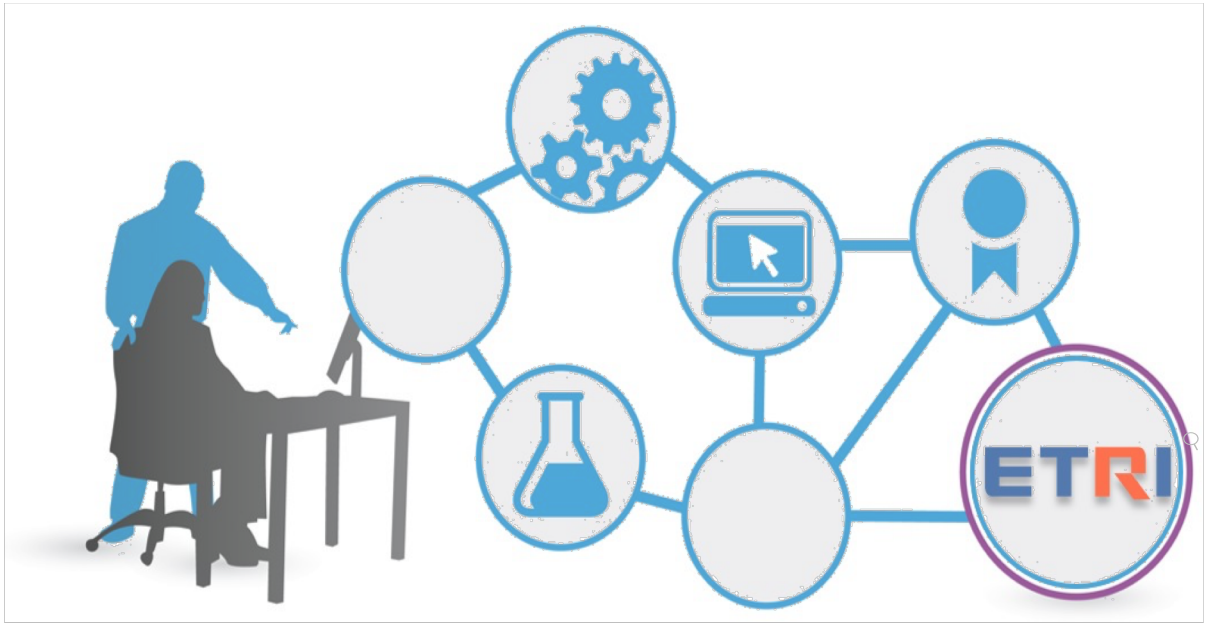
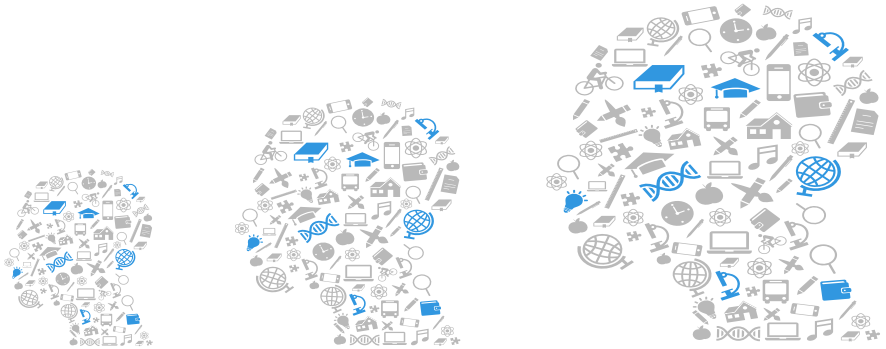
What is beyond Hyper-Connectivity?



2019. 3. 26.

Dong-Seung Kwon, Ph.D



Considerations

Hyper-Connectivity

- Average number of connected devices, per person, is 13
- Global number of Internet connected devices reaches 109,200,000,000
- Global Internet traffic grows to 708 exabytes per month
  * 2014 : 42 exabytes per month
- Calculations per second, per $1,000, equals 10^{17} (one human brain)

Future Cities: Everything Connected & Safe

Our future is urban:
New technologies set to transform our future cities

Autonomous Vehicles: Realtime Mission-Critical

Share of global car sales taken by autonomous vehicles equals 20% and flying cars hit the road and the air

Holograms & UI: Ultra-Broadband

Holograms with more natural and intuitive gesture UI (gesture, speech and matrix-style mind uploading)

Connectivity

Degrees of connectedness in IoT from IBM [2]

(1) Things are connected when the devices are attached to the Internet or private network, can exchange data and are uniquely addressable.
(2) Things are interconnected when they can interact with each other and with decision agents via the Internet or private network.
(3) Things are intelligently interconnected when the data is parsed into analytic or AI-based algorithms for autonomous decision making and to drive more efficient machine-to-human interaction.

Intelligent Connectivity: the sum of the systems, services and technologies connecting people, data and infrastructure. [1]

Intelligent Connectivity unites a broad range of emerging technologies to enable smarter, healthier, more resilient and economically vibrant urban life.

