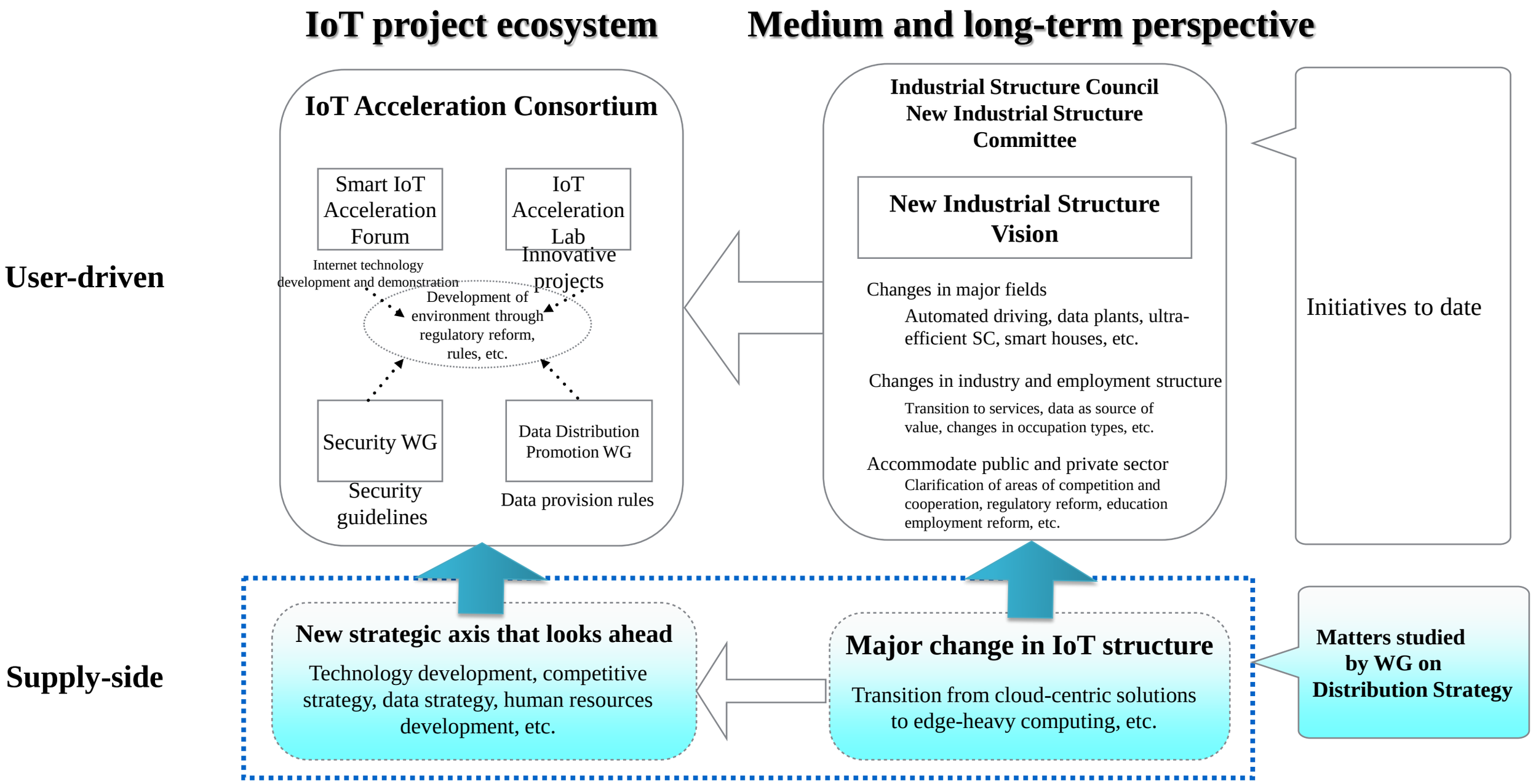
Information Economy Subcommittee, Industrial Structure Council

Overview of Interim Summary of WG on Distribution Strategy

November 2016

Background and positioning of discussions

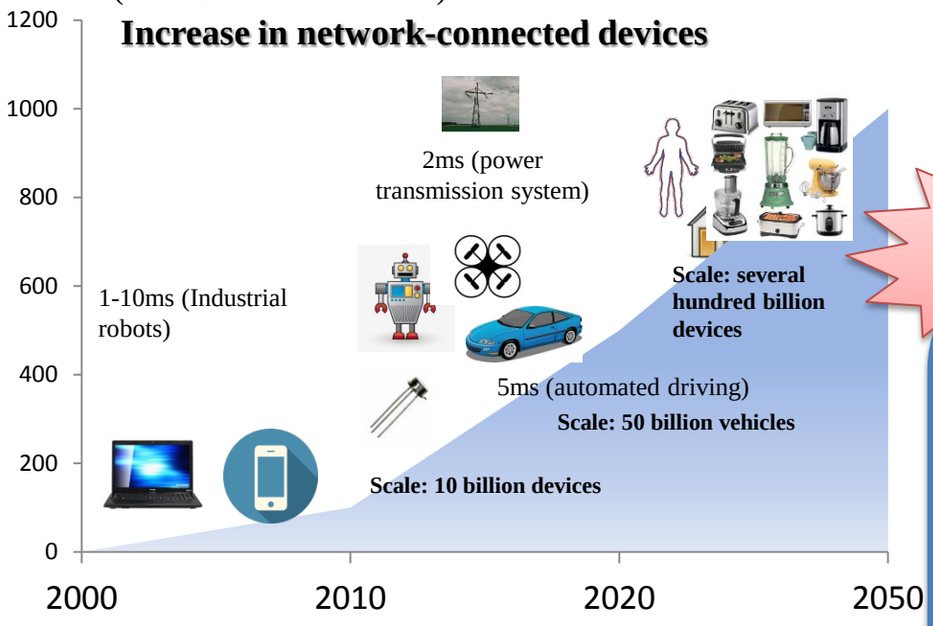
The WG on Distribution Strategy (chaired by Prof. Kokuryo of the Faculty of Policy Management at Keiyo University) was established under the Information Economy Subcommittee of the Industrial Structure Council, and conducted discussions on nine occasions starting from March this year.



Medium-term challenges facing IoT acceleration

Explosive data growth and real-time response

(Unit: 100 million devices)



→ How to handle massive number of devices and corresponding data?

