1st ITU Workshop on Data Processing and Management
for IoT and Smart Cities & Communities
(Brussels, Belgium, 19 February 2018)

Use cases for DPM and the related activity in ITU-T FG-DPM

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Champion of ITU-T FG-DPM activity on

Use Case Analysis and General Requirements for DPM (D1.1)

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FG-DPM WG1 "Use Cases, Requirements and Applications/Services": status of targeted deliverables

- D1.1 - Use Cases Analysis and General Requirements for DPM
  - initial version as output of Oct 2017 FG-DPM meeting [three use cases sets collected, first draft of use case template (building on ITU-T SG20, NIST and ISO/IEC JTC1 WG9 use case template experiences)]
  - progressed in various e-meetings focusing on finalization of the "Unified DPM Use Case template"
  - unified template has been disseminated (early Feb) for recommended usage by DPM use case contributors to Brussels FG-DPM meeting (and beyond)
- D1.2 - IoT and SC&C Applications and Services using DPM
  - to be initiated asap (current discussion on its precise scope versus "development of guidelines for applications based on the work done in D1.1")

Deliverable of general applicability [not WG1 specific] but highly related to D1.1 : D0.1 - DPM Terms and Definitions, Taxonomies

- its content progressed till now in the D1.1 activity context
- formally, still to be initiated (IMHO: pragmatic decisions are needed about the precise spectrum of this work)

D1.1 “Use Cases Analysis and General Requirements for DPM”: entry point for the whole FG-DPM work

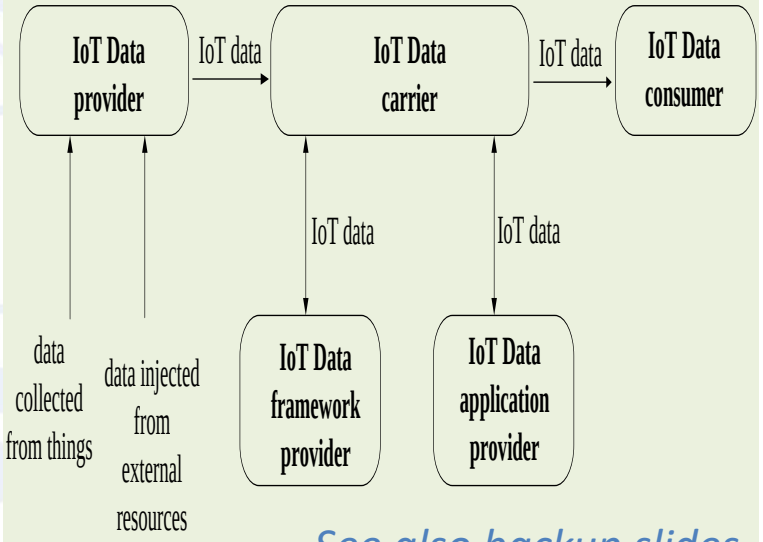
- Objectives
  - To support identification of ecosystem actors and business roles, data characteristics, capabilities, requirements and other aspects, from Data Processing and Management perspective, which are specific to a particular use case - **Use cases classification**
  - **To facilitate comparison among different use cases** (across single or **multiple domains**) -> enabling common data processing and management features to be identified and/or adopted, and facilitating single/cross-domain applications’ implementation
  - **To allow new services to be created** at little extra cost (see slide on template’s further discussion and enhancements)
  - **To feed with its findings other FG-DPM deliverables** (DPM framework, area-specific frameworks, others) – see slide with links to other deliverables

- Current main clauses of deliverable D1.1
  - **Unified DPM Use Case template**
  - **DPM use cases** (described according to the template)
  - **General requirements** (common versus use case specific requirements)

Technical areas of the Unified DPM Use Case template: objective, background, scenario and ecosystem

Use case title	Name	
	Domain – Cross domain	
	Version	
	Source	
Objective		
Background	Current practice	
	Rational for the use case	
Ecosystem NOTE – To consider – if and as useful – the distinction between "business roles" and "actors" (an actor can play one or more business roles)	○ **Stakeholder roles and responsibilities** ○ **Stakeholder relationships**	
Scenario	○ Contextual illustration ○ Pre-requisites ○ Pre-conditions (if any) ○ Triggers ○ Typical operational procedure ○ Process flow diagram ○ Post-conditions ○ Information exchange ○ Considerations on publicity of results (if any)	
Detailed scenarios **(with respect to above basic scenario, presenting typical work patterns for different stakeholder roles)**	(same structure than "Scenario")	