Raised the following four issues based on the scenarios

Usership vs Ownership, Realtime Data Ecosystem, Bridging the Digital Divide, Safe Travels

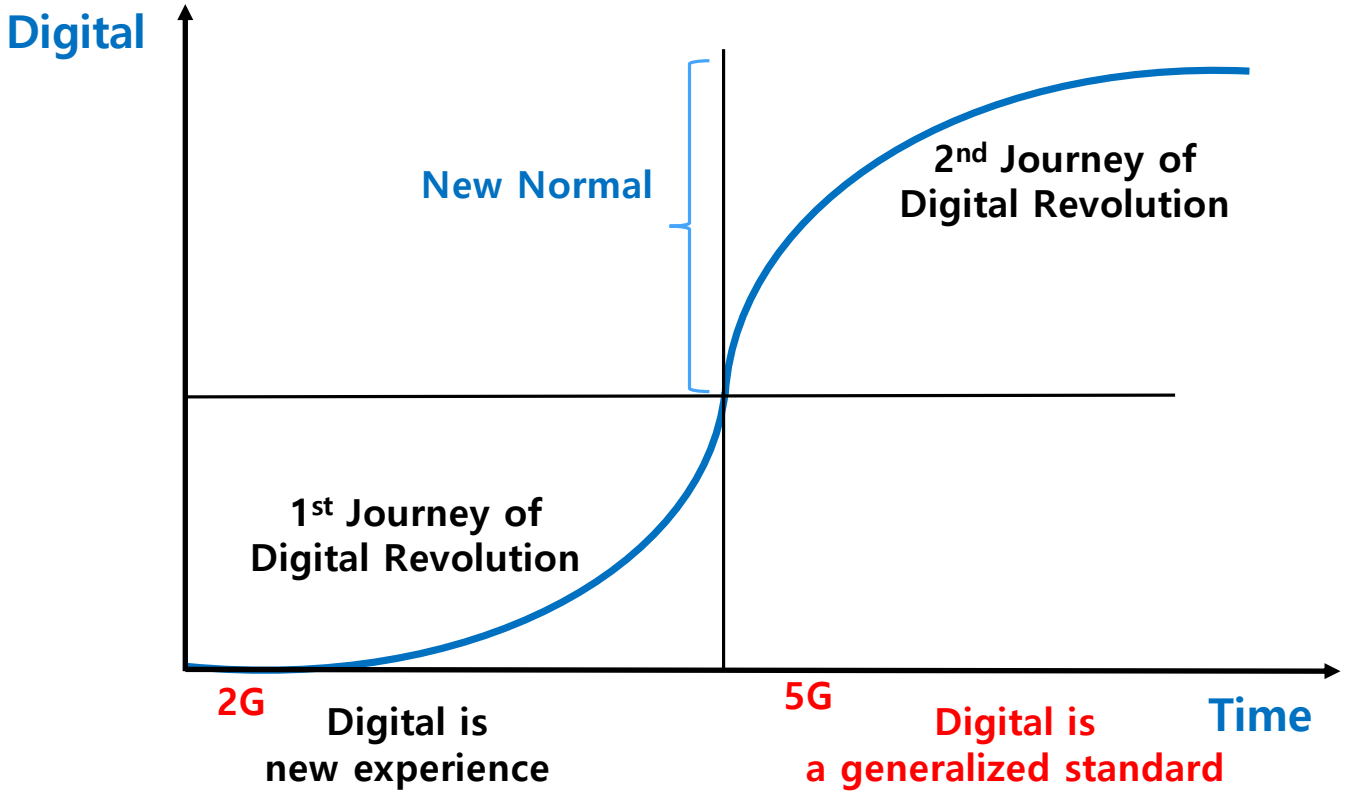
The combination of 5G, artificial intelligence (AI), smart platforms and the Internet of Things (IoT) form the basis of what we call 'Intelligent Connectivity'. [3]

Intelligent Connectivity takes this further and marks the beginning of an era of highly contextualised and personalised experiences, underpinned by ubiquitous hyper connectivity.

(1) "Intelligent Connectivity for Seamless Urban Mobility," Arup with Qualcomm, 2015
(2) "Intelligent connections – Reinventing enterprises with Intelligent IoT" Global C-suite study 19th edition, IBM Institute for Business Value, 2018
(3) "Intelligent Connectivity," GSMA, Feb. 2019

The New Normal: Explore the limits of the digital world

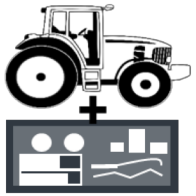
<Peter Hinssen 2011>



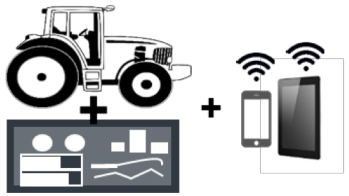
Technology	Information	Thirst for knowledge from the sea of information
Data	Intelligence	Genuine information in accordance with the specific situation analysis
Connectivity	Integration	Ability to connect systems smarter

