

Smart City Saitama Model: Information Bank and Data Services

Prof. of Keio University

Chair person of Misono Town Management Consortium

President of Omotenashi ICT Consortium

Director of Edge Platform Consortium

Hiroaki Nishi



Saitama Urawa-Misono Smart Town

Smart Town Project around Urawa-Misono Station

- Area: 320ha
- Population: 32,000 (Current 12,000)

Urban Design Center Misono (Center office)

Members

Saitama City

**Keio Univ., Kougakuin Univ., Shibaura Tech Univ.,
Tokyo Denki Univ.**

**AEON Retailing Group, Softbank, Tokyo Gus, IBM
Japan, Felica Pocket Marketing, TANITA,
Panasonic, Mitsubishi**

**Local house building companies, Local banks
(40> companies and organizations)**



UDCMi Smart Data Infrastructure

Smart city data services

Data services based on secondary-use of data
Data anonymization

Smart city information platform

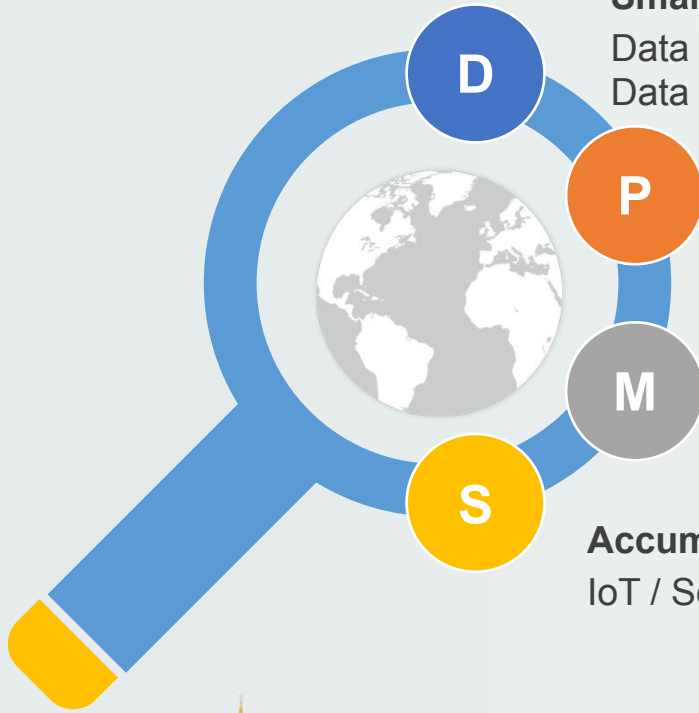
Flexible service application provisioning
Data and IoT device are encapsulated by using data anonymization and traffic management at edge

Vender Consumer Relationship Management

Venders manage consumers for providing services
Consumers manage service vendors for controlling private data distribution

Accumulating use cases and penetration into the whole city

IoT / Sensors / Shelves / Infrastructures



Services in UDCMi

Urawa-Misono Smart Town



- Workshops for "Designing My Own Smart Town"



- Rental electric kickboard



- Hydrogen Station for FCV



- EV garbage truck



- e-money card



Body composition meter

Monitoring

Activity meter

- Rental electric bicycle



- WiFi Sopt



- Smart Home town blocks



- BLE Local Positioning
- BLE antenna Infrastructure



- Automated Driving EV Bus



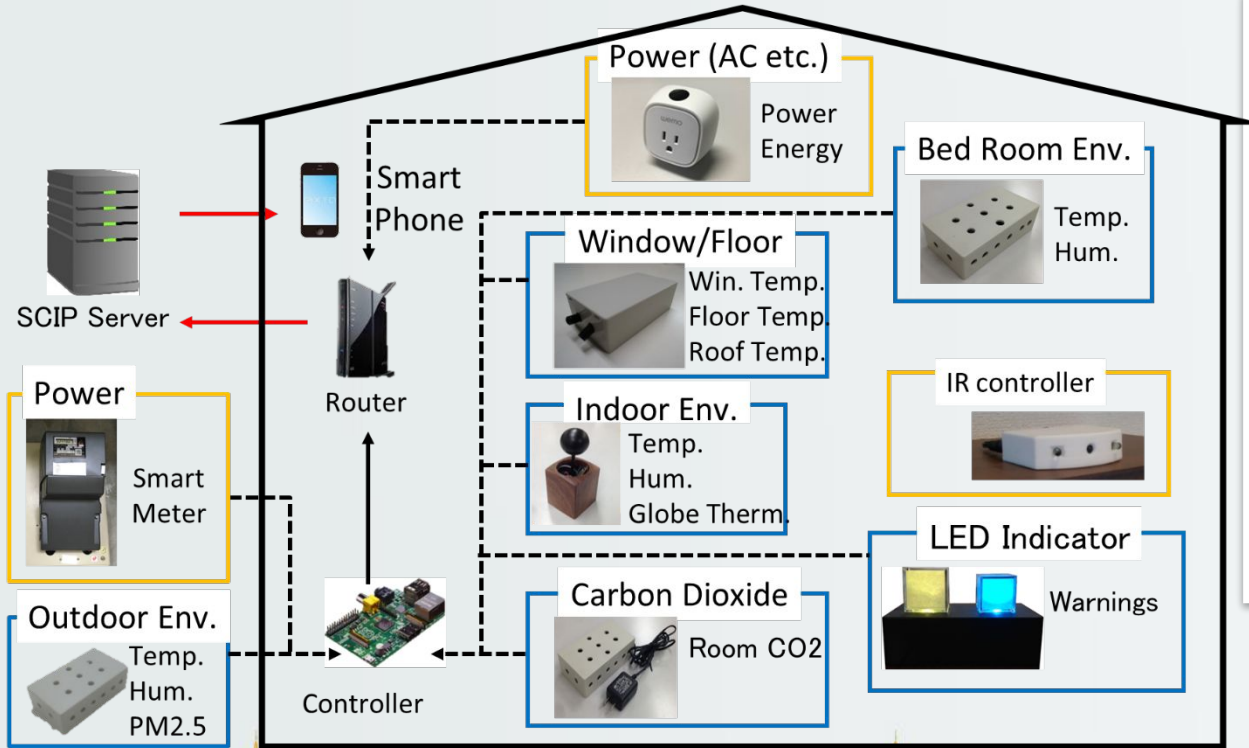
- Child-rearing support BAMB!



