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FUJITSU Cloud Service K5 IoT Platform Service Functional Overview

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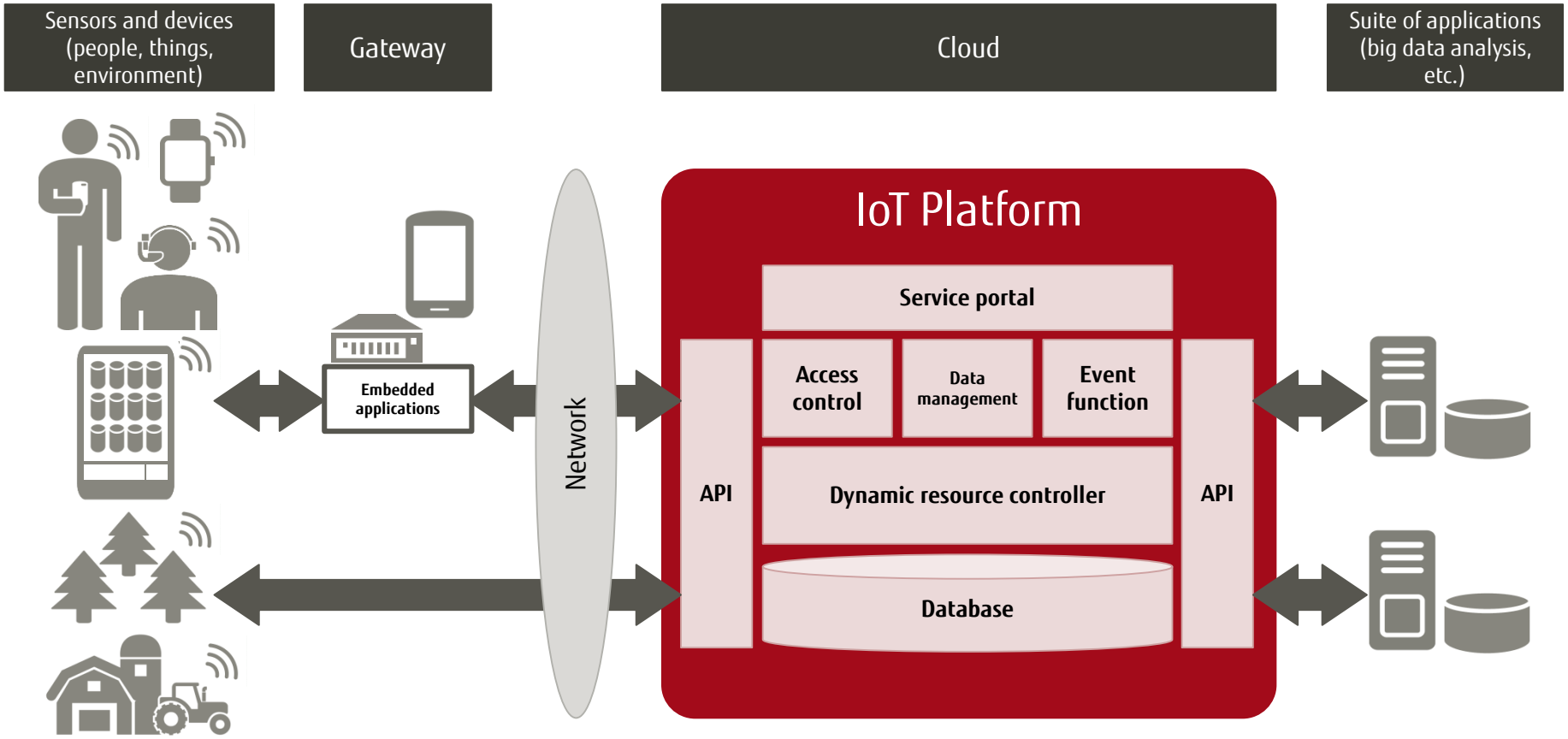
Fujitsu Limited

Contents

About the IoT Platform

The IoT Platform is a dedicated IoT cloud service for sending, receiving, storing and collecting data from the enormous number of sensors and devices required when using the Internet of Things. It enables efficient data collection through real-time decision-making, action taking and data distribution functionality.



Service features

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A common platform (PaaS) that enables simple and efficient usage of data from various sensors and gateways using a standard procedure.

Enables rapid IoT system building

The basic functions required for using the IoT system (data collection, retention and searching, access control, and event detection and notification) are provided as a package, which enables customers to focus on using the IoT and developing the desired business applications. The inclusion of a standard interface enables easy application development.

Accommodates a diverse range of sensors and devices

In addition to the conventional HTTP/HTTPS protocols, it also supports the lightweight MQTT/MQTTS protocols which are designed to have low communication load and battery consumption for the IoT. There is no need for special modules when developing devices and applications, as open source and other technologies enable a wide range of sensors and devices to be used for business.

