FG-DPM Activities and Deliverables of Data Processing and Management
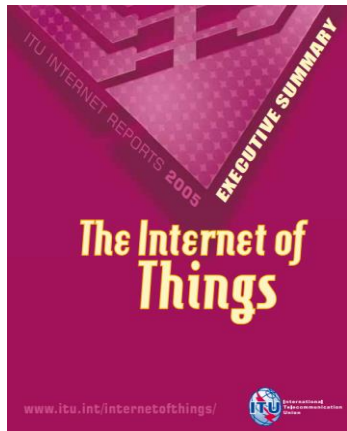
Gyu Myoung Lee

Chair, ITU-T FG-DPM

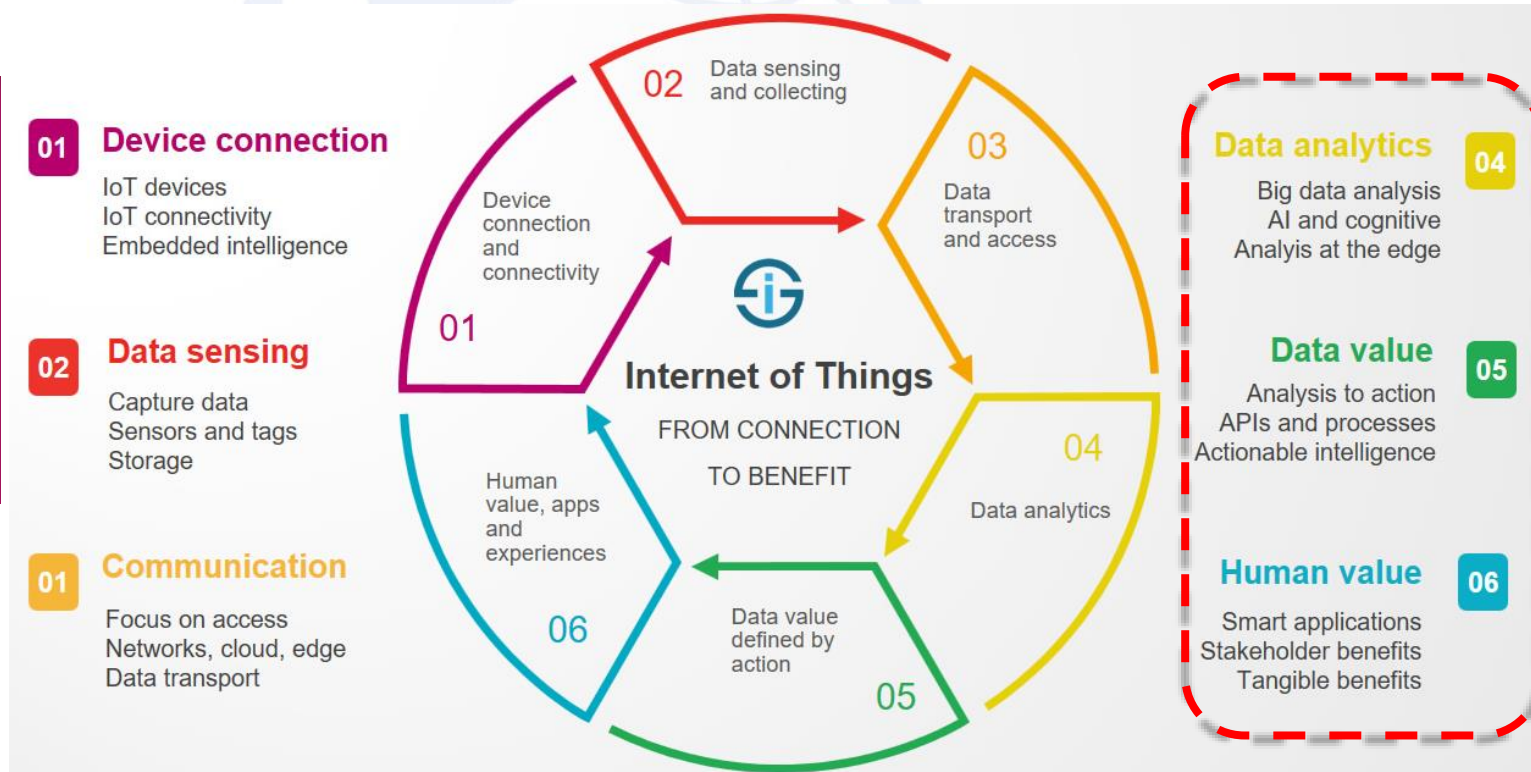LJMU, UK/KAIST, Korea

gmlee@kaist.ac.kr
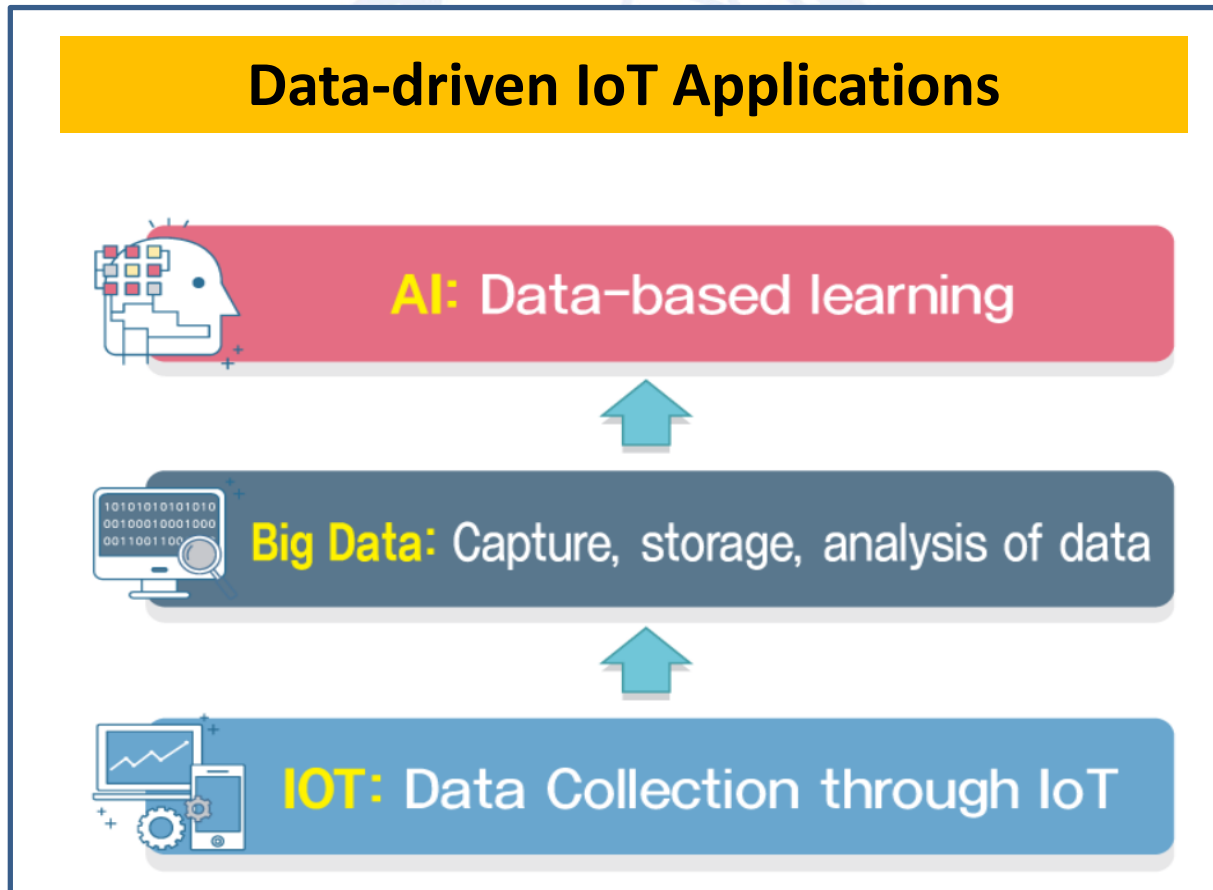
Internet of Things and **Data**

- From connecting devices to **creating value**

https://www.itu.int/osg/spu/publications/internetofthings/InternetofThings_summary.pdf

01 Device connection
IoT devices
IoT connectivity
Embedded intelligence

02 Data sensing
Capture data
Sensors and tags
Storage

01 Communication
Focus on access
Networks, cloud, edge
Data transport

02 Data sensing and collecting

03 Data transport and access

Device connection and connectivity

01

Internet of Things
FROM CONNECTION
TO BENEFIT

04 Data analytics

Human value, apps and experiences

06

05 Data value defined by action

Data analytics 04
Big data analysis
AI and cognitive
Analyis at the edge

Data value 05
Analysis to action
APIs and processes
Actionable intelligence

Human value 06
Smart applications
Stakeholder benefits
Tangible benefits

Source: i-SCOOP, https://www.i-scoop.eu/internet-of-things-guide/internet-of-things/

