ASPROM
OPTEZ POUR L'INNOVATION

Paris, 13 Juin 2014

IoT: Major trends and impact on vertical industries

Prof. Daniel Kofman
Co-founder and Director of LINCS
International Advisor

Fast growth of connected devices, and then?

$1 Trillion M2M Industry Growing At Warp Speed - How M2M Is Turning Sci-Fi Fantasy Into Reality, March 14, 2013, AT&T

Figure 2-2: Worldwide M2M connections and wireless wide-area mobile connections 2011-2020 [Source: Machina Research]

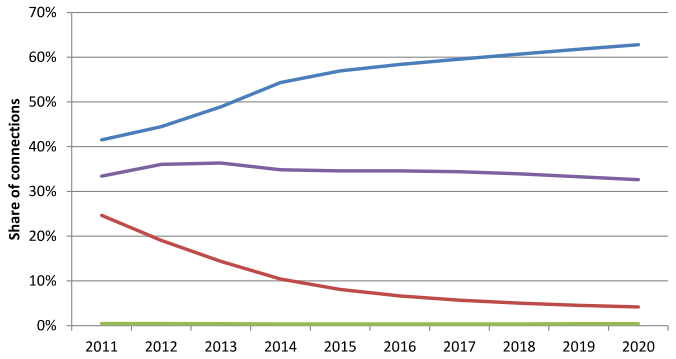
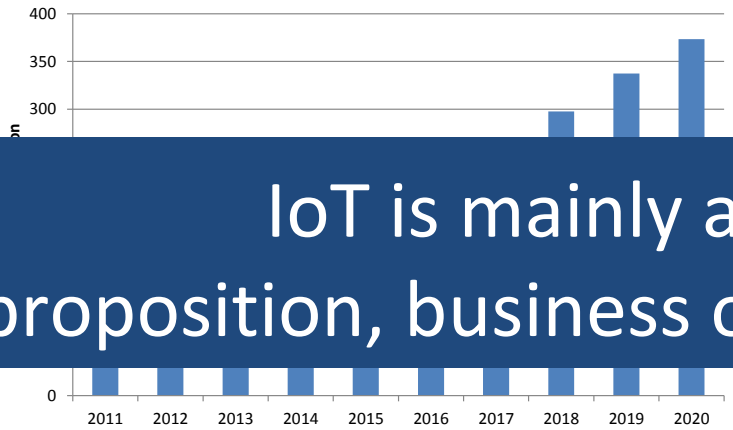
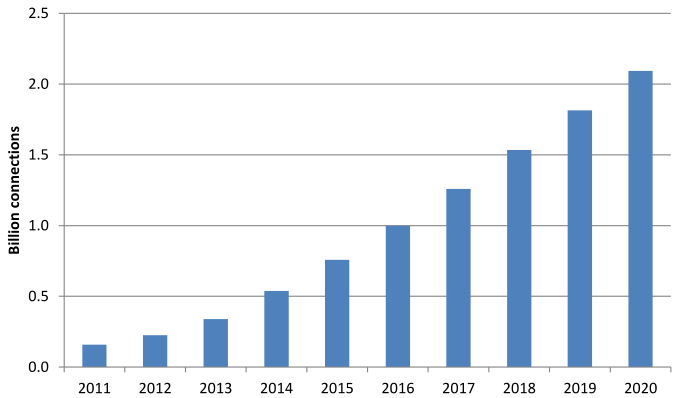


Figure 2-5: Total Addressable M2M revenue opportunity for mobile operators [Source: Machina Research, 2012]



IoT is mainly about new lifestyles and new value proposition, business opportunities and business models

Figure 2-3: Wireless Wide Area Network M2M connections 2011-2020 [Source: Machina Research, 2012]



Frost & Sullivan
"smart meter revenue in Europe is expected to grow from $318.4 million in 2010 to $1.93 billion in 2017"

Content

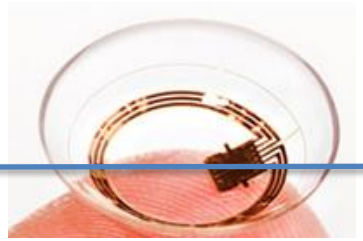
Internet of Things: from Examples to Definition

A Driver for Disruptive Transformations
in most Society and Industry Sectors

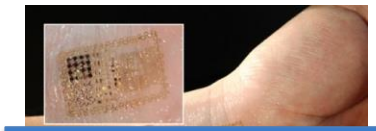
Business and Technical Challenges
Perspectives

New health paradigms

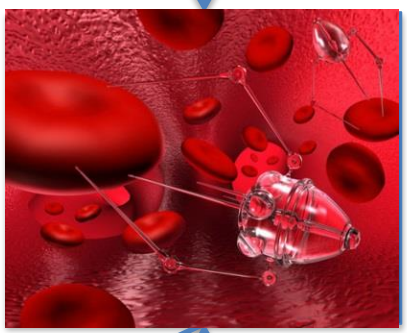
Epidemiology - automation



Diagnostic



Continuos monitoring, Real time measurements



Prevention

Treatment follow-up

Analysis

First Concepts

- Distant real-time monitoring and actuation
- New Interfaces, Natural User Interface
  - Functional lenses, electronic skin, wearable computers
- Robots and Nanobots Swarms
- Body Area Network
  - Skin transmission, intra-body communications, molecular interfaces
- Gateways, Personal Area Network
  - Wearable devices
    - Smart watches, smart glasses, smart clothes
    - ABI (2013): 485M wearable devices annual shipment by 2018
- Stream Reasoning on Big Data

Architectu

Objects
Smart Gateways
Access & Core
Service Platforms
Energy
Supply Chai
Transportation
Smart City
Smart House/Building
Health

