



Montevideo - March 16, 2015



Internet of Things - IoT a major innovation driver for vertical sectors

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

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

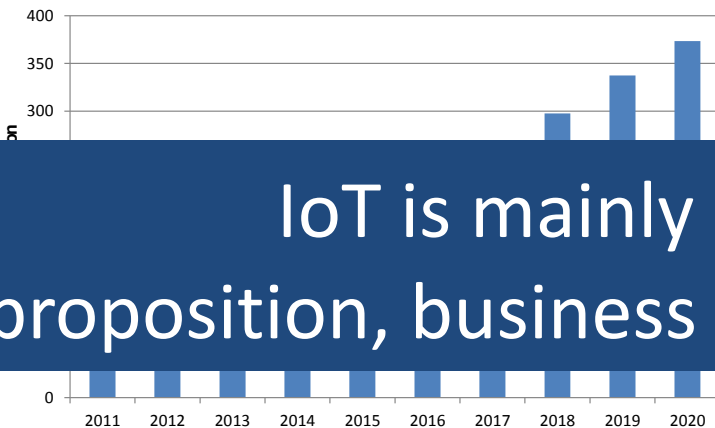
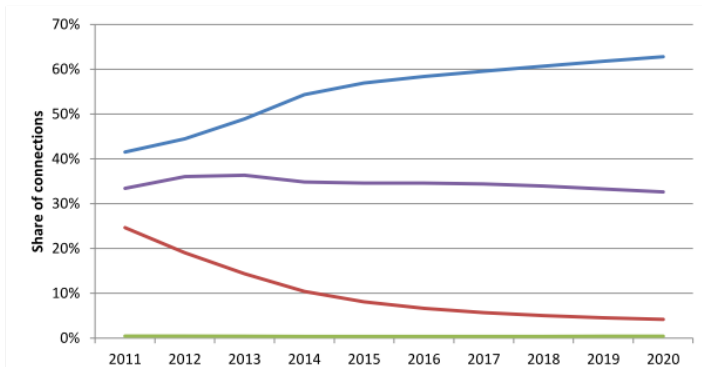


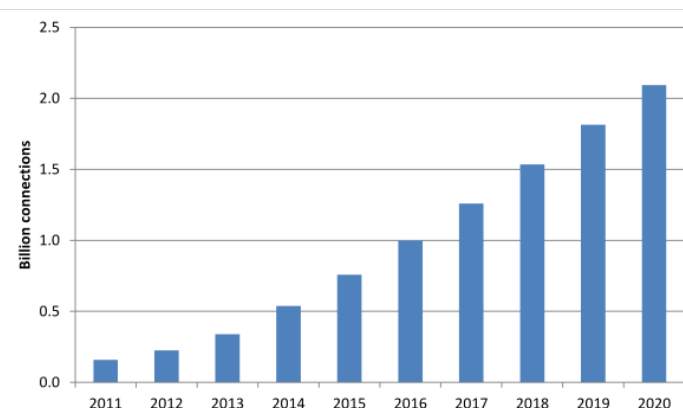
Figure 2-2: Worldwide M2M connections and wireless wide-area mobile connections 2011-2020 [Source: Machina Research]



