Connected Industries Open Framework (CIOF) for Manufacturing in Japan

2020.04.28.

Hatsuko Kouroku

Industrial Value Chain Initiative, Japan

Evangelist.

Agenda

1. Introduction to IVI
2. CIOF: Connected Industries Open Framework
3. CIOF Use Cases
4. Road Map of Digital Transformation of Manufacturing

Agenda

1. Introduction to IVI
2. CIOF: Connected Industries Open Framework
3. CIOF Use Cases
4. Road Map of Digital Transformation of Manufacturing

IVI: Japan's Initiative in Smart Manufacturing

- History: Established in June 2015
  mainly by 53 Japanese manufactures
  initiated by METI and JSME-MSD
- President: Prof. Yasuyuki NISHIOKA
  Hosei Univ., Japan

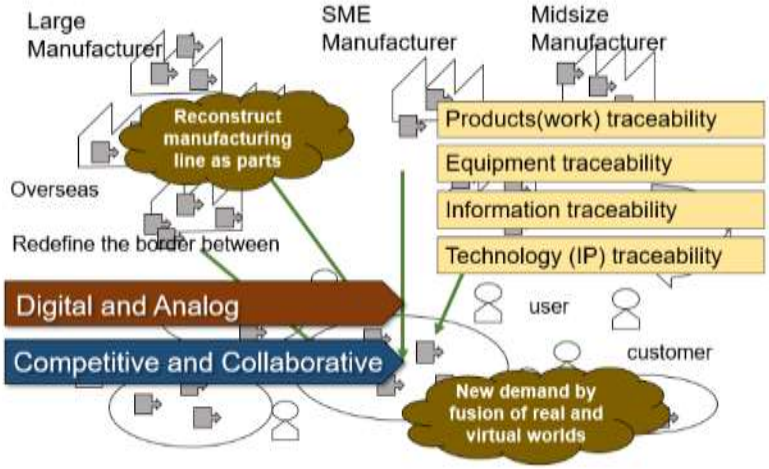
- Committees: General Planning & Strategy
  Business Cooperation
  Platform
  IP management and Diffusion (Promotion)
- Members: more than 700 members (as of April. 2020)
  from Corporate (Enterprises, SMEs) and Academia
- URL: https://iv-i.org/wp/en/
- Contact: globl_office@ivi-i.org

