Industry Data Value Workshop

Enabling technology of Connected Industries Open Framework

February 28th, 2022

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Industrial Value Chain Initiative, President

Outline

1. Introduction
2. Use cases
3. Architecture
4. User experience
5. Conclusion

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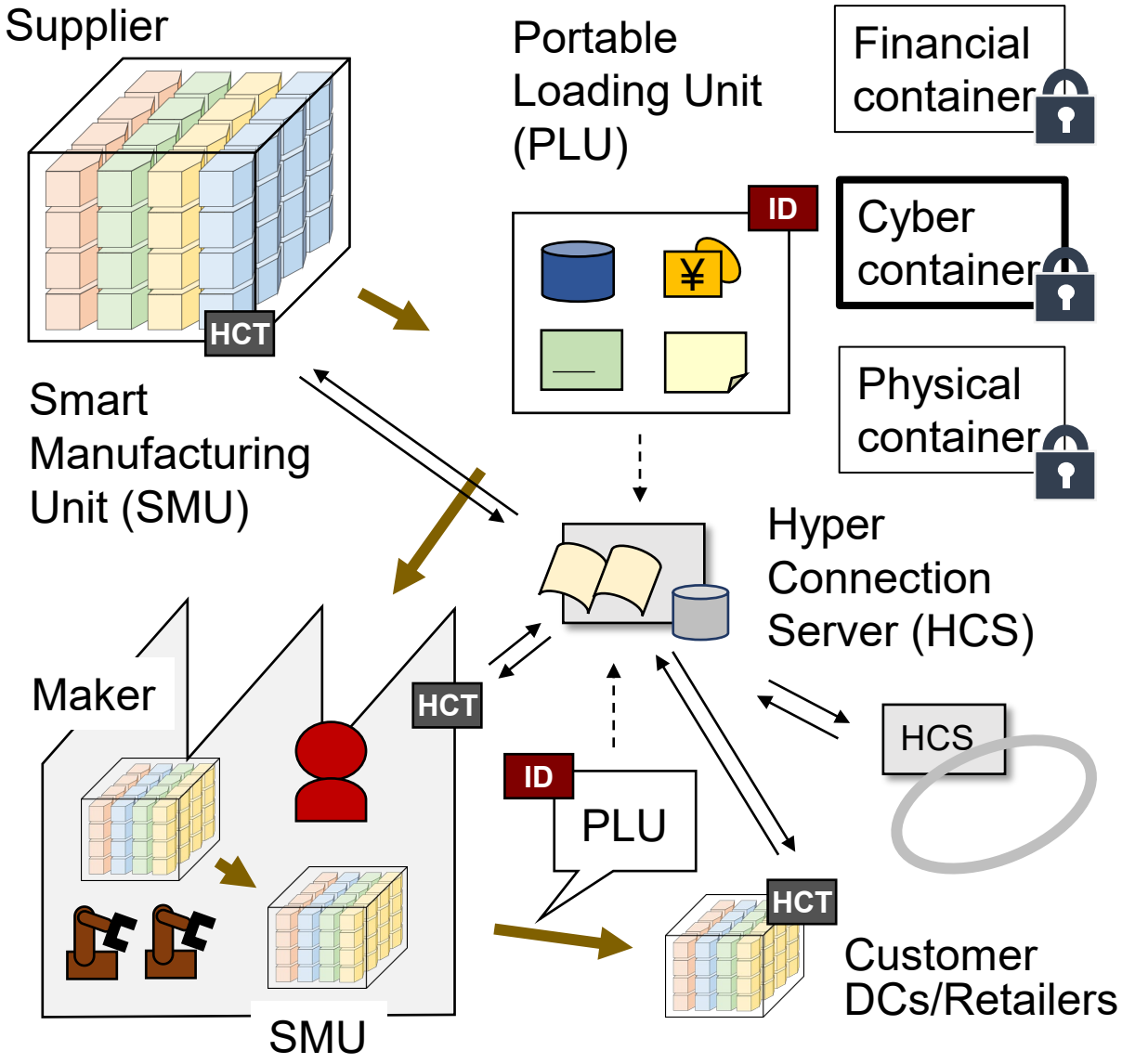
Vision of Industry Data society on Manufacturing

- Industry does not create value without data network.
- Industry deals with Deep Data on trustworthiness.
- Data trade between firms needs contracts one by one.
- Peer-to-peer distribution is as basis of data transactions.
- Semantic gaps are filled by loose (soft) standards.



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The History of Connected Industries Open Framework

- March 2018, Round table with the minister of METI, and the CIOF Report was published by Connected Industries WG of METI.
- March 2019, Project for a deliverable of CIOF PoC with FUNAC, Mitsubishi Electronics, DMG MORI and HITACHI, supported by METI
- December 2019 to February 2022, CIOF Project of enabling technologies on Data empowered manufacturing with DMG MORI, JTEKT, Mitsubishi Electronics, Business Engineering Corporation, Yasukawa Electronics, SCSK and ApstoWeb supported by METI.
- April 2022, CIOF services will be launched by IVI and CIOF partners.

