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IOT and Smart cities

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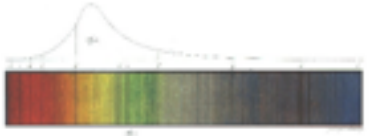
TU-Berlin /Fraunhofer Fokus /International Institute for Innovation Aysen

Joseph von Fraunhofer (1787 - 1826)

Scientist
Discovery of the "Fraunhofer-Lines" in the solar spectrum

Innovator
New tooling methods for lenses

Entrepreneur
Director and associate of a glass factory



„The most profound technologies are those that disappear“

IPfication of devices

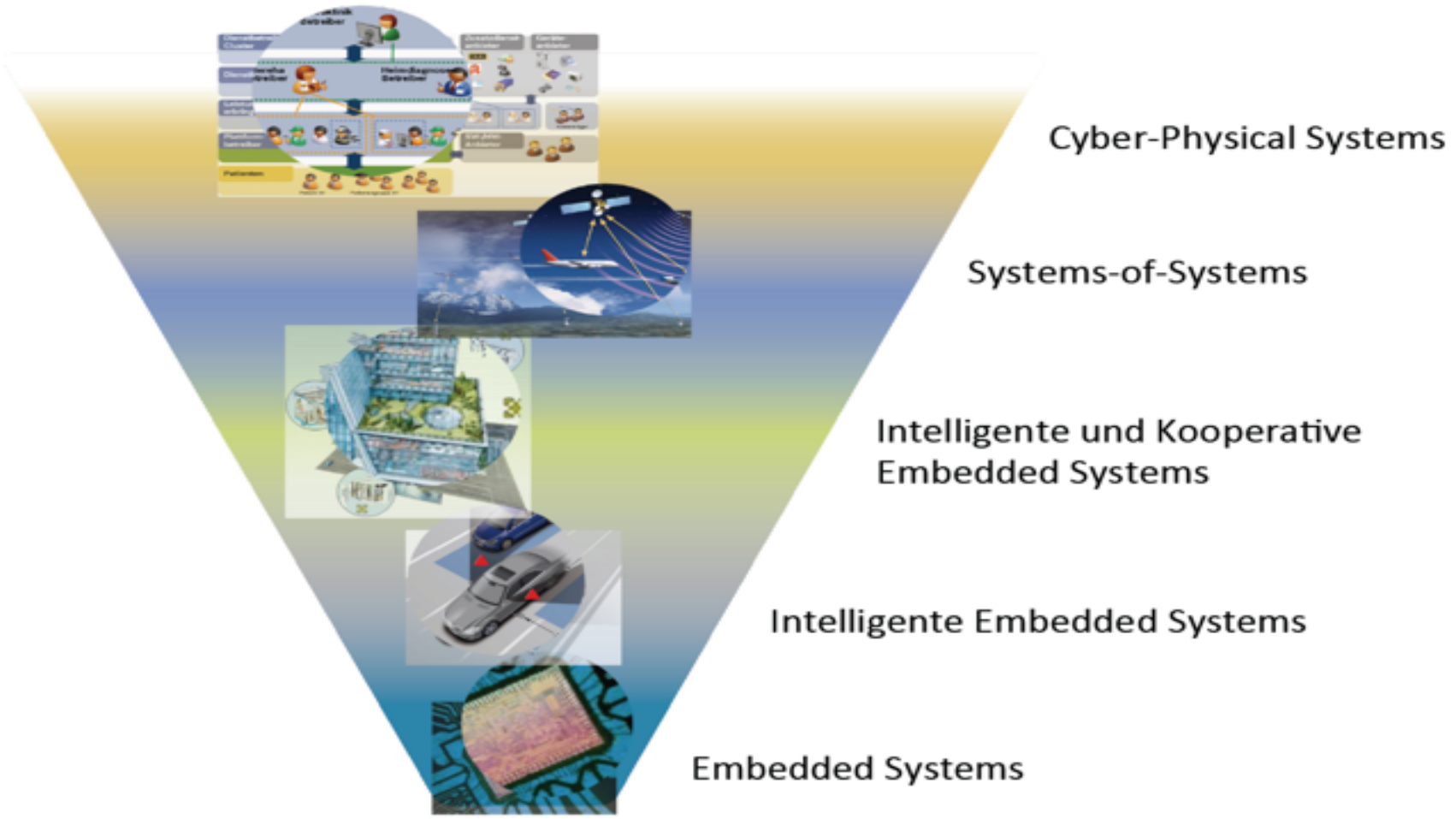
Internet

Real, physical world

Zero-Gateway Architecture

Internet

CYBER PHYSICAL SYSTEMS /IOT/ Industrial internet/INDUSTRIE4.0/ 5G systems etc etc etc



From CIM to Cyber physical Sytems- a look behind

- 1973 Josef Harrington introduced CIM computer integrated manufacturing)
  - CIM is the integration of total manufacturing enterprise by using integrated systems and data communication coupled with new managerial philosophies that improve organizational and personnel efficiency (Wikipedia)
  - Islands , physical separation closed systems (even in the enterprise, no communication with the outside world)
  - Limited attack potential
  - Limited potential attackers (only from inside)
- Cyber physical Systems are networks of ITC subsystems with mechanical and electronical components over a data communication infrastructure like Internet (Wikipedia)
  - Interconnected systems - open systems
  - End - systems – the embedded systems
  - Geographical non limited attack potential and nr of attackers

Cyber-physical Systems

The openness and complexity of a system defines the dimension of the attack space

- CP Systems Security a NP complex problem

- Security for CP systems redefined :
  - Security against attackers
  - Safety of the controlled systems
  - Intellectual Property

- There is no Secure System; we can improve but we never achieve a complete secure system (fata morgana effect)

- It is better to learn how to live in an insecure cyber space rather than hope that technology will provide secure systems.

- we need Security “Gebrauchanweisung” for products and services we are using and integrate.