Manages data securely

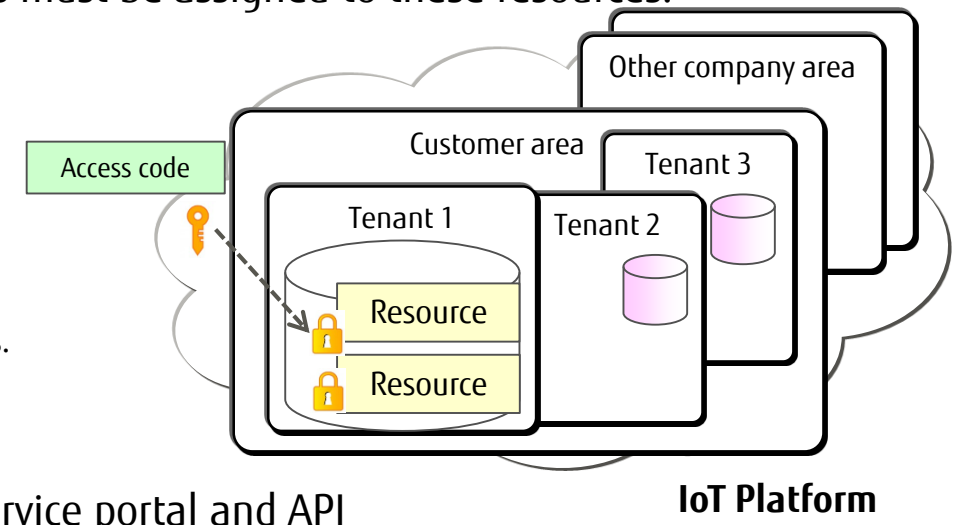
The ability to set access privileges down to a granular level for each piece of data stored by the customer enables secure data sharing and use with business partners.

Collects data reliably

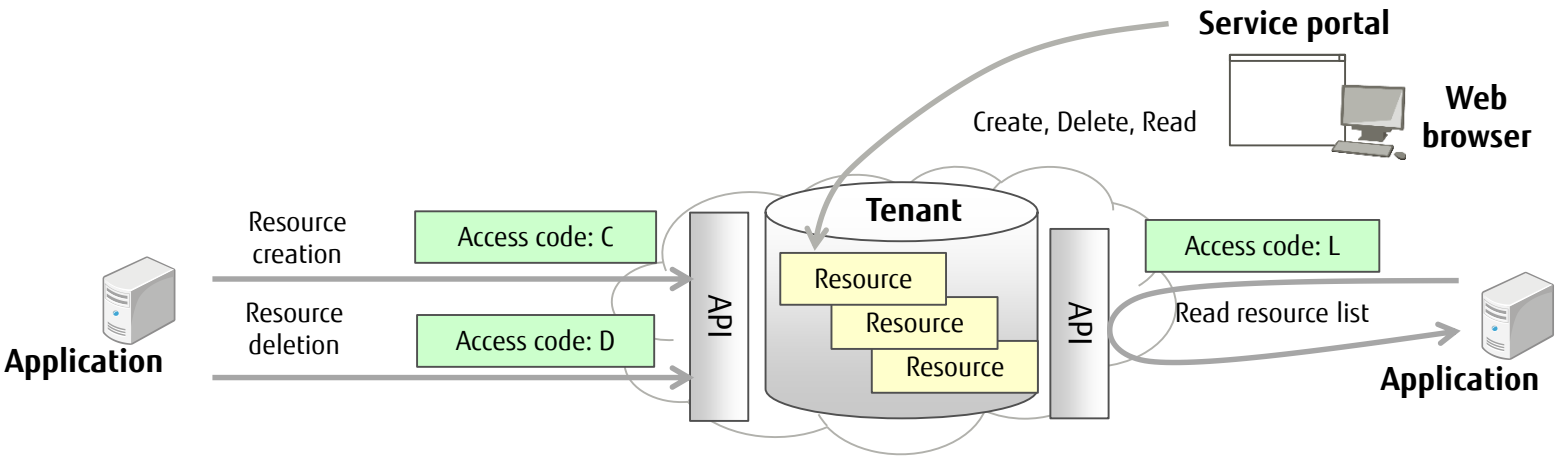
The dynamic resource controller, which is Fujitsu's proprietary complete optimization technology, provides wide-area network distribution functionality, and enables efficient and reliable data collection of fluctuating data traffic when collecting the data generated by sensors and other devices.

Function overview - 1. Data collection and usage (1/2)

- Data collection
  Data is collected in resources created within customer-specific tenanted areas. Data transfer to external systems is also possible. Access codes must be assigned to these resources.
  - Resources
    Unit for registering data with the service
  - Access code
    Code showing task privileges*
    for resources and access codes
    *Including Create (C), Register (R) and Delete (D) operations. Refer to the "API provided" section for details.

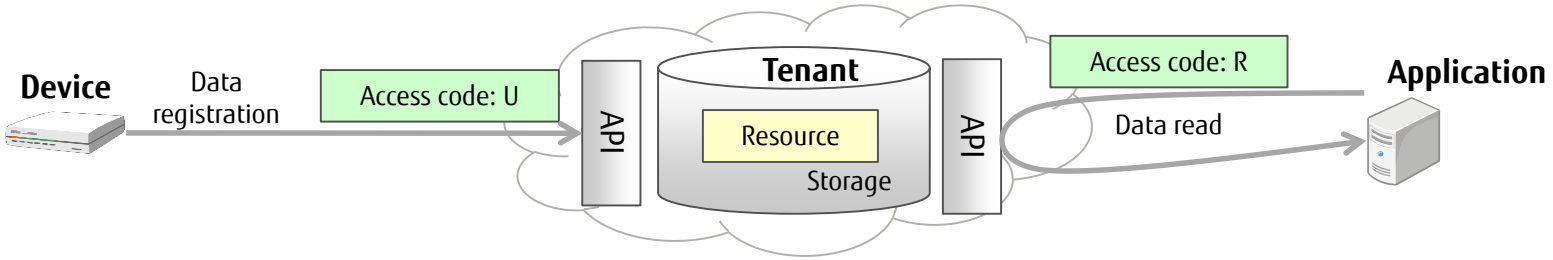


- Data collection preparation
  Create resources and access codes from the service portal and API