Y.4114 "IoT data roles" [intended as the key roles relevant in an IoT deployment from a data operation perspective]



See also backup slides

Guidelines for filling up the template

- *each grey box is a use case entry*
- *each area and bullet are something the use case contributor may want to consider when describing the use case*

Technical areas of the Unified DPM Use Case template: data characteristics, quality and formats

Data characteristics, quality and formats	**Data input characteristics** ○ Data granularity ○ Characteristics of meta data **Data output characteristics** ○ Data accessibility ○ Data availability ○ Data traceability **Data quality considerations** ○ Data authenticity ○ Data reliability ○ Data integrity ○ Data usability **Data format, incl. standard, structured**	

Technical areas of the Unified DPM Use Case template: DPM capabilities

DPM capabilities considerations NOTE – The description should focus on considerations about the DPM capabilities, not on the solutions adopted in the use case for the implementation of the DPM capabilities	**Data processing capabilities** ○ Aggregation and grouping ○ Cleaning and filtering ○ Classification and indexing ○ De-identification, anonymization and pseudonymization ○ Transfer ○ Pre-processing and processing ○ Analysis and analytics ○ Reading and query ○ Visualization **Data management capabilities** ○ Access and use ○ Administration ○ Acquisition and collection ○ Creation ○ Preservation incl. protection ○ Sharing ○ Storage ○ Update **Considerations on system capabilities** ○ Functions and operations ○ Service Level Agreements (SLAs) ○ Performance (incl. 5Vs of Big Data) ○ Data models and modelling ○ Data backup, archiving and recovery ○ Event management ○ System resilience ○ System sustainability	
	Data application to the different interests, incl. stakeholders' interests	

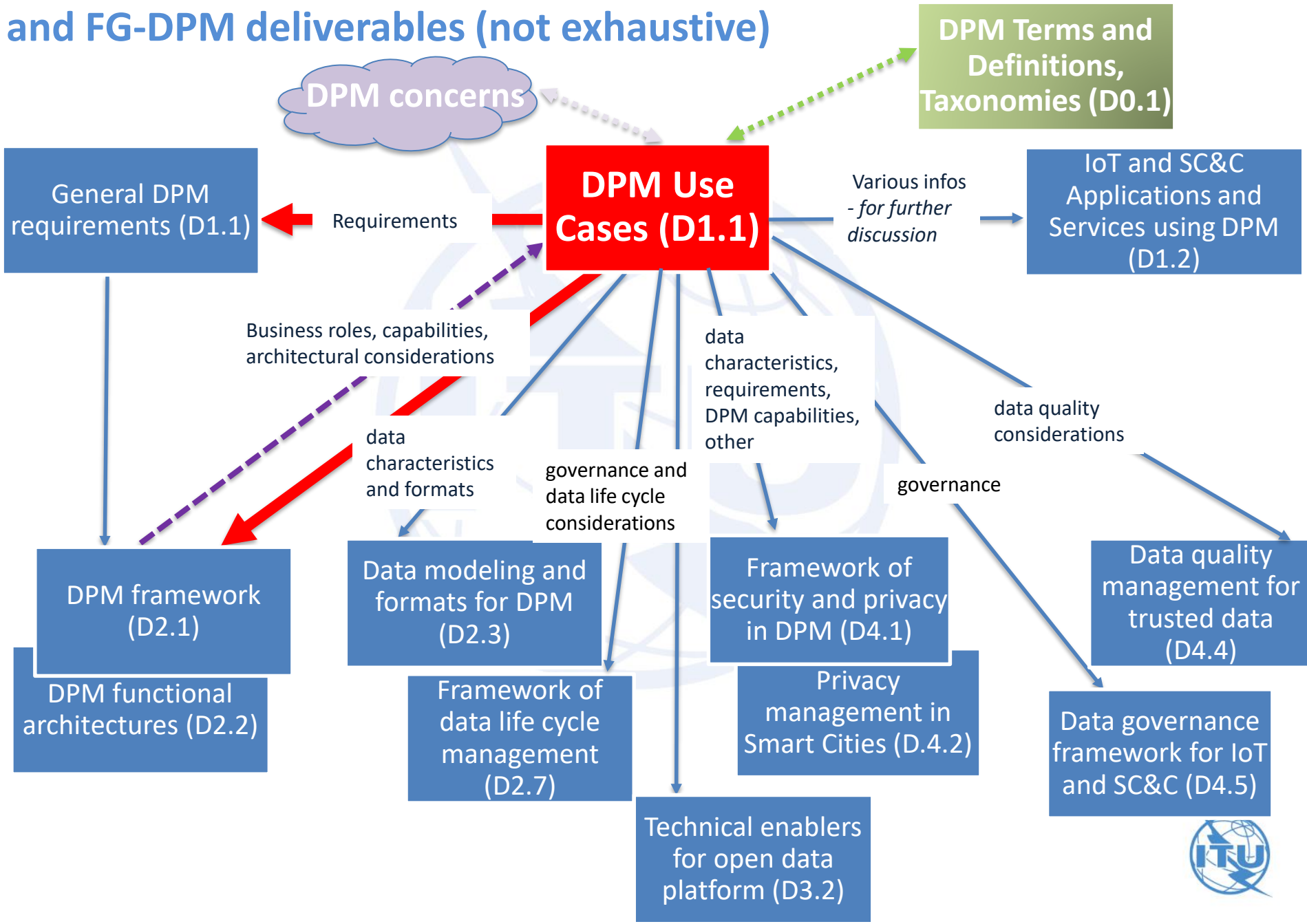
Technical areas of the Unified DPM Use Case template: governance and data life cycle

