cea

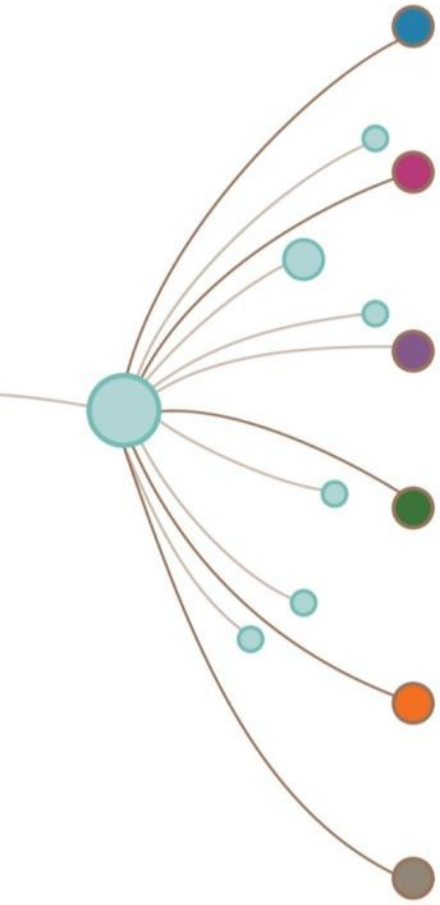
leti innovation for industry

Internet of Things

JM Goiran 15 /11/2013

MINATEC CAMPUS

LeTI : a Technology institute
A few facts



Founded in 1967

A single mission : Innovate with Industry

1700 collaborators
160 PhD + 40 post-doctorants
38 % foreign students

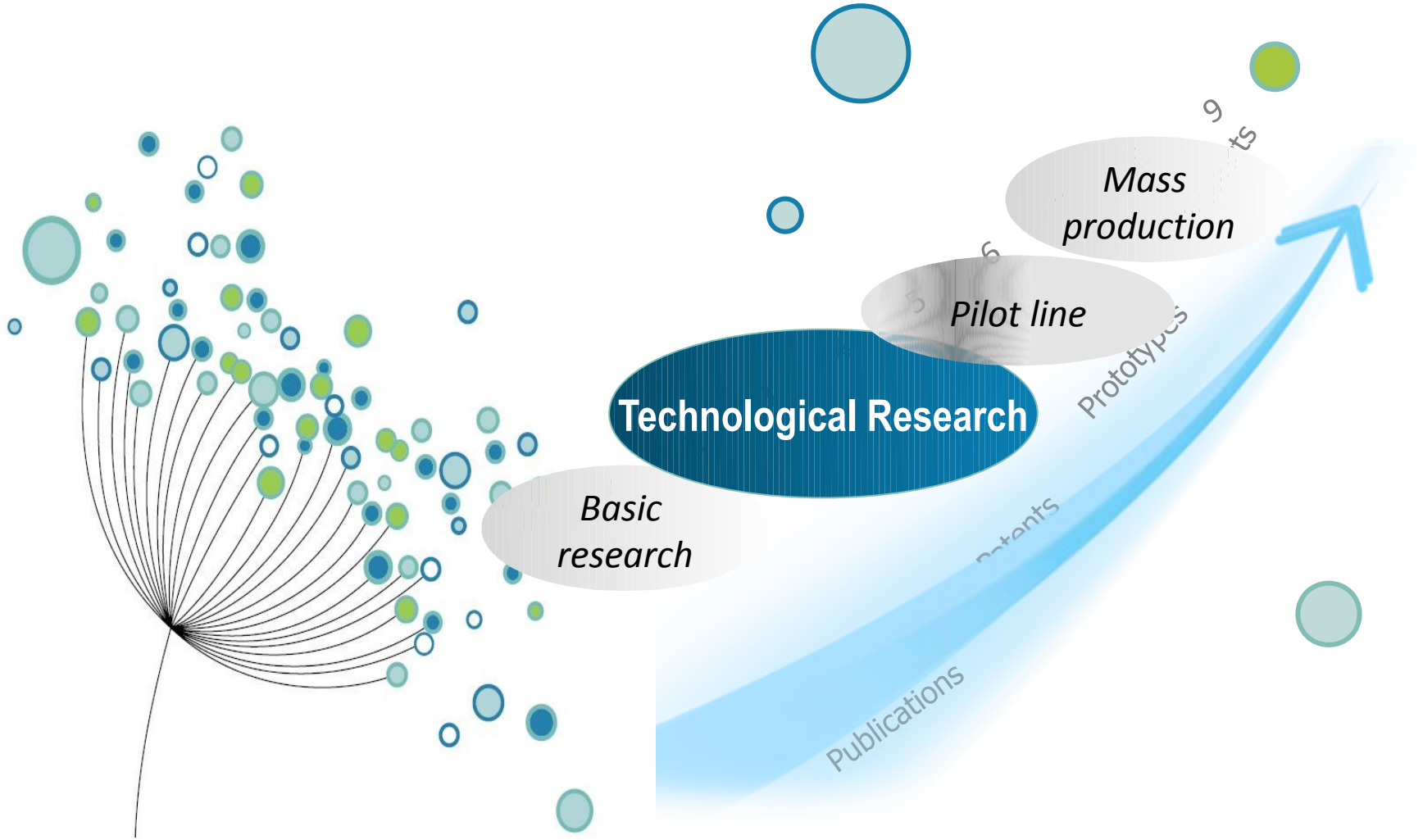
2200 patents
286 registered in 2012
40 % under licensing