EC priorities in ICT for Health

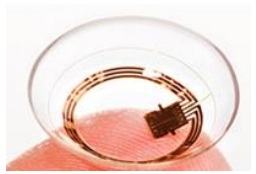
- Empower the individual
  - Lifestyle, disease prevention, disease management and management of comorbidities.
    - **Personalized services, e.g. based on computational modeling of individual human physiology**
    - Detection, diagnosis, decision and
  - Ageing and Independent Living
    - Solutions may combine health, social care and smart living systems and 'age-friendly' environments.
  - "ICT for smart and personalized inclusion", accessible solutions for personalized interfaces to smart environments and innovative services for all users including those at risk of exclusion
  - ICT for Governance and Policy

Defining the Internet of Things

- A well understood fact: We observe a progressive merge of the real world and the digital one
  - M2M, WSAN, IoT, CPS but also: digitalizing the real world, virtual and augmented reality
- The « things » of the real world become connected and communicating
- They communicate with Information Systems but also between each other
- They can identify themselves, describe their capabilities, present the services they can provide, self-discover each other and geo-locate, self-organize in order to dynamically create new services and answer all types of requests.

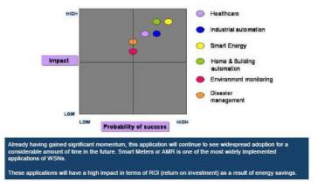
Societal impact of near future services

- ICT : At the core of key innovations with very high socio-economic impact
  - **Health** : distant and continuous monitoring of health state, support of elderly at home,…



  - **Energy Optimization:** Energy grid, sensor and dynamic control of (home, building,…) automation systems, beyond smart metering …

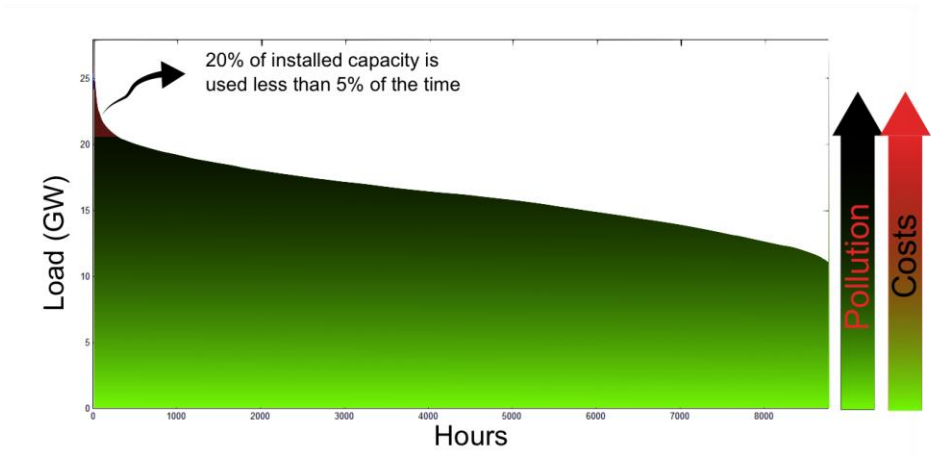
  - **Transportation** : Smart Vehicles, Vehicular networks for road security, Smart Cities, Multimodal Transports, Fleet Management …
  - **Smart Manufacturing**: 4th industrial revolution
  - **Disaster Management** : self-organized systems based on users' devices (smartphones and beyond), …
  - **Environment, Enterprise Service Oriented organizations, Surveillance/Tracking,** …

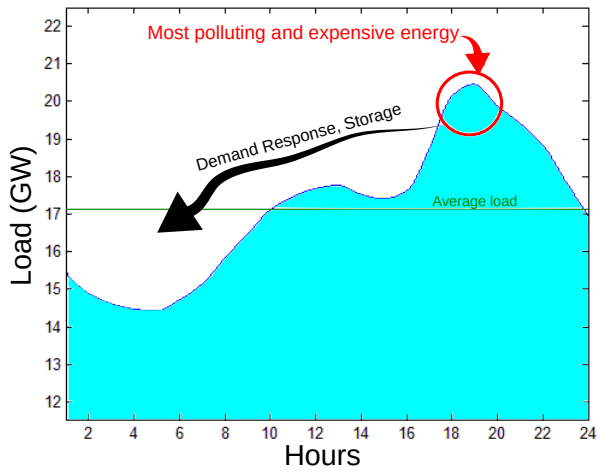



Electric vehicle
E-Box
IoT communicating objects
Service Platforms
Energy
Supply Chain
Transportation
Smart City
Smart Home/Building
Health