Technical challenges

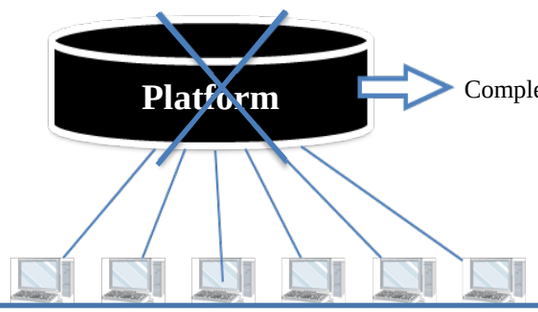
Ensure high degree of reliability and security

Make visible → **Project** → Control

Transportation systems
Production systems
Infrastructure systems
Etc.

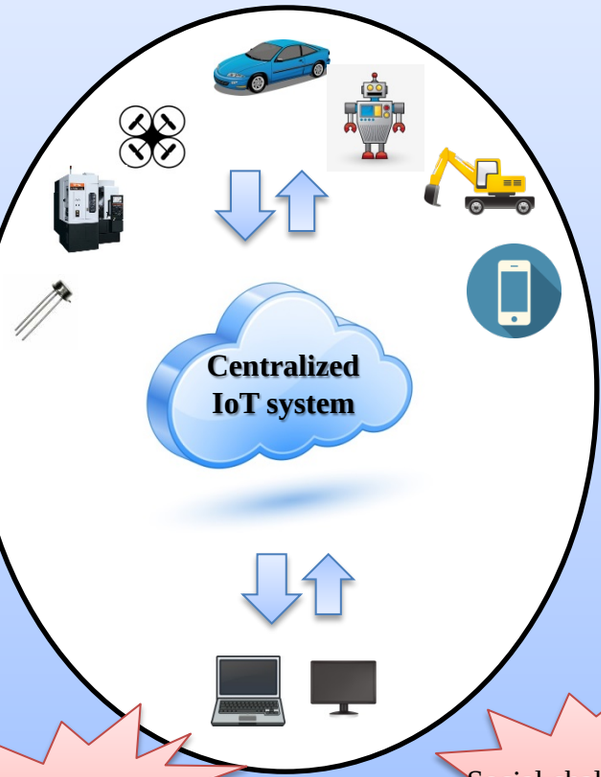
Technical challenges

From 2010: cloud-centric focus



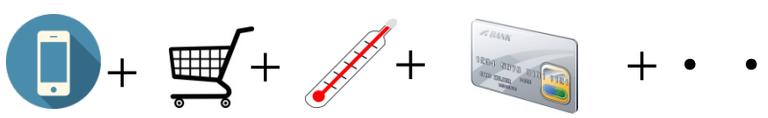
→ Ensuring reliability of system and data is key

Existing IoT systems



Privacy protection concerns

Medium and longer-term accumulation of various data



Possibility of convenient, customized services

Conflict

Rising global concern over privacy

Social challenges

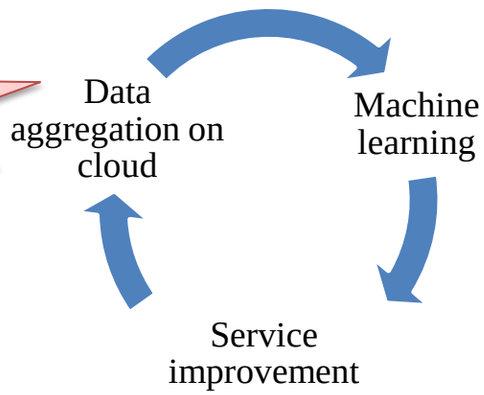
EU moves to strengthen protection through personal information protection laws, etc.

→ Balance of privacy and data usage needs to be restructured

Data oligopolization raises lock-in concerns

Structure that supports competitive advantage based on data aggregation

Social challenges



Global Internet giants
Google,
Amazon,
Facebook,
Apple,
etc.

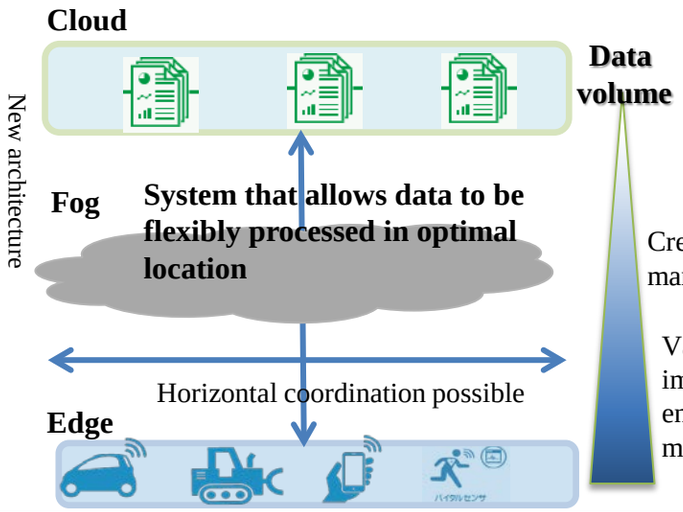
→ If data oligopolization leads to an excessive lock-in effect in the future, there is a possibility of services lacking sufficient competitiveness from the standpoint of users.

Future vision of IoT based on the coming of a new tide

Data distribution structure driven by data users

[New tide] Edge-heavy (fog) computing

Resolves data traffic problems and enables **flexible data strategies for user companies**. Also, helps facilitate security and innovation based on in-the-field experiences through micro services.

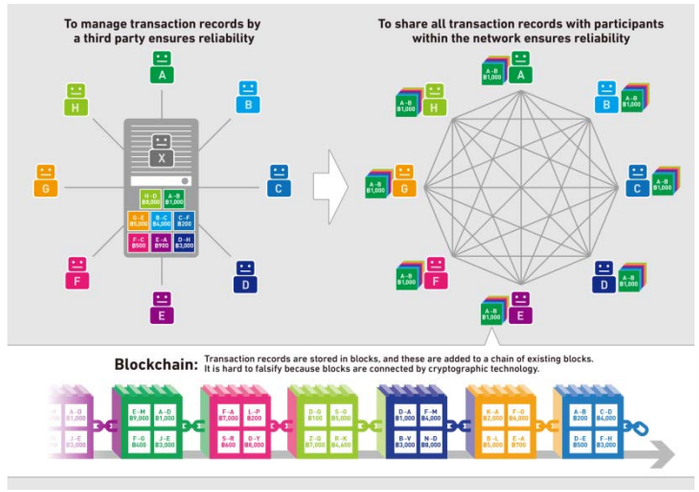


In particular, automated driving, production systems, infrastructure control, etc.

