Big data meeting Cloud of Things
for empowering the citizen clout
in smart cities

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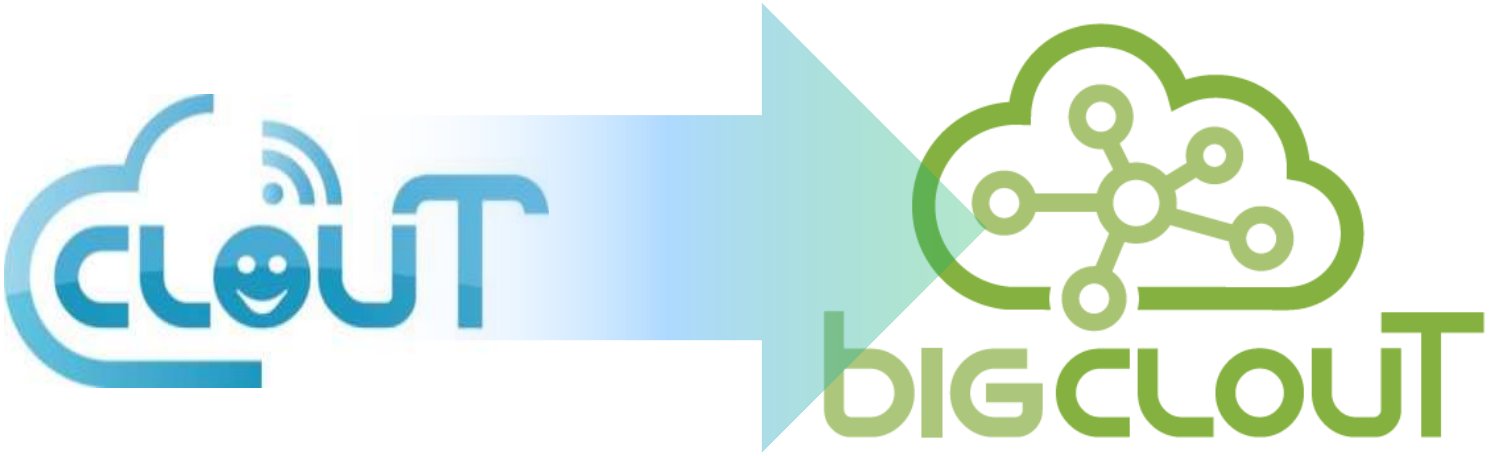
BigClouT Overview

- Project Title: BigClouT: Big data meeting Cloud of Things for empowering the citizen clout in smart cities
  (EUJ-02-2016: **IoT/Cloud/Big Data** platforms in social application contexts)

  BigClouT project will in particular make use of today's three key technologic enablers, Internet of Things (IoT), cloud computing and big data, for the objective of increasing the efficiency in using urban infrastructure, economic and natural resources shared by the increasing
- Project Term: 3 years (July2016 – June2019)
- Budget: 186 Million Yen (Japan side) / 3years

ClouT to BigClouT



Cloud + IoT

+ Big Data

Make cities SMART by utilizing data from IoT and Cloud computing

Make cities MORE SMART by supporting to make decisions by analyzing big data from IoT and Cloud computing

What is smart city?

- Smartness: ['smɑːtnɪs] *N.* *ability to think and respond quickly and effectively*
  - To be responsive to all going around
  - Fast to analyse, reason, plan and make decisions
  - Fast to react with desirable effects
- Smart city: [smärt sĭt′ ē] city with ability to think and respond quickly and effectively
  - To be responsive to all going around - **capture all events going around (with sensors, social networks, crowd sensing, etc.)**
  - Fast to analyse, reason, plan and make decisions – **integration, real-time big data analytics, complex event processing, rule engines, business intelligence**
  - Fast to react with desirable effects – real-time actuating, apply quick measures, collect feedbacks and iterate…

IoT, big data and cloud for answering urban challenges

- **More than half of the world population lives in cities**
- **Urban population percentage is around 75% in Europe, 90% in Japan**
- **On 2% of the earth's surface, cities use 75% of the world resources**

Why cities need to be smart?