Budget : 275 M€

50 start-ups
& 350+ Industry partners

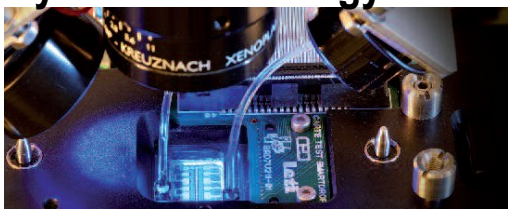
A Business Model …

Create and transfer innovation to our industrial partners



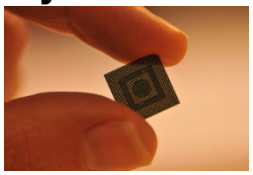
Leti

Systems for biology & healthcare



30 %

Systems for communication

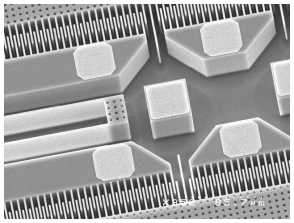


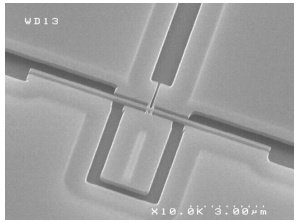
Optoelectronics components

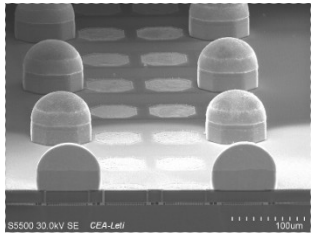
20 %

50 %

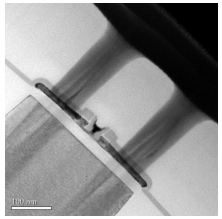
Silicon microsystems

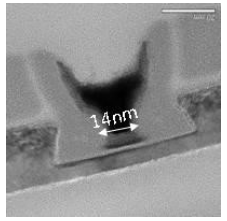


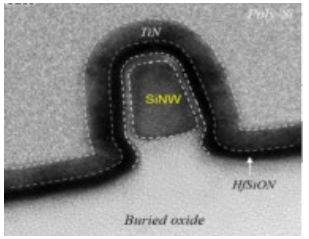




Silicon microelectronics







Markets require smarter, safer, connected, more efficient :

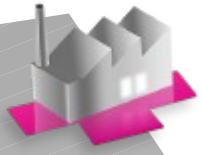
Consumer appliances

Smartwear

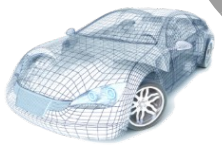
And humans ?