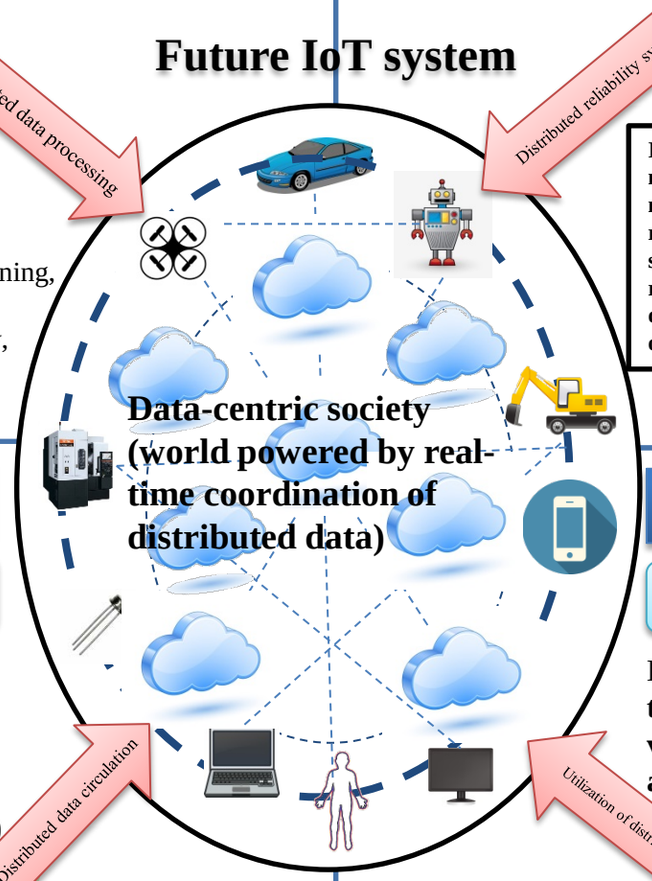
New industrial society system that changes trust mechanisms

[New tide] Blockchain (publicly released, distributed ledger)

Serves as a foundation to secure IoT reliability (**e.g., ensuring data authenticity during the absence of an administrator**) and leads to **substantial change in contract-based social systems** (e.g., registration, rights, contract management).



IoT data supply chain management, rights management, replacement of contract society foundation, regional currencies, demonstration of value of education, etc.

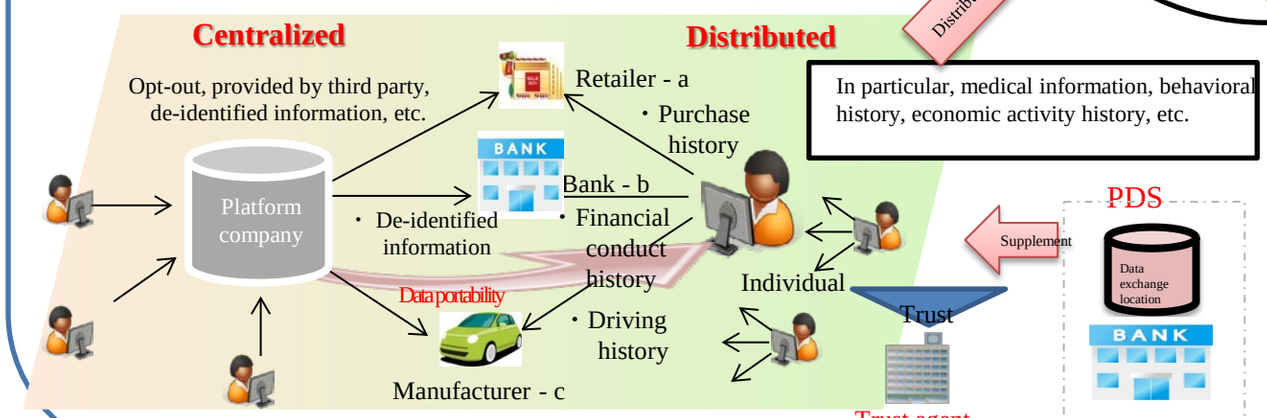


Hybrid data distribution system

[New tide] Personal Data Store (PDS)

In addition to conventional centralization models, **deep data**, which entails long-term individual name aggregation, realizes **a system under which individuals conduct distributed management and circulation of data**, and thus supports the development of customized services.

Overview of data distribution system (conceptual image)



In particular, medical information, behavioral history, economic activity history, etc.

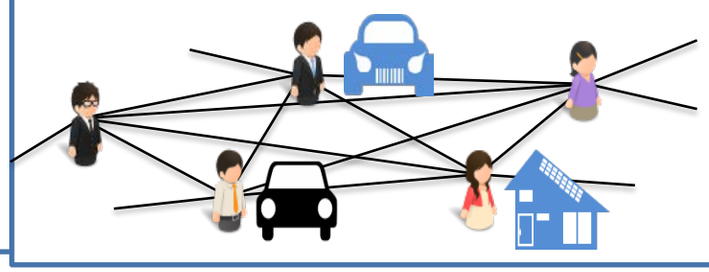
Public, distributed business model

[New tide] Sharing Economy

Distributed social assets (things, spaces, money, people, energy, etc.) **are turned into digital assets**, and fully utilized in accordance with **demand variables**. **Conventional public services also transform into mutual assistance**.

Means of getting around, spaces, transportation, skills, meals, electricity, production systems, storage & computational resources, childcare & nursing, data, etc.

Maximum utilization of all idle resources through N-to-N



Mutual assistance in public services for which partial utilization is expected to be effective

Childcare center → Intermediate care services
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Strategic direction of Japan's IT industry, etc.