Digital Transformation

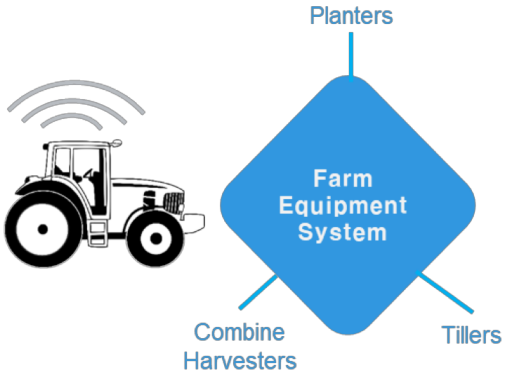
1. Product



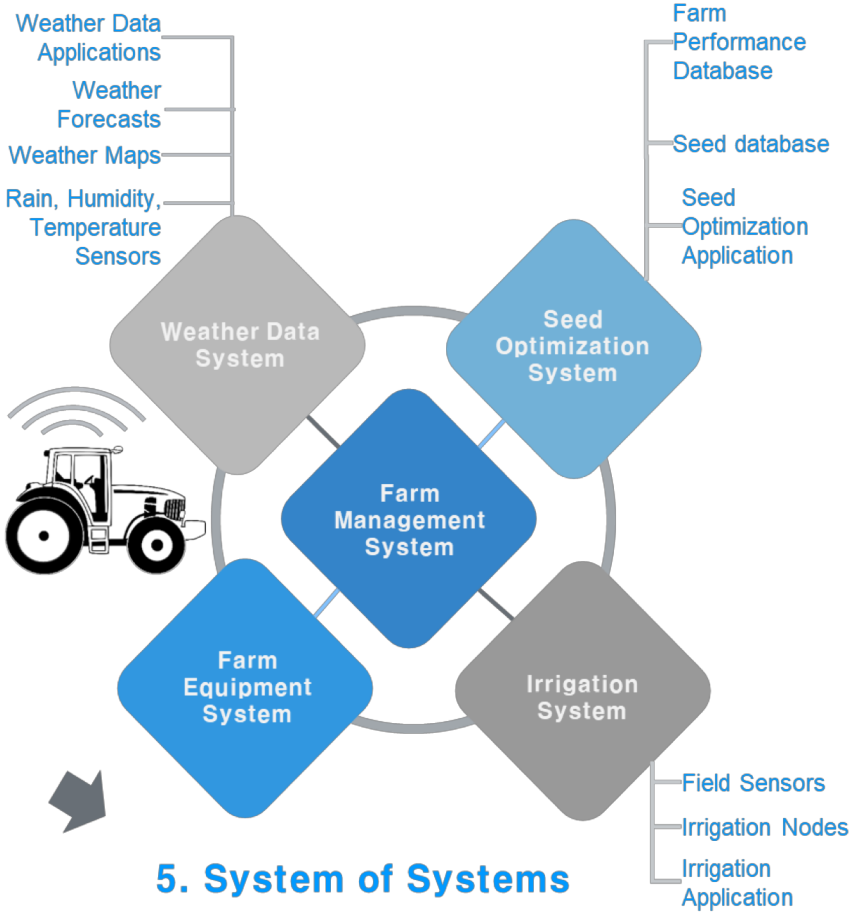
2. Smart Product



3. Smart, Connected Product



4. Product System

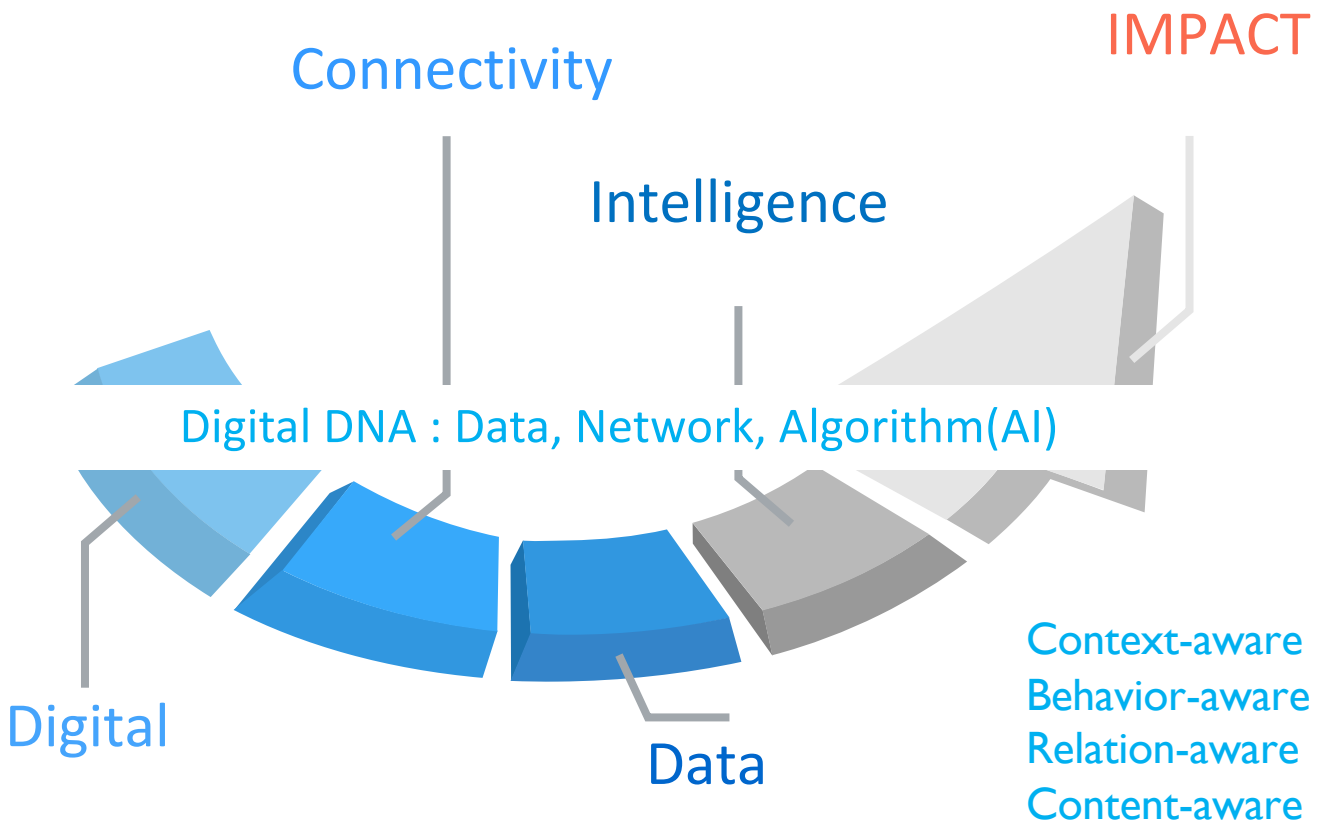


5. System of Systems

How Smart, Connected Products Are Transforming Competition, Michael E. Porter, James E. Heppelmann
(출처 : Harvard Business Review, THE NOVEMBER 2014 ISSUE)

Digital Transformation

Digital transformation is the profound transformation of business and organizational activities, processes, competencies and models to **fully leverage the changes and opportunities of a mix of digital technologies and their accelerating impact across society in a strategic and prioritized way**, with present and future shifts in mind.



