

Fifth ITU Workshop on Network 2030 (Geneva, 14-16 October 2019)

Data and AI driven Infrastructure

Gyu Myoung Lee

Chair, ITU-T FG-DPM

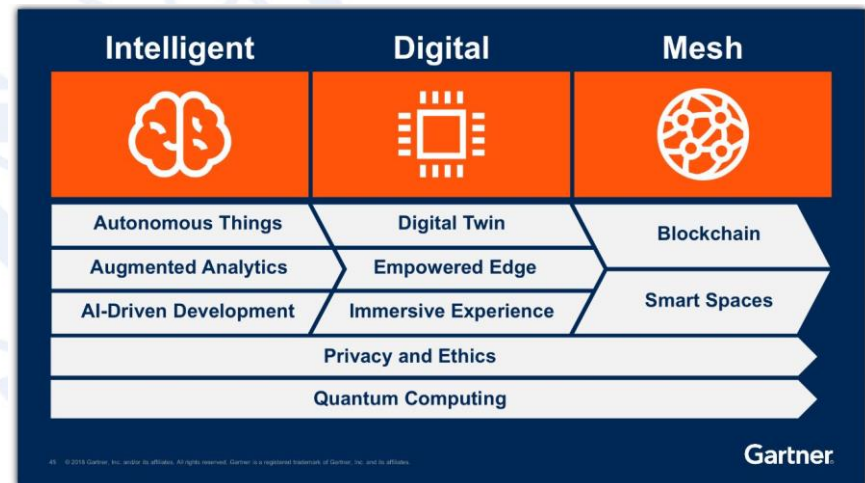
LJMU/KAIST

gmllee@kaist.ac.kr



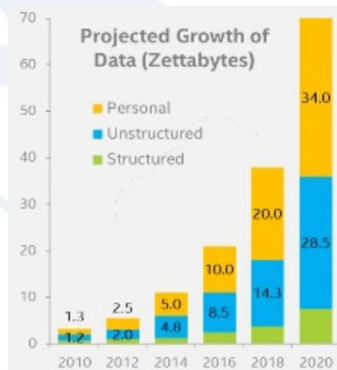
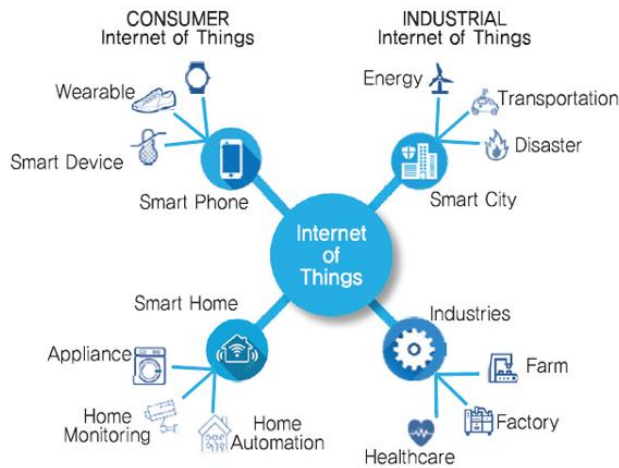
Top 10 Strategic Technology Trends for 2019

- IoT with Artificial Intelligence
- Edge Computing
- Blockchain technologies
 - New decentralized operating and distributed business models
 - Blockchain inspired approaches

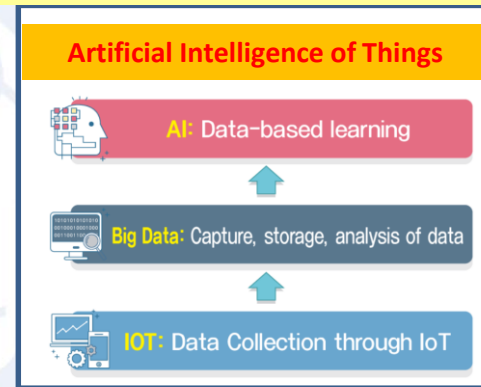


IoT and Data: Artificial Intelligence of Things (AIoT)