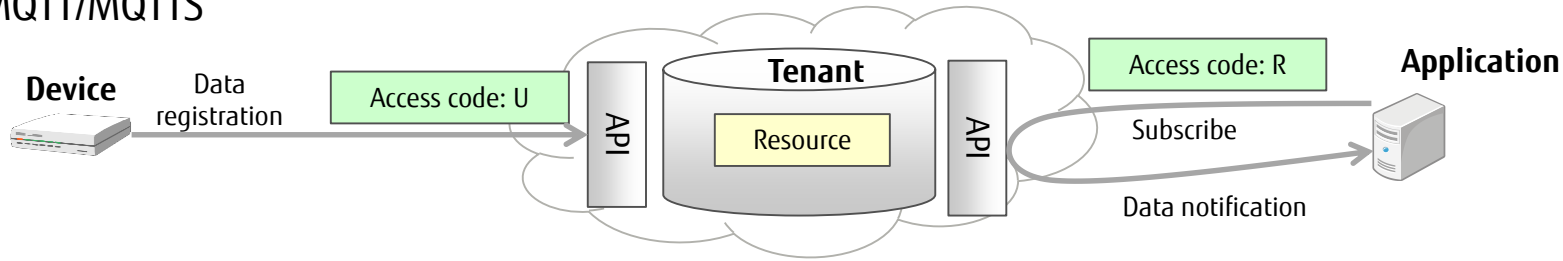


Function overview - 1. Data collection and usage (2/2)

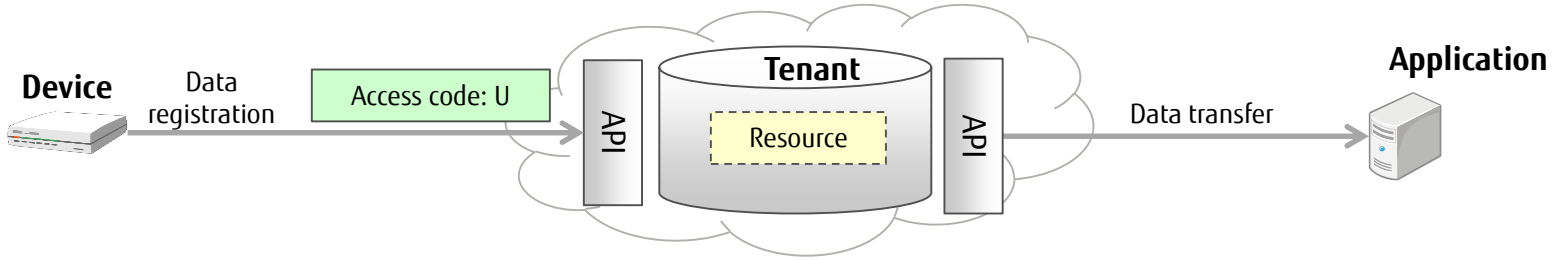
- Data storage
  Data registration and read operations are run from the API
  - HTTP/HTTPS



  - MQTT/MQTTS

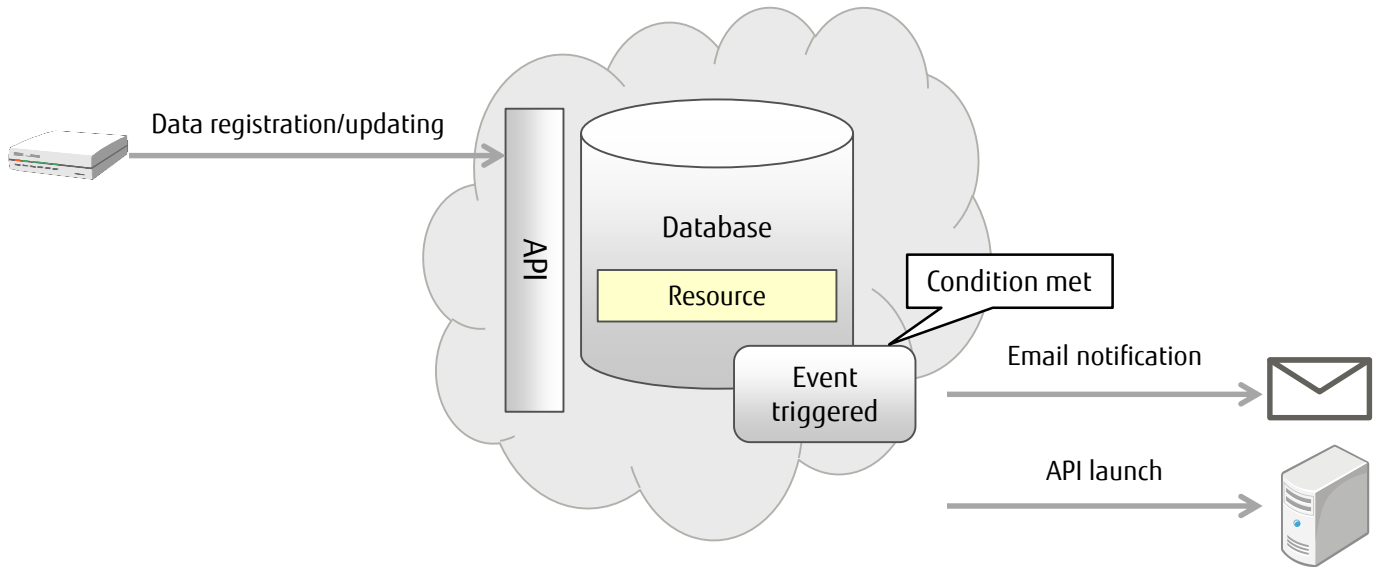


- Data transfer
  Data transfer to another service is possible without being stored by this service