Cities

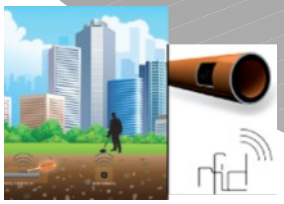
Living world



Factories



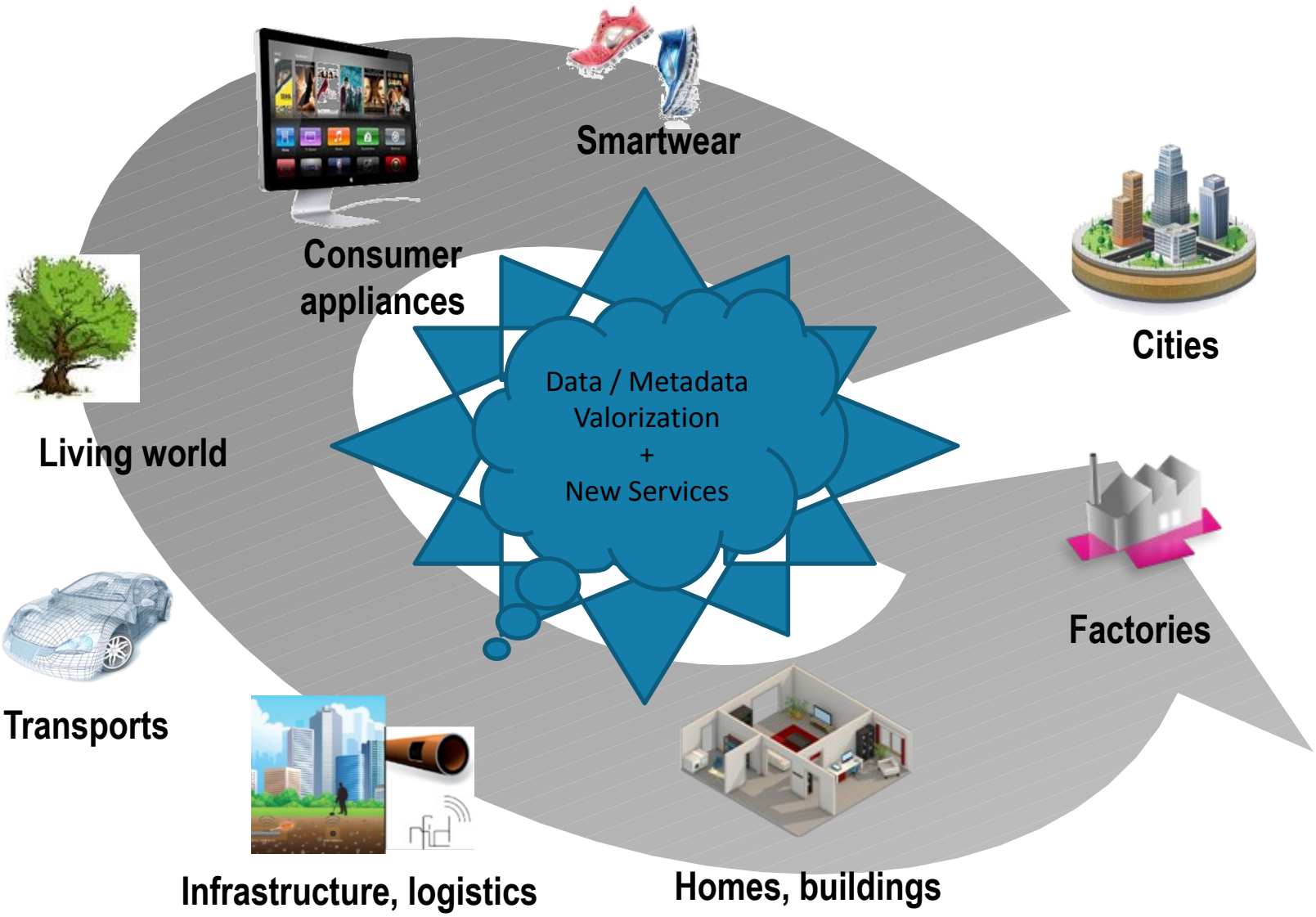
Transports



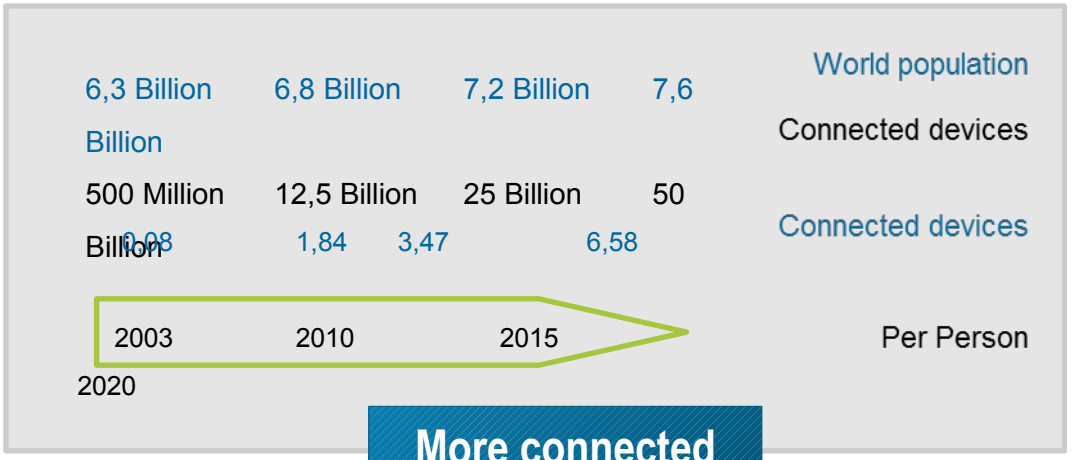
Infrastructure, logistics

Homes, buildings

IoT will generate new opportunities



IoT Context



Metcalf Law

Moore Law