Extension of IoT Applications



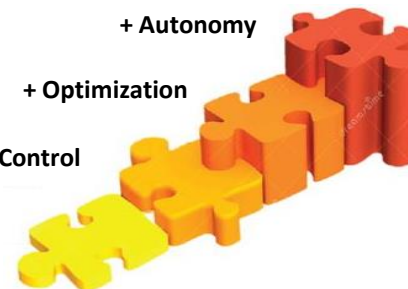
Leverage **the massive amount of data**



From
Connecting
Devices to
**Creating
Value**



Identification/Sensing



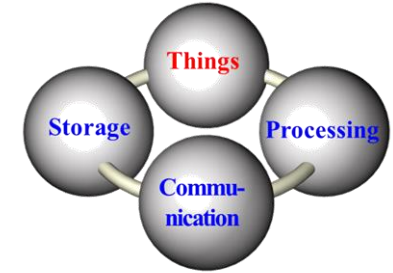
+ Remote Control

+ Optimization

+ Autonomy

From CPS to Digital Twin

Internet of Things
Cyber Physical Systems



Future of **Things**

Robotized Things

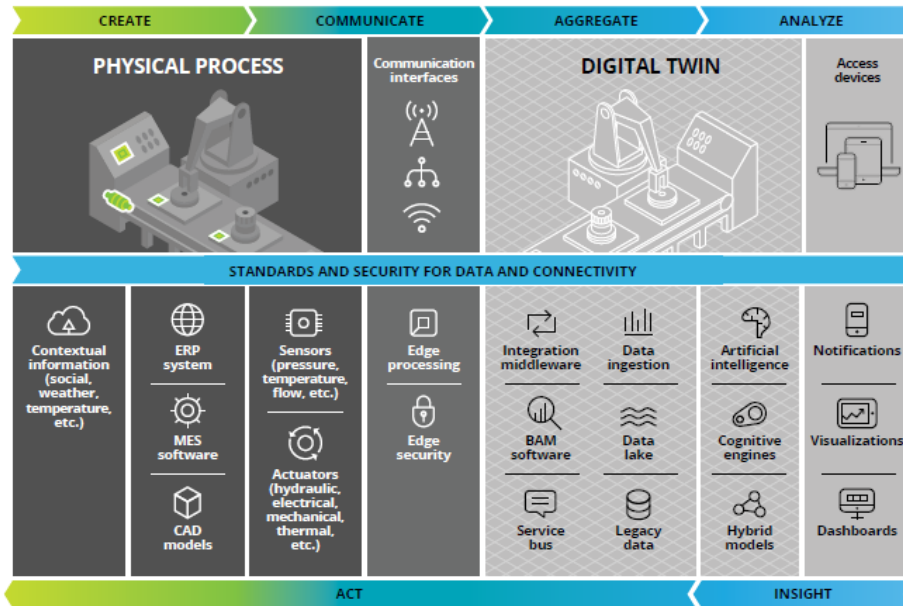
- Smart Appliances
- AI Assistant & Social Robots

Digital Twined Things

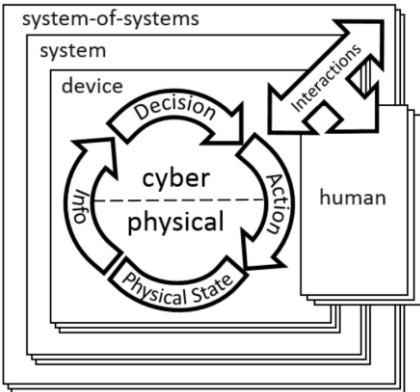
- Mission-Critical Things
- Convergence of IT & OT

Tiny Things

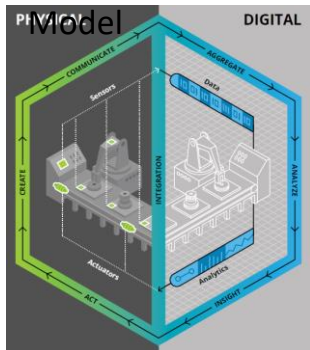
- Microscopic RFID Chips
- OT: Operational Technology