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Use case categories of CIOF

Category 1

Intellectual property management of data including manufacturing know-how

Category 2

High value-added management through quality data management

Category 3

Issue of strengthening competitiveness of connected SMEs

Category 4

Edge data collection and distributed value sharing with AI

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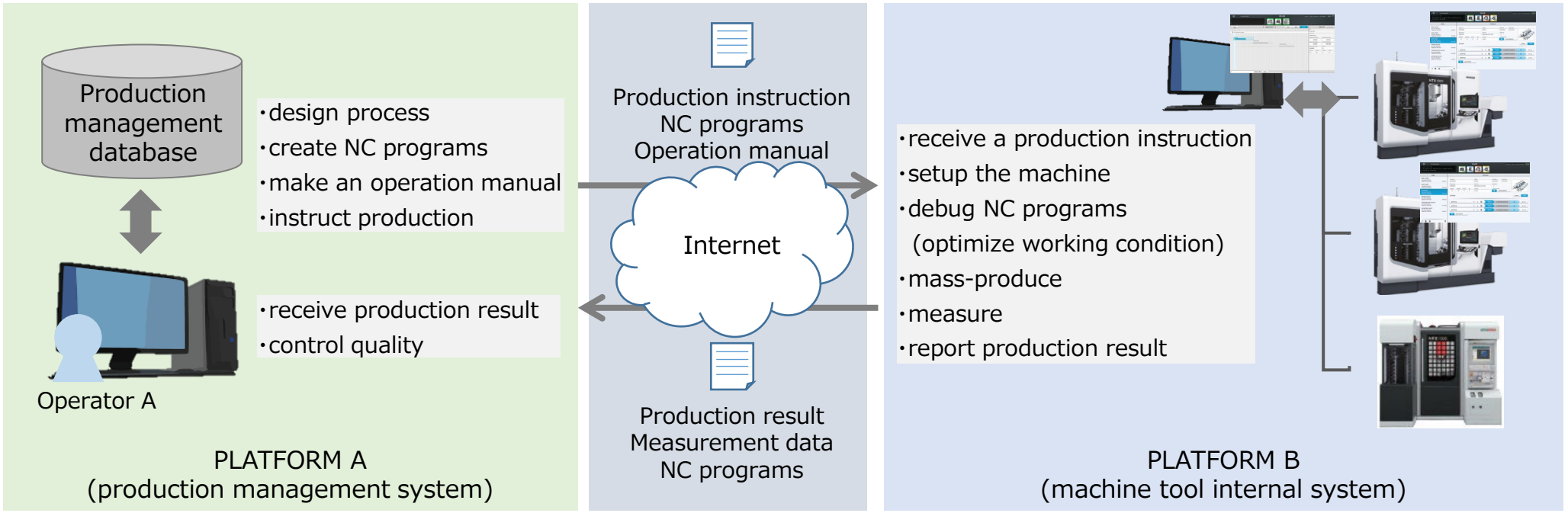
Achievement through CIOF by DMG MORI

1. **Develop External I/F that enables JOB(*1) creation, acquisition and deletion**
   With special API, operators can input/output the condition of machines on shopfloor and working progress.
   [shopfloor] order machines JOB creation/deletion
   [client] manage/have access to a log – it is one of CIOF features
2. **Expanse of applicable machines**
   [2020] a single CELOS(*2) machine
   [2021] multiple CELOS machines
   [2022] multiple CELOS/non-CELOS machines
3. **Link with all data for machining including measurement data**

(*1) "JOB" is a set of data necessary for production such as NC programs.
(*2) "CELOS" is DMG MORI's operation system for machine tools.



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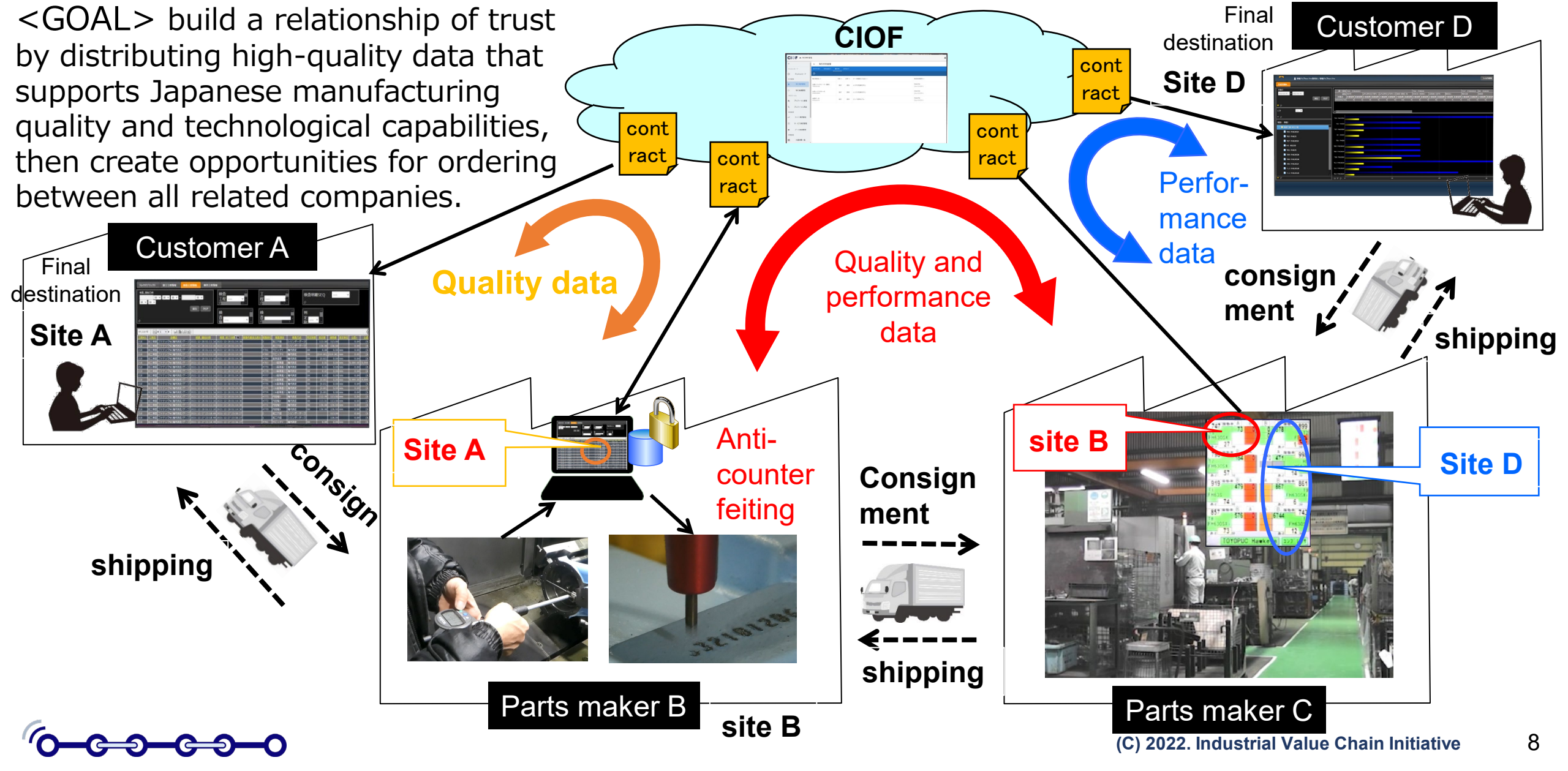
Quality data sharing among supply chain by JTEKT

<GOAL> build a relationship of trust by distributing high-quality data that supports Japanese manufacturing quality and technological capabilities, then create opportunities for ordering between all related companies.