BigData analytics

More connected devices than people

New Internet Inhabitants

Koubachi

Intelligent Parking

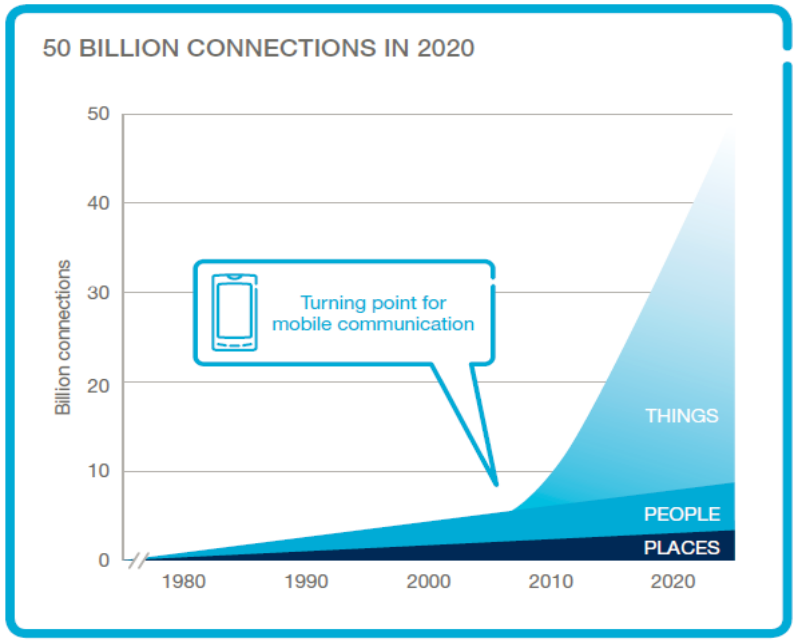
Twitter @Montgomerymae

Quantify self

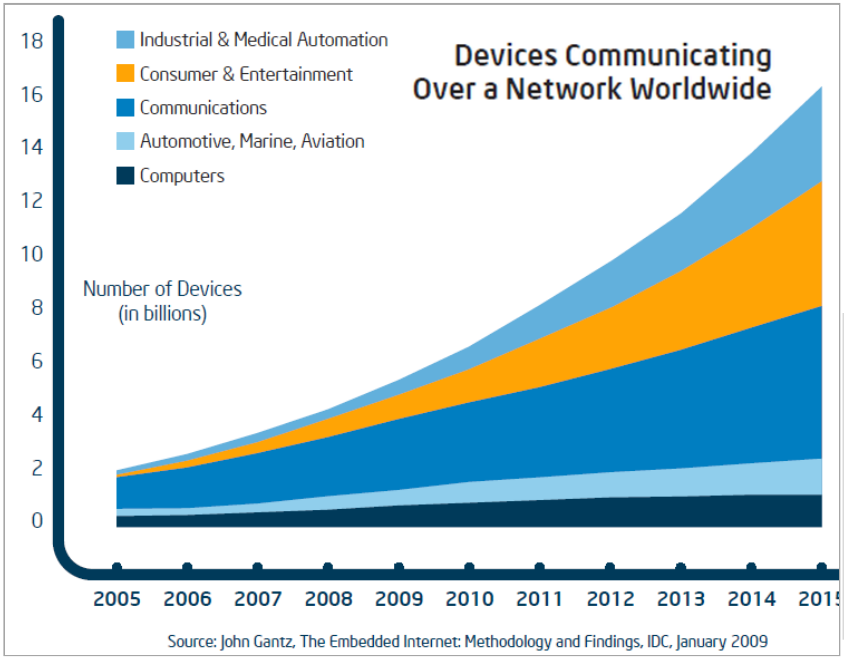
Forecasts call for billions and billions of connected devices