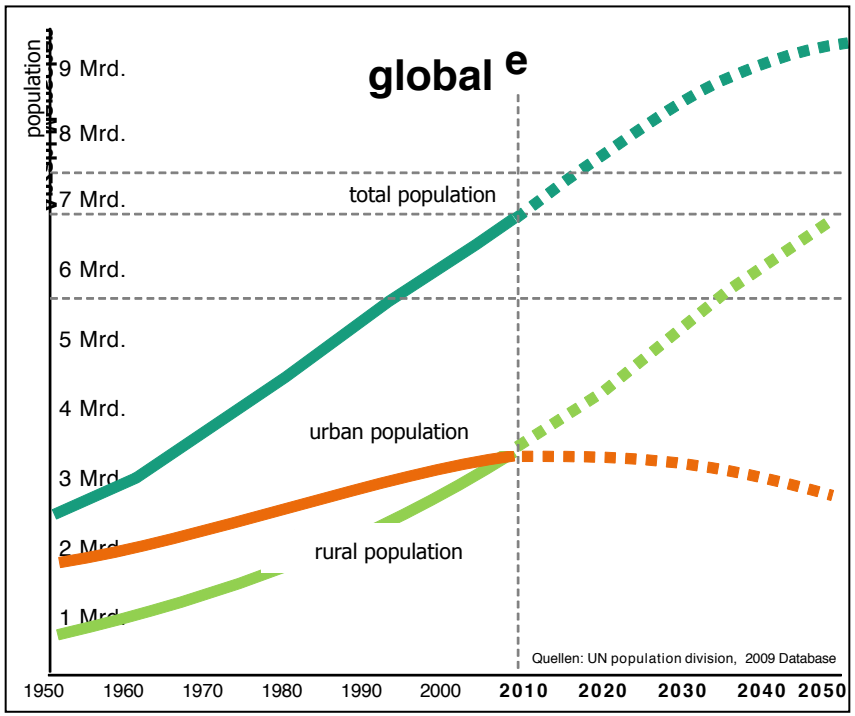
Cyber physical Systems

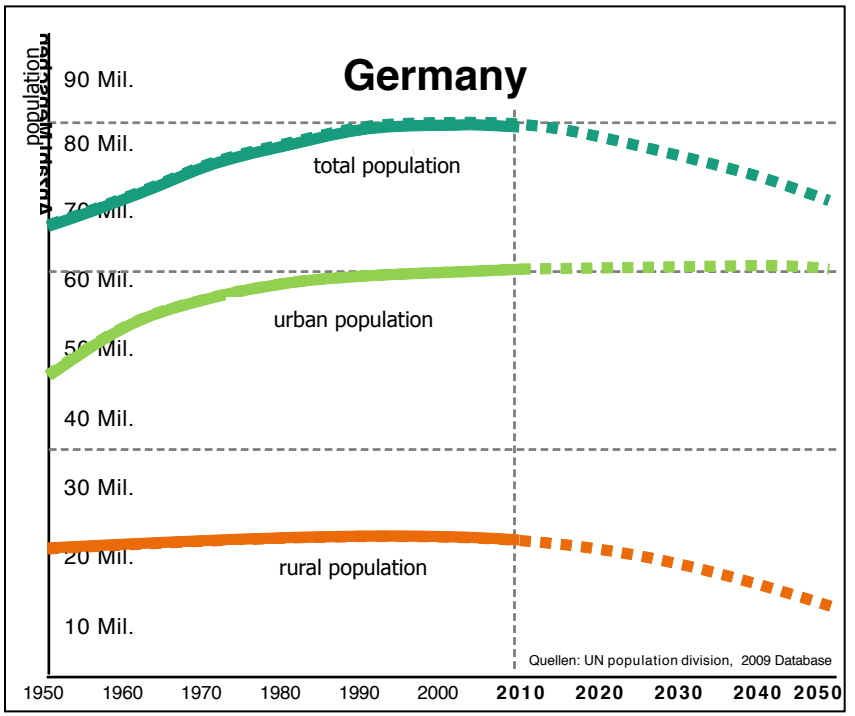
- Security by design
  - Dream or reality?
    - For CP systems secured by designed Internet has to be redefined
    - CP systems require a NP complex security framework
    - Security (technological, governence, laws, etc) independent of countries borders and legislations.
- What should be done
  - Identity ,identity, identity of persons, of objects, of services of everything
    - Identity the bridge between real world and cyberspace
  - Certification of everything in the communication space of the CP systems
  - End to end authentication in order to provide trust and responsability
  - Different levels of security needed different technologies
  - Provide Security Gebrauchanweisung und learn to evaluate the RISC of your application in a certain system (consider physical separation)

The 21st Century´s Challenge

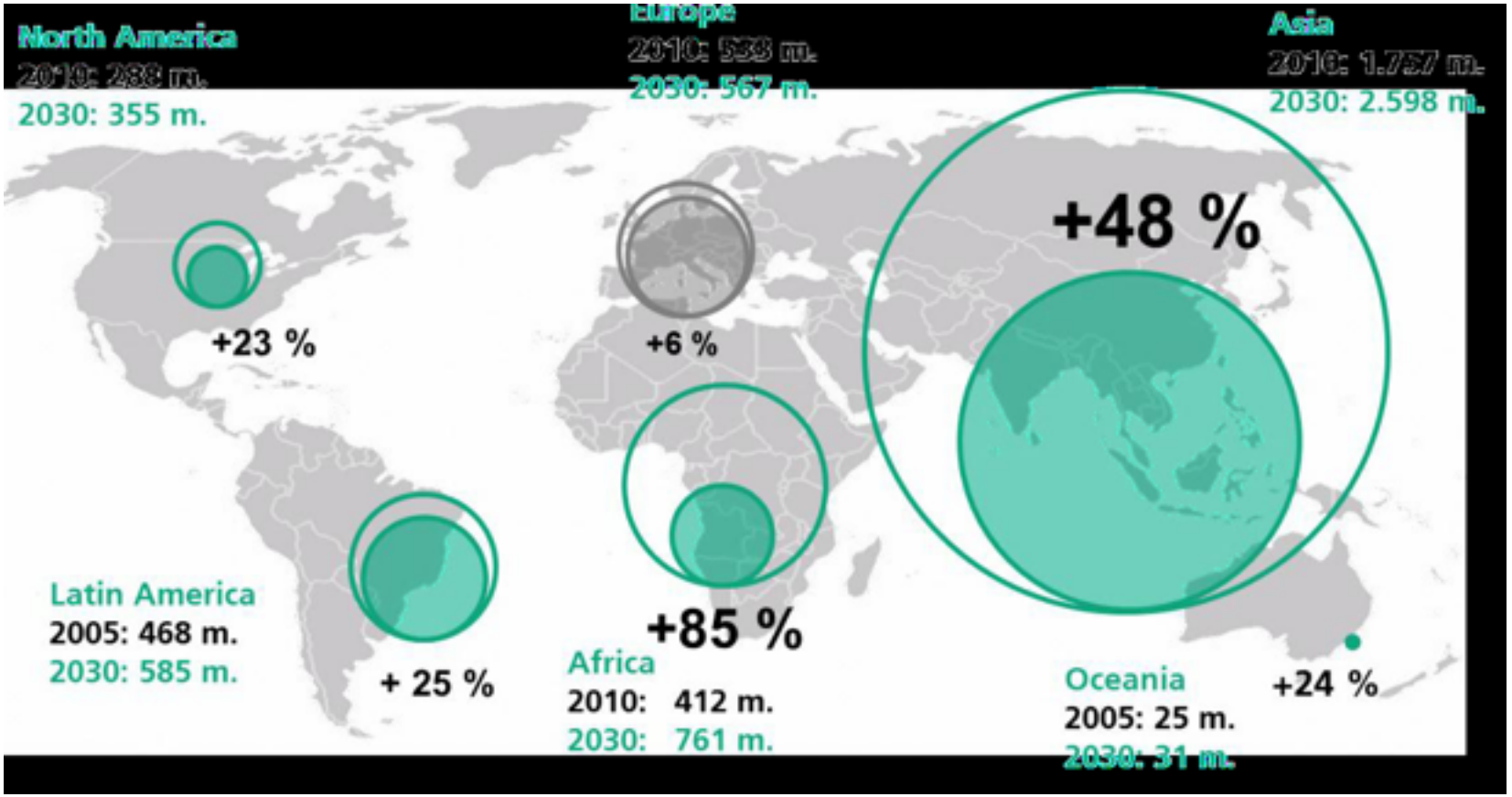
Growth of cities and sustainable development