Governance and data life cycle considerations	Data accountability	
	Data isolation	
	Personal data (incl. sensitive personal data)	
	IPR and Licensing ○ Open data vs private data ○ Licenses of data use and reuse	
	SLAs enforcement	
	Risk management, incl. different concerns and dimensions of risks (cybersecurity, privacy, safety, risks assessment, change management)	
	Data distribution ○ Technical management considerations on data distribution ○ Data access rights and data authorization considerations according to the different stakeholders (e.g. in a smart city scenario, (1) main groups of internal employees, (2) external business partners, (3) general public)	
	Data value chain maintenance, incl. data asset management (data asset value appraisal, identification, registration and disposition)	
	Incident management process	
	Continuous improvement process, incl. data minimization	

Technical areas of the Unified DPM Use Case template: requirements and architecture considerations

Requirements	**Functional requirements** (with respect to the different DPM capabilities indicated above)	
	Non-functional requirements, incl. ○ **Availability** ○ **Data continuity** ○ **Flexibility** ○ **Interoperability** ○ **Reliability** ○ **Safety** ○ **Security and privacy** ○ **Trust (incl. traceability)**	
	Other requirements	
	Available International Standards supporting the requirements (if any)	
	References (related to above standards or other useful information (e.g. on regulatory aspects))	
Architecture considerations	○ Communication infrastructure ○ Data consistency across systems involved in the use case ○ Deployment considerations ○ **Interface requirements, incl. user interfaces and APIs** ○ **Performance criteria**	