Members of IVI

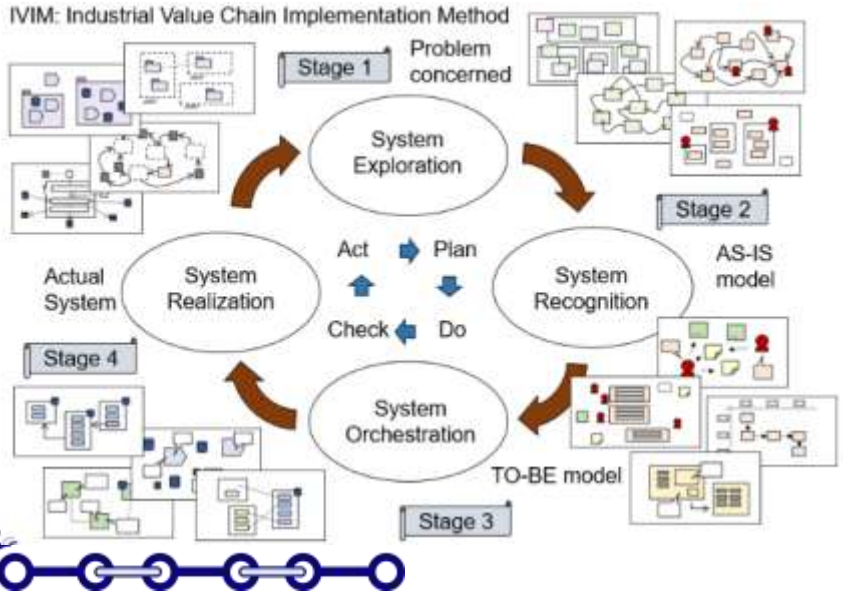
Members of IVI

Key concept of IVI

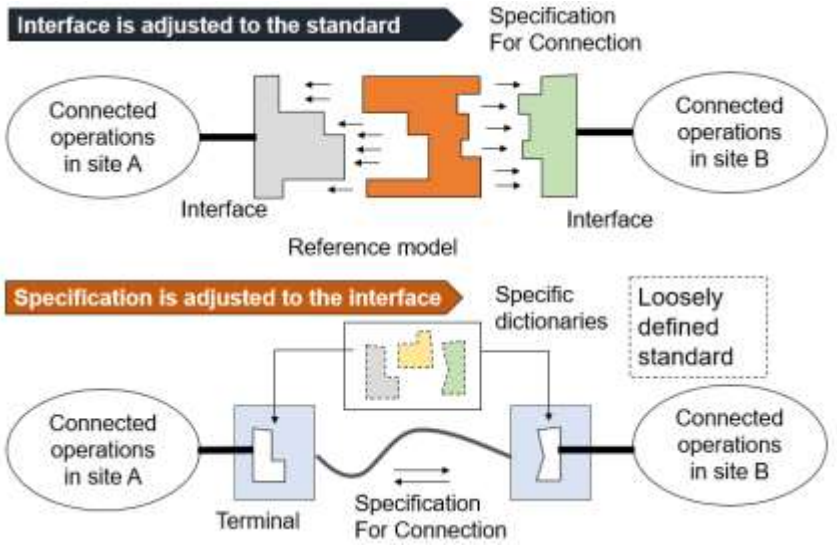
Connected Manufacturing



Human & Field Centric



Loosely Defined Standard



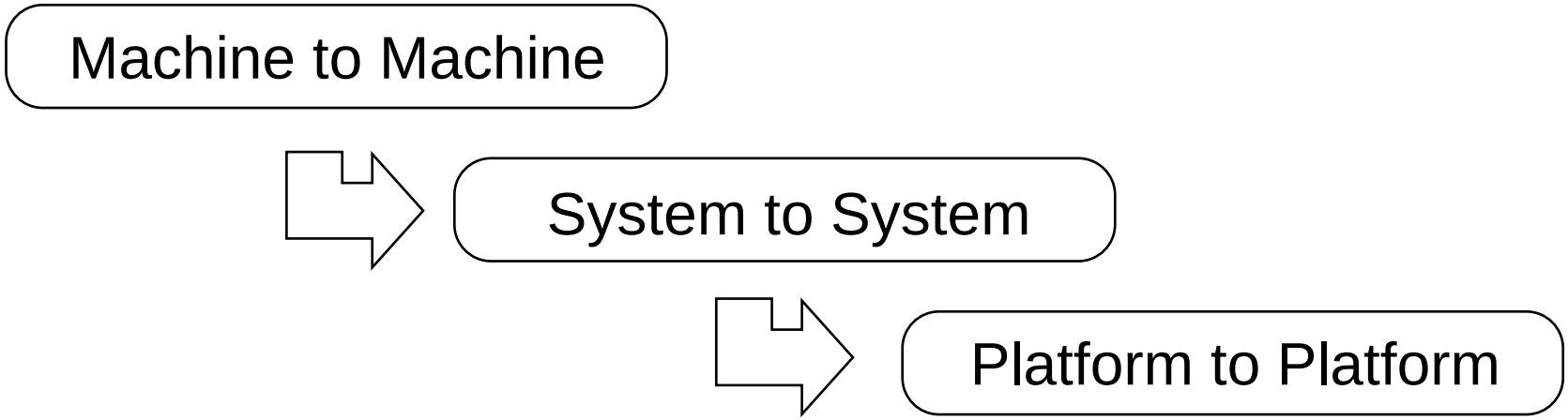
Agenda

1. Introduction to IVI
2. CIOF: Connected Industries Open Framework
3. CIOF Use Cases
4. Road Map of Digital Transformation of Manufacturing

CIOF: Connected Industries Open Framework

Data Sharing based on IVI concept

- Interoperability between platforms by open and simple framework
- Connecting value processes across enterprises by sharing data on peer-to-peer basis
- Dealing with industry data as intellectual property by keeping the rights of data ownership



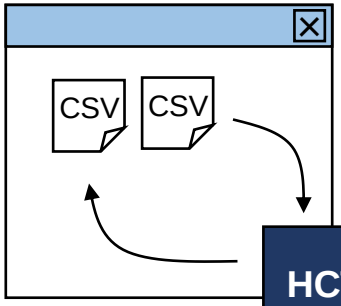
Simple and easy implementation

Operations in a office and a factory are connected seamlessly by means of data connections with liability

Machine Shop floor

Automation

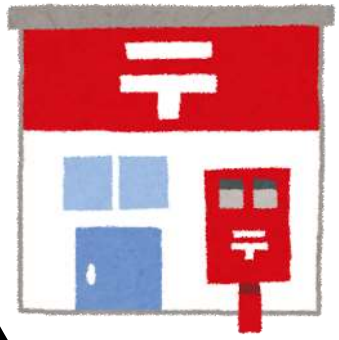
HCT



HCT

Design Office

HCS



Maintenance Service

Supplier

HCT

Customer Center

Double stages translation by dictionaries

Data Provider

Common dictionaries are selected to adjust the local dictionaries for each side.