- STB UDCMi Channel



Smart Home Infrastructure



Usage Details

Usage of Bathroom

Items	This month	Previous month	Same month last year	Comments
Total usage	62,402kWh	67,760kWh	67kWh	It seems that you did not use them in the same month last year.
Dryer's usage	62,402kWh	62,876kWh	67kWh	
Duration of usage	216.00hours	210.00hours	240.00hours	It seems that you did not use the dryer when it was sunny in this month. Please consider drying clothes in the sun as possible.
Frequency of usage	21 times	21 times	21 times	
Duration of usage at night (18:00-24:00)	180.00hours	240.00hours	210.00hours	The frequency rate of a electrical use of dryer at night is 100%. It is desirable to use dryer at night.

Usage Details

Usage of Kitchen

Items	This month	Previous month	Same month last year	Comments
Total usage	54,936kWh	55,244kWh	67kWh	It seems that you did not use them in the same month last year.
Total usage	54,936kWh	55,244kWh	67kWh	
Socket's	47.14days	48.25days	67kWh	It seems that you consumed electricity 8.81% less than last year.
Base Consumption	9,453kWh	9,531kWh		

Usage of Eco Cute

Items	This month	Previous month	Same month last year	Comments
Total usage	402.00kWh	424.00kWh	67kWh	It seems that you did not use them in the same month last year. Please consider raising the temperature or the amount of hot water.
Duration of usage	260.00hours	220.00hours	4.00hours	
Frequency of usage	6 times	6 times	6 times	

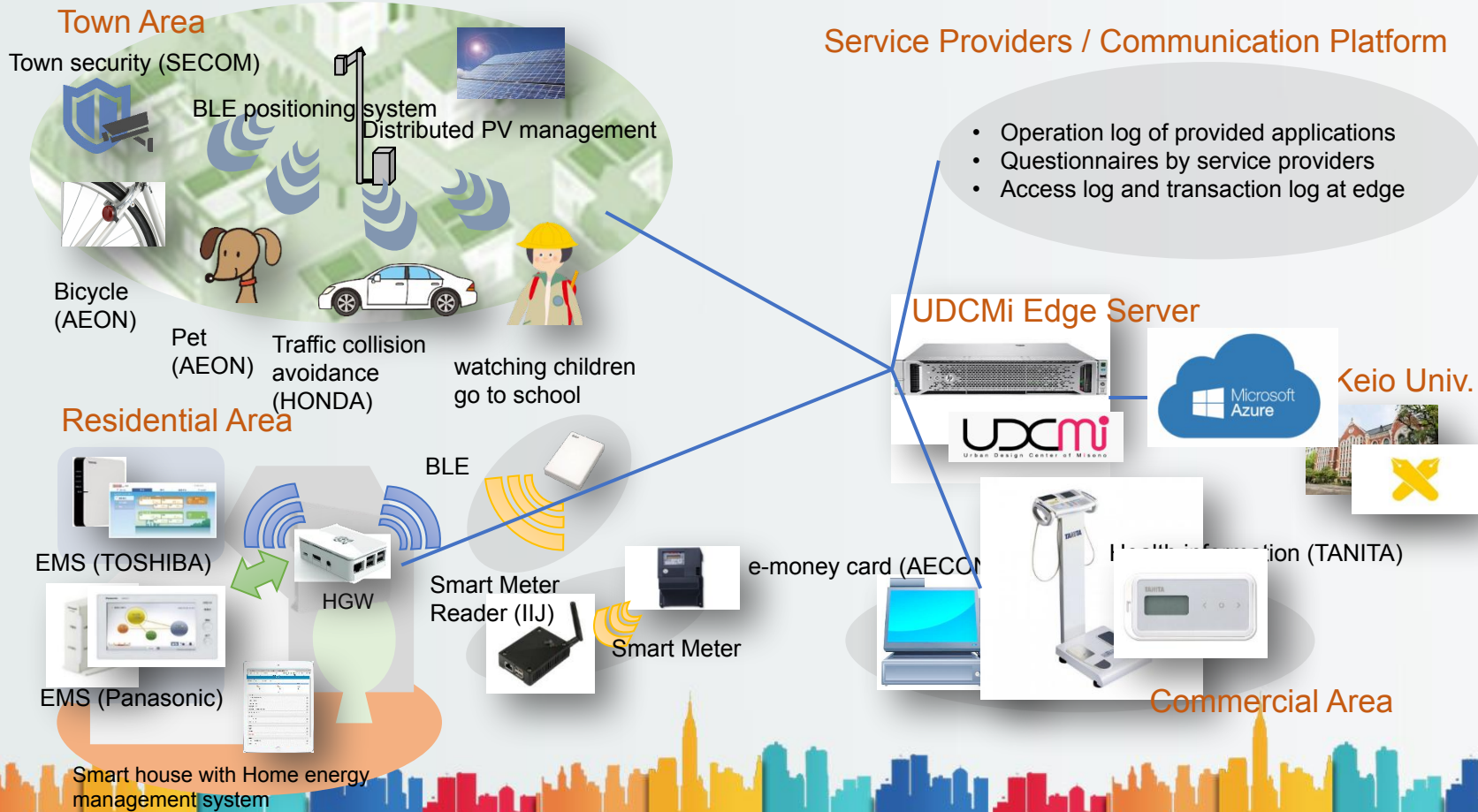
Usage of Lighting and Sockets in LD rooms