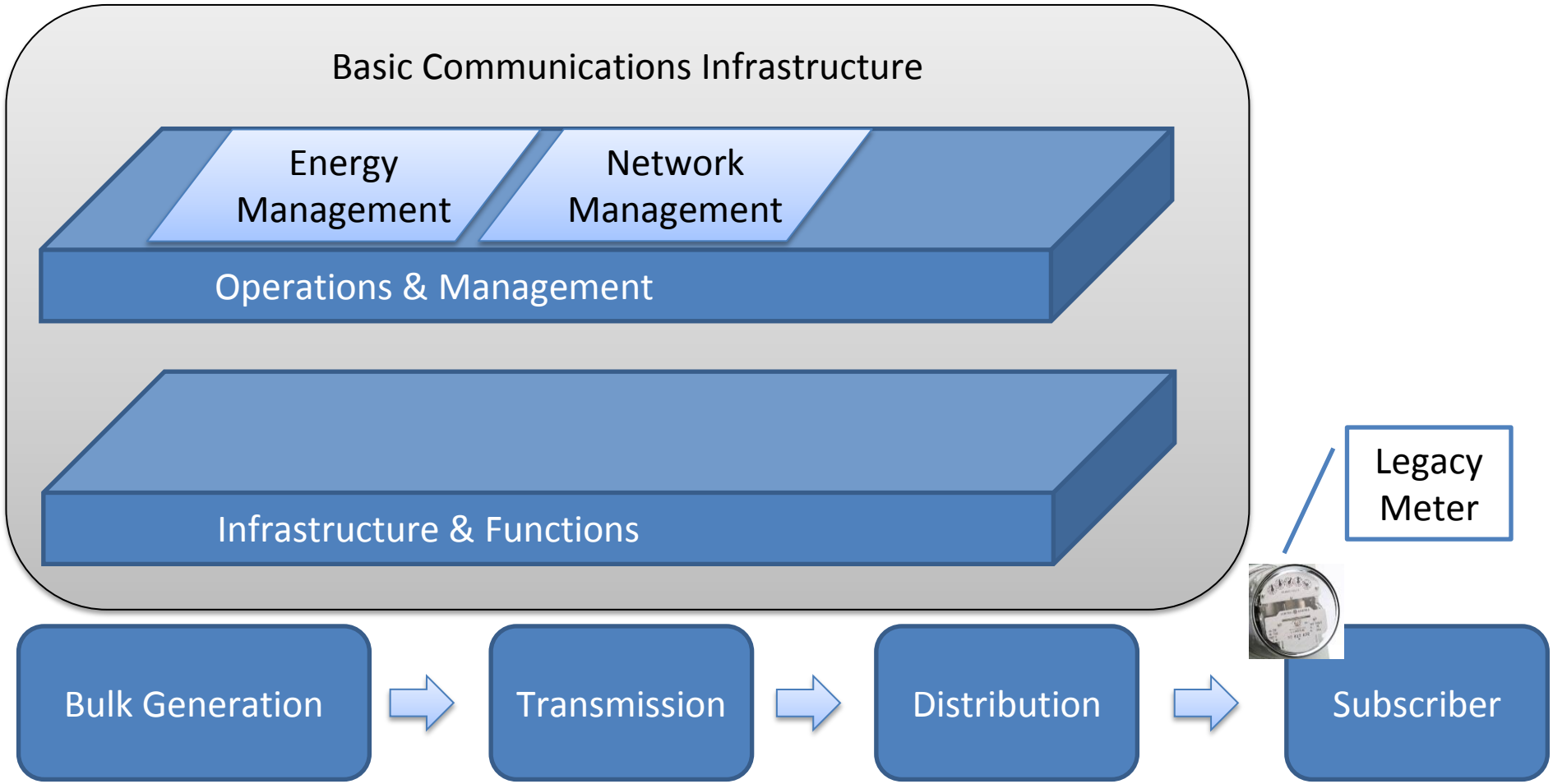
IoT and the smart grid

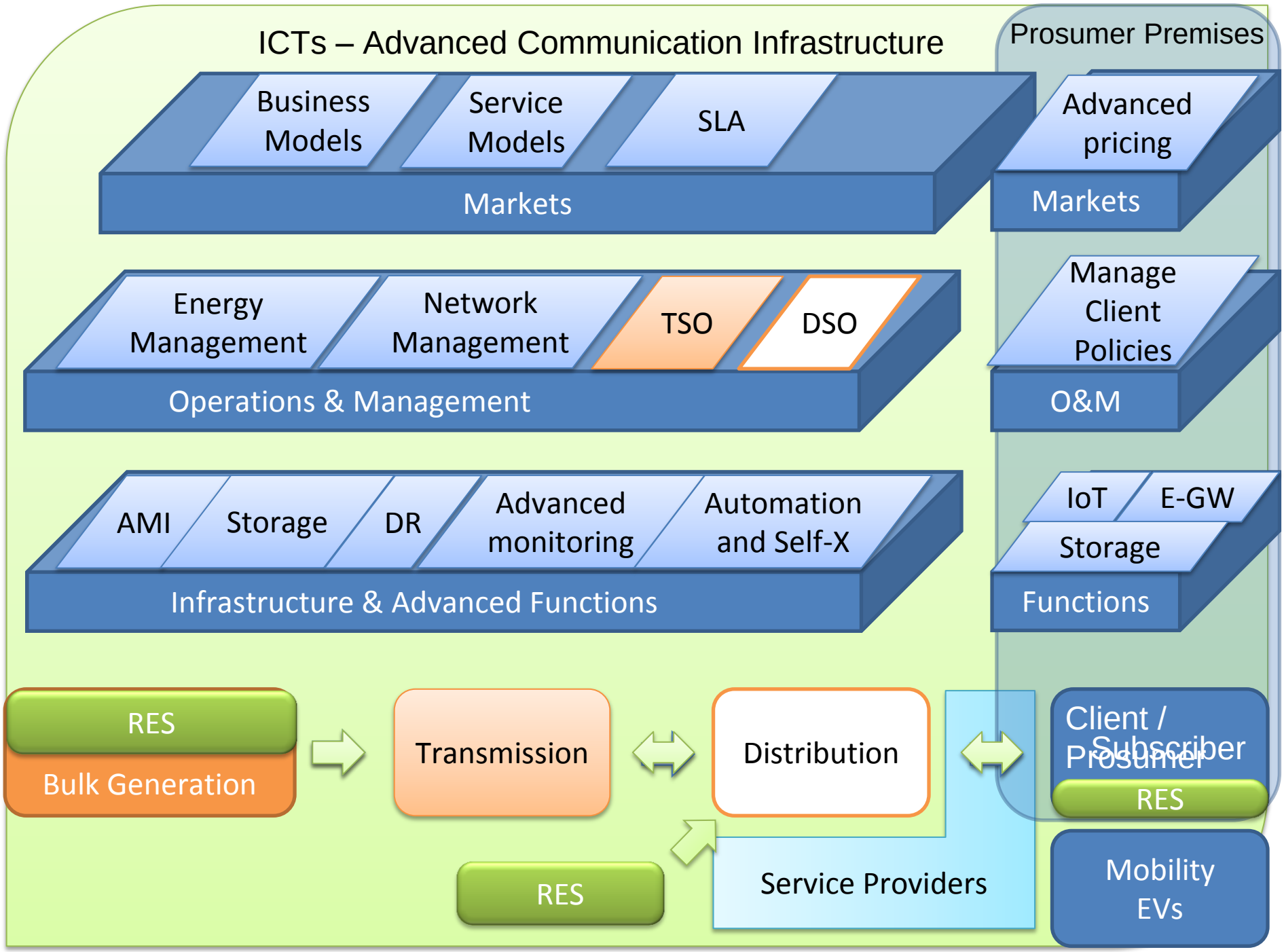
- For a typical electricity company, the 10% highest demand peak arises during a few days during the year
- This requires large investments that are not used most of the time
  - Or the need to buy energy from other companies
- In addition, dealing with the peak is in most cases producing the highest amounts of CO2 because of the type of generation used to deal with the peaks
- The target is therefore to shape those peaks, which requires a better control on the demand