Function overview - 2. Event function

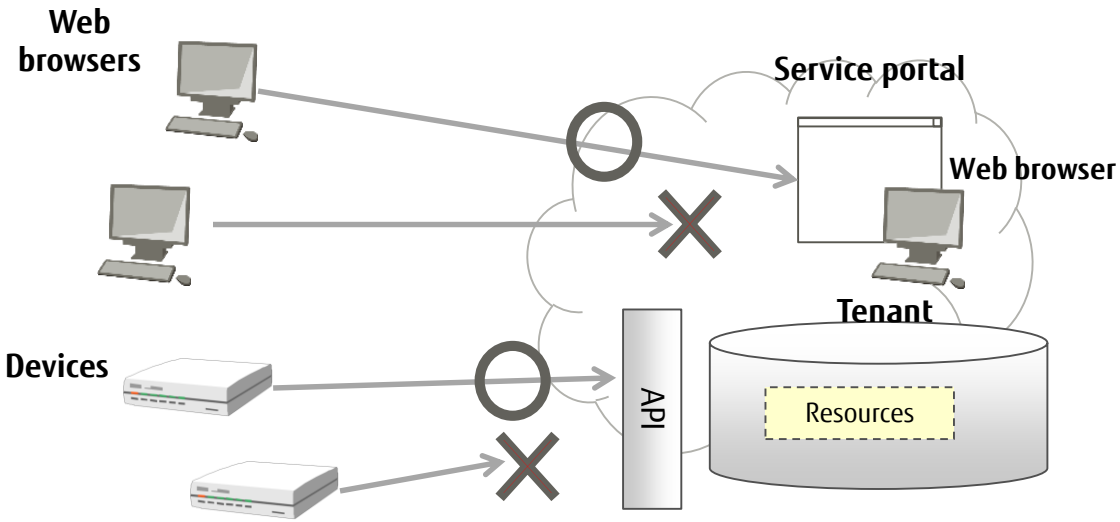
- Setting up of event detection conditions and actions related to data collection
  By setting data detection conditions, such as events, it is possible to trigger actions when specific conditions are met during data registration or updating.
  - Actions
    Email notification or launch of a specific API



Note: For binary data, actions are triggered only for data registration.

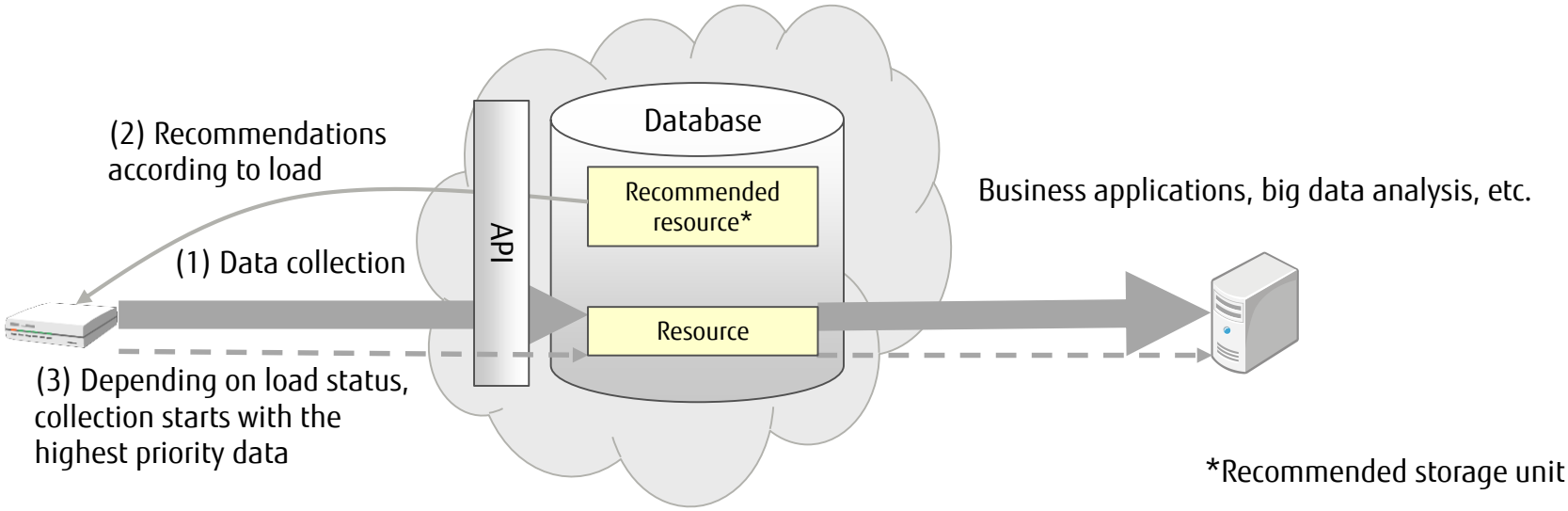
Function overview - 3. Access control

- This service provides IP address access control by allowing access to resources and the service portal according to the source IP address.
  Robust security measures ensure that internet access is prevented for leaked access codes.