"Future Internet 2020: visions of an industry expert group,"

<European Commission - Information Society and Media, May 2009>

How the Future Internet could shape the lives of all Europeans in or around 2020 based on the following future scenarios

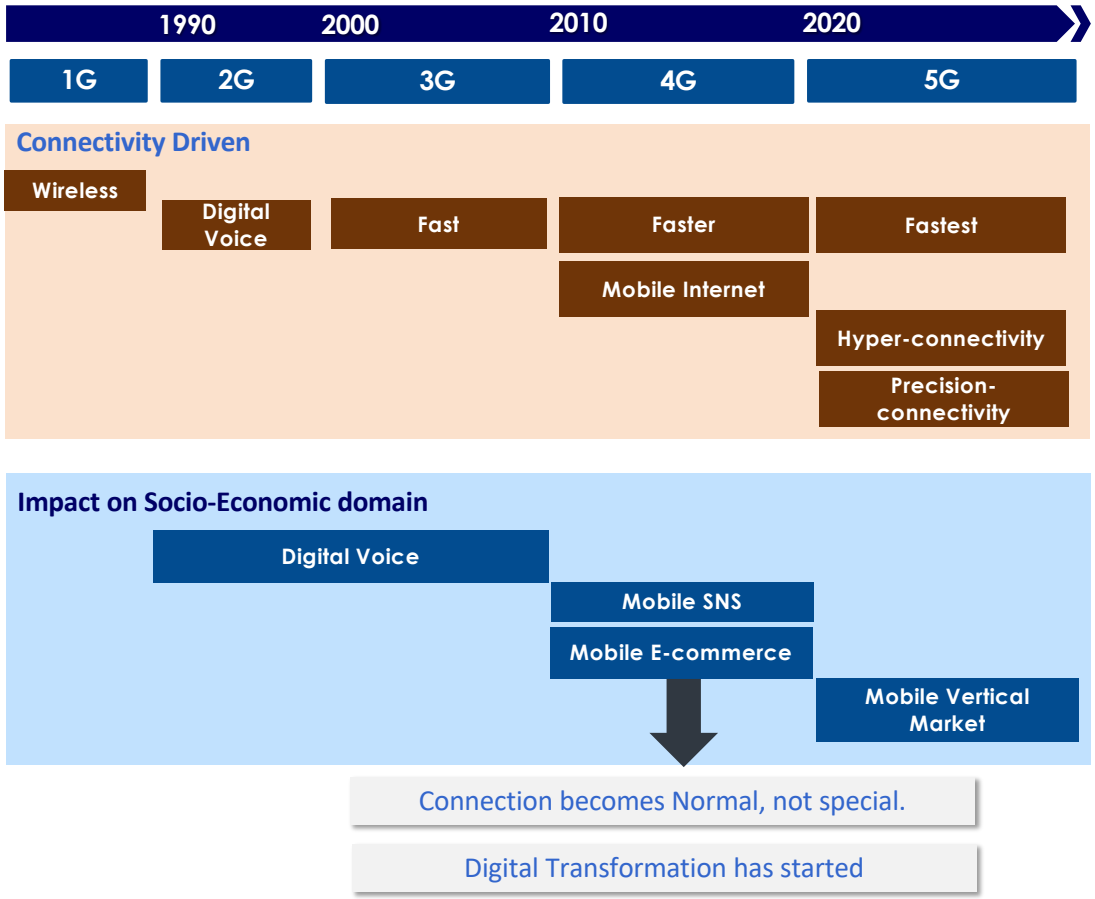
- Life On The Net: The personal global network
  Network 2020: Information on the move
- The Market Of One: The web-based service economy
  Pierre Goes to the Gym, Like My car? I Designed It Myself,
- Atoms and Bits: An Internet with Things
  The smith Family goes Skiing, Talking to the Laundry, The Personal Mash-up
- Pushing the Horizon: New Regulatory Spaces
  My Personal Blackbox

The suggested key issues are not currently solved today.

Going beyond the limits of current technology

(1) The internet was never designed as a general communications infrastructure.
(2) Seamless connectivity that spans from the personal to the global level
(3) Technique to handle the data deluge
(4) System-wide trust and security
(5) Long-term digital storage
(6) Personalization

Retrospection on Mobile Communication



Expected Issues by Hyper-Connectivity

- Is 5G sufficiently robust to support autonomous everything with mobility?
  Realtime insights and on-the-spot actions
- Intelligent and/or trustworthy connectivity?
  How many data do you have, but how do you get reliable and trustable data?
- Secured data? Usership vs. Ownership
- How to protect the attack surface that is extended by hyper-connectivity?
- Privacy, personalized service
  In a perfectly transparent and perfectly connected future society, how can you safeguard your information?
- How will the complexity of hyper-connectivity be managed?

What will be the next connectivity for IDX (Intelligent Digital Transformation)?
Data Driven? Intelligence Driven?

