100 mW / N/A	100 mW / N/A	Any
CAN	Stationary fixed	500 W / ≤ 60 m AHAAT[c] 250 W / ≤ 90 m AHAAT 125 W / ≤ 120 m AHAAT 66 W / ≤ 180 m AHAAT 33 W / ≤ 240 m AHAAT 4 W / ≤ 500 m AHAAT	4 W / 10 m AGL	Vertical
GBR	All	4 W / N/A	4 W / N/A	Any
European Union	All	4 W / N/A	4 W / N/A	Any
SGP	Fixed	36 dBm / N/A	20 dBm / N/A	Any
COL	Stationary fixed	4 W / 30 m AGL, 76 m GHAAT	4 W / 30 m AGL, 76 m GHAAT	Any
COL	Personal Portable (Modes I & II)	100 mW / N/A	100 mW / N/A	Any
ZAF	Rural fixed	41.2 dBm per 8 MHz channel or 22.2 dBm per 100 kHz / 80 m AGL	41.2 dBm per 8 MHz channel or 22.2 dBm per 100 kHz / 80 m AGL	Any
ZAF	Urban fixed	36 dBm per 8 MHz channel or 17 dBm per 100 kHz / 30 m AGL	36 dBm per 8 MHz channel or 17 dBm per 100 kHz / 30 m AGL	Any
ZAF	Rural nomadic	20 dBm per 8 MHz channel or 1 dBm per 100 kHz / 80 m AGL	20 dBm per 8 MHz channel or 1 dBm per 100 kHz / 80 m AGL	Any
ZAF	Urban nomadic	20 dBm per 8 MHz channel or 1 dBm per 100 kHz / 30 m AGL	20 dBm per 8 MHz channel or 1 dBm per 100 kHz / 30 m AGL	Any
—	—	—	—	—

[a] AGL: Above ground level
[b] GHAAT: Ground height above average terrain
[c] AHAAT: Antenna height above average terrain