Data User

AS-IS approach

A common single dictionary is defined and both side adjusts the local words to it.

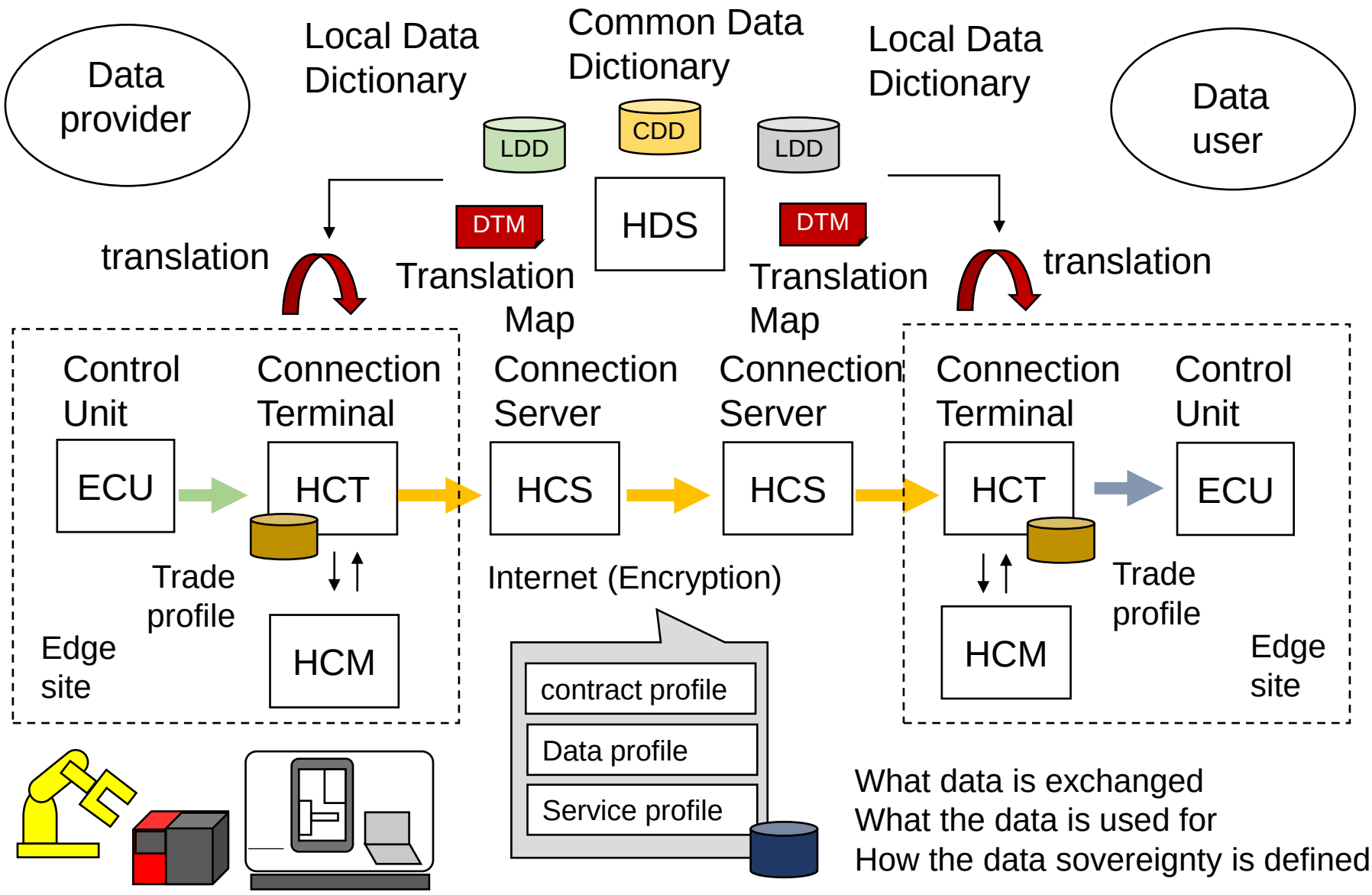
Undefined local words are out of control and difficult to maintenance them.