AI is an enabler for Digital Twin



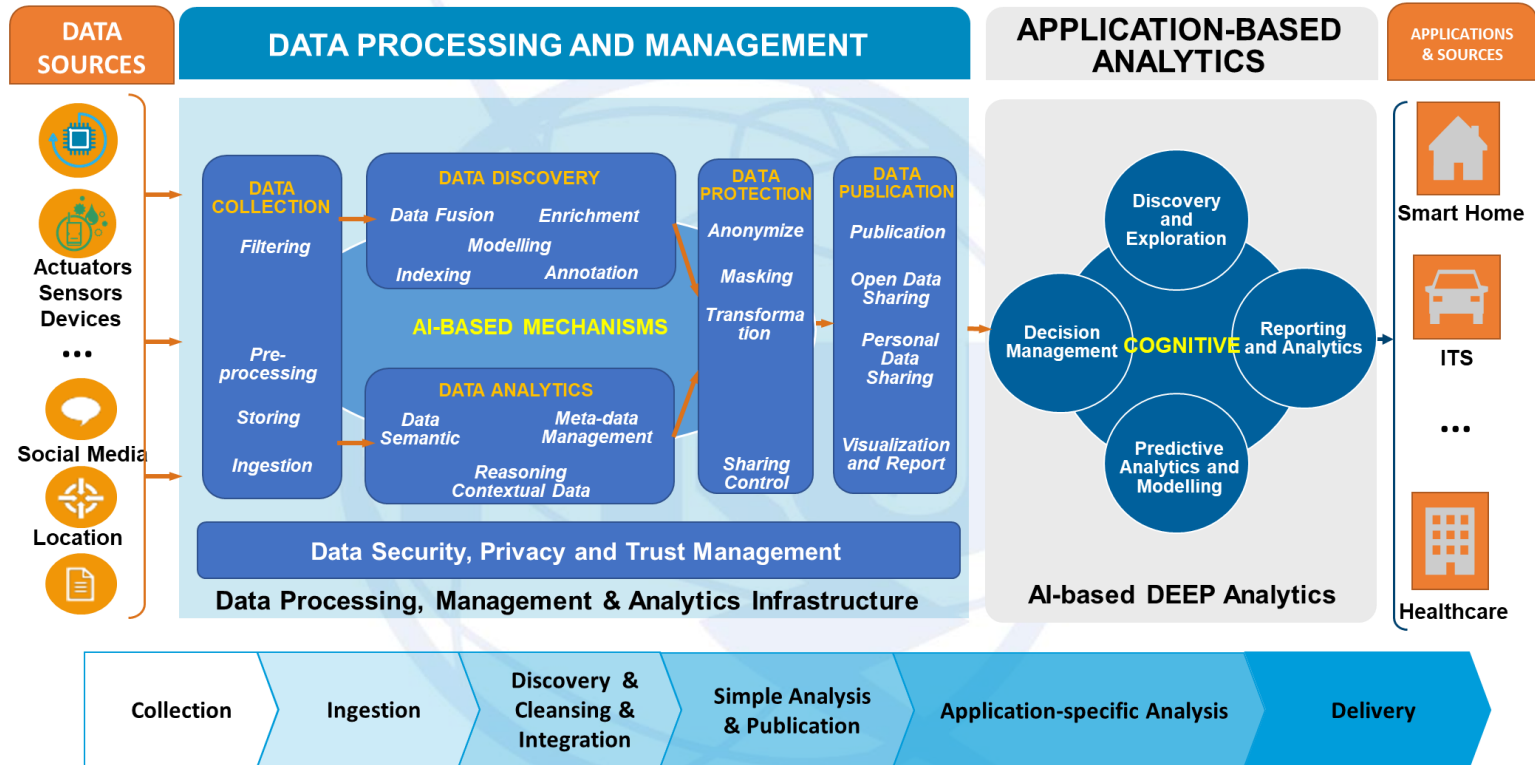
Digital Twin



Source: Deloitte University Press



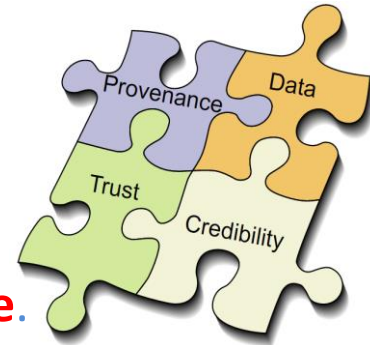
Data-driven AIoT



Data Security, Privacy, Trust and Governance for trustworthiness in AIoT

Trustworthiness encompasses the concerns of **security, privacy, safety, reliability and resilience**, which are too often addressed separately and in isolation in risk management approaches. (NIST CPS Framework)

Trustworthiness in AIoT

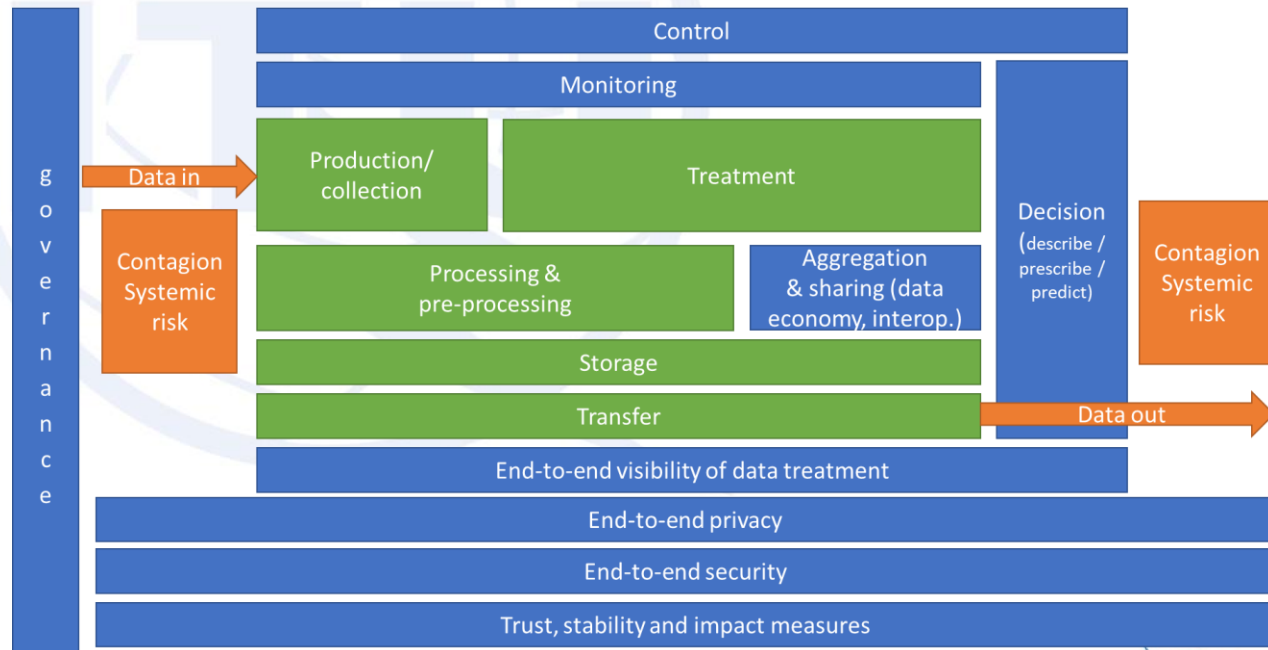


Trust is an essential element in Big Data and Analytics for **Intelligence**.

“**Trust** is the **oxygen** which will breathe life into the IoT. Industry needs to show **data** is safe and that it is properly treated.” (source: www.techuk.org.)



