

ITU Arab Workshop on Emerging Technologies
Algiers – Algeria, 14-15 Feb. 2018

ITU-T SG20 IoT data and information related standardization activities



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Agenda

- SG20 in a nutshell
- Main SG20's data-related IoT Recommendations
 - IoT Semantics requirements (Approved)
 - IoT Big Data Requirements (Approved)
 - Things Description Requirements (Ongoing)
 - Business Process Requirements (NWI)
- Some interesting documents from FG-DPM
- What about ML & AI ?

SG20 IN A NUTSHELL

ITU

SG20 structure and mandate

“IoT and Smart Cities & Communities”

Responsible for studies relating to IoT and its applications, and smart cities and communities (SC&C).

It includes studies relating to Big data aspects of IoT and SC&C, e-services and smart services for SC&C



Res 98 Enhancing the standardization of Internet of things and Smart Cities and Communities for global development

Lead study group on

Internet of things (IoT) and its applications

Smart Cities and Communities (SC&C), including its e-services and smart services

IoT identification



Last SG20 meeting: 4-15 September 2017
Last RGM & WP1/20 meeting: 15-24 Jan 2018
Next SG20 meeting : 6-16 May 2018, Cairo

2 Working Parties

7 Questions

4 Regional Groups

Over **100** International experts



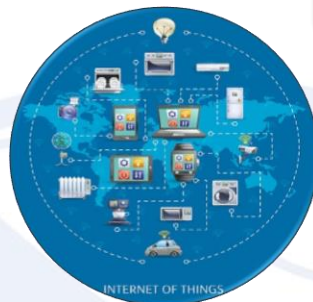
MAIN SG20'S DATA-RELATED IOT RECOMMENDATIONS

SG20 outcomes

Main results (Oct. 15 – Jan. 18)

17 New Recommendations approved

- ITU-T Y.4101 "Common requirements and capabilities of a gateway for Internet of Things applications"
- ITU-T Y.4116 "Requirements of transportation safety service including use cases and service scenarios"
- ITU-T Y.4117 "Requirements and capabilities of Internet of Things for support of wearable devices and related services"
- ITU-T Y.4455 "Reference architecture for IoT network service capability exposure"
- ITU-T Y.4805 "Identifier service requirements for the interoperability of Smart City applications"
- ITU-T Y.4806 "Security capabilities supporting safety of the Internet of Things"
- ITU-T Y.4113 "Requirements of the network for the Internet of Things"
- ITU-T Y.4451 "Framework of constrained device networking in the IoT environments"
- ITU-T Y.4452 "Functional framework of Web of Objects"
- ITU-T Y.4453 "Adaptive software framework for IoT devices"
- ITU-T Y.4553 "Requirements of smartphone as sink node for IoT applications and services"
- ITU-T Y.4702 "Common requirements and capabilities"
- **ITU-T Y.4114 "Specific requirements and capabilities of the IoT for Big Data"**
- ITU-T Y.4115 "Reference architecture for IoT device capability exposure"
- ITU-T Y.4500.1 "oneM2M- Functional Architecture"
- ITU-T Y.4200 "Requirements for interoperability of smart city platforms"
- ITU-T Y.4201 "High-level requirements and reference framework of smart city platform"



10 New Supplements agreed

- ITU-T Y.Supp.45 to ITU-T Y.4000 series "An overview of smart cities and communities and the role of information and communication technologies"
- ITU-T Y.Supp.42 to ITU-T Y.4100 series "Use cases of User-Centric work Space (UCS) Service"
- ITU-T Y.Supp.34 to ITU-T Y.4000 series "Smart Sustainable Cities - Setting the stage for stakeholders' engagement"
- ITU-T Y.Supp.33 to ITU-T Y.4000 series "Smart Sustainable Cities - Master plan"
- ITU-T Y.Supp.32 to ITU-T Y.4000 series "Smart sustainable cities - a guide for city leaders"
- ITU-T Y.Supp.31 to ITU-T Y.4550 series "Smart Sustainable Cities - Intelligent sustainable buildings"
- ITU-T Y.Supp.28 to ITU-T Y.4550 series "Integrated management for smart sustainable cities";
- ITU-T Y.Supp.29 to ITU-T Y.4250 series "Multi-service infrastructure for smart sustainable cities in new-development areas";
- ITU-T Y.Supp.30 to ITU-T Y.4250 series "Overview of smart sustainable cities infrastructure";
- ITU-T Y.Supp.27 to ITU-T Y.4400 series "Setting the framework for an ICT architecture of a smart sustainable city".

