



EU-Japan Smart City Project

City Platform as a Service

April 11, 2017

Stephan Haller
Chiaki Ishikawa
Martin Strohbach





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Project Introduction & Architecture

[si:pɑ:sdɒtɑiəʊ]

シーパース・ドット・アイオー

What is a Smart City?

„A city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance“

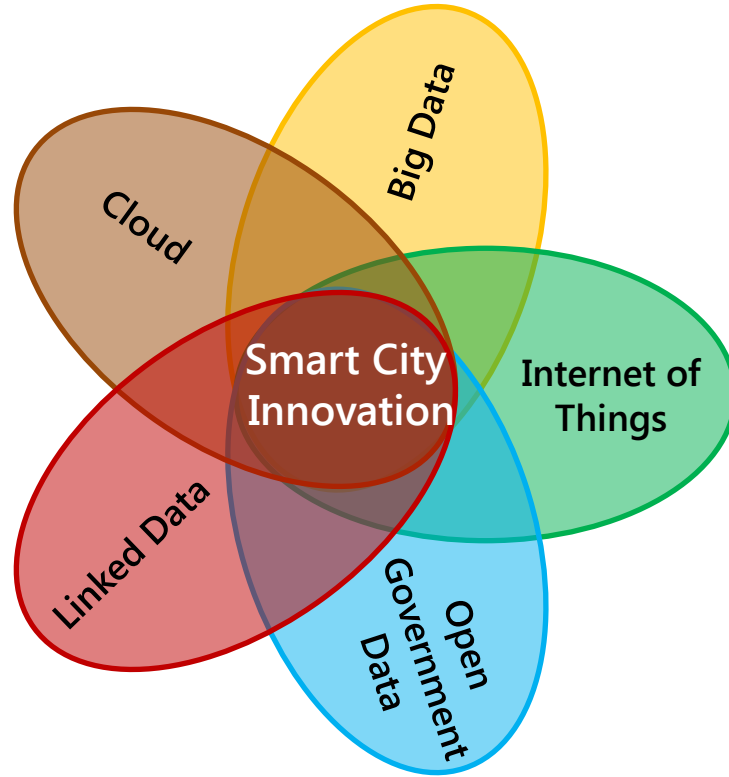
Caragliu et al., 2011

„A smart city is a well-defined geographical area, in which high technologies such as ICT, logistic, energy production, and so on, cooperate to create benefits for citizens in terms of well-being, inclusion and participation, environmental quality, intelligent development; it is governed by a well-defined pool of subjects, able to state the rules and policy for the city government and development“

Dameri, 2013

„A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operations and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects.“

ITU-T, 2016



Joint Research and Innovation Action (RIA) between Europe and Japan

Funding Institutions &
Programmes

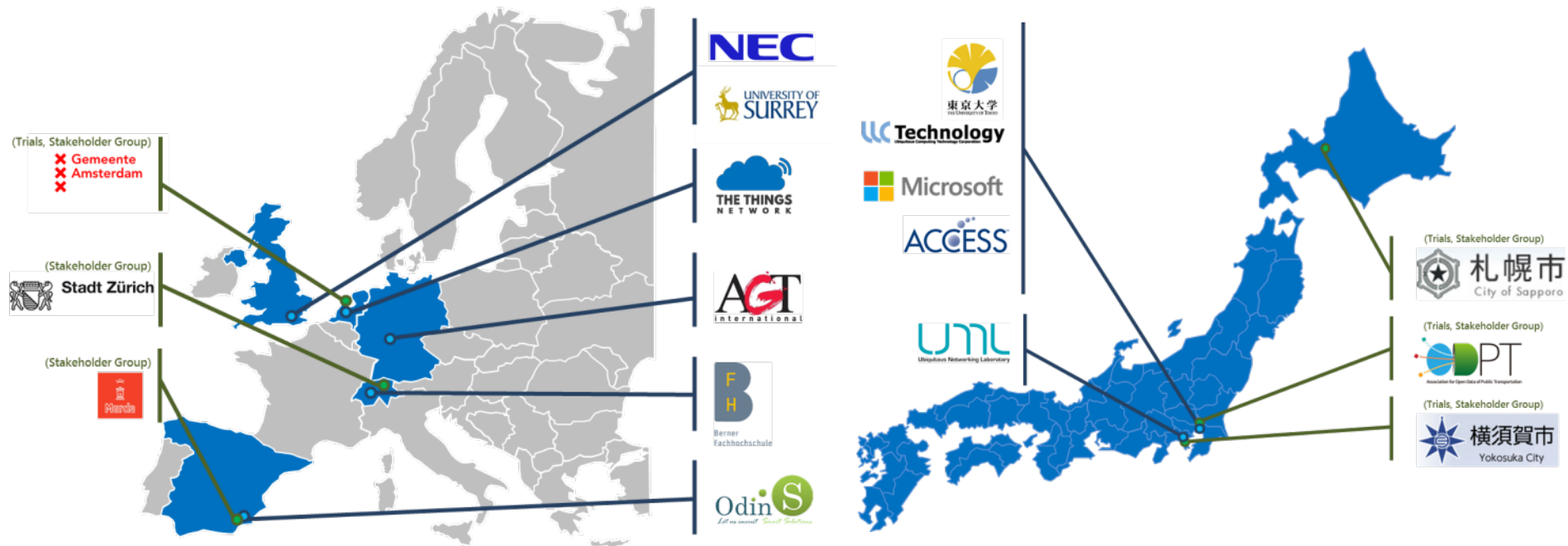
H2020 EUJ-02-2016
NICT
(高度通信・放送研究開発委託事業)



Duration

July 1, 2016 – December 31, 2018
(2.5 years)

Project Partners





1. **Develop** an Open Social City Platform



2. **Deploy** the City Platform as a Service Solution



3. **Empower** the citizen to her data



4. **Validate** the platform with use cases providing public value

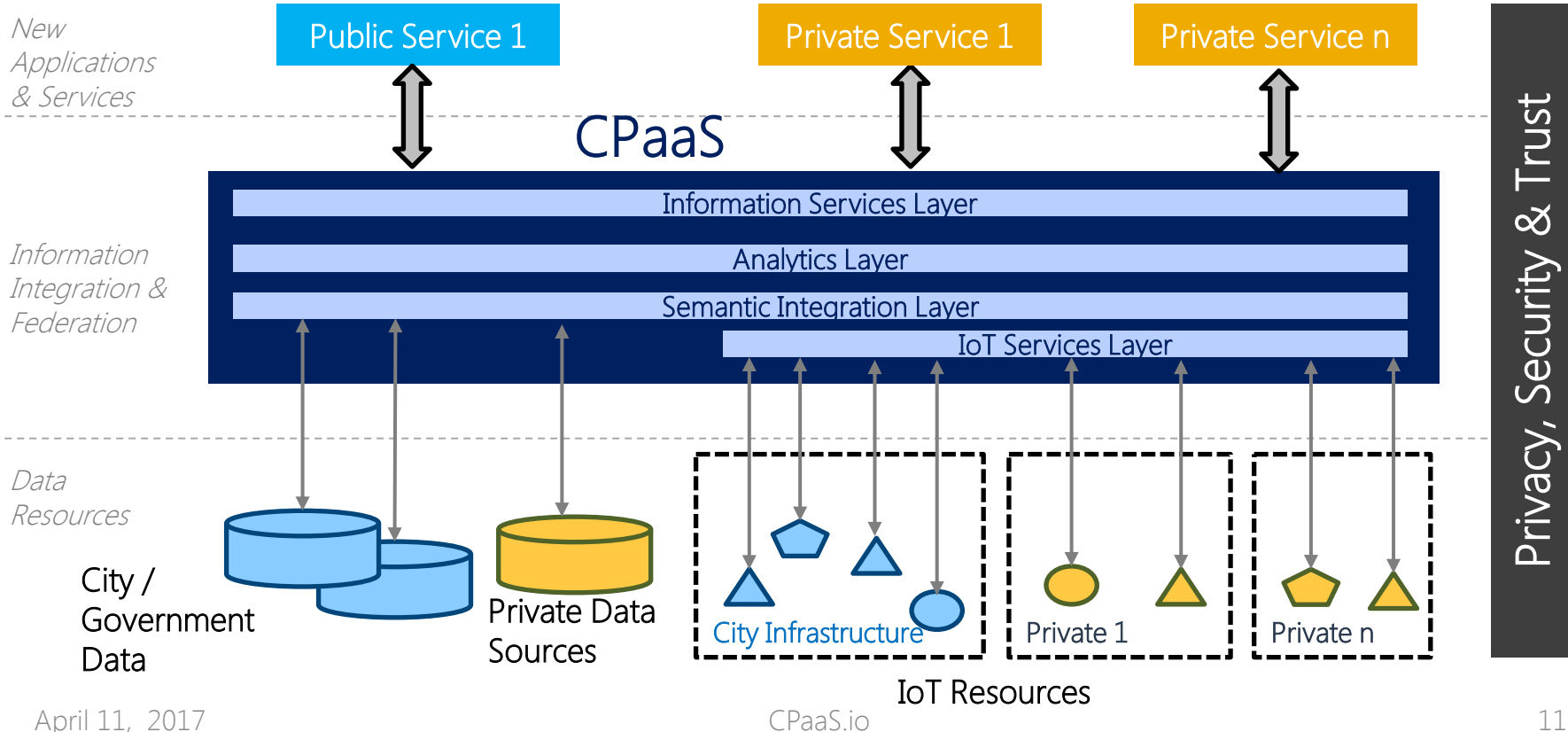


5. **Develop blue prints** for the adaptation and transfer of solutions to other cities