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

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

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

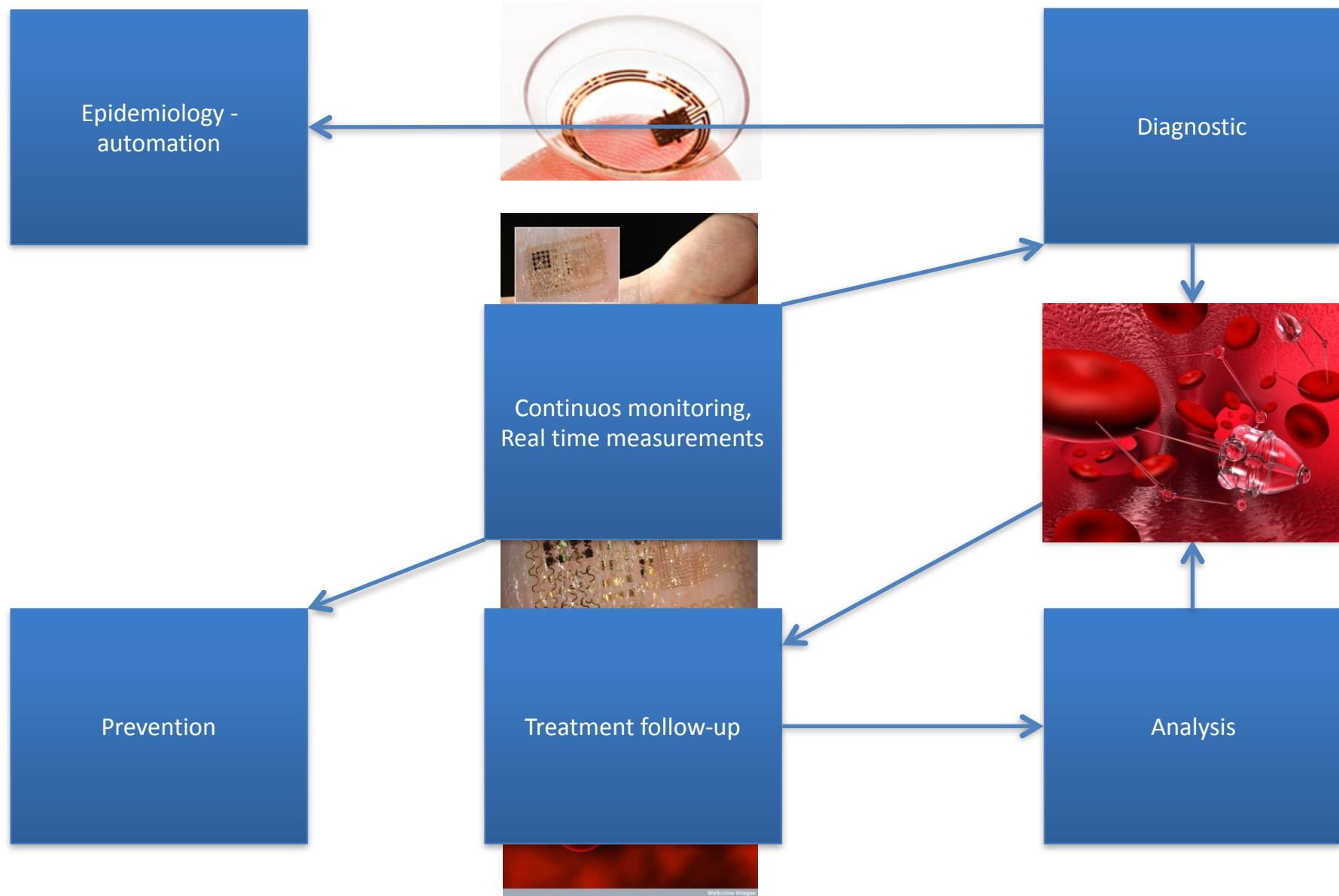


Content

IoT: A Driver for Disruptive Transformations
in most Industry Sectors

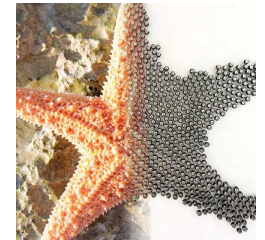
Business and Technical Challenges
Perspectives

New health paradigms



First Concepts

- Distant real-time monitoring and actuation
- New Interfaces, Natural User Interface
 - Functional lenses, Electronic skin, Wearable computers, Brain Machine Interface
- Robots and Swarms of Nanobots
 - From safe physical interactions between robots and humans towards human-machine convergence
- Body Area Network
 - Skin transmission, intra-body communications, molecular interfaces
- Gateways, Personal Area Network
 - Wearable devices
 - Smart watches, smart glasses, smart clothes
- Stream Reasoning on Big Data
 - **Personalized services, e.g. based on digital models of individuals**
 - Physiology model and, more speculative, digitally upload a human consciousness

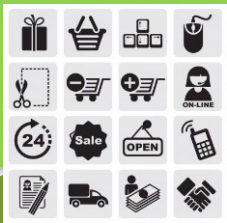


Harvard SEAS

Architecture



Energy



Supply Chain



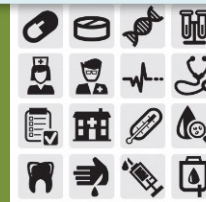
Transportation



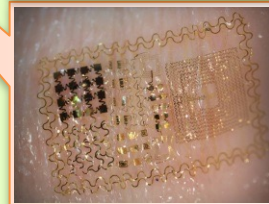
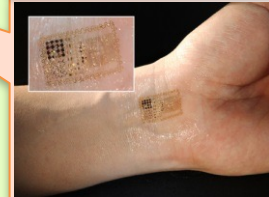
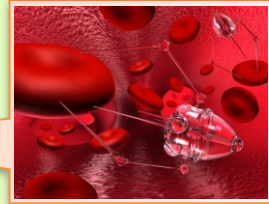
Smart City