2 Draft new Recommendations determined

- ITU-T Y.4454 "Platform Interoperability for Smart Cities"
- ITU-T Y.4500.2 (ex.Y.oneM2M.REQ) "oneM2M-Requirements"

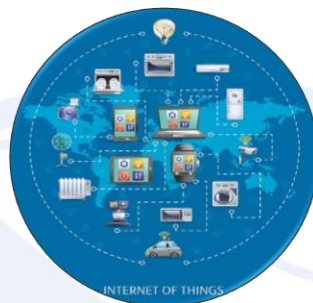


SG20 outcomes

Main results (Oct. 15 – Jan. 18)

15 oneM2M Specifications translated into new Recommendations

- Y.4500.1 (ex Y.oneM2M.ARC) "oneM2M- Functional Architecture"
- Y.4500.4 (ex Y.oneM2M.SLCP) "oneM2M Service Layer Core Protocol Specification"
- Y.4500.6 (ex Y.oneM2M.DM.BBF) "oneM2M Management enablement (BBF)"
- Y.4500.15 (ex Y.oneM2M.TF) "oneM2M- Testing framework"
- Y.4500.10 (ex Y.oneM2M.PB.MQTT) "oneM2M- MQTT Protocol Binding"
- Y.4500.14 (ex Y.oneM2M.IWK.LwM2M) "oneM2M- LwM2M Interworking"
- Y.4500.13 (ex Y.oneM2M.InteropTest) "oneM2M- Interoperability Testing"
- Y.4500.22 (ex Y.oneM2M.FDC) "oneM2M- Field Device Configuration"
- Y.4500.5 (ex Y.oneM2M.DM.OMA) "oneM2M- Management enablement (OMA)"
- Y.4500.11 (ex Y.oneM2M.CT) "oneM2M- Common Terminology"
- Y.4500.9 (ex Y.oneM2M.PB.HTTP) "oneM2M- HTTP Protocol Binding"
- Y.4500.8 (ex Y.oneM2M.PB.CoAP) "oneM2M- CoAP Protocol Binding"
- Y.4500.23 (ex Y.oneM2M.HAIM) "oneM2M-Home Appliances Information Model and Mapping"
- Y.4500.12 (ex Y.oneM2M.BO) "oneM2M Base Ontology"
- Y.4500.20 (ex Y.oneM2M.PB.WebSocket) "oneM2M- WebSocket Protocol Binding"



6 oneM2M Specifications translated into new Technical Papers

- Y.oneM2M.Ind.DE "oneM2M Industrial Domain Enablement"
- Y.oneM2M.UCC "oneM2M Use Case Collection"
- Y.oneM2M.DG.AppDev "oneM2M- Application developer guide: Light control example using HTTP binding"
- Y.oneM2M.DG.CoAP "oneM2M Developer Guide of CoAP binding and long polling for temperature monitoring"
- Y.oneM2M.DG.DM "oneM2M- Developer guide of device management"
- Y.oneM2M.DG.SEM "oneM2M-Developer Guide of Implementing semantics"

SG13 transferred Recommendations

- Y.4111/Y2076 (ex Y.IoT-semantic-reqt) "Semantics based requirements and framework of the IoT"

SG20 Ongoing Work Items

- Y.IoT-things-description-reqts "Requirements of things description in the Internet of Things" (in progress)
- Y.IoT-BPM-reqts-caps "Specific Requirements and Capabilities of the Internet of Things for Business Process Management" (NWI)



Q2/20 data & information related work items

- **Published Recommendations**

- [Approved Y.4111](#) “Semantics based requirements and framework of the Internet of things”
- [Approved Y.4114](#) “Specific requirements and capabilities of the IoT for Big Data”

- **Ongoing work items**

- [Y.IoT-things-description-reqts](#) “Requirements of things description in the Internet of Things”
- [Y.IoT-BPM-reqts-caps](#) “Specific Requirements and Capabilities of the Internet of Things for Business Process Management” (NWI)
- Further activities TBD

IOT SEMANTICS REQUIREMENTS



IoT Semantics requirements

Few details on [approved Y.4111](#) "Semantics based requirements and framework of the Internet of things"

Structure of the document:

- introduction to semantic technologies for the IoT;
- semantics based use cases for IoT actors;
- semantics based requirements of the IoT;
- semantics based capability framework of the IoT.
- Appendix I : IoT semantics applications scenarios

Essential requirements of the IoT infrastructure for data and services:

- interoperability, scalability, discovery, consistency, reusability and composability, analytics and reasoning for actionable intelligence, automatic operations