TO-BE approach

Each side can define the local words of its dictionary and prepare the translation map

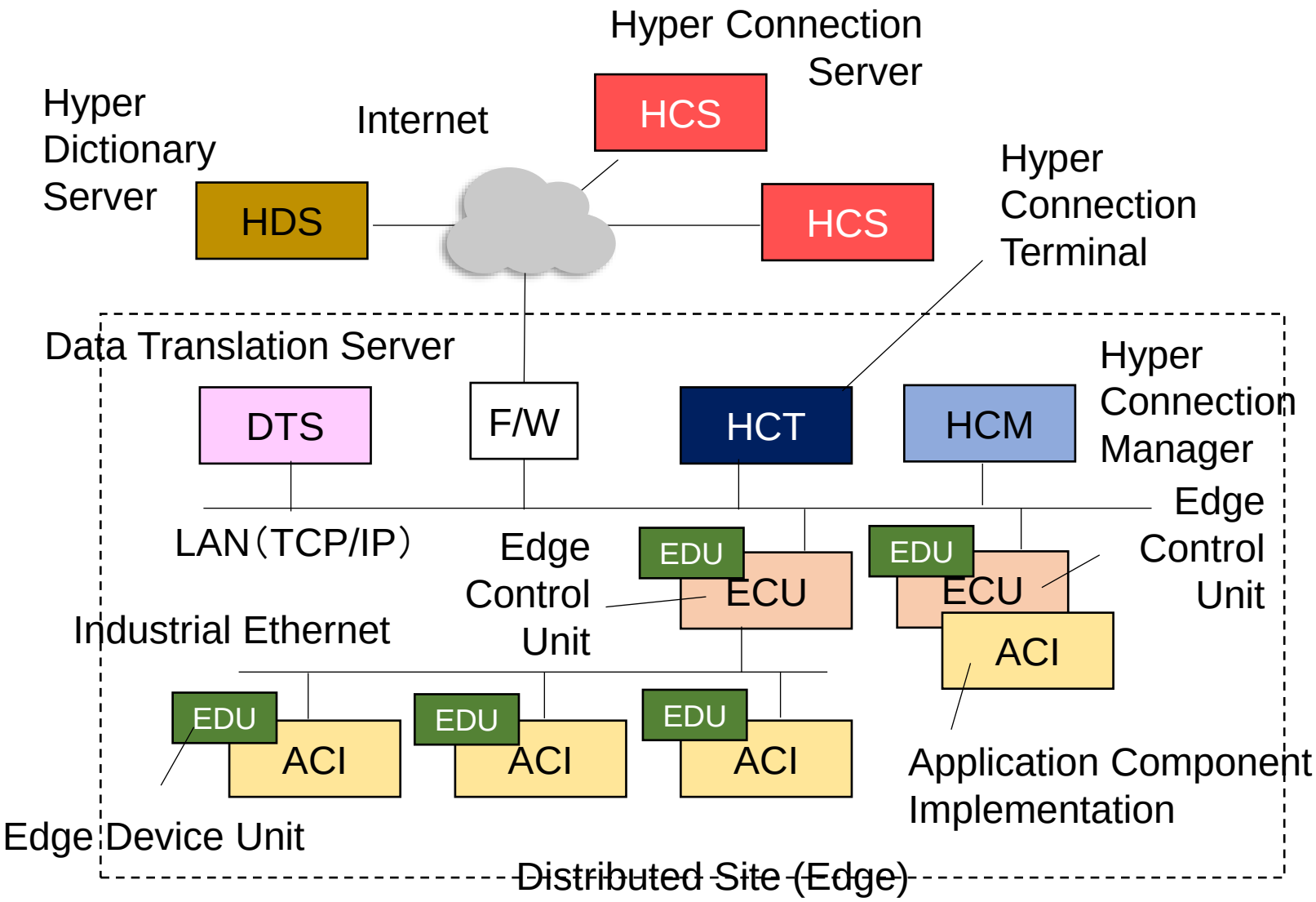
Local site can flexibly choose the words to adjust the system to the reality.

