

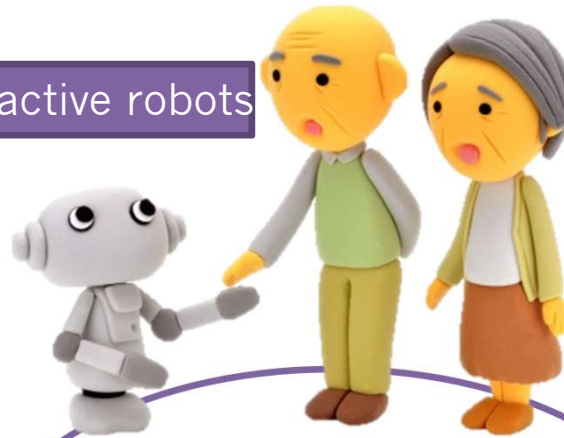
# Lifestyle Authentication & Lifestyle Analysis

Next Generation Personal Authentication Technology Lab.  
(Sponsored by Mitsubishi UFJ NICOS Co. Ltd.)  
School of Information Science & Technology  
The University of Tokyo  
24<sup>th</sup> July 2018

# The society by Artificial intelligence (AI)/Internet of Things (IoT) technologies

- As AI/IoT technologies advance . . . Mercedes-Benz concept photo <https://www.mercedes-benz.com/en/mercedes-benz/innovation/research-vehicle-f-015-luxury-in-motion/>

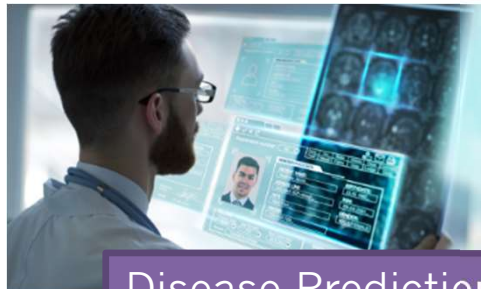
Interactive robots



Autonomous Driving



Disease Prediction/Health Management



AI/IoT technologies

Crime Prevention/Tracking suspicious individuals

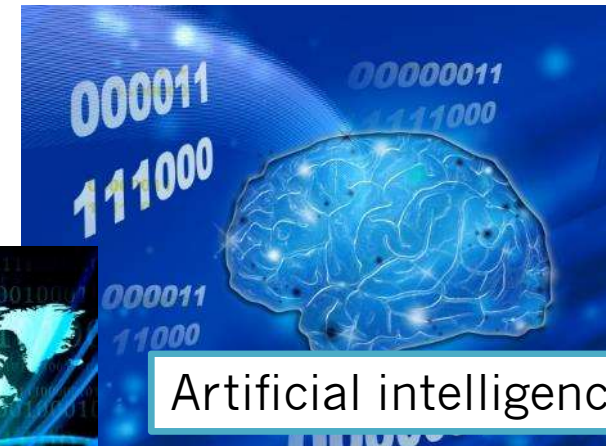


Automation of Insurance Reviews



# The objective is a safe, comfortable society

- What is needed to realize a safe, comfortable society?
  - To improve convenience and comfort, and make people safer

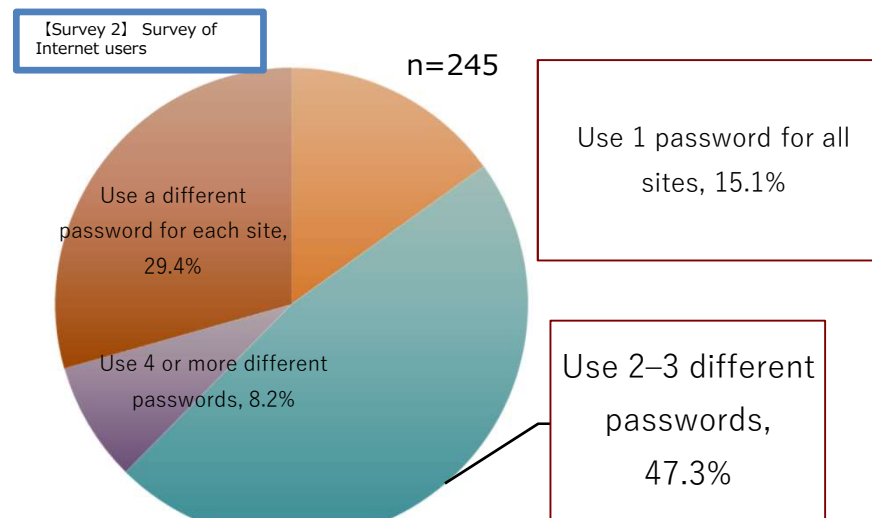
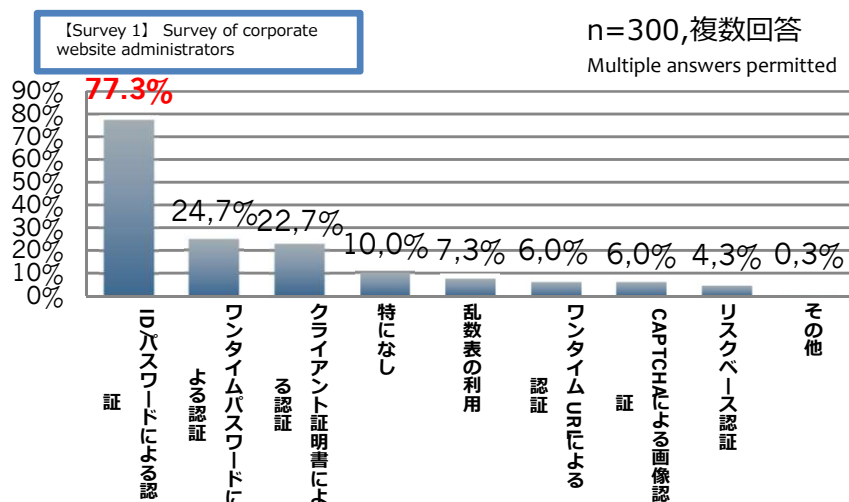




# Current situation regarding passwords

- Most sites rely on **ID and password**.
  - The reason is that it is inexpensive and convenient.
- However, users tend to use the same password.
  - Users can't remember passwords.
  - In the services provided by Yahoo! JAPAN, there are approx. 15,000 password resets per day due to users forgetting their passwords. (<http://news.mynavi.jp/news/2017/04/20/220/>)

What kind of user authentication is currently carried out on your company's site? Do you use different passwords for each payment service?



**77% of sites use ID and password**

**62% use 1-3 different ID and passwords**

Symantec survey : [https://www.jp.websecurity.symantec.com/welcome/pdf/password\\_management\\_survey.pdf](https://www.jp.websecurity.symantec.com/welcome/pdf/password_management_survey.pdf)

# Research background

- ◆ “ID and password” is reaching its limit.
  - ◆ Passwords dependent on people’s memory tend to be vulnerable
    - ◆ Improving user literacy is a very long-term project.
  - ◆ Systems based on encryption keys require specialized software and hardware.
    - ◆ Have not become widespread
- ◆ The remark that “highly secure and convenient authentication is required” has been heard for the past 10 years, but nothing has changed.
  - ◆ As well as high security and convenience, something else is required.
- ◆ New attacks happen all the time.
  - ◆ In the future, fingerprints will be collected from photographs.  
(<https://allabout.co.jp/gm/gc/467302/>)

⇒ **The whole of society must be drastically changed.**



# Why Not Use Advanced Authentication Tech.?

Various organizations have conducted surveys on this question

- ◆ Information-technology Promotion Agency (IPA)  
(A Government Agency in Japan)

“Field Survey of Online User Authentication Methods”\*1:

- ◆ Concern that other measures will result in a decline in rates of use  
⇒Considering the burden on users, it is difficult for service providers to change to a new method.
- ◆ On the other hand, Banking Services tended to use multi factored authentication such as OTP.
  - ◆ However, the users were reluctant to use them.