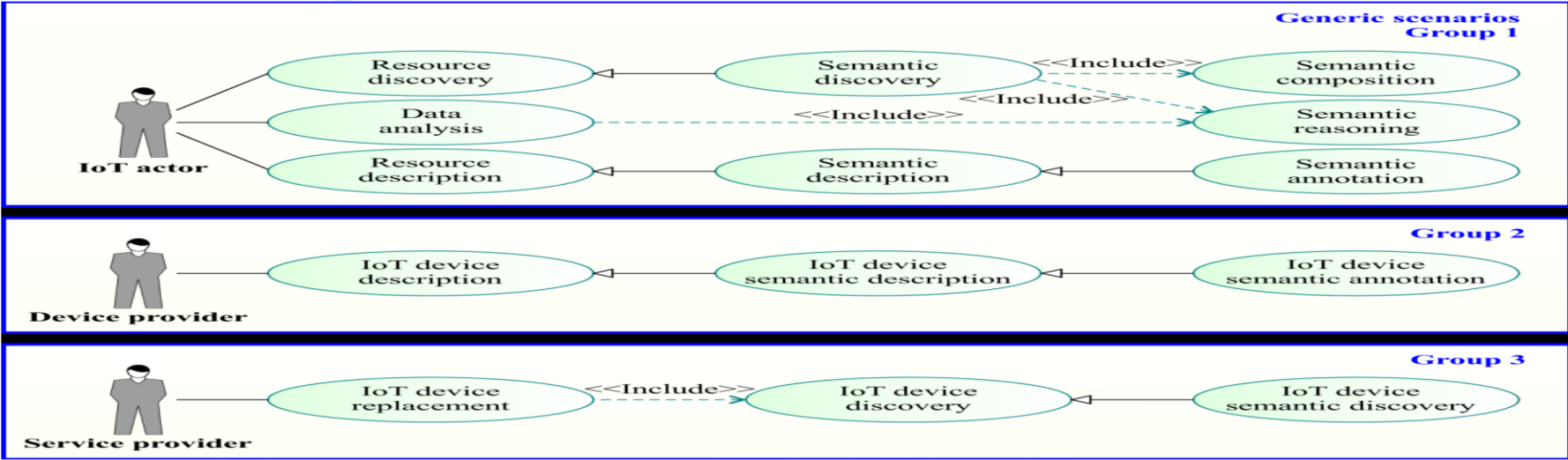
Some factors driving these requirements: number of interconnected things, variety of devices, types of collected data, number and types of services

The semantics based approaches reveal outstanding features to support these requirements, increasing the level of interoperability of IoT systems

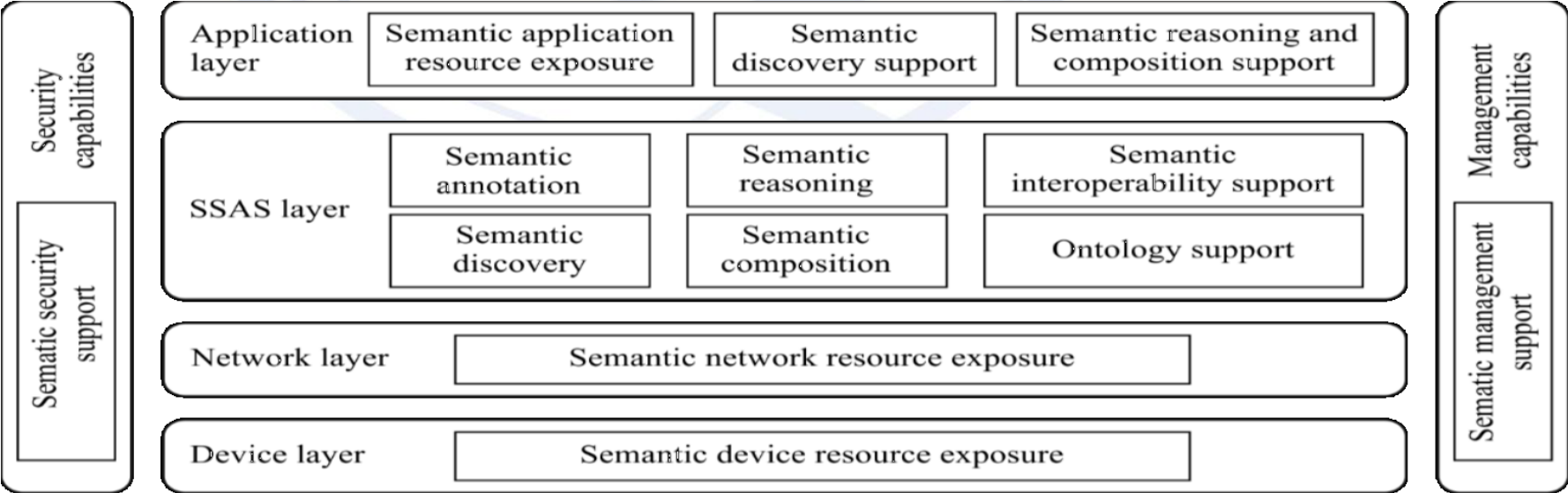
IoT Semantics requirements

Few details on [approved Y.4111](#) "Semantics based requirements and framework of the Internet of things"

Semantics based scenarios of the IoT (examples)



Global view of the IoT semantics based capability framework



IOT BIG DATA REQUIREMENTS



IoT Big Data Requirements

Few details on [approved Y.4114](#) “Specific requirements and capabilities of the IoT for Big Data”

Structure of the document:

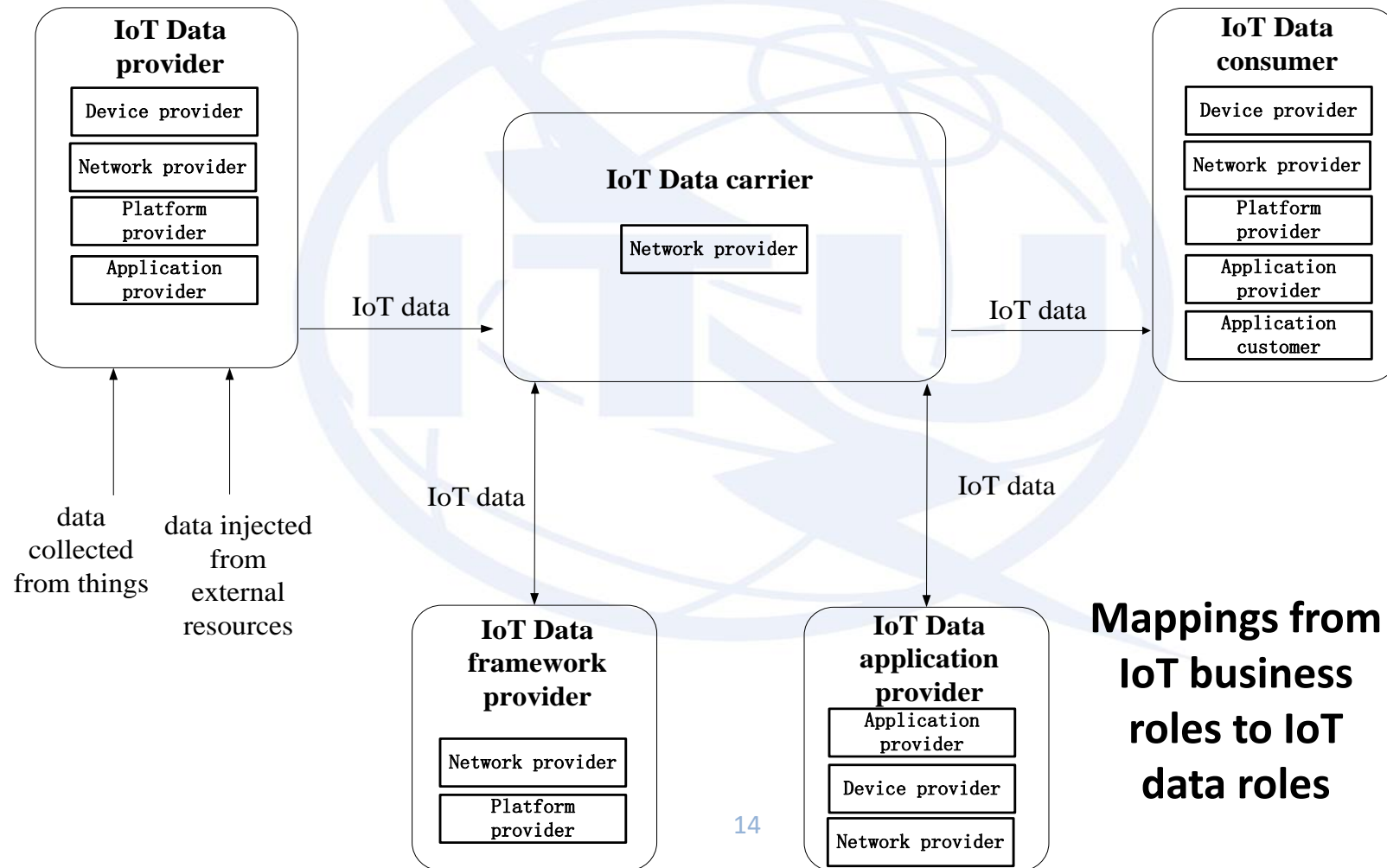
- Overview of Big Data in the IoT
- Requirements of the IoT for Big Data
- Capabilities of the IoT for Big Data

It complements the developments on common requirements and functional framework of the IoT [ITU-T Y.4100] (common reqts) [ITU-T Y.4401](fct fx) in terms of the specific requirements and capabilities that the IoT is expected to support in order to address the challenges related to Big Data

A basis for further standardization work (e.g. functional entities, APIs and protocols) concerning Big Data in the IoT

IoT Big Data Requirements

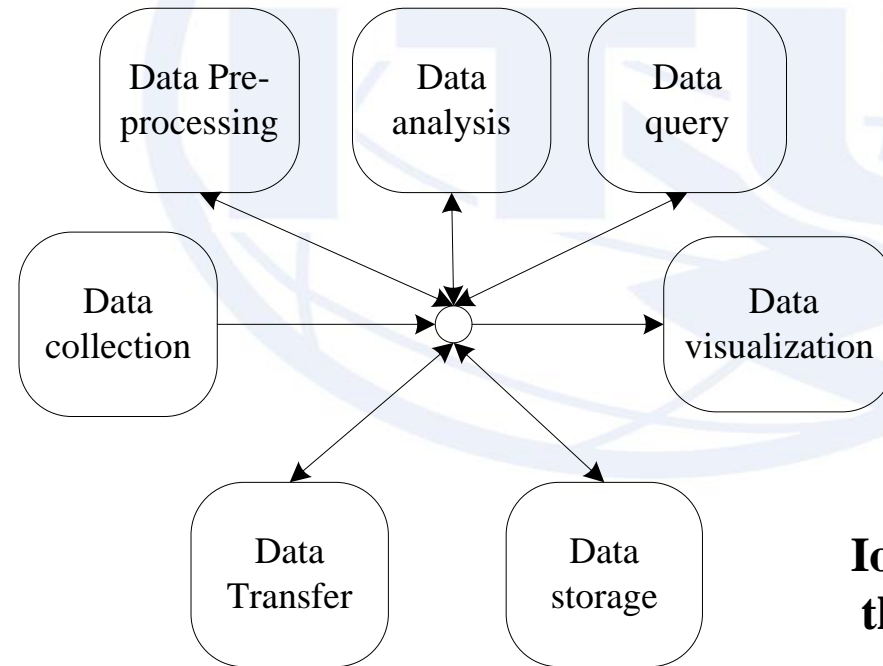
Few details on [approved Y.4114](#) “Specific requirements and capabilities of the IoT for Big Data”