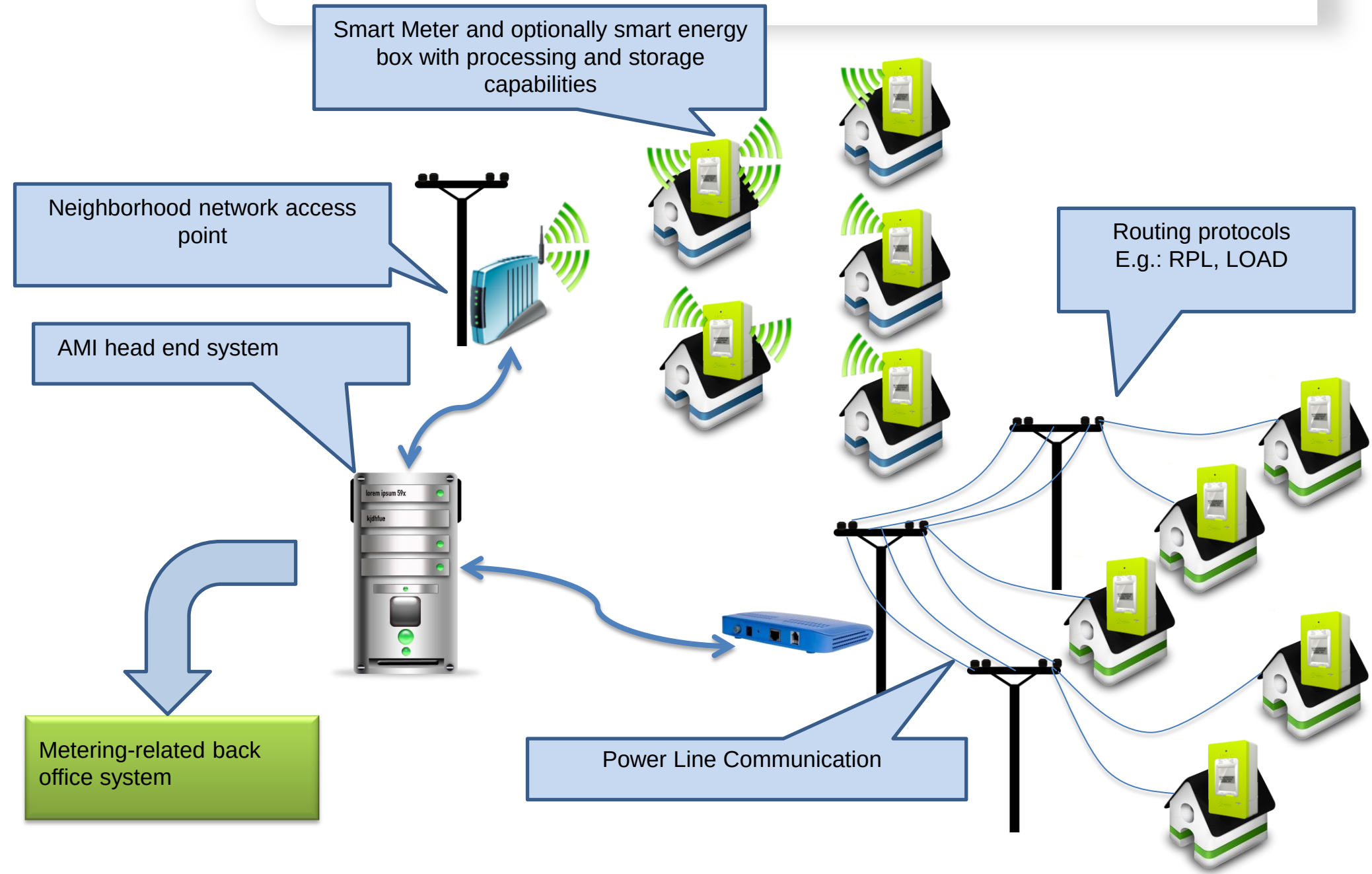


The "legacy" grid

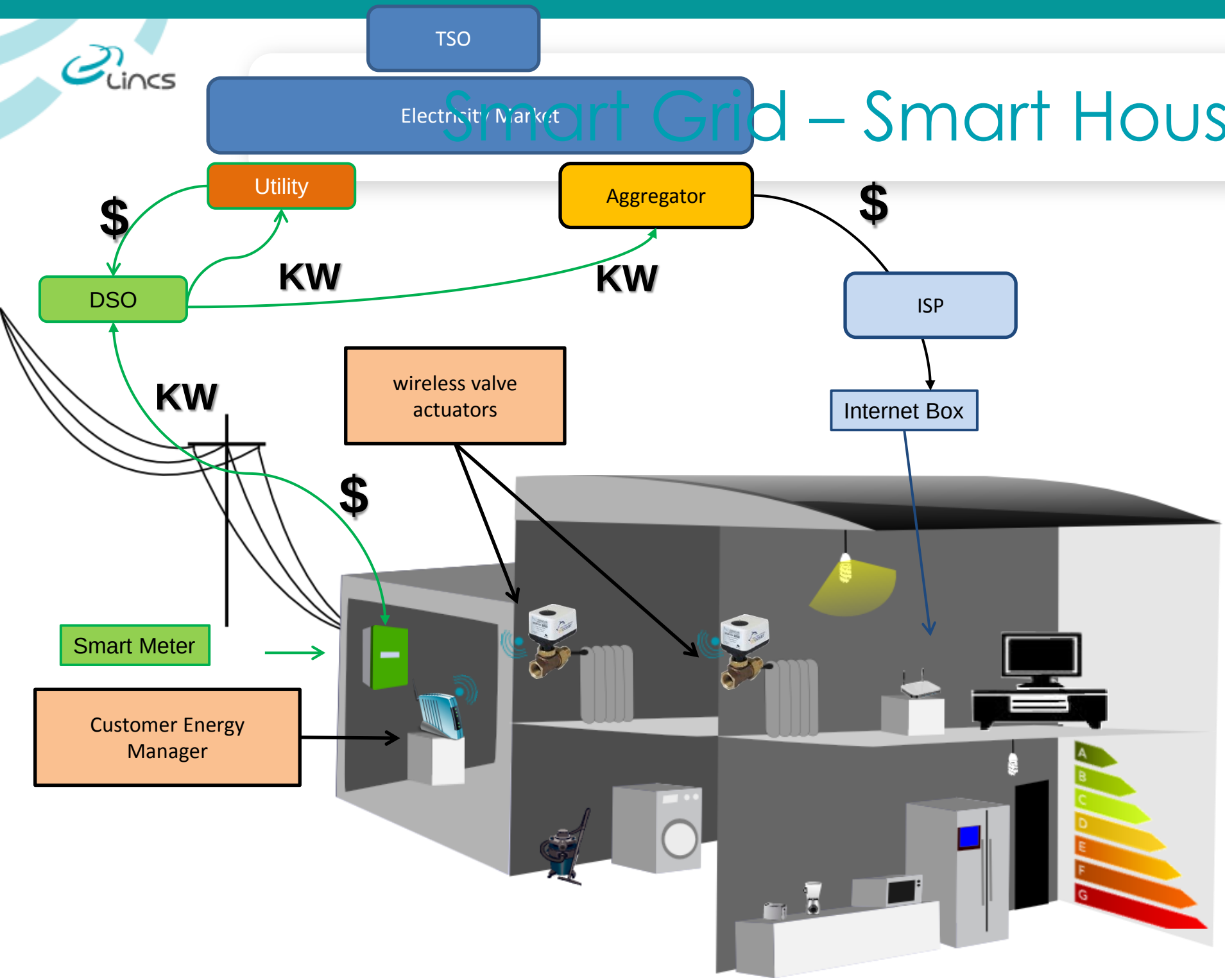



ICTs – Advanced Communication Infrastructure
Prosumer Premises
Business Models
Service Models
SLA
Markets
Advanced pricing
Markets
Energy Management
Network Management
TSO
DSO
Operations & Management
Manage Client Policies
O&M
AMI
Storage
DR
Advanced monitoring
Automation and Self-X
Infrastructure & Advanced Functions
IoT
E-GW
Storage
Functions
RES
Bulk Generation
Transmission