\*1 <https://www.ipa.go.jp/security/fy26/reports/ninsho>

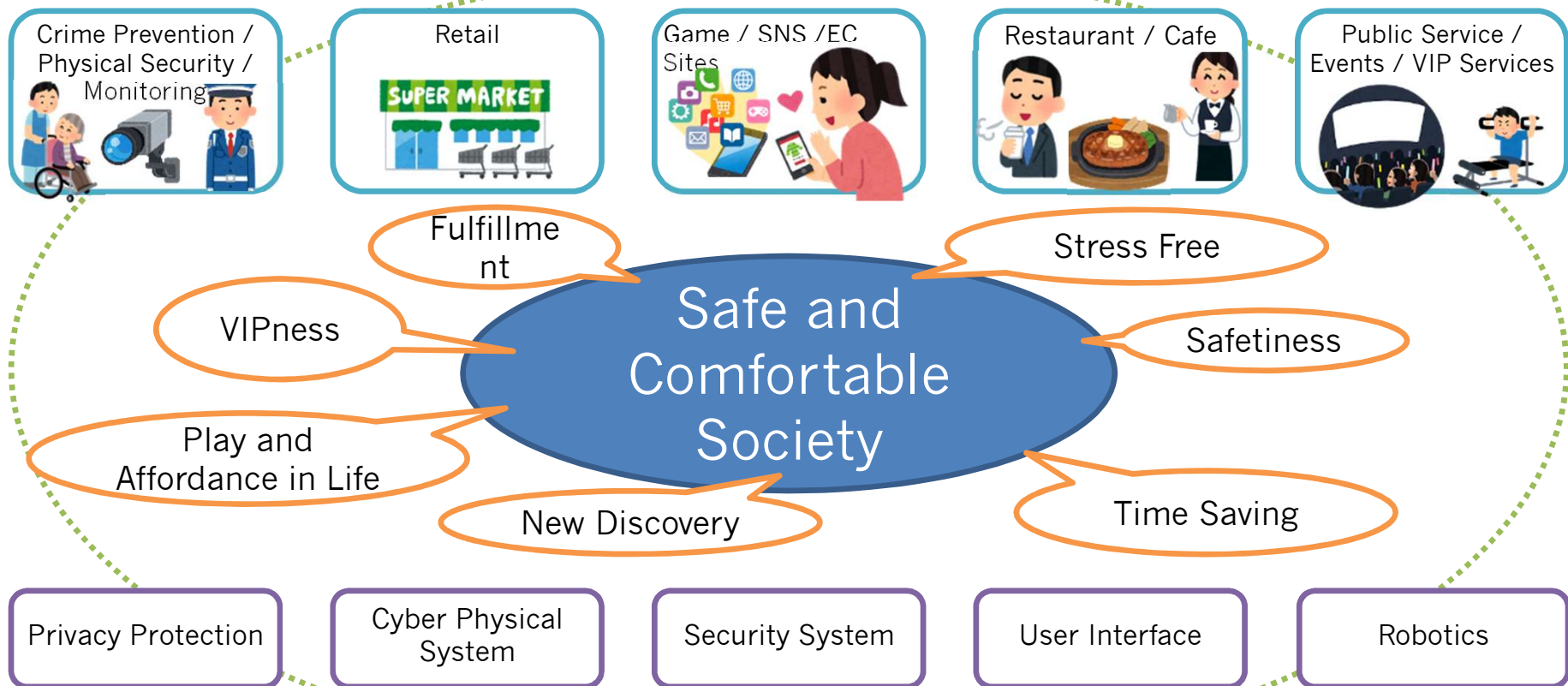
# Do Not Focus Only on Information Security

- ◆ Security experts tend to seek :  
“Perfect Security,” and within that,  
“Convenience.”=>This is unrealistic!!
- ◆ In the credit card world? =>Cost-effectiveness is important
  - ◆ User acceptance is also important
    - ◆ For Low-value payments, they tolerate sign-less payment.  
(<https://www.engadget.com/2018/04/09/us-credit-cards-will-no-longer-require-signatures/>)
  - ◆ Fraudulent use is covered by insurance
    - ◆ By accepting some fraudulent use and reducing the cost of system introduction, total costs are reduced.
- ◆ Increasing security with this outlook will result in cheaper total system cost and improved user convenience.
- ◆ Combine Cyber Security with Insurance / Risk Evaluation to Create a new Social System

# A Safe And Comfortable Society

- Towards diverse safe and convenient services based on security related ICT technology