IoT Big Data Requirements

Few details on [approved Y.4114](#) “Specific requirements and capabilities of the IoT for Big Data”

Abstract representation of the various IoT data operations and related data flows (considering that the diverse set of concrete IoT deployments do not imply a unique logical sequencing of the various IoT data operations)



IoT data operations mapped in the document on layers of IoT Reference Model

IoT Big Data Requirements

Few details on [approved Y.4114](#) “Specific requirements and capabilities of the IoT for Big Data”

IoT data operations\IoT components	Device	Gateway	Network	IoT Platform	IoT Application Server
Data Collection	√	√		√	√
Data Pre-processing	√	√		√	√
Data Storage	√	√		√	√
Data Analysis	√			√	√
Data Transfer	√	√	√	√	√
Data Query		√		√	√
Data visualization/application	√				√

Key IoT data operations performed by the different IoT components

Capabilities of the IoT for Big Data :

- Big Data collection
- Big Data pre-processing
- Big Data storage
- Big Data transfer
- Big Data time synchronization
- Big Data analysis
- Big Data query
- Big Data visualization
- Big Data security and privacy protection

THINGS DESCRIPTION REQUIREMENTS



Things Description Requirements

Few details on ongoing draft Rec. [Y.IoT-things-description-reqts](#) “Requirements of things description in the Internet of Things”

Rationale for the study item: *many types of things can be integrated together in an IoT system. Because of the heterogeneity of these different things, their description is provided from different angles via different information models. So, normally, things descriptions are domain-dependent. The identification of common requirements for things description in the IoT aims to enable the usage of a diversity of (existing and under development) metadata and ontologies.*

Work plan of the study item: *based on ITU-T Y.4000 (IoT overview), considering related requirements of IoT, as well as related work of SDOs, incl. oneM2M and W3C, requirements of things description from a global view point are investigated. The requirements focus on the aspects which can help bridging the things description efforts between ITU-T and other SDOs. The requirements are expected to be collected from a variety of stakeholders (from vendors to providers and administrations) of the international community.*

Current structure of the document:

- *Introduction of things description in IoT (overview, relationships, description types)*
- *Requirements of things description in IoT (high level requirements, information elements)*

Things Description Requirements

Few details on ongoing draft Rec. [Y.IoT-things-description-reqts](#) “Requirements of things description in the Internet of Things”