6. **Create impact** in cities

Architecture



Privacy, Security & Trust

1. Economic Development & Attractiveness
2. Sustainable Development and City Planning
3. Effective Service Provisioning
4. E-Participation

Success Factors for Smart City Projects

Characteristics of Smart City Applications

- Highly Dynamic Environment
- Bottom-Up vs. Top-Down
- Many Stakeholders involved



- Public-Private-Partnership (PPP) common model
- Partner ecosystem has to be open for new partners
- Important stakeholders:
 - City Administration
 - Citizens / Users
 - Enterprises

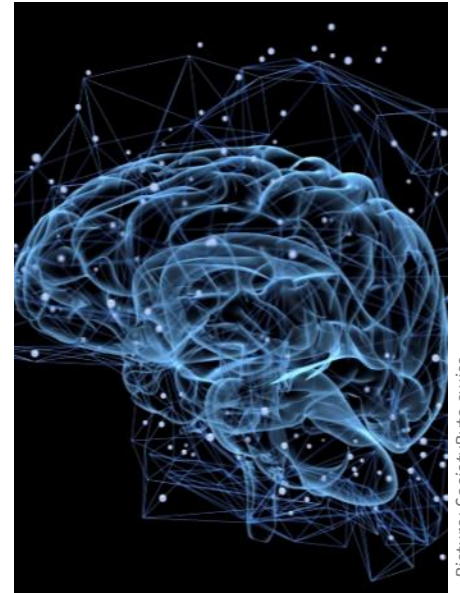


Picture: pixabay (geralt)

Sources:

- *Walser, K., Haller, S. (2016): Smart Governance in Smart Cities. In: Meier A., & Portmann E. (Eds.), Smart City: Strategie, Governance und Projekte, Springer Vieweg, pp. 19-46.*
- *van Winden, W., Oskam, I., van den Buuse, D., Schrama, W., van Dijck, E. (2016): Organising Smart City Projects – Experiences from Amsterdam, Amsterdam University of Applied Sciences*

- Open Data (Government, IoT, ...)
- Availability of open data platforms to enable bottom up innovation
- Data semantics and understanding of data quality are important
- Sharing of knowledge and experiences



Picture: SocietyByte.swiss

Sources:

- *Walser, K., Haller, S. (2016): Smart Governance in Smart Cities. In: Meier A., & Portmann E. (Eds.), Smart City: Strategie, Governance und Projekte, Springer Vieweg, pp. 19-46.*
- *van Winden, W., Oskam, I., van den Buuse, D., Schrama, W., van Dijck, E. (2016): Organising Smart City Projects – Experiences from Amsterdam, Amsterdam University of Applied Sciences*
- *Fraefel M., Haller S., Gschwend A., Big Data in the Public Sector. Linking Cities to Sensors, accepted for the IFIP EGOV-EPART 2017 Conference, St. Petersburg*

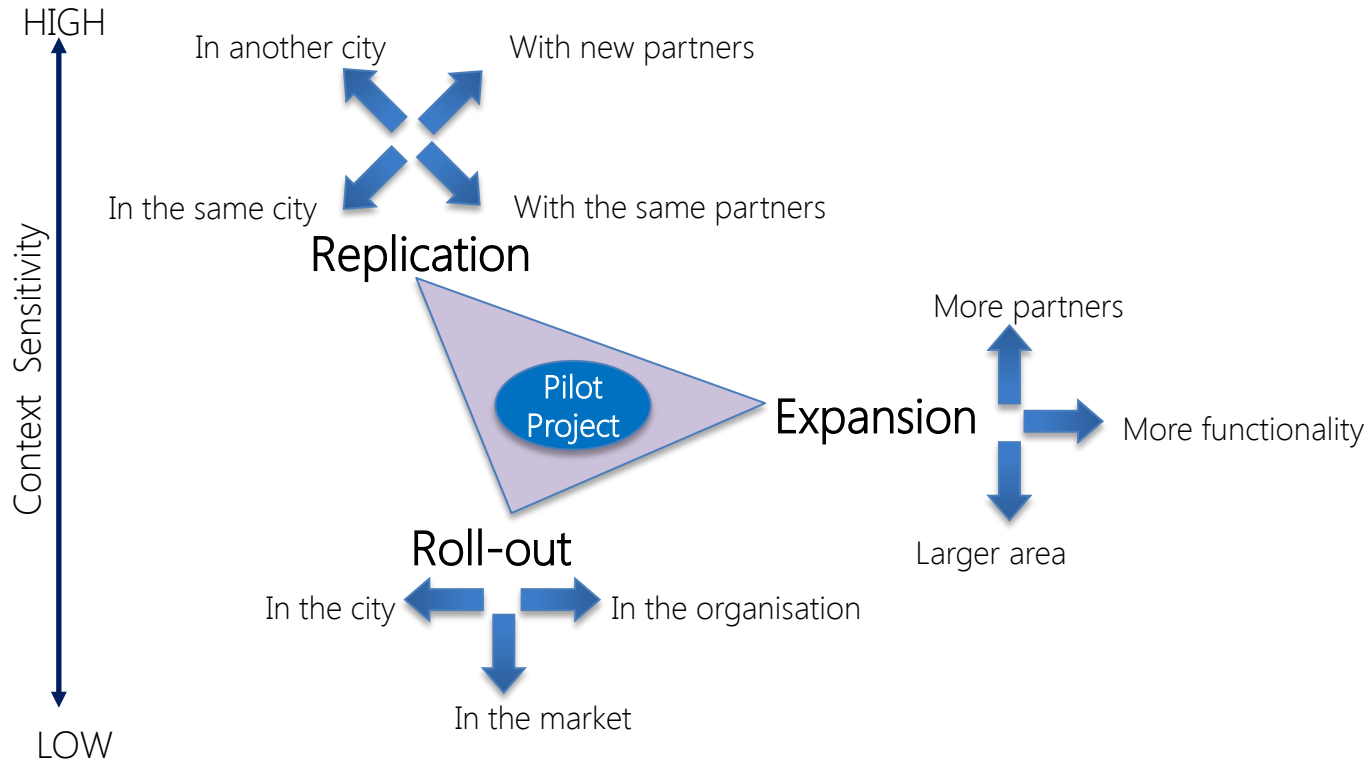
- Realistic business model essential for going beyond pilot stage
- Translating sustainable and social value into continuous revenue streams is difficult, but important
- Upscaling potential must be considered early



Picture: MaxPixel

Source: van Winden, W., Oskam, I., van den Buuse, D., Schrama, W., van Dijck, E. (2016): *Organising Smart City Projects – Experiences from Amsterdam*, Amsterdam University of Applied Sciences