## Realize Safe and Convenient Services

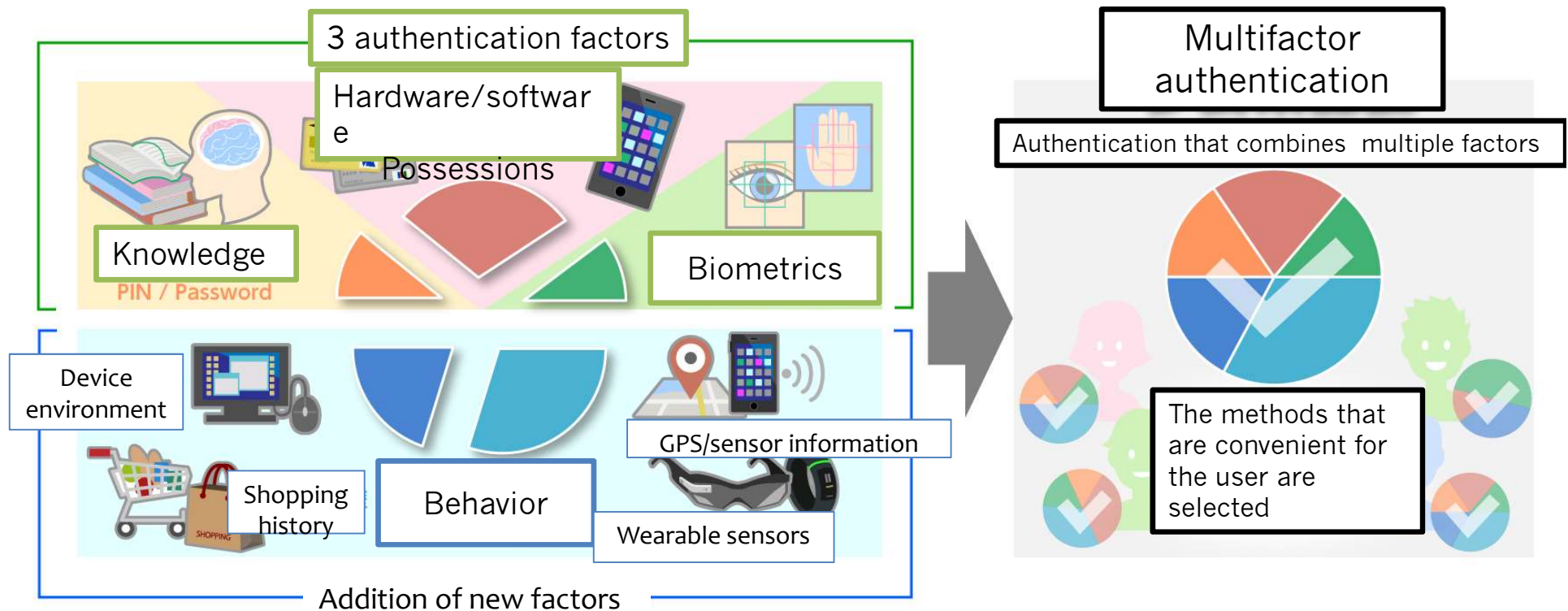


## Infrastructure Technology for Safety



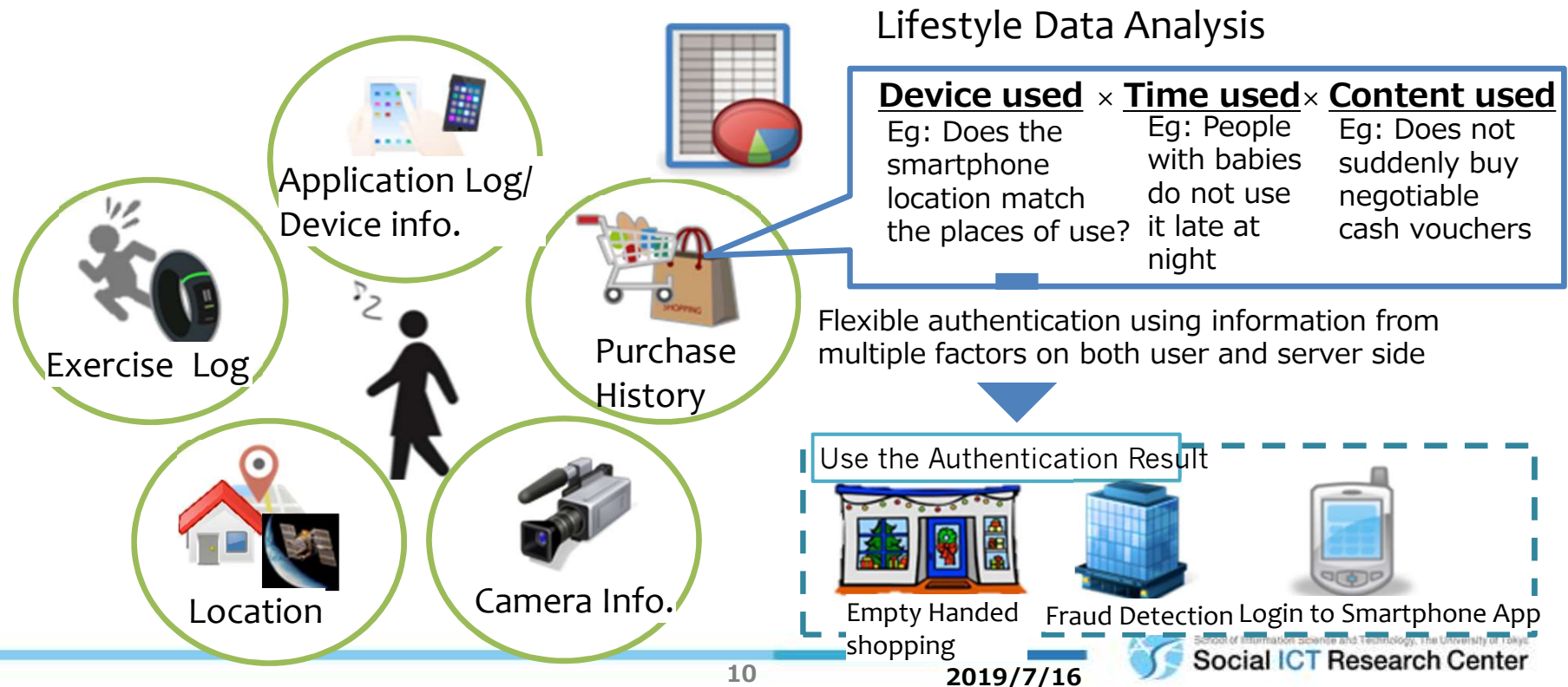
# Our Focus: 4<sup>th</sup> Factor

- 4<sup>th</sup> Factor!! Behavior-Based Authentication
  - Propose authentication based on information about people's behavior history
    - (e.g.,) Purchase history, wearable devices
- Multifactor Authentication
  - Propose a more accurate and user-friendly means of authentication that combines multiple authentications

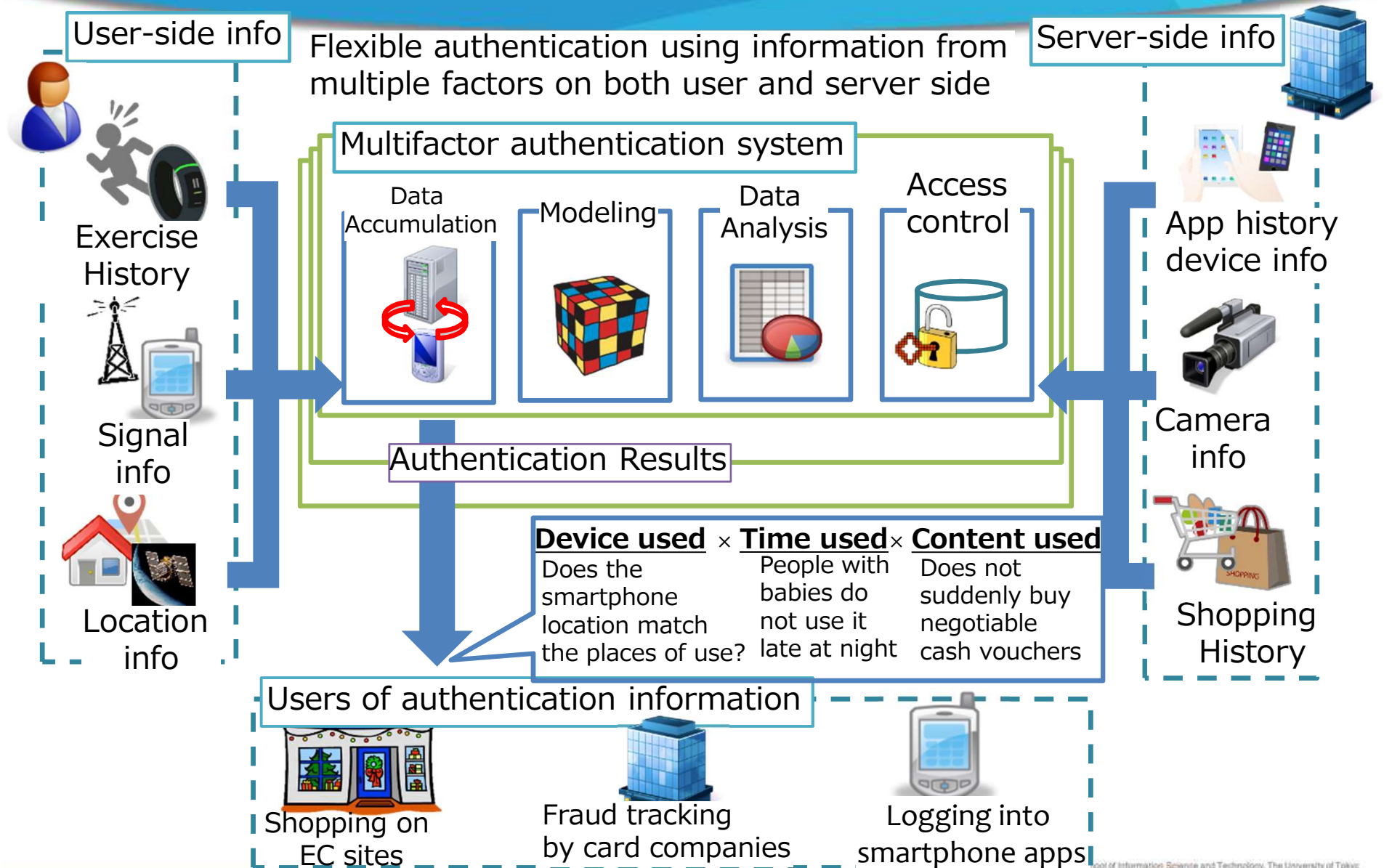


# What is Lifestyle Authentication

- An authentication technology which makes use of peoples' lifestyle information to identify a user
  - Uses information from smartphones/wearable terminals to identify a user without explicit user activity.
  - Focusing on users' convenience in order to increase the number of users resulting in a safer society



# Lifestyle authentication achievable in an IoT society



# A new era of security: lifestyle authentication

- ◆ **Lifestyle authentication** as a way of realizing multifactor/multimethod authentication
  - ◆ Data extracted from habitual behavior of users are used in authentication
    - ◆ Effective use of sensor data
    - ◆ Authentication factors extracted from habitual behavior of users
- ⇒ Forms robust authentication infrastructure
  - ◆ Flexible vulnerability response
    - ◆ e.g., Measures against forgery of biometric information
  - ◆ Realization of various factor combinations
    - ◆ e.g., Devices and environments used differ between people
  - ◆ Potential safety improvements (behavioral characteristics)
  - ◆ Not dependent on user literacy



Multi-factor Identification/auTHentication  
ReseArch (MITHRA) Project  
Lifestyle Authentication Field Test



# MITHRA Field Test Overview

- ◆ MITHRA: Multi-factor Identification/ authentication ReseArch project
- ◆ Lifestyle authentication field test
  - ◆ Period: Jan 11–April 26, 2017
  - ◆ Scale: **Approx. 57,000 participants**
  - ◆ Aims:
    - ◆ Collect large-scale data on multifactor authentication
    - ◆ Check system connectivity
- ◆ Factors used
  - ◆ Device information, location, signal (Wi-Fi), IP address, exercise history, *manga* history, e-flyer history



# MITHRA Field Test results: No. of participants

- Total participants in field test (includes overlapping)

Data collection	Collection method	Test participants
MITHRA data	MITHRA app: University of Tokyo	16,027
<i>Manga</i> history	MangaONE: Shogakukan Inc.	7,584
E-flyer history	Shufoo!: Toppan Printing Co., Ltd.	33,338
Activity monitor data	HJA-750C: Omron Healthcare Co., Ltd.	97

(Total)

57,046



MITHRA



MangaONE



Shufoo!



Activity monitor

# Privacy considerations

- Consent screens

- Consent of test participants acquired differently depending on data being collected
- Addresses of prize winners passed to outside parties
  - Information is not acquired by University of Tokyo