Distribution
Client / Prosumer
Subscriber
RES
RES
Service Providers
Mobility EVs

IoT and AMI


Smart Meter and optionally smart energy box with processing and storage capabilities
Neighborhood network access point
AMI head end system
Routing protocols
E.g.: RPL, LOAD
Metering-related back office system
Power Line Communication

Smart Grid – Smart House



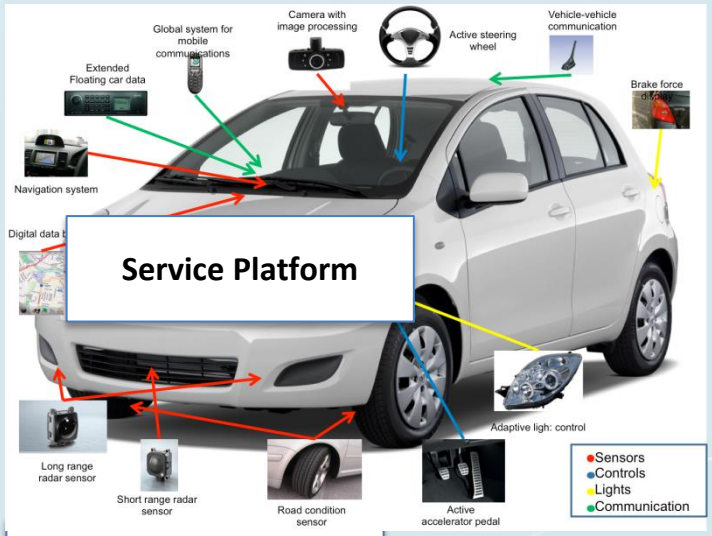
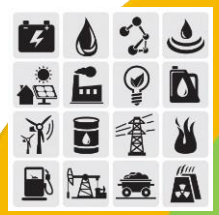
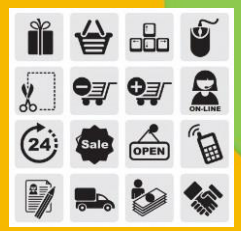