Way-forward : Vision 2030

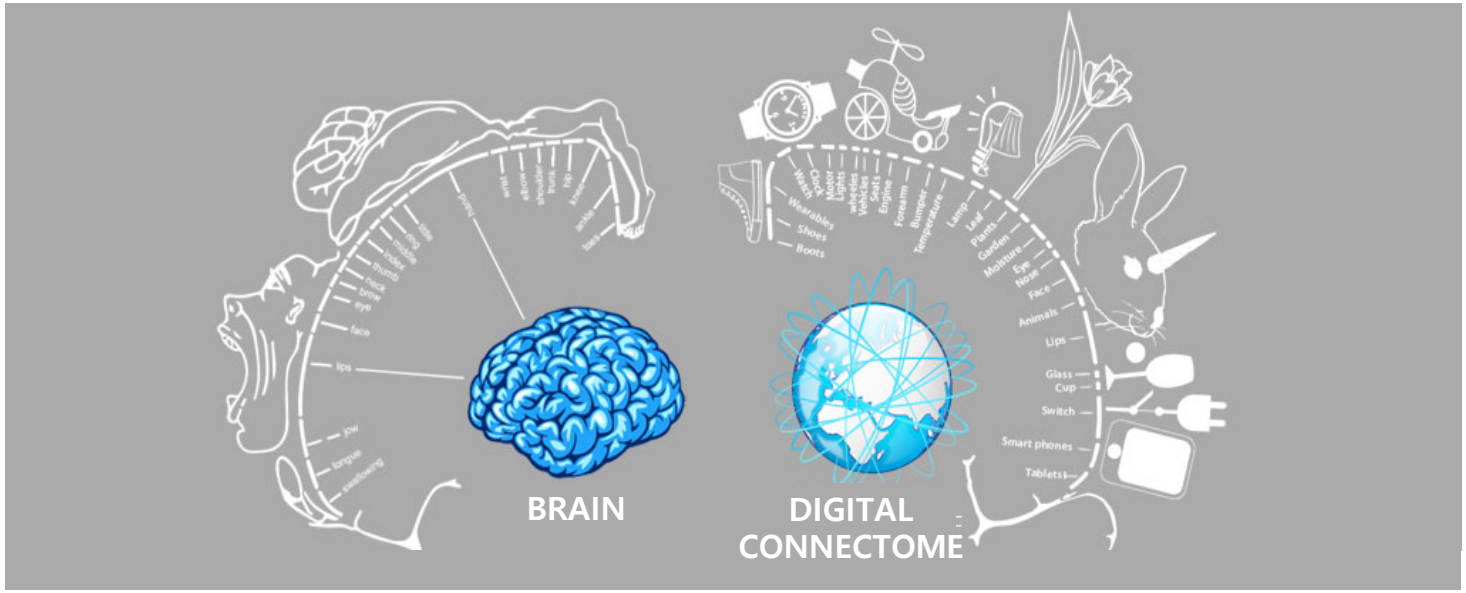
Direction

In the future society it is predicted that
the boundary between man and machine,
the boundary between production and consumption
and the boundaries between physical and digital worlds will be broken,
and new industrial, economic and social systems will emerge.

The greatest change of the future Internet has the ability to learn
how to interpret, guess and predict.
(Wired for Thought)

It is essential to connect a large-scale world without limits,
to secure a reliable connection,
and to provide autonomous and intelligent services.

Digital Connectome*



* Connectome Technologies Inc.,

Connectome: Comprehensive map of neural connections in the brain

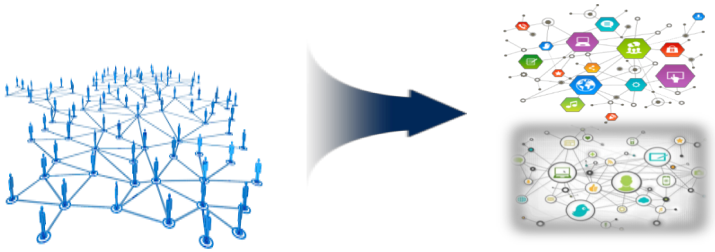
Digital Connectome: maps the flow of information through all the connections of the internet

As complexity within the Digital Connectome continues to increase (hyper-connected)
– as more and more people, objects and increasingly intelligent software agents become connected –
we will undoubtedly see many new phenomena emerge.

A view on the future changes and issues

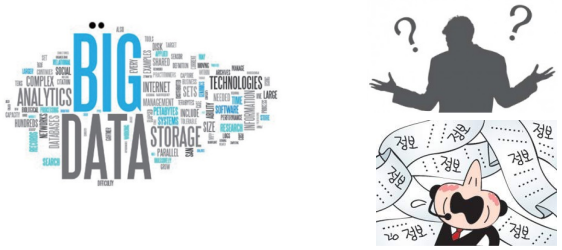
Information society ➔ Intelligent information society

Extension of connected objects



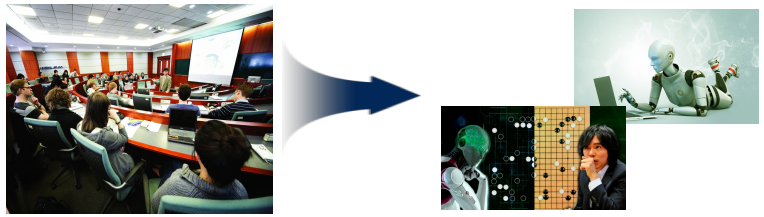
- 5 BillionsThing/Machine/Process centric Massive Connectivity
- How to connect with safe and trustworthy manner?

Flood of information



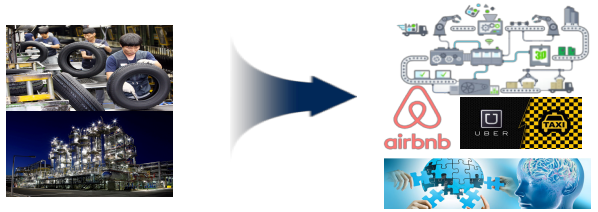
- Ultra information generated by massive Connectivity
- How to satisfy user's personalized needs ?

Increased complexity of interaction



- Emergent of novel industry through convergence of hyper-connectivity and intelligence
- How to converge?