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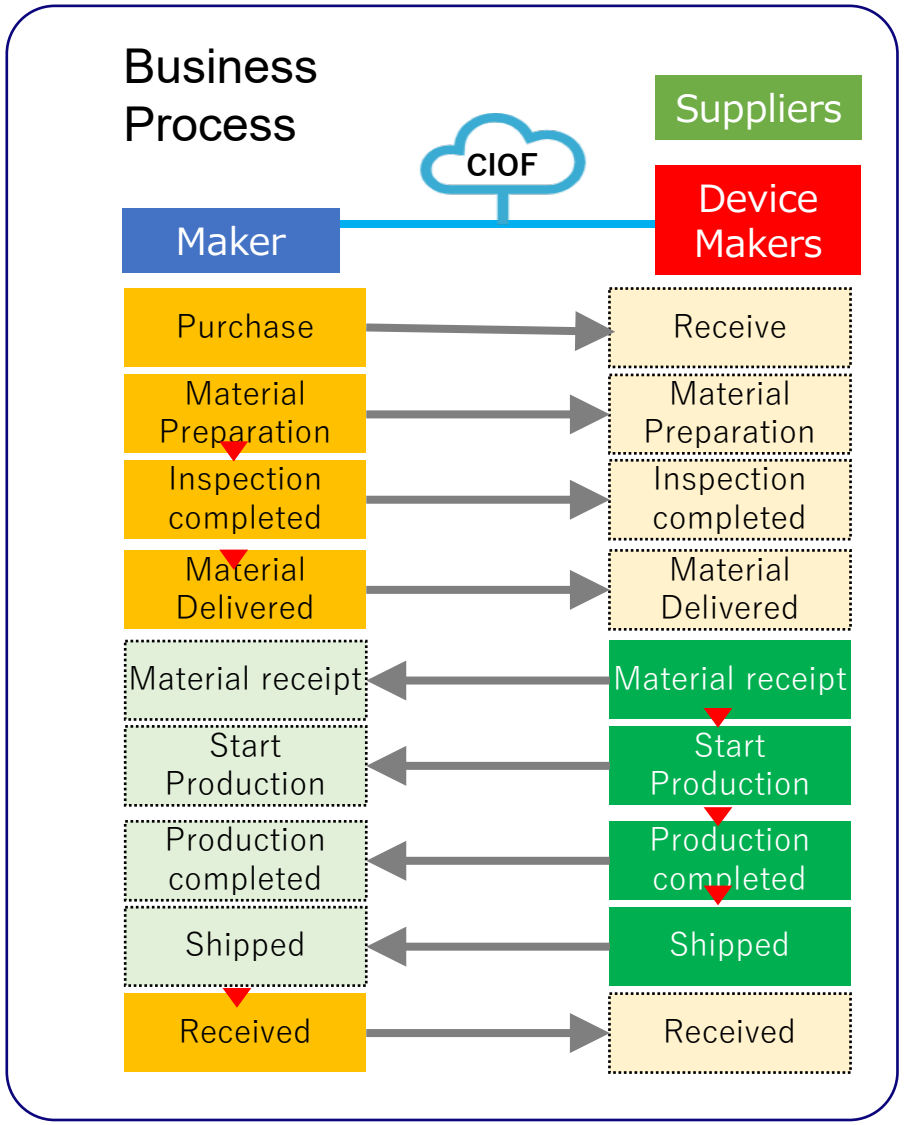
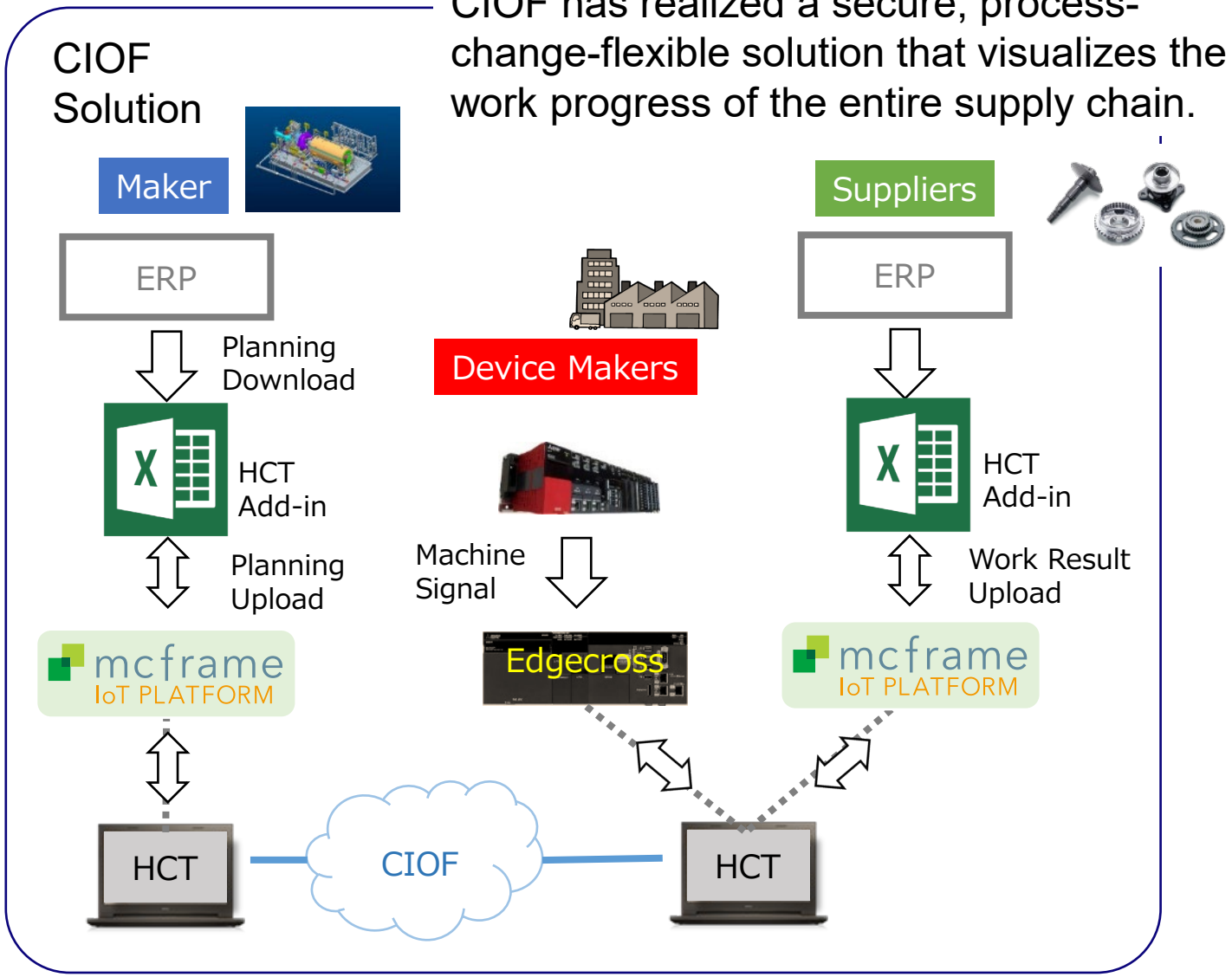
Connected SME solutions by MITSUBISHI ELECTRIC and b-en-g IVI