"Smart Connected Devices To Reach 13.5 Billion in 2016" - **Harbor Research** (link)

Ericsson CEO Hans Vestberg estimates 50 billion devices will be connected to the Web by 2020 (link)



50 Billion Connections in 2020 – Ericsson
(from page 18 of 2010 annual report)



John Gantz of IDC forecasts 15 billion devices will be communicating over the network by the year 2015 (link)

Graph found here and here

One research report forecasts as much as $4.5 trillion in spending by 2020

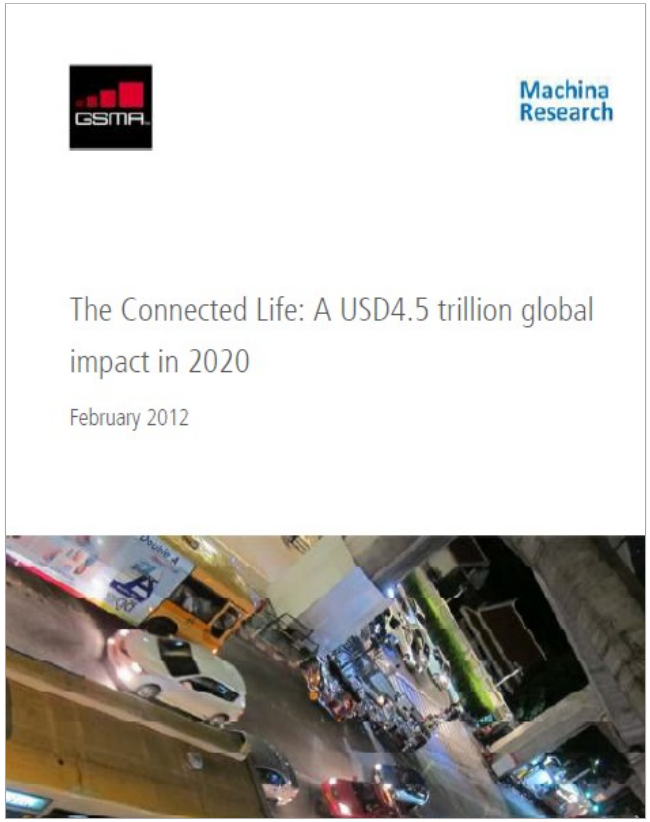
"The Business Impact of Connected Devices could be Worth US$4.5 Trillion in 2020." – **GSMA (link)**

Top Ten Connected Applications in 2020 – GSMA (link)

Application	Value ($USb)
Connected Car	600
Clinical Remote Monitoring	350
Assisted Living	270
Home and Building Security	250
Pay-As-You-Drive Car Insurance	245
New Business Models for Car Usage	225
Smart Meters	105
Traffic Management	100
Electric Vehicle Charging	75
Building Automation	40

"The Connected Life will open up new revenue streams, facilitate new business models, drive efficiencies and improve the way existing services are delivered to create a global business impact worth as much as US$4.5 trillion" – **GSMA (link)**

The Connected Life: A USD4.5 Trillion Global Imp
– GSMA & Machina Research Report



Main markets starting already

Smartcities

UK 50M smartmeters bid, France's ERDF bid. Market $20.2 billion by 2020

eHealth and wellness

Wearable telehealth devices is a 6B$ market by 2016 (IMS)

security

Video Surveillance System and Service Market worth $36.28 Billion by 2018

Advanced manufacturing

20% Profitability Increase Experienced By Mid-Market Manufacturers Using Advanced Techniques.

What is a smart city ?