Types of Upscaling



Source: Van Winden et al., 2016

Use Cases

Use Cases

Smart Government
スマート政府



Smart Events
スマート イベント



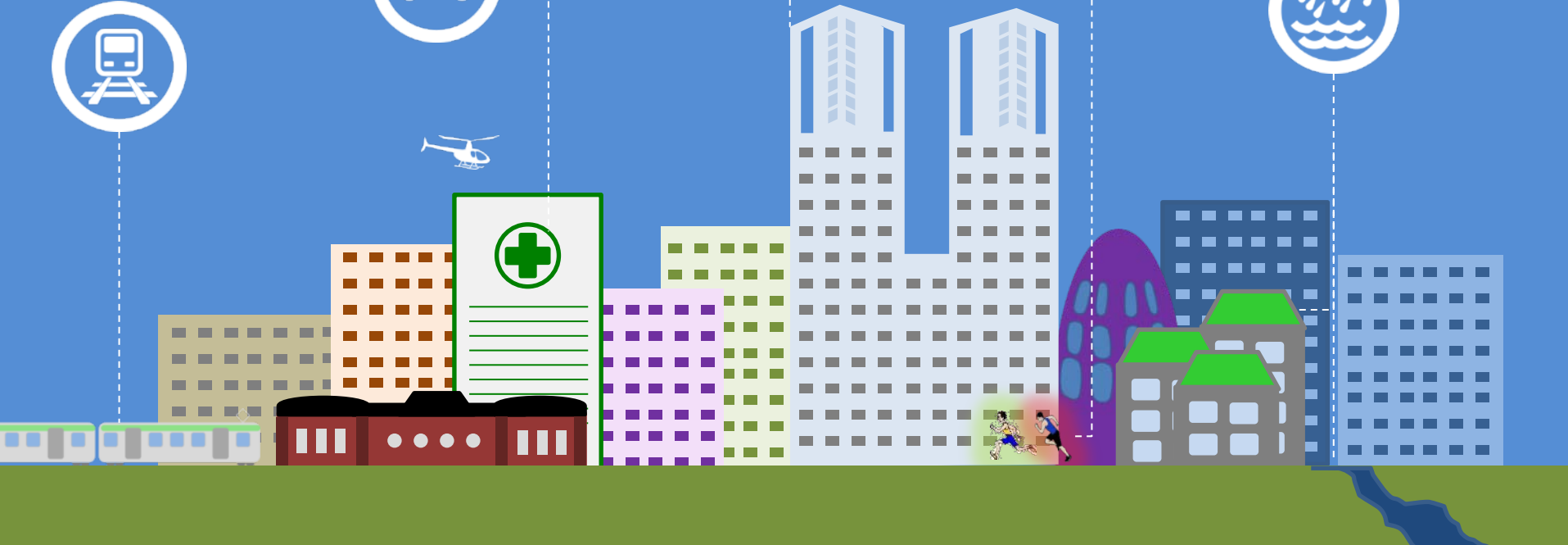
Smart Emergency Care
スマート 緊急医療



Smart Water Management
スマート水の管理



Smart Transportation
スマート 輸送



Use Cases

Smart Government
スマート政府



Smart Events
スマート イベント



Smart Emergency Care
スマート 緊急医療

Smart Water Management
スマート水の管理



Main Goal

- Prevention of floods

Approach

- Water retention elements with sensors and valves are installed on rooftops, connected via a LoRaWAN network
- Data from various sources is collected, aggregated and analysed in the CPaaS.io platform
- Automatic or remote closing/opening of valves



Use Cases

Smart Government

Smart Events スマート イベント

Goals

- Better health and emergency services for the population
- On-site triage support

Approach

- Location data, images and IoT sensor data give emergency staff a complete picture of the situation
- Information exchange between ambulances, hospitals and potentially additional third party service providers
- Data analysis for better resource allocation