MITHRA app consent screen



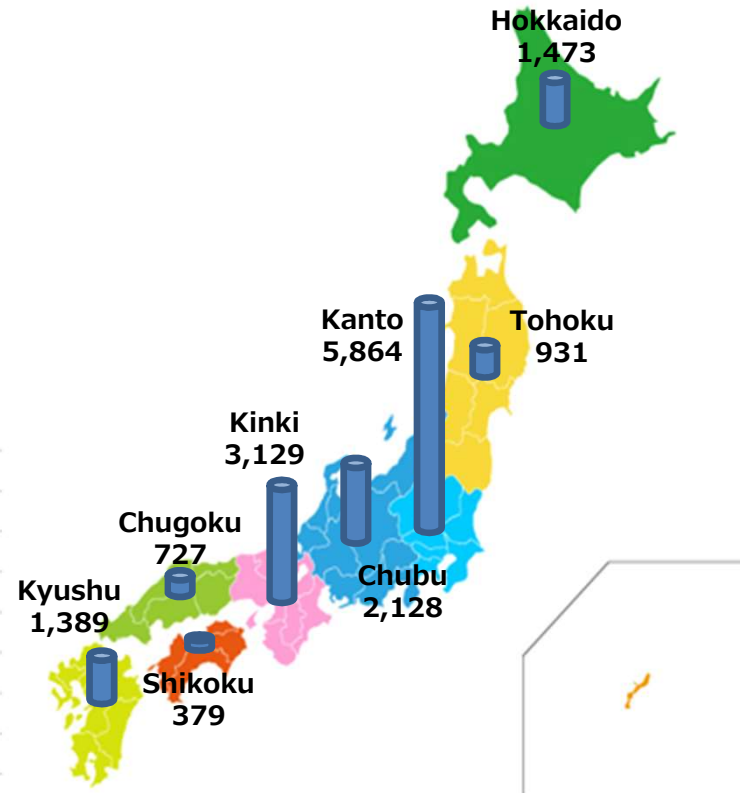
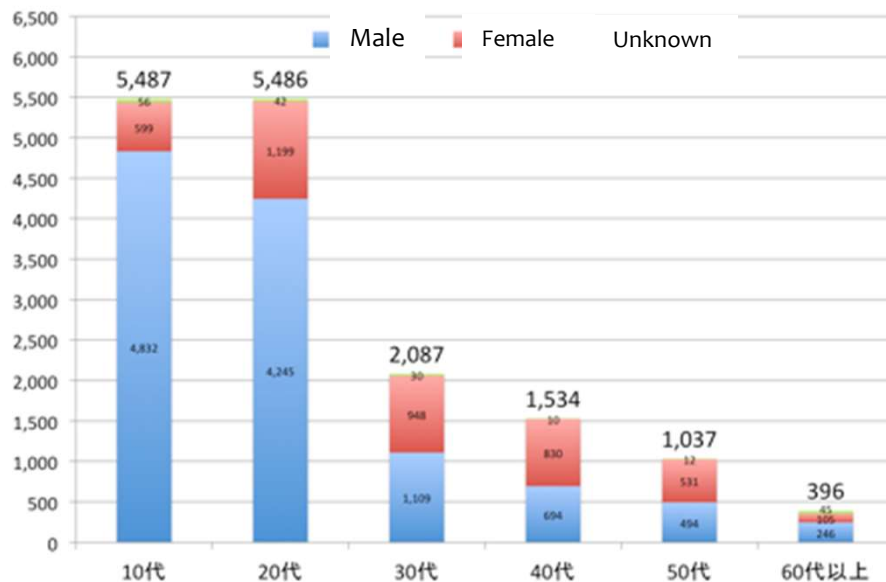
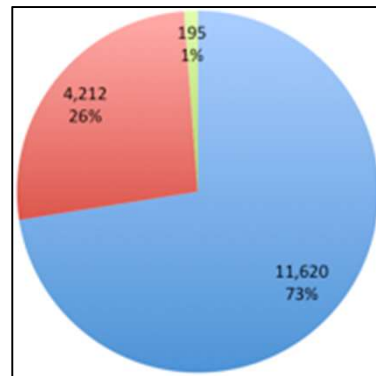
Shufoo! consent screen