Image: thanks to G. Pau

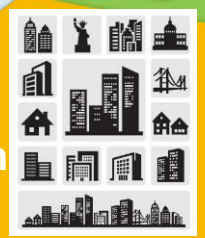


Energy



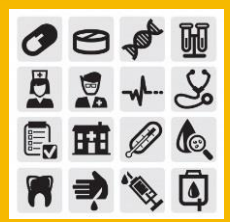
Supply Chain

Transportation



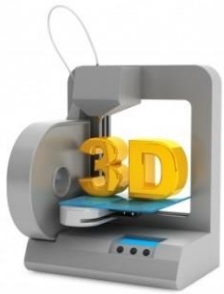
Smart City

Smart Home/Building



Health

Design/Customization/Prototyping



OBJECT ADN

CUSTOMER

ADN

ADN

Object designer store

Other Customers

ORDER

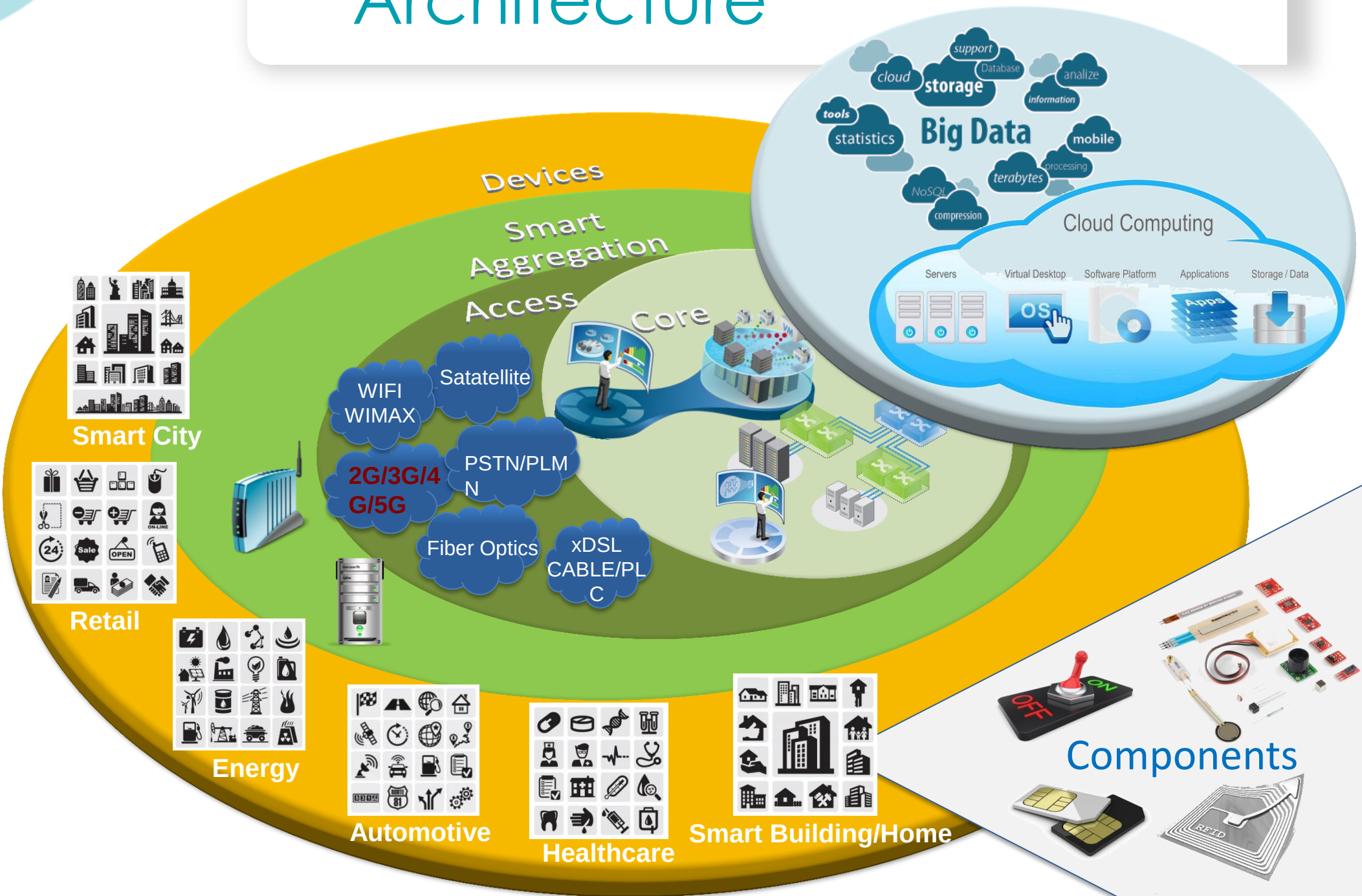
New Intermediations

Smart Factory

Manufacturing Process

Smart Factory

Architecture



Swivel Chair Integration
Siloed Architecture

REDUCED VISION

Swivel Chair Integration

Specific Data Processing and Analytics

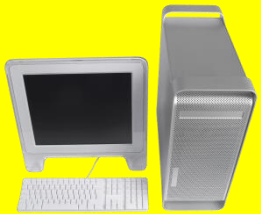
...

Intranets of Things

...