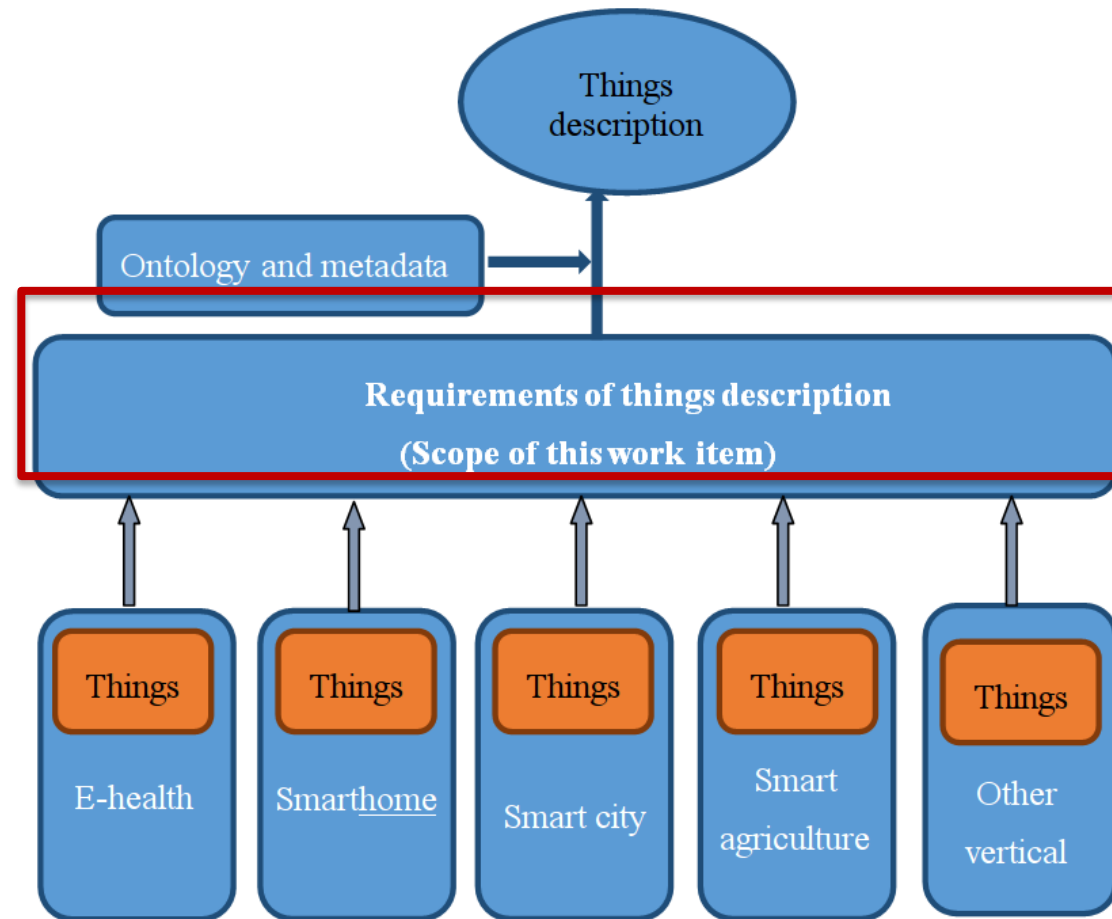


Figure X.1 – The role of the requirements of things description

Things Description Requirements

Few details on ongoing draft Rec. [Y.IoT-things-description-reqts](#) “Requirements of things description in the Internet of Things”

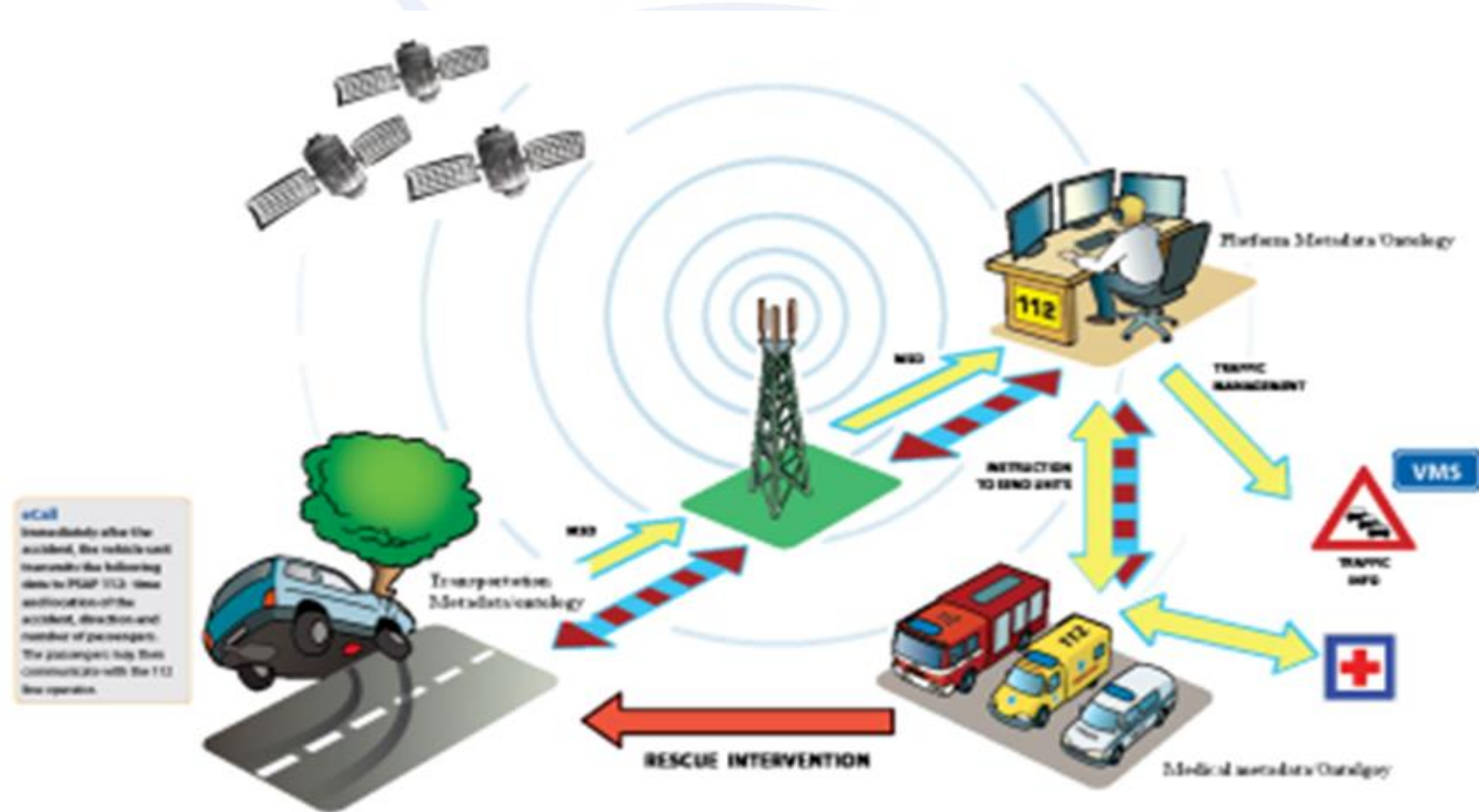


Figure X.2 – An example of application scenarios (E-call) which can benefit from this work item (e.g., data interoperability between hospital data, satellite data, car data, ambulance data)