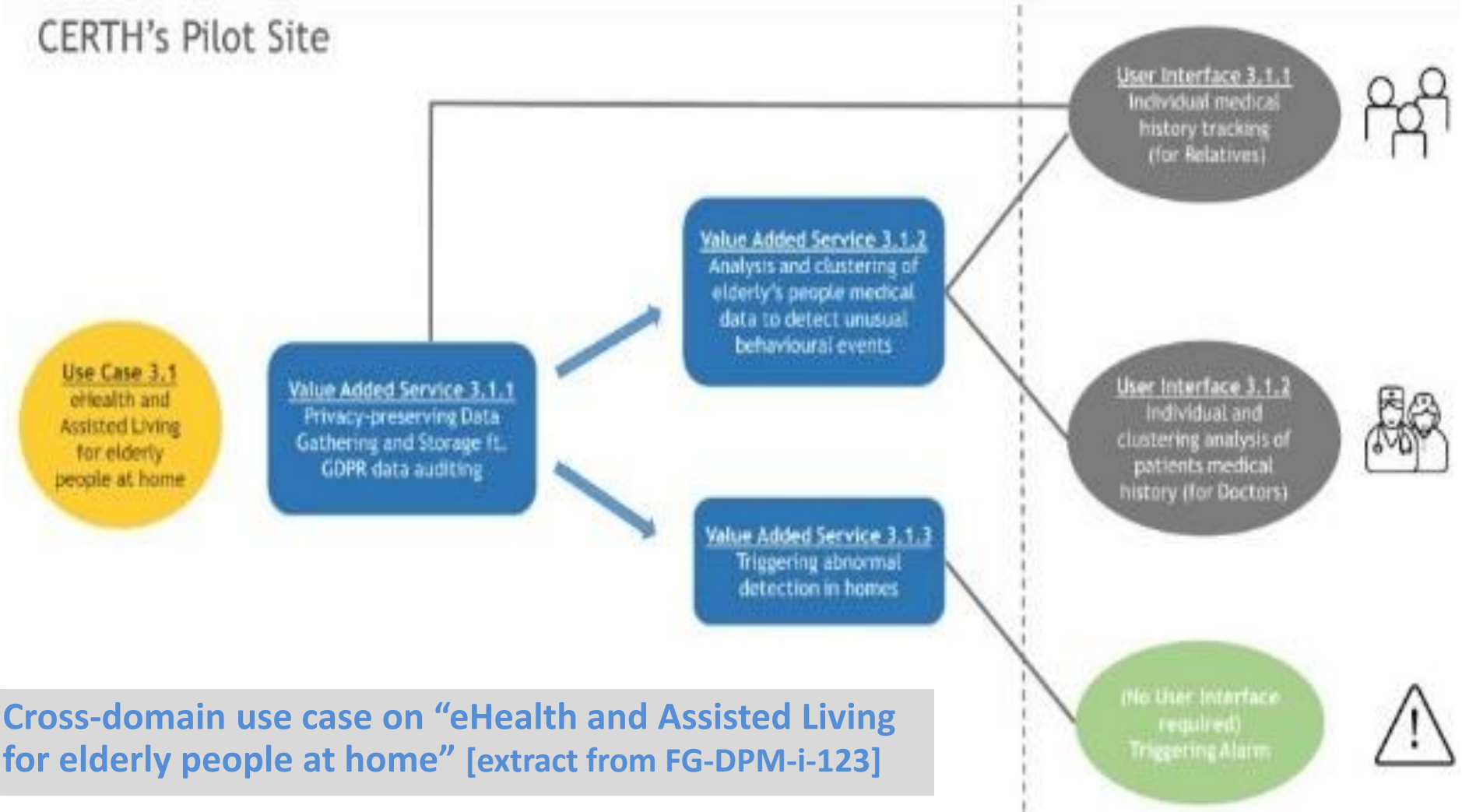
(Expected) relationships between DPM use cases and FG-DPM deliverables (not exhaustive)



Example of DPM Use Cases

Use cases collected at Oct 2017 FG-DPM meeting - not yet adapted to the unified template

- E-health/Assisted Living from Vicinity project
- Smart Cities from SynchroniCity project
- Digital Interface to urban processes for registered legal entities from GOLEM IMS GMBH