- **Resources in civil infrastructure (water, energy, public transportation, parking spaces, buildings, roads, bridges, etc.) to be shared by the increasing population**

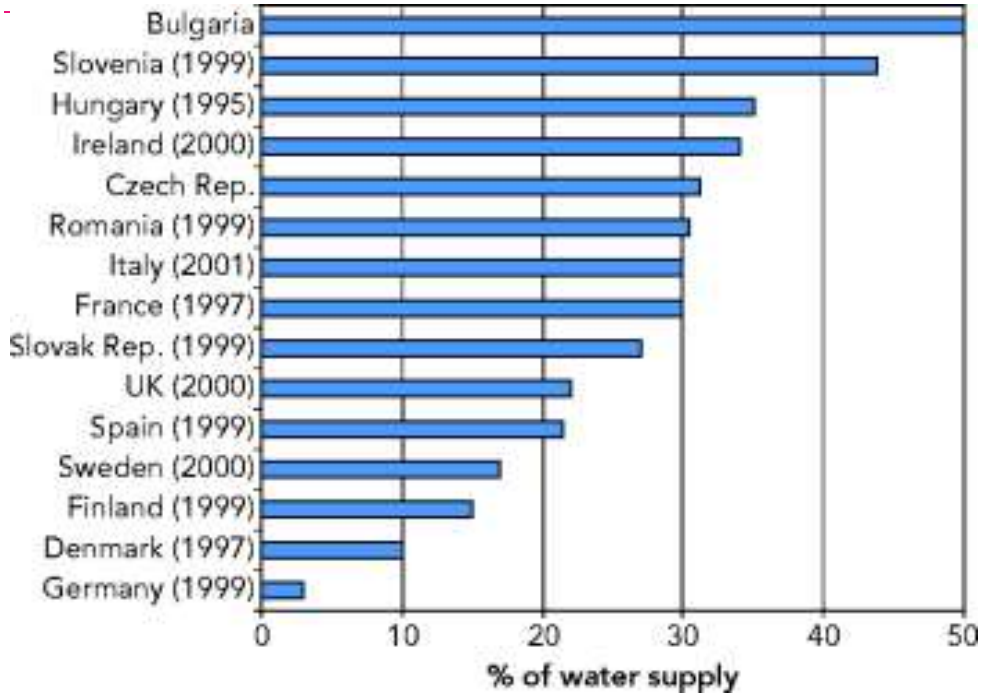
  => direct consequences on the city life

- **Transport as an example**
  - **In Europe and US, drivers spend from 5 to 10 working days per year stuck in the traffic**
  - **30% of city traffic consists of people looking for parking**
  - **Generate negative impact:**
    - **Social : Stress and desperation! 60% of drivers have given up on an activity recently due to the difficulty of finding parking**
    - **Environmental : Huge CO2 emission worldwide due to parking searches**
    - **Economic: loss of time, efficiency (knowing nonetheless that parking is in the top 3 largest source of revenue in a city)**

Why cities need to be smart?

Water

Worldwide, up to **60%** of water is lost due to leaky pipes—to the tune of **US$14 billion every year.**[1]



A faucet that drips just **once per second** wastes **2,700** gallons of water annually.[4]

60% of European cities over-exploit their groundwater resources

European Environment Agency

IBM/US Environmental Protection Agency

Why cities need to be smart?

Energy

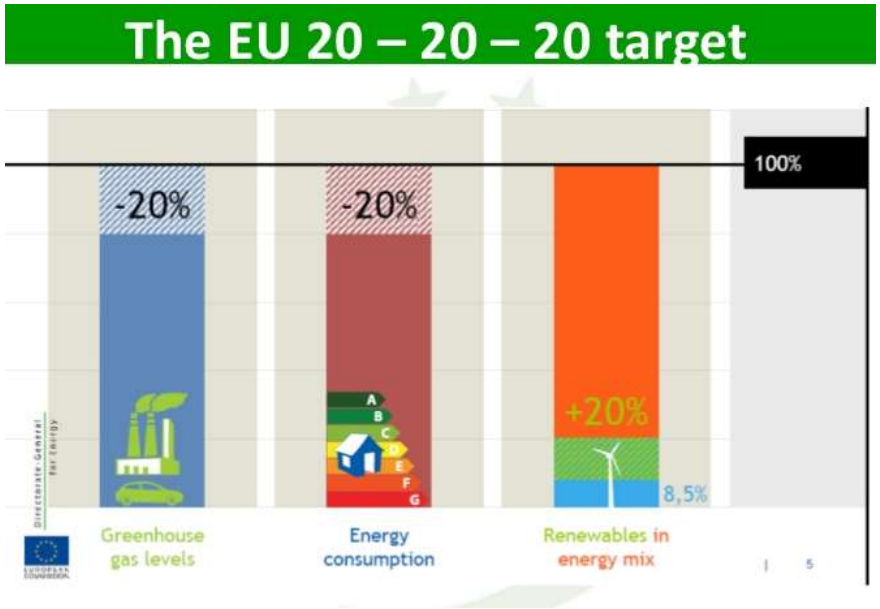
Power Interruptions cost European Union businesses **€150** billion each year

In US, the electricity system is **99.97%** reliable, yet still allows for power outages that cost at least **$150** billion each year

The cost of generating a kWh of electricity is **70 to 170** times the cost of "saving" a kWh through efficiency

GE Digital Energy
US Department of Energy

In Europe, **50 %** of energy consumed today is imported – expected to reach **70 %** by **2030**



What is smart city?

