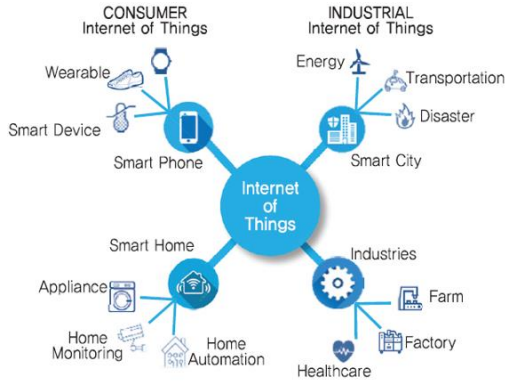
Data Processing and Management in Future Networks

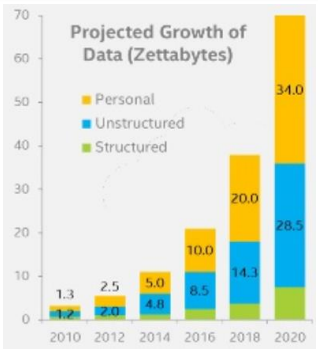
Gyu Myoung Lee (WP3/13 Co-Chair)

Data

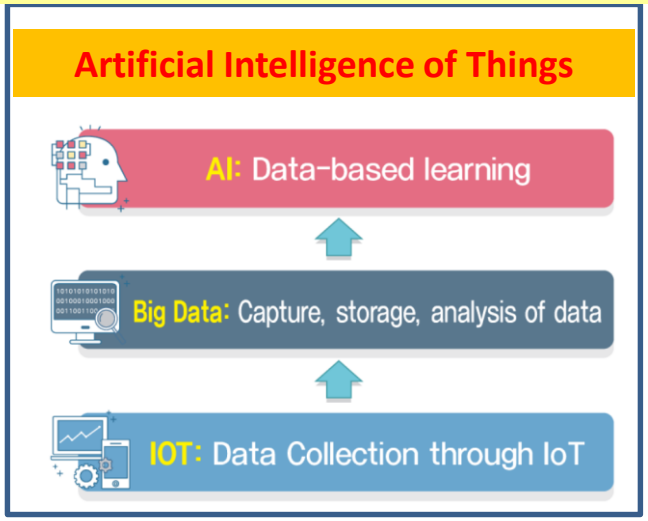
Extension of IoT Applications



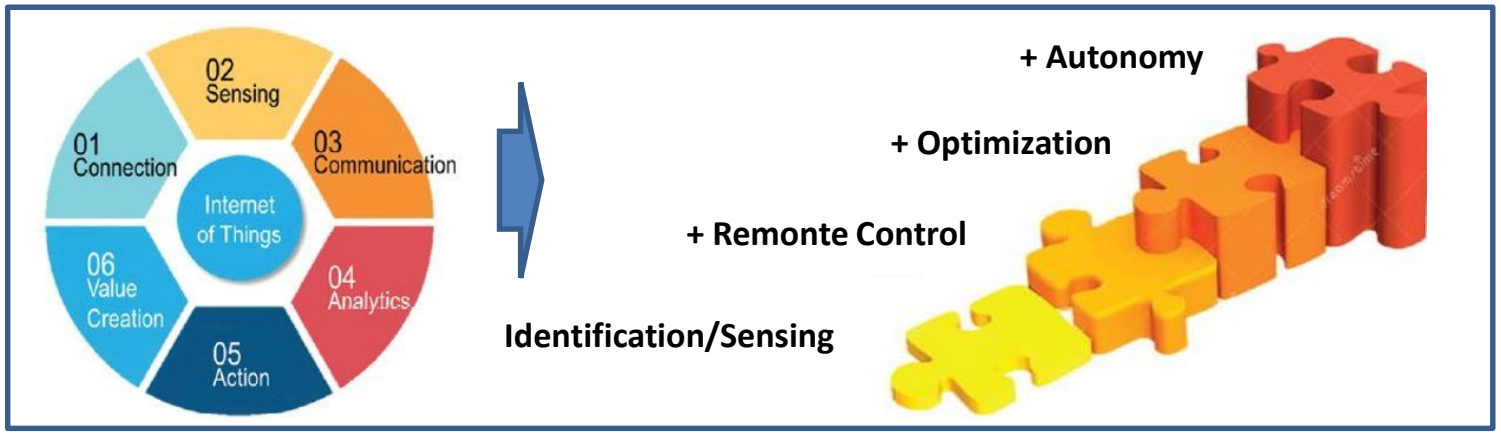
Data Explosion



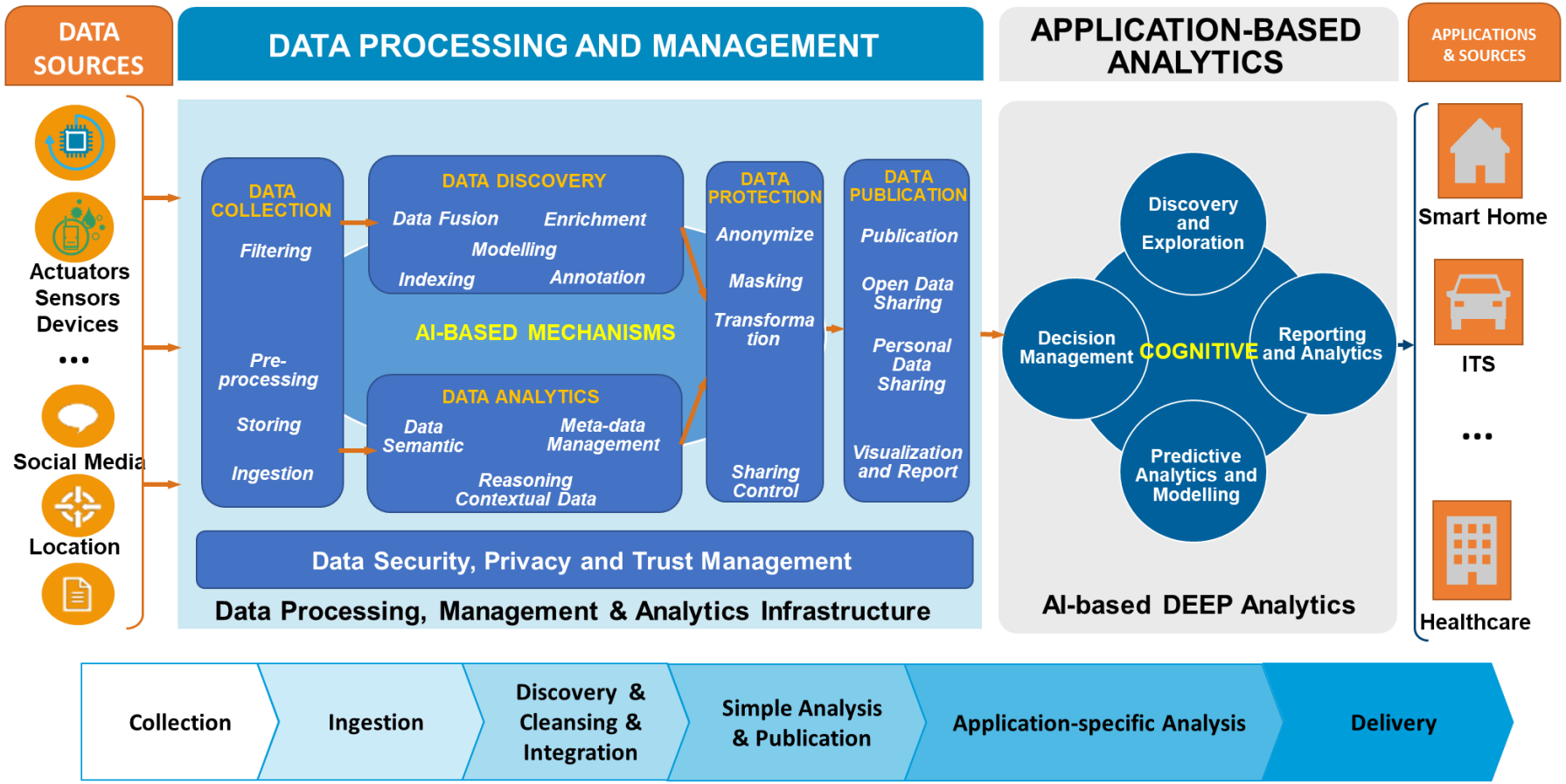
