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USN in NGN

ITU-T work on Ubiquitous Sensor Networks (USN)

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Outline

1. What are Ubiquitous Sensor Networks – Definitions
2. The « 4A Vision »
3. What is sensed by USN?
4. Components of USN
5. Detecting, tracking, monitoring – USN applications
6. Standardization activities in USN
7. Relevant ITU-T Recommendations
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USN – Definition

- Ubiquitous Sensor Network (USN):

  *« A conceptual network built over existing physical networks which make use of sensed **data** and provide **knowledge** services to anyone, anywhere and at anytime, and where **information** is generated by using **context awareness**. »*

- Transformation of
  - Sensed data -> knowledge
  - Context awareness -> information

- Definition taken from Draft Recommendation ITU-T Y.2221

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The « 4A Vision »

- “ubiquitous” – Latin *ubique*, meaning “everywhere”
- Sensors everywhere, on every single part of the globe? Not a realistic aim.
- Technology which can be available anywhere, rather than everywhere
  - Anywhere it is useful and economically viable to expect to find a sensor
- Availability is more than geographical measure
  - Anywhere
  - Anytime
  - by Anyone
  - Anything

4A Vision, often used to illustrate trend towards ubiquitous (network) society

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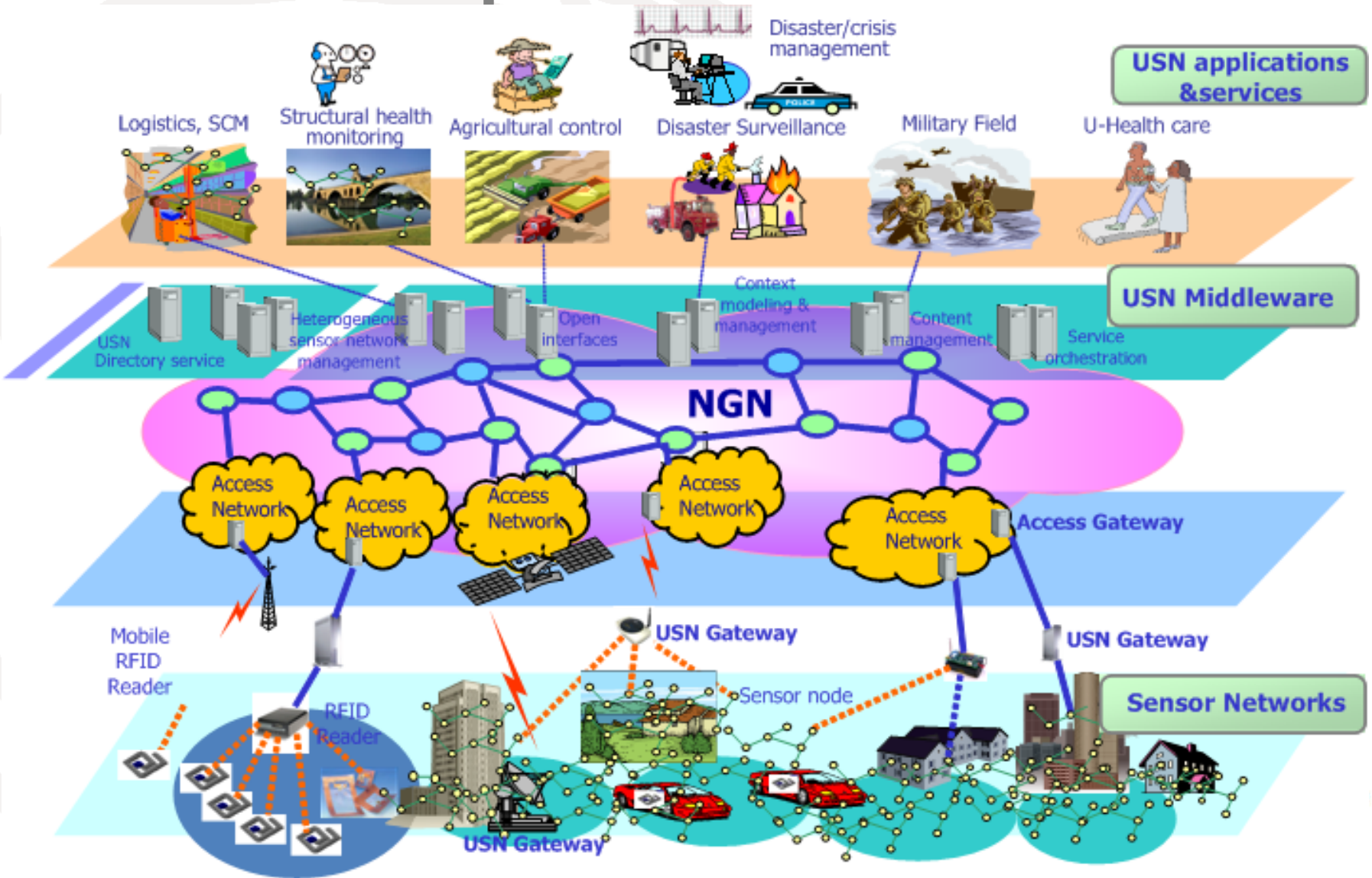
What is sensed by USN?

