Rapid Urbanization
By 2050 the urban population will grow to 66% an increase of 2.5 billion inhabitants\(^1\)
Need the manage the building integrity in case of natural disasters

Environmental Context
Cities are responsible for 78% of energy consumption, and produce more than 60% of Greenhouse Gas\(^2\)
Implementation of regulation on the energy market

Building Context
Residential and commercial buildings account for 45% of final energy consumption\(^3\)

Technological Context
Expansion of digital: several billion of connected devices by 2020, Moore Law\(^5\) ...

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1: source World Urbanization Prospects 2014 United Nations
2: source UN-Habitat 2014
3: source MEDDE – SOeS 2014
4: source Gartner 2014
5: Gordon Moore fondateur d'Intel - doublement de la puissance de calcul à cout constant tous les 18 mois – loi vérifiée depuis 50 ans
Smart Cities / Smart Homes

... AN ENABLER FOR SMART SOCIETY

Smart Cities
Smart Utilities
Smart Spaces
Smart Shopping
Smart healthcare
Smart Transport

MANY OPPORTUNITIES AND CHALLENGES

Applications

Smart Nodes
Servers

Internet of Things Value Add by 2020

$1.9 Trillion

Manufacturing: 15%
Healthcare Providers: 15%
Insurance: 15%
Utilities: 15%
Transportation: 10%
Banking & Securities: 11%
Real Estate & Business Services: 8%
Retail & Wholesale: 8%
Agriculture: 8%
Computing Services: 4%
Government: 4%
Other: 3%

Source: Gartner
What is smart city?
What is smart city?

Be responsive
Collect information respecting privacy
What is smart city?

Analyze, reason, plan, learn
City Artificial Intelligence

Be responsive
Collect information respecting privacy
What is smart city?

- Act *rapidly* and efficiently in a *trusted* manner
- Analyze, reason, plan, learn
- City Artificial Intelligence
- Be responsive
- Collect information respecting privacy
What is smart city?

City data sources
IoT

Social networks
Mobile applications
WorldWideWeb
Legacy Devices
IoT Devices
What is smart city?

Big data processing, data mining, data analytics, cloud computing, Artificial Intelligence, visualization…

Social networks

Mobile applications

WorldWideWeb

Legacy Devices

IoT Devices
What is smart city?

Actuators, dashboards, Cyber Physical Systems, information systems, business processes…

Social networks  Mobile applications  WorldWideWeb  Legacy Devices  IoT Devices
Many challenges

Achieving true smart cities and smart homes will require to solve many challenges
Heterogeneity/Interoperability: How to handle the numerous types of devices, protocols, standards?
IOT SDO/ALLIANCE LANDSCAPE – VERY COMPLEX!

Home/Building  Manufacturing/Industry Automation  Vehicular/Transportation  Healthcare  Energy  Cities  Wearables  Farming/Agrifood

Source: AIOTI WG3 (IoT Standardisation) – Release 1.3
Today: Domain-centric, vertical solutions

SmartHome
- Monitoring medicine intake
- Personalized diabetes assistance
- Providing training tips
- …
- Monitoring and controlling
- Saving energy comfortably
- Interacting with appliances
- …

SmartHealth
- Promoting carpooling
- Minimizing taxi delays
- Avoiding traffic jams
- …

SmartTransport
- Managing parking space
- Lighting up a city efficiently
- Monitoring Air Quality
- …

SmartCity
- Managing sparkdeals
- Getting advice on buying goods
- Retrieving discount
- …

SmartShopping

Illustrations from the EU FP7 BUTLER project
Tomorrow: horizontal smart solutions

SmartLife

Illustrations from the EU FP7 BUTLER project
Tomorrow: horizontal smart solutions

Illustrations from the EU FP7 BUTLER project

HW/SW platforms
Interoperability
Many challenges

- **Heterogeneity/Interoperability**: How to handle the numerous types of devices, protocols, standards?

- **Scalability**: How to handle the big number of connections/big data coming from millions of devices?
Distributed processing (fog computing, edge computing, in-network aggregation, etc.)