# Demographic Data on the Participants (Gender, Location)

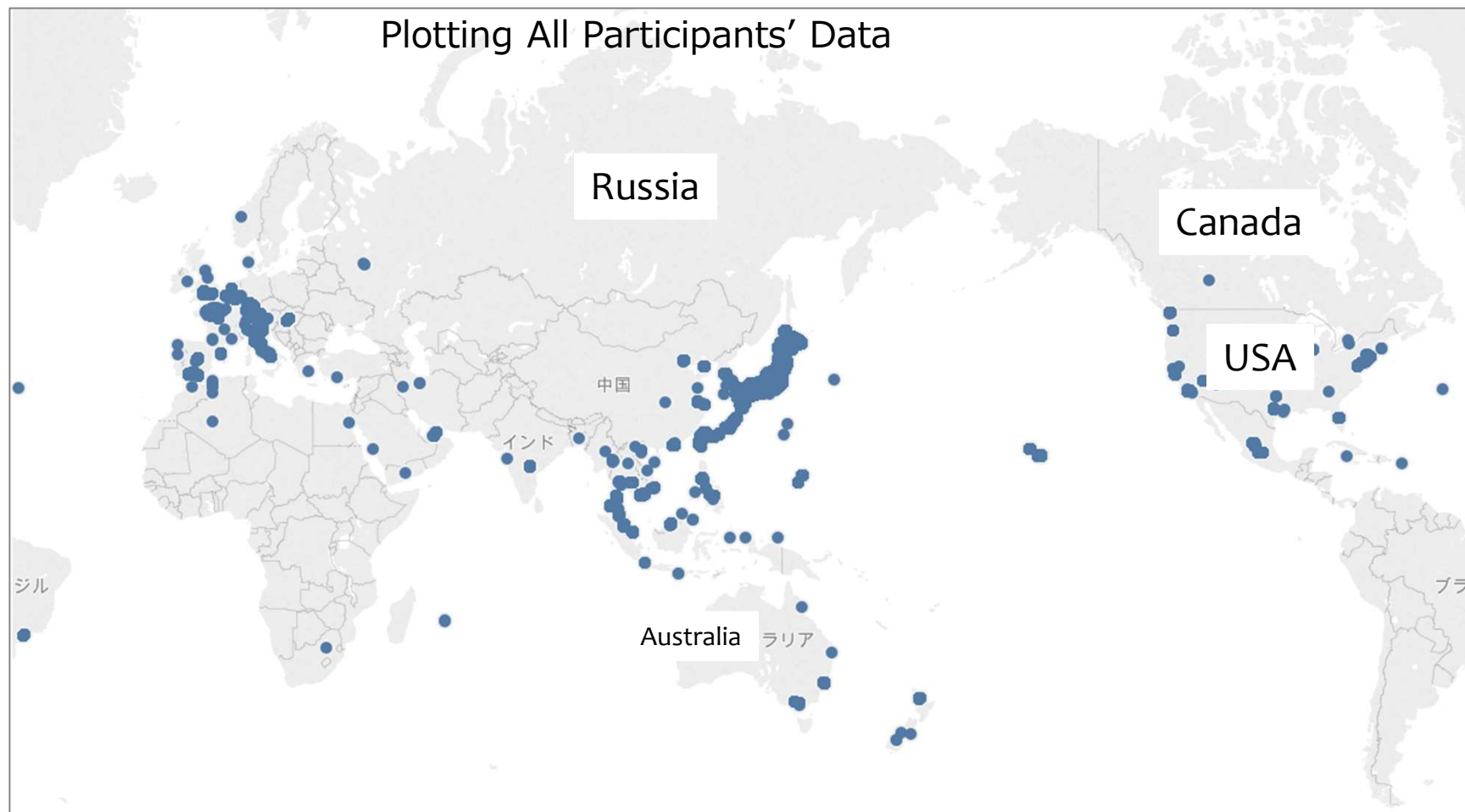
MITHRA App. Participants: 16,027



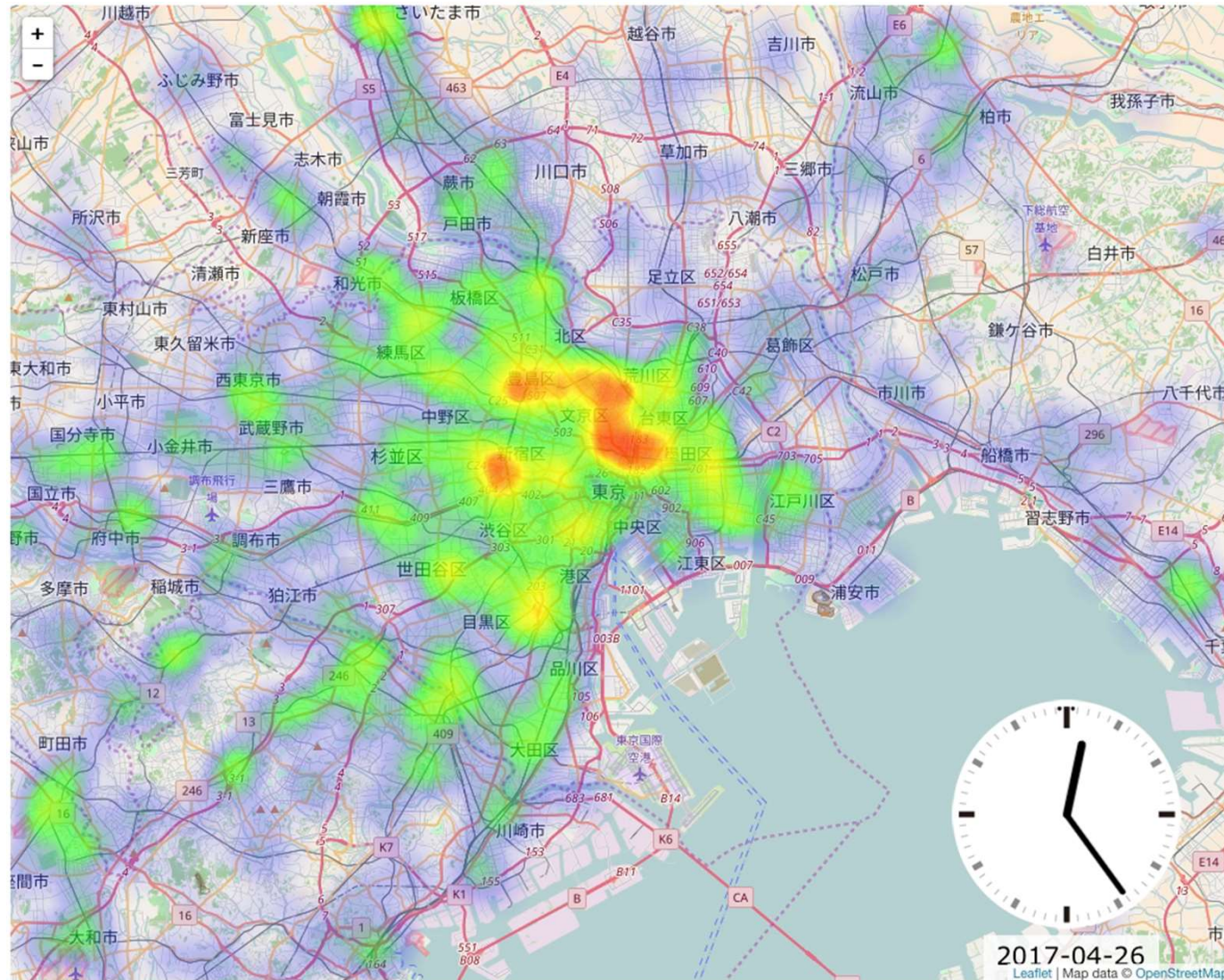
# Location: Wifi-Data

## 💧 位置情報データ

### 💧 Collected 34Million Data

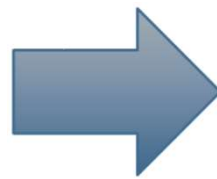


# A Day in the Life

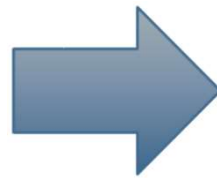
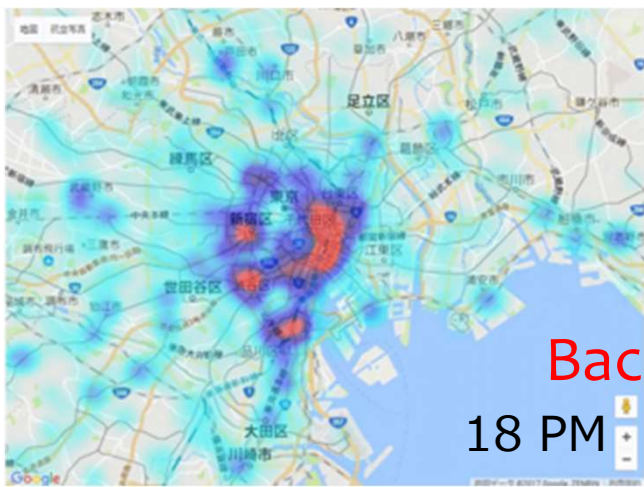




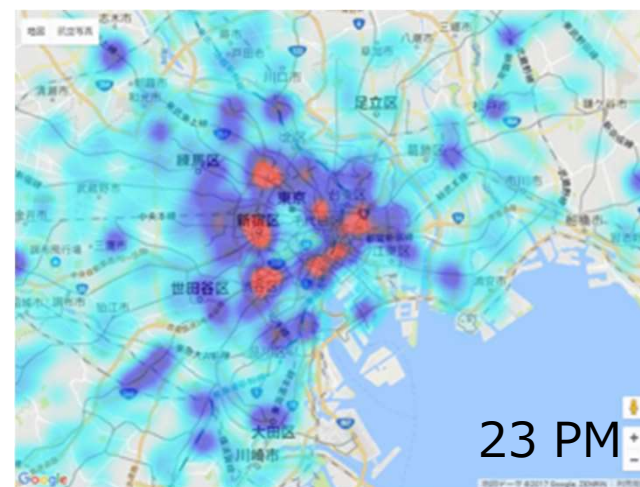
# 24 Hour Heat Map in Tokyo Area



Move to Central Tokyo

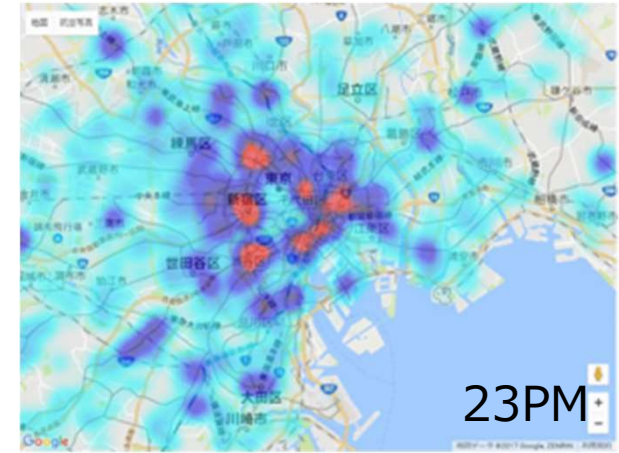
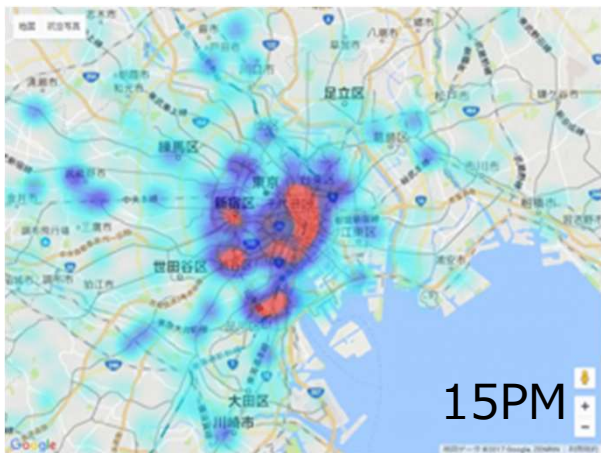
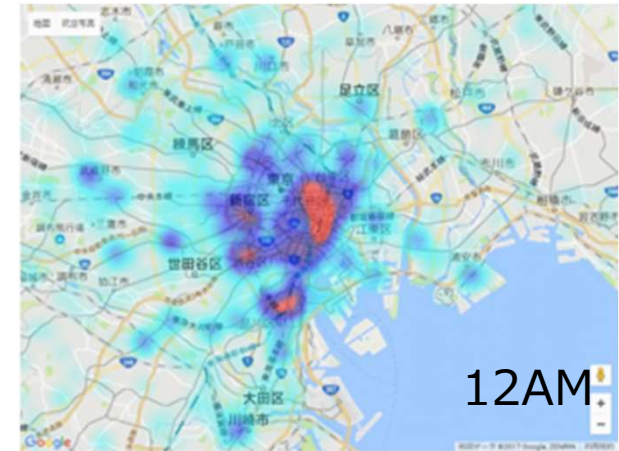
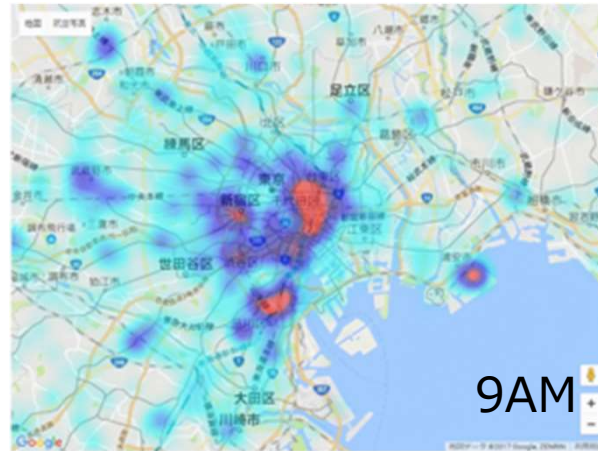


Back to Home





# (Supplemental) 2 Hour Heat Map



# No. Of Monitoring Per Hour (Per Day for a Certain Participant)

💧 We Can Observe Certain Monitoring Characteristics

💧 Eg: Participant with ID:226 daily monitors at 8Am and 20 PM

226	20170201	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	19	0	0	0
226	20170202	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	12	0	0	0
226	20170203	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	15	0	0	0
226	20170204	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	18	0	0
226	20170205	0	0	0	0	0	0	0	0	17	0	0	5	0	0	0	0	0	0	0	15	0	0	0
226	20170206	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	18	0	0	0
226	20170207	0	0	0	0	0	0	0	0	31	0	0	0	0	0	0	0	0	0	0	24	0	0	0
226	20170208	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	25	0	0	0
226	20170209	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	23	0	0	0
226	20170210	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	0	0	0	16	0	0	0
226	20170211	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	21	0	0	0
226	20170212	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	15	0	0	0
226	20170213	0	0	0	0	0	0	0	0	26	0	0	0	0	0	0	0	0	0	0	0	17	0	0
226	20170214	0	0	0	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0	17	0	0	0
226	20170215	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	19	0	0	0
226	20170216	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	15	0	0	0
226	20170217	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	23	0	0	0
226	20170218	0	0	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0	0	0	13	0	0
226	20170219	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	18	0	0	0
226	20170220	0	0	0	0	0	0	0	0	27	0	0	0	0	0	0	0	0	0	0	17	0	0	0