Smart Emergency Care スマート 緊急医療



Smart Transportation スマート 輸送



EVENT ANALYTICS USE CASE

Quantifying Event Experience

CPaaS.io Example: The Color Run



Objective: Quantifying people's event experience

Event Participants



Quantify my experience

Connect to exciting situations

Sample Metrics

- Happiness
- Activity
- Color Intensity
- Fashion Style
- Running Type

Event Organizer



Quantify the event



Event Analytics

- Happiness
- Activity
- Color Intensity
- Fashion Style



City Pulse

- Happiness
- Activity
- Color Intensity
- Fashion Style

Color Run in a Nutshell

GUESTS

8.5K

interested

6.6K

went

2.4K

shared with

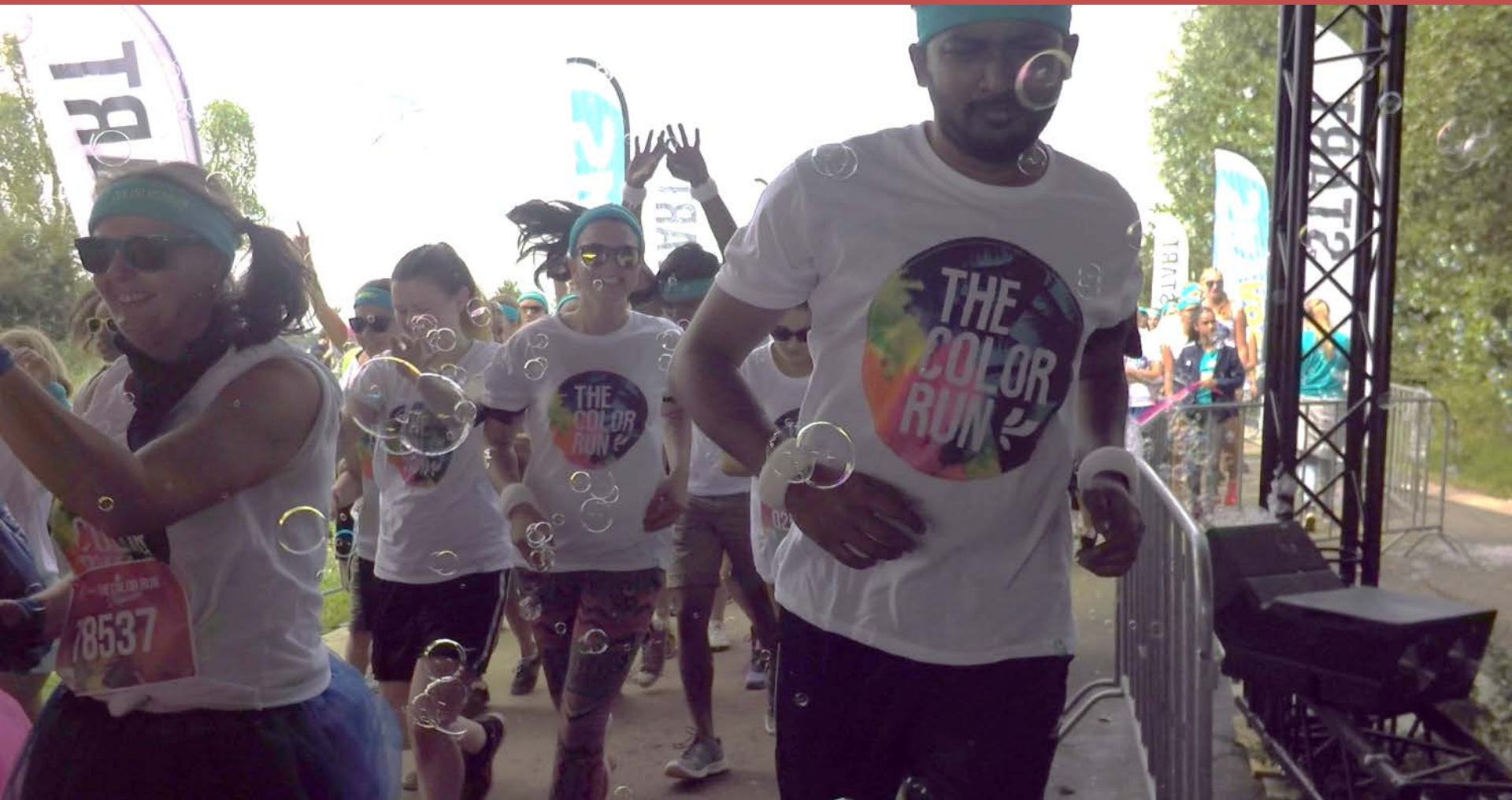
5 km of Running



8 hours of Colorful Partying



Starting the Run



Approaching The Pink Station

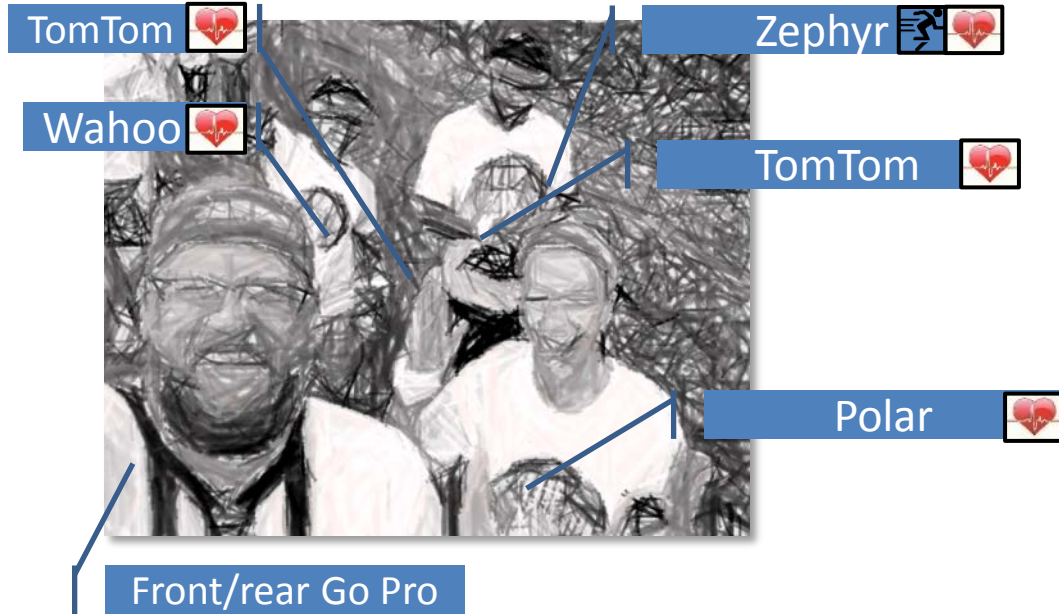


At The Pink Station

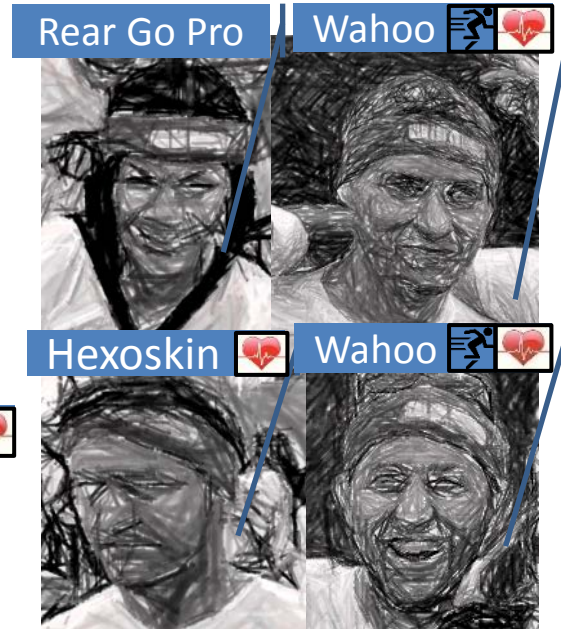


The running set up – MS Bands and GPS traces for all

Fun Runners ~ 40 min



Ambitious Runners ~ 25 min



Data Collected

1.5 hours / 26GB of video data

49min /16 GB of Slow runners
Ground truth
(Fully annotated)

30min/9.4GB of Fast Runners
Ground Truth
(Fully annotated)

3 min/221 MB of Ground truth for
time syncing

90K / 21 MB GPS Locations

4K/1MB to 19K/4MB per user

3.6GB Wearable Data

GPS (Phone, TomTom)
Acceleration (Phone, MS Band 2,
Zephyr, Wahoo)
Gyroscope (MS Band 2)
Heart Rate (MS Band 2, TomTom,
Wahoo, Polar, Zephyr)

...

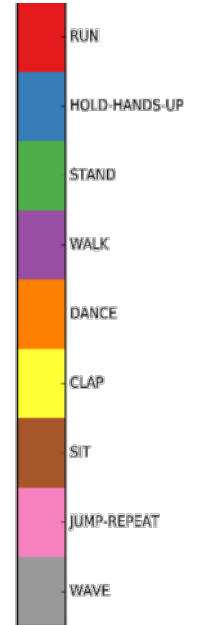
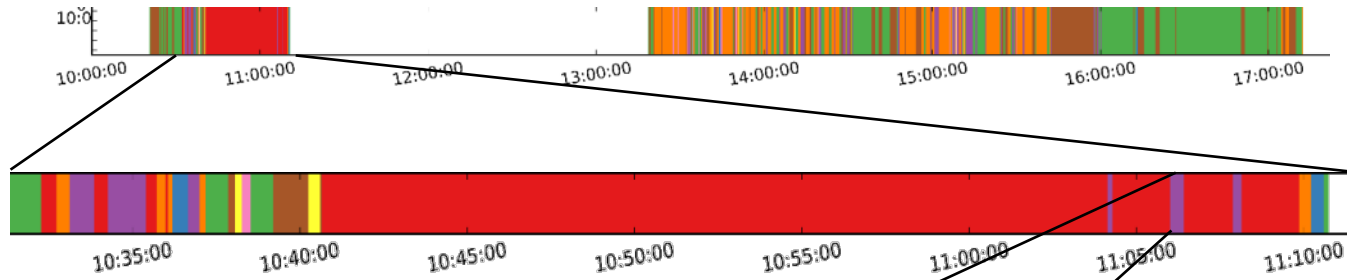
Other Data

18 Pages of Questionnaires
179 Still Pictures
1 GB User Generated Content
(w/o Whatsapp data)

8 Participants



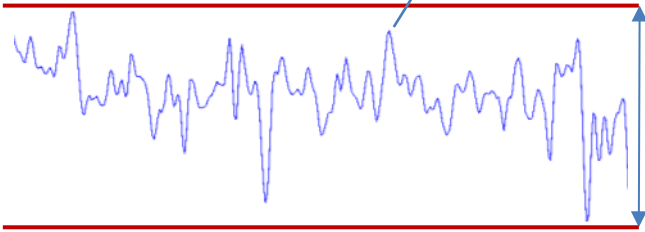
Activity Recognition



What is your running type ?

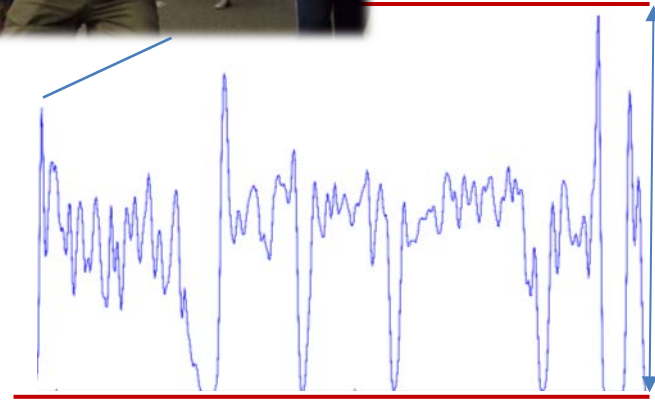
>> Ambitious Runner vs. Fun Runner

Ambitious Runner



Small variations
in Agitation Index

Fun Runner



High variations in
Agitation Index

Color Detection

>> Where are the Color Stations and what are the dominant colors ?



How people dress at Color Run



People come in groups and dress alike

Skirts are very popular

Shirts are cut and modified

Some prefer long, some short trousers



Image Source: <https://www.facebook.com/TheColorRunNederland/>

Comparing Dressing Styles



Untypical
clothing



Typical clothing

EVENT MANAGEMENT USE CASE

Better Event Experience for Tourists



CPaaS.io Example: Sapporo Snow Festival

Picture: Flickr (David McKelvey)

1. Sapporo Use Case Overview
2. Setting up organization for sustainability
3. What has been done, survey and evaluation
4. Summary

Sapporo Use Case

Prepared by Chiaki Ishikawa of YRP Ubiquitous Networking Laboratory (UNL for short).

Credit:

- The CPaaS.io project is jointly funded by the European Commission (grant agreement n° 723076) and NICT from Japan (management number 18302).
- The survey quoted in this presentation was performed in another project executed by Microsoft Japan and YRP UNL with the cooperation of many parties including the City of Sapporo under the sponsorship of MIC (the Ministry of Internal affairs and Communications of Japan)

S-1. Sapporo Use Case Overview

Sapporo is a city in the northern island of Hokkaido.