What is smart city?

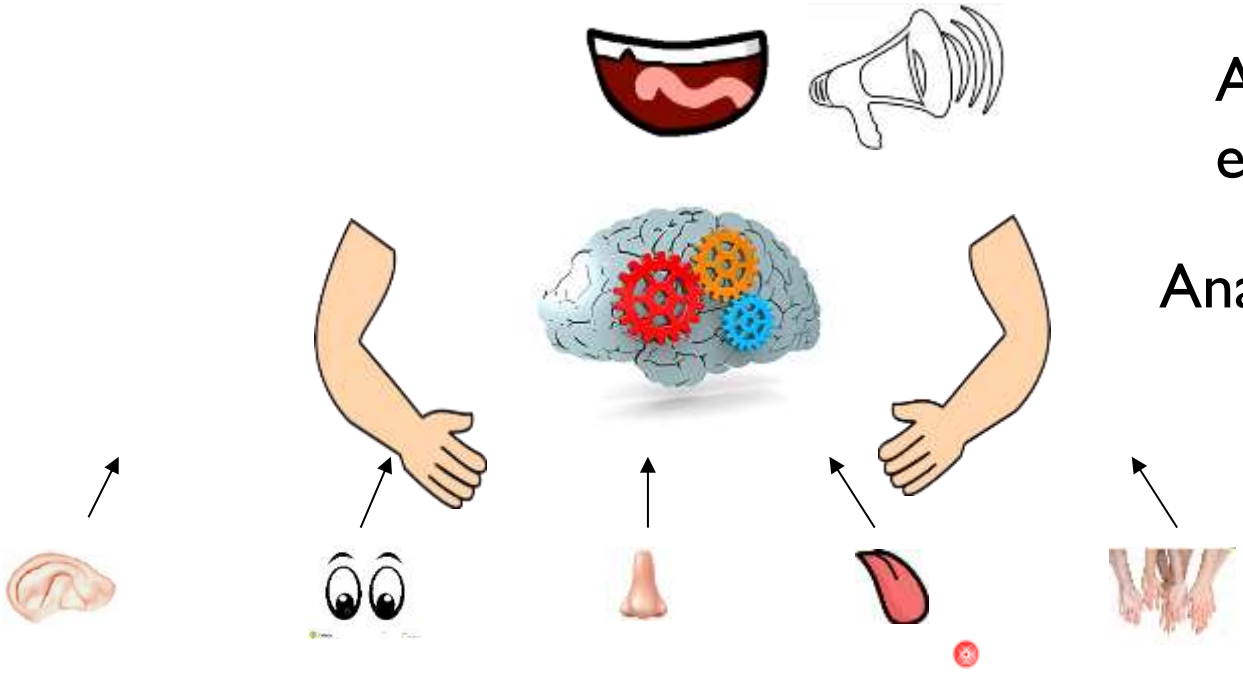
Be responsive

What is smart city?

Analyse, reason, plan

Be responsive

What is smart city?