- In 2050, more than 6.3 billion people will be living in urban environments – nearly twice as much as today



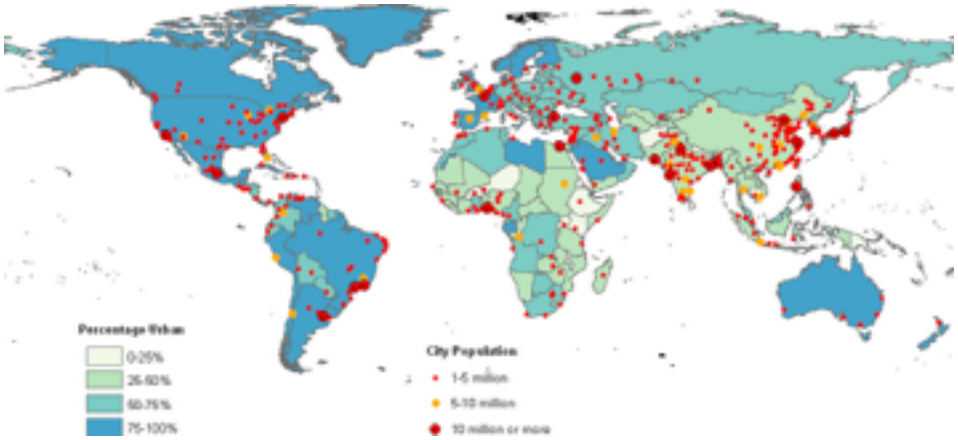


Growth of urban population until 2030 (UN 2010)

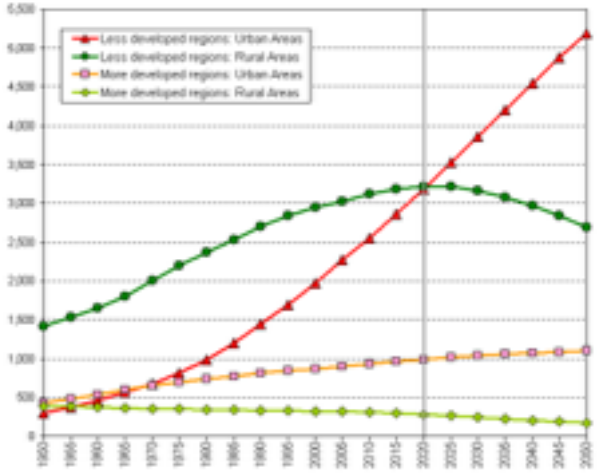


World Urbanization Prospects, the 2009 Revision

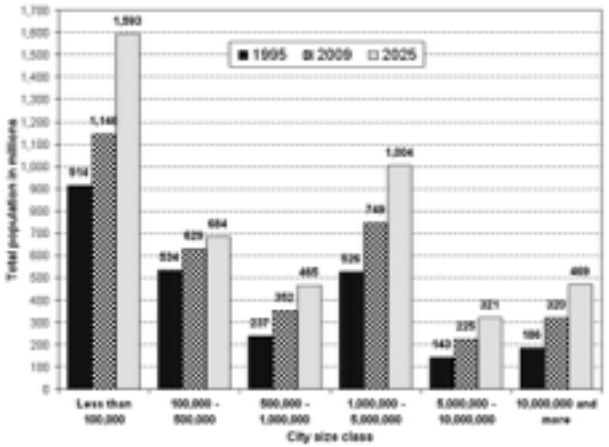
United Nations, Department of Economic and Social Affairs, Population Division



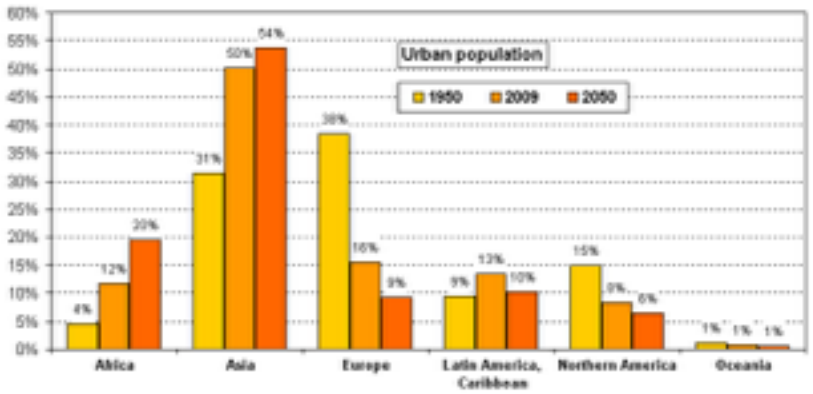
Urban Agglomerations in 2009 (proportion urban of the world: 50.1%)



Urban and rural population by development regions (in mill.)



Total population by city size class (in millions)



Distribution of the world urban and rural population by major area

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What makes a city smart(er)?

Environment

The city produces **nearly zero CO_2 emissions**.

Energy

The city is highly **energy efficient**.

Administration

The city owns a **transparent and collaborative** administration.

