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Working Group on Sensor Networks

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UKNB input to JTC1 WG7

1. Introduction

The UKNB would like to propose some amended definitions which it believes are key to differentiating the work of JTC1 and IEC in this area. In addition the UKNB have provided some input on related definitions for consideration in the development of the various parts of ISO/IEC 29182 Information technology — Sensor Networks — Reference architecture for sensor network applications and services.

UK recognises some of these inputs need to be reflected in an updated scope for the document and plans to contribute to this task. UK also recognises some of these inputs need to be reflected in an updated "Introduction" where additional explanation of the differentiation between open and closed systems and their applications could set the context for the reference architecture described in the standard. There is also a potential need for the revision of the scope of the *ISO/IEC 29182* standard (both the general scope for the series of specifications and the specific scope for each Part) and the UK will contribute to these activities when the contribution below has been reviewed.

There is also a need for further discussion and the agreement of definitions for generic terms such as "Network.".

2. UKNB proposed Term and Definition

2.1 UKNB proposed Term and Definition 1

Term: **Sensed Data**
Definition:
Data sensed by a sensor which is attached to a specific sensor node.
Note:
Sensed data can be represented by 1-D, 2-D, 3-D, or higher dimensional data.

2.2 UKNB proposed Term and Definition 2

Term: **Sensor**
Definition:
Device that responds to a stimulus or condition by developing sensed data representing that stimulus or condition.
Note: The stimulus or condition may be of any type, including biological, chemical and physical.

2.3 UKNB proposed Term and Definition 3

Term: **Actuator**
Definition:
Device that changes the external environment in response to received data

2.4 UKNB proposed Term and Definition 4

Term: **Sensor node**
Definition:
Device consisting of one or more sensor(s) with related processing and data

communications functions for capturing, processing and transferring sensed data; it may include actuators.

2.5 UKNB proposed Term and Definition 5

Term: **Control Node**
Definition:
Device consisting of one or more actuators with sensors, control and communication functions
Note: Control nodes are typically used in applications that are safety related or time critical.

2.6 UKNB proposed Term and Definition 6

Sensor Network
Definition:
A system of spatially distributed sensor nodes interacting with each other and, depending on applications, interacting with other infrastructure in order to acquire, process, transfer, and provide information extracted from the physical world with a primary function of information gathering.
Note: A sensor network may have some control capability.
Note: Distinguishing features of a sensor network is that it can include: wide area coverage, radio networks, flexibility of purpose, self-organising topologies, openness, providing data for multiple applications – This requires further discussion.

2.7 UKNB proposed Term and Definition 7

Term: **Control Network**
Definition:
A system of spatially distributed control nodes interacting with each other and, depending on application, interacting with other infrastructure in a controlled process, to provide the function of control for a process or machine.
Note: Distinguishing features of a control networks is that it is typically a closed systems of predefined operation with emphasis on deterministic performance to ensure reliability and repeatability as required by safety related and time critical control applications.
Note. The distinction between control networks and sensor networks is changing as technology evolves so devices designed for one type of network application may be reused in another – however the integrity of a control network must not be impacted

3. Consolidation of definitions and various sources where related terms are used building on assignments from London meeting

3.1 Actuator

UKNB proposed Term and Definition 3
Term: **Actuator**
Definition:
Device that changes the external environment in response to received data

Term: **Actuator**
Definition:
A device that performs a physical response caused by an input signal

Source: WGSN-008 (ISO/IEC 29182 Information technology — Sensor Networks — Reference architecture for sensor network applications and services)

Also used in:

Standard	Clause	Definition	Database	Note
tbd				

3.2 Sensed Data

UKNB proposed Term and Definition 1
Term: **Sensed Data**
Definition:
Data sensed by a sensor which is attached to a specific sensor node.
Source:
Note
Sensed data can be represented by 1-D, 2-D, 3-D, or higher dimensional data.

Also used in:

Standard	Clause	Definition	Database	Note
ITU-T F.USN-MW	3.2.3	Data sensed by a sensor which is attached to a specific sensor node.		

3.3 Sensor

UKNB proposed Term and Definition 2
Term: **Sensor**
Definition:
Device that responds to a stimulus or condition by developing sensed data representing that stimulus or condition.
Note: The stimulus or condition may be of any type, including biological, chemical and physical.

Term: **Sensor**
Definition:
A device that observes phenomenon/phenomena, measures physical property and quantity of the observation, and converts the measurement into a signal.
Note:
Signal can be electrical, chemical, or other types of sensor responses.
Signal can be represented by 1-D, 2-D, 3-D, or higher dimensional data.
Source: WGSN-008 (ISO/IEC 29182 Information technology — Sensor Networks — Reference architecture for sensor network applications and services)

Also used in:

Standard	Clause	Definition	Database	Note
ITU-T F.USN-MW and ITU-T Y.221	3.1.2	Electronic device that senses a physical condition or chemical compound and delivers an electronic signal proportional to the observed characteristic.		
ISO 1213-1:1993	11.2.1	A detector or transducer normally used for measuring quantities or detecting occurrences.		
ISO 14511:2001	3.2.1	Element of a measuring instrument or measuring chain that is directly affected by the measurand.		
ISO 2806:1994	2.1.5	Unit which is actuated by a physical quantity and which gives a signal representing the value of that physical quantity.		
ISO/TR 12155:1994	3.2	Component which detects objects in the monitoring range.		
ISO/TR 9953:1996	3.1.1	Component which detects objects in the monitoring range.		
ISO 14617-5:2002 ISO 14617-5:2002	3.1 3.5	Primary element of a measuring chain which converts the input variable into a signal suitable for measurement [ISO 5598, IEC 60050-351]		
ISO 10418:2003	3.1.51	Device which automatically detects an operating condition and transmits a signal to initiate/perform a specific control function		
	IEV 351-32-39	Functional unit that senses the effect of a measured variable (quantity) at its input and places a corresponding measurement signal at its output NOTE 1 – The corresponding physical unit is named sensor or detecting device. NOTE 2 – Examples of sensors are a) thermocouple b) foil strain gauge c) pH electrode.		
IEC 60079-29-1, ed. 1.0 (2007-08)	3.3.2	Assembly in which the sensing element is housed and that may also contain associated circuit components		
IEC 61888, ed. 1.0 (2002-08)	3.20	Portion of a channel that responds to changes in a plant variable or condition and converts the measured process variable into a signal, for example, electric or pneumatic		
IEC 61511-1, ed.	3.2.80	Device or combination of devices, which		

1.0 (2003-01)		measure the process condition (for example, transmitters, transducers, process switches, position switches)		
IEC 62642-1, ed. 1.0 (2010-06)	3.1.58	Part of a detector which senses a change in condition		

Other sensor related definitions:
Term: **sensor measuring element**
Definition:
Part of a measuring instrument, or measuring chain, which is directly affected by the measurand and which generates a signal related to the value of the measurand
Source: IEC 60050 IEV number: 311-05-01

Term: sensing element
Definition:
That part of the control which is intended to be exposed to the influences of the activating quantity to which the automatic action of a sensing control responds
Source: 72 IEC 60730-1, ed. 4.0 (2010)

Term: sensing means
Source: 17B IEC 60947-5-3, ed. 1.0 (1999)

Term: sensing range
Source: 17B IEC 60947-5-9, ed. 1.0 (2006)

Term: sensing unit
Definition:
Unit that is activated by any physical phenomenon or combination of those
Source: 23J IEC 61058-1, ed. 3.0 (2000)

Term: sensors and actuators
Definition: measuring or actuating elements connected to the process equipment and to the control system
Source: 65 IEC 62443-1-1, ed. 1.0 (2009)

3.4 Sensor Node

UKNB proposed Term and Definition 4
Term: **Sensor node**
Definition:
Device consisting of one or more sensors with related processing and data communications functions for capturing, processing and transferring sensed data; it may include actuators

Term: **Sensor node**
Definition:
A **sensor node**, also known as a 'mote' (chiefly in North America), is a node in a wireless sensor network that is capable of performing some processing, gathering sensory information and communicating with other connected nodes in the network. The typical architecture of the sensor node is shown in the figure to the right. The main components of a sensor node as seen from the figure are microcontroller, transceiver, external memory, power source and one or more sensors. (Wikipedia)

Also used in:

Standard	Clause	Definition	Database	Note

ISO/IEC 14772-1:1997	3.91	A node that enables the user to interact with the world in the scene graph hierarchy. Sensor nodes respond to user interaction with geometric objects in the world, the movement of the user through the world, or the passage of time. See 4.6.7, Sensor nodes, for details.		
ITU-T F.USN-MW and ITU-T Y.221	3.1.4	A device consisting of sensor(s) and optional actuator(s) with capabilities of sensed data processing and networking.		

Related Term: **Sensor node interface**
Definition:

Also used in:

Standard	Clause	Definition	Database	Note
ISO/IEC 9506-5:1999	3.1.6	interface function to sensors and actuators converts - the input signals and/or data obtained from the machine/process to appropriate signal levels for processing; - the output signals and/or data from the signal processing function to appropriate signal levels to drive actuators and/or displays		Definition of interface function to sensors and actuators

3.5 Sensor Network and related terms

UKNB proposed Term and Definition 6

Sensor Network

Definition:

A system of spatially distributed sensor nodes interacting with each other and, depending on applications, interacting with other infrastructure in order to acquire, process, transfer, and provide information extracted from the physical world with a primary function of information gathering.

Note: A sensor network may have some control capability.

Term: Sensor network
Definition:
A system of spatially distributed sensor nodes interacting with each other and, depending on applications, interacting with other infrastructure in order to acquire, process, transfer, and provide information extracted from the physical world.
Source: WGSN-008 (ISO/IEC 29182 Information technology — Sensor Networks — Reference architecture for sensor network applications and services)
Also used in:

Standard	Clause	Definition	Database	Note
ITU-T F.USN-MW and ITU-T Y.221	3.1.3	A network comprised of inter-connected sensor nodes exchanging sensed data by wired or wireless communication		

Also Termed **Ubiquitous Sensor Network**

Standard	Clause	Definition	Database	Note
ITU-T F.USN-MW and ITU-T Y.221	3.1.5	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 the information is generated by using context awareness.		