IEEE 802.22.3

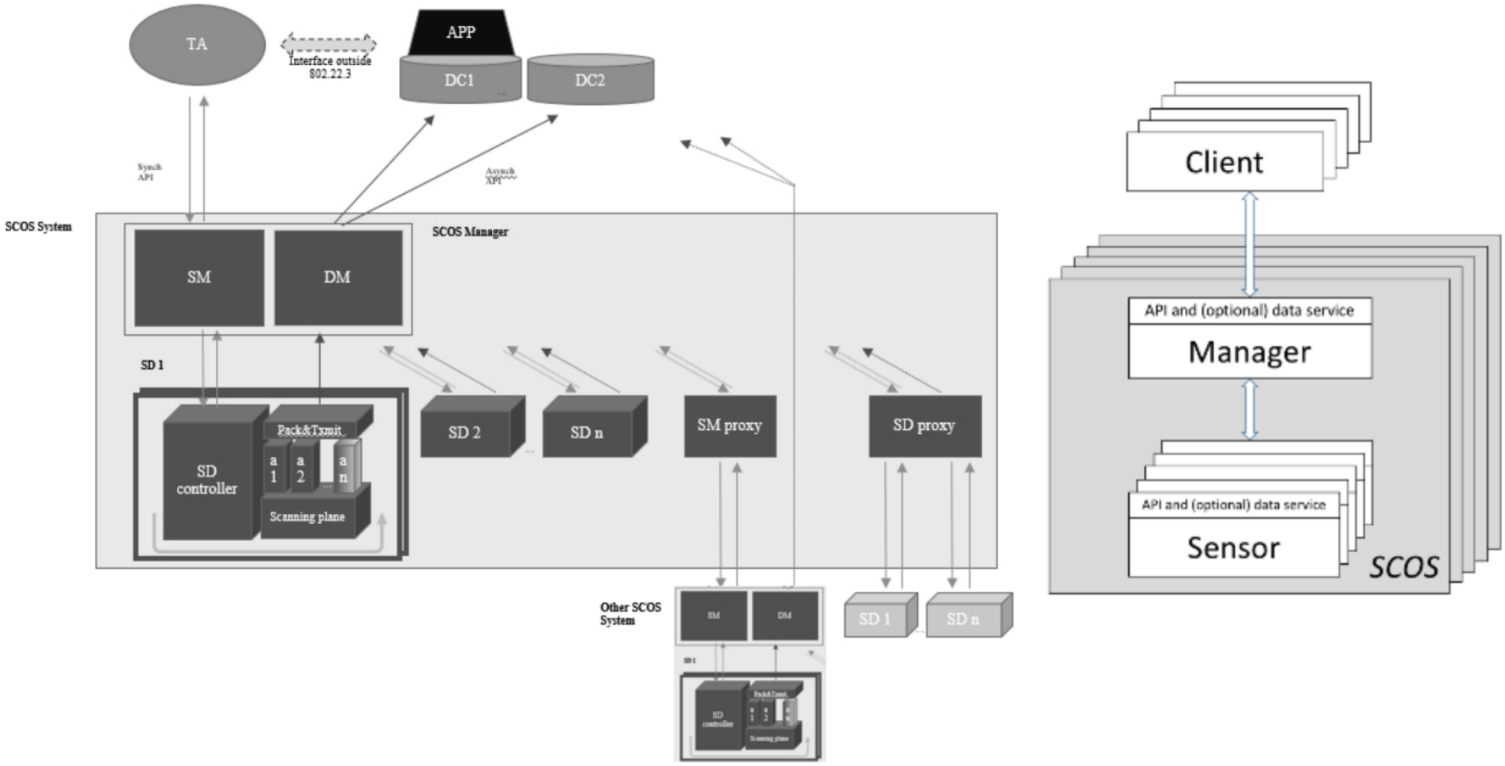
IEEE 802.22.3 (updated) PAR

- **Scope:** This Standard defines a Spectrum Characterization and Occupancy Sensing (SCOS) System. It defines the formats for system configuration and spectrum measurement parameters. It includes protocols for reporting measurement information that allow the coalescing of results from multiple systems. The standard leverages interfaces and primitives that are derived from IEEE Std. 802.22-2011. It uses any available transport mechanism to control and manage the system, and to share sensing data. The standard provides means for conveying value added sensing information to various spectrum database services.
- **Purpose:** The purpose is to specify operating characteristics of the components of the Spectrum Characterization and Occupancy Sensing System.

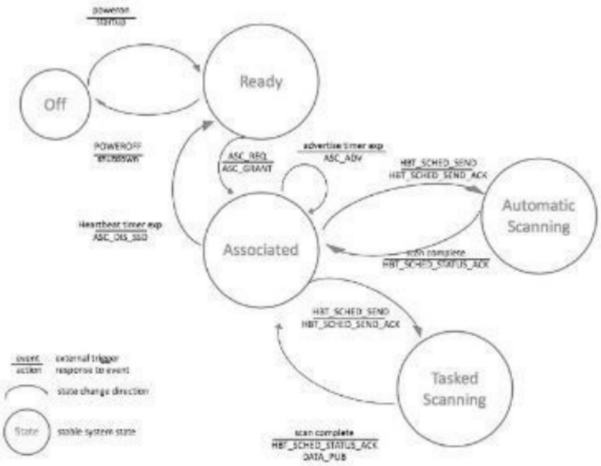
Extended PAR so the work on development of the standard can continue until the end of 2019; may be extended until end of 2020

IEEE 802.22.3

(acronyms/details will be verbally explained!)

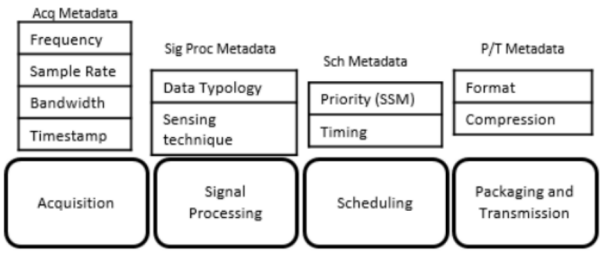


SSD State Diagram - Mode 2 (Basic Mode)

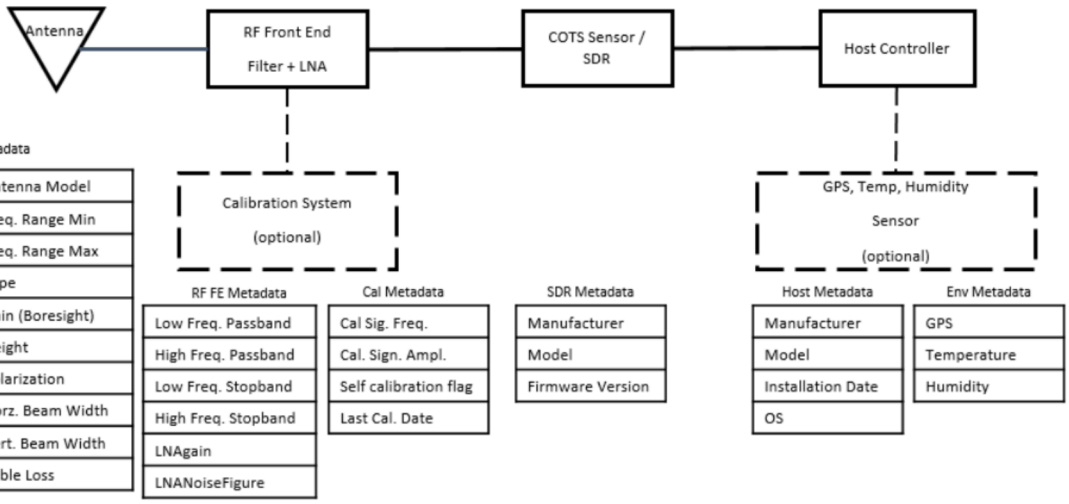


IEEE 802.22.3

Software Layer Process



Hardware Layer Components



IEEE STANI

Oliver Holland, IEEE 802.22 Vice-Chair
oliver.holland@ieee.org

Apurva Mody, IEEE 802.22 Chair
apurva.mody@ieee.org

www.ieee802.org/22