

Wireless Networks and Standards

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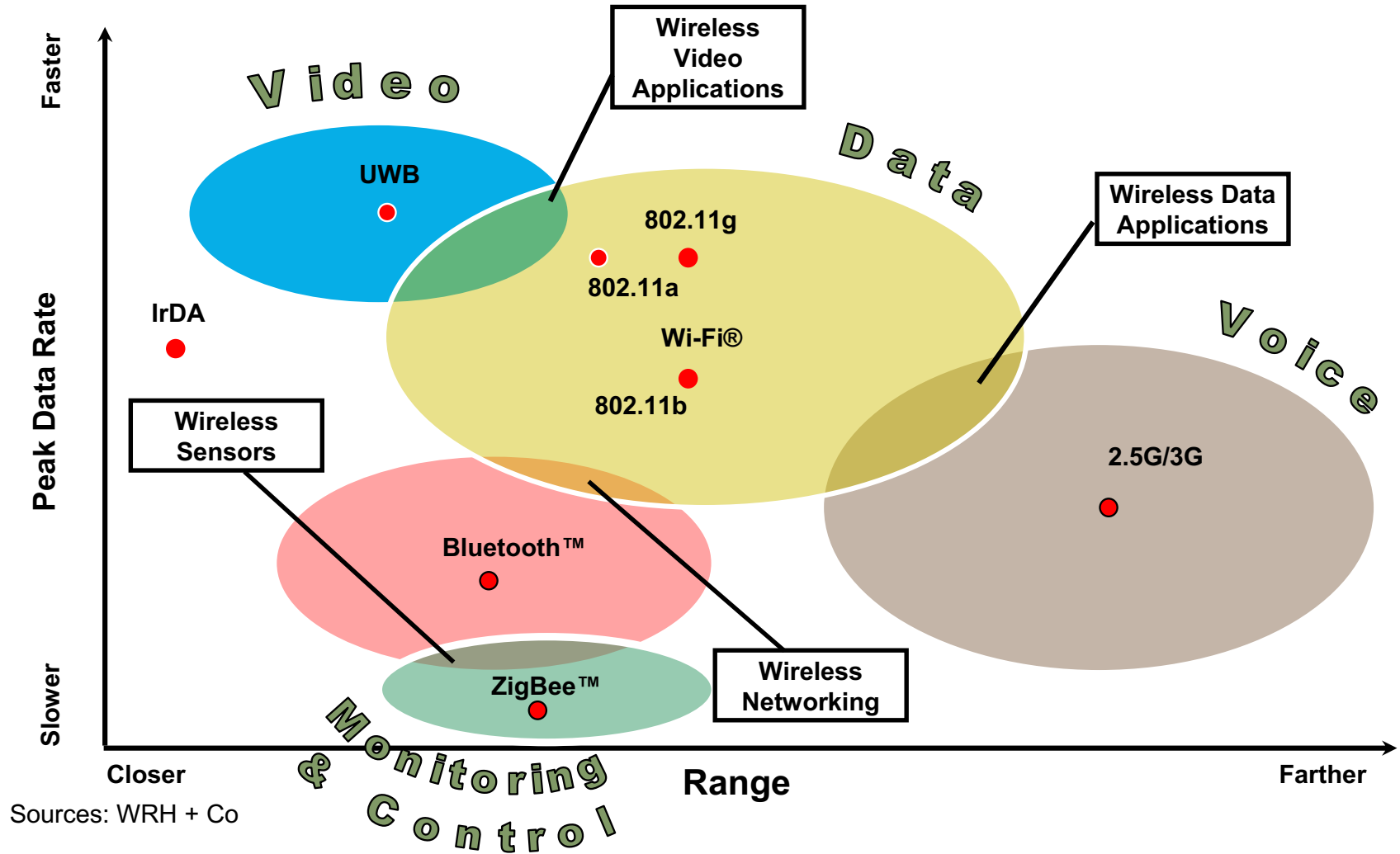
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Types of Wireless Networks

- Satellite Networks
 - Globalstar, Iridium
- Cellular Networks
 - 2G: GSM, D-AMPS, cdmaOne
 - 3G: UMTS, CDMA2000
 - 4G: LTE
- Broadband Wireless Access (BWA) (FWA, WMAN)
 - IEEE 802.16 (WiMAX), ETSI HIPERACCESS
- Wireless Local Area Networks (WLAN)
 - IEEE 802.11 (Wi-Fi), ETSI HIPERLAN 1 e 2
- Wireless Personal Area Networks (WPAN, PAN)
 - Bluetooth, IEEE 802.15.4 (ZigBee), IrDA

Differences between these two groups?

Scope of Wireless Networks Operation



IEEE 802 Standards Committee

- **Active** Working Groups and Study Groups
 - 802.1 Higher Layer LAN Protocols Working Group
 - 802.3 Ethernet Working Group
 - 802.11 Wireless LAN Working Group
 - 802.15 Wireless Personal Area Network (WPAN) Working Group
 - 802.16 Broadband Wireless Access Working Group
 - 802.17 Resilient Packet Ring Working Group
 - 802.18 Radio Regulatory TAG (Technical Advisory Group)
 - 802.19 Wireless Coexistence Working Group
 - 802.20 Mobile Broadband Wireless Access (MBWA) WG
 - 802.21 Media Independent Handover Services Working Group
 - 802.22 Wireless Regional Area Networks
 - 802.23 Emergency Services Working Group

* In red, groups related to wireless communications (almost all)