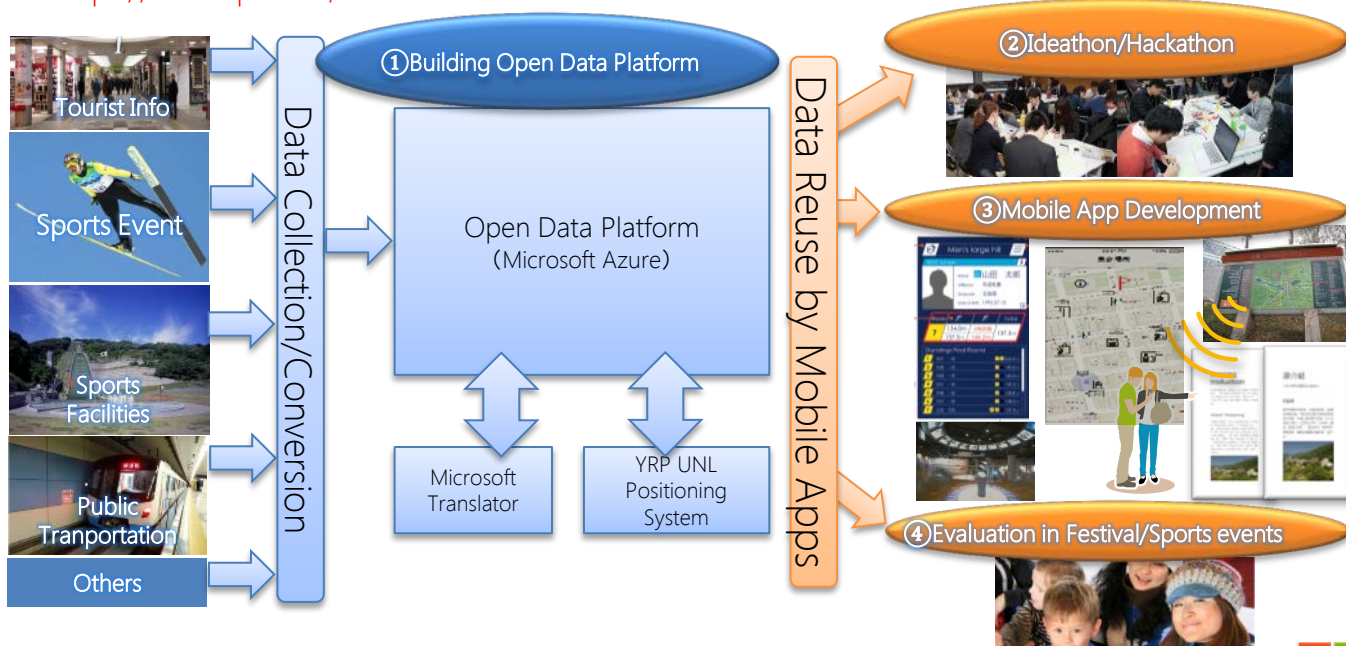
The aim of the use case there is setting up “hospitality” service environment especially for overseas visitors to Japan (think of 2020 Tokyo Olympic games). Sapporo has winter sports events, and snow festival (drawing about 2 million people each year.)

Features:

- Open data (many sources in the private sector)
- Setting up organization for sustainability: government and private players involving Sapporo transportation operators (buses, subways, etc.)
- Supporting sport events by working with big sport event organizer and sport organizations.
- Using advanced ICT technologies such as
 - automatic machine translation (Microsoft Japan) into multiple languages, and
 - the use of location beacon markers to offer location-coordinated sightseeing guidance (YRP UNL and UCT).

cf. Open Data City project in Sapporo City in 2016

Open data City was the strategic project of MIC (Ministry of Internal Affairs and Communication) and Microsoft executed with UNL(Ubiquitous Network Laboratory and the University of Tokyo led by Professor Sakamura (He is now at Toyo University starting in April 2017). Achievement of this project has taken over to CPaaS (City Platform as a Service) project in 2016. CPaaS.io is collaborative project with Japanese government and EU institution and executed by UNL with Microsoft and other members. Detail information of this project is here. <https://www.cpaas.io/>



S-2. Setting up organization for sustainability

Sapporo Open Data Association (札幌オープンデータ協議会 : tentative English translation)

- Partners for
 - Collecting open data and disseminating
 - Developing information services that use the open data
 - Promotion of the information services that use the open data

Secretariat: Microsoft Japan, YRP UNL

Members:

- Expert advisers:
 - Prof. Noboru Koshizuka (U Tokyo), et al.
- Local city government offices
- Sapporo Zoo,
- Sport events organizers,
- Hotel associations, etc.

Parties in red are CPaaS.io members.

S-3. What has been done, survey and evaluation

3.1 Drawing up standards for data of sightseeing and sport events, etc.

- Implementation specification was drawn up and infrastructure system was built.
- Data standards were discussed and defined as follows.

No.	Data item	Data standard discussed and defined
1	Event	Name, duration, venue, description, how to participate, and contacts
2	Tourist spot	Location, description of historical sites, etc., signs, and photos
3	Restaurant	Location, availability of menus in foreign languages, Halal food, and staff who speaks foreign languages, and contacts
4	Shopping	Souvenirs and famous local products, local gourmet food, and shops
5	Lodging facilities	Room information, availability of rooms, facilities and service, availability of staff who speaks foreign languages, contacts, and location
6	Other services	Wi-Fi access points, ATMs that accept overseas cards for cashing, public toilets, coin-operated lockers, rent-a-car services, pick up points of taxis and sightseeing buses, parking lots, and underground shopping course introduction.
7	Sport stadiums and arenas	Location, floor layouts, auxiliary facilities
8	Sports	Event results, and participating athletes

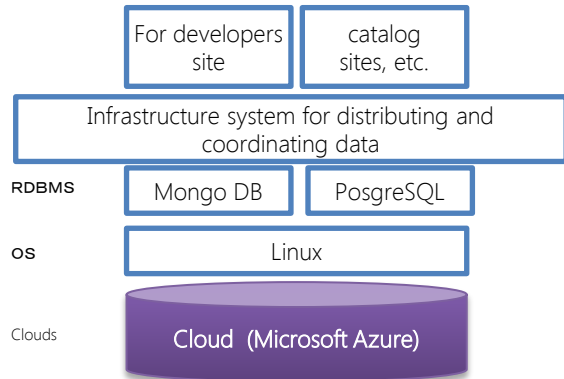
Some are in common vocabulary. Some are offered in CSV format, etc.

S-3. What has been done, survey and evaluation

3.2 Building the infrastructure system for coordinating data of sightseeing and sport events (1/3)

- Infrastructure system for coordinating data has been built to satisfy requirements in the requirement specification
- There was a positive review that the usage of the infrastructure system is useful to introduce how to enjoy sightseeing in Sapporo, and increasing the sales by inbound tourists.

Overview of the completed infrastructure system for distributing and coordinating data



Reviews of the usefulness of the infrastructure system

We could extend the manner the sightseeing is enjoyed by the dissemination of information using apps and sensors, and also we obtained hints for the future extension of such services in the similar directions.

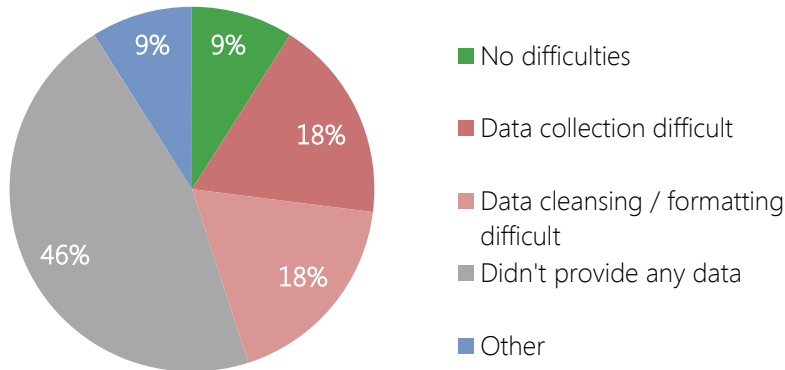
"We could verify that the usage of ICT is effective for solving issues for the receiving environment, and increasing the consumption by the inbound tourists."

S-3. What has been done, survey and evaluation

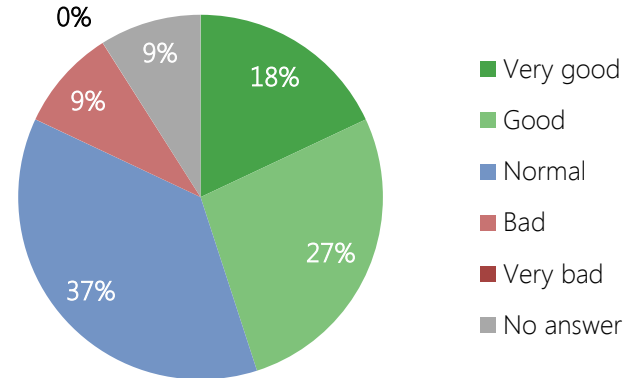
3.3 Building the infrastructure system for distributing and coordinating data of sightseeing and sport events (2/3)

On the supplier side of data in this open data project, there were answers that refer to the difficulty of collecting and organizing the data.