CIOF Data Transportation

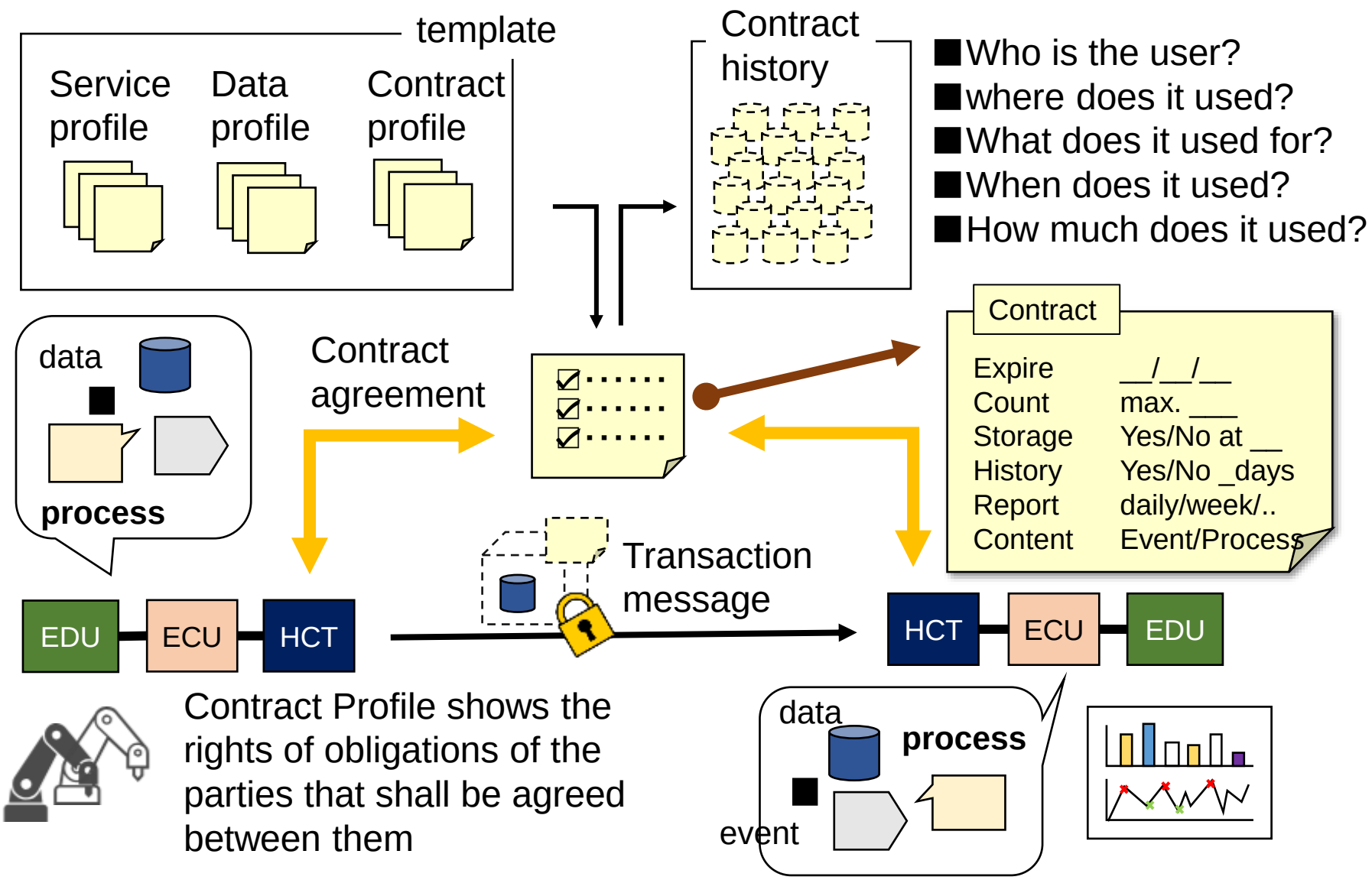


What data is exchanged
What the data is used for
How the data sovereignty is defined

System Architecture



Trade Contract Profile between parties



Agenda

1. Introduction to IVI
2. CIOF: Connected Industries Open Framework
3. CIOF Use Cases
4. Road Map of Digital Transformation of Manufacturing

CIOF Use Cases

Data Ownership as Intellectual Property

Scenario 1

CNC data of machine tools are securely managed in a remote site and by decentralizing the remote site.

TOSHIBA

DMG MORI

Machine tool

Quality Assurance by Data Sharing

Scenario 2

Monitoring results of a inspection process and inquiring a image data of a particular NG lot.

FUJITSU

FANUC

Robot

Value Process Integration across SMEs

Scenario 3

Lot inspection at supplier SME directly by the customer and generating account payable