Smartness - Global infrastructures

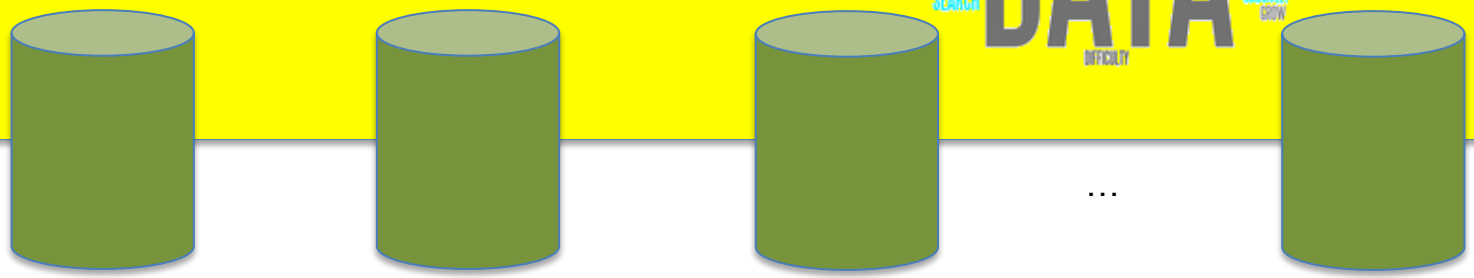
BROAD VISION



Advanced Integration

Big Data optionally Cloud based
Capturing, Processing, Analyzing, Presenting

Specific Data Processing And Analytics



Intranets Of Things

Then Global integration - better distribution of the intelligence

BROAD VISION

Advanced Integration

Big Data optionally Cloud based
Capturing, Processing, Analyzing, Presenting

Specific Data Processing And Analytics

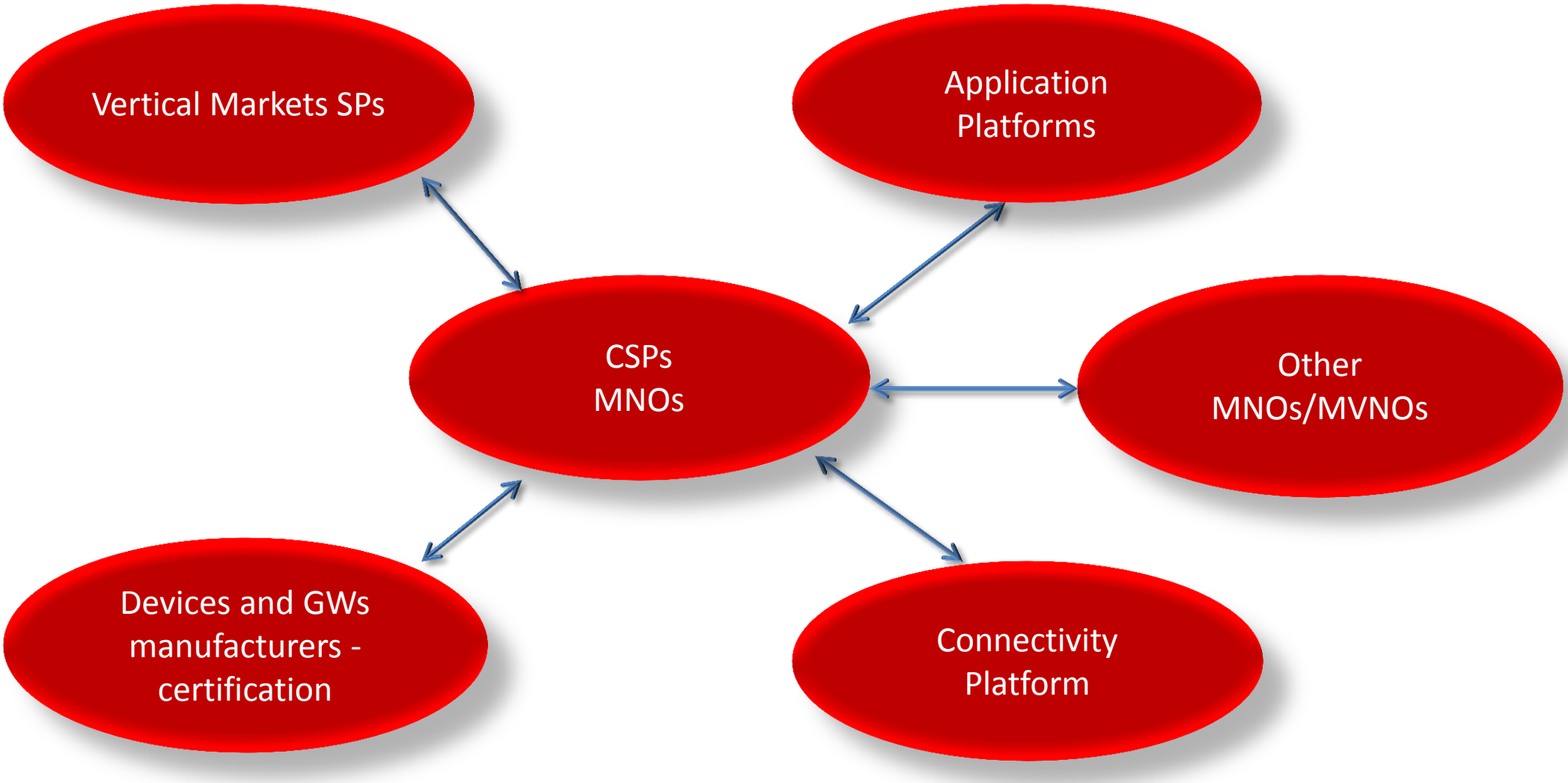
…

Internet of Things

Intranets/Subnets of Things

…

Partnerships



Content

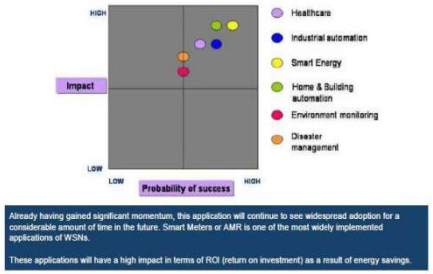
Internet of Things: from Examples to Definition