Function overview - 4. Dynamic resource controller

- Data collection can be tailored according to the customer's IT resources
  This service recommends data collection methods that can be used as a guide for managing data collection according to the load placed on the cloud. It calculates service-related load information (TPS (transactions per second) and BPS (bytes per second)) and compares these values with conditions set by the customer in order to provide the recommendations. By following the recommendations, the customer is able to collect data in the most efficient manner based on load status.



Reference: Dynamic resource controller usage example

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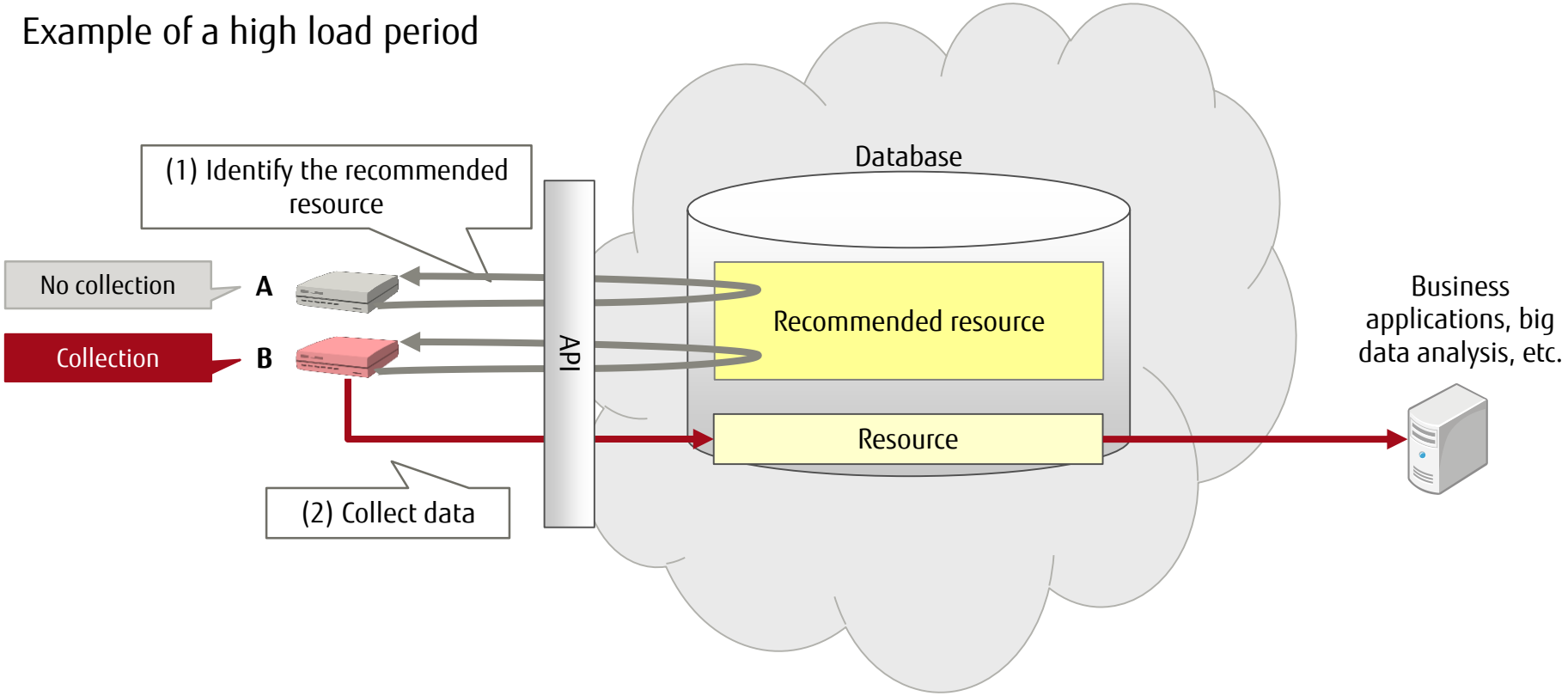
- Data priorities are set in advance and data is collected according to the recommended resource results (load status).
  - A: Low priority data (no collection during periods of high load)
  - B: High priority data (collection even during periods of high load)

Example of a high load period



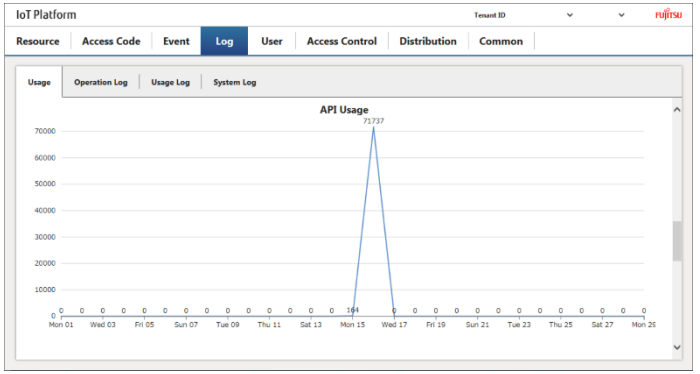
Function overview - 5. Service portal

The service portal is used to configure the service and manage data.