CIOF has realized a secure, process-change-flexible solution that visualizes the work progress of the entire supply chain.



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CIOF File Transfer Application by YASKAWA

Exchange data for predictive maintenance

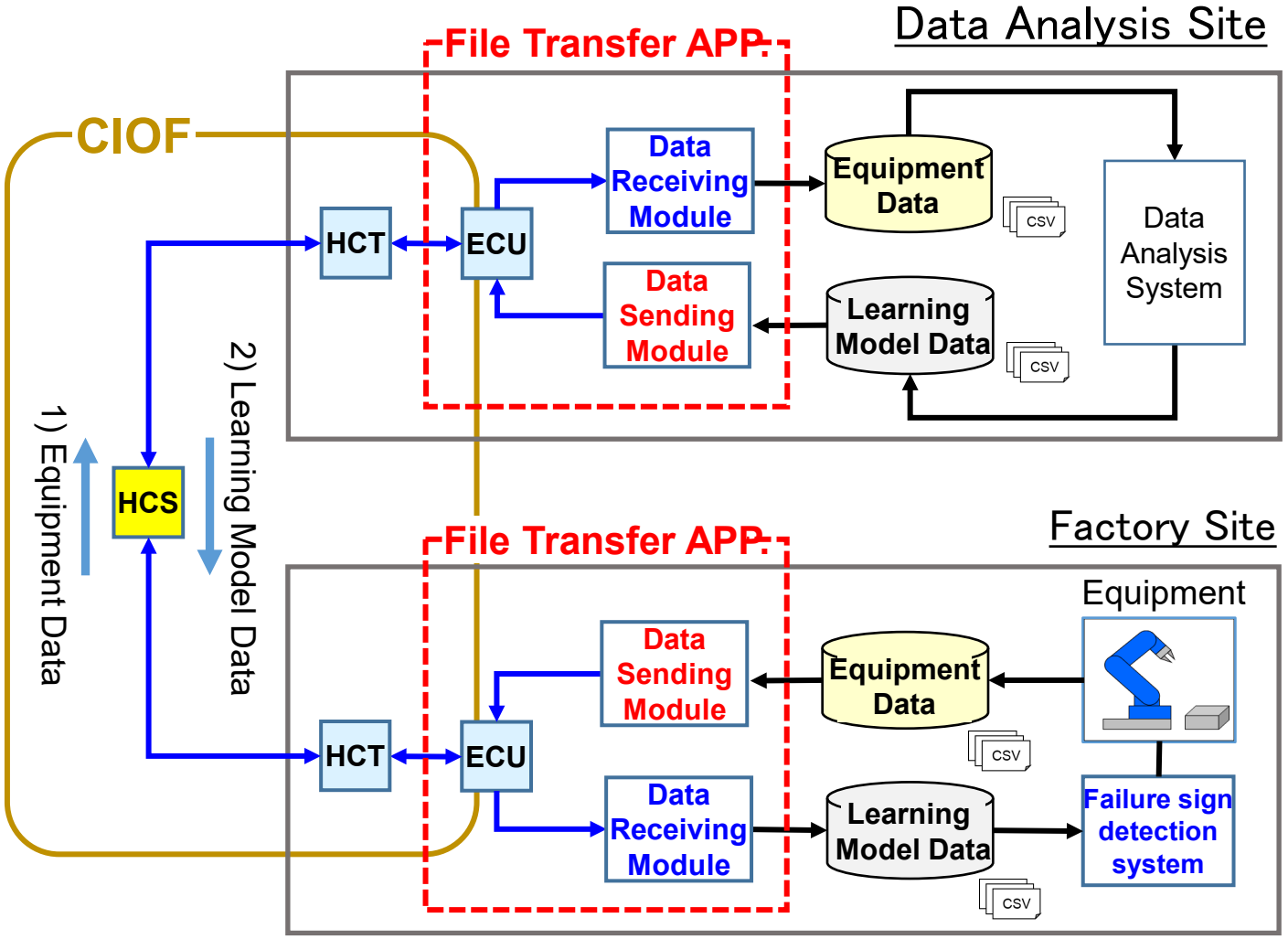
1) Equipment Data

Time-series data including equipment operation data and sensor data measuring the equipment condition

The equipment data (csv files) saved in the sending folder are sent automatically according to schedule defined with CIOF calendar

2) Learning Model Data

The analysis result data including parameter list for configuration of a failure sign detection system