The difficult points in supplying data



Re the items and sufficiency of the published open data

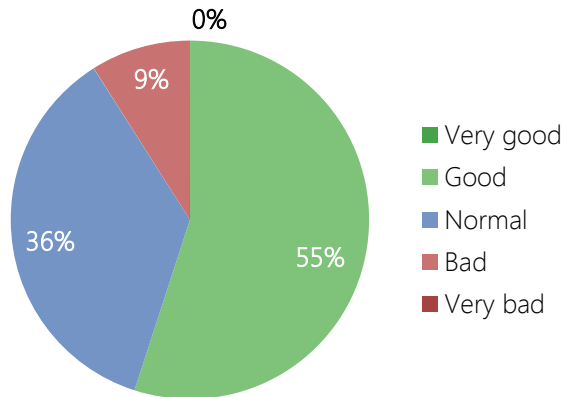


S-3. What has been done, survey and evaluation

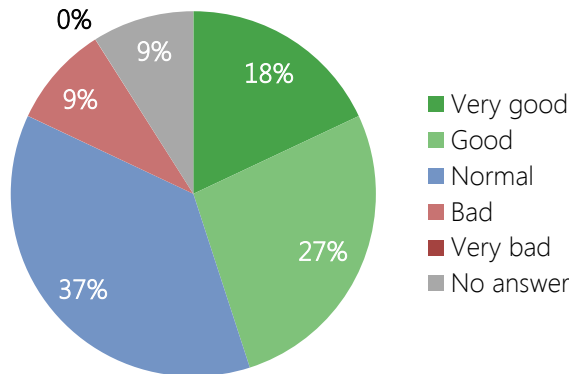
3.3 Building the infrastructure system for distributing and coordinating data of sightseeing and sport events, etc (3/3)

The answers were generally positive regarding the infrastructure system and the system specifically developed for the events.

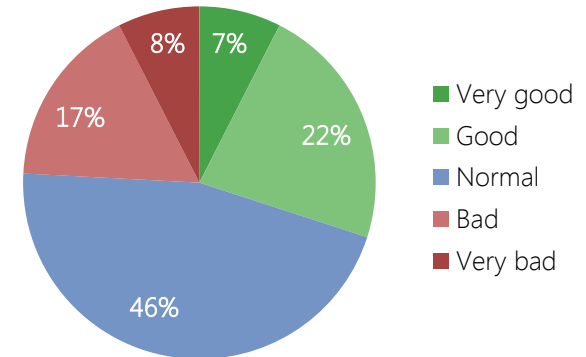
Re the usage of catalog site



Re the usage of developer API



Re the usage of event guidance site



S-3. What has been done, survey and evaluation

3.4 Verifying the effect of open data of sightseeing and sport events, etc.

- Data with location information such as facilities were assigned the attribute of the longitude and latitude so that the location can be shown in maps.
- Data were organized as the foundation for building sightseeing guidance apps in conjunction with the location identification technology that uses beacons.

BLE markers that were installed in the underground shopping streets of Sapporo station

Evaluation result



Later.

BLE Marker installed at underground of Sapporo station



BLE Marker installed at underground of Sapporo station

In a snow-deep city, underground streets are very important

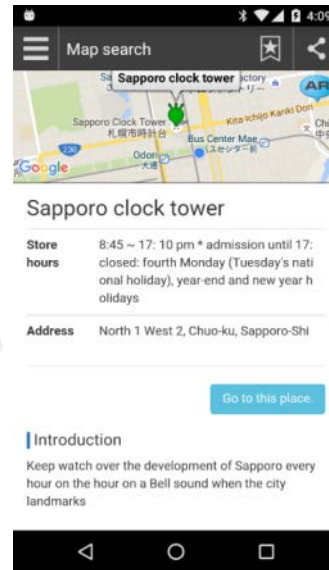


Tourist information service by "ucode" beacon

Send beacon from information board



Receive beacon



Provide information of facilities on board in multiple language
Based on multipurpose location service platform, called kokosil

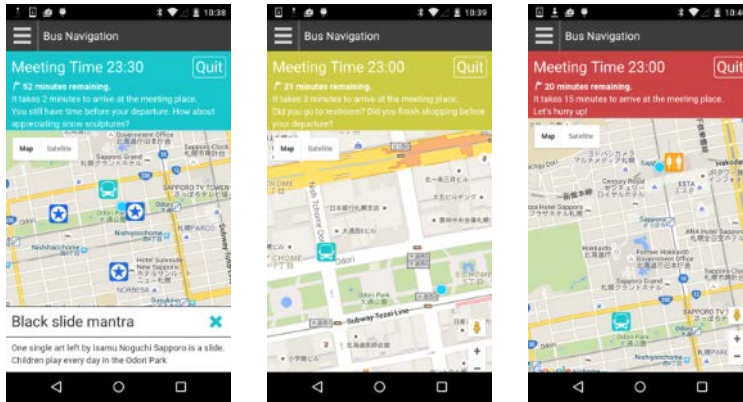
S-3. What has been done, survey and evaluation

3.5 Verifying the provision service of data of sightseeing and sport events, etc. - service to the sightseers who come in the sightseeing buses

An app has been created to offer information regarding the neighborhood, and send reminders based on the date/time and the current location.

The screen of bus rendezvous app

Evaluation result



Later

Guidance based on the date/time
and the current location →

S-3. What has been done, survey and evaluation

3.5 Verifying the provision service of data of sightseeing and sport events, etc. - provision of multi-language content of tourist signs

- There is a function to provide information about the neighborhood based on the beacon signal emitted by the BLE devices that are installed on the tourist signs.
- Additional functions to introduce how to buy tickets for transportation services and how to use transportation payment IC cards.

Provision of multi-language content of tourist signs

観光看板から電波発信



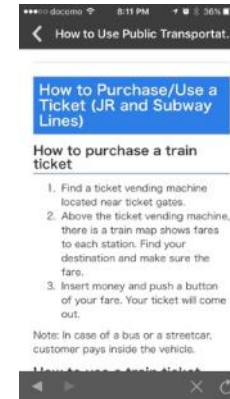
電波受信



BLE marker on sign posts emit beacon

Information on facilities on the sign is provided in many languages. (MT on MS Azure)

Offering tips



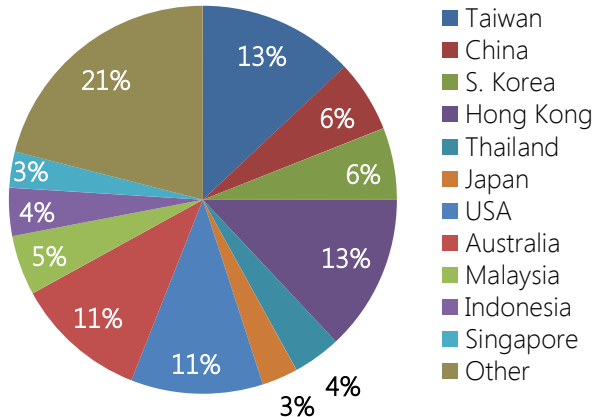
S-3. What has been done, survey and evaluation

3.5 Verifying the provision service of data of sightseeing and sport events, etc. - provision of multi-language content of tourist signs

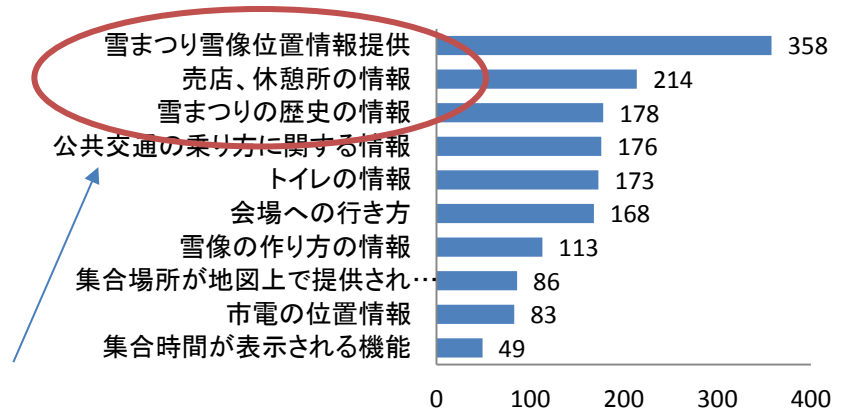
There is a function to provide information about the neighborhood based on the beacon signal emitted by the BLE devices that are installed on the tourist signs.