Items	This month	Previous month	Same month last year	Comments
Total usage	60.270kWh	60.270kWh	67kWh	It seems that you did not use them in the same month last year. Please consider turning off all LED lighting when not in use.
Base Consumption	0.000kWh	0.000kWh	0.000kWh	

Usage of AC in LD rooms

Items	This month	Last month	Same month last year	Comments
Total usage	6.110kWh	6.220kWh	67kWh	It seems that you did not use them in the same month last year.
Duration of usage	0.00hours	0.00hours	0.00hours	It seems that you did not use them at night in this month.

UDCMi Infrastructures



Information Bank

Service

Identifier / Attributes

Local Government (Data)

Government's open data

Data Aggregator

STB Viewing (Optical)

Web Page Viewing (Bambi)

Purchasing History (WAON)

Health (Activity, Body Comp.)

Disaster Response

Local e-money History

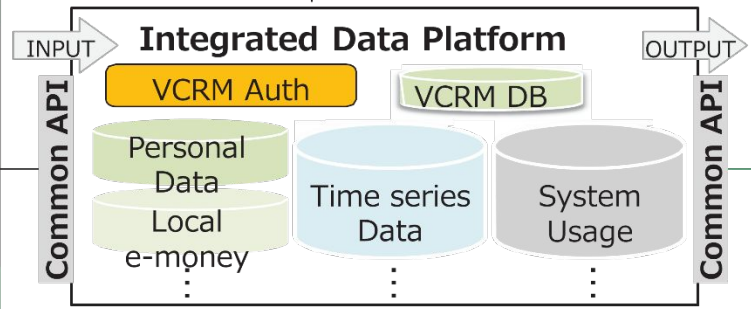
Location (GPS, BLE, Wi-Fi)

EMS (House, Building, EV)

Build. Management

IoT / Sensor / Wearables

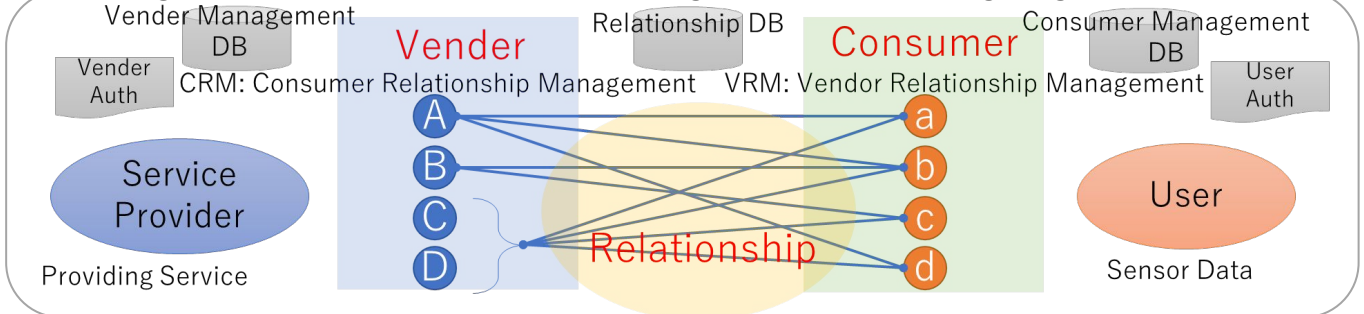
- Selection of services
- Data filtering
- Anonymization level



[VCRM]

Vender and Consumer Relationship Management

Managing Opt-In, Opt-Out, Data anonymization method and level, service providing method, incentives, service providing position (Cloud, Fog, Edge)



Local Government (Service)

- Location Analysis
- Mobility Design**
- Purchasing / Behavior Ana.
- Promotion Design**
- Moving / DR Analysis
- District Continuity Plan**
- Service Provider
- Location / DR analysis
- Watching / Monitoring**
- Purchasing / Health
- Health care**
- EMS / Build. Manage.
- Facility Management**
- House / EMS
- Housing assets mng.**
- Attributes / Moving
- Retail network design**