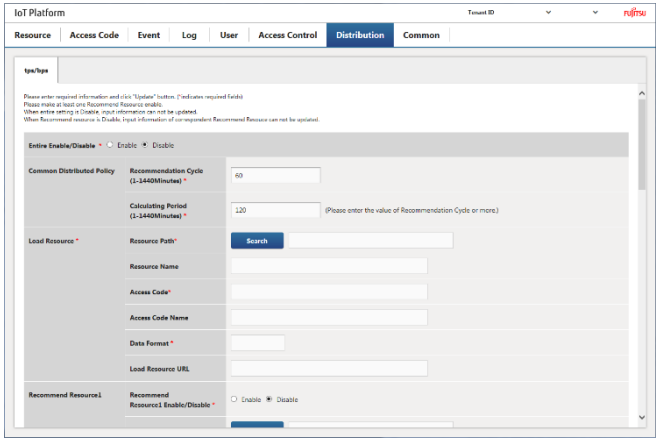
Management functions provided

Function	Details
Accounts	•Create and delete service portal accounts •Reissue passwords
Resources	•Create, edit, delete and bulk register resources •Auto-delete data from resources (from 1 to 9,999 days) (Data can be read up to a maximum of one day after the set date and time) •Display, search and download the list of resources
Access codes	•Create, edit, delete and bulk register access codes •Display, search and download the list of access codes
Events	•Create, edit and delete events •Display and search the list of events
Logs	•Display, search and download the service portal operation log •Display a summary of monthly usage •Display the monthly usage •Download the date and time usage log file (for billing confirmation) •Display the system log
Access control	•Create, edit and delete the service portal access control conditions •Create, edit and delete the access code access control conditions
Distribution settings	•Configure, edit and delete settings for the dynamic resource controller •Enable and disable the distribution policy
Common settings	•Display and edit the MQTT password

Log example: Screen showing monthly usage (API)



Data distribution configuration example



Function overview - 6. API

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Uses standard IoT protocols (HTTP/HTTPS and MQTT/MQTTS)

- Support for both JSON and binary format data enables use of protocol-independent common data models.
- Uses automatic log management and time management (auto history) for sequential data.
- A wide range of query and event processing support is available, particularly when using JSON data.

API Provided (privileges, operational targets and supported protocols)

Privilege	Details	Target	Protocol
Create (C)	•Privilege to create •Enabled under specified resources*1	Resources Access codes Events	HTTP/HTTPS
Read (R)	•Privilege to read data stored in resources •Enabled for specified resources only	Resource data	HTTP/HTTPS MQTT/MQTTS*2
Update (U)	•Privilege to register data in resources •Privilege to update data stored in resources (MQTT/MQTTS not supported) •Privilege to delete data stored in resources (MQTT/MQTTS not supported) •Enabled for specified resources only	Resource data	HTTP/HTTPS MQTT/MQTTS
Delete (D)	•Privilege to delete •Enabled under specified resources*1	Resources Access codes Events	HTTP/HTTPS
List (L)	•Privilege to list resources under specified resources •Enabled under specified resources*1	Resources Access codes Events	HTTP/HTTPS

*1. When privileges are contradictory, the higher level privilege shall apply.

*2. MQTT/MQTTS is not supported for acquiring data lists from scheduled updates of binary data.

Functions

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Function	Overview
Data collection	Stores data in this service and can also transfer data directly to external services. Includes support for both JSON and binary format data.
Approvals management	Includes an approvals function for API requests. Approvals can be managed on a resource-by-resource basis (data collection basis).
Event function	Actions (API launch or email notification) can be triggered when the set conditions are met for data registered with the service.
Access control	Allows access only from the customer's specified IP address.
Dynamic resource controller (distribution control)	Enables efficient data collection using the customer's limited IT resources. Offers data collection recommendations that can be used as a guide for controlling data collection according to the load placed on the cloud.
Service portal	Dedicated service portal for the customer's administrators to manage data.
API	The API enables the execution of functions to manage, collect and use data. It supports the HTTP/HTTPS and MQTT/MQTTS protocols.

Restrictions and Notes (1/2)

- Refer to the Service Description on FUJITSU Cloud Service K5 Website to confirm the regions in which this service is offered.
- Usage in excess of limits
  - If any one of the following item limits for data registration and reading frequency are expected to be exceeded, the customer's usage scenario may not be possible with this service. In this case, please check with your Fujitsu sales representative beforehand.
  - Please note that if communication frequency has exceeded the limit for a certain period of time all requests will result in error (in case of HTTP/HTTPS) or will be discarded (in case of MQTT/MQTTS).