Accommodating a new architecture

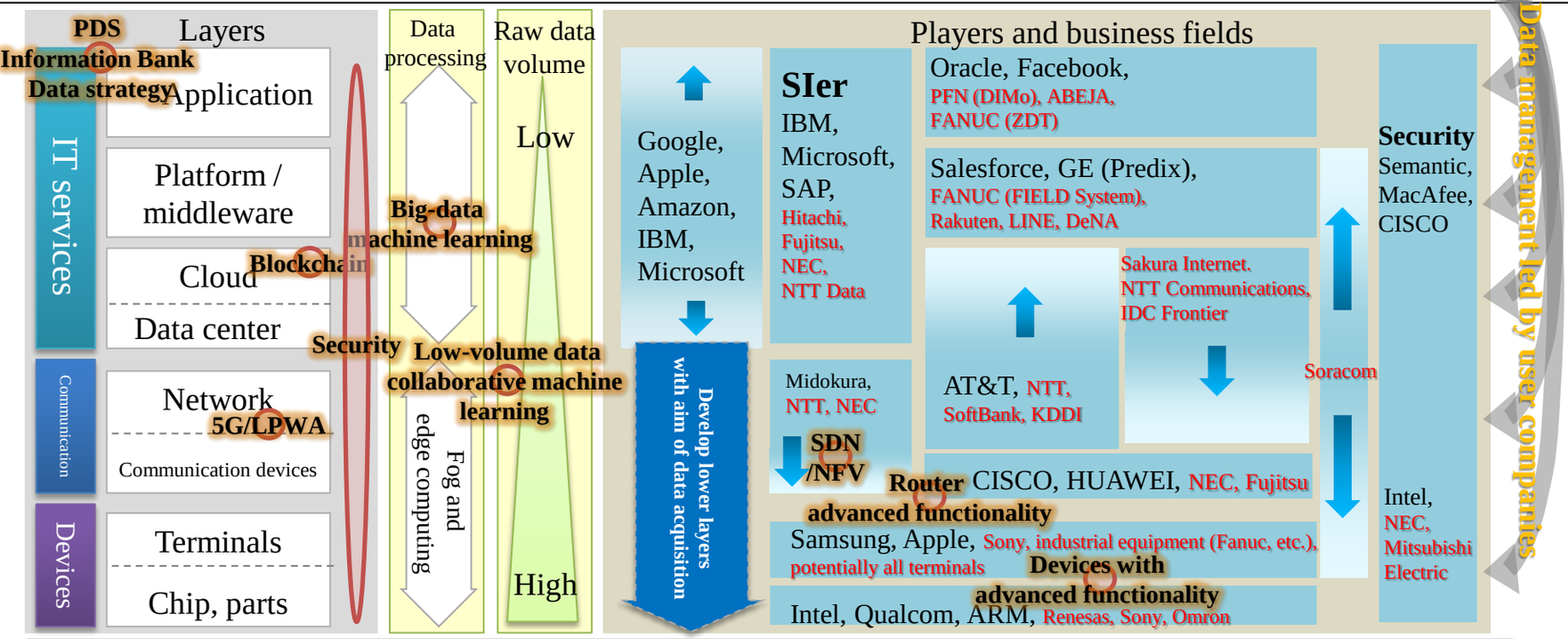
○Open innovation led by user companies

With Japanese user companies (which excel in real-time solutions) as the starting point, the platform is expected to be constructed based on a big-picture overview of the overall structure of the system, the strategic pursuit of cooperation and optimization among the various layers, and efforts to incorporate global venture companies.

○Formation of ecosystem with venture companies at the center of innovation

Targeting advanced venture companies involved in machine learning, which plays a central role in supporting fresh innovation, major IT vendors are expected to commit to a bridging role between venture company funding and user companies from the perspective of purchasing human resources and time, and thus help establish an ecosystem.

IT user companies (final products, services): cars, machine tools, distribution, energy, healthcare, etc.



○Micro services created based on in-the-field experience

Venture companies operating on an agile development model develop a large number of micro services, and are expected to deliver innovation based on in-the-field experience. (AI, blockchain, virtualization, production management and other service applications)

○Local cloud market acquisition

In addition to value-added in the form of coordination between cloud and virtualization, IoT edge processing, machine learning, data protection and distribution, super energy saving and miniaturization, new markets are also expected to be captured.

○Shift to high value-added devices and link with embedded software

Collaboration with top platforms (through incorporation of chips, etc., related to machine learning, encryption technology, and security control) and integrated development of devices and software are expected.

User company business fields (data generators): Smart plants, smart homes, robots, automated driving, infrastructure management, etc.

○Human resources foundation in the new architecture

Rather than conventional SIer, what is needed are human resources who (1) can develop a grand architecture design that incorporates aspects ranging from cloud to networking, (2) can engage in agile development of micro services, (3) have an understanding of hardware and can write code, and (4) can manage machine learning that is able to use code and probability theory. Appropriate sharing of human resources is expected through external utilization and collaborative projects.

New data coordination by user companies

○Appropriate acquisition and management of data assets

Data is expected to be shared and strategically utilized based on a rigorous distinction of collaborative fields for retained data assets and on a clarification of data to be acquired from others. When attempting to develop customized services for individuals, a personal data store mechanism intended to build a relationship of trust with users is expected to be actively utilized. Internal frameworks to manage such data can be expected to be strengthened.

Shift to user-driven business models

○Development of user-led business models

Utilizing a sharing economy or blockchain, etc., efforts will be made to rapidly create business models that support integration with users to co-create fresh innovation with an eye toward substantially changing existing markets, and such business models are expected to be developed globally.

Challenges for the realization of a future IoT structure, and direction of initiatives (1)

Data distribution structure driven by data users

[New tide] Edge-heavy (fog) computing

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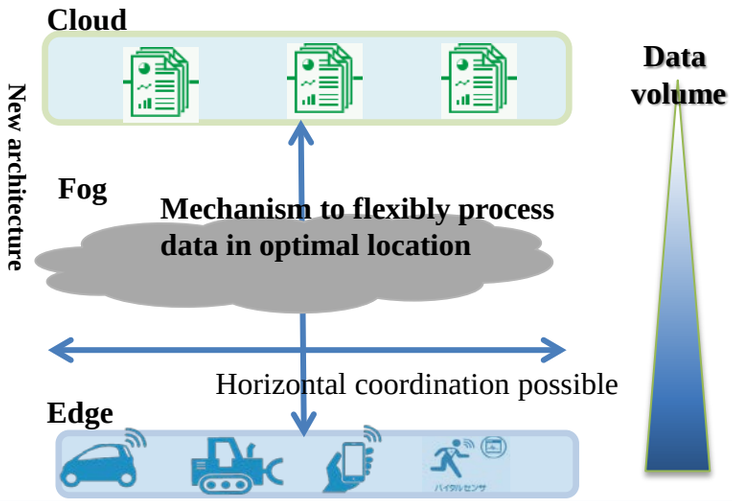