Leverage **the massive amount of data**



From Connecting Devices to Creating Value



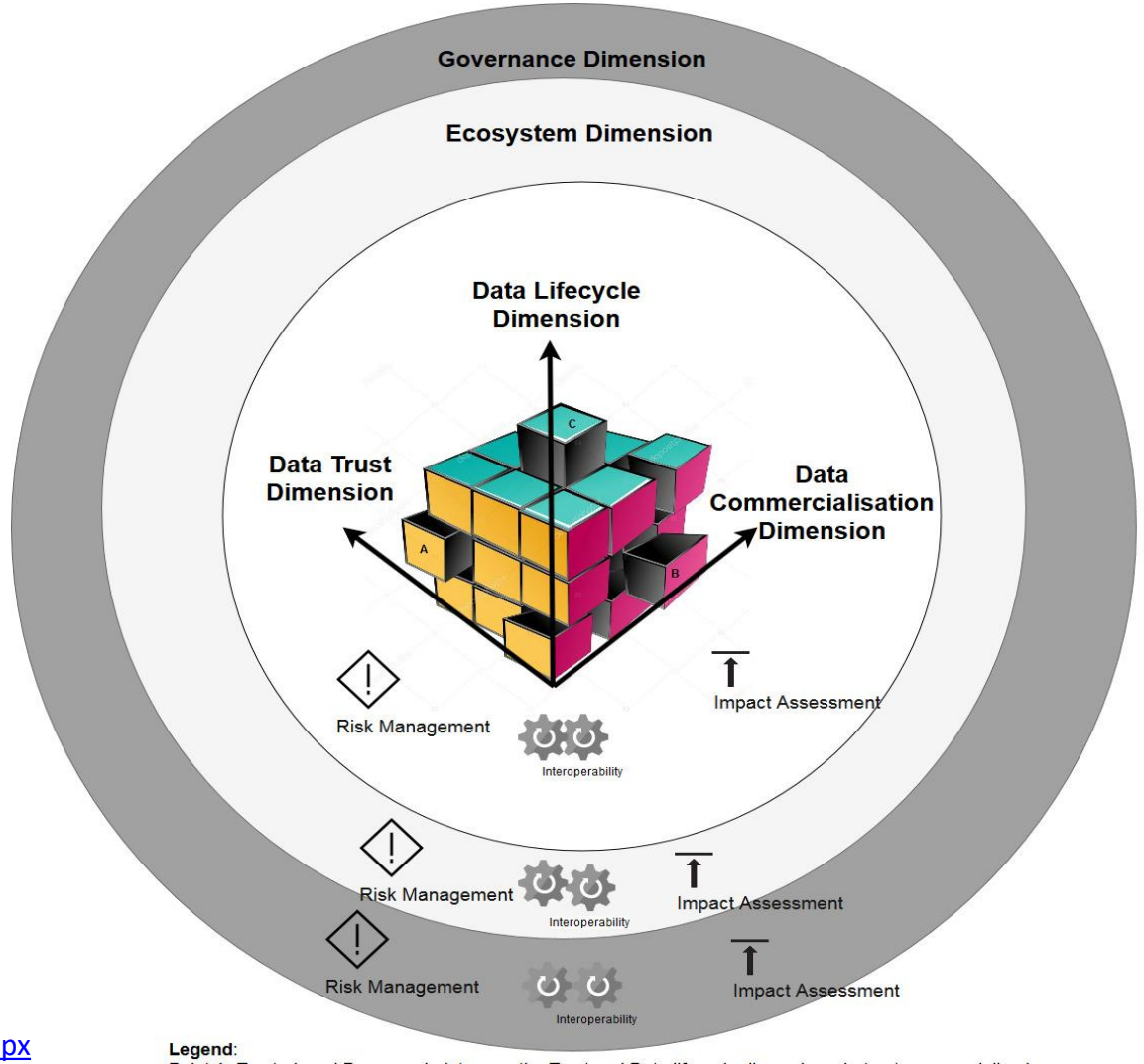
SG20 - Data-driven Artificiel Intelligence of Things (AIoT)