Things Description Requirements

Few details on ongoing draft Rec. [Y.IoT-things-description-reqts](#) “Requirements of things description in the Internet of Things”

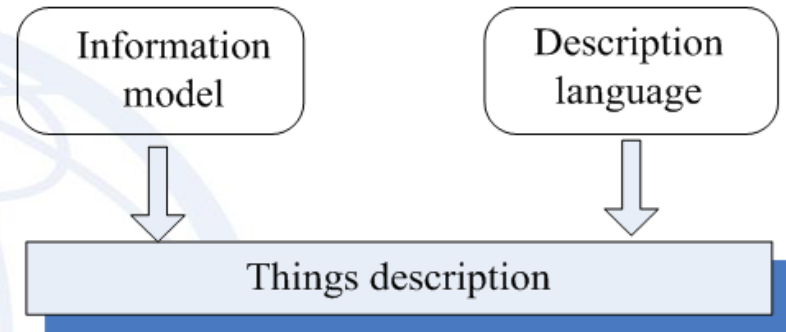
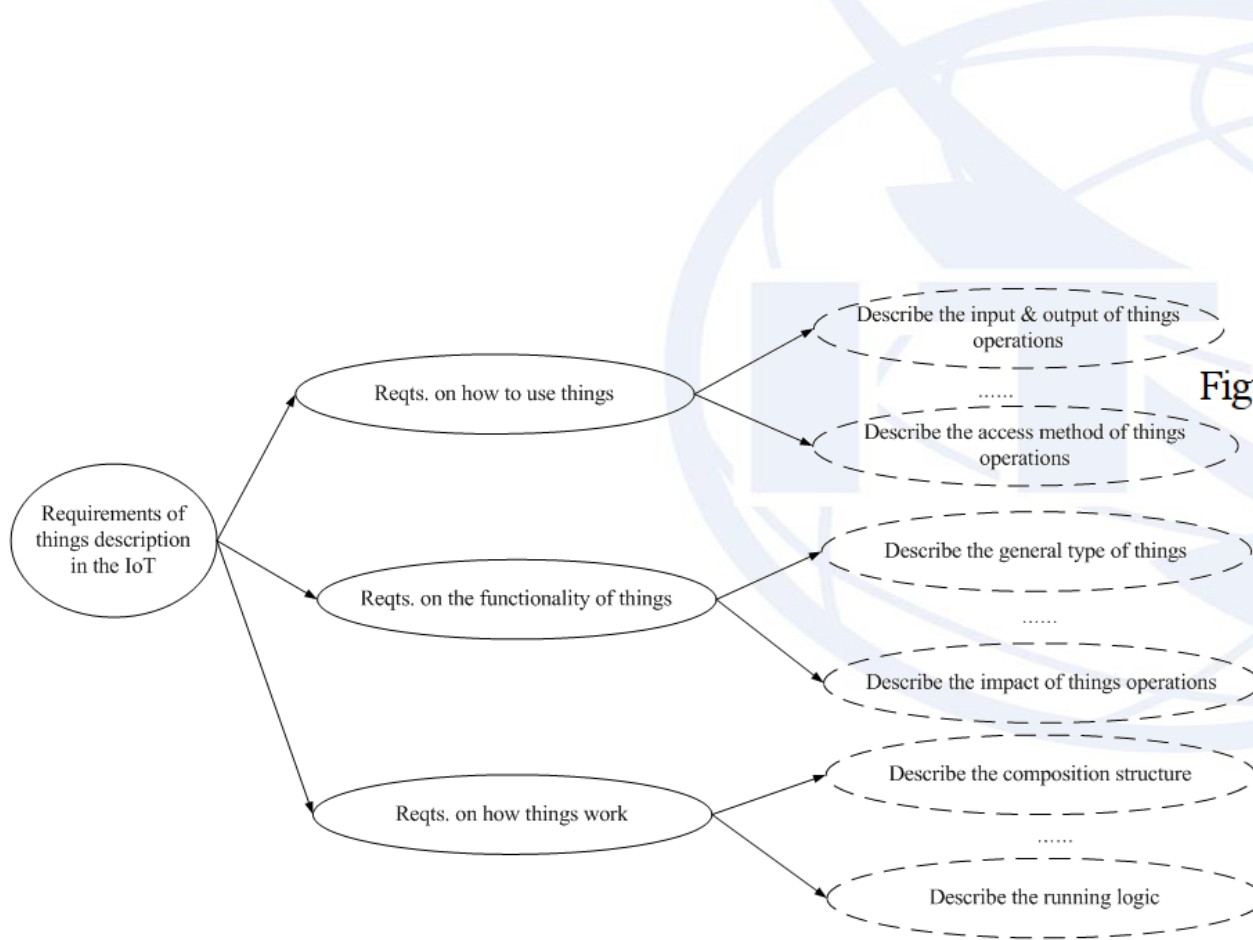