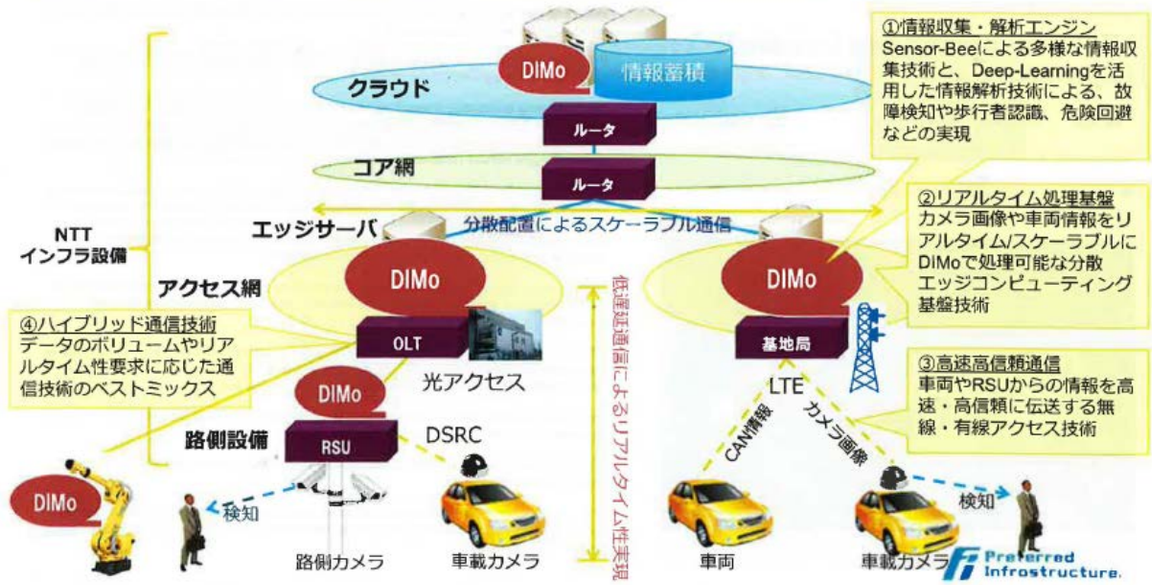
In particular, automated driving, production systems, infrastructure control, etc.

Creation of local cloud market

Value of machine learning, incorporation of encryption technology, micro services, etc.

Example of edge-heavy computing (automated driving)

PFNのDeep-Learning基盤であるDIMoと、NTTのリアルタイム分散処理基盤であるエッジコンピューティングを組合せ、IoT Networkを構築



Key challenges and direction of initiatives

Creation of opportunities for Japanese companies

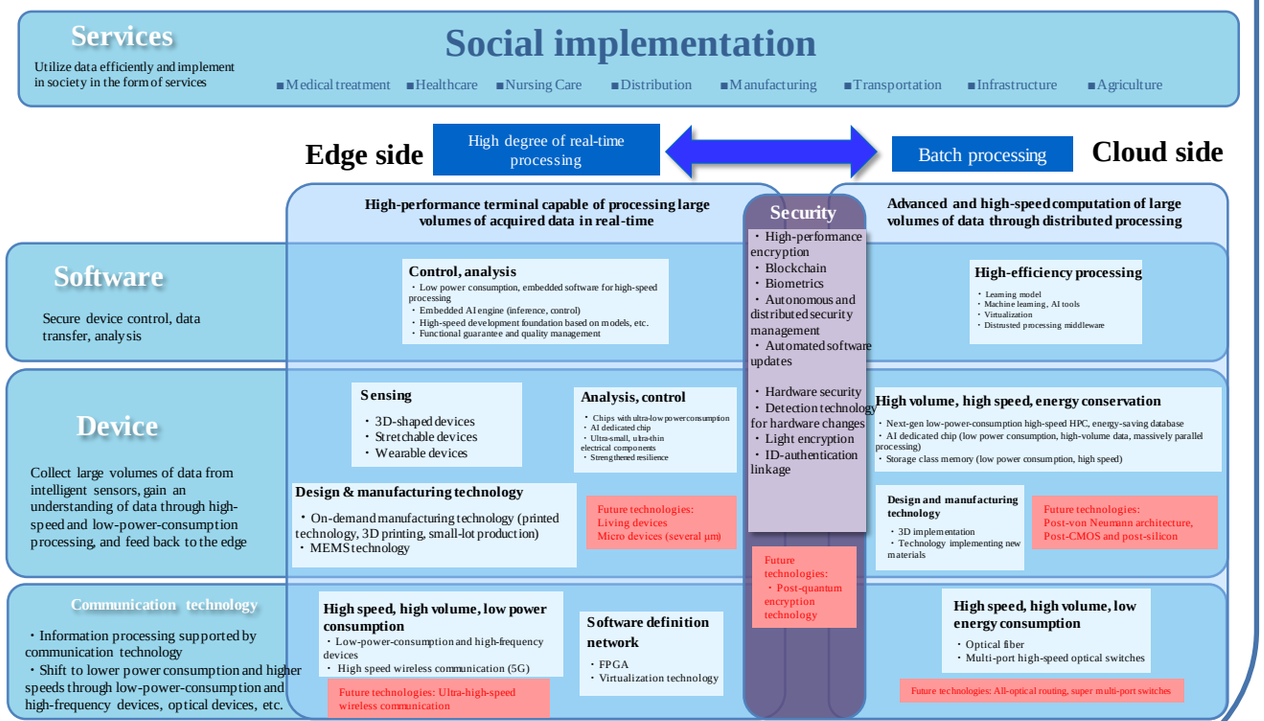
Technology strategy to accommodate new architecture

- Develop, promote, and establish an environment for data processing chips and devices that deliver real-time AI, encryption for security and privacy, and ultra-low energy consumption.
- Develop Japanese cloud based on edge collaboration model which requires verification of system-wide optimization, and open up to companies in a wide range of fields.
- Partner with overseas entities such as the OpenFog Consortium, and cooperate in areas such as desirable architectures and standardization.
- As a priority for the IoT Acceleration Lab, strategically tackle projects that support the new architecture, and consider preferential selection of various demonstration projects, etc., based on project composition.
- NEDO to formulate a technology development strategy for IoT that supports the new architecture.

Strengthening of human resources foundation that can support the new structure

- Consider a review of qualifications, etc., to accommodate a grand architecture design and new structural changes from cloud to network virtualization. Provide venues where professionals can engage in exchange about the latest trends in IoT.