  Limits:

Single data size	Communication frequency (peak)		Registered resources	Data storage capacity per resource (JSON)	Simultaneous connections
	Data API	Management API			
256 KB	100 times/sec.	1 time/sec.	10,000	100 MB	100

- Overly intensive use

  Overly intensive use is not permitted. Intensive use that could cause serious damage to this service, such as the following, may result in denial of access.
  - Sudden usage that greatly exceeds the above limits
  - Usage that regularly exceeds the above limits

Restrictions and Notes (2/2)

- Other items
  Please refer to the following documents for details on the functions provided and additional restrictions. The documents are available at K5 PaaS Portal > Documentation > IoT Platform
  - Fujitsu Cloud Service K5 IoT Platform Service Details Instruction Manual
  - IoT Platform Service Portal Operating Manual
  - IoT Platform API User Guide
  - IoT Platform API Reference

Usage scenario - 1. Sensor-based monitoring

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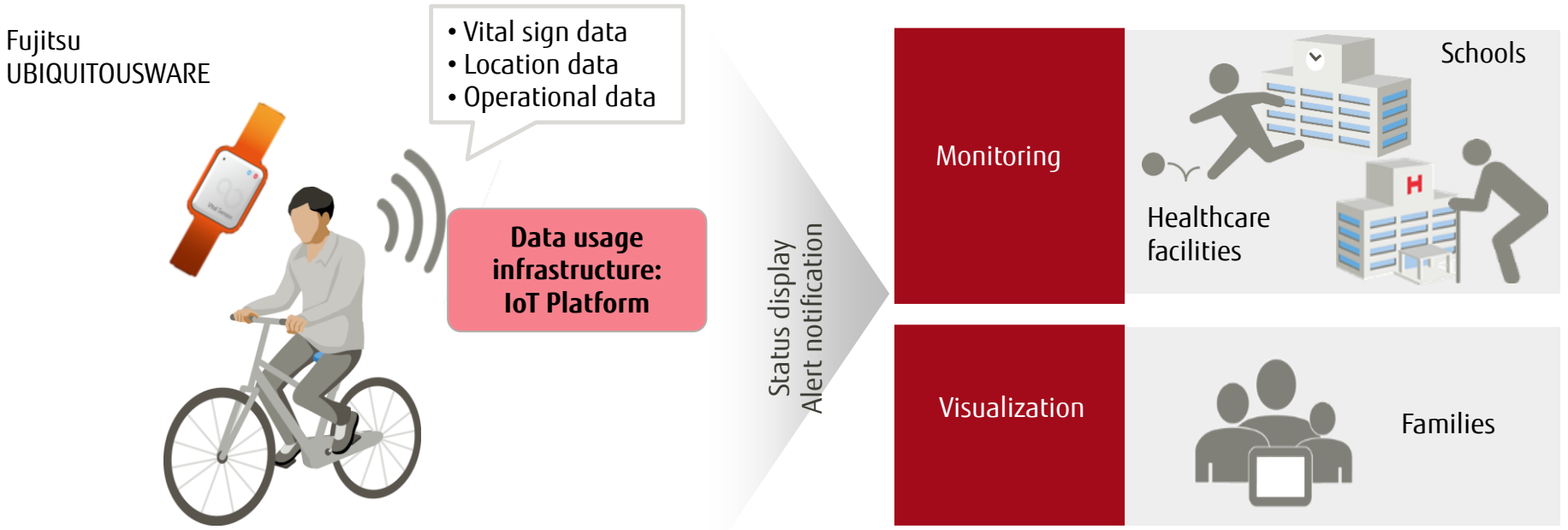
Enhancing a business using new value created by incorporating IoT into existing products

- **Scenario**
  Build new sensors into existing products, and then aggregate and monitor the operational data collected or vital sign (biometric) data acquired from wearable devices.
- **Benefits**
  Provide a sense of security to the people being monitored by creating an environment that enables them to feel safe when going out.
  Also, provide caregivers or care providers with a sense of comfort by being able to visualize the status of the person they are caring for.



Usage scenario - 2. Visualization of factory operations

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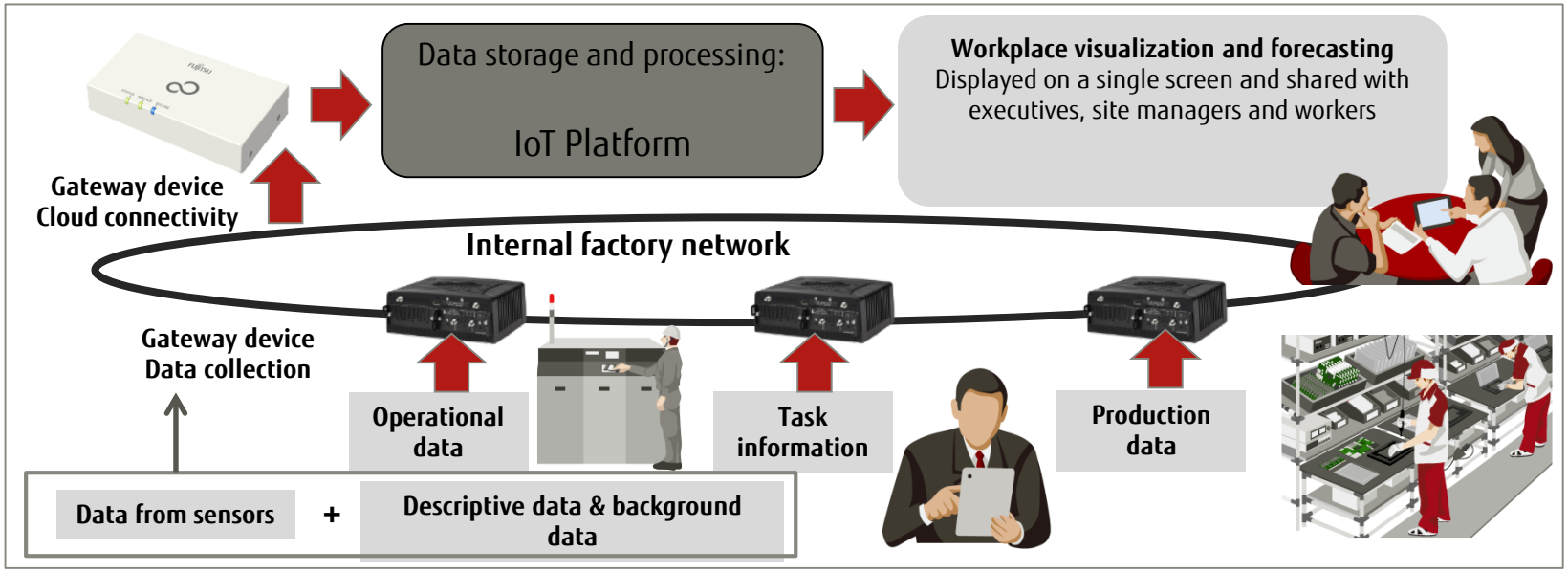
Improving production efficiency through visualization of the workplace using IoT

