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ITU-R studies in support of the Internet of Things

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The Internet of Things

Challenge- collect, transmit, exchange, process, distribute BBBD (bigibigbig Date) – broadband wireless access

Wireless access

The spectrum requirements and standards for IoT wireless access technologies and techniques are being addressed in ITU-R, including:

- **HARMONIZATION** of frequency ranges, technical and operating parameters used for the operation of short range devices
- **STANDARDS** for wide area sensor and actuator network systems
- **SPECTRUM** to support the implementation of narrowband and broadband machine-type communication infrastructures
- **SUPPORT** for massive machine-type communications within the framework of the standards and spectrum for IMT-Advanced (4G) and IMT-2020 (5G)
- **USE** of fixed-satellite and mobile-satellite communications for IoT

Resolution ITU-R 66: *Studies related to wireless systems and applications for the development of the Internet of Things*

- Different radiofrequency bands, many of which provide communication channels, infrastructure and capacity, could be used in IoT deployment with the aim of ensuring cost-effective deployment and efficient use of the radiofrequency spectrum
- IoT is a concept encompassing various platforms, applications, and technologies that are, and will continue to be, implemented under a number of radiocommunication services
- The implementation of IoT currently does not require specific regulatory provisions in the Radio Regulations
- ITU-R is invited to conduct studies on the technical and operational aspects of radio networks and systems for IoT
- Development of ITU-R Recommendations, Reports and/or Handbooks as appropriate, on the basis of the studies

Resolution ITU-R 66 http://www.itu.int/pub/R-RES-R.66

Resolution ITU-R 54 on Short Range Devices (SRDs)

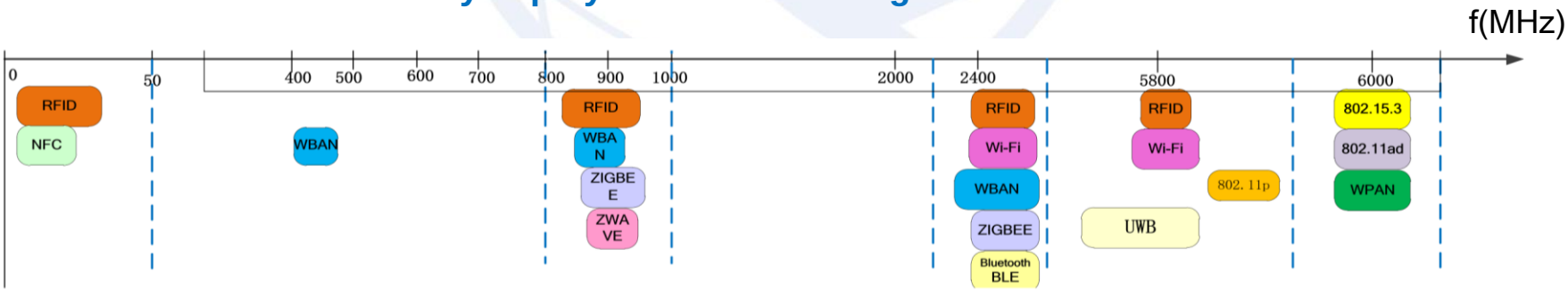
- **Achieve Harmonization for SRDs** for Economies of scale; Technological advances / Tuning ranges; Spectrum sharing; Integration in consumer products crossing borders
  - ✓ Harmonization of technical and operating parameters (use advanced technologies)
  - ✓ Measurement procedures to verify these parameters and ensure protection to radio services
  - ✓ Deployment in specific bands, harmonised globally or regionally (may ease the use of relevant frequency bands/tuning ranges, preferably on a global or regional basis)
  - ✓ Recognized role played by some SRDs in the Internet of Things (IoT)
- Technical & operating parameters and spectrum use for SRDs (Rep. ITU-R SM.2153)
- Frequency ranges for global/regional harmonization of SRDs (Rec. ITU-R SM.1896)
- Global harmonization of SRD categories (Rec. ITU-R SM.2103)
- Other on-going studies on SRD for IoT Deployment, e.g.: LPWAN description for MTC and IoT in frequency ranges harmonised for SRD operation

Source: Resolution ITU-R 54-2 http://www.itu.int/pub/R-RES-R.54

Typical applications supported by SRDs

Class	Applications	Technologies
Personal Area Networks (PANs)	Headsets, device links (e.g. medical/sport to iPhone)	Bluetooth®(2.4 GHz)
Home Area Networks (HANs)	Alarms, Home Automation, Smart Lighting (sub GHz)	ZigBee® (2.4 GHz), KNX® (868-870 MHz), Wideband Networking such as IEEE 802.11ah (sub GHz)
RFID (See Report ITU-R SM.2255)	Tag reading, Ticketing, payment cards, car tolls	Sub GHz (4-channel plan) and 2.4 GHz
Metropolitan Area Networks (MANs)	Sensing and control applications	Low Power Wide Area Networks (LPWAN – LoRa™ and SigFox) (sub GHz); Wi-SUN (sub GHz) Low speed metering networks (169 MHz)
Satellite M2M	Truck tracking, remote sensor reading	Under study at 862-863 MHz