Technical components required for edge-heavy computing



Challenges for the realization of a future IoT structure, and direction of initiatives (2)

Hybrid data distribution system

[New tide] Personal data store (PDS)

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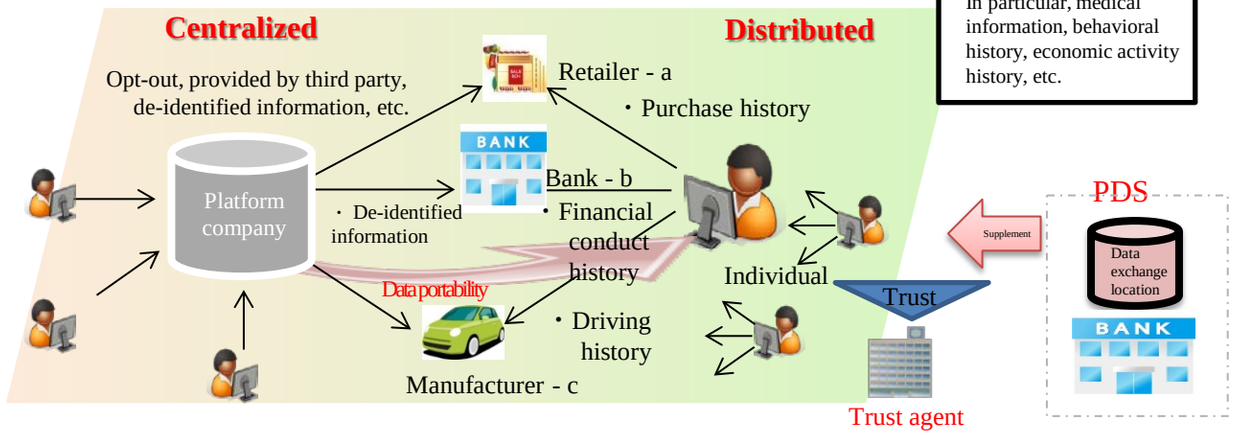

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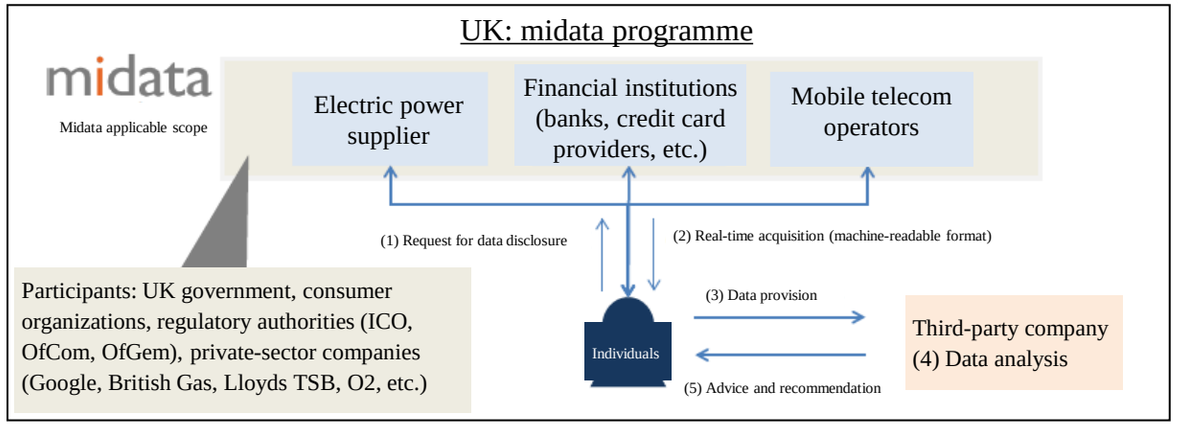
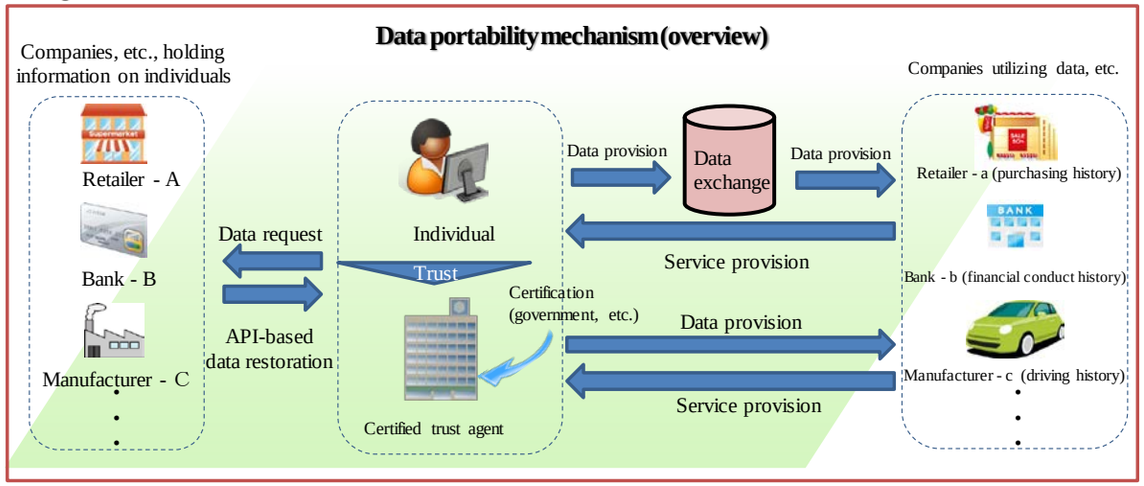
Example of personal data store



- **Data portability**
  ・・・Model that puts data in the hands of individuals, and lets users distribute the data at their own discretion.
- **Personal data store**
  ・・・Agent function that aggregates and manages individuals' data on their behalf.
- **Data ownership**
  ・・・Approach that recognizes data utilization rights for people who contributed to data generation