Smart City IOC

Smart Building

Intelligent Building System
In-Building Communication Network
Smart Office and Business Solutions

Smart Transportation

Smart Signal Control
Traffic Information
Parking Information
Illegal Parking Detection

Smart Urban Infrastructure

Underground Facility Identification
Water-pipe Monitoring
Streetlight Monitoring

Smart Park

RFID Ticketing
Park Info
Child ID

Public Surveillance
Smart Bench
Mobile Community and Tourist Info
LED mood lighting

Smart Street

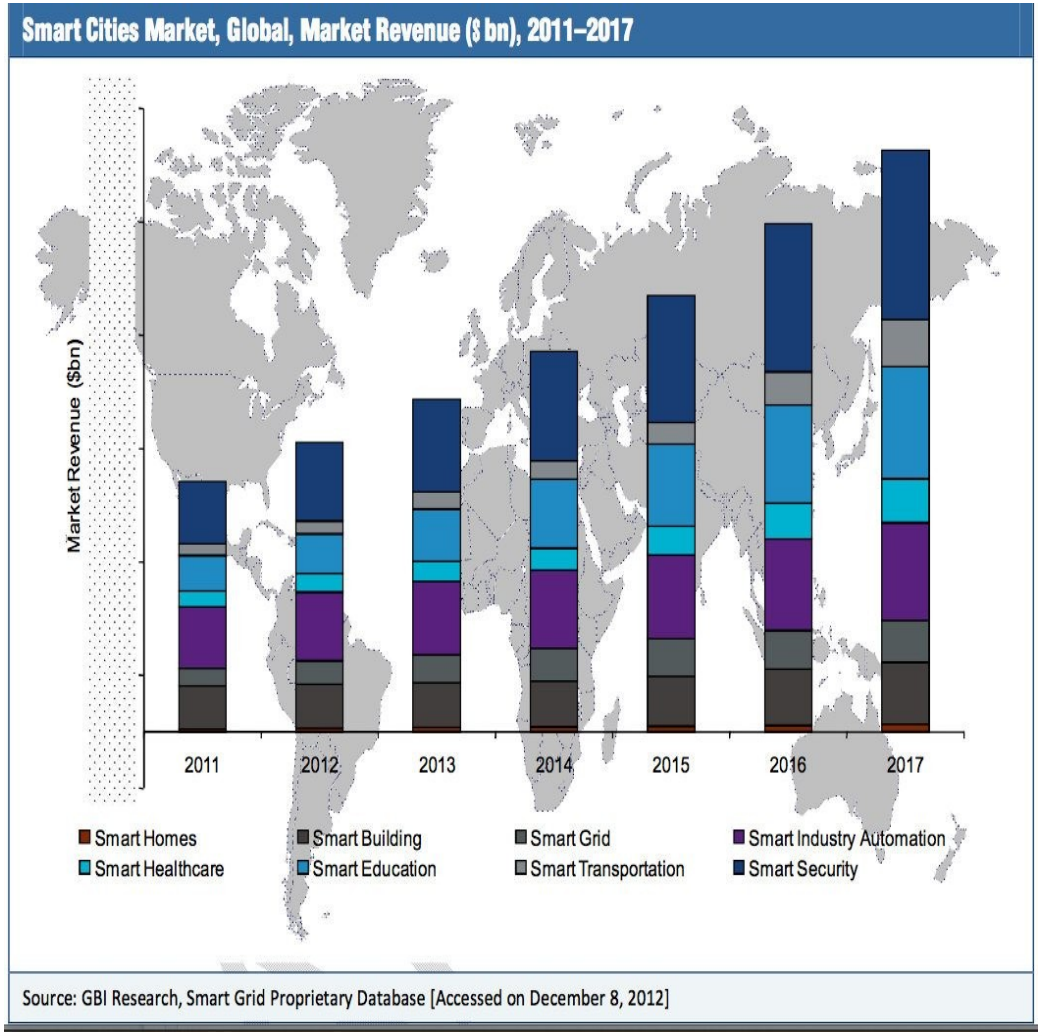
Smart Digital Signage

Kiosk, Signage, Screens, Floors, Projections, etc.