DATA
FOR THE PEOPLE
HOW TO MAKE
OUR POST-
PRIVACY
ECONOMY WORK
FOR YOU
ANDREAS
WEIGEND



Source: ITU-T FG-DPM Ad-hoc group (by Nathalie Feingold)

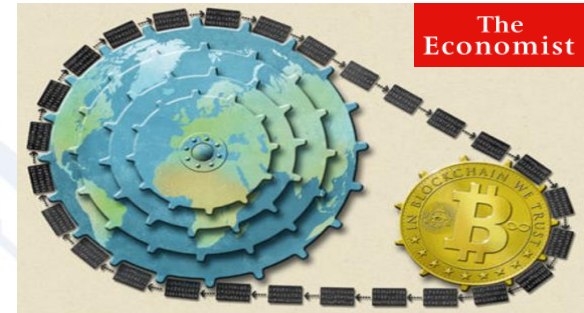




BLOCKCHAIN

Internet of Value

A machine for creating trust



- The currency in the Internet is **data**.
- Revolutionizes how transactions are recorded
 - a **decentralized digital ledger** that records transactions
 - builds **trust** with **accountability** and **transparency**

The **IoV** is as a platform of the next generation Internet that enables various types of assets to be digitalized and represented as digital value using **Blockchain**.

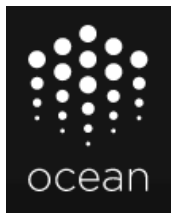
Decentralization



Decentralized AI Platforms



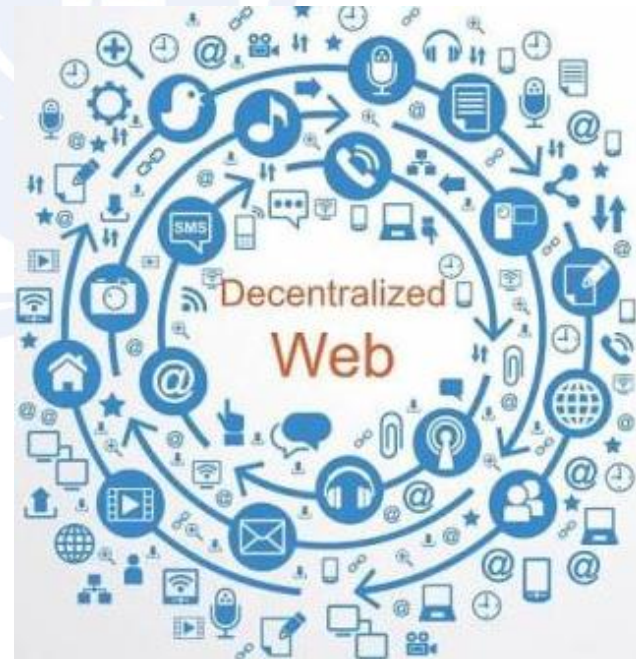
ALGORITHMIA



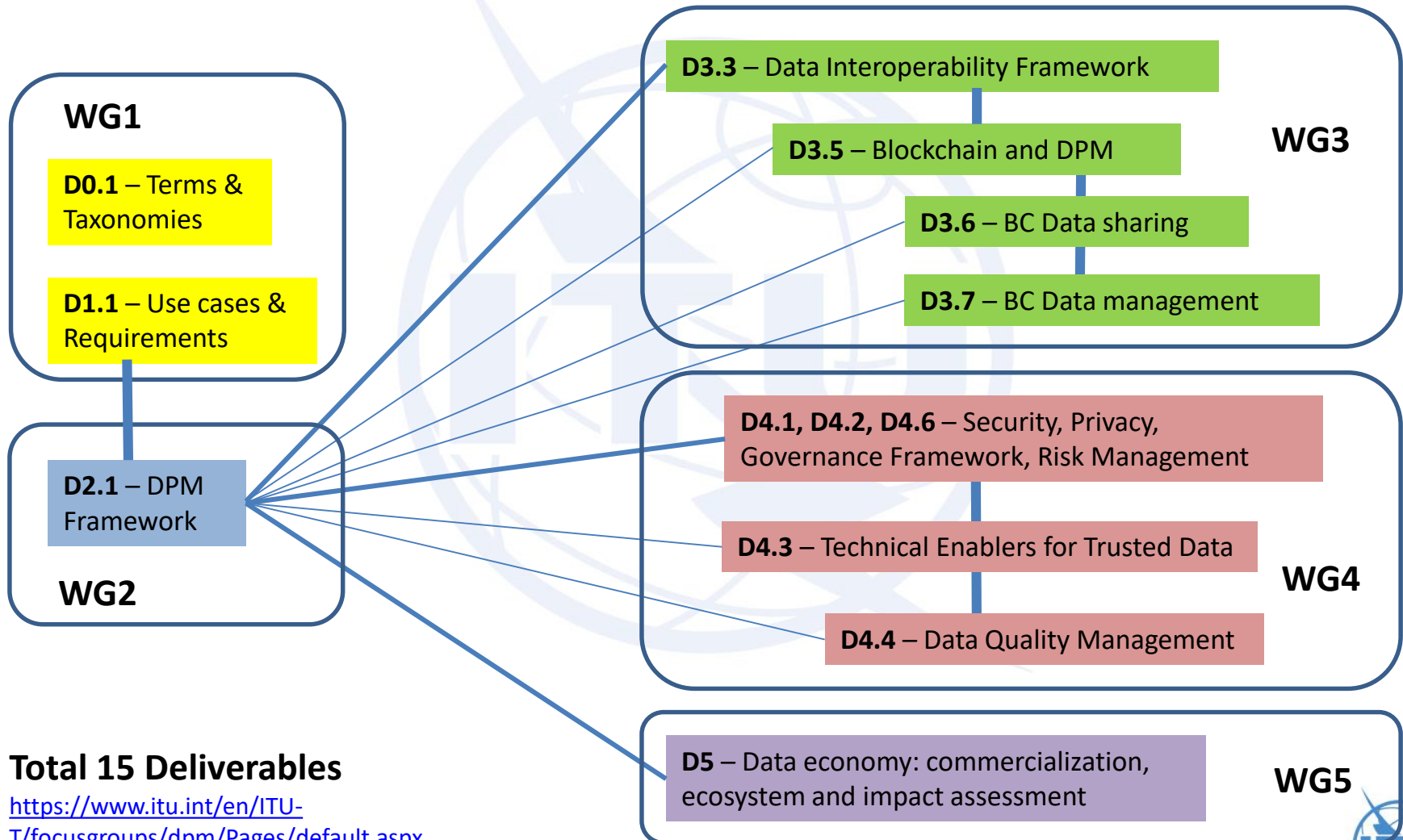
Decentralisation: the next big step for the world wide web