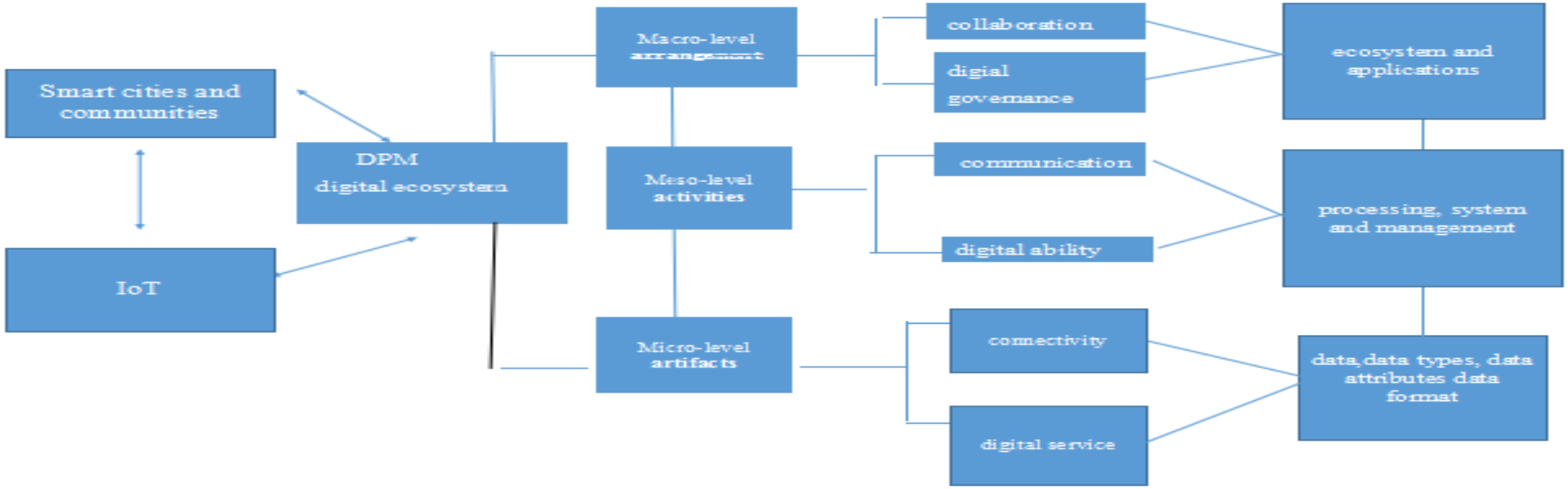


Cross-domain use case on "eHealth and Assisted Living for elderly people at home" [extract from FG-DPM-i-123]

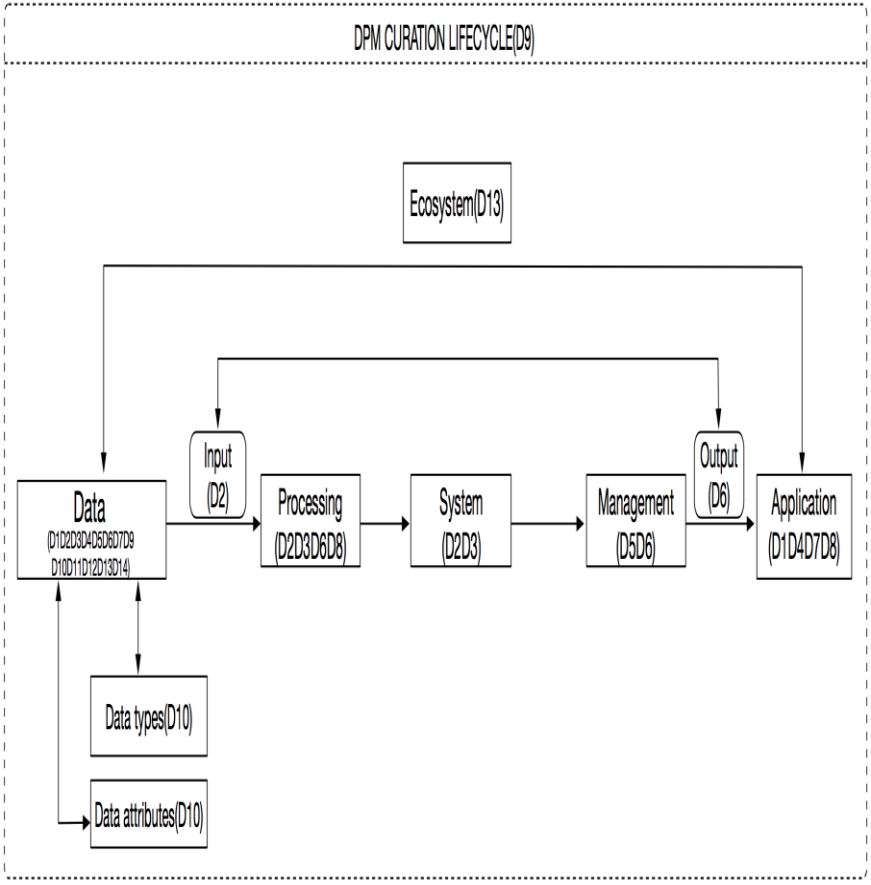
DPM terms and taxonomies [topic highly related to the use case template] – 1/2

Conceptual framework	Macro-level	Meso-level	Micro-level
Digital continuity model (An, et al, 2016)	digital governance capability building continuity of ecosystem collaboration arrangement	digital management ability building continuity of processing, system and management communication activities	digital service capability building continuity of data, data types, data attributes, data format connectivity of artifacts
DCC model (Higgins, 2008)	ecosystem and application	processing, system, management	data, data types, data attributes, data format
Integration of digital continuity and DCC model	collaboration of arrangement: people-concentric smart city framework and lifecycle governance interdependence	communication of activities: IoT intelligent process interconnections	connectivity of artifacts: data-driven smart service interactions