Smart Home

Home Automation
Home Security

A booming market



The global *smart city* technology *market* will grow from $6.1 billion in annual revenue in 2012 to $20.2 billion by 2020

Examples for a city* of 1 million people		
Smart metering	600.000 meters	$120 million opportunity
Electric vehicle charging infrastructure	45.000 electric vehicles	$225 million opportunity
Remote patient monitoring (diabetes)	70.000 people w/ diabetes	$14 million opportunity
Smart retail establishments	4.000 stores	$200 million opportunity
Smart bank branches	3.200 PTMs	$160 million opportunity

*e: High level estimates given by IDC Report Boston March 4, 2010

IoT major benefits

New services and revenues

- Data monetization,
- Co-marketing/branding…
- Generate service offerings in place of HW one-off sales

New business models

- usage based pricing
  => Ex: insurance, coffee machines, printing…

But you can only optimize what you can measure

Business process optimization

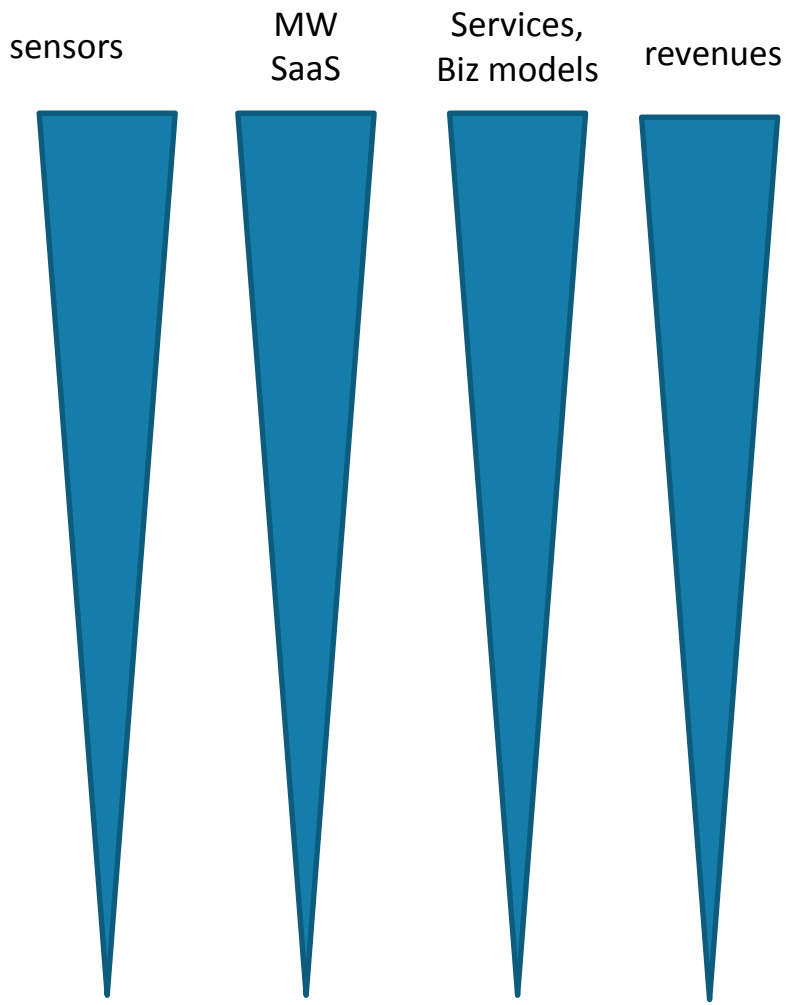
- Customer usages knowledge
- remote maintenance & controlling,
- supply chain optimization…