NEC

MITSUBISHI ELECTRIC

PLC

Use Case Scenarios of CIOF

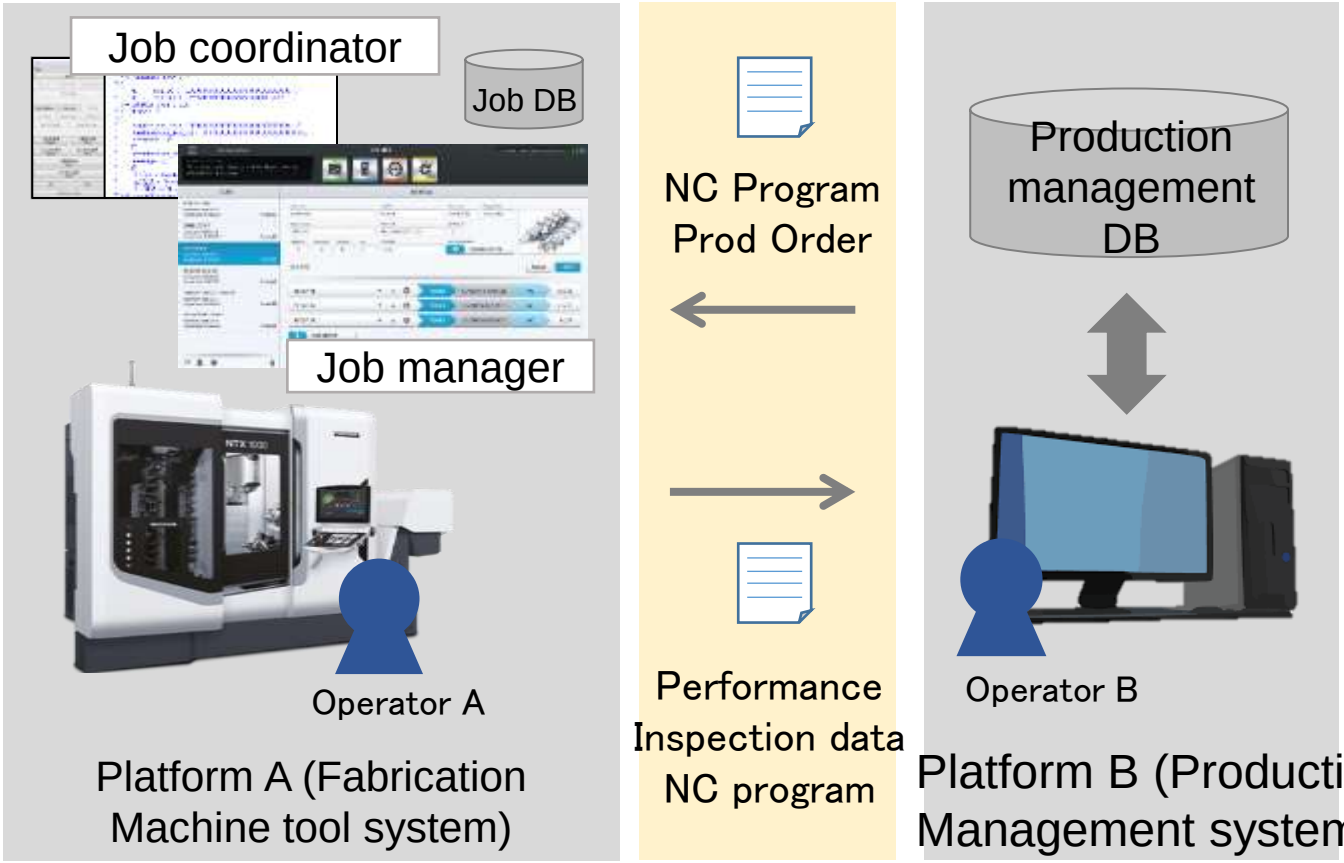
- Data Ownership as Intellectual Property
  - Open & closed distribution process and usage management for data as intellectual property
- Quality Assurance by Data Sharing
  - Enhancement of quality assurance by inspection data management and added value of manufacturing industry
- Value Process Integration across SMEs
  - SME strengthening by integrating field data with business processes of business partners
- Decentralized Big Data Management for AI
  - Adding Intelligence of equipment maintenance by big data analysis of production site using AI

Data Ownership as Intellectual Property

Scenario 1

DMG MORI CELOS ⇄ Meister TOSHIBA series

CNC data of machine tools are securely managed in a remote site by decentralizing its data control.



1. Push production orders and NC program by maker (D ← T)
2. Fabricator makes parts after updating the NC program
3. Push production result and NC program by fabricator (D → T)