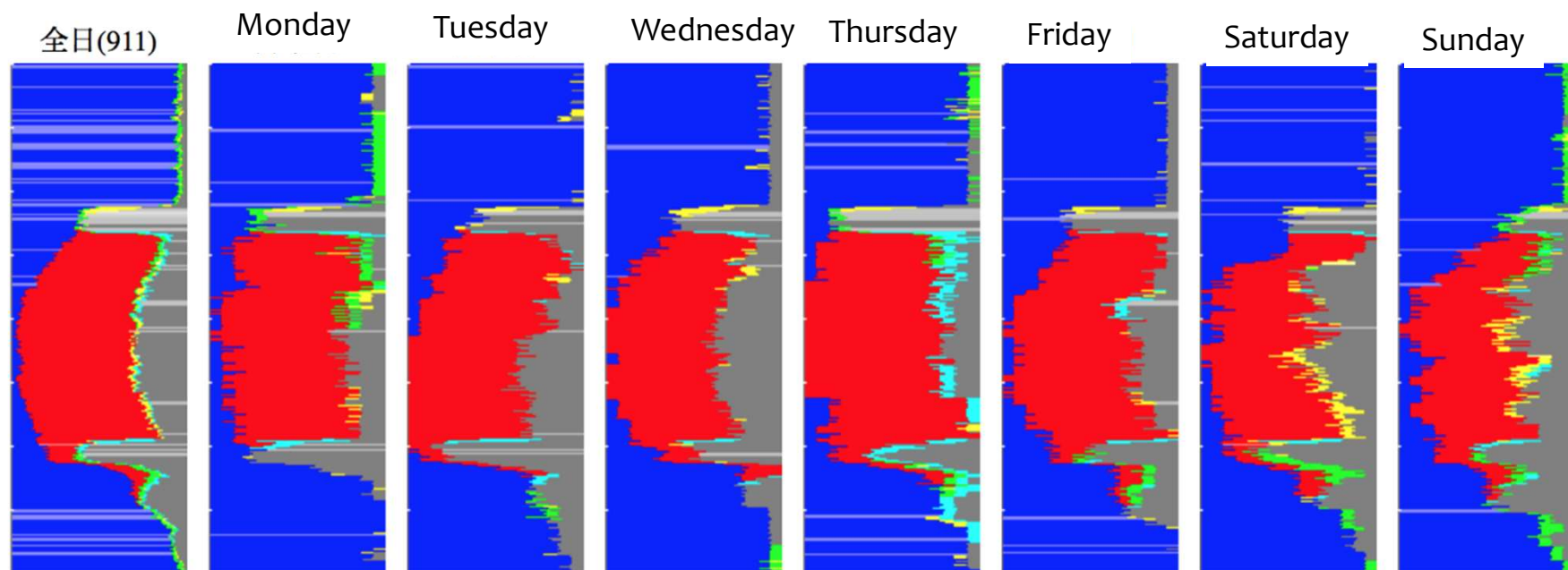


# Participants with Specific Monitoring Habits

- Participant with ID: 911

- Monitors Eflyers while Commuting

色凡例: 自宅 勤務先 立寄1 立寄2 立寄3



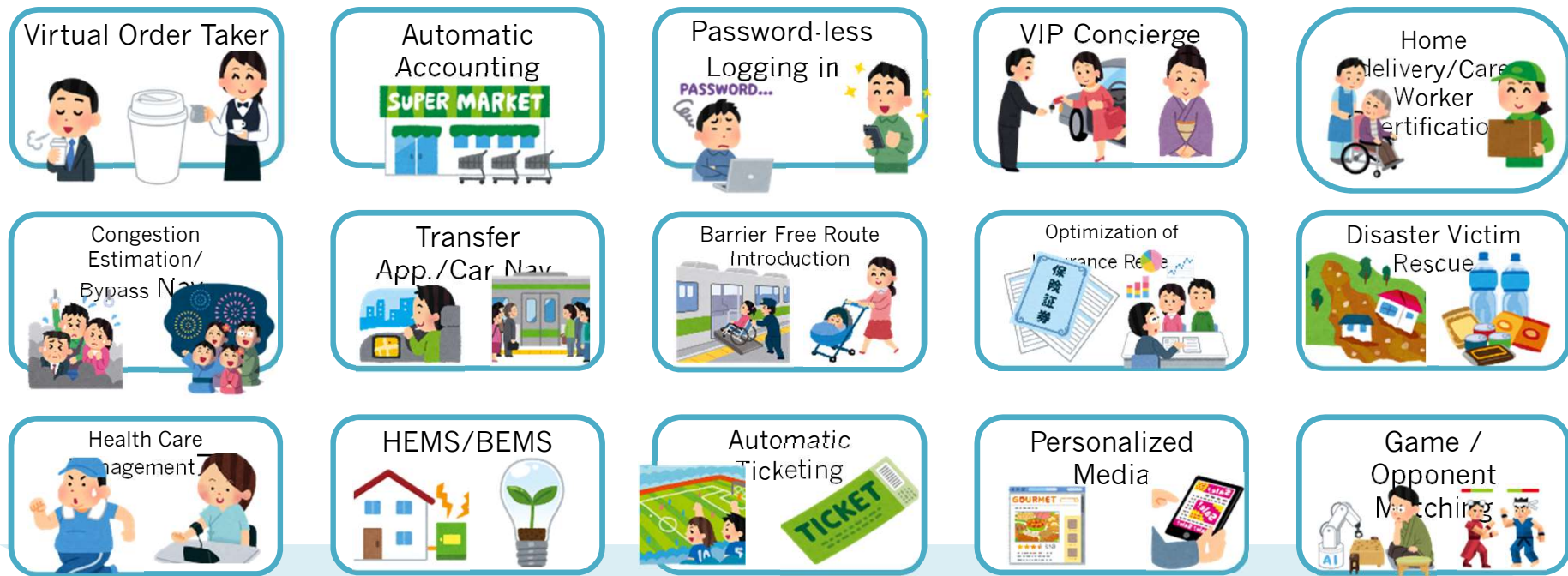
# From Lifestyle Authentication to Services Based on Lifestyle Analysis





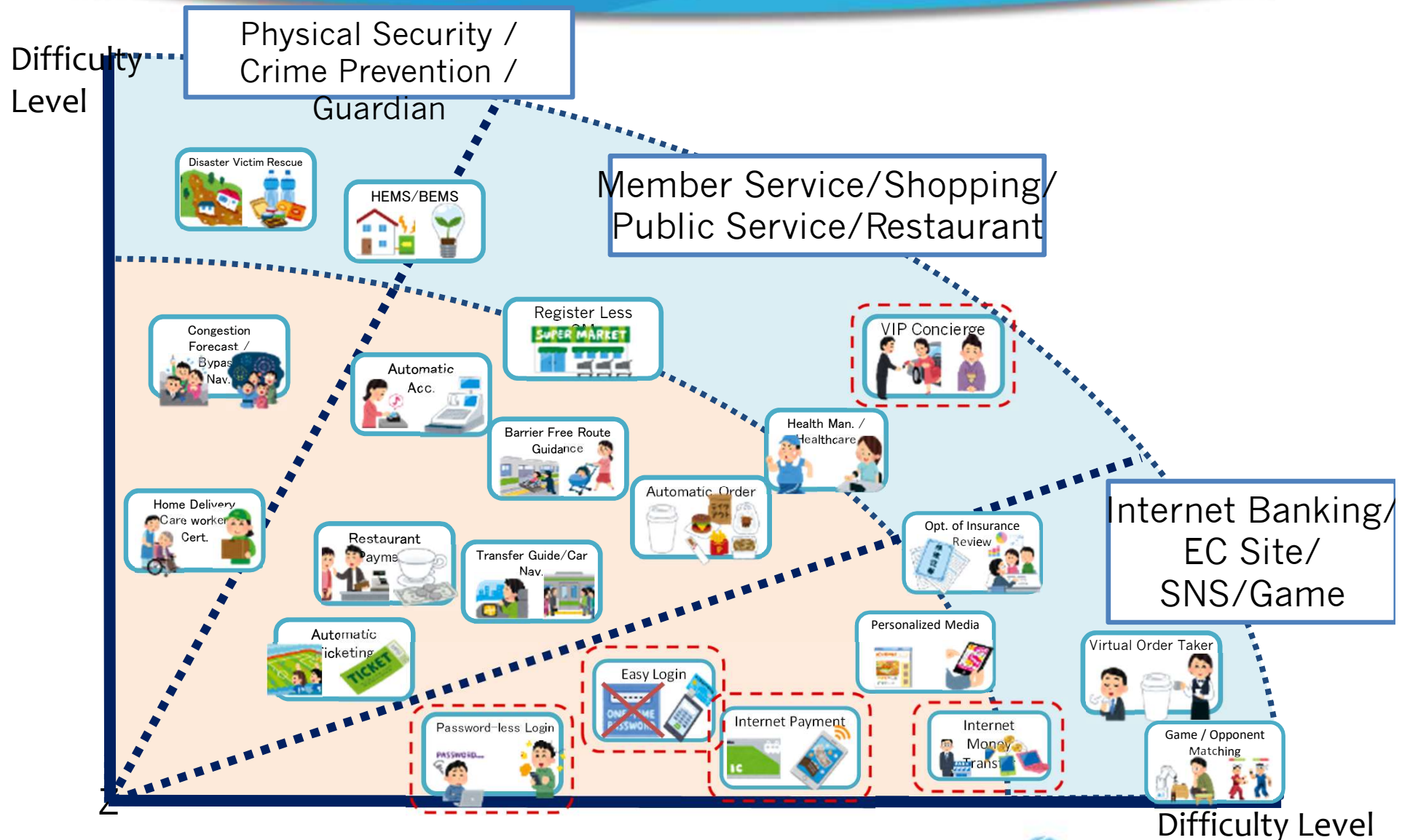
# Lifestyle Authentication as a Platform