Smart House/Building



Health



Smartness - Global infrastructures



BROAD
VISION

AllJoyn/HyperCat/HayStack/IFTTT/Temboo/Wink/SgortCut/Google Fit/ThingWorks/
SmartThings/Apple HomeKit/HealthKit/OSGI/HGI/IoTSys...

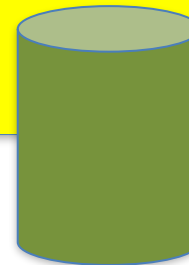
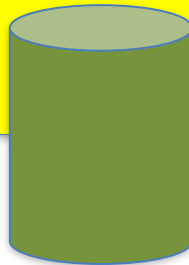
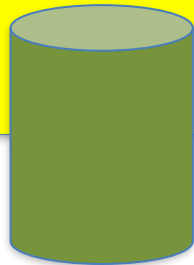


Advanced
Integration

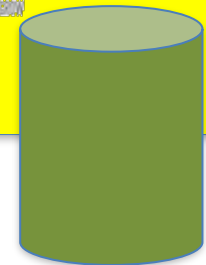
Big Data optionally Cloud based
Capturing, Processing, Analyzing, Presenting



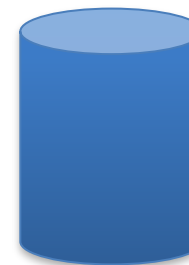
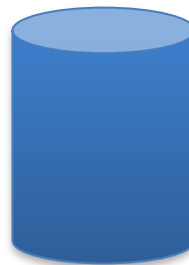
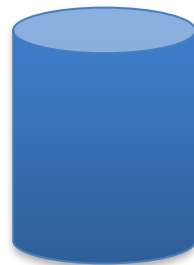
Specific Data
Modeling,
Processing
and Analytics



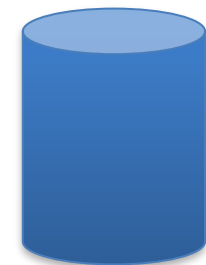
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Intranets
of Things

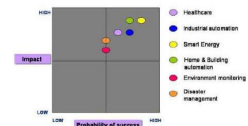
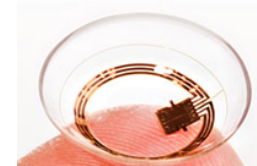


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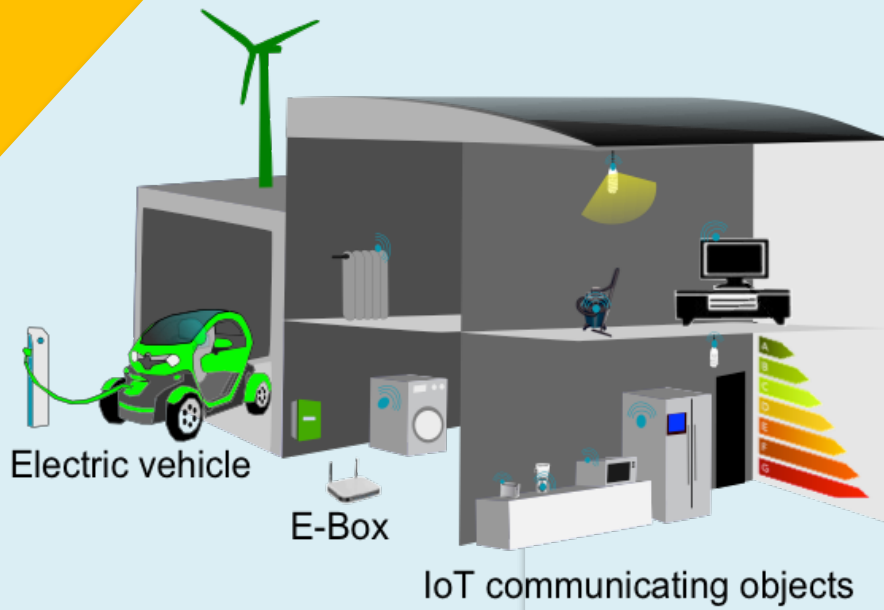


Societal impact of near future services

- **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, ...**



Already having gained significant momentum, this application will continue to see widespread adoption for a considerable amount of time in the future. Smart Meters or AMR is one of the most widely implemented applications of ICTs.
These applications will have a high impact in terms of ROI (return on investment) as a result of energy savings.