Adverse effect of Digitalization

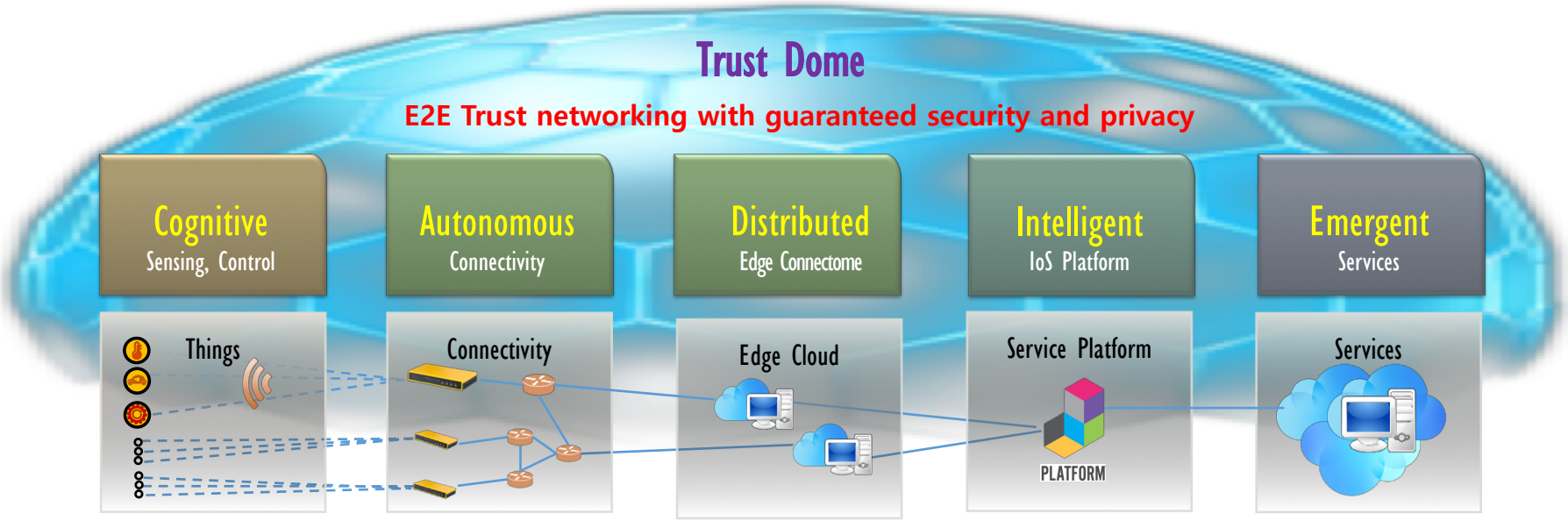


- Changing from traditional economy to autonomous economy on cyber world
- How to guarantee privacy and security ?

Ultra-high speed Networking ➔ Hyper-connected Intelligent Networking

Hyper-connected Intelligent Platform

As the human brain and all the neurons are densely inter-connected to each other (Connectome), people and everything (space, creature, information, business, intelligent agent and objects) communicate and interact with each other at the desired exact time.



- Smart data generation
- Context control

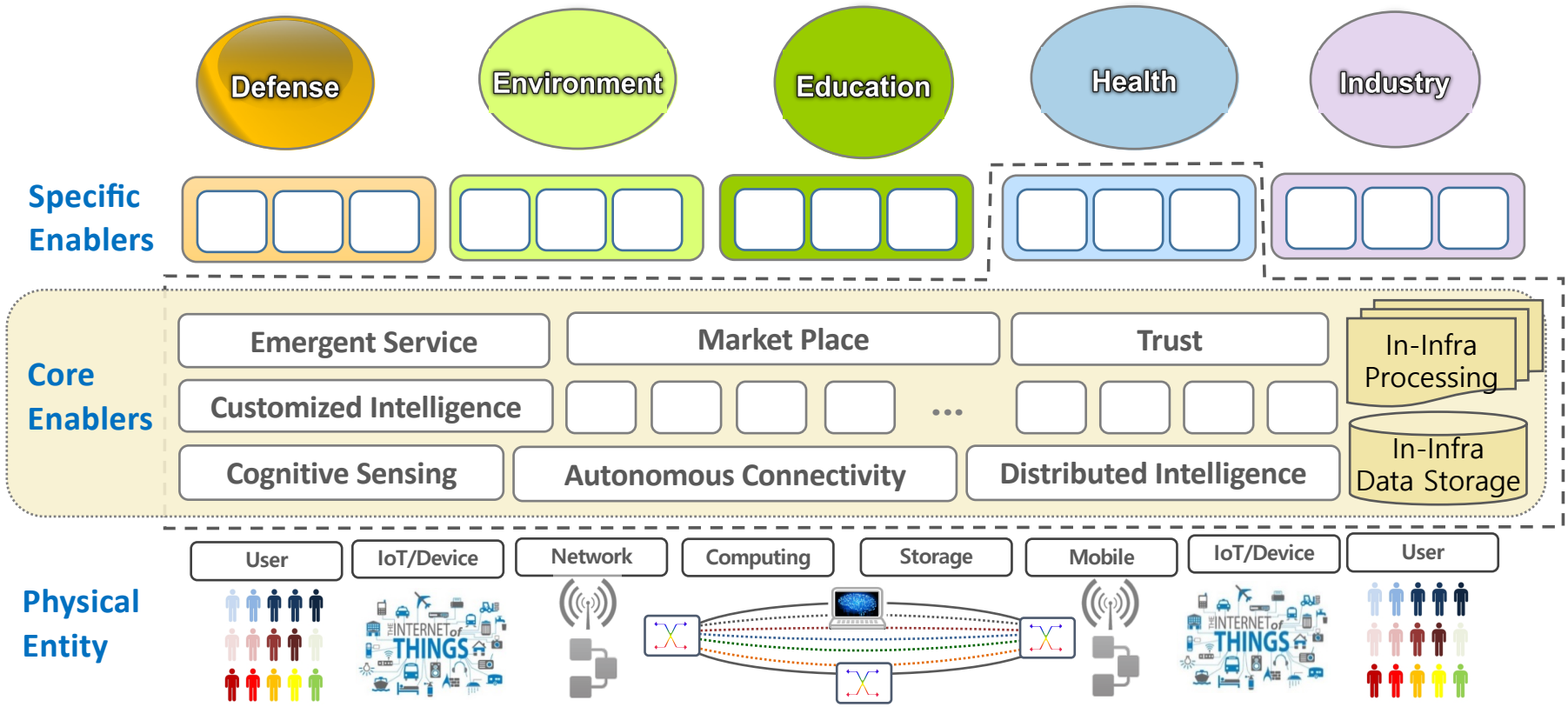
- Autonomous Networking
- Zero Jitter delay
- Layer disruptive protocol