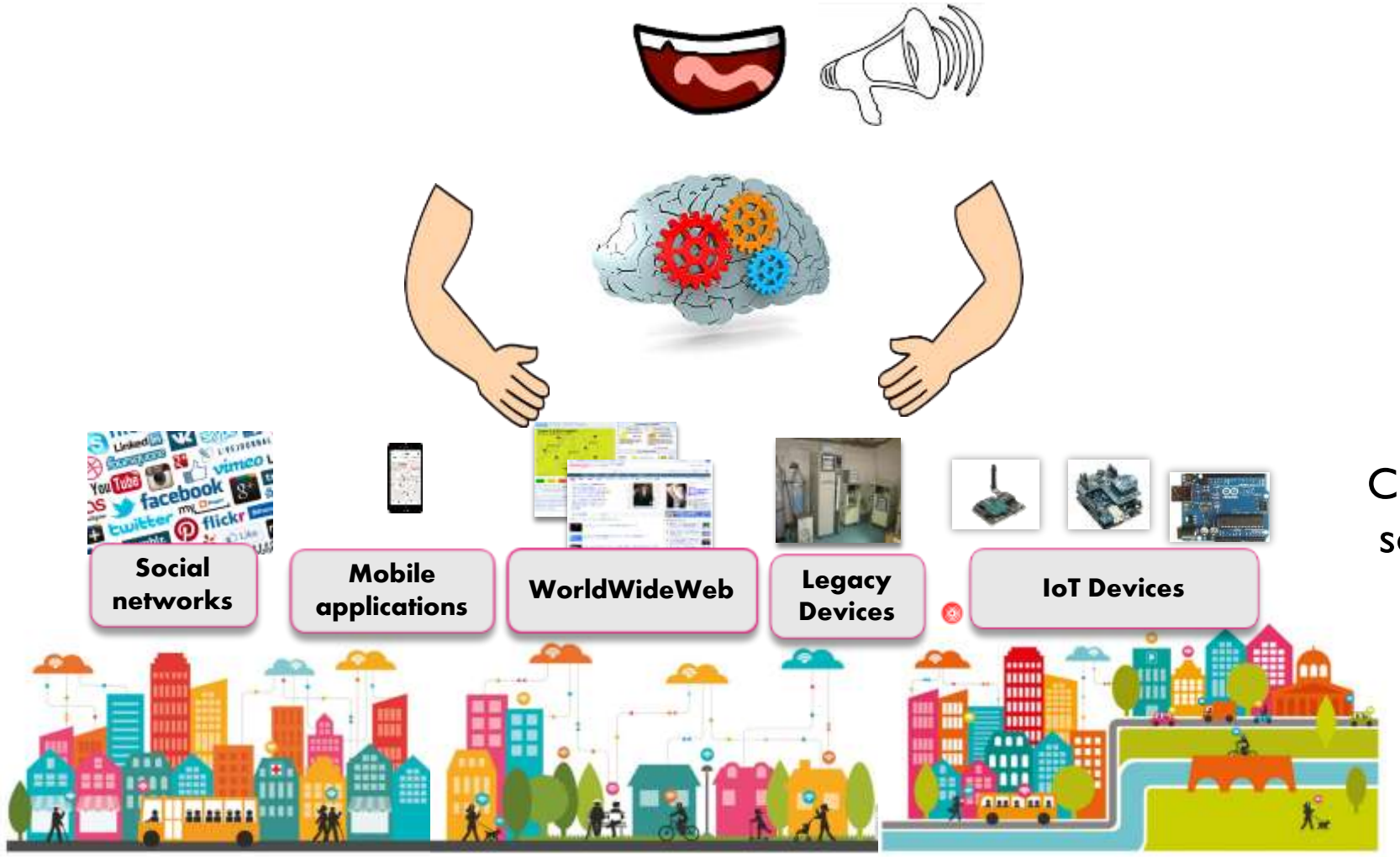


Act rapidly and efficiently

Analyse, reason, plan

Be responsive

What is smart city?



City data sources

What is smart city?

Big data processing, data mining, data analytics, cloud computing, visualisation…

Social networks

Mobile applications

WorldWideWeb

Legacy Devices

IoT Devices

What is smart city?