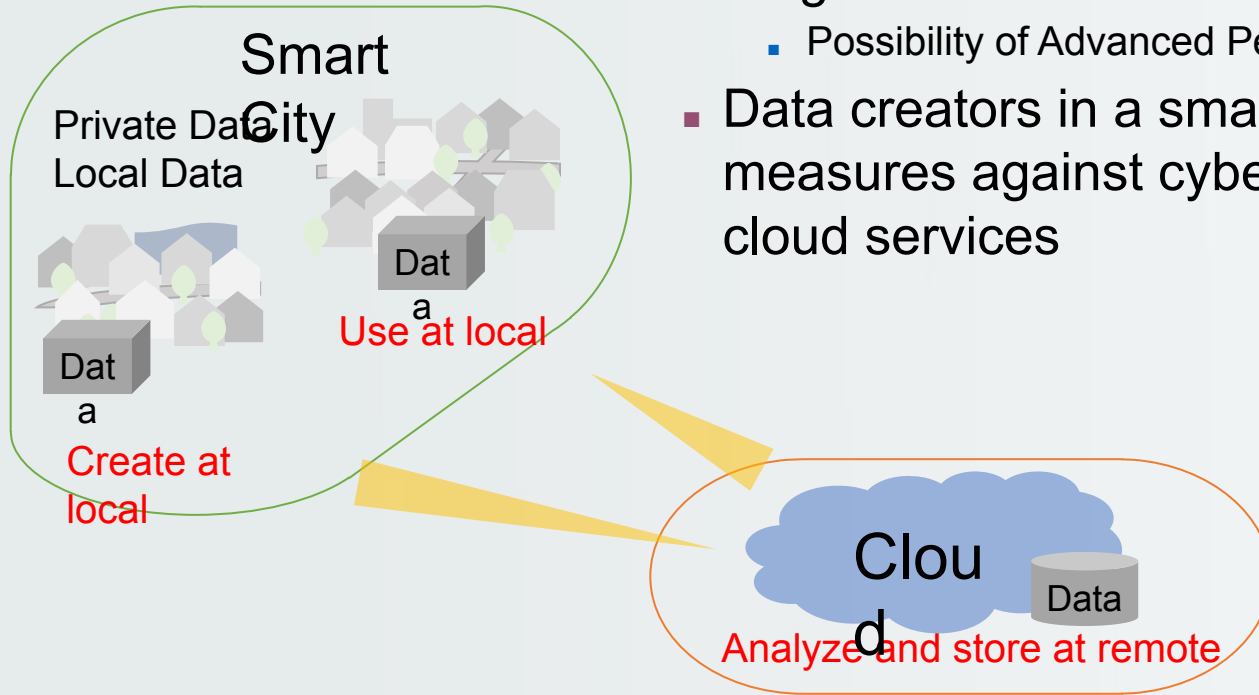
Why does Saitama City manage Info-Bank?

- To carry out their roles
 - One of city's roles is to provide basic local services for citizens by using tax, such as load, water, security, gas, electricity, etc.
 - However, information is not managed at this moment, and it causes cyber crimes and deprive of wealth. Information should be same with other infrastructures.
- Future taxing
 - VS GAFA: GAFA and other dot-com companies earn money by using private information of citizens and local resources; however, they does not pay tax.
cf. online purchasing
- Developing local economics
 - Using new smart city data services
- Branding
 - Get feedbacks from citizens as data and use the data to improve city services
 - Making rewards as monetary benefit to citizens
 - Providing new services of data security, preservation of privacy, etc.



Data Privacy/Security in Smart Cities

- Single Point of Failure Problem
 - Possibility of Advanced Persistent Threat
- Data creators in a smart city must take measures against cyber attacks as well as cloud services



Smart Community Data Privacy/Security

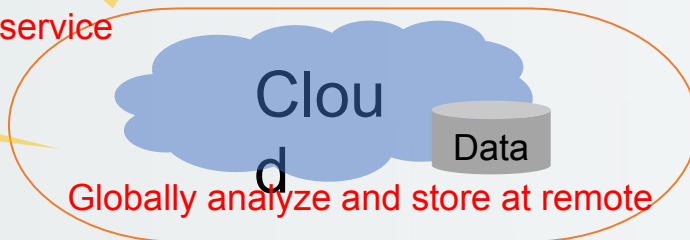
Smart City

- Share appropriately anonymized data only
- Private data is encapsulated in a local area
- Locally provide private services and globally provide common services
- Cyber attack cost becomes high