A Driver for Disruptive Transformations
in most Society and Industry Sectors

Business and Technical Challenges
Perspectives

Challenges, an overview (1)

- Legal and regulation issues, e.g. privacy issues
- Vertical markets variable openness to innovation
- Very partitioned market
  - Industry verticals, although some very large silos
- Multiplayer business model
  - Complex eco-system, need strategic and opportunistic partnerships
  - Integration blocked by fears to loose positioning
- Need for multiplayer technical Integration
  - Flexible and evolving, Interoperability issue
  - Standards issue
- Generic platforms together with specific solutions per vertical markets
- Need for adapted pricing, accounting and billing schemes
- Market Education



Challenges, an overview (2)

- Automation of provisioning and management processes
- Interoperability
  - Large diversity of devices and interfaces
    - Multi-technology, multi-competences
    - Role of semantics
  - Standardization processes, de facto standards
    - ETSI M2M, IETF (CoRE, 6LowPAN, ROLL, CoAP), 3GPP MTC, IEEE (802.11, 802.15.4), RFID/NFC, TIA, ISA100, IPSO, Bluetooth, CEN M-BUS, KNX,…not exhaustive
  - Alliances and certification processes
    - Applications portability issue
- Security, Reliability
- Big data, Data analytics
  - From data to information, from information to knowledge
  - Semantics, stream reasoning (real-time)

Internet of Things, you said Internet?

- ROLL: Routing Over Low power and Lossy networks
  - Routing Protocol for Low-Power and Lossy Networks (RPL)
- 6LOWPAN:
  - IPv6 over Low power WPAN
- CoRE: Constrained RESTFul Environments
  - CoAP: Constrained Application Protocol

Challenges, an overview (2)

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  - Alliances and certification processes
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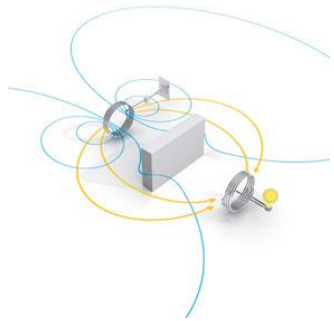
- Big data, Data analytics
  - From data to information, from information to knowledge
  - Semantics, stream reasoning (real-time)

Challenges, an overview (3)

- Identity management and naming
  - IDs: RFID, 2D, GPS, metadata tagging (e.g. geo tagging)
- Discovery, orchestration
  - Semantics
- Scalability
- Powering
- Security, Reliability

Challenges: a focus on Powering

- Innovation in energy converters and storage
  - New generation storage
    - Based on nanotechnologies, “charge your smartphone in 5s”
  - Wireless electric power (NFMI-R)
    - See e.g. WiTricity Corp.’s (MIT IP, range: several x size of devices)
  - New materials: e.g. cotton T-shirt transformed into a capacitor
    - Feed at the gym : bicycle as a power converter
  - Batteries printed in electronic skin
  - Harvesting energy from the environment
    - Electromagnetism
    - Movement, kinetic energy
    - Heat
    - Sound (Sound Charge - Orange)
    - …



Challenges: a focus on security

- E-Health:
  - A software virus may now kill a human being
  - Murders in the cyberspace
- Plant Control, vehicles traffic control
  - Terror attacks
- Smart metering
  - Steeling goods
- Smart city
  - Spying

Content

Business and Technical Challenges,
Perspectives

From smart spaces to service platforms

The Internet of Things will enable disruptions in most industry sectors

We foreseen a digital world based on cross industry sectors applications
- Enabled by advanced, highly distributed, service platforms

Smart spaces could become critical components of service platforms, offering services far beyond those related their "physical design"

Disruptive opportunities and risks for solutions' providers
Open Vs closed service platforms?
Opportunities for new players?

Evolving ICT eco-system

« BIG DATA »

CONTENT CREATION,
CONTENT PROCESSING

DATA

« CLOUD COMPUTING »

CONTENT DISTRIBUTION NETWORKS

NETWORKS

Future ICT Ecosystem

SERVICES & APPLICATIONS INTERFACES

FEDERATION / ORCHESTRATION

CLOUD FUNCTIONS

APPLICATION PLATFORMS COMPONENTS

NETWORK FUNCTIONS

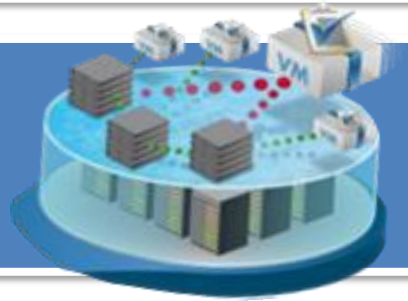
IoT GATEWAYS FUNCTION

NETWORK FUNCTIONS

CLOUD FUNCTIONS

CONTENT DISTRIBUTION FUNCTIONS

APPLICATION PLATFORMS COMPONENTS



VIRTUALIZED INFRASTRUCTURE

Joint value creation: digital industry and vertical industries, Internet of Things, 5G.

« OTT » and « Cloud »
Web 2.0 – Social Networks
Mobile Internet and High Speed 2.0
Skype-2003, Facebook-2003, YouTube-2005, AmazonEC2-2006, iPhone-2007, 4G-Mobile

~1969 - Ancestors
~1984 - Internet
~1992 – Open to mass market
~1995 - Web 1.0
~2000 – High speed 1.0
Google-1998, Akamai-1999, Napster-1999

Thank You

Time for Questions,
Remarks, Contributions, …

Contact: daniel.kofman@telecom-paristech.fr