Leverage the massive amount of data

Data-driven IoT Applications

AI: Data-based learning

Big Data: Capture, storage, analysis of data

IOT: Data Collection through IoT
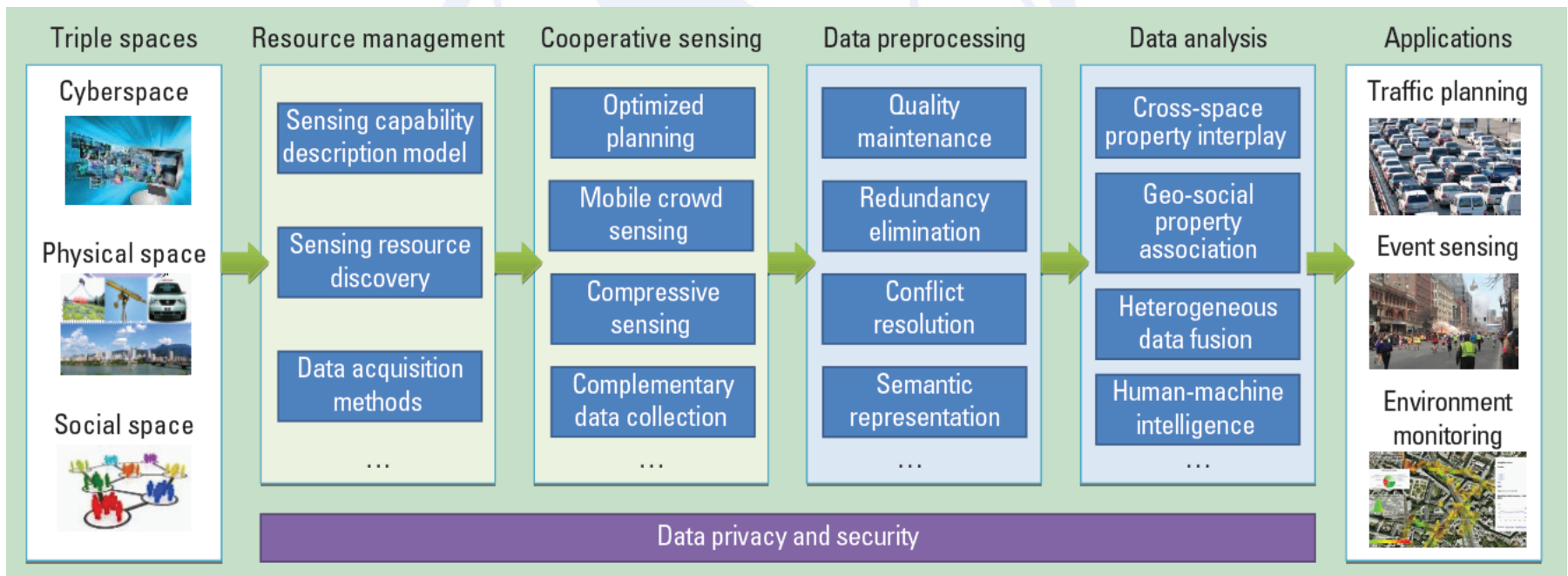
Data-driven
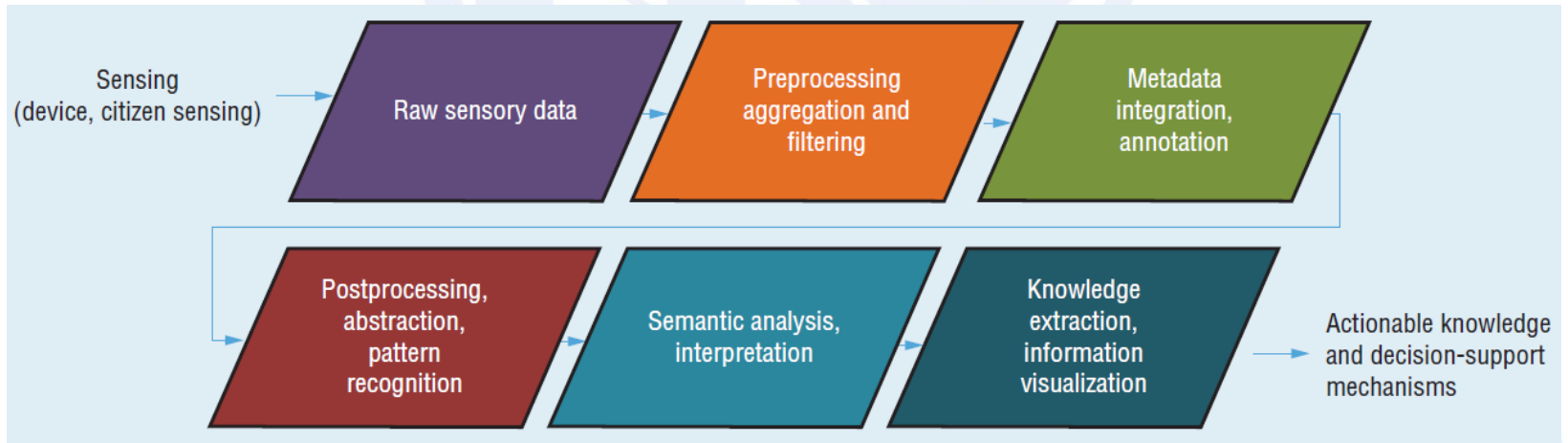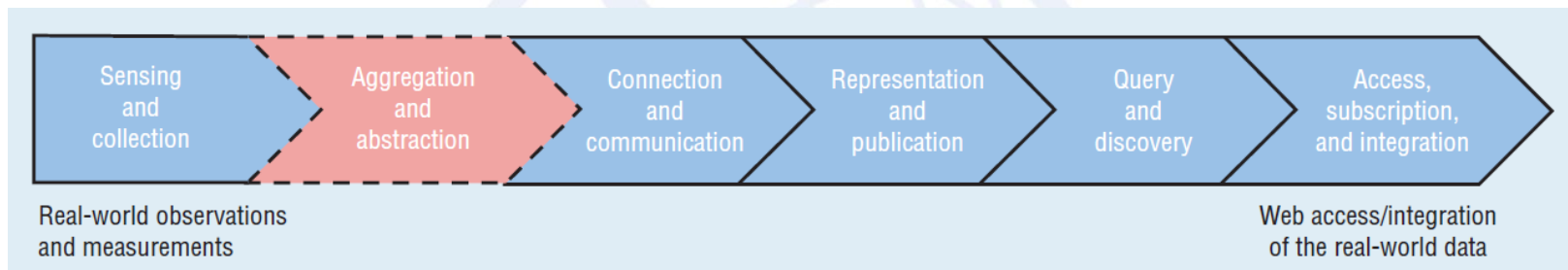# IoT and Smart Cities & Communities