Private Data
Local Data

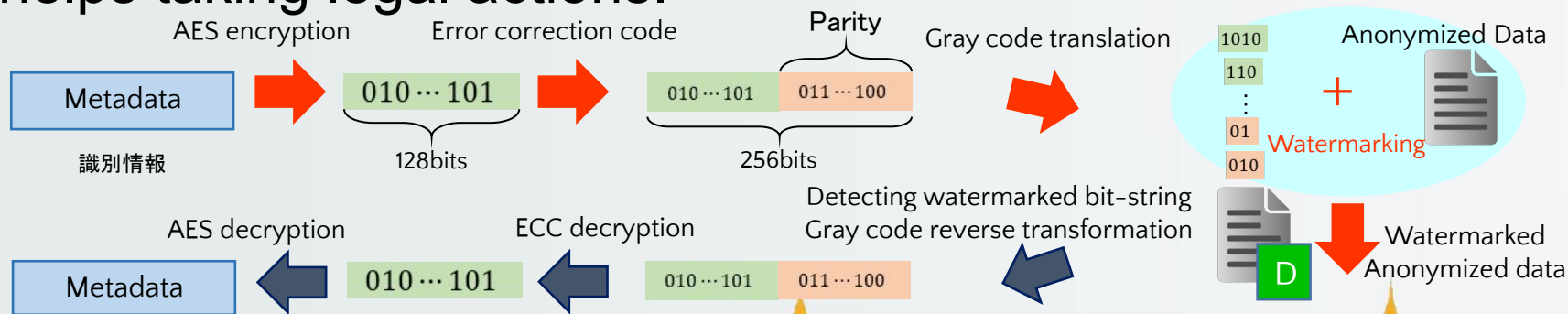


Share data for global service



Data Anonymization with Watermarking

- Embed metadata into anonymized data using diversity of anonymization
 - When replacing word in anonymization process, it selects appropriate word considering the words distance of Skip-Gram model.
 - Metadata: who, when, to whom, what object, contract type
- The metadata works as a deterrent for illegal data leakage and helps taking legal actions.