- Intelligent Distributed computing

- Self-learning and autonomous intelligent platform

- For Vertical industry

Hyper-connected Intelligent Platform

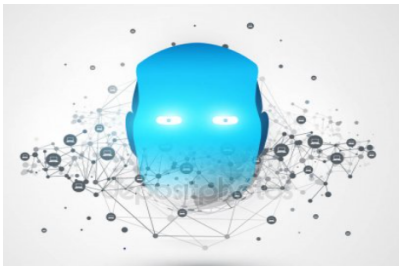


Hyper-connected Intelligent Infrastructure

AS-IS — Capacity and Speed — Intelligence and Trust — TO-BE

1. Zero-Limit connectivity

- Unlimited connectivity
- Extend the connectivity into underwater, underground and aerial space

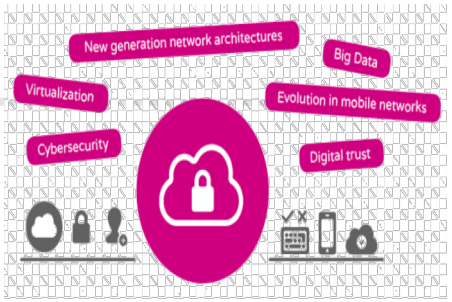


2. Network Intelligence

Autonomy without human intervention

- Network autonomously connects, controls, and evolves by itself

3. Trust Infra



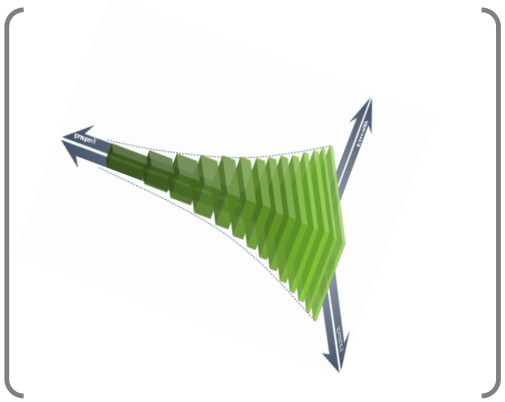
Security and privacy inherent in everything

- A super-trust infrastructure that implements security intelligence in all areas and ensures the distributed secure transactions autonomously.

Zero-Limit connectivity

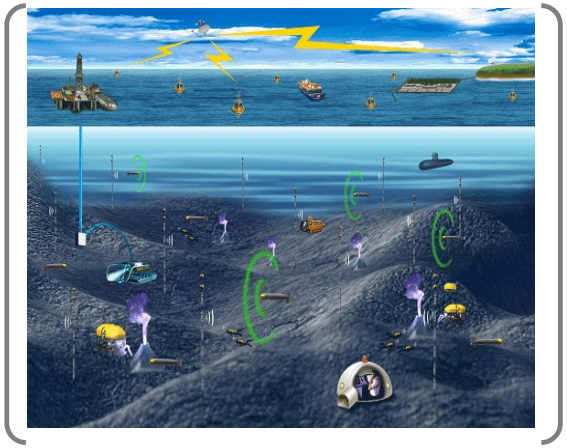
Connectivity without restriction of resource, space and experience.

Resources



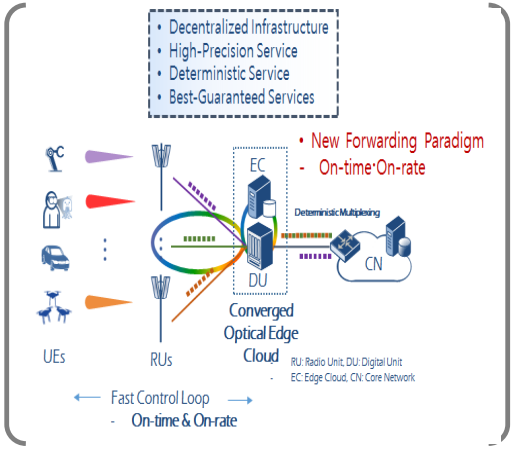
Overcome the resource limit of frequency, delay, capacity, energy regardless of the situation

Space



Extend connection space from ground to underground, underwater and air

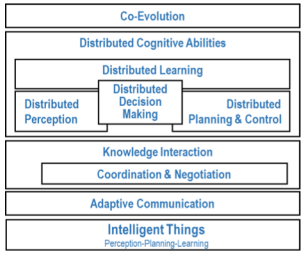
QoE



Paradigm shift from overcoming network limit to overcoming limit of user experience

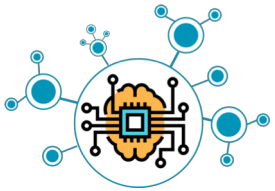
Network Intelligence

Thinking Internet that enables large-scale wired and wireless network resources, data, SW, and objects to autonomously connect and control according to the situation, to perform mission through distributed cooperation among intelligent objects, and to evolve by itself



Distributed Collaborative Intelligence

Distributed Collaborative Intelligence, which helps autonomously perform and grow a given task through collaborations between intelligent things in a hyper-connected environment