Quality of Life

The city offers **best quality of life for every citizen**.

A Smart City links its urban subsystems and by this all of its potentials

… and many more…

Economy

The city is attractive for establishing **new business models**.

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Climate Change

The city **responds to** the Auswirkungen **climate change´s impacts**.

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Mobility

The city is a field for **continious eMobility**.

Quelle: www.dtg.dk

End Systems

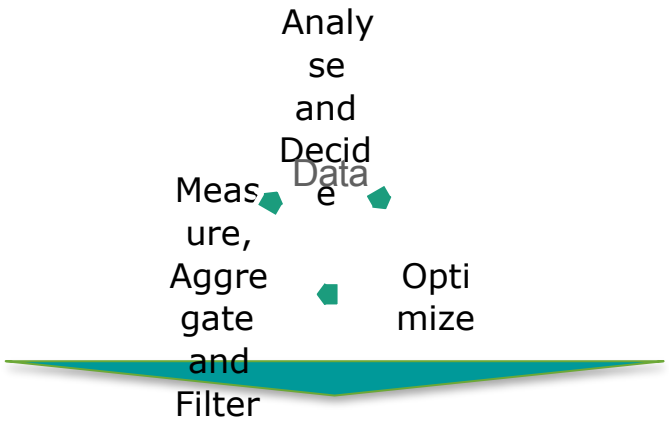

Web 3.0: Everything goes connected
Permanent
connected devices:
15 Mrd. 2010
30 Mrd. 2020
Temporary
connected devices:
50 Mrd. 2010
200 Mrd. 2020
WWW

Produce and consume DATA

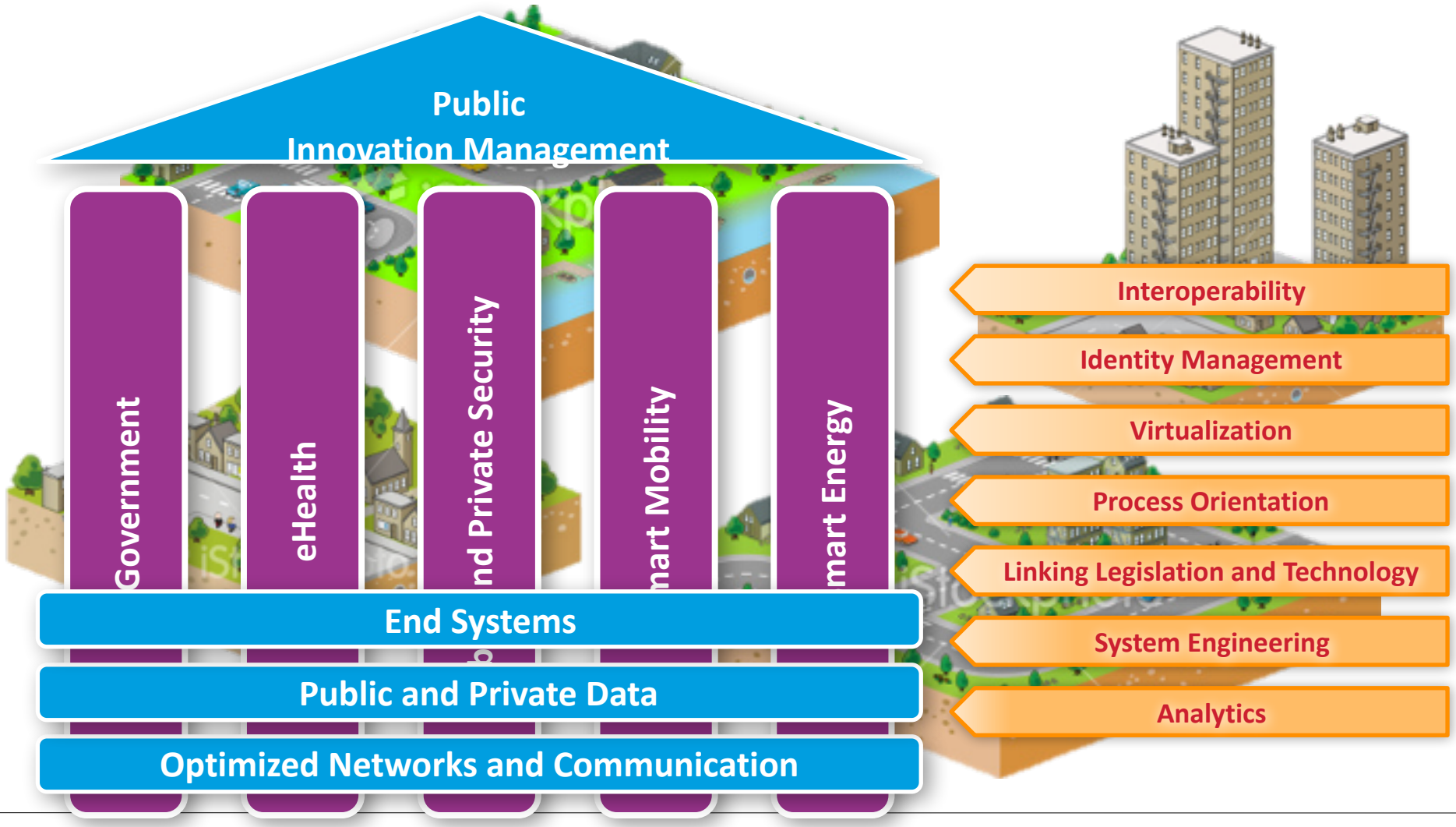
Data, Data, Data… 2.5 trillion! Day by Day

WHERE TO START?