Actuators, dashboards, information systems, business processes…

Social networks

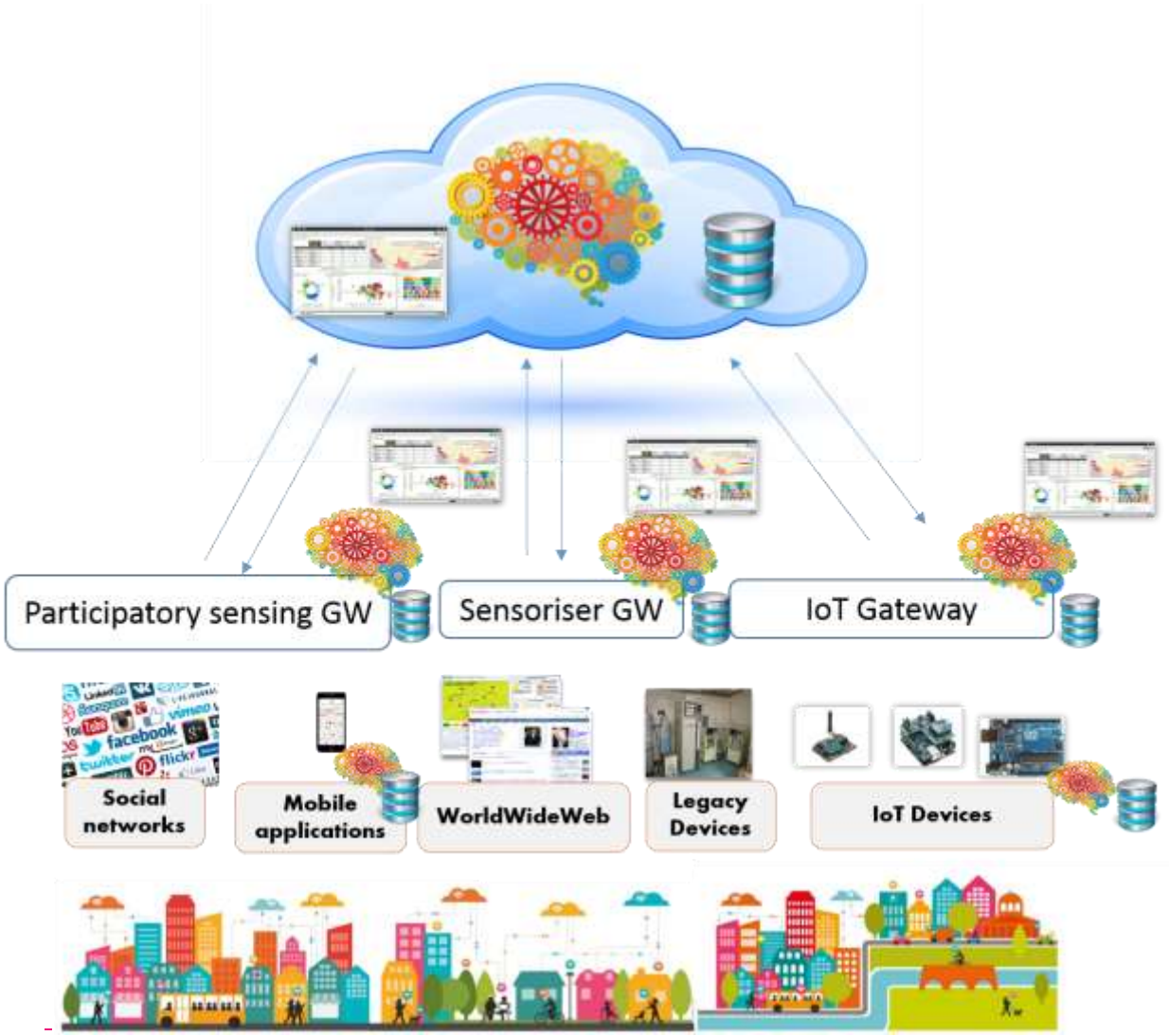
Mobile applications

WorldWideWeb

Legacy Devices

IoT Devices

IoT, big data and cloud for answering urban challenges



Cloud computing, analysis and visualisation on aggregated big data

Edge computing for adaptive processing, distributed intelligence and management.