IEEE 802 Standards Committee

- **Inactive** Working Groups and Study Groups
 - None at this time
 - **Disbanded** Working Groups and Study Groups
 - 802.2 Logical Link Control Working Group
 - 802.4 Token Bus Working Group
 - 802.5 Token Ring Working Group
 - 802.6 Metropolitan Area Network Working
 - 802.7 Broadband TAG
 - 802.8 Fiber Optic TAG
 - 802.9 Integrated Services LAN Working Group
 - 802.10 Security Working Group
 - 802.12 Demand Priority Working Group
 - 802.14 Cable Modem Working Group
- * In red, groups related to wireless communications (none)

ETSI BRAN Committee

- Successor of the former Sub-Technical Committee RES10, which developed the **HIPERLAN/1** specifications
- BRAN Standards (obsolete):
 - **HIPERLAN2**: a mobile broadband short-range access network operating at the 5 GHz band
 - **HIPERACCESS**: a fixed wireless broadband access network targeting high frequency bands, especially the 40,5 - 43,5 GHz band
 - **HIPERMAN**: a fixed wireless access network operating between 2 GHz and 11 GHz
 - **HIPERLINK**: short-range very high-speed interconnection of HIPERLANs and HIPERACCESS (cancelled)
- * ETSI - European Telecommunications Standards Institute
- * BRAN - Broadband Radio Access Networks

Industry Based Organizations

- ATM Forum
- Wi-Fi Alliance
- Bluetooth SIG (Special Interest Group)
- ZigBee Alliance
- WiMAX Forum
- WiMedia Alliance
- HART Communication Foundation
- These organizations are formed to specify or promote standards and to certify the compatibility and interoperability of products

IEEE 802.15 Working Group

- Focuses on the development of standards for **Wireless Personal Area Networks (WPANs)**
- Address wireless networking of **portable and mobile computing devices** such as PCs, Personal Digital Assistants (PDAs), peripherals, cell phones, pagers, sensors and consumer electronics devices; allowing these devices to communicate and interoperate with one another
- Addresses the issues of coexistence and interoperability with other wired and wireless networking solutions
- **Composed of several Task Groups (TGs)**

IEEE 802.15 Task Groups

- **Task Group 1** (WPAN/Bluetooth)
 - Definition of the lower transport layers (L2CAP, LMP, Baseband, and radio) of the **Bluetooth** wireless technology.
 - Later versions of Bluetooth (after v1.2) did not become future IEEE standards, due to the discontinued relationship with the Bluetooth SIG.
- **Task Group 2** (Coexistence)
 - Developed Recommended Practices and a set of **Coexistence Mechanisms to facilitate coexistence of WPANs (802.15) and WLANs (802.11)**.
 - Developed a Coexistence Model to quantify the mutual interference of a WLAN and a WPAN.
 - Standard 802.15.2 published in 2003.

IEEE 802.15 Task Groups

- **Task Group 3 (WPAN High Rate)**
 - Standards for high rate WPANs (20Mbit/s or greater)
 - Provision for low power, low cost solutions addressing the needs of portable consumer digital imaging and multimedia applications
 - TG3: High Rate WPAN - standard published in 2003.
 - TG3a: High Rate Alternative PHY - based in UWB.
 - Cancelled due to deadlock between two proposals: Multi-Band Orthogonal Frequency Division Multiplexing (MB-OFDM), supported by the WiMedia Alliance, and Direct Sequence UWB (DS-UWB), supported by the UWB Forum.
 - TG3b: Amendment to 802.15.3 MAC.
 - TG3c: Millimeter Wave Alternative PHY – to operate in new and clear band including 57-64 GHz unlicensed band.

IEEE 802.15 Task Groups

- **Task Group 4 (WPAN Low Rate)**
 - Chartered to investigate a low data rate solution with multi-month to multi-year battery life and very low complexity
 - Potential applications are sensors, interactive toys, remote controls and home automation
 - Latest 802.15.4 standard published in 2006
 - Some active groups:
 - TG4e: intends to enhance and add functionality to the 802.15.4-2006 MAC to better support the industrial markets
 - TG4f: modifications of the 802.15.4 to allow for efficient communications with active RFID tags and sensor applications

IEEE 802.15 Task Groups

- **Task Group 5** (WPAN Mesh Networking)
 - The IEEE 802.15 Task group 5 is chartered to determine the necessary mechanisms that must be present in the PHY and MAC layers of WPANs to enable **mesh networking**.
 - A mesh network is a PAN that employs one of two connection arrangements, full mesh topology or partial mesh topology. In the full mesh topology, each node is connected directly to each of the others. In the partial mesh topology, some nodes are connected to all the others, but some of the nodes are connected only to those other nodes with which they exchange the most data.

IEEE 802.15 Task Groups

- **Task Group 6** (BAN – Body Area Network)
 - The IEEE 802.15 Task Group 6 (BAN) is developing a communication standard optimized for low power devices and operation on, in or around the human body (but not limited to humans) to serve a variety of applications including medical / healthcare, consumer electronics/ personal entertainment, fitness and others.
- **Task Group 7** (VLC - Visible Light Communications)
 - The IEEE 802.15.7 Task Group is chartered to write a PHY and MAC standard for Visible Light Communications (VLC).
- Other new task groups are constantly being created.

Useful Links

- IEEE 802 Working Groups
 - <http://www.ieee802.org/dots.shtml>
- IEEE Standards
 - <http://standards.ieee.org/about/get/>
- 802.15 Documents
 - <https://mentor.ieee.org/802.15/documents>
- ETSI Publications Download Area
 - <http://pda.etsi.org/pda/queryform.asp>
- Bluetooth SIG
 - <https://www.bluetooth.org/>
- ZigBee Alliance
 - <http://www.zigbee.org/>