The decentralised web, or DWeb, could be a chance to take control of our data back from the big tech firms. So how does it work and when will it be here?

the guardian



FG-DPM Core Deliverables



Lessons from ITU-T FG-DPM

- Data → DPM (the new oil)
- Sharing data - Blockchain
- Data interoperability
- Data Security, Privacy, Trust and Governance for trustworthiness



FINDABLE



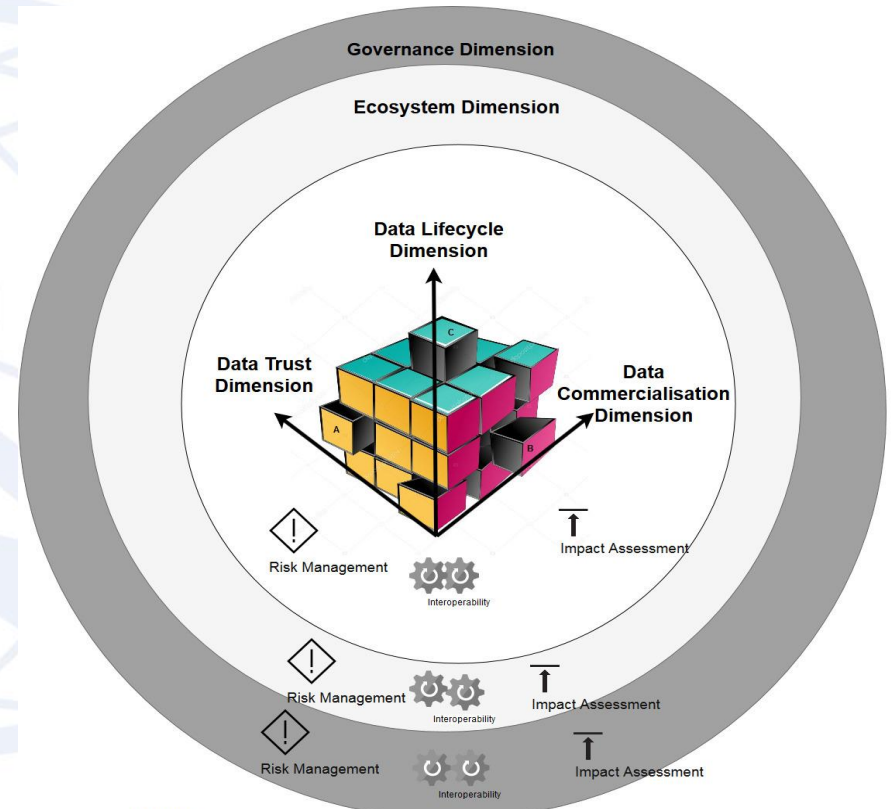
ACCESSIBLE



INTEROPERABLE



REUSABLE



Legend:

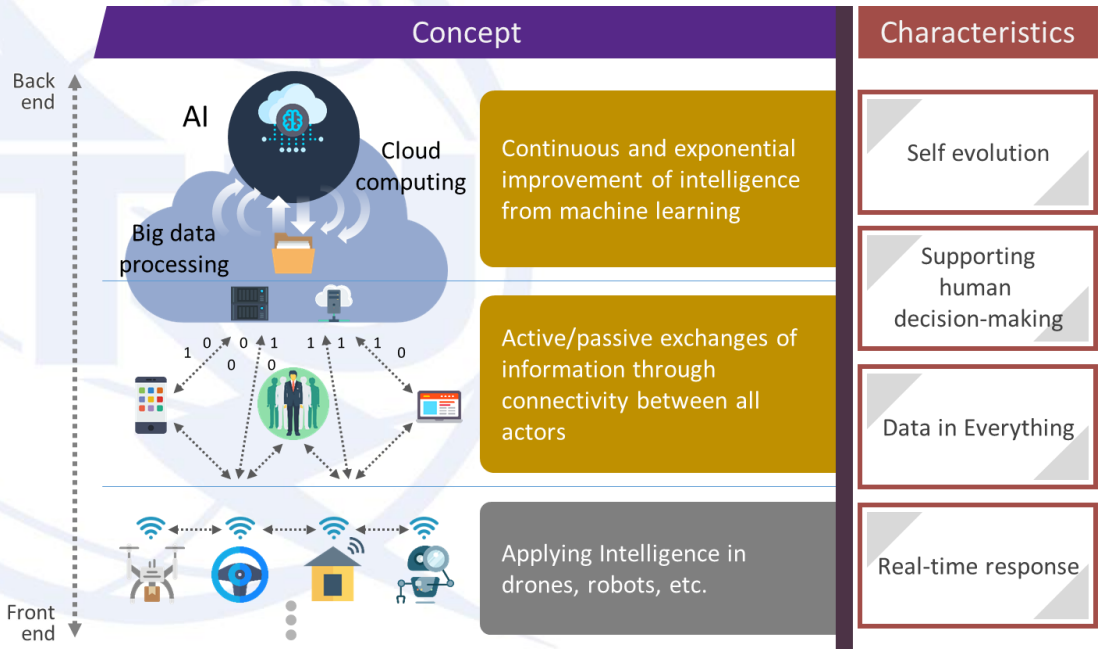
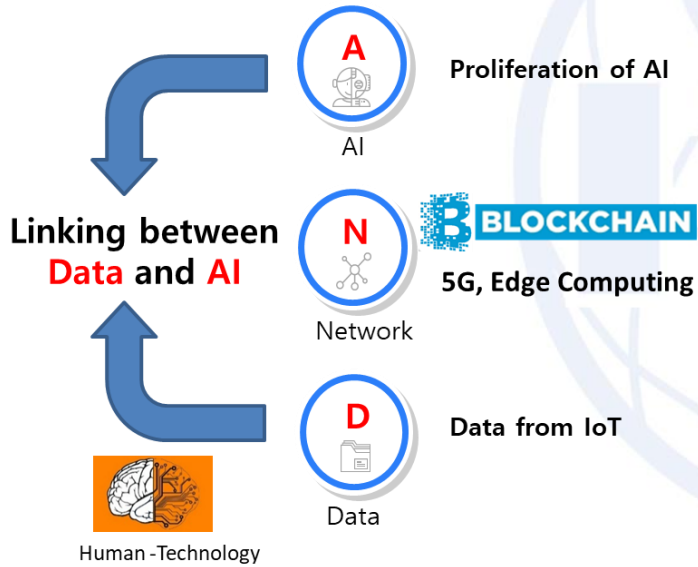
Point A: Trusted, and Processed data over the Trust and Data lifecycle dimensions, but not commercialised
Point B: Processed and commercialised data over the Data lifecycle and commercialisation dimensions, but not trusted
Point C: Trusted, Processed and commercialised data over the Trust, the Data lifecycle and commercialisation dimensions



Data – Network – AI (DNA)

“The combination of AI, data, and networks is beginning to emulate human intelligence.”

Driving Force for Changes



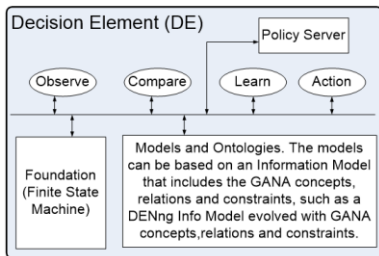
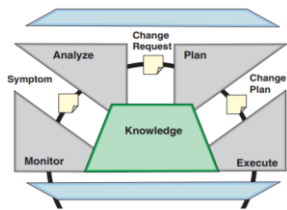
Potential Items for Future Work

- **DNA core technologies**
 - A new networking paradigm – Data-driven networking
 - DNA platform – Technology convergence (IoT+Big Data+Cloud+AI)
 - Data-Information-Knowledge-Wisdom (DIKW) process
- Use of AI in ICT infrastructures and services (**trustworthy autonomous ICT**)
 - Automative control and management in networking and services
 - Operational efficiency in Things + Processing + Communications + Storage
- Data-driven applications with AI (**linking between data and AI**)
- Security, privacy and trust including regulatory issues
 - **Trust in DNA**, particularly human-technology interface including social aspects

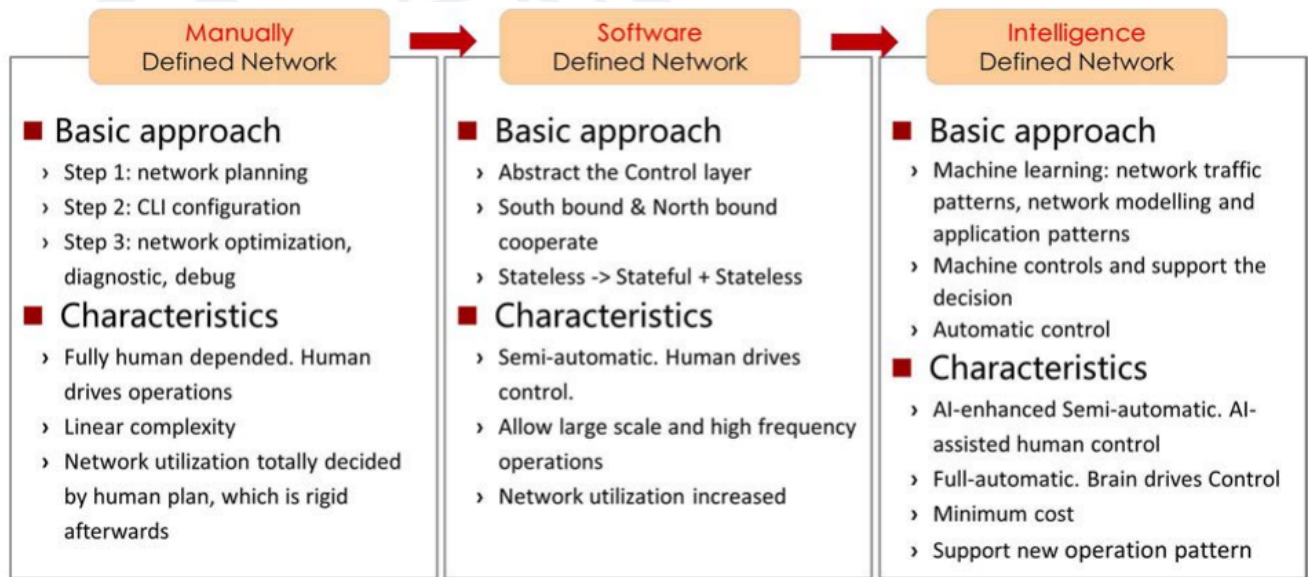
Key Topic – Computing and Networking Integration