Programmable city data platform including IoT and other data sources

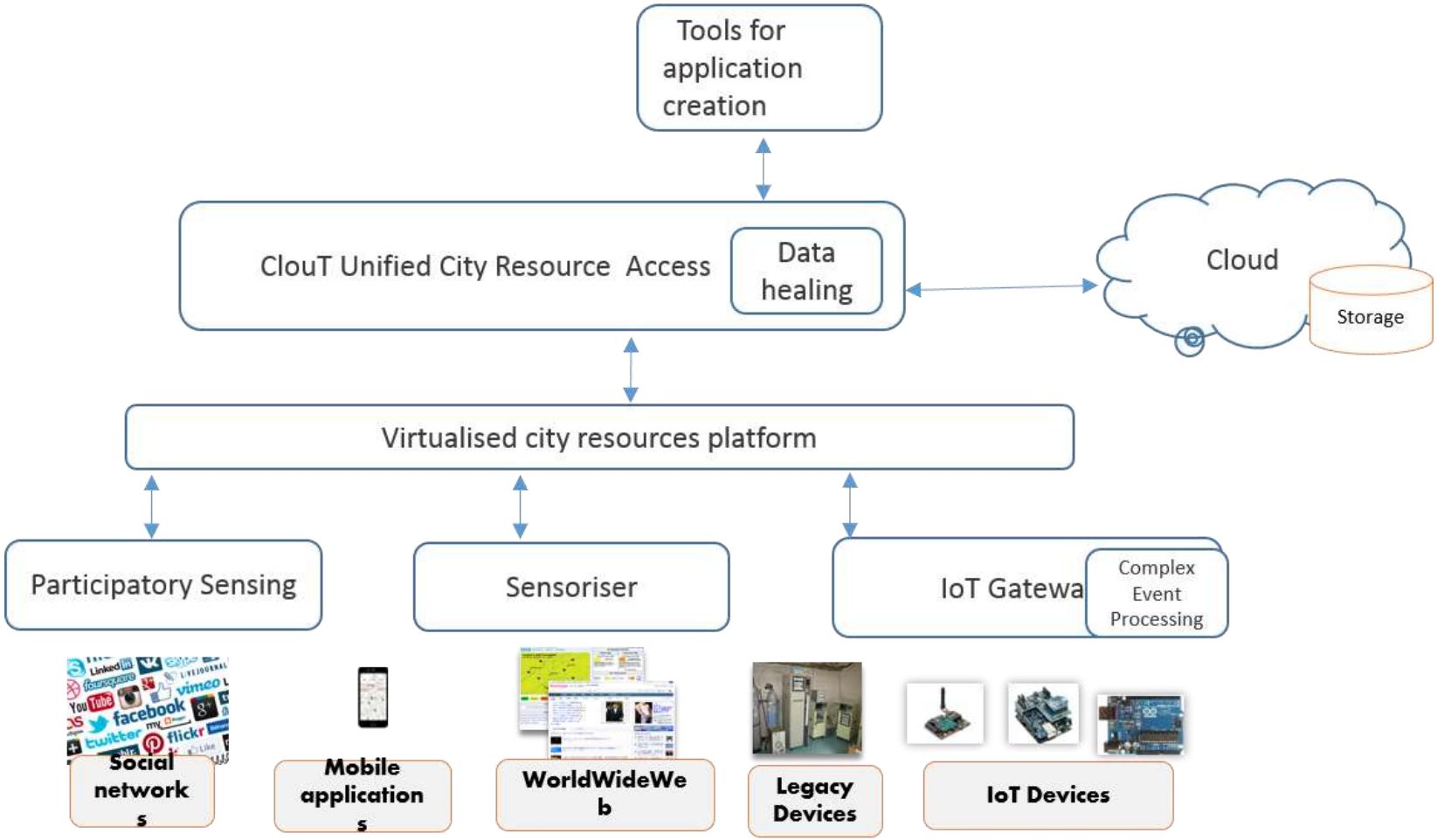
BigClouT Objectives

- Build an interoperable architecture enabling data-driven IoT applications
- Enable self-awareness in smart city platform with programmability and dependability properties
- Provide libraries and tools for scalable knowledge extraction
- Design and assess, with citizens and end-user involvement, attractive smart city services and applications with all relevant stakeholders
- Propose sustainable dissemination and exploitation plans and create an ecosystem of innovators (SMEs, startups, citizens, etc.) with realistic win-win business models