Key challenges and direction of initiatives

Break away from stagnation through introduction of new approach

Create new data distribution structure driven by individuals

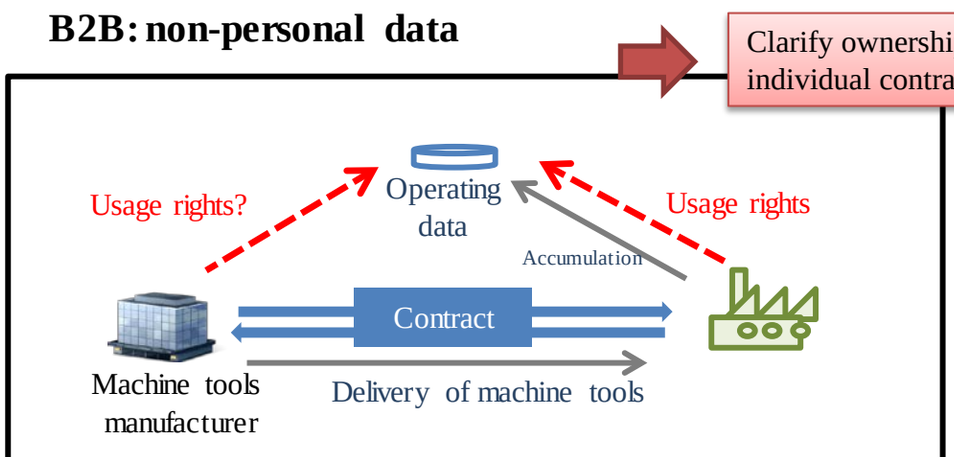
- Project composition and support in private business to realize and expand personal data store and projects. Key is to raise user receptivity.
- As a medium-term issue, consider rule development for data portability and trust agents, which are components of the personal data store.
- Consider formulation of rules while supporting data exchange private businesses through the IoT Acceleration Lab, etc.
- Consider further promotion of open data and Digital First.

Move forward with data coordination by clarifying data ownership

- In addition to considering revising data distribution contract guidelines in an effort to clarify data exchange in contracts, clarify application cases in major fields.
- Consider development of environment that supports data collaboration by leveraging undisclosed distribution and calculation technologies so that companies can open up data more easily.
- While pushing forward with a system for de-identified information, resolve separate corporate cases in the Data Distribution Promotion Working Group, etc., and establish common rules for camera footage, etc.

B2B: non-personal data

Clarify ownership of individual contract parties



Challenges for the realization of a future IoT structure, and direction of initiatives (3)

New industrial society system that changes trust mechanisms

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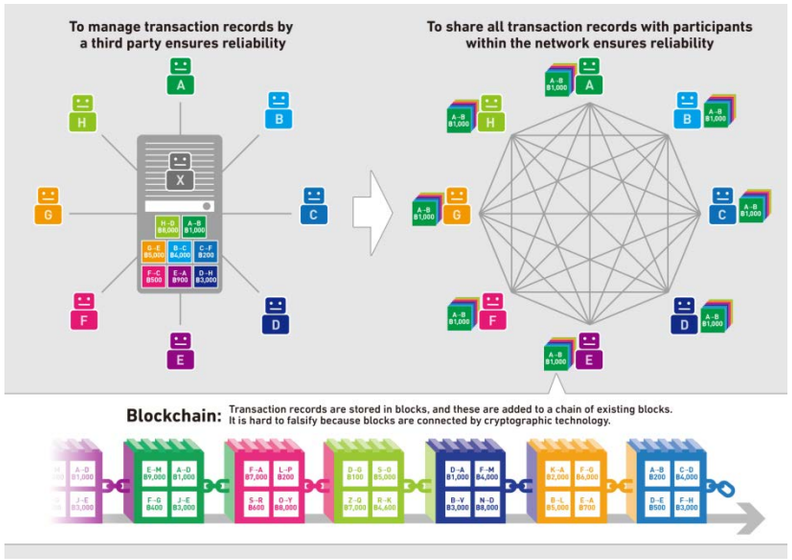

Deployment example based on blockchain use case

Finance
- Payment (SETL、FactoryBanking)
- FX·Remittance·Saving (Ripple、Stellar)
- Stock exchange (Overstock、Symbiont、BitShares、Mirror、Hedgy)
- Bitcoin trading (itbit、Coinffeine)
- Social banking (ROSCA)
- Remittance for immigrants (Toast)
- Remittance for Developing countries (Bitpesa)
- Remittance for Muslim (Abra、Blossoms)

Point／Reward
- Gift card exchange (GyftBlock)
- Reward for Artists (PopChest)
- Prepaid card (BuyAnyCoin)
- Reward Token (Ribbit Rewards)

Finance Arrangement
- Artist equity trading (PeerTracks)
- Cloud funding (Swarm)

Communication
- SNS (Synereo、Reveal)
- Messenger (Getgems、Sendchat)

Asset mgmt
- Bitcoin asset mgmt (Uphold(Bitreserve)
- Land registration (Factom)

Storage
- Data storage (Stroj、BigchainDB)

Authentication
- Digital ID (ShoCard、OneName)
- Certification Of Authenticity (Ascribe/VeriSart)
- Verification of medicine (Block Verify)

Sharing Services
- Ride sharing service (La'ZooZ)

Distribution mgmt
- Supply chain mgmt (Skuchain)
- Tracking mgmt (Provenance)
- P2P market place (OpenBazaar)
- Gold storage (Bitgold)
- Diamond ownership (Everledger)
- Digital asset mgmt & trading (Colu)

Contents
- Media streaming (Streamium)
- Games (Spells of Genesis、Voxelnauts)

Future prediction
- Future / Market prediction (Augur)

Public sector
- Visualization of civic budget (Mayors Chain)
- Voting (Neutral Voting Bloc)
- Virtual nation/ Space dvlpmt (BitNation/Spacechain)
- Basic incomes (GroupCurrency)

Medical
- Medical information (BitHealth)

IoT
- IoT (Adept、Filament)
- Mining chip (21 Inc, Bitfury)

Key challenges and direction of initiatives **Promote initiatives ahead of the rest of the world**

Move forward with social implementation of blockchain technology

- Support advanced projects through the IoT Acceleration Lab, etc.
- Aim for utilization in government systems such as document management, etc.
- Consider the state of systems aimed at promoting innovation and under which governments certify private-sector IT services.
- Promote collaboration between Japan's industry and academic communities, which excel in encryption technology.
- In addition to developing performance standard indicators, actively support international standardization.

Promote review of existing systems

- With regard to examination, authentication, and certification systems, etc., verify possibility of systems review through the future introduction of blockchains.
- Include the state of legal admissibility based on the Electronic Signature Act.
- Verify handling of juridical personality and hard fork in case of a distributed organization.

Learning history

• By using blockchains, an individual's **entire learning history** can be tracked. Learned knowledge is immediately recorded, and linked to jobs offered by individuals or companies that require such knowledge. In this way, **learning can become synonymous with earning**.

• **Also enables recording based on a value unit that is much more precise than before**, transcending a summary of degrees and qualifications, etc., to also include recreational study and credits for completed courses, etc. Moreover, **this results in a clear 'genealogy of learning'** that shows learners, learned content, and absorbed knowledge.