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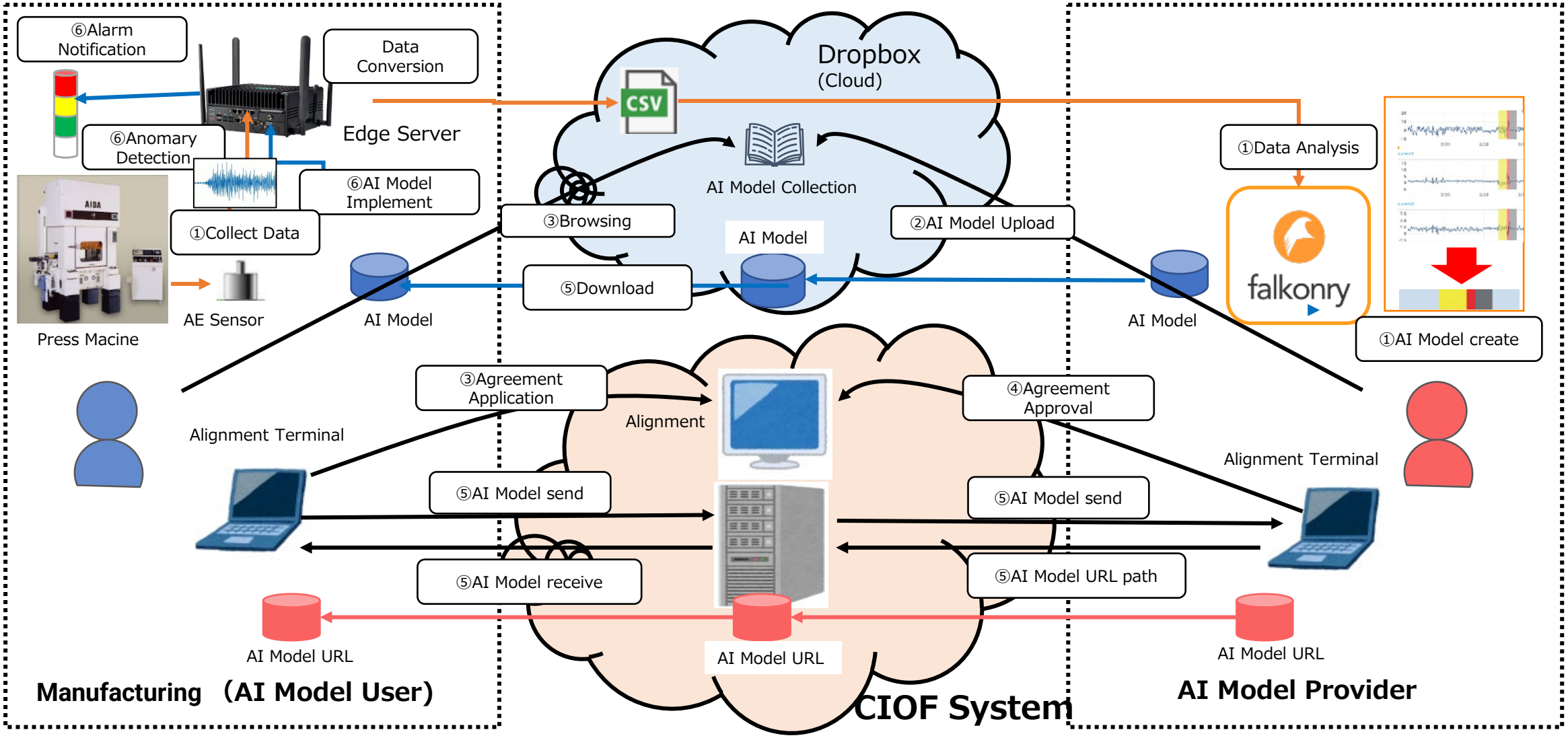
Edge AI Model Analysis with CIOF system



CIOF absorbs the differences between the data from each machine and share the data to applications.
Also falkonry is aiming at sharing “models” made by AI engines through CIOF to decrease the human resources of making model.

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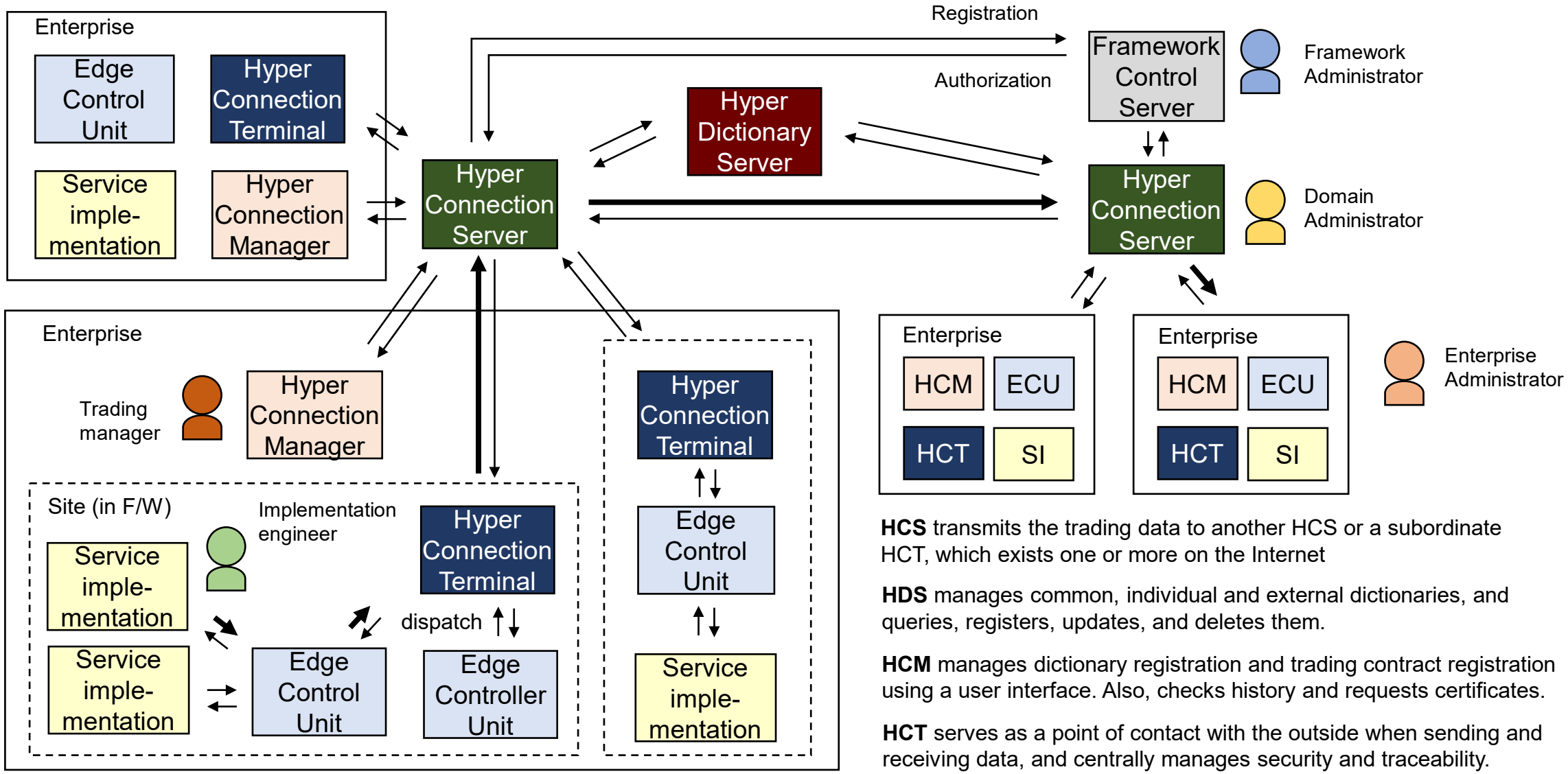
CIOF Architecture