Some widely deployed SRD technologies in Sub 6 GHz bands



Source: Presentations at the ITU Workshop on Spectrum Management for IoT Deployment (www.itu.int/go/ITU-R/RSG1SG5-IoT-16)

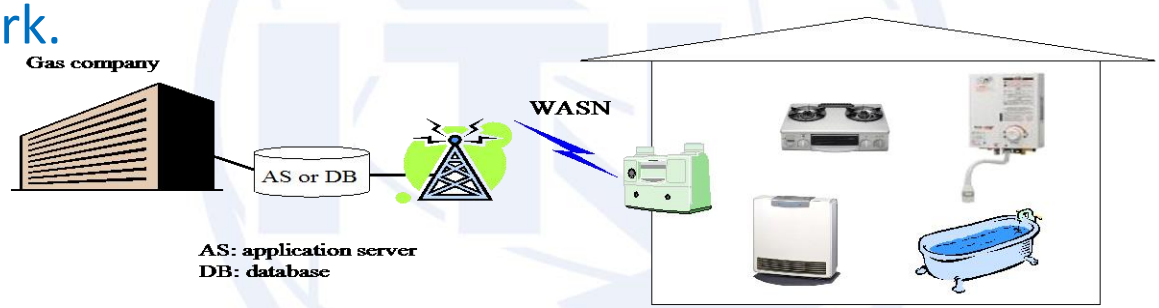
Studies on Wide-area Sensor and Actuator Network (WASN) Systems

Wide-area sensor and/or actuator network (WASN) systems support machine-to-machine communications to a large number of sensors and/or actuators.

- Recommendation ITU-R M.2002 "*Objectives, characteristics and functional requirements of wide-area sensor and/or actuator network (WASN) systems*". The key objective of WASN systems is to support machine-to-machine service applications irrespective of machine location.
- Report ITU-R M.2224 "*System design guidelines for wide area sensor and/or actuator network (WASN) systems*". The Report provides detailed information for system design policy, the wireless applications and examples of WASN systems for information sharing.

WASN – 2 main network functionalities

- *Automatic sensing and information collection*: automatically collect the information acquired by sensors and send it to application servers (ASs) or databases (DBs) via the core network.



- *Remote actuator control*: control actuators remotely using ASs via the core network.

Resolution 958 (WRC-15) - Urgent studies required in preparation for WRC-19 – Annex item 3

- **Studies on the technical and operational aspects of radio networks and systems, as well as spectrum needed, including possible harmonized use of spectrum to support the implementation of narrowband and broadband machine-type communication infrastructures, in order to develop Recommendations, Reports and/or Handbooks, as appropriate, and to take appropriate actions within the ITU Radiocommunication Sector (ITU-R) scope of work**
  - **WRC-19 agenda item 9.1 issue 9.1.8 (Reference: Circular Letter CA/226)**

Responsible group: WP 5D
Contributing groups: WP 1B, WP 5A

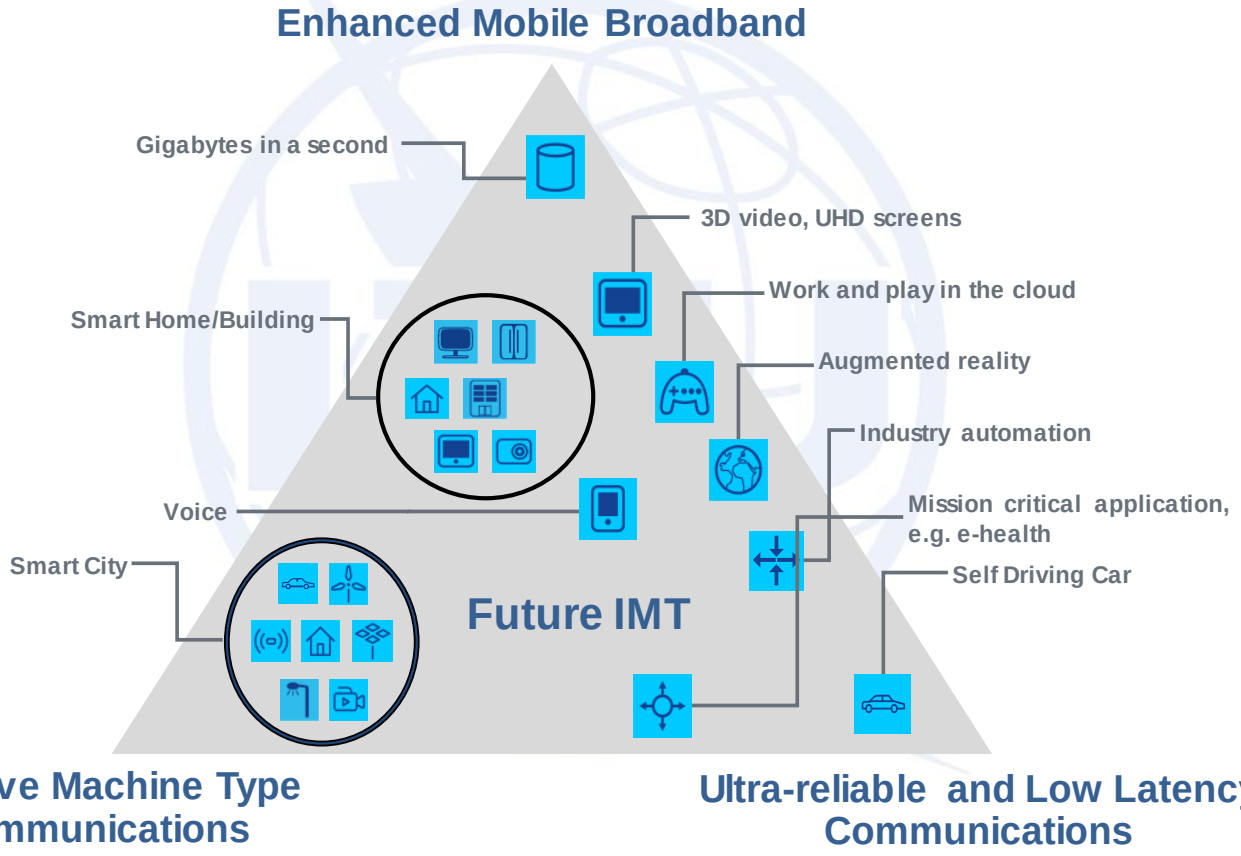
Sources: Resolution 958 (WRC-15) https://www.itu.int/dms_pub/itu-r/oth/0c/0a/R0C0A00000C0024PDFE.pdf