- Support higher volume and velocity of data

"A Data-Centric Framework for Cyber-Physical-Social Systems", IEEE IT Professional, Nov.-Dec. 2015.

From Data to Actionable Knowledge

- The data production and access chain

"From Data to Actionable Knowledge: Big data challenges in the WoT," IEEE Intelligent System, 2014

ITU-T FG-DPM

- **Parent study group**: ITU-T SG20 (IoT and SC&C)

- **Established**: ITU-T SG20 meeting (Dubai, 22 March 2017)

- **Open to all stakeholders** (ITU members & non-members)

- **Overall objectives**:
  - promote the establishment of trust-based data management frameworks for IoT and SC&C
  - investigate existing and emerging technologies
  - Identify and address standardization gaps and challenges

FG-DPM: Focus group structure

WG	Title	Chair
WG1	**Use Cases, Requirements and Applications/Services**	Mr Martin Brynskov (Open and Agile Smart Cities Initiative)
WG2	**DPM Framework, Architectures and Core Components**	Mr Steve Liang (OGC), Mrs Hakima Chaouchi (Telecom SudParis)
WG3	**Data sharing, Interoperability and Blockchain**	Mrs Liangliang Zhang (Huawei)
WG4	**Security, Privacy and Trust including Governance**	Mr Robert Lewis-Lettington (UN-HABITAT)
WG5	**Data Economy, commercialization, and monetization**	Mr Okan Geray (Smart Dubai), Mr Abdulhadi AbouAlmal (Etisalat)

Previous FG-DPM Meetings

1st meeting: 17-19 July 2017 (Geneva)

2nd meeting: 20-25 October 2017 (Geneva)

3rd meeting: 19-23 February 2018 (Brussels)

4th meeting: 1-3 May 2018 (Cairo)

FG-DPM Deliverables (1)