Example when incorporated in IoT

Usage flow of learning history database

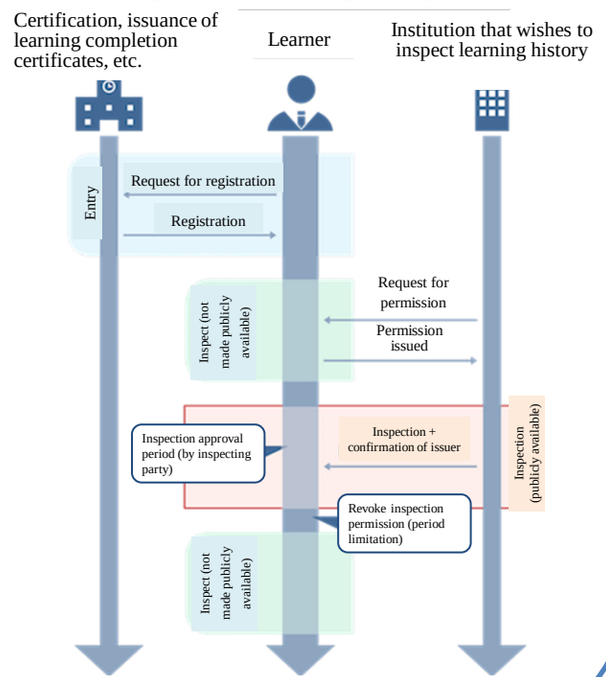

Figure: Compiled by METI on the basis of data provided by Recruit Technologies Co., Ltd.

Challenges for the realization of a future IoT structure, and direction of initiatives (4)

Public, distributed business model

[New tide] Sharing economy

Distributed social assets (things, spaces, money, people, energy, etc.) are turned into digital assets, and fully utilized in accordance with demand variables. Conventional public services also transform into mutual assistance.

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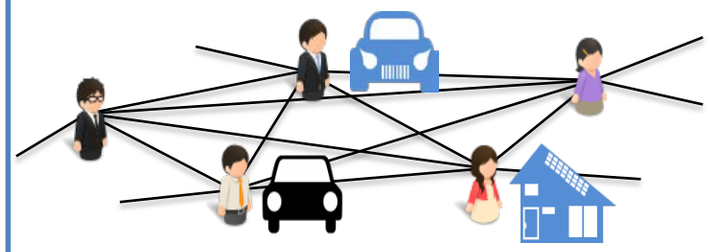

Mutual assistance in public services for which partial utilization is expected to be effective

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Policies in other countries

- In the **US**, sharing economies are firmly entrenched among citizens, and studies show that 10.3 million people, or 4.2% of the adult population, derive income from sharing services.
- Over 70 local governments (including states) have enacted legislation and ordinances that approve ride sharing.

- In the **EU**, the European Commission announced sharing economy guidelines on June 2, 2016, and requested that member states encourage balanced development of such businesses (not legally-binding).
- Some media reports suggest the European Court of Justice plans to make a determination on whether Uber should be legally categorized as an operator of transportation services similar to taxis or as an Internet service provider.

- In **China**, Premier Li has declared that the country will aggressively promote sharing economy promotional systems reform while ensuring intellectual property protection and information security.
- Decision to legalize ride sharing has been finalized. Requirements for the driver will include the absence of a criminal record, at least three years of driving experience, passing a driving skills examination, etc.

- In **South Korea**, Seoul has reduced excessive infrastructure development (roads, parking spots, libraries, etc.) in conjunction with population growth via the Sharing City Seoul project (announced in September 2012), and the city is also providing administrative services by leveraging sharing economies for citizens. Ride sharing has been prohibited by law since the summer of 2015.

- In **Singapore**, Prime Minister Lee Hsien Loong has indicated a recognition that sharing economies are responsible for improvements in convenience, etc., and accordingly contribute to the enhancement of citizens' lives.
- In April 2016, the Land Transport Authority announced privately hired drivers will need to obtain a private vehicle dispatch driver's license, and concurrently indicated it will simplify the requirements to obtain a taxi driver's license.

Key challenges and direction of initiatives — Promote incorporation into economic society

Expand social acceptance of sharing economies

- Formulate cross-industry voluntary guidelines and move forward with private-sector authentication systems with the aim of building social trust via voluntary sharing economy initiatives.
- Verify economic effects, etc., of sharing economies that cannot be grasped in existing GDP data.

Promote utilization of mutual assistance in public services in regional areas, etc.

- Develop "sharing cities" in regional areas, and promote collaboration with business operators while also identifying work-related challenges that may become obstacles.

Make adjustments, etc., for conflicts with laws governing separate businesses, etc.

- Verify establishment of rules when fully implementing sharing economies, including ride sharing, the possibility of joint shipping of goods, etc.
- Utilize systems that eliminate gray-zone areas, address company-side need for in-depth clarification, and consider clarification of concrete elimination of gray-zone-area in e-commerce rules, etc.

事業者と自治体の連携事例

List of Committee members

Junji Annen	Professor, Chuo Law School
Fujiyo Ishiguro	President ＆ CEO, Netyear Group Corporation
Takuo Inoue	Director, Value Creation Investment Group, Innovation Network Corporation of Japan
Yuji Ueda	President ＆ CEO, Gaiax Corporation
Ryuutarou Kawamura	Vice President, Network Innovation Laboratories
Masanori Kusunoki	CISO Board, Public Policy ＆ Corporate Governance, Corporate Management Group, Yahoo Japan Corporation
Jiro Kokuryo	Vice-President / Prof. of Faculty of Policy Management and Trustee and Chairperson, Keio Academy of New York
Makoto Shiono	Partner Managing Director, Industrial Growth Platform, Inc.
Masahiro Shimohori	IoT Senior Specialist, Intel Corporation
Kaoru Sunada	Executive Research Fellow, The Center for Global Communications (GLOCOM)
Hideki Sunahara	Professor, Graduate school of media design, Keio University
Katsuya Tamai	Professor, Intellectual Property Law, Research Center for Advanced Science and Technology
Hiroshi Deguchi	Professor, Department of Computer Science, School of Computing
Izumi Hayashi	Attorney-at-Law
Toshihiro Matsui	Director General, Electronics, Information and Machinery System Unit, Technology Strategy Center (TSC), New Energy and Industrial Technology Development Organization
Hiroshi Maruyama	Chief Strategy Officer, Preferred Networks, Inc.