Scenario

- Using the cloud, aggregate a range of data generated from sensors in factories, together with related background information, and use this to visualize factory operations.
- Make the process of developing and implementing improvements more efficient by sharing information with executives, site managers and workers.

Benefits

- Simplifies the task of detecting and analyzing issues related to the timely sharing of information between management and workers, and making improvements (from one week to same-day).
- Enables workers to directly see the impact of their improvements (25% fewer line stoppages, etc.), and improves the motivation to work productively.



Usage scenario - 3. Worker safety management

Using IoT to collect data on routine tasks and detecting data variance to avoid unexpected outcomes

- **Scenario**
  Digitization and monitoring of workplace equipment and worker status.
- **Benefit**
  Instead of the conventional practice of having site managers make decisions on workplace safety management, an offsite support team can make informed decisions on suitable accident prevention measures for heatstroke, unexpected equipment stoppages, etc.

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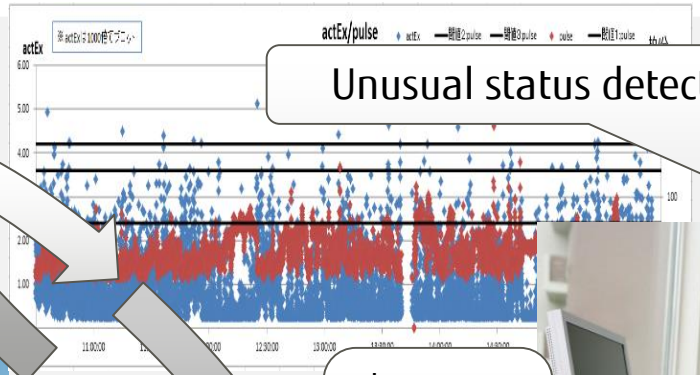
Vital-sign sensing band

Data usage infrastructure: IoT Platform

- Vital sign data
- Equipment data



Unusual status detected

Alert workplace and provide support

- Predict heat stress using pulse, temperature and humidity data to avoid heatstroke and other dangers.
- Combine with acceleration and air pressure data to detect falls.

Reference: IoT cloud comparison

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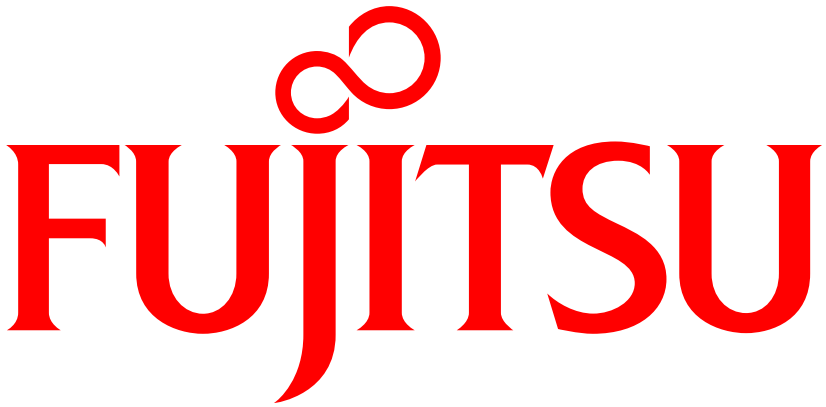
Other companies have a range of cloud offerings divided by function, which are combined and integrated by systems engineers and the customer to meet requirements, with the customer subsequently responsible for system operation.
In contrast, Fujitsu's IoT platform provides the full package of functions necessary for data usage and edge computing connectivity, thereby enhancing convenience.

Function type and pricing	Function	FUJITSU K5	Company A	Company B	Company C
Device and app access (API)	Communication protocols	IoT Platform	Company A IoT platform service	Company B IoT platform service	Company C IoT platform service
	Access source authentication and control				
	Data element level approval				
	API-based data searching				
Data management	Recent data retention				Company C IoT platform service
	Log storage		Various databases	Various databases	Various databases
Data discrimination and processing	Distributed processing for large enterprises (dynamic resource controller: edge computing control)				
	Event detection and notification		Various tools	Various tools	Company C IoT platform service
	Data analysis				Various tools
	Data visualization				
Pricing	-	Monthly subscription plan (312.50, 625.00 or 3,125.00 GBP) + some usage fees apply	Full pay-per-use system (usage fees vary according to the service) However, separate application development and integration is needed for any additional functional requirements		



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