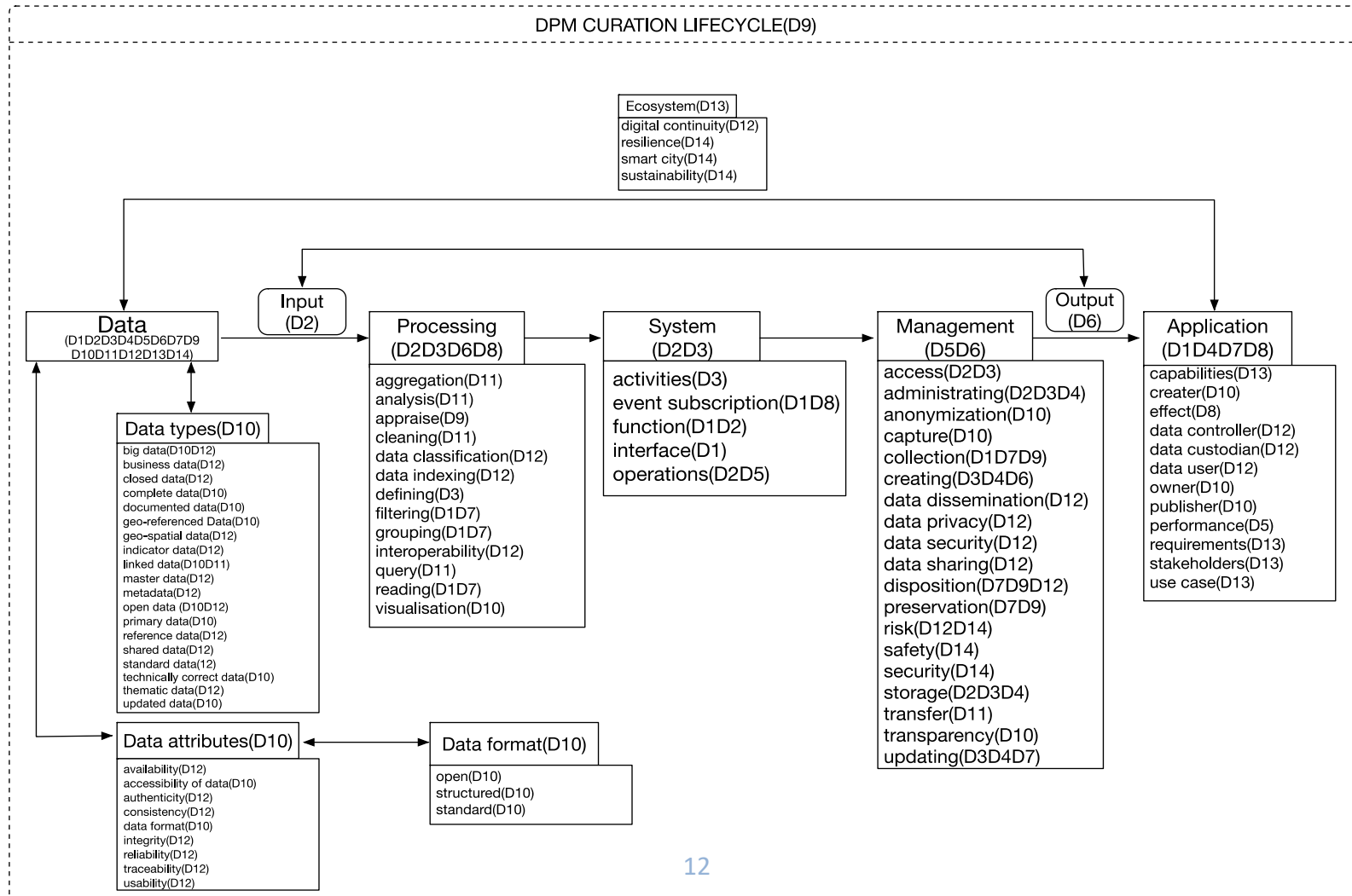| Deliverable	Title	Output document
D0.1	TS - "Data Processing and Management for IoT and Smart Cities and Communities: Vocabulary"	FG-DPM-O-072
D1.1	TS - "Use Cases Analysis and General Requirements for DPM"	FG-DPM-O-078
D3.3	TR - "Framework to support data interoperability in IoT environment"	FG-DPM-O-075
D3.5	TS - "Overview of Blockchain for supporting IoT and SC&C in DPM aspects"	FG-DPM-O-073
D3.6	TS - "Blockchain-based data exchange and sharing technology"	FG-DPM-O-074
D4.1	TR - "Framework of Security and Privacy in DPM"	FG-DPM-O-067
D4.3	TS - "Technical Enablers for Trusted Data"	FG-DPM-O-071
D4.4	TR - "Data quality management for trusted data"	FG-DPM-O-065
D4.5	TS - "Data Governance Framework for IoT and SC&C"	FG-DPM-O-066
D4.6	TS - "Risk Management in DPM for IoT and smart cities"	FG-DPM-O-064
D5.1, D5.2, D5.3, D5.4	TS - "Data Economy Impact, Commercialization and Monetization"	FG-DPM-O-069