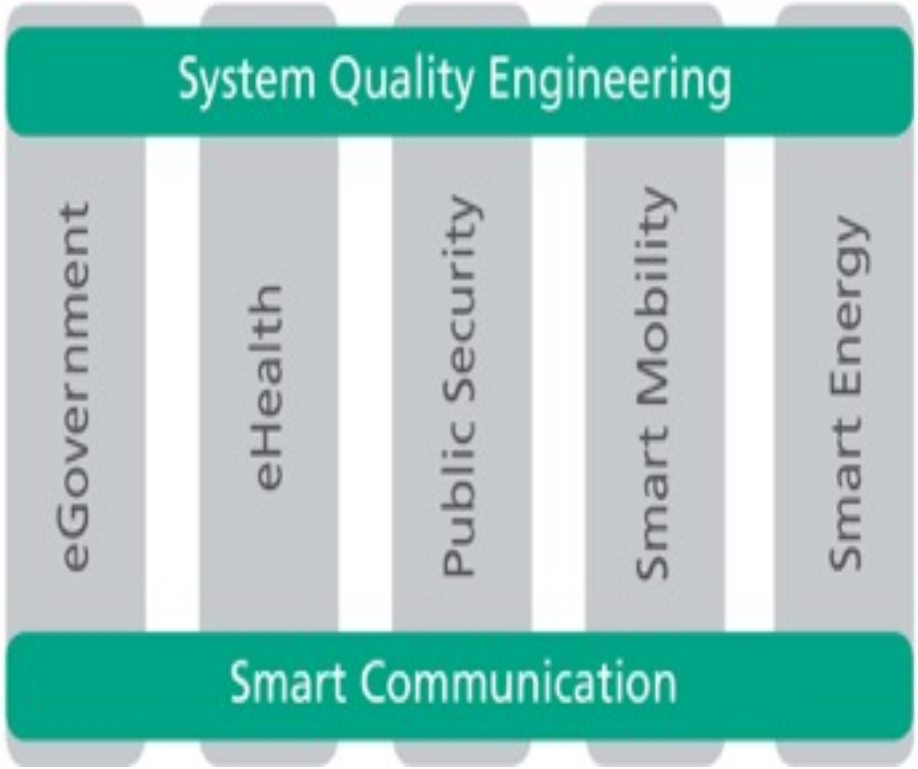
- **ICT Architecture: Data Centric**
- **Data sources: government, citizens utilities, traffic data, open data**
- **Big Data (2020 : 30 Zettabytes)**
- **Analytics**
- **Use Cases**
- **Legislation**
- **Business models**



Activity Domains



Data as Power of Tomorrow´s Cities´ Topics



Tomorrow´s City is steered by Data

Tomorrow´s city is steered by a control cycle of data.

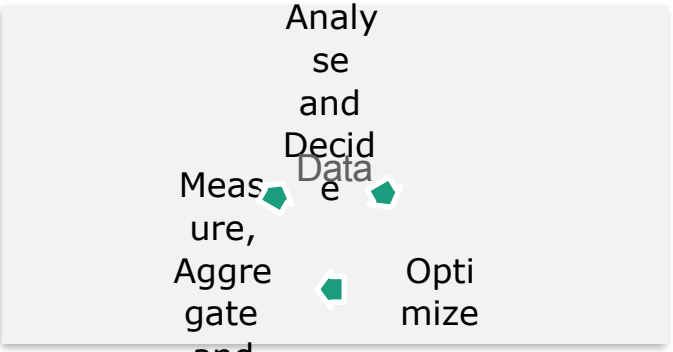
ICT in Smart Cities

Backbone for Smart Cities

City as a system of systems

Set of separate technical systems → Integrated systems

Effectivity and efficiency results from optimized integration of separated systems



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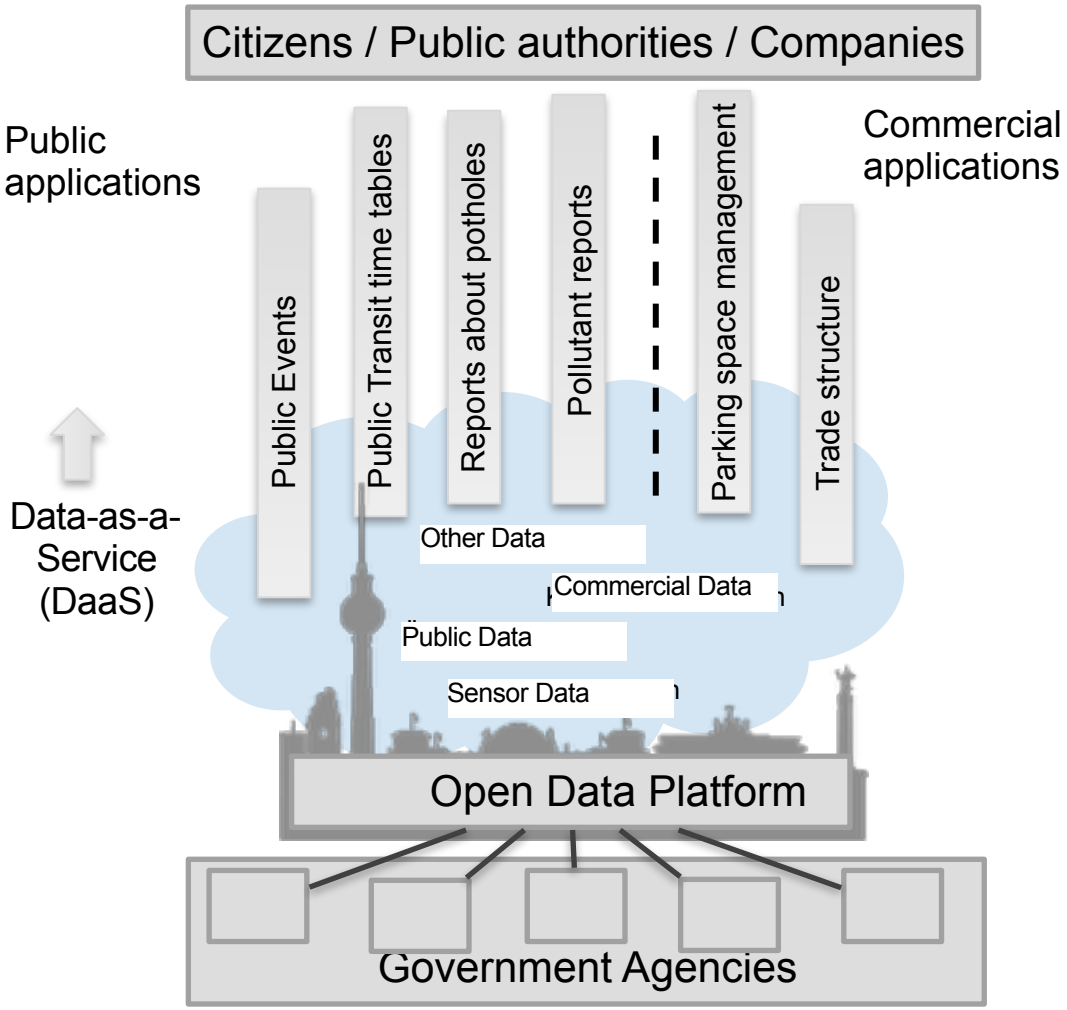
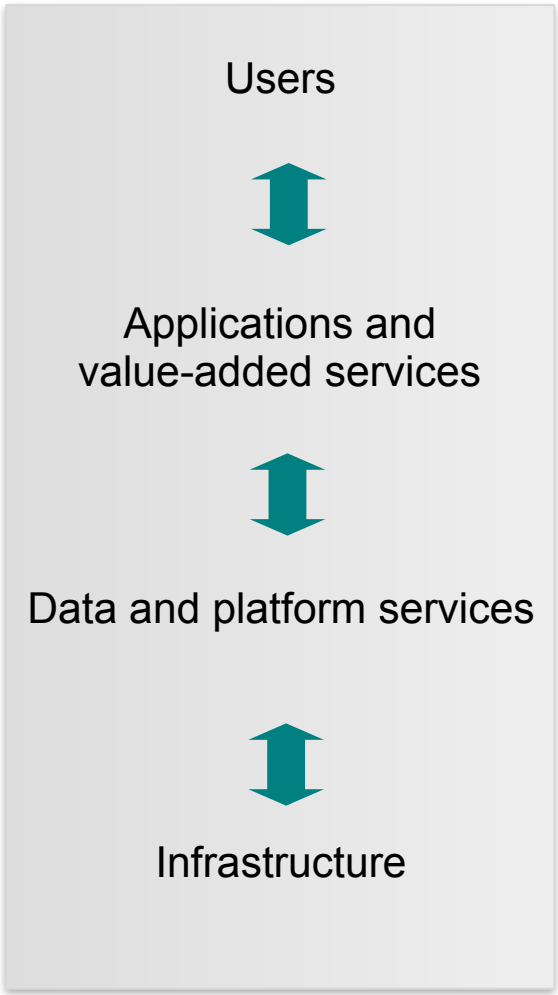
as Enabler and Integrator for ICT-based Solutions