IMT - International Mobile Telecommunications

IMT support for IoT:

- **In the short term, the current IMT-Advanced 4G standard (Rec. ITU-R M.2012) is being enhanced to include support for IoT (e.g. NB-IoT systems).**
- **In the longer term, IoT is seen as an integral element of the IMT-2020 5G standard being developed in ITU – extending the benefits of the IMT massive economies of scale and globally harmonized frequencies and standards to all industry sectors.**
- **The framework and overall objectives of the future development of IMT for 2020 and beyond is detailed in Recommendation ITU-R M.2083.**

5G usage scenarios



Integration of satellite systems into Next Generation Access Technologies

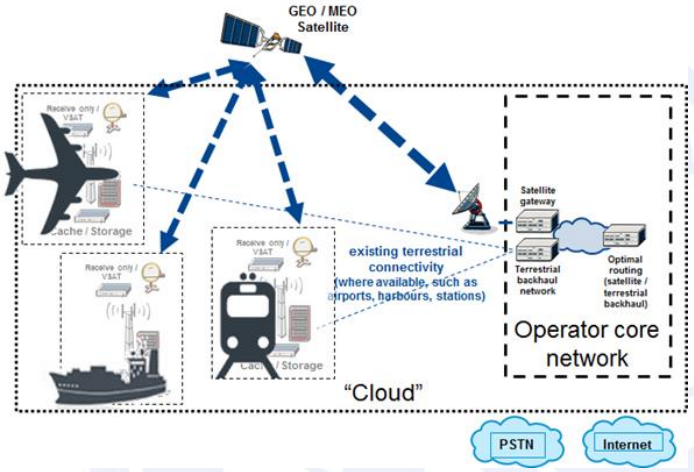
- Satellites cover a wide area with high capacity and can instantaneously connect any place within their footprint, allowing rapid connection of cities, villages, businesses and homes with a predictable quality of service.

- In addition, satellite networks are less vulnerable to natural disasters and similar incidents than their terrestrial counterparts – an intrinsic property that makes them the preferred delivery method for highly secure and mission-critical services.

- Satellites may help to accelerate the commercially viable development of Next Generation Access Technologies anywhere in the world, provided a number of satellite-specific issues are considered.

- Both geostationary and non-geostationary satellite networks have their specific benefits for integration of satellite-based solutions into Next Generation Access Technologies.

Example use case - Communications on the Move



- This use case is about high speed backhaul connectivity to individual planes, trains and vessels (including cruise ships and other passenger vessels), with the ability to multicast the same content (e.g. video, HD / UHD TV, as well as other non-video data) across a large coverage (e.g. for local storage and consumption). The same capability also allows for the efficient backhauling of aggregated IoT traffic from these moving platforms, for instance, IoT devices on containers (e.g. for tracking and tracing) connected via a Relay UE on a transport vehicle such as a ship, train or truck.

Summary

- A variety of radio technologies will be used to implement the Internet of things, extending from short range devices to wide area sensor networks and global terrestrial IMT systems as well as satellite systems.

- The ITU-R Study Groups are developing technical and operational standards to facilitate the deployment of IoT on a global basis, including harmonized frequency spectrum and appropriate regulatory regimes.

- Associated aspects will also be addressed at the forthcoming World Radiocommunication Conference 2019 (WRC-19) agenda items 1.11, 1.12, 1.13, 1.16 and 9.1 (issues 9.1.5 & 9.1.8)

Your participation in these activities is more than welcome!

Thank you!

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