An integrated conceptual framework for DPM taxonomies [extract from FG-DPM-i-110 contribution into Brussels meeting, source: Prof. Xiaomi An, Renmin University of China]

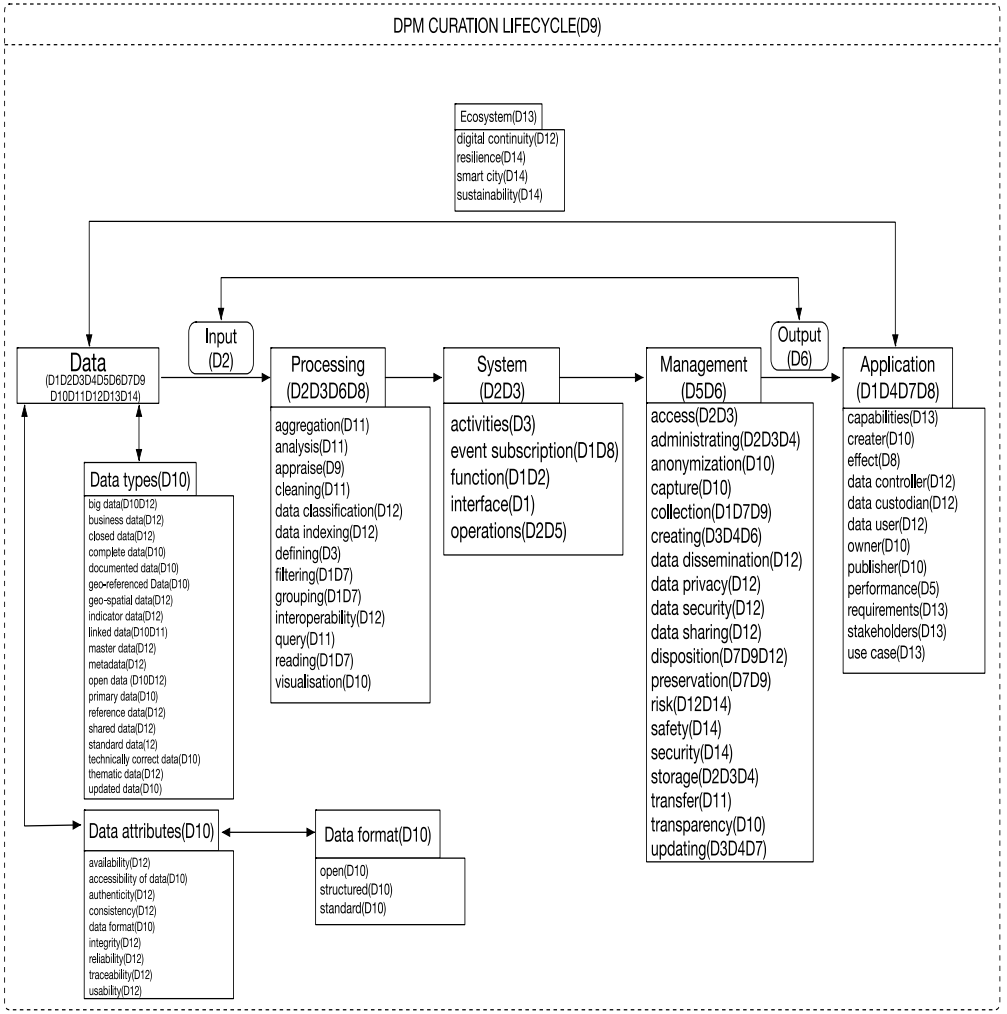


DPM terms and taxonomies [topic highly related to D1.1 use case template] – 2/2



Conceptual framework of DPM taxonomies based on DCC model (FG-DPM-i-098)

[extract from FG-DPM-i-110 contribution into Brussels meeting, source: Prof. Xiaomi An, Renmin University of China]



Conceptual framework for DPM taxonomies with an extension of DCC lifecycle model

[extract from FG-DPM-i-110 contribution into Brussels meeting, source: Prof. Xiaomi An, Renmin University of China]

For further discussion and potential enhancement of the Unified DPM Use Case template