Purchasing History using e-money card



Body composition meter

Reward / Services

Deposit Personal Data

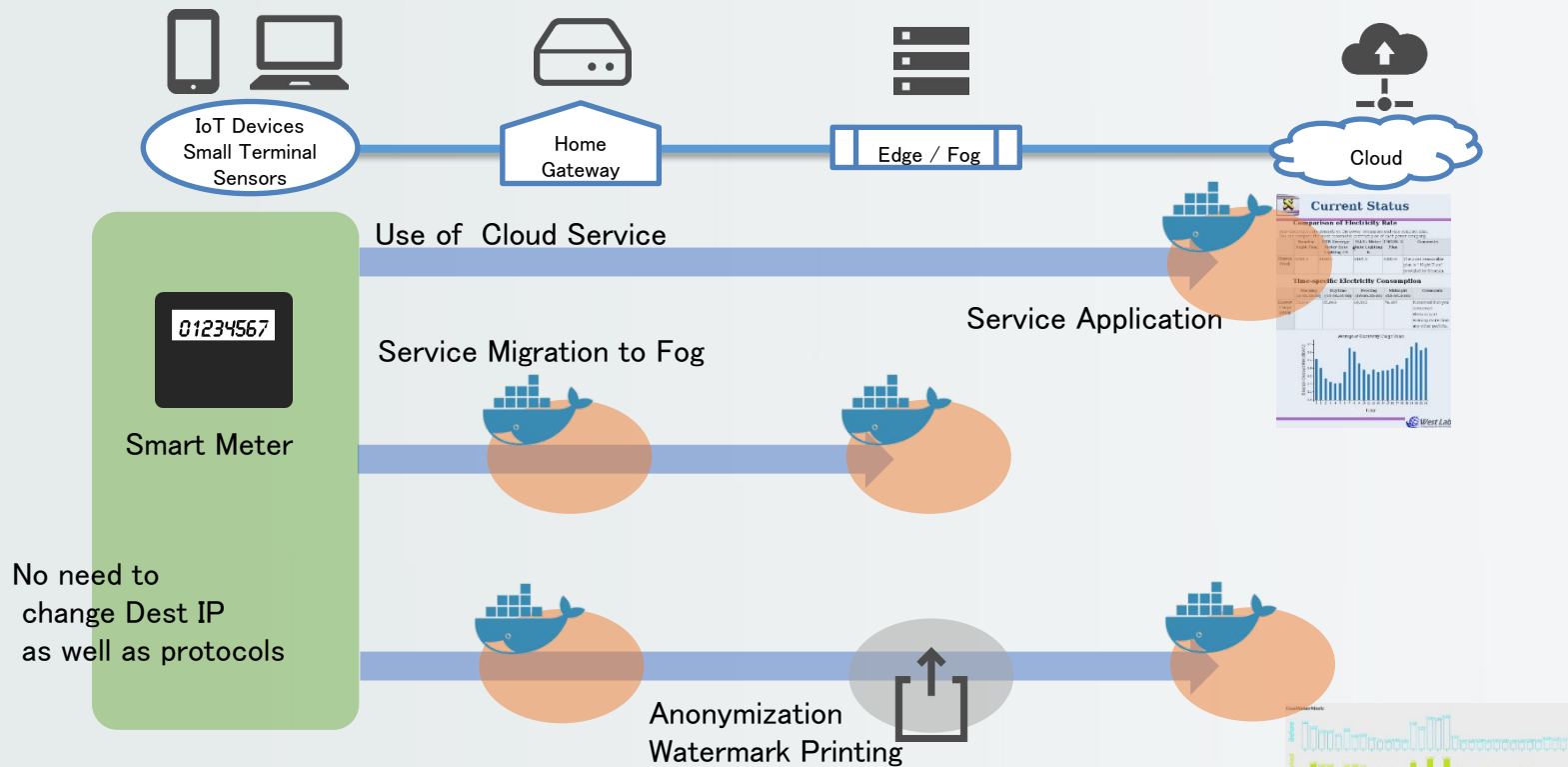
Information Bank



Provide Personal Data



Smart Community Information Platform



Demonstration of Service Provisioning

The screenshot displays a web browser window on the left and a terminal window on the right. The web browser shows a form titled "Urban Design Center of Misori" with a "Welcome!" message and fields for "User ID: v00001", "Service ID:", "Vender ID:", "Privacy Level:" (set to 1), "Data Type:" (set to power), and "Interval:". A "Send" button is at the bottom, and a "home" link is at the bottom left. The terminal window shows a shell prompt on a Raspberry Pi. It displays the output of a REST client command: "Session: 0.3.1 localhost:~/code/ppm/CMsys/restserver/relation/class> [2017-03-06(Mon) 17:35] niwe@localhost class\$.a.out socket running". Below this, three separate terminal sessions are shown, each labeled "Gateway1", "Gateway2", and "Gateway3". Each gateway session shows the command "pi@raspberrypi:~/NITWA/soap_stand_alone_server \$./standaloneserver" and the output "Socket connection successful: master socket = 4". The text "Relationship Manager" is centered at the bottom of the terminal area.

Urban Design Center of Misori

Welcome!

User ID: v00001

Service ID:

Vender ID:

Privacy Level:

1

Data Type:

power

Interval:

Send

home

```
Session: 0.3.1 localhost:~/code/ppm/CMsys/restserver/relation/class> [2017-03-06(Mon) 17:35] niwe@localhost class$.a.out socket running
```

Gateway1

```
pi@raspberrypi:~/NITWA/soap_stand_alone_server $ ./standaloneserver Socket connection successful: master socket = 4
```

Gateway2

```
pi@raspberrypi:~/NITWA/soap_stand_alone_server $ ./standaloneserver Socket connection successful: master socket = 4
```

Gateway3

```
pi@raspberrypi:~/NITWA/soap_stand_alone_server $ ./standaloneserver Socket connection successful: master socket = 4
```

Relationship Manager

Demonstration of Smart Service

The screenshot shows a Mozilla Firefox browser window displaying the GCTC GUI. The browser's address bar shows the URL `localhost:3333`. The page has a light gray background with a white sidebar on the left and a main content area on the right.

Menu

- HOME
- WESTLAB MY PAGE
- GITHUB
- GITHUB.IO
- YOUTUBE

Get in touch

I am Tada Matz from Westlab, Keio university, Japan

- Westlab My Page
- GitHub
- GitHub.io
- YouTube

GCTC GUI by Westlab, Keio University

(re)write JSON file from web browser.

file list

- REFRESH (FILELIST)
- ANONYMIZER.JSON
- RECOMMENDATION.JSON
- WATERMARK.JSON

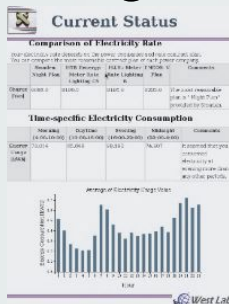
input filename to be read on server

recommendation.json

The browser's status bar at the bottom shows the terminal prompt `root@localhost:~/gctc` and the page number `1 / 4`.

ECO-Comfort Report Service

- ECO-Comfort nudge service using AI
 - Automatically generate the ECO-Comfort life report
- Behavior change is automatically detected using sensors and the report is generated according to the behavior change



8/1	31°C	25°C	70%	⊙	×	⊙
8/2	32°C	25°C	62%	×	⊙	×
8/3	33°C	25°C	69%	⊙	⊙	×
8/4	34°C	25°C	66%	×	×	⊙
8/5	35°C	25°C	66%	×	⊙	×
8/6	36°C	25°C	65%	⊙	⊙	⊙
8/7	28°C	28°C	65%	⊙	⊙	×
8/8	31°C	31°C	64%	×	×	×
8/9	28°C	25°C	64%	⊙	×	×
8/10	28°C	28°C	63%	×	⊙	⊙
8/11	32°C	28°C	63%	×	×	×
8/12	26°C	28°C	62%	⊙	⊙	⊙
8/13	31°C	25°C	62%	⊙	×	×
8/14	28°C	28°C	61%	×	⊙	⊙
8/15	31°C	23°C	61%	⊙	⊙	×
8/16	32°C	25°C	60%	×	×	⊙
8/17	31°C	25°C	60%	×	⊙	⊙
8/18	28°C	25°C	59%	⊙	⊙	×