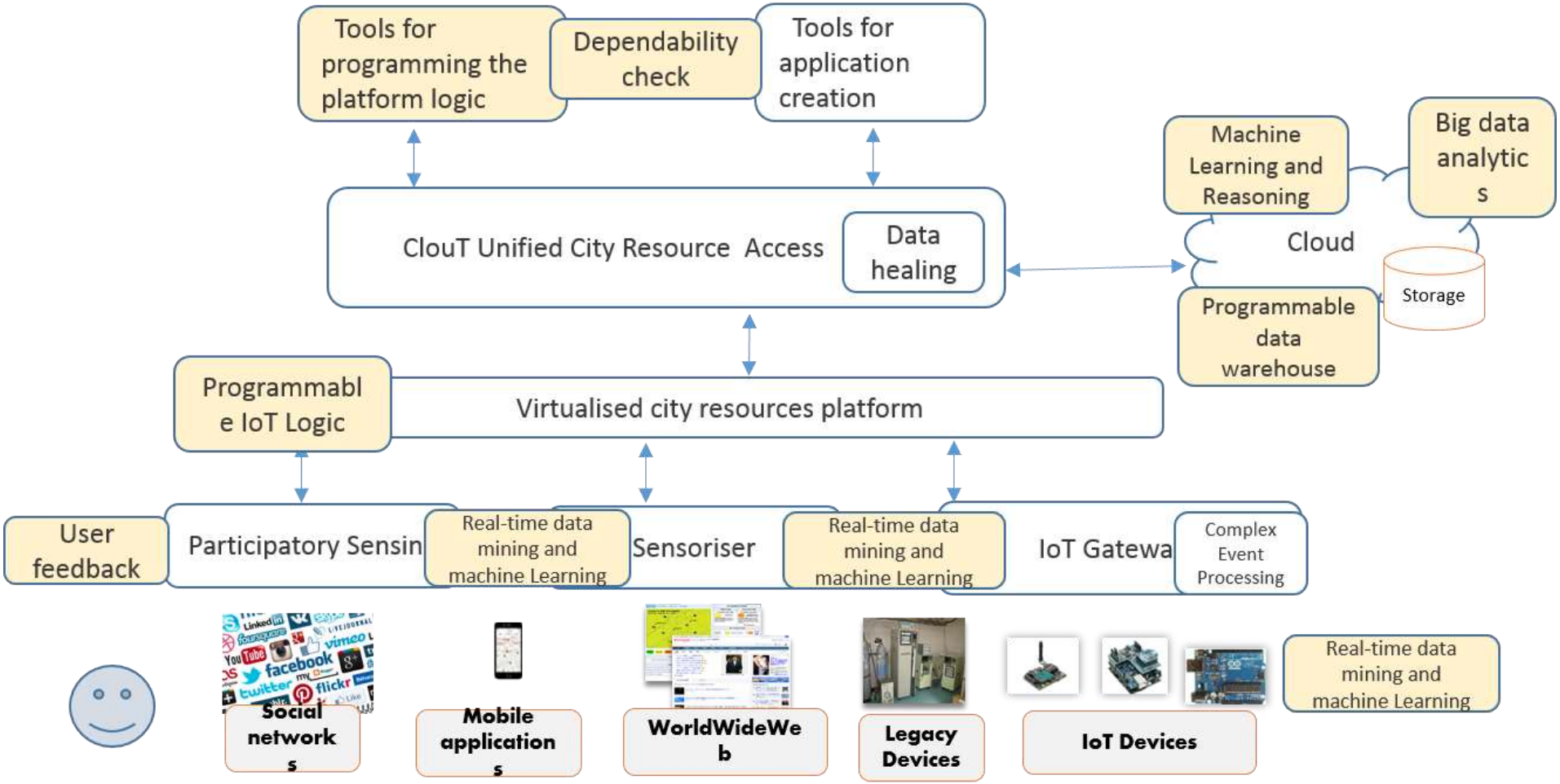
Big ClouT Consortium

	Partner	Main Role	Technical expertise
EU	CEA	Project coordinator, IoT platform provider	Autonomic computing, Application development tools
	ENG	Dissemination and Exploitation planner	Architecture building, Cloud computing, big data analytics
	ICCS	Technical coordinator	Distributed intelligence, real-time data mining, machine learning
	LANC	Citizen involvement	IoT application development tools, citizen engagement and pilots evaluation
	AK	Innovation management	NA
	GRE	Pilot city	NA
	BRI	Pilot city, SME exploiting project results	Smart city, API, infrastructure provider
JP	NTTE	Project coordinator, pilot organiser	NA
	KEIO	Technical coordinator, citizen involvement	Smart city data platform, social smart city applications
	NII	Scientific dissemination planner	Model-driven software, Dependability and self-additivity.
	NTTRD	IoT service provider	M2M platforms, Privacy management
	TSU	Big data solutions provider	Data stream processing, online analytics
	YRP	Standardisation manager	IoT networking (Wi-Sun)
	Fujisawa	Pilot city	NA
	Tsukuba	Pilot city	NA

From ClouT …


Tools for application creation
ClouT Unified City Resource Access
Data healing
Cloud
Storage
Virtualised city resources platform
Participatory Sensing
Sensoriser
IoT Gatewa
Complex Event Processing
Social networks
Mobile applications
WorldWideWeb
Legacy Devices
IoT Devices

… to BigClouT


Tools for programming the platform logic
Dependability check
Tools for application creation
Machine Learning and Reasoning
Big data analytics
ClouT Unified City Resource Access
Data healing
Cloud
Storage
Programmable data warehouse
Programmable IoT Logic
Virtualised city resources platform
User feedback
Participatory Sensin
Real-time data mining and machine Learning
Sensoriser
Real-time data mining and machine Learning
IoT Gatewa
Complex Event Processing
Social networks
Mobile applications
WorldWideWeb
Legacy Devices
IoT Devices
Real-time data mining and machine Learning