TS: Technical Specification, **TR**: Technical Report
Output documents of the Cairo meeting

FG-DPM Deliverables (2)

Deliverable	Title	Output document
D2.1	TR - "DPM Framework for Data-driven IoT and SC&C"	FG-DPM-O-045
D2.3.1	TR - "Data format in IoT and smart city"	FG-DPM-O-044
D2.3.2	TR – "Web based Microdata formats for IoT and Smart city"	FG-DPM-O-008
D2.3.3	TR - "Metadata format in IoT and smart city"	FG-DPM-O-009
D3.2	TS - "SensorThings API – Sensing, a cross-domain IoT data model and RESTful API"	FG-DPM-O-018
D3.7	TS - "Blockchain Based Data Management"	FG-DPM-O-054
D4.2	TR - "Privacy Management for DPM in IOT and Smart Cities"	FG-DPM-O-051

TS: Technical Specification, TR: Technical Report
Output documents before the Cairo meeting

D0.1 (Data Processing and Management for IoT and Smart Cities and Communities: Vocabulary)

- Provides a set of core terms and associated definitions arranged in alphabetical order to reflect the basic and general concepts used in the DPM IoT and SC&C domain.

- Aims to encourage a mutual and consistent understanding of, and a coherent approach to, the activities relating to DPM, and the use of uniform terminology.

Taxonomy from perspectives of data ecosystem model based on integration of digital continuity model and lifecycle model

DPM CURATION LIFECYCLE(D9)

Ecosystem(D13)
digital continuity(D12)
resilience(D14)
smart city(D14)
sustainability(D14)

Data
(D1D2D3D4D5D6D7D9
D10D11D12D13D14)

Input (D2)

Processing (D2D3D6D8)
aggregation(D11)
analysis(D11)
appraise(D9)
cleaning(D11)
data classification(D12)
data indexing(D12)
defining(D3)
filtering(D1D7)
grouping(D1D7)
interoperability(D12)
query(D11)
reading(D1D7)
visualisation(D10)

System (D2D3)
activities(D3)
event subscription(D1D8)
function(D1D2)
interface(D1)
operations(D2D5)

Management (D5D6)
access(D2D3)
administrating(D2D3D4)
anonymization(D10)
capture(D10)
collection(D1D7D9)
creating(D3D4D6)
data dissemination(D12)
data privacy(D12)
data security(D12)
data sharing(D12)
disposition(D7D9D12)
preservation(D7D9)
risk(D12D14)
safety(D14)
security(D14)
storage(D2D3D4)
transfer(D11)
transparency(D10)
updating(D3D4D7)

Output (D6)

Application (D1D4D7D8)
capabilities(D13)
creater(D10)
effect(D8)
data controller(D12)
data custodian(D12)
data user(D12)
owner(D10)
publisher(D10)
performance(D5)
requirements(D13)
stakeholders(D13)
use case(D13)

Data types(D10)
big data(D10D12)
business data(D12)
closed data(D12)
complete data(D10)
documented data(D10)
geo-referenced Data(D10)
geo-spatial data(D12)
indicator data(D12)
linked data(D10D11)
master data(D12)
metadata(D12)
open data (D10D12)
primary data(D10)
reference data(D12)
shared data(D12)
standard data(12)
technically correct data(D10)
thematic data(D12)
updated data(D10)

Data attributes(D10)
availability(D12)
accessibility of data(D10)
authenticity(D12)
consistency(D12)
data format(D10)
integrity(D12)
reliability(D12)
traceability(D12)
usability(D12)

Data format(D10)
open(D10)
structured(D10)
standard(D10)