Lessons from ITU-T FG-DPM

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

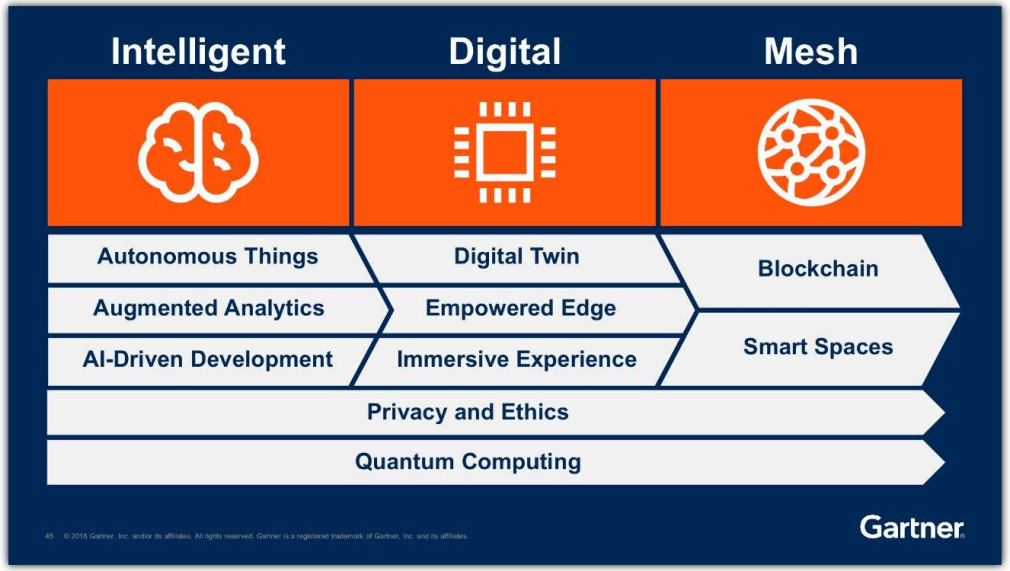
Total 15 Deliverables https://www.itu.int/en/ITU-T/focusgroups/dpm/Pages/default.aspx



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

Top 10 Strategic Technology Trends for 2019

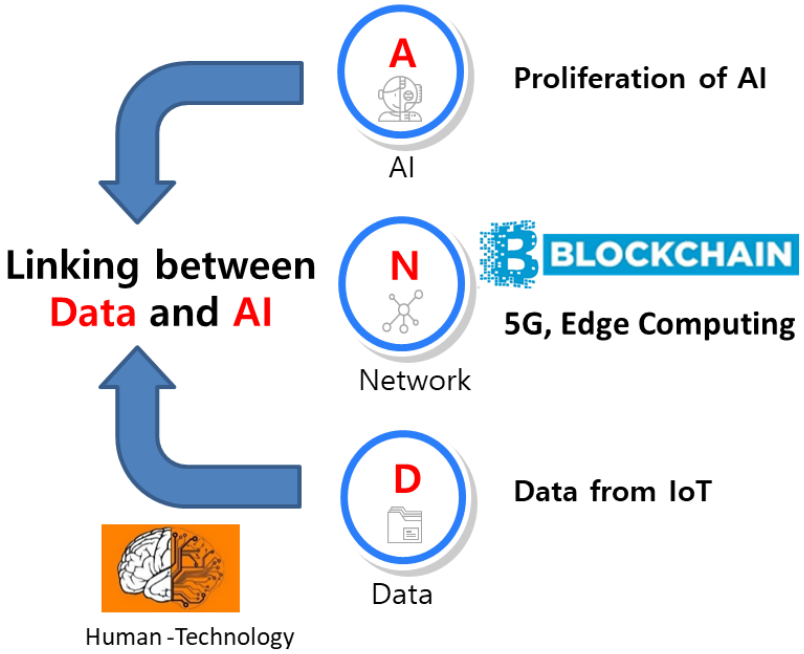
- IoT with Artificial Intelligence
- Edge Computing
- Blockchain technologies
  - New decentralized operating and distributed business models
  - Blockchain inspired approaches