- Lifestyle authentication can be used as a platform for various services other than authentication



Lifestyle Authentication Platform

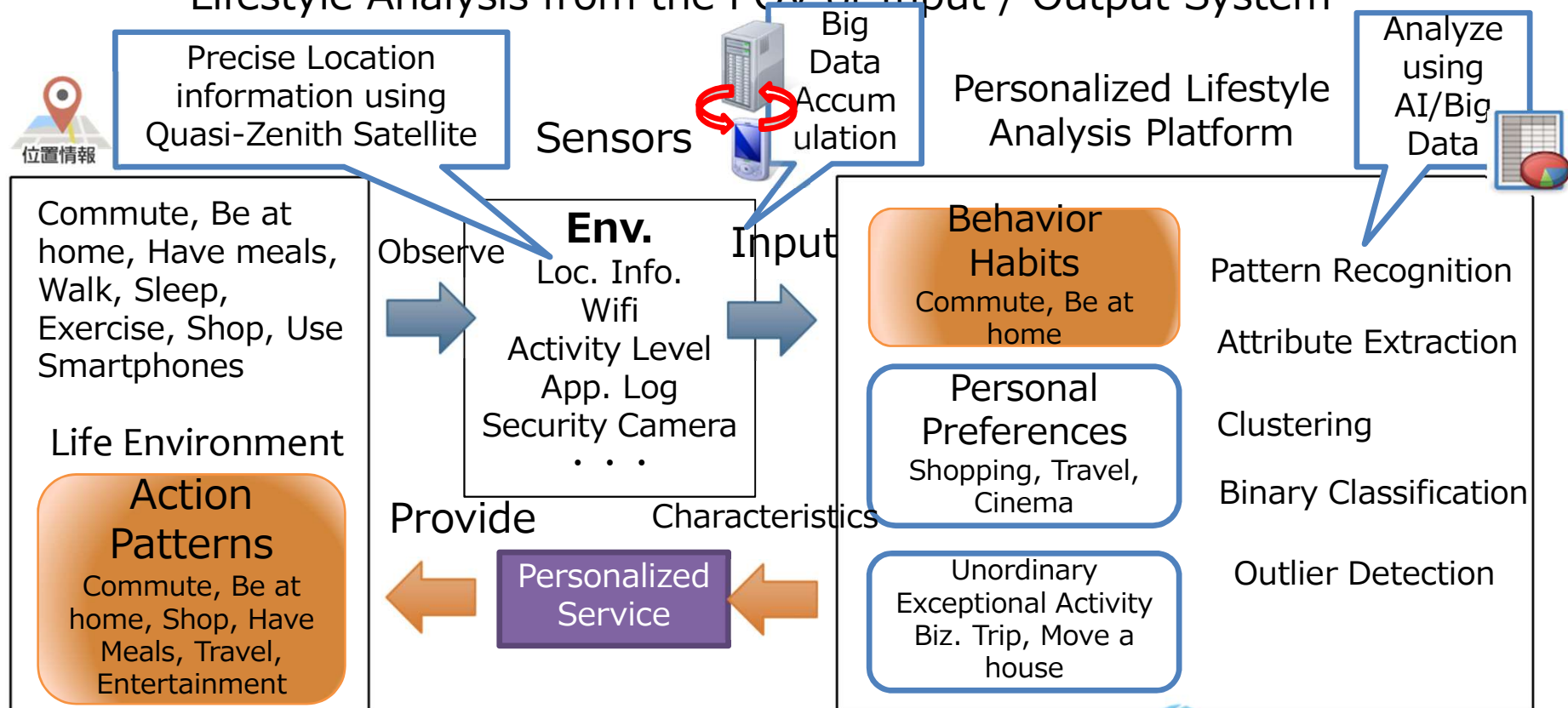
# Difficulty Level of Lifestyle Analysis Application



# Personalized Lifestyle Analysis

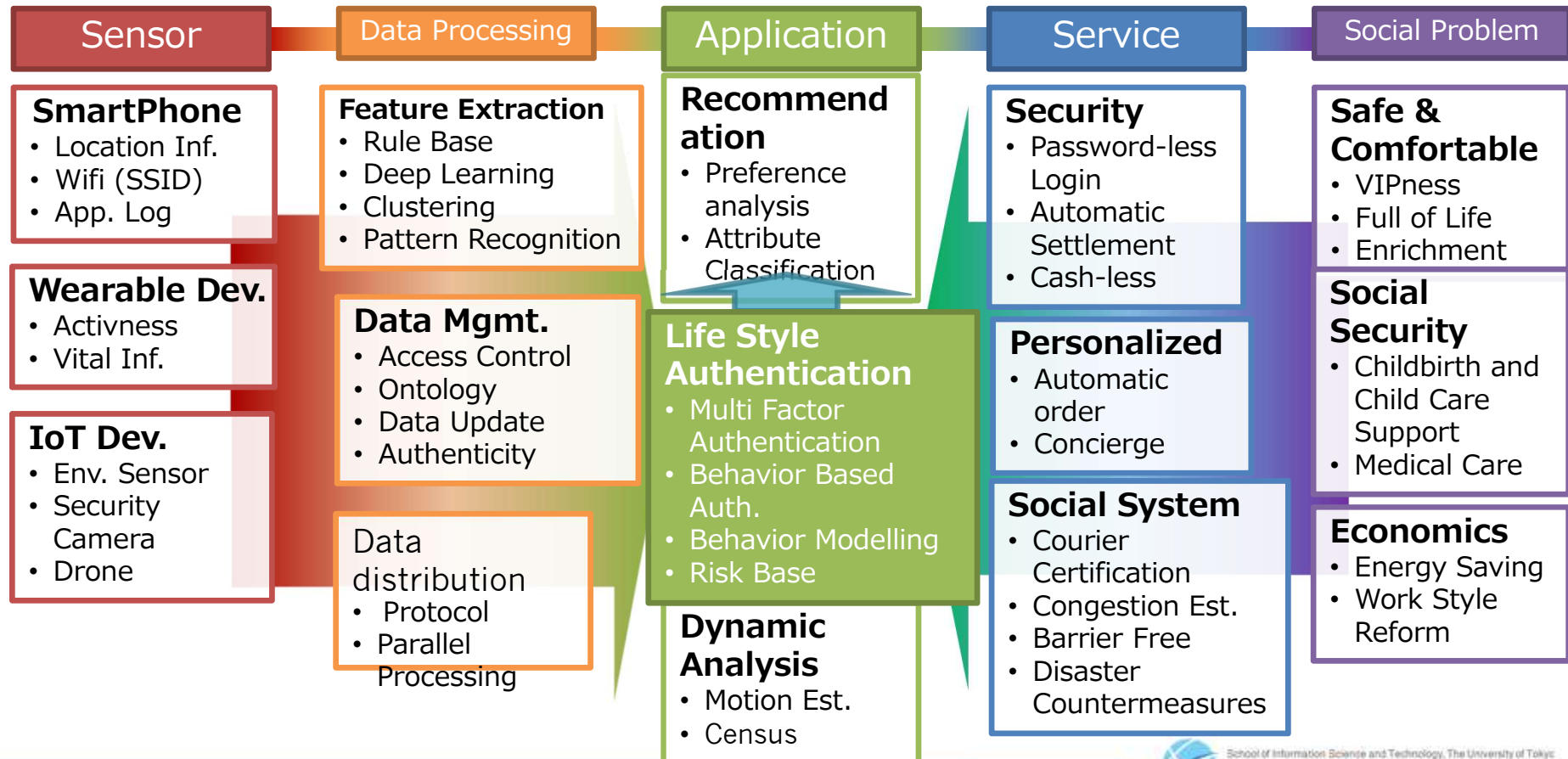
- ✓ Observe/collect a person related information using sensors
- ✓ Derive a person's characteristics such as customs / preferences using lifestyle analysis platform
- ✓ Utilize the characteristics for personalized services/ personal authentication