**Smart Computing Distribution**
Transforming data into information as early as possible

- Stream data processing
- Stream data processing
- Stream data processing
- Stream data processing

**Communication costs more than computing, exploit computing capabilities as much as possible**
Many challenges

- Heterogeneity/Interoperability: How to handle the numerous types of devices, protocols, standards?
- Scalability: How to handle the big number of connections/big data coming from millions of devices?
- Dynamicity: plug&play, self-configuration, self-management, self-matchmaking
Plug & play, self-management with minimum human intervention

(auto-discovery) Intelligent devices - Autonomy
Avoiding the “black box” syndrome, IA for controlling devices access

- auto-discovery
- self-optimisation
- auto-scaling
- continuous-deployment
- auto-discovery
- self-configuration
- self-matchmaking
- auto-description
- self-optimisation
- self-healing
- energy-harvesting

(Artificially) Intelligent devices - Autonomy
Avoiding the “black box” syndrome, IA for controlling devices access
Many challenges

- Heterogeneity/Interoperability: How to handle the numerous types of devices, protocols, standards?
- Scalability: How to handle the big number of connections/big data coming from millions of devices?
- Dynamicity: plug&play, self-configuration, self-management, self-matchmaking
- Trustability: rapid development and deployment yet reliable and dependable applications
People should have trust in the smart city or smart home

Dependability
Correctness
Predictability
Safety
Real-time
Reliability
Security
Autonomy

Intelligence and predictability

Be careful! It is the physical world!
Embedded intelligence needs local high end computing

Safety will impose guaranteed performances so that users can TRUST the services of the smart-city
Key ingredients for having trustable systems

Security ≠ Privacy ≠ Safety

Mixed-criticality
Many challenges

Heterogeneity/Interoperability: How to handle the numerous types of devices, protocols, standards?

Scalability: How to handle the big number of connections/big data coming from millions of devices?

Dynamicty: plug&play, self-configuration, self-management, self-matchmaking

Trustability: rapid development and deployment yet reliable and dependable applications

And privacy, security and safety: Simple Efficient and Trustable (see this morning workshop)
• More **intelligent** (Cognitive) **detection and counter-measure**
  • Intrusion Detection System (IDS) that detects attacks by difference from normal behavior
  • Reconfigure the network automatically in reaction to cyberattacks
  • **Adaptive resilience** to threats from inside and outside the network

• Hide user’s data ”statistically”: **differential privacy**

• **Homomorphic Encryption for using untrusted cloud**

• **User empowerment**: helping device owner to manage data privacy
Cloud, big data, IoT, *edge computing and Artificial Intelligence* for urban challenges with *various criticalities* (*energy/water management, emergencies, civil security services, ...*)

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.
Japan and the European Union are two key players in the ICT field.

Scale of today’s global challenges requires that we work together more closely and effectively.
- In conformity with the mutual interests and the research orientation of the EU and Japan.

Acceptance of the smart-x solutions will require collaboration, tests, validation, analysis, interoperability, dependability.

Smart Houses and Cities are concrete enablers for active collaborative research between Japan and Europe.
What to do to have smarter cities?

Understand that smart city is **not**...

Controlled world

![Controlled world](image)

Experimentation testbed

![Experimentation testbed](image)

Control of the privacy,
leak of personal information by the user

Research object without taking real problems into consideration

![Research object](image)
What to do to have smarter cities?

... but rather a place where citizens live, work, enjoy

- Cities belong to citizens
- Involve them in the city life (*Human in the loop*)
- Smart citizens \( \uparrow \Rightarrow \) smarter cities
Key points to take home

- **Heterogeneity/Interoperability:** How to handle the numerous types of devices, protocols, standards?

- **Scalability:** How to handle the big number of connections/big data coming from millions of devices?

- **Dynamicty:** plug&play, self-configuration, self-management, self-matchmaking

- **Trustability:** rapid development and deployment yet reliable and dependable applications

- **Privacy, security and safety:** simple efficient and trustable
Thank you for your attention

どうもありがとうございました

marc.duranton@cea.fr