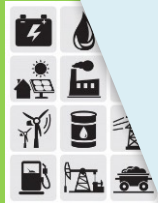


Electric vehicle

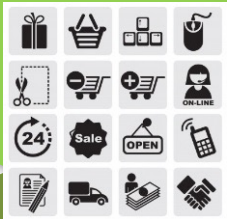
E-Box

IoT communicating objects

ce Platforms



Energy



Supply Chain



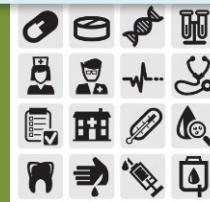
Transportation



Smart City



Smart Home/Building



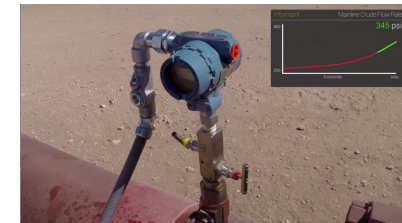
Health



Accès

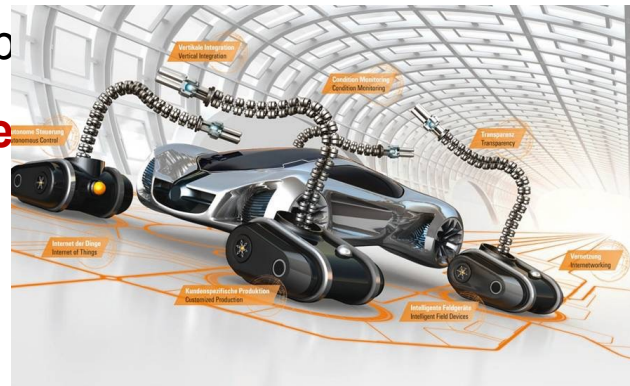
Simple examples for Oil and Gas

- Sensors and actuators examples:
 - Sensing workers ' environment (level of dangerous products)
 - Connected pipeline valves, surface pressure controllers, geophones, hydrophones...
 - In-pipe, In-tanker, In wells - Robot Swarms,...
 - Performing measurements in places where it is not possible without the IoT paradigm
- Real-time processing of the collected data and decision making
 - Dynamic and automated management of the supply chain
- Distant control of the infrastructure
 - Reducing risks, reducing impact of failures
 - Integrated view of large and heterogeneous infrastructures

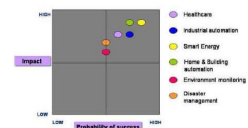


Societal impact of near future services

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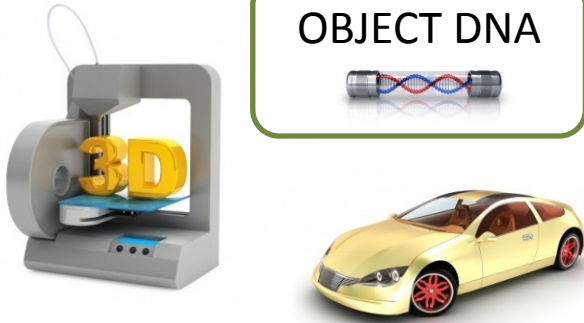
Organizations, Surveillance/



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Design/Customization/Prototyping

OBJECT DNA

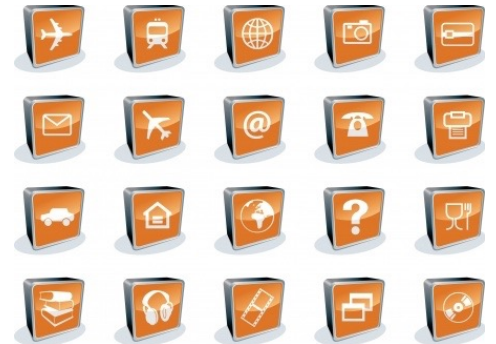


PROSUMER



DNA

Digital designs store



Other "Prosumers"