## Lifestyle Analysis from the POV of Input / Output System



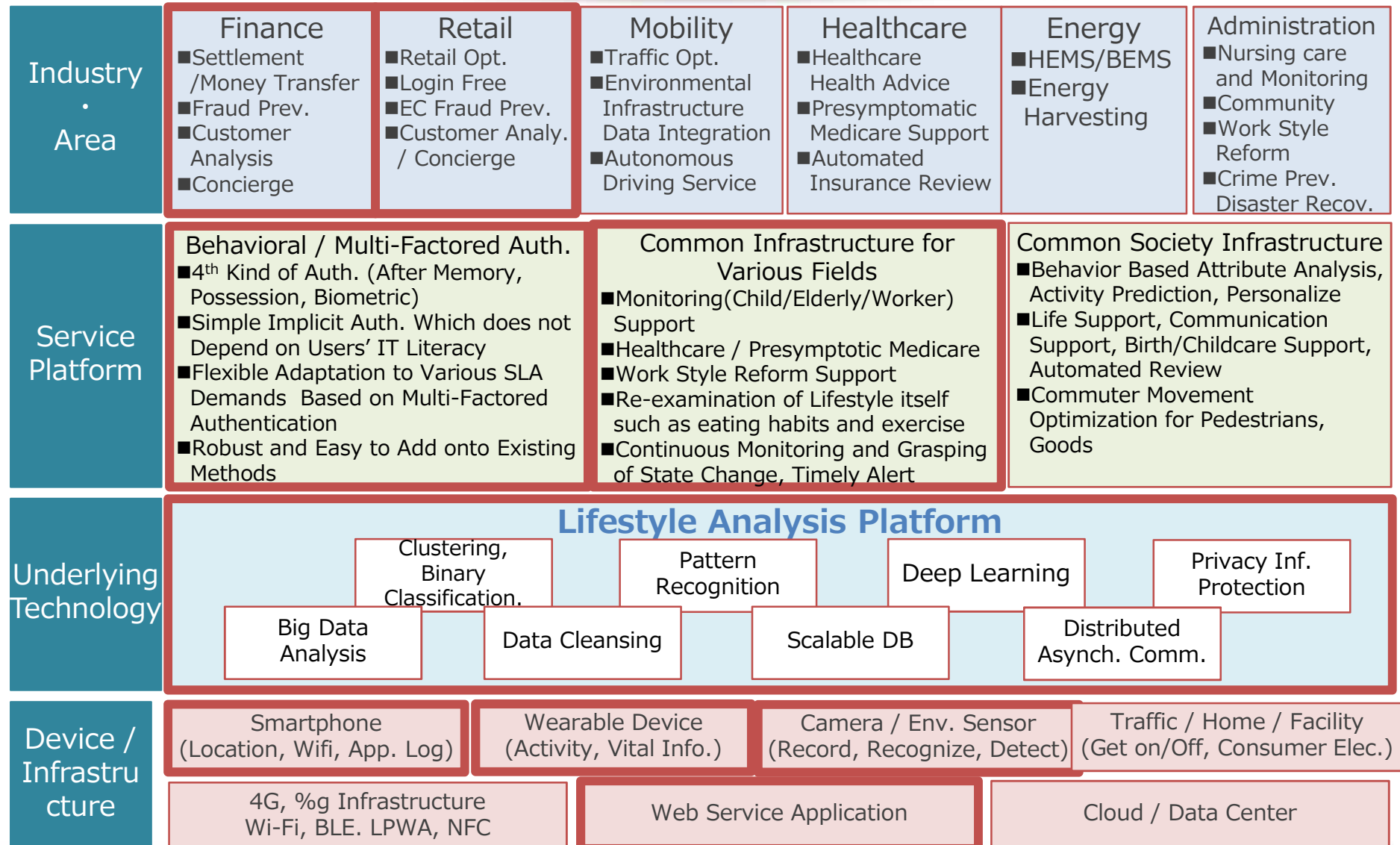
# Technology Overview of Lifestyle Analysis

- ✓ Process person related data derived from sensors
- ✓ Interpret the processed data and apply to services
- ✓ Solve social problems through service creation

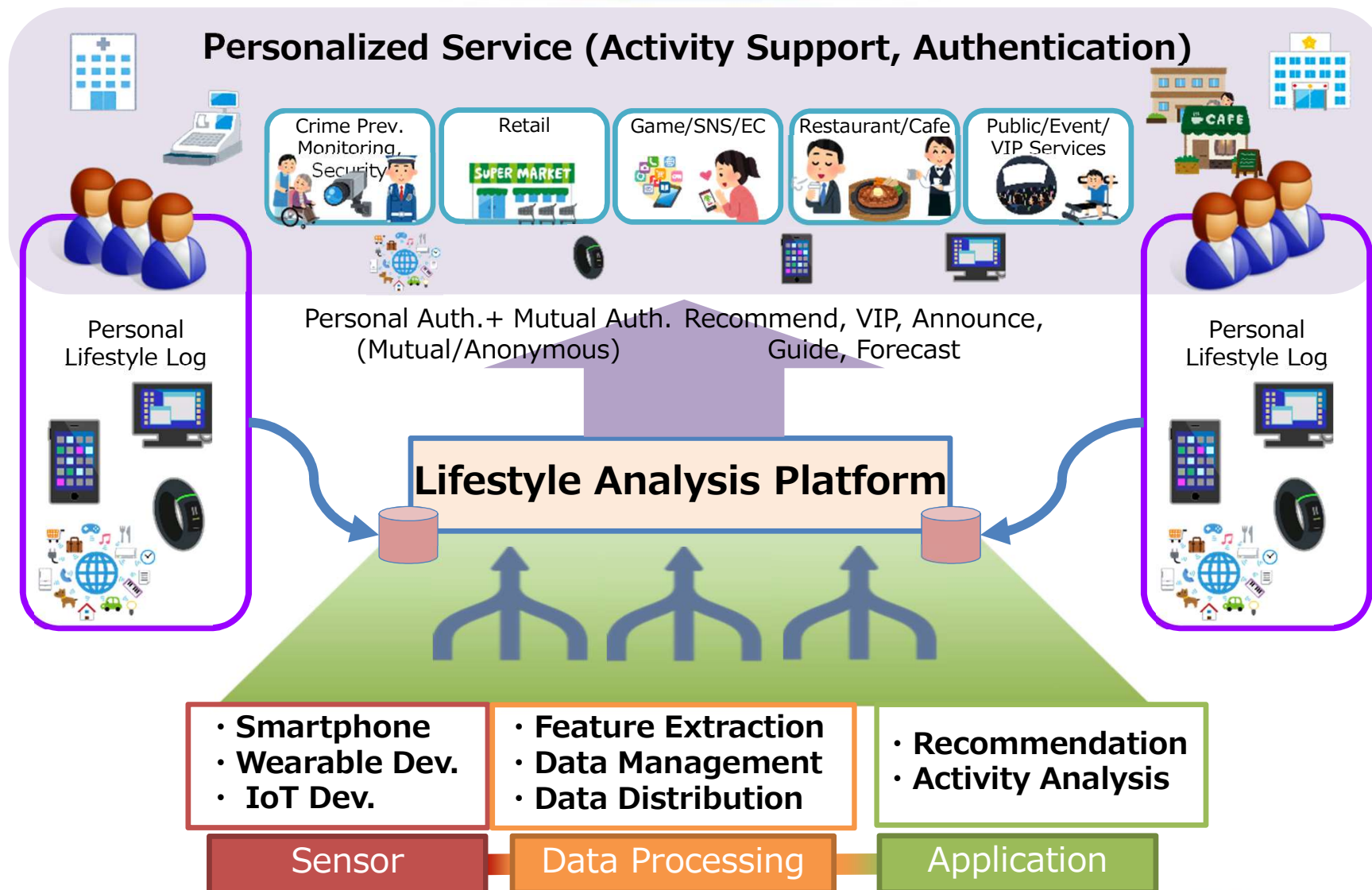




# Lifestyle Analysis Architecture



# Value Creation through Lifestyle Analysis Platform



# Closing Remarks

- ◆ Realization of Total Security
  - ◆ Bring other factors than ICT Technology into the implementation in order to meet with user acceptance and a variety of risks
- ◆ Usecase not Restricted to Authentication
  - ◆ Technology Innovation which will utterly change peoples' lifestyle.
  - ◆ Creation of highly convenient new services
- ◆ Bring peace of mind, VIP ness and enrichment of mind into life