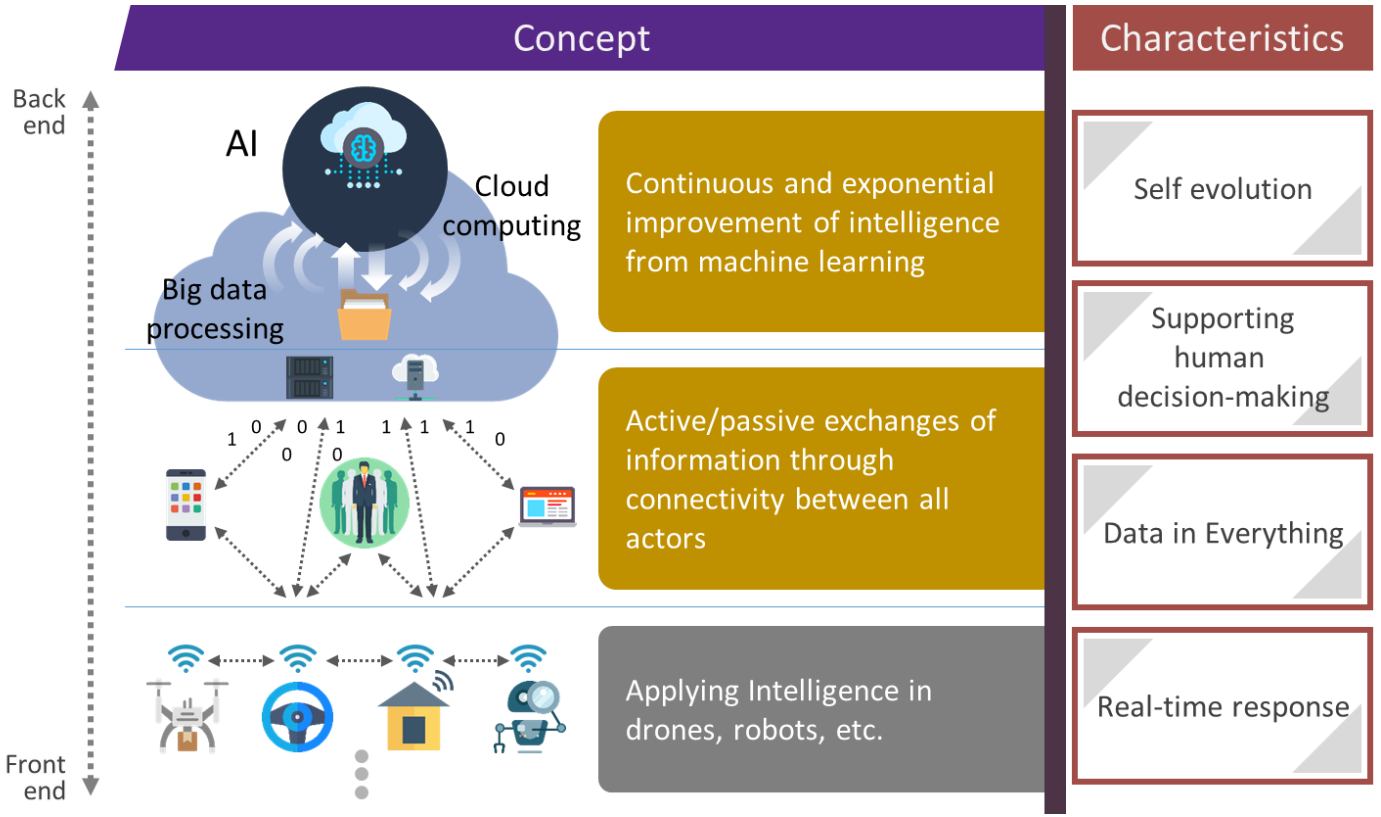


Data – Network – AI (DNA)

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

Driving Force for Changes



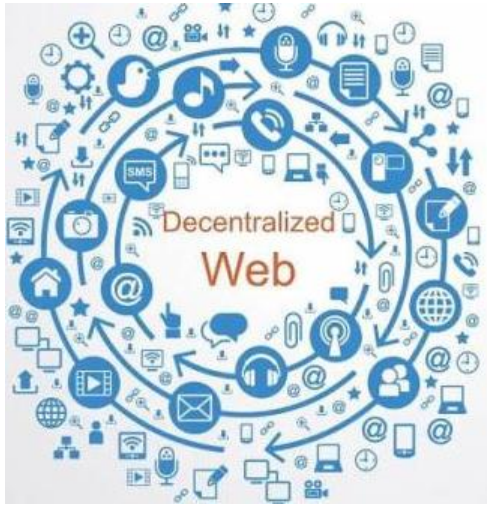


Decentralization

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?