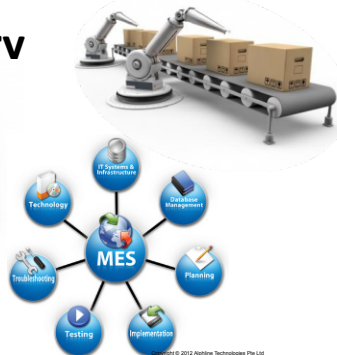


ORDER



New Intermediations

Smart Factory



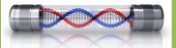
Manufacturing Process



Smart Factory



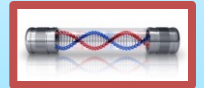
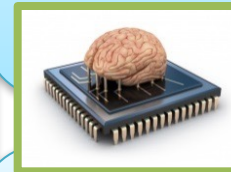
Living Smart Product



Keeps its DNA through its life cycle



Learns about usages, keeps in memory traces and logs.
Can be identified, located and queried
and **may "mutate"**



Interacts with its ecosystem to self-configure new functionality,
interacts with a 3D printer for producing a
broken part



Proposes approaches for disposal, recycling, etc.

Smart
Product

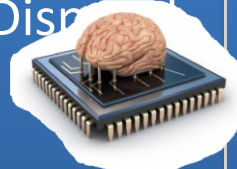


Production



Usage

Disposal



Design
Components

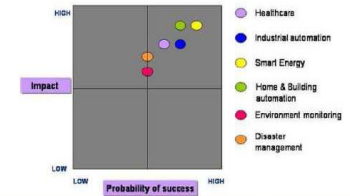
Content

IoT: A Driver for Disruptive Transformations
in most 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
- Generic platforms together with specific solutions per vertical markets
- Need for adapted pricing, accounting and billing schemes
- **Market Education, confidence development**



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These applications will have a high impact in terms of ROI (return on investment) as a result of energy savings.

Challenges, an overview (2)

- **Automation of provisioning and management processes**
- Need for Digital models of the real world
 - Of human beings for personalized health
 - Of machines for autonomic optimization of manufacturing plants
 - Of enterprises' Business Processes
- **Interoperability**
 - Large diversity of “things”, interfaces, data models...
 - Multi-technology, multi-competences
 - Role of semantics
 - Standardization processes, de facto standards
 - Alliances and certification processes
 - Applications portability issue

Challenges, an overview (3)

- **Big data, Data analytics**
 - From data to information, from information to knowledge
 - Semantics, stream reasoning (real-time)
- 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 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
 - Stealing goods
- Smart city
 - Spying

Content

Perspectives

From smart spaces to service platforms

Smart objects and spaces become part of Distributed Service Platforms, offering services beyond their first purpose “physical design”

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

Uberization and Nestification

- Companies are moving « Digital », A key drive to avoid being « Uberized »
 - Uberization phenomenon
 - A company that becomes dominant in a given previously partitioned market
 - Through new intermediation paradigms (web n.0, n=2 to 5, social networks...)
 - Includes new payment paradigms (beyond Bitcoin)
 - With global and permanent coverage (any place, any time, any type of access device and network)
 - Supported by Capital Risk for rapid market penetration
- Impact: Music, Movies, News, Hotels, Flights (transport toward multimodal), Restaurants, Banks, Retail, and then Education, Health, Lawyers firms...
- Nestification of “tangible” products’ markets: from smart home controllers to Swiss watches and German cars

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

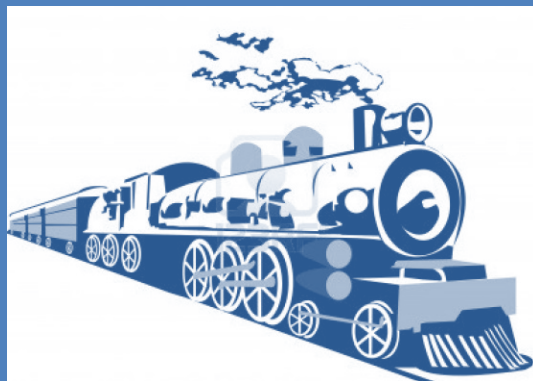




Joint value creation: digital industry and vertical industries, Internet of Things, 5G-Global convergence, Global virtualized infrastructures for smartness



« 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