HCS transmits the trading data to another HCS or a subordinate HCT, which exists one or more on the Internet

HDS manages common, individual and external dictionaries, and queries, registers, updates, and deletes them.

HCM manages dictionary registration and trading contract registration using a user interface. Also, checks history and requests certificates.

HCT serves as a point of contact with the outside when sending and receiving data, and centrally manages security and traceability.

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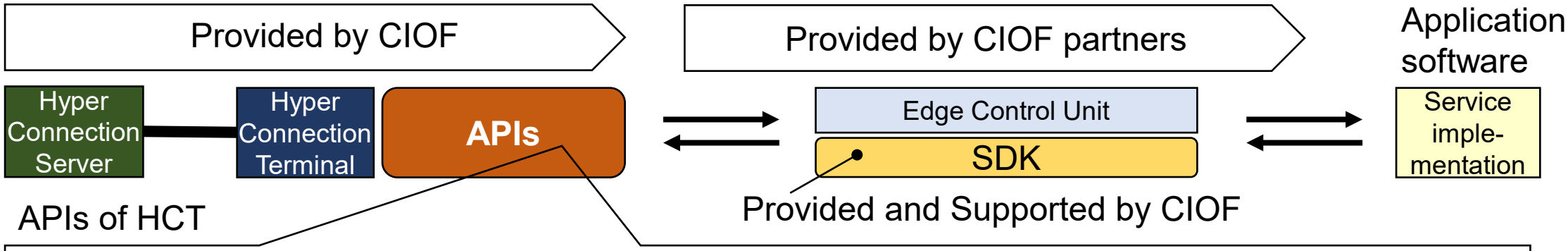
How to develop a controller of CIOF



No	endpoint	description	method
1	/hct/api/v2/controller	Put the current controller's status	PUT
2	/hct/api/v2/service_implementations	Get the profile of the service implementations	GET
3	/hct/api/v2/service_implementations	Put the status of the service implementations	PUT
4	/hct/api/v2/data_implementations	Get the profile of data implementations	GET
5	/hct/api/v2/data_implementations	Put the status of the data implementations	PUT
6	/hct/api/v2/trade_contracts	Get the content of trade contracts	GET
7	/hct/api/v2/calendars	Get the calendar definitions	GET
8	/hct/api/v2/messages	Get trade data as messages	GET
9	/hct/api/v2/messages	Post the trade data according to the contract	POST
10	/hct/api/v2/requests	Get request parameters to create or delete	GET
11	/hct/api/v2/requests	Post request parameters to create or delete	POST
12	/hct/api/v2/service_record	Post service records of data usage or delete	POST

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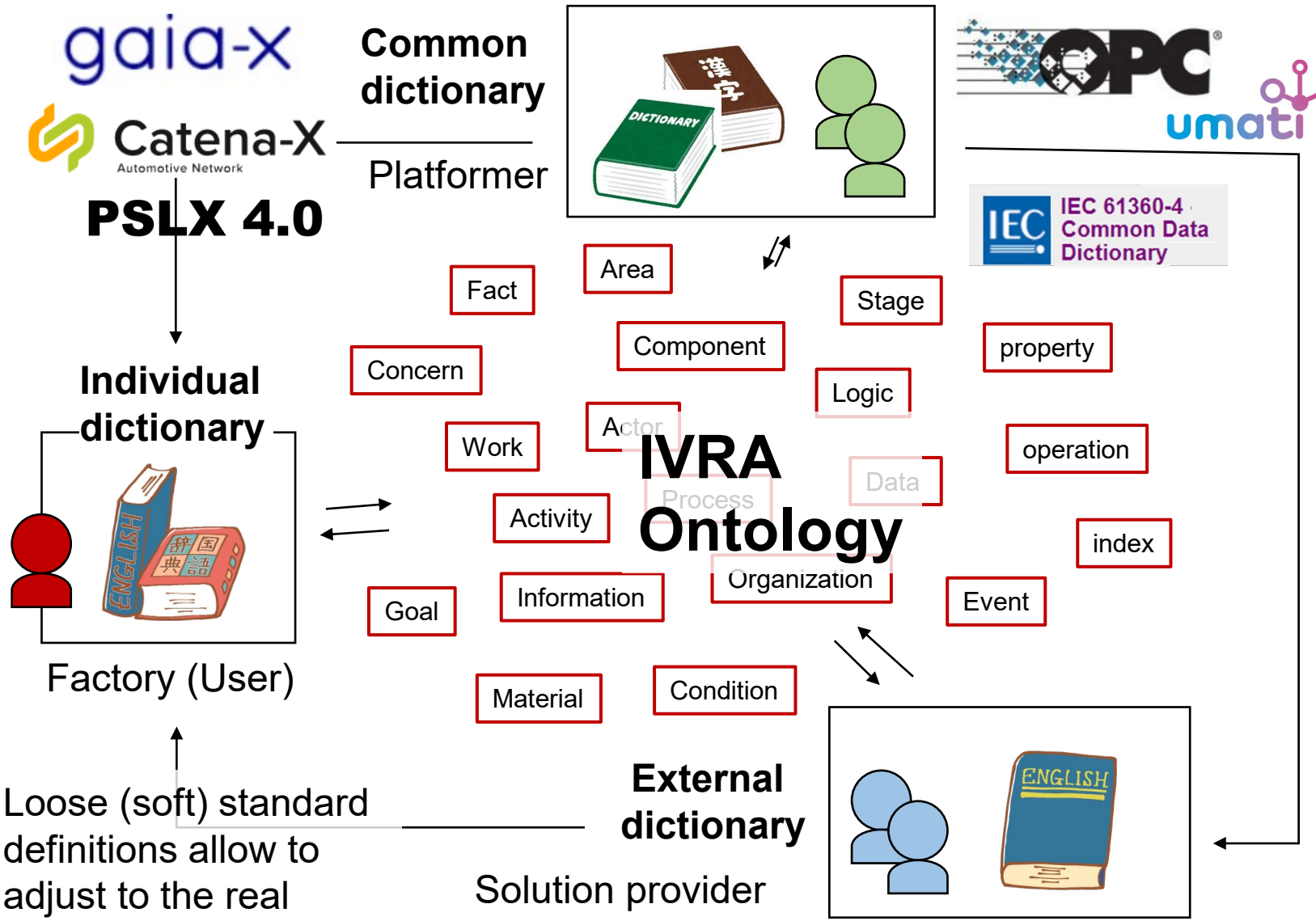
Dictionary control system for interoperability