- To consider inclusion of “Value-Added Services considerations” in the template [input from FG-DPM-i-124/125, source Dr. Dave Faulkner, Climate Associates Limited]
  - Value-added services might be added at little or no extra cost to existing IoT infrastructures with application of new software acting upon existing data sources
- To consider development of Guidelines for filling in the template [input from FG-DPM-i-125, source Dr. Dave Faulkner, Climate Associates Limited]
  - Nature of different experts expected to be involved in filling in the template
  - Which level of information is sufficient for considering the use case completed
  - DPM capabilities: separation between requirements and solution aspects
  - Other
- Concerning Guidelines, to describe how to fill in the ecosystem aspects (actors and business roles) [Marco’s view based on use cases contributed till now]
- To consider feedback from related FG-DPM studies (D2.1, D0.1, others)
- To consider feedback from participants in Brussels meeting and from external parties planning to contribute Use Cases in FG-DPM
- To confirm relationship between D1.1 and D1.2 (and consider any potential enhancement required for the template)

Dissemination of the Unified DPM Use case template and next D1.1 steps including external collaboration

Early Feb unified DPM use case template version disseminated - for recommended usage - to various external parties as potential contributors on DPM Use Cases

- *AG02, ASTAP, BDVA, City Standards Institute, EIP-SCC-01 Lighthouses, EIP-SCC-03 ESPRESSO/OGC, EPI / IERC, ETSI ISG CDP, ETSI ISG CIM, ISO TC 268, NIST, oneM2M, SF-SSCC [ITU-T SG20, OASC, SynchroniCity and Vicinity* involved since 1st FG-DPM meeting]
- Some feedback received in time for Brussels – more is expected after Brussels
- Other potential contributors: *ISO/IEC JTC1 SC41, ISO/IEC JTC1 SC42, IEEE Smart Cities*

Next steps specific to D1.1 include

- Analysis of Brussels DPM Use Cases contributions (Brussels meeting)
- Feedback on unified use case template (incl. contributed use cases' impact) – and potential enhancement of the template (Brussels meeting, beyond) [see slide on further discussion topics]
- Development of general DPM requirements from use cases (Brussels meeting, beyond)
- Interaction with D2.1 (DPM framework) (TBD in Brussels, certainly after Brussels)
- Synchronization - as needed - with D0.1 (potential enhancement of the template)
- Re-iteration of the above steps (post-Brussels e-meetings and 4th FG-DPM meeting)

Win-win collaboration with external parties (above list of parties, but not limited to) to enable efforts convergence and shared outcomes in DPM for IoT and SC&C

- Current aggressive target for D1.1 completion (4th FG-DPM meeting) might require adjustment

Thanks for your attention

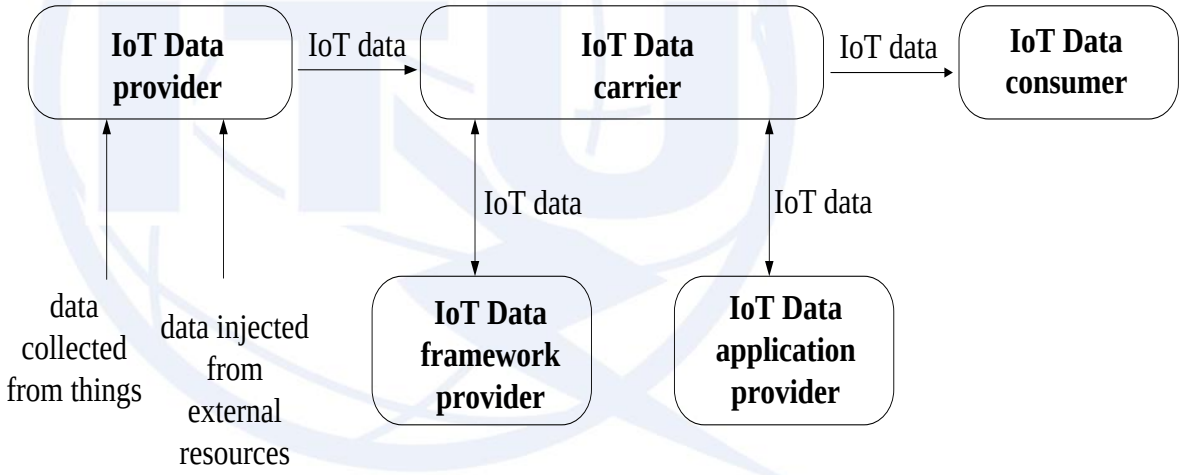
Backup slides

Y.4114 "Specific requirements and capabilities of the IoT for Big Data"