Figure 6 Relationships among things description and information models

BPM REQUIREMENTS

ITU

Business Process Requirements

Few details on ongoing draft Rec. [Y.IoT-BPM-reqts-caps](#) “Specific Requirements and Capabilities of the Internet of Things for Business Process Management”

Rationale for the study item: *Currently some BPM applications make use of IoT to access, real time sensed data coming from physical world instead of DBs, to automatically and physically enact business processes, via actuators, to reduce latency of decision making. IoT can be enhanced to support more efficiently BPM applications, and to leverage advanced and complex BPM scenarios.*

Work plan of the study item: *identifies specific requirements and capabilities of the IoT for supporting BPM, and builds on common requirements of the IoT [ITU-T Y.4100] and on functional framework and capabilities of the IoT [ITU-T Y.4401], in terms of the specific reqts & caps that the IoT is expected to provide to support more efficiently BPM applications, and to leverage advanced and complex BPM scenarios*

NOTE – In the other way, BPM can also be beneficial for IoT applications, but this is not considered in the scope of this recommendation.

Current structure of the document:

- *Overview of BPM in the context of IoT*
- *Requirements of the IoT for BPM*
- *Capabilities of the IoT for BPM*



SOME INTERESTING DOCUMENTS FROM FG-DPM



Focus Group on Data Processing and Management to support IoT and Smart Cities & Communities (FG-DPM)



5 Working Groups

WG1 - Use Cases, Requirements and Applications/ Services

WG2 - DPM Framework, Architectures and Core Components

WG3 - Data sharing, Interoperability and Blockchain

WG4 - Security, Privacy and Trust including Governance

WG5 - Data Economy, commercialization and monetization

First meeting: Geneva, 17-19 Jul. 2017

Second meeting: Geneva, Oct. 2017

Third meeting : Brussels, 20-23 Feb. 2018

[1st ITU Workshop on Data Processing and Management for IoT and Smart Cities & Communities \(Brussels, Belgium, 19 Feb. 2018\)](#)

Key priorities:

To propose mechanisms , frameworks and guidelines for supporting the security, privacy and interoperability of datasets and data-management systems within the IoT and smart city domain.



FG-DPM: Some interesting documents !

- D1.1 UCs Analysis and General Reqts for DPM
 - Apx.II.1. UCs in the Healthcare : EMR, healthcare processes, ...
 - Apx.II.2. UCs SynchroniCity : DMP example architectures
 - Apx.II.3. Digital Interface to urban processes for registered legal entities (SC&C as big cyber-physical system) : actors, urban processes...
- D2.1 DPM Fx for Data-driven IoT/SC&C
 - Draft Technical Report on “DPM Fx for Data-driven IoT/SC&C” : key concepts, value chain, ref archs...
- D2.3 Data Modeling and Formats Specification for DPM
 - Draft Technical Report on “Data format in IoT and smart city”
 - Draft Technical Report on “Web based Microdata formats for IoT and Smart city”
 - Draft Technical Report on “Metadata format in IoT and smart city”
- D3.2 Technical Enablers for Open Data Platform
 - Draft technical specifications on “SensorThings API – Sensing, cross-domain IoT data model and RESTful API”
 - Draft Technical Report on “Framework to support data interoperability in IoT environments”
- NIST Big Data Interoperability Framework (NBDIF), EURO CITIES (Data WG), oneM2M relationship to DPM, Proposed TR on DPM S/M Smart Cities (U4SSC WG1 : setting fx), Context info mgnt (ETSI), Proposed TR on Fx of overall design of opendata (SESIAD, Spain), etc²⁶

WHAT ABOUT ML & AI ?

ITU

Machine Learning & Artificial Intelligence

- Focus Group on Machine Learning for Future Networks including 5G (set by SG13 at its Nov 2017 meeting) :
 - 1st meeting: 29 January - 1 February 2018 (Geneva) & [Workshop](#) on Machine Learning for 5G and beyond, 29 January 2018.
 - 2nd meeting: 24, 26 - 27 April 2018 (Xi'an, China) & Workshop on Impact of AI on ICT Infrastructures, 25 April 2018.
- [FG-ML5G](#) structure :
 - WG1 "Use cases, services and requirements"
 - WG2 "Data formats & ML technologies"
 - WG3 "ML-aware network architecture"
- Why not a FG-DPM/WG on ML&AI ?
- Or why not a [Focus Group on ML&AI for IoT/SC&C](#) ?



THANK YOU



<http://itu.int/go/tsg20>

Ali ABBASSENE (Arab ET Workshop Algiers, 14-15 Feb. 18)