SMART CITY: A CONTINOUS PROCESS

Open Government Data





Data Sources for Tomorrow´s City

Social media

Logistic

Health care

Education

Open government

Sensor data, un-/poly-/structured data, open / private data , high volume data

Smart grid

Smart mobility

Public safety

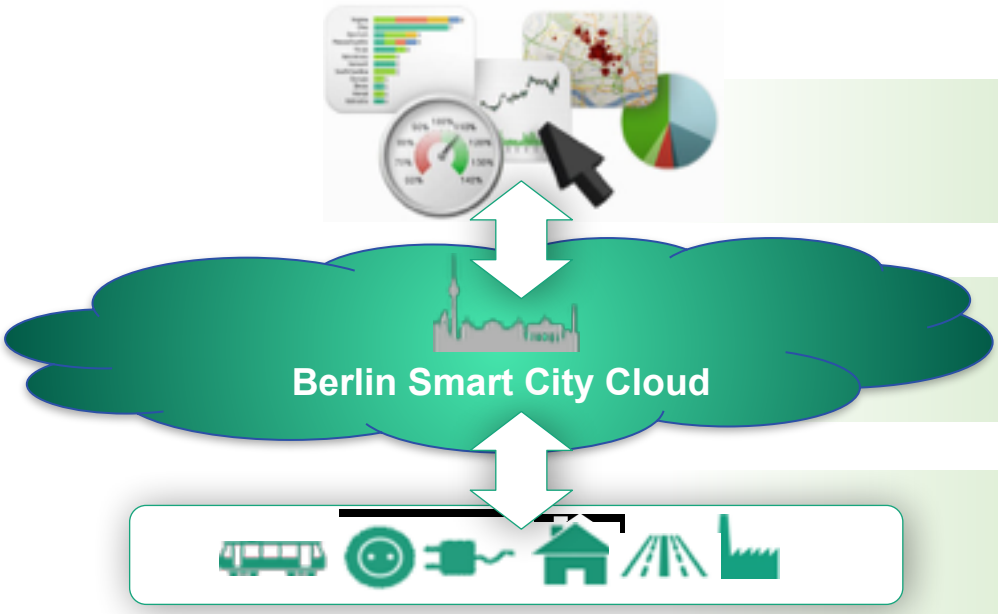
Production Industry 4.0

Life logs

Data, Data, Data!

Smart City Cloud is the ICT Fundament for the Smart City of Berlin

- Data and services are the key to control and optimization of urban systems and processes
- Berlin needs an infrastructure to provide and link urban data and electronic services



Monitoring, control, optimization of urban systems and processes

Allocation, preparation and integration of distributed urban data and services

Urban ITC Infrastructure (sensors, techniques, data bases…)

Participation and Open Innovation

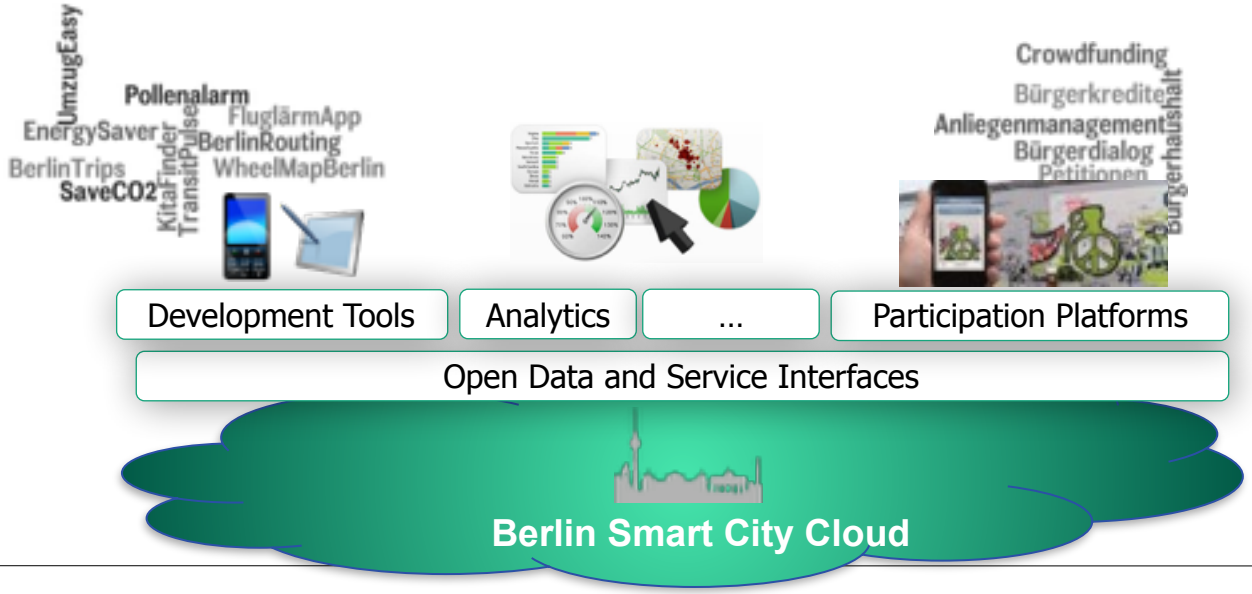
Berlin Smart City Cloud is the Enabler of new Business Models in Order to Involve the Citizens