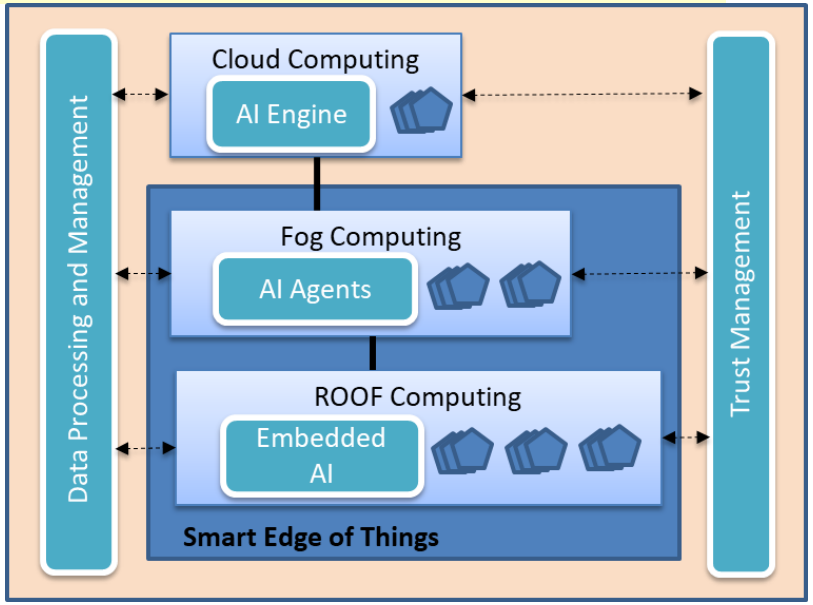
▲ Illustration: James Melaugh



Decentralized AI Platforms

- SingularityNET
- OpenMined
- Agorithmia DanKu
- Ocean

Distributed Computing - Edge Intelligence



NOTE - ROOF: Real-time Onsite Operations Facilitation

Potential Items for Future Work

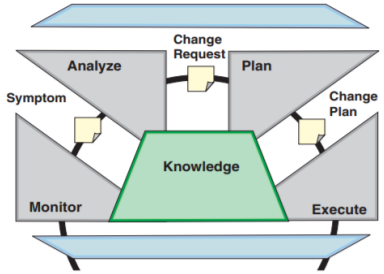
- **DNA core technologies**
  - A new networking paradigm – Data-driven networking
  - DNA platform – Technology convergence (IoT+Big Data+Cloud+AI)
  - Data-Information-Knowledge-Wisdom (DIKW) process
- Use of AI in ICT infrastructures and services (**trustworthy autonomous ICT**)
  - Automative control and management in networking and services
  - Operational efficiency in Things + Processing + Coomunications + Stroage
- 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

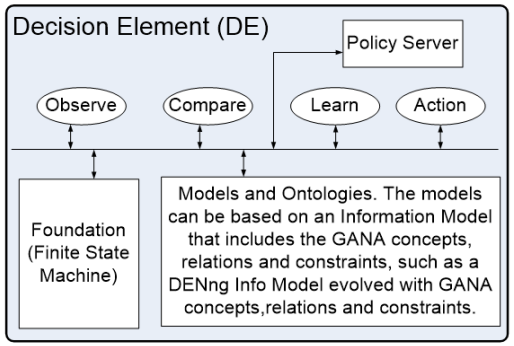
Key Topic – Computing and Networking Integration

- 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





ESTI - GANA - Generic Autonomic Networking Architecture

Manually Defined Network

- **Basic approach**
  - Step 1: network planning
  - Step 2: CLI configuration
  - Step 3: network optimization, diagnostic, debug
- **Characteristics**
  - Fully human depended. Human drives operations
  - Linear complexity
  - Network utilization totally decided by human plan, which is rigid afterwards

Software Defined Network

- **Basic approach**
  - Abstract the Control layer
  - South bound & North bound cooperate
  - Stateless -> Stateful + Stateless
- **Characteristics**
  - Semi-automatic. Human drives control.
  - Allow large scale and high frequency operations
  - Network utilization increased