4 Pilot sites

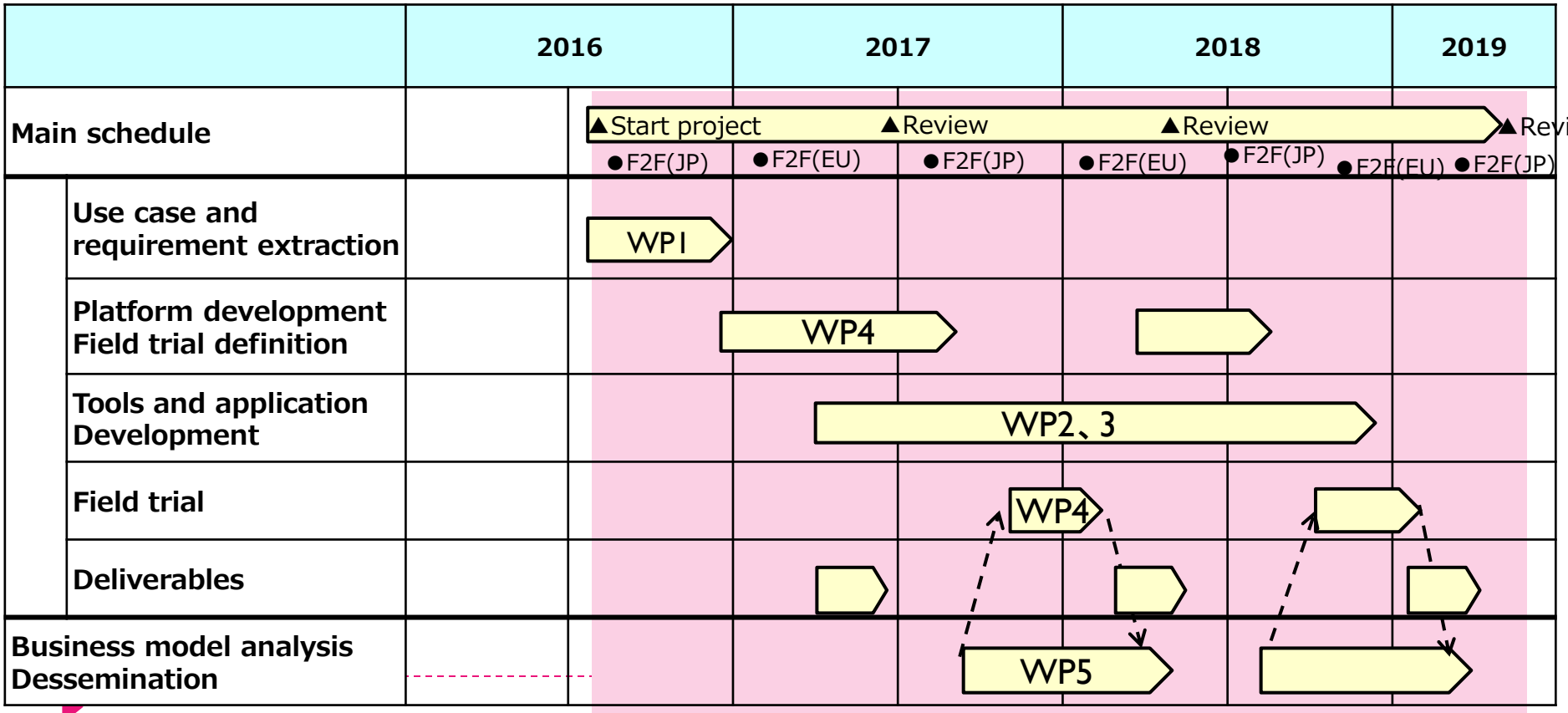
BigClouT

Use cases

	Initial use cases selection	Urban needs	Trial places
1	Monitoring the incidence on local economy of hosting large International Congresses (scientific and professionals)	Promotion of local city economy and/or sightseeing places for visitors	Grenoble
2	Optimizing the incidence on local economy of Tokyo Olympics Paralympics 2020		Fujisawa
3	Environment and Congestion Prediction	Enhanced mobility, disaster prevention and safety management of citizens/visitors	Tsukuba
4	Improving citizens' transport options	Enhanced mobility of citizens/delivery services	Grenoble Bristol
5	Organizing and monitoring a recycle competition among the local people	Promotion of pro-environmental citizen behavior for a more ecologic life	Fujisawa
6	Smart energy management		Bristol
7	Boosting the utilisation and links for existing industrial parks through social applications and occupancy monitoring	Attract and retain as much business/Industry as possible on the territory	Grenoble

BigClouT Schedule

1st year(July2016 – June2017) : Use case and requirements extraction
2nd year(July2017 – June2018) : 1st field trial
3rd year(July2018 – June2019) : 2nd field trial
R&D for BigClouT Architecture and Big data analysis, and business model analysis through 3 years of whole project term



Project Progress (As of September 2016)

- Kick off meeting
  - F2F kick off meeting in Tokyo in July 2016
- Dissemination
  - Published BigClouT Website
  - Published press release by CEA
- Use case extraction
  - Questionnaires for 4 cities
    - Issues, FT scenario, existing assets stakeholders, BigClouT technologies etc.
- Identify and analysis on existing assets
  - Members listed up their existing properties
- Field trial guideline
  - Started discussing about field trial guideline

どうもありがとう! Thank you!