- Data on the Edge and In-Network Computation
 - to improve network and application performance, agility, security, and privacy by better integration
- IRTF Research Group - **Computing in the Network (COIN)**

Key Topic – Intelligence Defined Networking



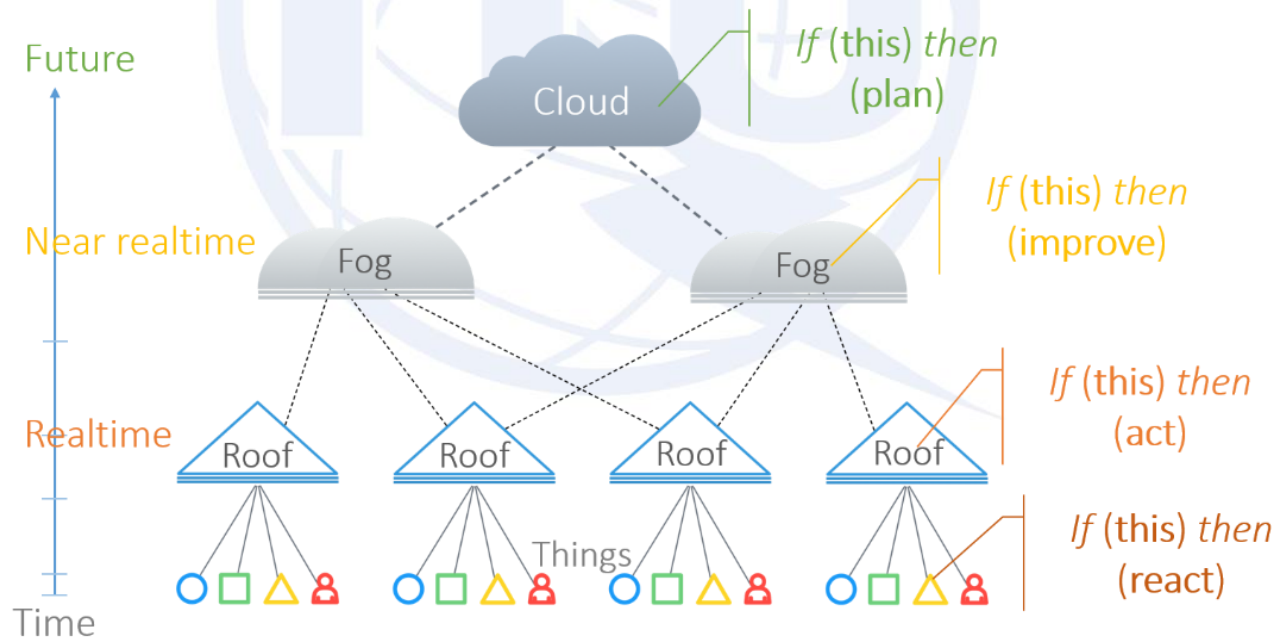
ETSI - GANA - Generic Autonomic Networking Architecture



- ETSI GR NGP 006 (06/18), ITU-T Y.3324 (12/18)

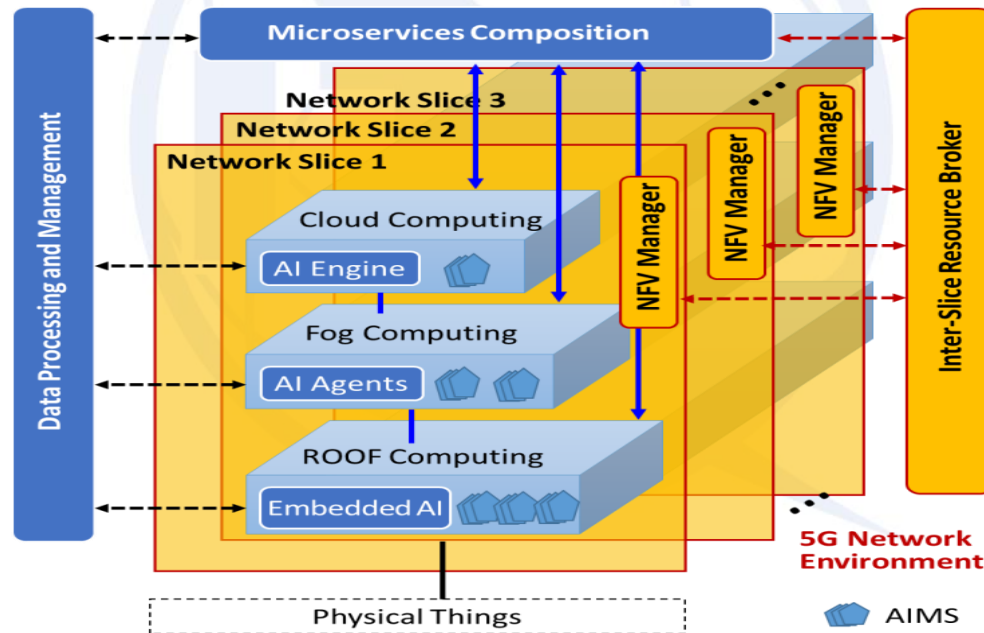
Key Topic – Distributed Intelligence

- Decision making hierarchy
 - Action (AI + Networking)
- Collaborative problem solving