- Physical conditions: Temperature, pressure, motion, acceleration, vibration, sound, light, etc.
- Chemical compounds: pollutants, toxic substances, etc.
- Location
- ...
- Anything

Components of USN



Components of USN (contd.)

- **Sensor network:** Network of inter-connected sensor nodes exchanging sensed data by wired or wireless processing
  - IP based sensor nodes, possibility of direct connection to NGN
  - non IP based nodes, often managed via gateway
- **USN Gateway:** A node which interconnects sensor networks with other networks
- **Network infrastructure:** Likely to be based on NGN

Components of USN (contd.)

- **USN Middleware:** Tasks include sensor network management and connectivity, event processing, sensor data mining, etc.
- **USN Applications and Services platform:** Technology platform to enable the effective use of a USN in a given application

USN applications

- **Areas of application:** civil engineering, healthcare, home automation, transport and logistics, disaster response, environmental monitoring, agriculture, military, etc.
- **Enabling factors:** connectivity, falling prices for USN components, increasing reliability and decreasing size of sensor nodes, partially independent from electricity networks
- **Highly application-specific:** types of sensors, choice of communication protocols and medium, energy supply

USN applications (contd.)

- **Detection:** of temperatures passing a particular threshold, of intruders, of bushfires, of landmines in former war zones, etc.
- **Tracking:** of items in supply chain management, of vehicles in intelligent transport systems, of cattle/beef in the food chain, etc.
- **Monitoring:** of a patient's blood pressure, of structural health of bridges and buildings, of inhospitable environments, etc.

Standardization activities in USN

- ISO/IEC JTC 1
  - SC 6 on Telecommunications and Information Exchange between Systems
- IEEE
  - Technical Committee on Sensor Technology (IEEE 1451)
  - Working Group for WPAN (wireless personal area network) (IEEE 802.15)
- IETF
  - 6LoWPAN (IPv6 based low-power WPAN)
- ZigBee Alliance
  - Implementation of WPAN communication protocols)

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Standardization activities (contd.)

- ITU-T
  - **SG 13:** Functional requirements and architecture including NGN view points
  - **SG 16:** Multimedia service descriptions and requirements aspects
  - **SG 17:** Security and Object Identifier (OId) aspects
  - **JCA-NID*:** Overall coordination on USN standard activities within ITU-T Study Groups and relevant bodies outside ITU

* Joint Coordination Activity on Network Aspects of Identification Systems (including RFID)

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Relevant ITU-T Recommendations

Study Group	Recommendation	Title	Status
SG 13	Y.2221 (Y.USN-reqts)	Requirements for support of USN applications and services in the NGN environment	Consented on 12 Sep 2009, currently in Last Call Judgement period
SG 16	F.744 (F.USN-mw)	Service description and requirements for USN middleware	Consented on 6 Nov 2009, currently in Last Call period
SG 16	F.USN-cc	Deployment guidance on USN applications and services for mitigating climate change	Expected 2011
SG 17	X.usnsec-1	Security framework for USN	Expected 2011-1Q
SG 17	X.usnsec-2	USN middleware security guidelines	Expected 2010-12
SG 17	X.usnsec-3	Secure routing mechanisms for WSN	Expected 2010-12

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ITU-T Y.2221 – Summary

- General characteristics of USN
- Areas and scenarios of USN applications and services
- Service requirements of USN applications and services (e.g., profile management, QoS support, connectivity, LBS support, mobility support, security, etc.)
- Based on USN service requirements, requirements of NGN (enhanced or additional) necessary to support USN applications and services