Term: **Sensor network application**
Definition:
The sensor network application is a use case of sensor networks supporting a set of sensor network services for users.
Note: The services are, for example, home utility monitoring and control, industrial automation, infrastructure and environment monitoring, weather and disaster condition monitoring and emergency alert.
Note: Sensor network application implies the utilization of software and hardware that can be performed in a fully or partially automatic way and can be accessed locally or remotely.
Source: WGSN-007 (Technical Document on Sensor Networks Version 3)
Source: WGSN-008 (ISO/IEC 29182 Information technology — Sensor Networks — Reference architecture for sensor network applications and services)

Also used in:

Standard	Clause	Definition	Database	Note

Term: **sensor network device**
Definition:
The sensor network device is sensor node or sensor network gateway.
Source: WGSN-008 (ISO/IEC 29182 Information technology — Sensor Networks — Reference architecture for sensor network applications and services

Also used in:

Standard	Clause	Definition	Database	Note

Term: **sensor network gateway**
Definition:
The sensor network gateway represents the bridge between the sensor network itself and the backend system.
Source: WGSN-008 (ISO/IEC 29182 Information technology — Sensor Networks — Reference architecture for sensor network applications and services

Term: **Sensor network metadata**
Definition:
Information about sensor network such as description of a sensor network, sensor node identifier, supported sensor type, the number of attached sensors for each sensor node, and the number of sensor nodes connected to the specific sensor network, etc.
Source: ITU-T F.USN-MW (3.2.5)

Also used in:

Standard	Clause	Definition	Database	Note

Term: **Sensor network metadata directory service**
Definition:

A directory service which provides sensor network metadata.
Source: ITU-T F.USN-MW (3.2.6)

Also used in:

Standard	Clause	Definition	Database	Note

Term: **Sensor network service**
Definition:
The sensor network service is the functions offered by the sensor nodes or sensor networks.
Source: WGSN-007 (Technical Document on Sensor Networks Version 3)

Definition:
A structure set of capabilities offered by the sensor nodes or sensor networks to support sensor network applications.
Source: WGSN-008 (ISO/IEC 29182 Information technology — Sensor Networks — Reference architecture for sensor network applications and services)

Related term: network services

Standard	Clause	Definition	Database	Note
IEC 61907 ed 1.0 (2009)		provision of network service functions and communication services to the network users NOTE 1 Communication services are the network services subscribed by the end-users. NOTE 2 A bearer service is a communication service function that allows transmission of user-information signals between user-network interfaces.		

Related term: Sensor network service management
Definition:
Sensor network service situation management and execution control process, supporting flexible execution between multi-services/multi-contents in the multi-domain environment.
Source: WGSN-008 (ISO/IEC 29182 Information technology — Sensor Networks — Reference architecture for sensor network applications and services)

Also used in:

Standard	Clause	Definition	Database	Note
ITU-T Recommendation F.USN-MW		A directory service which provides sensor network metadata.		**Related Term: Sensor network metadata directory service**

Many related terms e.g.
From IEC
Network Management 9 IEC 61375-1, ed. 2.0 (2007) operations necessary to remotely configure, monitor, diagnose and maintain the network.

Network Management 57 IEC 62351-2, ed. 1.0 (2008) Process of planning, designing, implementing, operating, monitoring and maintaining a network.

Network management 65 CIEC 61158-3-13, ed. 1.0 (2007) management functions and services that perform network initialization, configuration and error handling

Network management JTC 1/SC 25 ISO/IEC 14543-3-4, ed. 1.0 (2007) device-independent management procedures on the network as for example reading/writing the individual address and scanning the network. For these procedures no knowledge of the single devices is required

Network management system, NMS 100 IEC 60728-10, ed. 2.0 (2005) software based system for controlling and supervising cable networks

Network manager 65 CIEC 62591, ed. 1.0 (2010) entity that is responsible for configuration of the network, scheduling communication between network devices, management of the routing tables and monitoring and reporting the health of the network

Network Manager 65 CIEC/PAS 62601, ed. 1.0 (2009) responsible for configuration of the network, scheduling communication between routing devices, management of the routing tables and monitoring and reporting the health of the network. There must be one and only one network manager per WIA-PA network

From JTC 1 SC6
tbd

From ITU
tbd

3.5 Other terms to be considered for adoption in ISO/IEC 29182 specifications

3.5.1 from ITU-T H.snmf

3.5.1.1 Sensor network management protocol agent: A sensor network management protocol entity containing one or more command responder and/or notification originator applications (along with their associated sensor network management protocol engine)

3.5.1.2 Sensor network management protocol manager: A sensor network management protocol entity containing one or more command generator and/or notification

3.5.2 From Wikipedia (and other sources?)

Term: **Wireless sensor network**
Definition:
A **wireless sensor network** (WSN) consists of spatially distributed autonomous sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants (Wikipedia)