An example - AIMS

- The ecosystem of microservices distributed across the ROOF-Fog-Cloud systems over 5G networks

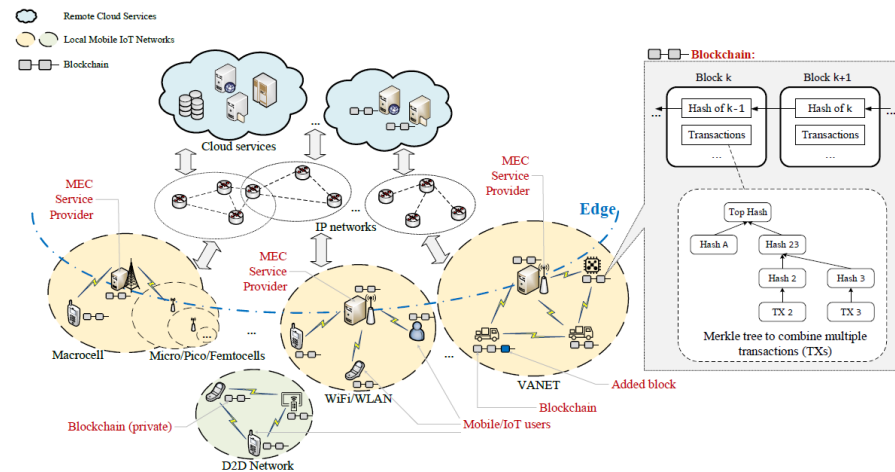


Source: Gyu Myoung Lee, Tai-Won Um, Jun Kyun Choi, "AI as Microservice (AIMS) over 5G networks," ITU Kaleidoscope 2018, November 2018. (Santa Fe, Argentina)

Key Topic - Internet of Blockchains

- Launch networks of individual and interoperable chains
- Enable programmers to innovate, allow for quick value transfers and seamless scalability

An example of MEC enabled Blockchain



INTERNET

Transfer information



TEXT



IMAGES



PROGRAMS



VIDEOS

BLOCKCHAIN

Transfer ownership



MONEY



CONTRACTS



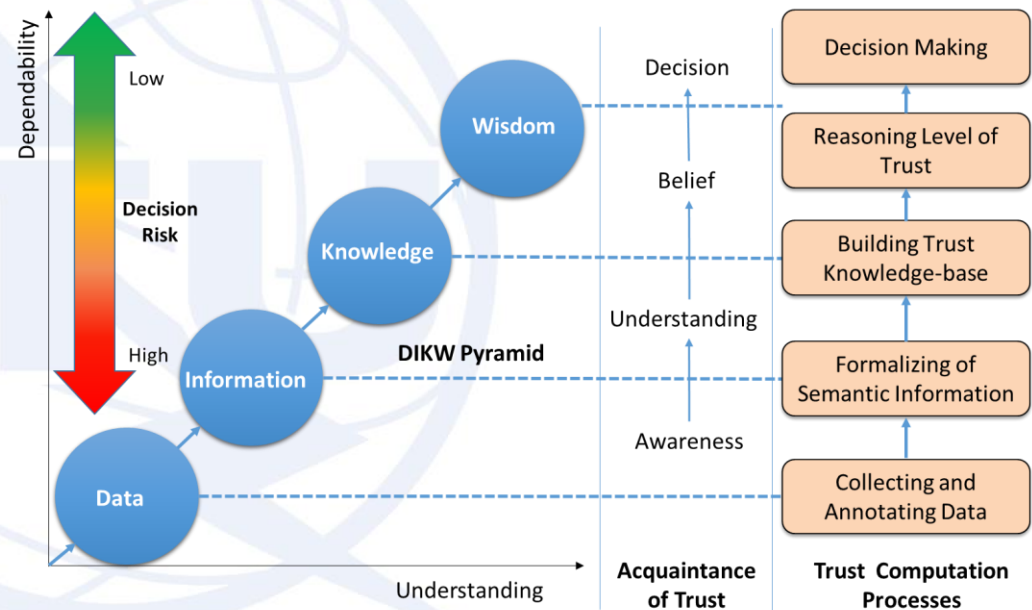
PATENTS



ASSETS

Key Topic - Trustworthiness

- Transparency
- Data protection
- Privacy preserving
- Policy and regulatory issues
- Ethics



Goal: Data and AI driven Infrastructure

- Trusted Decentralized Data Driven Networking and Services
- Hyper-Connected Distributed Intelligence

Strategic direction to be taken by ITU-T

- Maximize to use FG results
 - FG-ML5G (Machine Learning for Future Networks including 5G)
 - FG NET-2030 (Technologies for Network 2030)
- Restructuring
 - SG13 – a new group on Data and AI driven networking considering Network 2030
 - SG20 – a new Question on DPM and its applications
 - Coordination with other SGs (SG2, SG11, SG16 and SG17, etc.)



Questions for discussion

- How to identify challenging work items?
 - Gap analysis
- How to provide a good place?
 - Restructuring
- How to stimulate related activities?
 - Strategic direction and contribution driven
- How to collaborate and cooperate?
 - Liaison

Standardization of Data-Driven ICT

- Common features, but unlimited number of solutions



- Fregmentization
- Assembling