Y.4114 complements the common requirements and functional framework of the IoT [ITU-T Y.2066] [ITU-T Y.2068] 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

It is expected to constitute a basis for further ITU-T standardization work (e.g. functional entities, APIs and protocols) **concerning Big Data in the IoT**

The IoT data roles identified in Y.4114 [intended as the key roles which are relevant in an IoT deployment from a data operation perspective]



Big Data definition from [ITU-T Y.3600]: A paradigm for enabling the collection, storage, management, analysis and visualization, potentially under real-time constraints, of extensive datasets with heterogeneous characteristics.

NOTE – Examples of datasets characteristics include high-volume, high-velocity, high-variety, etc.

Description of the IoT data roles identified in Y.4114

- **IoT Data provider:** it collects data from things, injects data processed within the IoT system as well as data from external sources, and provides them via the IoT Data carrier to the IoT Data consumer (optionally, the applications provided by the IoT Data application provider may execute relevant data operations with the support of the IoT Data framework provider).
- **IoT Data application provider:** it provides applications related to the execution of IoT data operations (e.g. applications for data analysis, data pre-processing, data visualization and data query).

  NOTE - The applications provided by the IoT Data application provider can interact with the infrastructure (e.g. storage cloud) provided by the IoT Data framework provider through the IoT Data carrier or run on the infrastructure (e.g. scalable distributed computing platforms) provided by the IoT Data framework provider.
- **IoT Data framework provider:** it provides general IoT data processing capabilities and related infrastructure (e.g. storage and computing resources, data processing run time environment) as required by IoT Data provider, IoT Data carrier, IoT Data application provider and IoT Data consumer for the support of data operations execution.
- **IoT Data consumer:** it consumes IoT data. Usage of the consumed data depends on the application purposes.
- **IoT Data carrier:** it carries data among IoT Data provider, IoT Data framework provider, IoT Data application provider and IoT Data consumer.

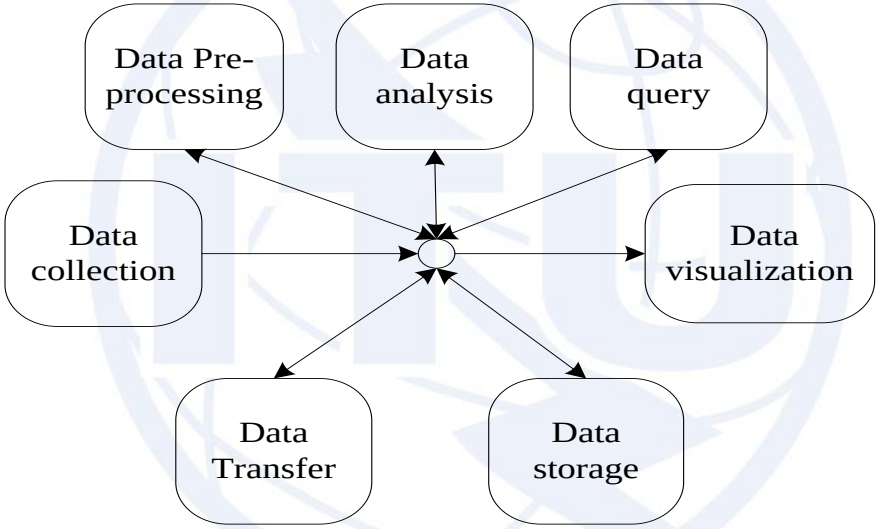
  NOTE - An actor of a concrete IoT deployment can play multiple roles. As an example, an actor executing data analysis plays the role of IoT Data application provider, but it also plays the role of IoT Data provider when it sends the results of this data analysis to other actors.

Y.4114 describes also key possible mappings from IoT business roles [Y.2060] to IoT data roles, as well as an example of deployment scenarios with respect to IoT data roles (Appendix).

Y.4114 – IoT data operations

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



The sequencing of IoT data operations in IoT highly depends on the service and deployment scenarios (e.g. data analysis with respect to scenarios implementing cloud computing vs edge computing)

Y.4114 Appendixes also describe relationships between IoT data roles and IoT data operations, as well as between IoT data operations and IoT components