Quality Assurance by Data Sharing

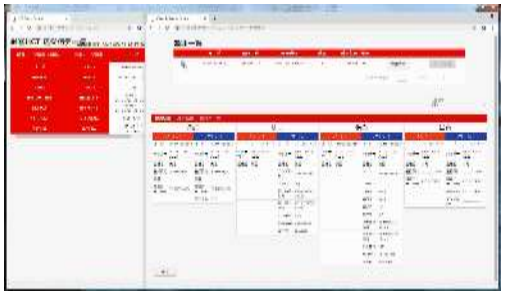
Scenario 2

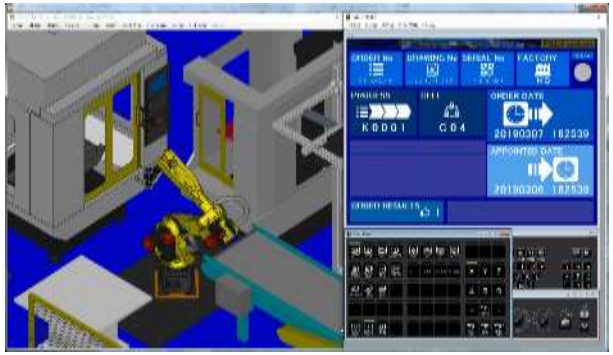
FANUC FIELD system ⇄ COLMINA FUJITSU

Monitoring results of a inspection process, and inquiring a image data of a particular problematic lot.

Sales order panel of supplier

Purchas order panel of customer (maker)





Production line of supplier

- Real time reporting of production line status
- Quality data distribution by push/pull procedures

1. Push production order by maker
   F ← F
2. Push production result by fabricator
   F → F
3. Push shipping result by fabricator
   F → F
4. Pull quality data (pictures) by maker
   F → F

Value Process Integration across SMEs

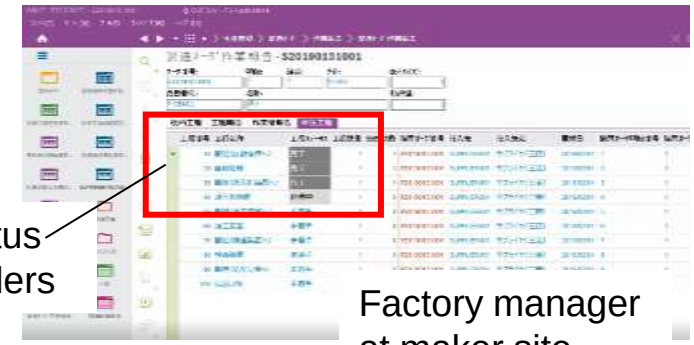
MITSUBISHI ELECTRIC | Edgecross | IFS Applications 10 | NEC

Scenario 3

Lot inspection at supplier SME directly by the customer and generating an account payable