- The *partial* opening of Smart City Cloud´s data and services is the basis for numerous new business models and development of innovative city apps
- Informed citizens actively take part in decision processes and support public authority´s duties


DIE WELT 05.Juni 2013

Warum Berlin das nächste Silicon Valley wird

Die deutsche Hauptstadt hat sich in den letzten Jahren zu einem Epizentrum der Technologie-Start-ups entwickelt. Investor *Maff Cohler* kennt fünf Gründe, die für Berlin sprechen.



The Berlin Smart City Cloud takes form

First parts are already implemented…

Organisztional Forms, examples:

FOKUS vertritt Berlin im Projekt Commons 4 Europe

Organization to merge urban demands and dedicated app developers

Applications, examples:

Mobile Early Warning System for Citizens

Efficient Reporting and Management of Citizen Requests

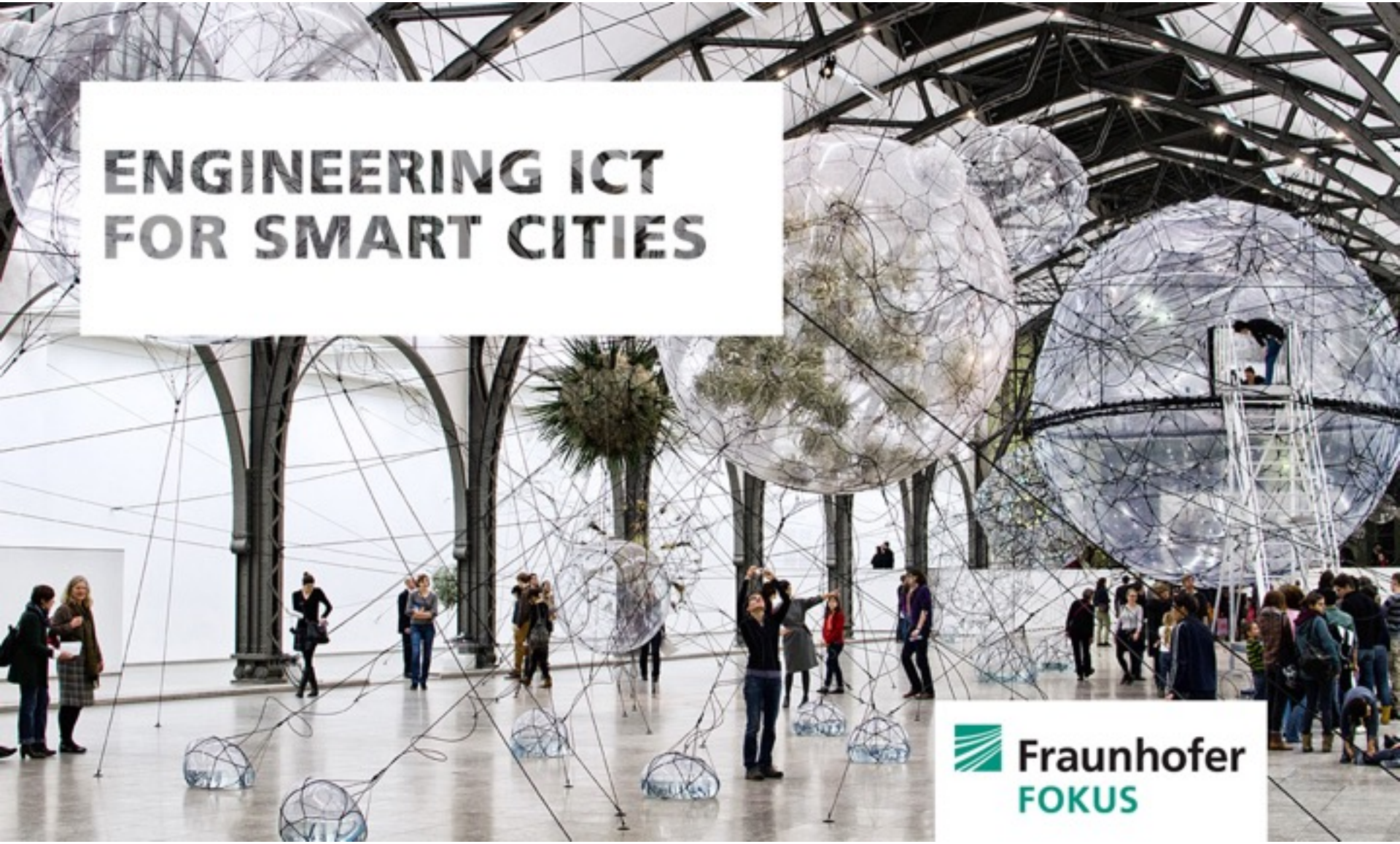
Plattforms, examples:

Cloud market place for administrational **and** economical services

Platform for Berlin´s Open Data

…in cooperation with numerous Berliner based companies:

IMMO SCOUT 24 · stone one · BerlinOnline · Bundesdruckerei · Vattenfall · ITDZ Berlin · VBB Verkehrsverbund Berlin-Brandenburg · Open Limit · SeSamBB · condat



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- Individual solutions are elaborated in direct contact with the customers
- The Fraunhofer Gesellschaft maintains
  - 60 self-contained Fraunhofer Institutes throughout Germany
  - with a staff of 21,000 scientists and engineers
  - 2.0 billion Euro annual budget
- 70% of funding are raised through innovative development projects, license fees and contract research
- Labs and representative offices all over the world