Additional functions to introduce how to buy tickets for transportation services and how to use transportation payment IC cards.

Breakdown of the regions from where the tourists came



Functions that were deemed useful



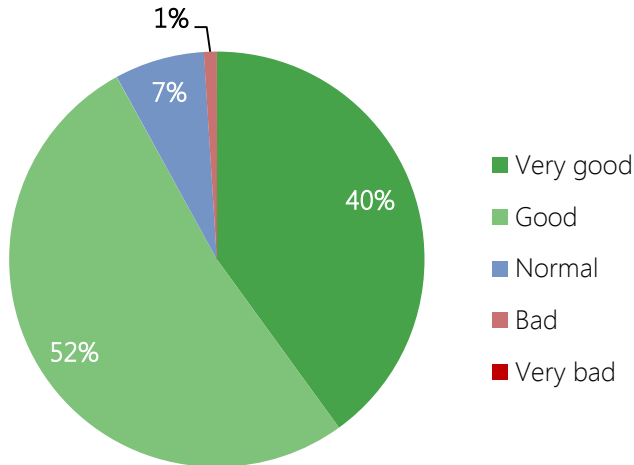
Top 3: 1. Location of snow statues during Snow Festival, 2: Information about shop stalls and resting areas, 3: History of Snow Festival

S-4. What has been done, survey and evaluation

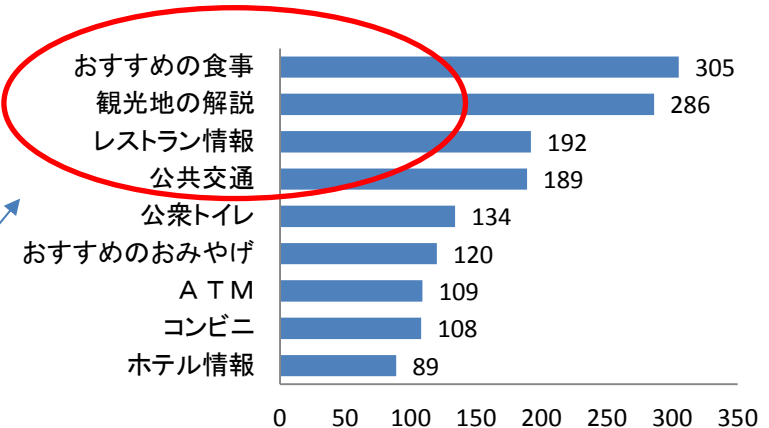
4.5 Verifying the provision service of data of sightseeing and sport events, etc. - provision of multi-language content of tourist signs

- Answers from 438 foreign tourists were included in the responses to the survey.
- High marks were given to the functions and the quality of translation services, and the tourists wanted information about suggested food and tourist spots.

Usage review of the app



What information tourists wanted regarding Sapporo sightseeing



Top 4: 1. Recommended food, 2: Introduction to tourist spots, 3: Information about restaurants, 4: Public transportation

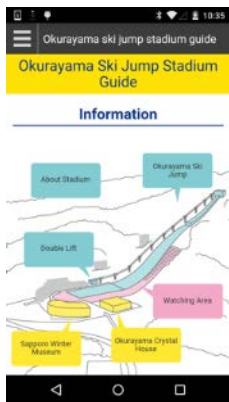
3.5 Verifying the provision service of data of sightseeing and sport events, etc. - guidance regarding the sport event venues

- An app was developed to introduce Okurayama Ski Jump Stadium.
- A function was developed to provide multi-language content to the displays in the facilities.

Guide to Okurayama Ski Jump Stadium

Winter Sports Museum guide

Evaluation result



English



Chinese



Japanese



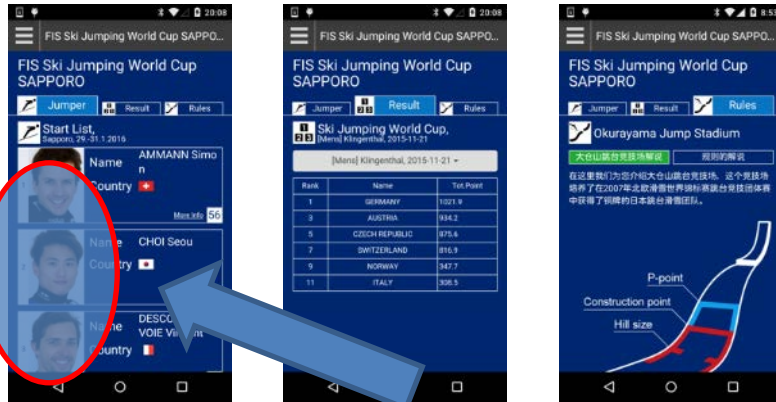
Later

S-3. What has been done, survey and evaluation

3.5 Verifying the provision service of data of sightseeing and sport events, etc. - guidance regarding the sport event venues

An app was developed to introduce the the next jumper based on the profiles of skiers and the order of the jumps on the day of the competition.

An app for Ski Jump competition



The venue and the survey

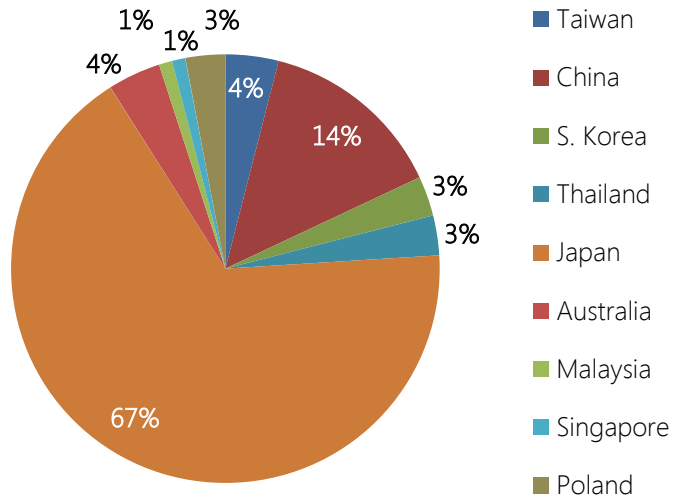


S-3. What has been done, survey and evaluation

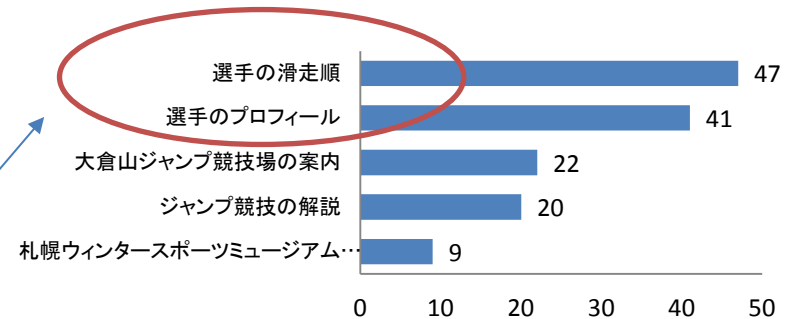
3.5 Verifying the provision service of data of sightseeing and sport events, etc. - guidance regarding the sport event venues

- 75 answers (30% of which is overseas tourists) were obtained.
- The order of jumps and the profile of the skiers were given high marks.