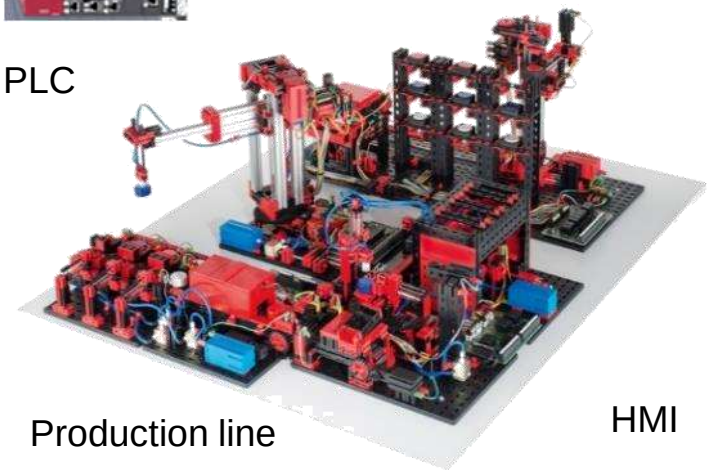
IPC

PLC

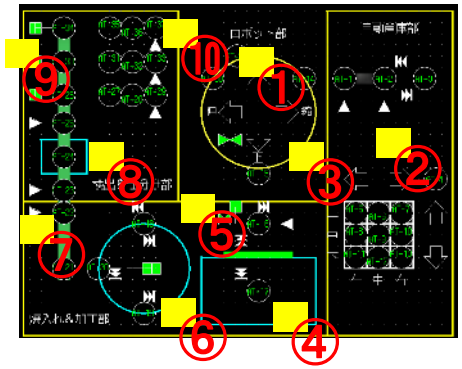


Monitor the status of purchase orders

Factory manager at maker site



Production line



HMI

1. Push purchase order by maker

M ← N

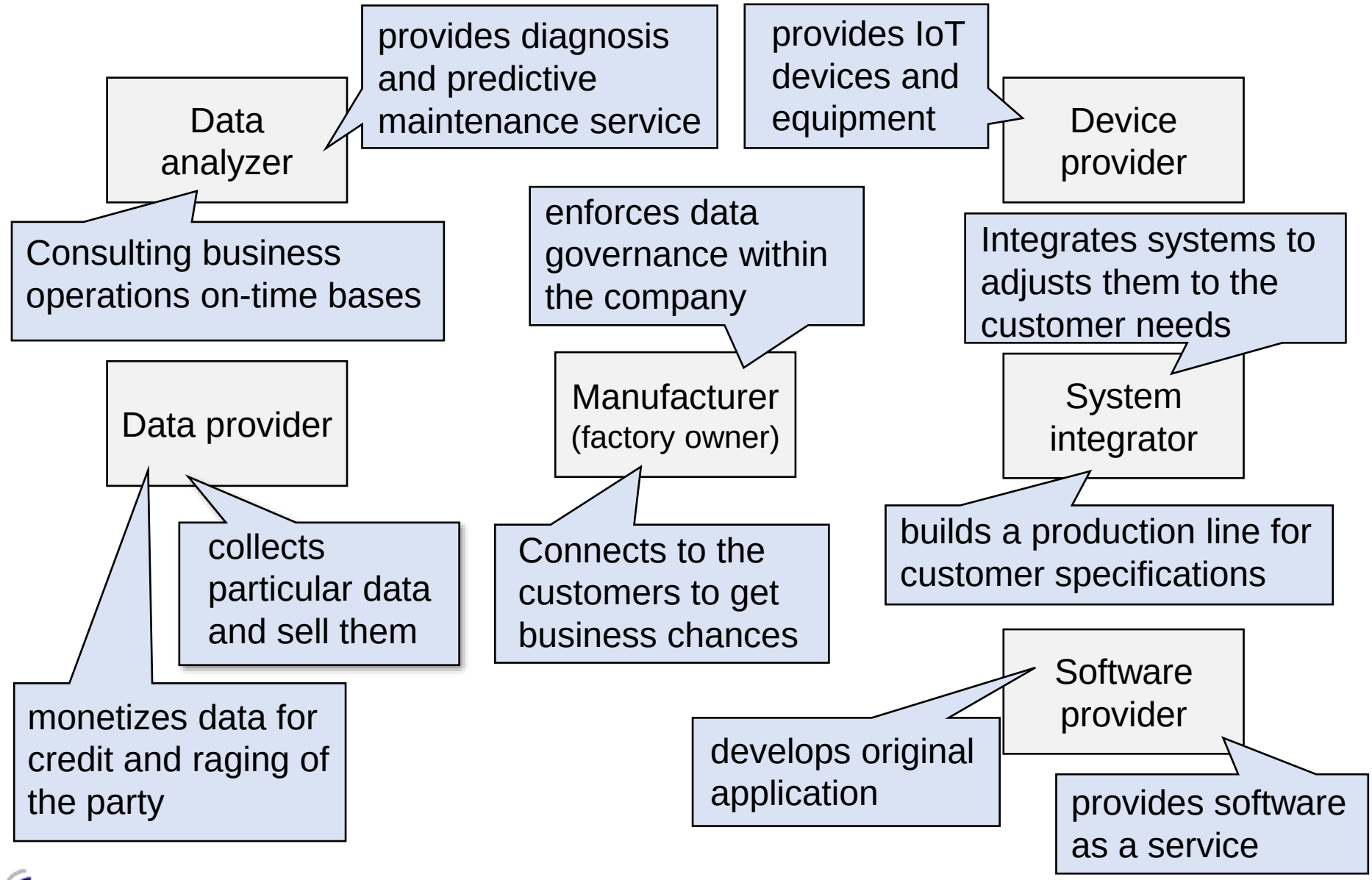
2. Push production progress by supplier

M → N

3. Pull direct acceptance by maker

M → N

Stakeholders of CIOF



Agenda

1. Introduction to IVI
2. CIOF: Connected Industries Open Framework
3. CIOF Use Cases
4. Road Map of Digital Transformation of Manufacturing

Road map and goals of CIOF

	Goals of Activities	Technical Achievement
FY2019	Implement all the functions of the minimum executable model, and start services by stable operation and support.	Collect words and relations of dictionaries for preliminary study on developing a self-organizing common dictionary
FY2020	Solution partners start their service operation so that users can choose and implement with a little integration cost	Design an additional function of dictionaries that recommends the correct words and mapping for the local users
FY2021	For scaling up and security improvement, implementation architecture and infrastructure are redesigned and rebuilt	Apply the technology of AI-based automatic translation between the local and common dictionaries
FY2022	Develop a strong authentication system both on hardware and software, so that proof of delivery is available	Optimize the rules and processes of translation and delivery on data trade using context depending historical data.
FY2023	Expand the system in open-basis, and contribute to developing international rules and standard of the data economy	Data trade is monitored by AI and it detects unauthorized use, as well as ranking and rating of the parties

Thank you!