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

- **Unified use case template for DPM**
  - Ecosystem
  - Scenario
  - Data characteristics, quality and formats
  - DPM capabilities considerations
  - Governance and data life cycle considerations
  - Requirements
  - Architecture considerations
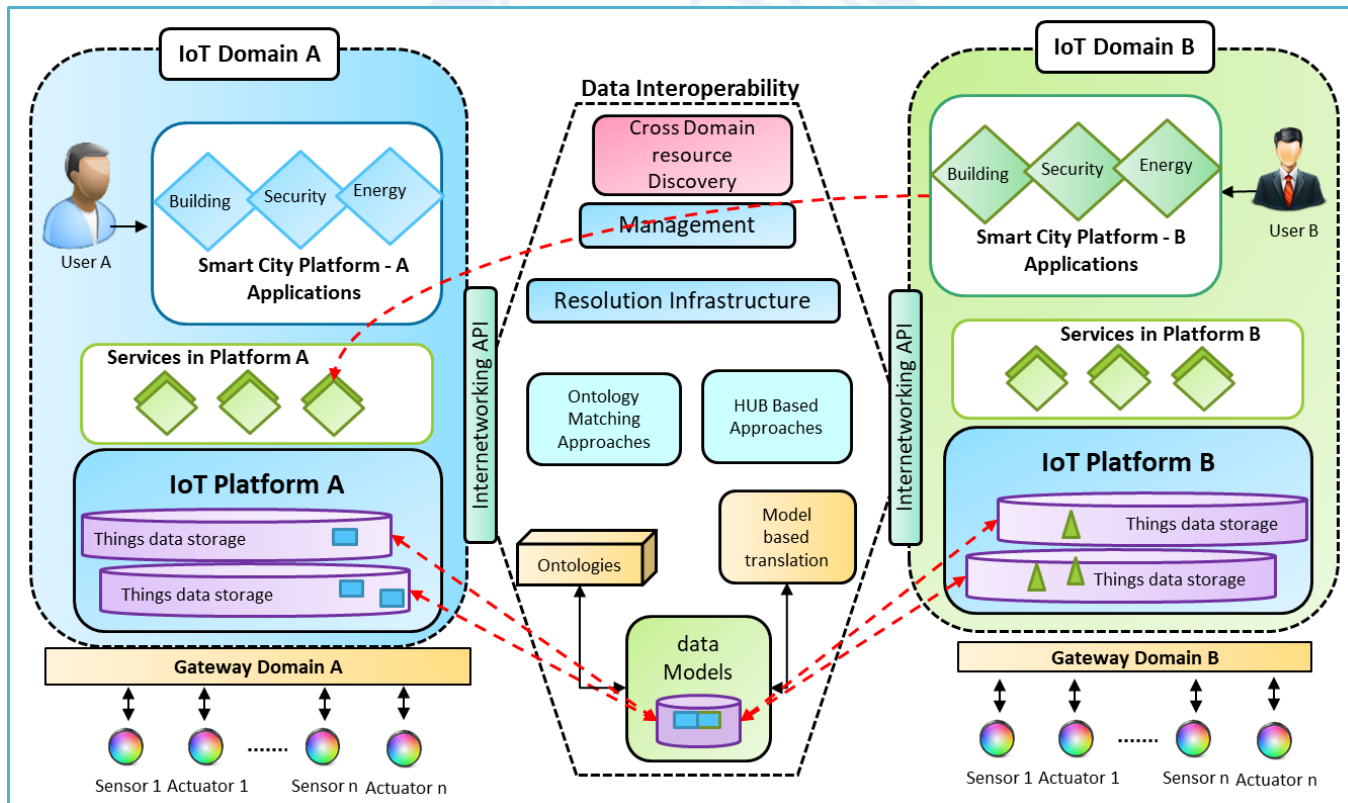- **General requirements for DPM**

D2.1 (Data Processing and Management Framework for Data-driven IoT and Smart Cities and Communities)

- An introduction to the principles of DPM in IoT and smart cities and communities;

- Overview of the DPM actors and business roles in IoT and smart cities and communities;

- The areas of concerns of DPM in IoT and smart cities and communities from functional and non-functional perspectives;

- A high level DPM framework in IoT and smart cities and communities from a capability perspective.

The ad-hoc team on "Global picture of DPM capabilities"

- Will develop a comprehensive picture of the main common DPM capabilities
    - which are judged necessary to support the use cases identified by the FG-DPM, including the interactions internal to the capability set and the interactions with the main (input and output) entities external to the capability set.
- The picture is expected to summarize the key macro-functionalities for the support of the use cases identified by WG1 and be an essential input for the full development of the DPM framework study in progress within WG2, taking into account - as applicable and at their greatest extent – the capability-related studies progressed by WG3, WG4 and WG5.