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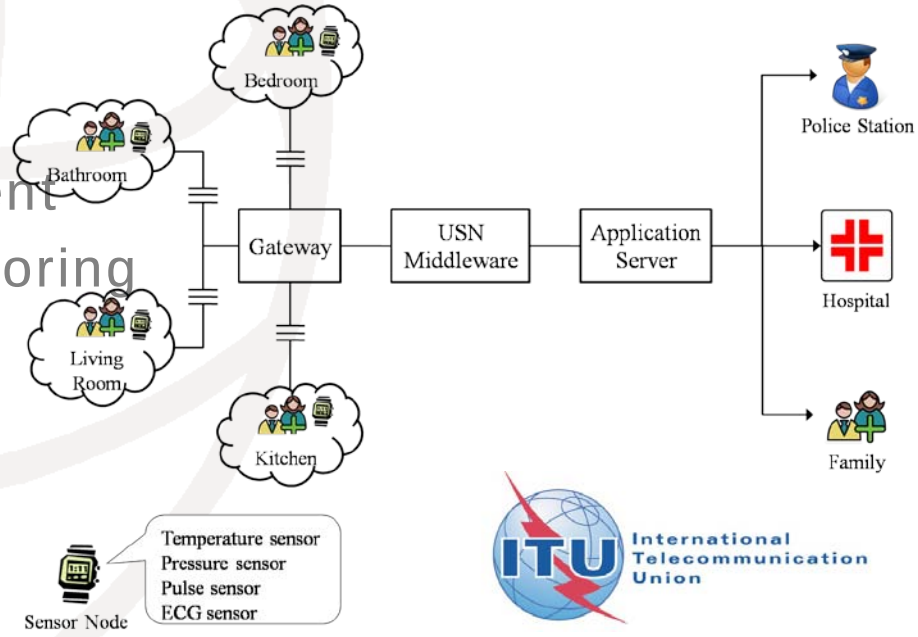
ITU-T F.744 – Summary

- Description of various USN services
- Functional model and requirements for USN middleware
- Use cases of USN services using USN middleware
  - Healthcare
  - Cold chain management
  - Sensor network monitoring



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ITU-T X.usnsec-1 – Summary

- Security threats and requirements in USN, including
  - Sensor node compromise
  - Eavesdropping
  - DoS attacks
  - Aspects of privacy of sensed data
- Security technologies and functions to respond these threats, such as
  - Key management schemes
  - Authenticated broadcast
  - Sensor node authentication

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ITU-T X.usnsec-2 – Summary

- Security threats and functional requirements for USN middleware
- Guidelines for USN middleware security

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ITU-T X.usnsec-3 – Summary

- Review of USN architecture
- Introduction of general USN network topologies and routing protocols
- Description of security threats of Wireless Sensor Networks (WSN) and offers countermeasures for secure routing in WSN

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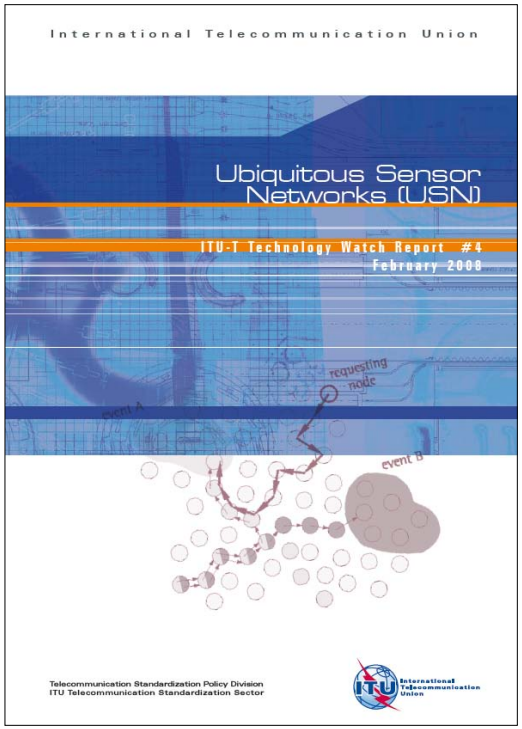
Related work

- ITU-T Technology Watch Reports
  - Ubiquitous Sensor Networks
  - ICT and Climate Change
  - ICT and Food Security
  - Intelligent Transport Systems



- Technical briefing papers on emerging ICT in a language accessible to non-experts
- http://www.itu.int/ITU-T/techwatch

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Thank you!

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