A common dictionary is used to associate data and service terms between different terminals. It is registered by a platform company or a standards organization.

An individual dictionary is defined using the contents of data and services that are implemented independently in each terminal site.

An external dictionary is created by a provider of an application or device. The contents are imported and used as an individual dictionary.



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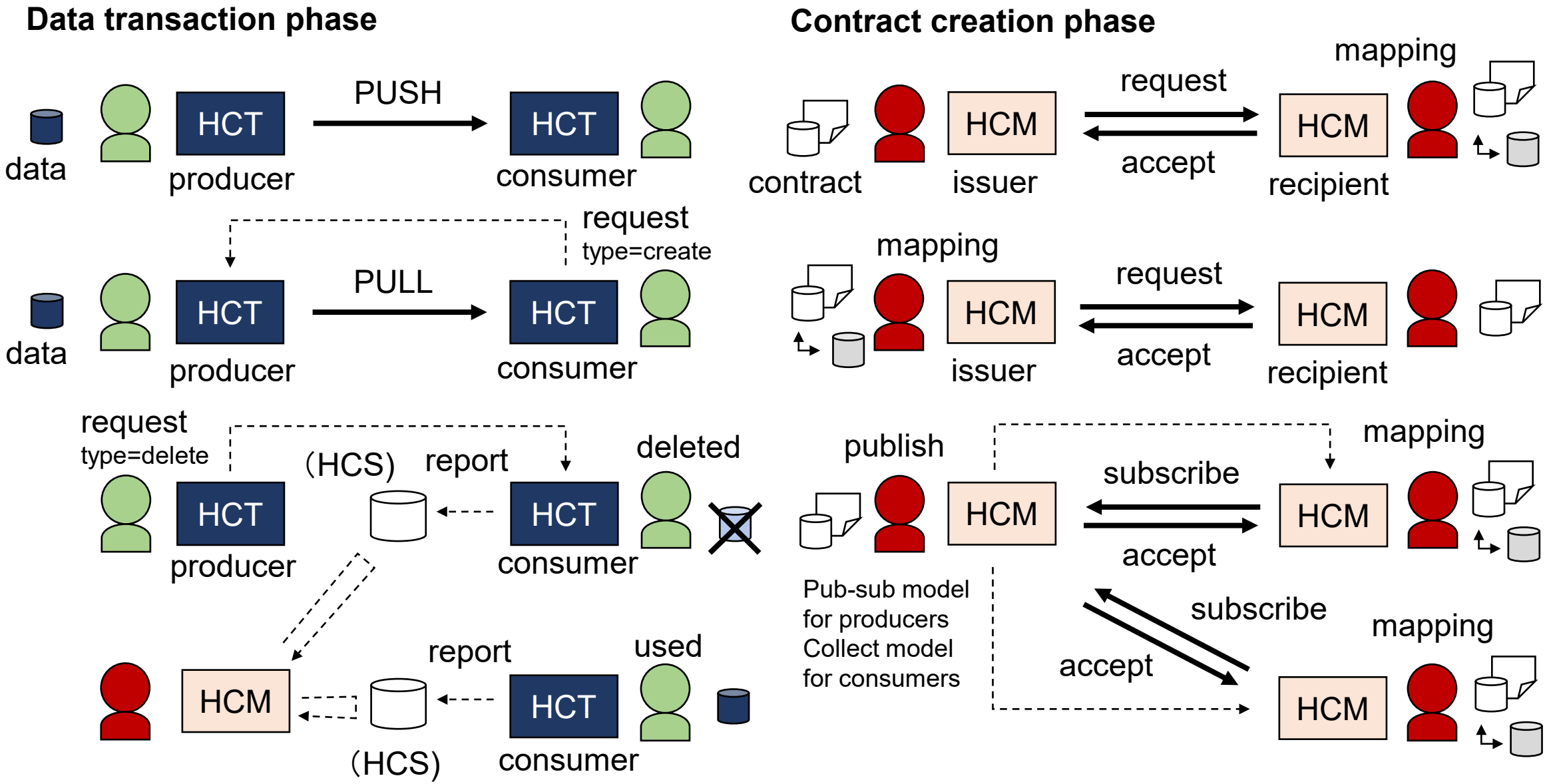
Protocols of data transactions and contracting