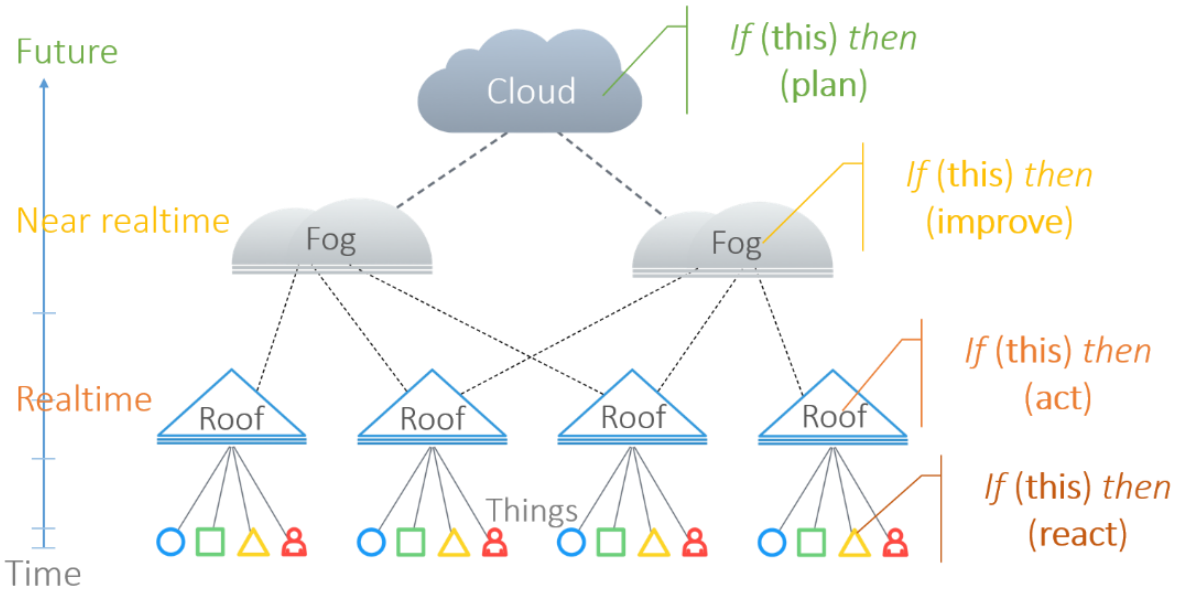
Intelligence Defined Network

- **Basic approach**
  - Machine learning: network traffic patterns, network modelling and application patterns
  - Machine controls and support the decision
  - Automatic control
- **Characteristics**
  - AI-enhanced Semi-automatic. AI-assisted human control
  - Full-automatic. Brain drives Control
  - Minimum cost
  - Support new operation pattern