Providing nudge service

Behavior change

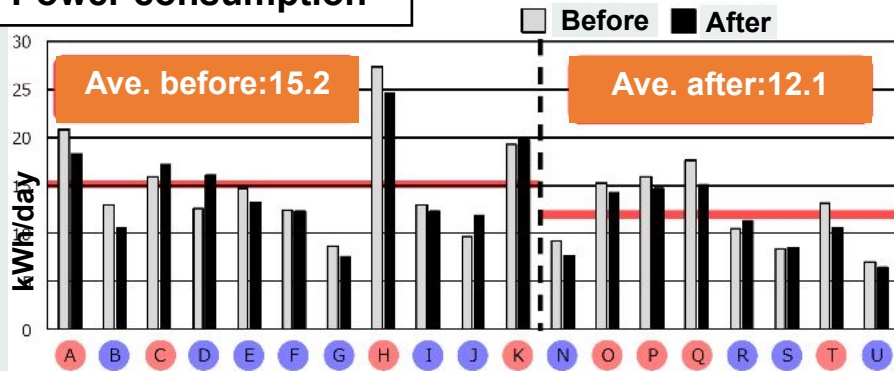
Behavior change detection



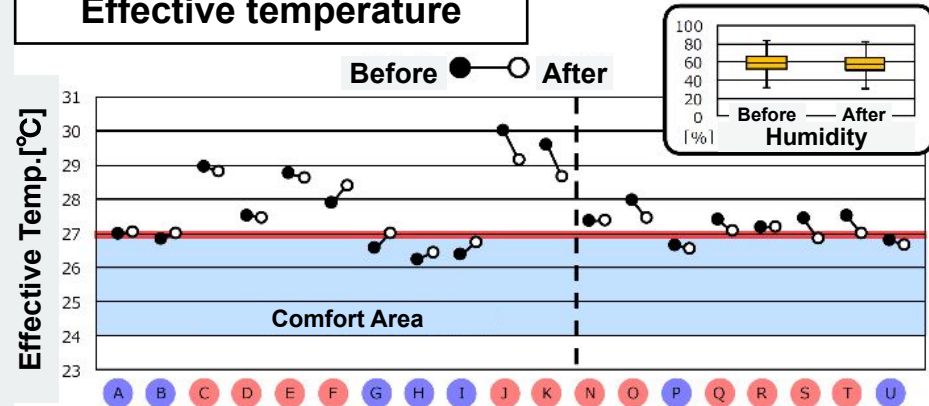
Results of ECO-Comfort Service

- 60% in ECO activity and 85% in Comfort activity reports are satisfied by users according to questionnaire queries.
- Power consumption was reduced by 20% in total.
- Comfort level was improved especially in risky area for health.

Power consumption

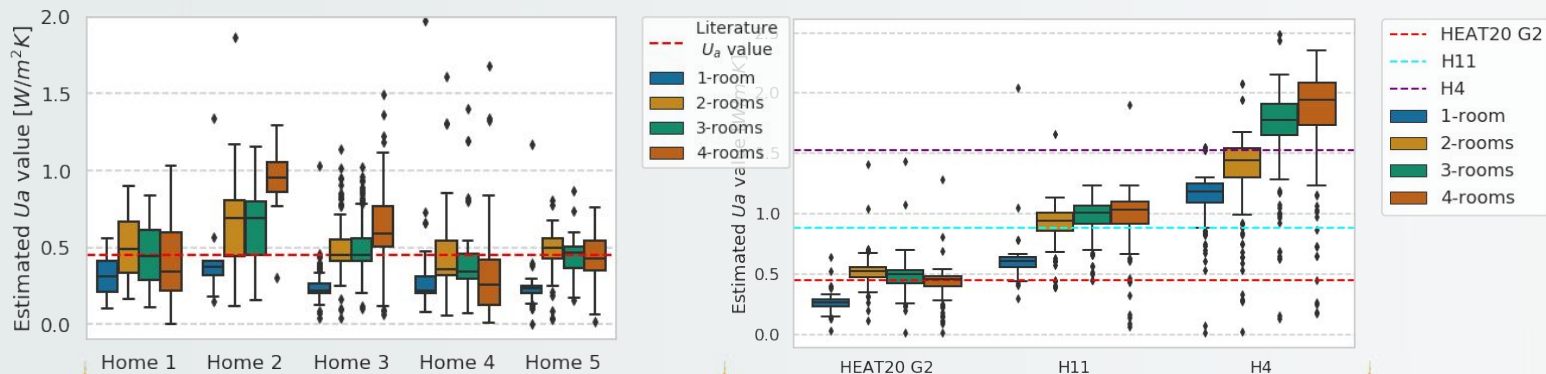


Effective temperature



Housing performance evaluation for GND

- Saitama has started GND following US and EN model.
 - City or investment company achieves improvement work of housing performance firstly and get return by the reduction of HVAC cost.
 - The problem is “how to select houses that should join the program”
 - Simple method was proposed using limited sensors (AC power consumption and temperature sensor) and ave. data (anonymized).



Positioning Service

- Original services
 - Bicycle location and school children commuting management
- Integrated services
 - Walking mileage program
 - Trajectory analysis around station for designing the optimal flows of bicycles and pedestrians
 - Sudden breaking point detection and improvements