Breakdown of the regions from where the tourists came



Functions that were deemed useful

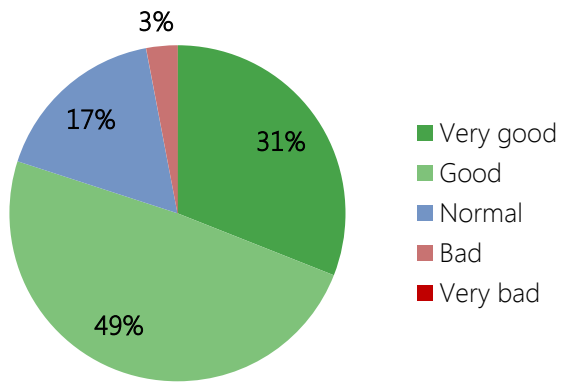


Top 2: 1. Order of ski jumps, 2: Skier profile

3.5 Verifying the provision service of data of sightseeing and sport events, etc. - guidance regarding the sport event venues

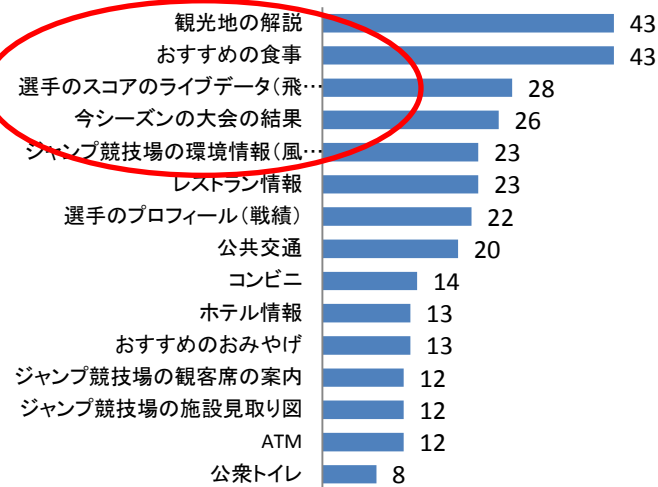
- 75 answers (30% of which is overseas tourists) were obtained.
- The order of jumps and the profile of the skiers were given high marks.

Usage review of the app



Top 5: 1. Introduction to tourist spots, 2: Recommended food, 3: Live result of skier scores, 4: Results of this season's competitions, 5: Environmental information of the Jump Stadium (wind speed, etc.)

What information tourists wanted regarding Sapporo sightseeing



S-3. What has been done, survey and evaluation

3.6 Promotion of the usage of data of sightseeing and sport events, etc. - building developers site

- Created developer site: <https://contest-sapporo.odcity.org/>
- Published API specification to retrieve data: <http://docs-sapporo.odcity.org/> (Sorry, these sites are in Japanese.)

Developers site



API specification
<http://docs-sapporo.odcity.org/>



Developers site
<https://contest-sapporo.odcity.org/>

S-3. What has been done, survey and evaluation

3.6 Promotion of the usage of data of sightseeing and sport events, etc. - organizing Ideathons and Hackathons

- **Ideathons** and **hackathons** were held in Nov 21-22, 2015 in Sapporo and Shinagawa (in Tokyo)
- 47 people attended (28 in Sapporo, 19 in Shinagawa in Tokyo) and eight applications were announced at the end.
- **Press conference** on Jan 19 with the mayor of Sapporo present in Sapporo and also in Tokyo.

Ideathon and Hackathon



Press Conference with Mayor of Sapporo present



From left: Yasuyuki Higuchi, CEO/Chair of Microsoft Japan
Katsuhiro Akimoto, Mayor of Sapporo
Ken Sakamura, Director of YRP UNL

S-3. What has been done, survey and evaluation

3.6 Promotion of the usage of data of sightseeing and sport events, etc. - organizing an Apps contest

- An apps contest was held in parallel to Ideathon and Hackathon. 22 apps were submitted.
- An award ceremony was held on March 8 in Sapporo.

Grand Prize

Shows where the action is

最優秀賞

Sapporo Heat Map (オープンデータ学園)

Sapporo Heat Mapは、初めて札幌を訪れる人でも、どこに行くか簡単に決められる直感的観光地発見ツールです。地元の人にとっては当然でも、初めて来た人はなにがあるのかわからない。その街で、どこが一番賑やかな場所なのか？ 遠くても見るべきところのある観光地は？ Sapporo Heat Mapはそんな情報を見つけるための手助けをします。



Pre-cached map: works without the net connection

First Prize

優秀賞

みちコレ (さくさくパブリックス)

“みちコレ”はユーザーがオリジナル地図を作成・共有するスマホアプリです。“みちコレ”が他の地図アプリと異なるのは「地図を他の人と共有」できることです。自分が作成した小さな地図が、他の誰かに利用され、成長し、多くの人を楽しませる大きな地図になっていきます。

Map creation app



札幌ローカルマップ (渡部陽太)

この札幌ローカルマップは、地図の表示、現在の位置にインターネット通信を必要としないiOSアプリです。札幌の地方という意味の「ローカル」と、地図データがアプリ内に存在する「ローカル(データ)」を掛けたアプリの名前です。



S-4. Summary – Sapporo Use Case

Some results established by the experiment/prototyping in Sapporo so far and the issues found and solutions attempted are as follows. CPaaS.io is proceeding using the previous results to offer city platform as a service in an integrated and open manner.

Establishment of Sapporo Open Data Association

- An association that consists of operators in sightseeing and transportation services and ICT stakeholders who will be developers of software
- Building the ecosystem to manage open data with the local partners from scratch

Learning the fundamental issues of provision of sports data

- The usefulness of provision of sports data using smartphone app was verified.
- However, care and due attention must be paid to regulation concerning the data handling (who can receive what), and the accuracy of realtime data, etc.

Advanced ICT elements such as automatic machine translation and beacon markers have been used.

- The provision of information in foreign languages by means of automatic machine translation was deemed very useful by tourists.
- By combining the location-based information, it was learned that we can offer more services than the paper-based information provision

It is an architecture created by YRP UNL and is also the name of commercial offering by UCT (a member of Japanese consortium of CPaaS.io)

<http://ts.uctec.com/uctec/jp/kokosil/>

<http://kokosil.net/>

There is kokosil Sapporo.

Kokosil will be as part of CPaaS.io implementation in Japan.

There will be other parts created and implemented.

Problems



Cities



Communities

**Amsterdam
User
Experience**



**Yokosuka
Emergency
Medical
Care**

Provide

Sapporo Snow Festival



**Waterproof
Amsterdam**



Validates

Innovative Solutions

Validates

Academia



Industry

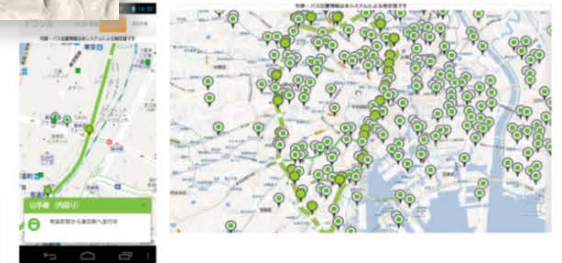


Transferrability

Event Management

**Sapporo
Events and
Experience**

**Tokyo Public
Transportation**



Summary

The project ...

- ... combines different, but complementary technologies
- ... develops a platform as a foundation for an urban data infrastructure
- ... shows the value based on concrete use cases defined by the cities

In addition to the technical and scientific innovation, it is an explicit goal to foster an innovative economic environment in cities.

Further Information



www.cpaas.io



cpaas@bfh.ch



[@cpaasio](https://twitter.com/cpaasio)

CPaaS.io – City Platform as a Service

Smart City Innovation is the goal of the CPaaS.io joint R&D project between Europe and Japan. This means creating value for the society and all actors in the city environment – people, private enterprises, public administrations. To achieve this, the CPaaS.io platform combines the capabilities of the Internet of Things (IoT), big data analytics and cloud service provisioning with Open Government Data and Linked Data approaches.

OVERVIEW
概要

Data has been termed to be the oil of the 21st century. Data will also be what the smart city of the future feeds on. To make this a reality, cities need a platform where data from a variety of sources – IoT and sensor data, open government data, social media, and other 3rd party data providers – can be processed, linked, and analysed in order to extract valuable information that in turn can also be provided as linked open data, and with which new types of services are created and provisioned. Both cities as well as private service providers can build novel applications and services on top of this platform; the platform thus becomes an economically valuable driver for Smart City Innovation.

The main goal of this project is to develop such a City Platform as a Service (CPaaS) that can be federated to support regional or even global applications, and that forms the basis for a smart city data infrastructure. Technical challenges that need to be addressed include data provenance, data quality, adaptive privacy levels, policies and adaptive processes for distributing and deploying processing intelligence to the cloud or to the edge. Other important aspects include data governance, data management and the empowerment of the citizen to control access and sharing of data about her using a MyData approach.

In addition to the development of the platform, several use cases in the domains of event and transport management, water management, and health

Thank You

Gracias Mulțumesc 謝謝 Paldies Eskerrik asko Dziękuję Mahalo תודה Go raibh maith agat спасибо Grazie आभारी
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ありがとう



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Q&A

Conclusion



April 11, 2017