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

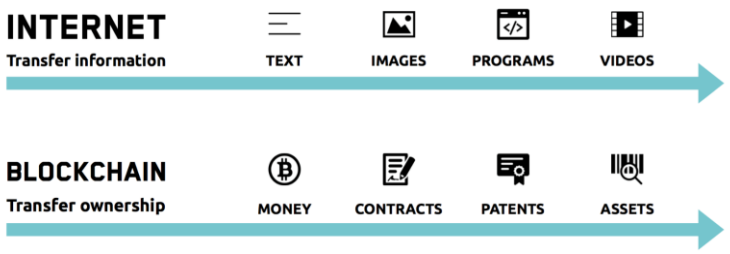
Key Topic – Distributed Intelligence

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

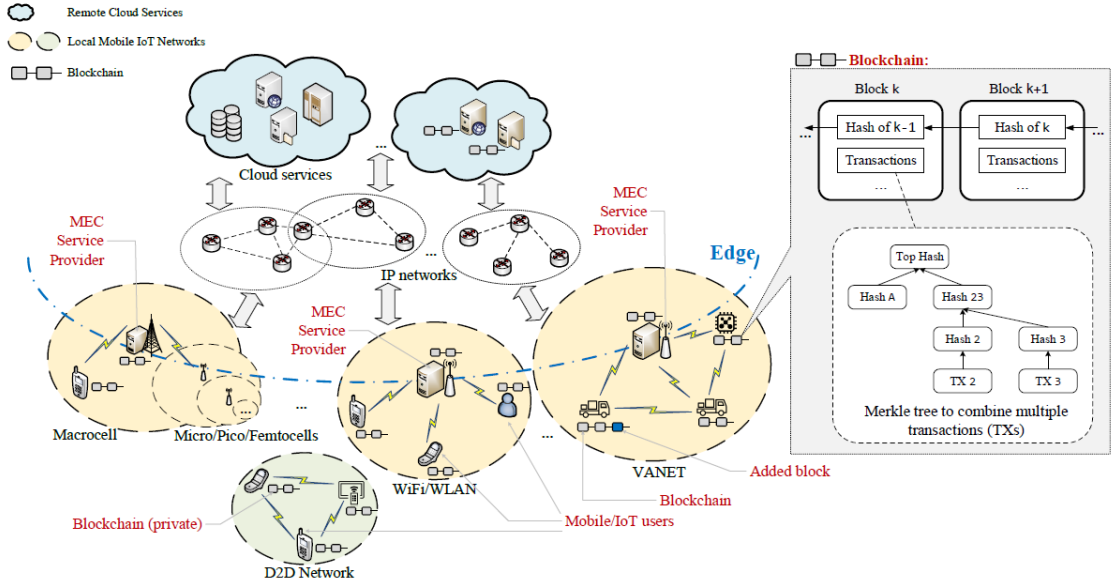


Key Topic - Internet of Blockchains

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

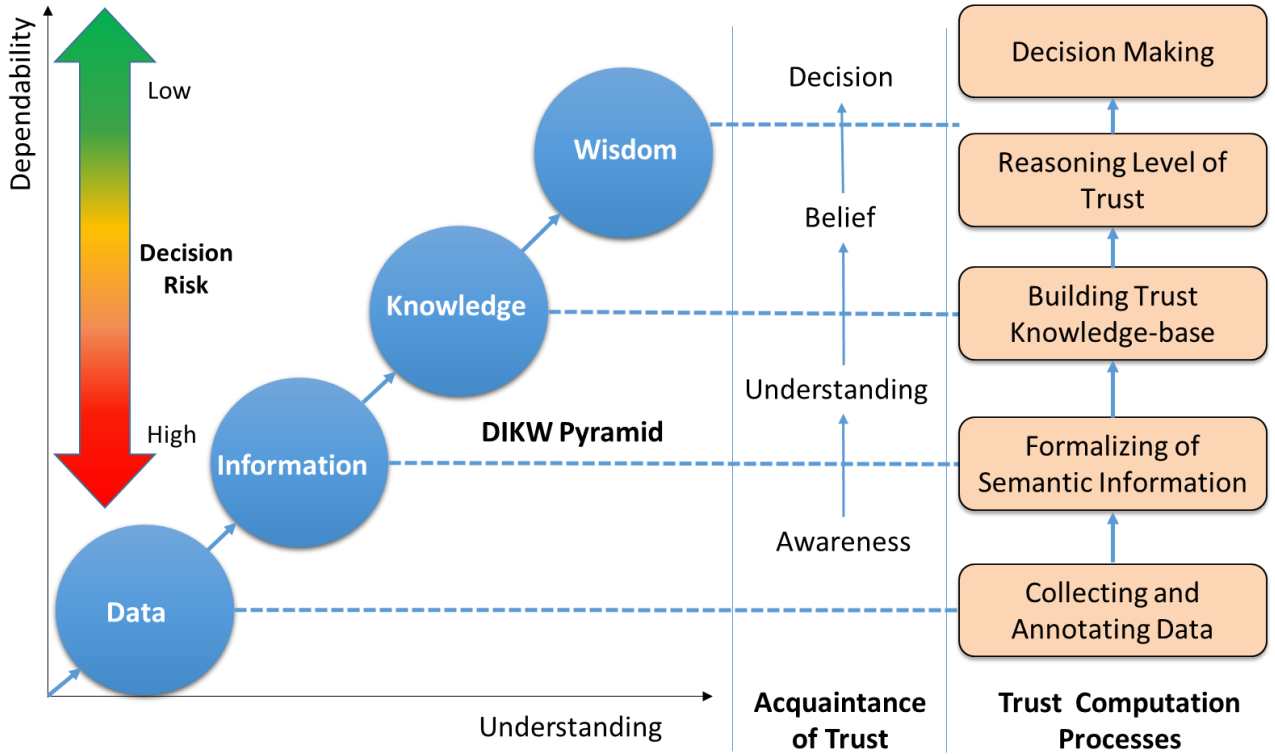


An example of MEC enabled Blockchain



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 AI applications
  - Coordination with other SGs (SG2, SG11, SG16 and SG17, etc.)

Questions for SGLA discussion

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

Standardization of Data-Driven ICT

- Common features, but unlimited number of solutions

- Fregmentization
- Assembling