BLE tag for bicycle



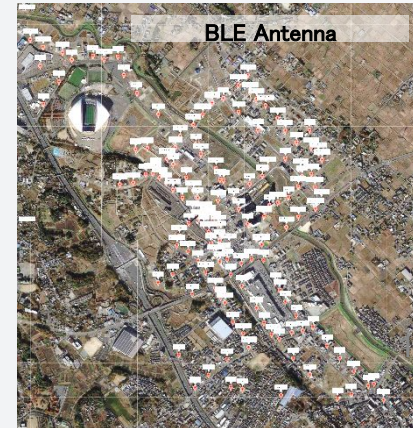
BLE Badge



Application

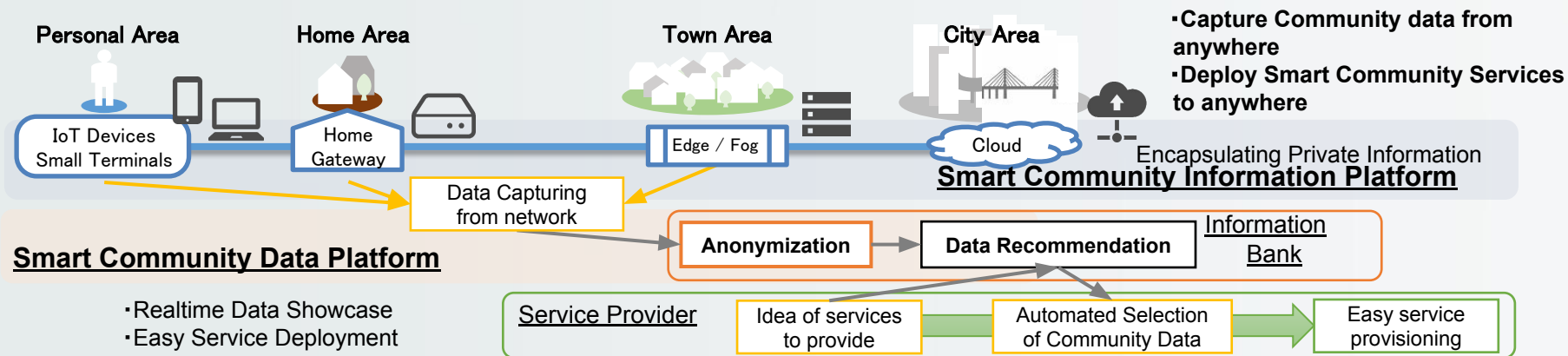


Photo of antenna

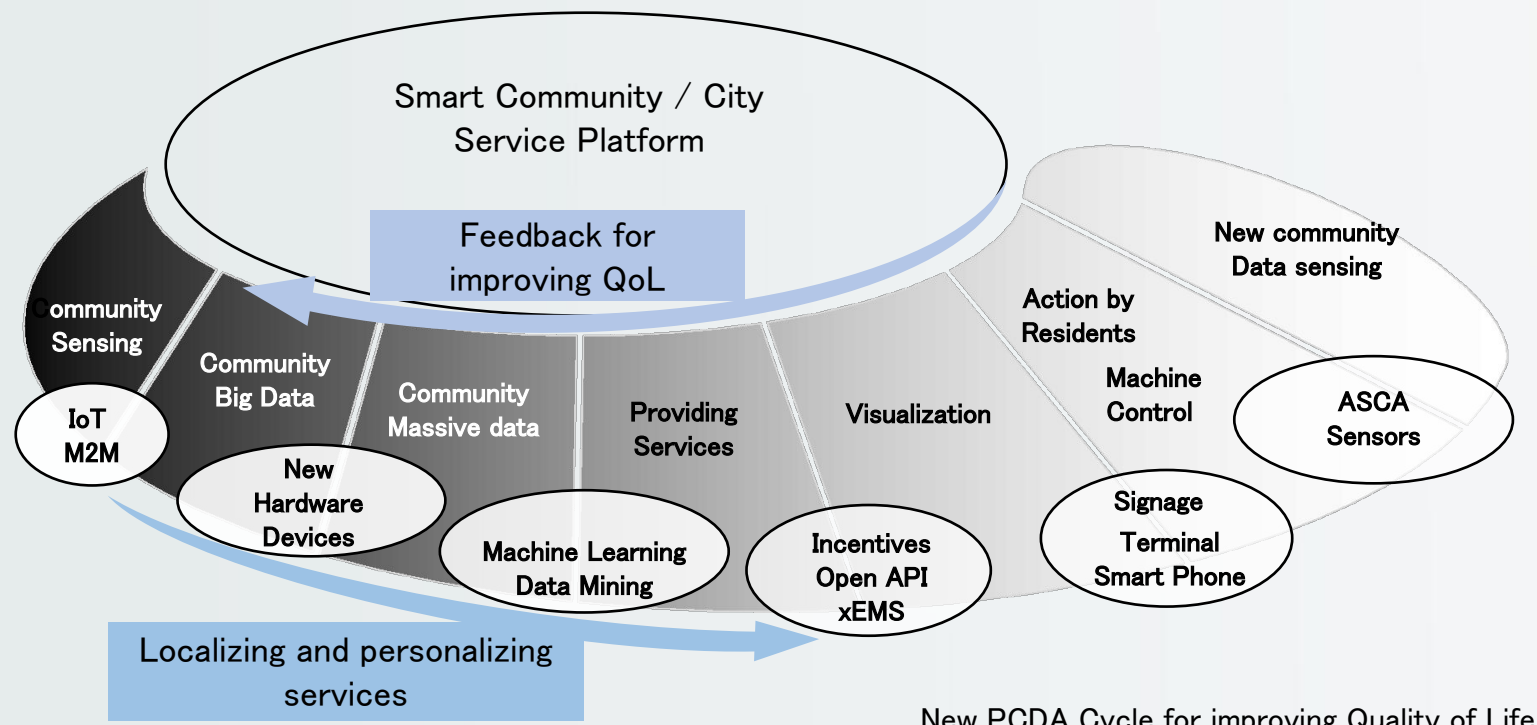


Data-Service Matching (Future work)

- Realtime Data Showcase: Stream data is available on the platform
- Easy Service Deployment: The system recommend the appropriate dataset for providing a service by finding “similar service and dataset” from using history.
- Anywhere feature: capture data from IoT devices, gateways, edge and fog nodes.



To solve urbanization problems by city data cycle



New PCDA Cycle for improving Quality of Life





Thank
You