D3.3 (Framework to support data interoperability in IoT environment)

D3.5, D3.6 and D3.7 (Blockchain)

D3.5 (Overview of IoT and Blockchain)	• Analysis on blockchain aspects of DPM for IoT and SC&C, including concepts, key characteristics, various models, use cases, standards, etc. • Analysis on the solutions of using blockchain as a decentralized database for IoT and SC&C • Analysis on the effects when using blockchain for IoT and SC&C, include positive and negative effects • Analysis on the roles of blockchain techniques in DPM for IoT and SC&C applications.
D3.6 (Blockchain-based Data Exchange and Sharing Technology)	• Analysis on the roles of blockchain in data exchange and sharing. • Identify the challenges for blockchain-based data exchange and sharing • The blockchain operations to support IoT data, especially for resilience, sharing, and auditable protection IoT data. • How blockchain can change the future of IoT, e.g. how blockchain can change the future of IoT, especially in relation to device identity and data integrity.
D3.7 (Using blockchain to improve data management)	• Use cases in E-Government and other aspects • Requirement analysis including service requirement and functional requirement • Blockchain-based enabler for data management • Key block chain technologies applicable for data management • Data management operation and flow

D4.1, D4.2 and D4.3 (Security, Privacy and Trust in DPM)

D4.1 (Framework of Security and Privacy in Data Processing Management)	• Defines a framework for security and privacy in data processing management for data-driven IoT and smart cities and communities. • provides a description of the current framework in terms of data processing management. • provides a rationale for a higher level ecosystem viewpoint for data security and privacy management in smart cities is elaborated. • explains the framework and provide guidance use.
D4.2 (Privacy Management for DPM in IoT and Smart Cities)	• Provides a landscape of privacy in smart cities • Describes ecosystem and roles from a privacy management viewpoint taking into account D4.1 • Describes operational processes, taking into account D4.1 on operational principles • Specifies privacy preservation solutions in smart city applications
D4.3 (Technical Enablers for Trusted Data)	• the definition of trusted data, including its attributes and process • the requirements of technical enablers for trusted data

D4.4, D4.5 and D4.6 (Trusted data, Data governance, Risk management)

D4.4 (Data quality management for trusted data)	• data quality management to provide trusted data provisioning in ICT infrastructures and services.
	   • Data Quality Management Overview
	   • Quality of Data Assessment Overview
	   • Provisional processes for data quality management
	   • Data quality provisions for trusteed data
	   • Data quality maturity model

D4.5 (Data Governance Framework for IoT and SC&C)	• Puts up a data governance framework for deploying data governance for IoT and SC&C. • Explains how such framework can be used to ensure multidimensional stakeholders' interests and concerns about responsibilities, rights and benefits for date-related processes in IoT and SC&C.
D4.6 (Risk Management in DPM for IoT and smart cities)	• Data processing and management in Smart Cities and IoT generates uncertainty; • Risks linked to data processing and management in Smart Cities and IoT generates other risks that also must be managed and forecast. • Multiple laws and regulations already exist in specific areas/countries/on specific cybersecurity or privacy topics, private sector proposes cyber-norms, but there is still a lack of consensus; • Lack of confidence in Telco to manage the data

D5.1, D5.2, D5.3 and D5.4 (Data Economy Impact, Commercialization and Monetization)

D5.1 (Modeling of Data Economy for value creation and Stakeholders identification)	• Describe concepts and features for value creation in data economy models • Identify stakeholders in data economy • Analyze data value chain including stakeholders involved in data economy, monetization and commercialization
D5.2 (Business models, commercialization and monetization to support data economy)	• Analyze existing IoT and SC marketplaces for value creation • Identify roles and requirements for data monetization and commercialization considering emerging marketplaces and various data categories • Define business models for data monetization and commercialization • Provide use cases of data monetization and commercialization
D5.3 (Data economy impact assessment, policy and sustainability implications)	• Formulate an economic impact assessment framework for data • Assess drivers of impact of data processing and management on economy • Identify economic inputs, outputs, and outcomes • Identify linkages and quantification aspects for economic impact assessment • Formulate a high-level policy guidance for data economy growth and related innovation • Identify enablers of sustainability and provide related guidance
D5.4 (Data economy regulatory framework)	• Identify regulatory and legal aspects and implications for DPM

Recent Progress and Future Plans

- **Reported 1st year activities** to the SG20 May meeting
  - Approved the extension of FG-DPM lifetime
- **Finalize Phase 1 deliverables**
  - Candidate deliverables (D1.1, D2.1 and other ones)
- Make progress for other deliverables
  - Prioritize deliverables and concentrate them
- Promote related activities
  - Workshops, liaisons (Collaborating with other groups)

Concluding Remark

A — Diffusion of AI — AI

N — Network — Data-Driven Networking and Services

D — Data from IoT — FG-DPM Deliverables — Data

Linking between **Data** and **AI**

22