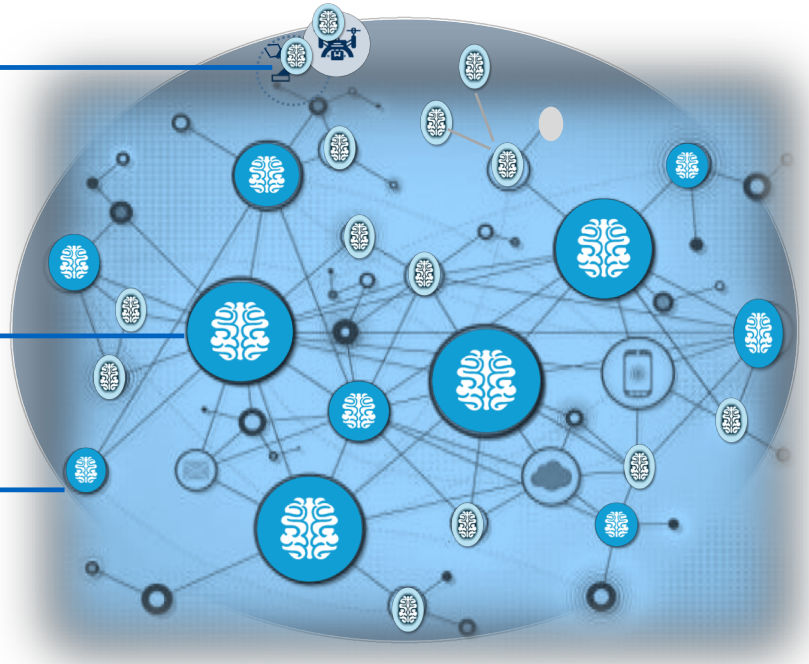


Autonomous Network

Autonomous networks that autonomously control and manage data-centric networks by applying AI technology to large-scale wired and wireless network infrastructures

Intelligent Edge

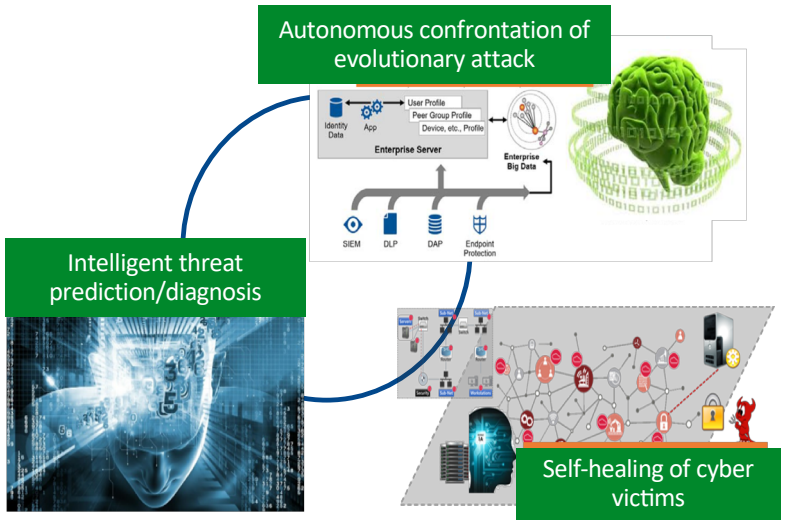
Super-dispersive real-time intelligent edge that enables self-awareness, judgment, real-time response, data accumulation, and autonomous learning at the edge



Trust Infra : Security and Privacy by design

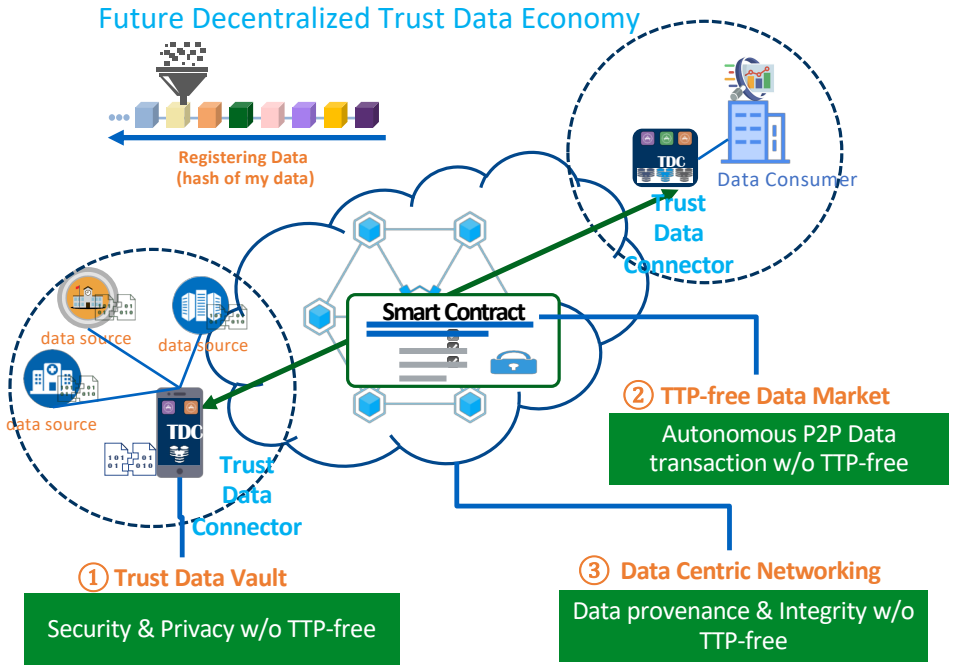
In order to prevent digital dysfunctions such as cyber threat increase and trust system collapse, security intelligence is embedded in all areas and distributed and autonomous trust management

Intelligent Security that blocks cyber threats



Autonomous hacking defense technology against AI hackers

Trust data connectome for realizing data safe society



TTP-free trust technology for data sovereignty and safe exchange

감사합니다!