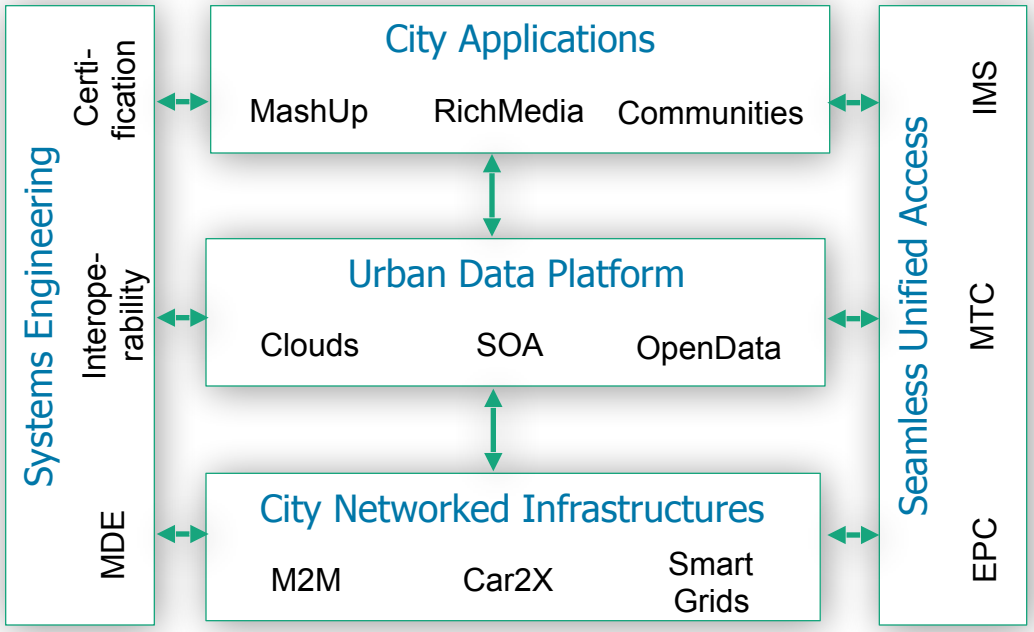
SMARTER ?


By smarter, we mean the world is becoming:
instrumented
interconnected
intelligent

Open ICT Architecture for Smart Cities

A Multi-Layered Approach

- City application platform for advanced apps by city stakeholders and communities
- Urban data platform of secured, distributed, and interconnected data for managed information access
- Various types of fixed, mobile, adhoc, sensor networks connecting devices and sensors
- Seamless and unified access to raw, aggregated and consumer data and meta-data for fixed and mobile services
- Efficient engineering (design, development and testing) of validated secure, interoperable, and robust reliable systems



Our Smart Cities Vision
Information is Key

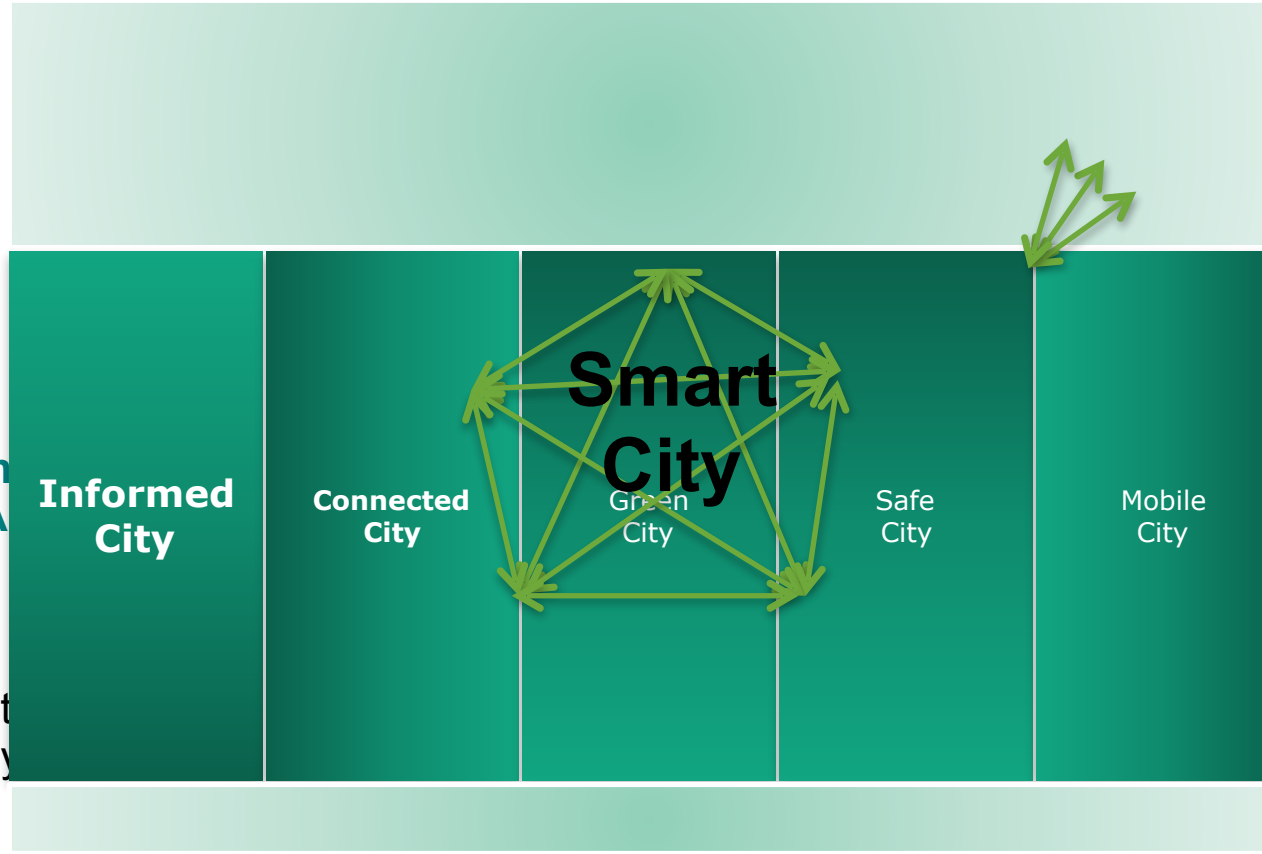
- City as **service provider**

  for citizens, enterprises, institutions, and tourists

- Smartness via

  Always Best Informed an
  Inter-Connected Urban A
  (Machines, Systems and People)

  Information at any need, at
  place, at any device, at any
  at any preference



Es gibt nichts Gutes, außer man tut es!

Erich Kästner

Action Fields: Smart Data for Tomorrow´s City

Architecturs and Infrastructurs for Smart Data

Syndication and Analytics for Smart Data

Standardization of selected aspects of Smart Data in order to enable interoperable solutions

Realization of examplary solutions of the mentioned action fields

Assessment and Improvement of Data Quality

Classification of Action Field in Smart Big Data Reference Model

Big Picture of Smart Data