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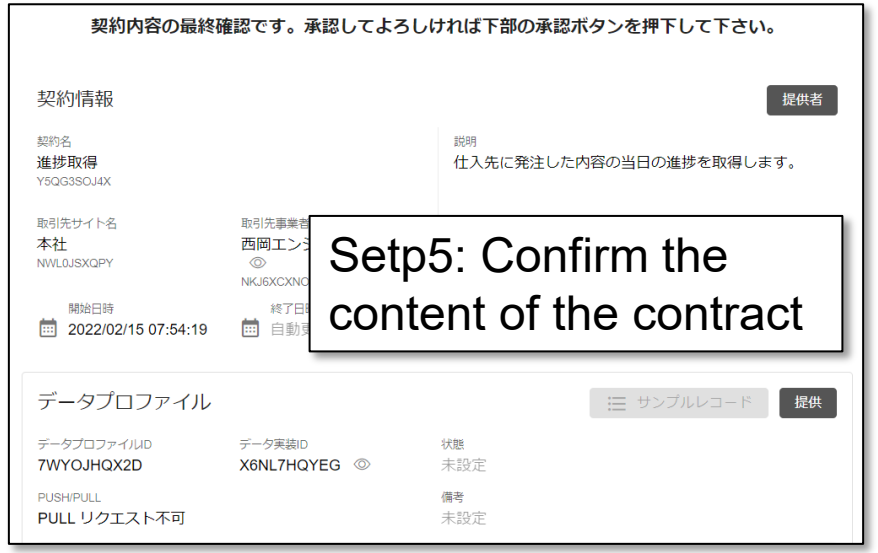
Procedure of making a contract between companies



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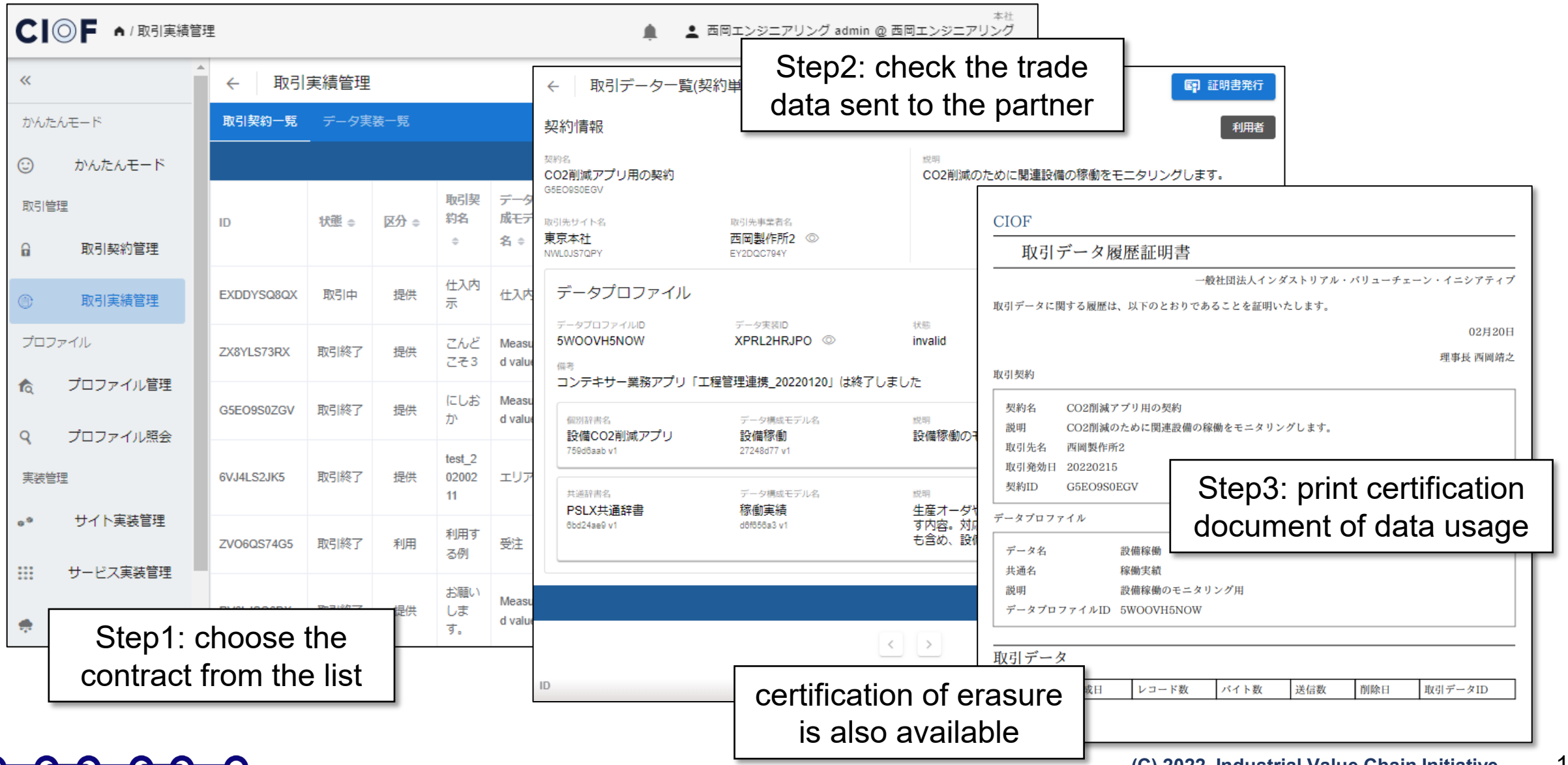
Management of data usage and description control



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Coming services of data value networking

Service menu	2022	2023	2024
✓Data transfer service	●	●	●
✓Contract broker service	●	●	●
✓Common dictionary service	●	●	●
✓Usage certification service	○	●	●
✓External dictionary service	○	●	●
✓Contract integration service	○	○	●
✓Data usage billing service	○	○	●
✓Dictionary translation service	○	○	●

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Summary of CIOF features

- ✓Essential types of data trade contract are illustrated
- ✓Data profiles are defined by common/individual dictionary
- ✓Semantic interoperability can be managed granularly
- ✓Service profiles are generated by the actual implementation
- ✓Data usage and delete action can be certified
- ✓Easy start without system development and integration
- ✓Industry data is encrypted and not stored on the Internet
- ✓Distributed architecture can be cooperated with others

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Connected Industries Open Framework
Powered by Industrial Value Chain Initiative

Thank you !

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