IoT

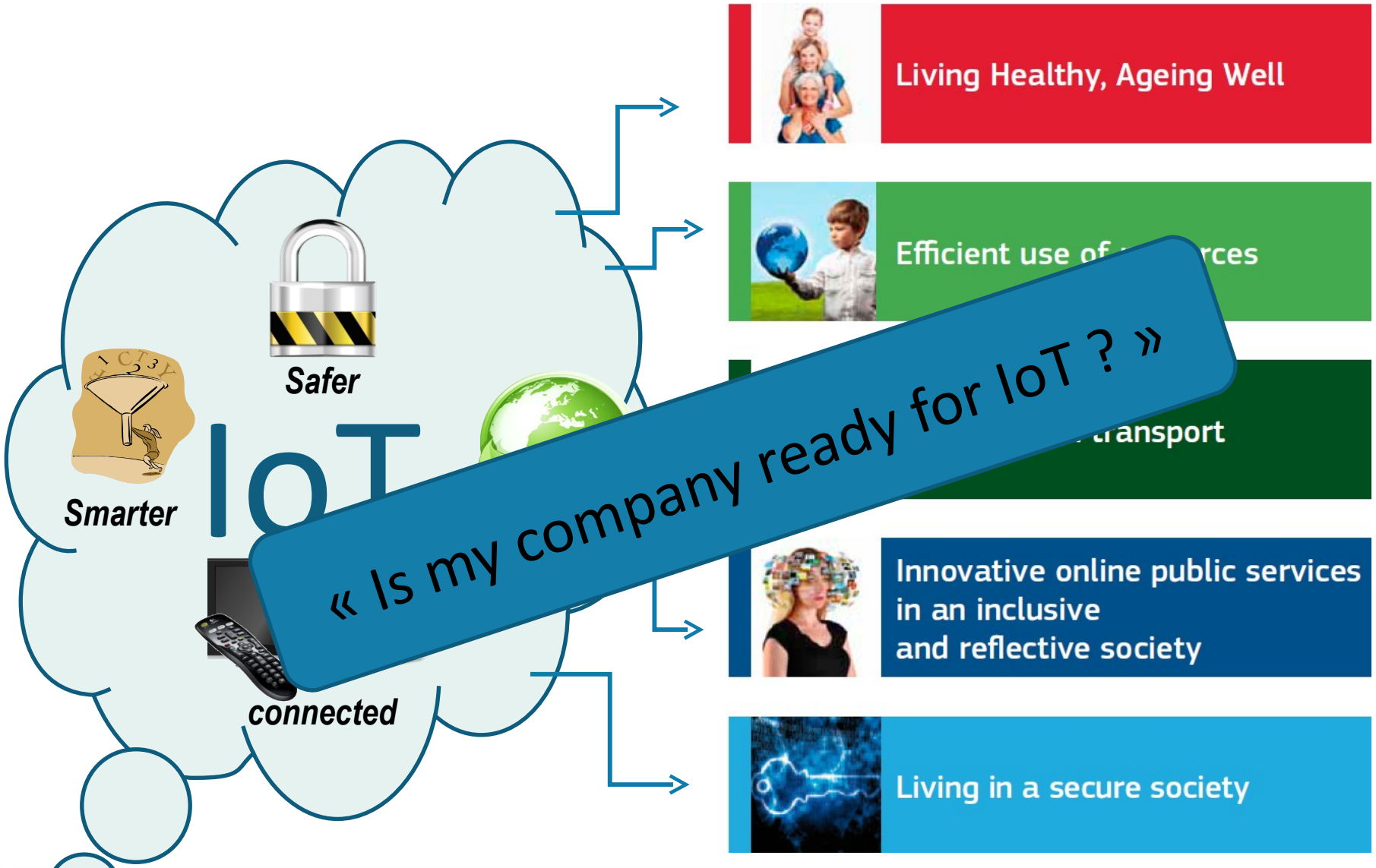
New services and revenues

New business models

Business process optimization



At the heart of societal challenges



It is just right time !

Investments and reorganisations

Mergers & initatives

Internet in all homes

OpenData

Infrastructure

Services

Leti

Advanced manufacturing

Smart Grids
Smart cities

Wellness
Quantify self

Security
Video-surveillance

White goods renewal

LE communication protocols

New sensors capabilities

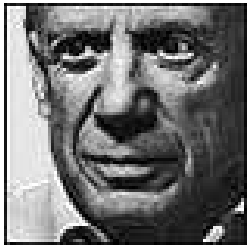
Low Power & Energy Harvesting

Localization

Integration

Les ordinateurs sont inutiles…
Computers are useless…

… ils ne donnent que les réponses.
… they only give answers.



Pablo Picasso

A few questions…

- Did you do the inventory of the digital data accessible to your product?
- Could your product transmit real-time data on its usage ? On its user ?
- Could these data be valuable ? For your product ? For you ? For others ?
- Is your product linked with external data ? Are these data streams socialized (Linked to external events or data or people)
- Could or would you react to your or external data to improve your product or service ?

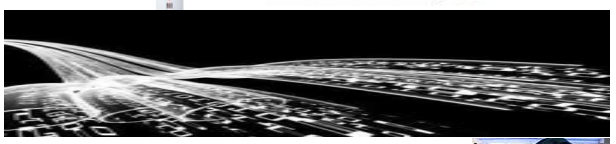
- How would I respect the privacy of my customer ?
- Would your product still comply with your Ethics ?

… applied to a…

- Did you do the inventory of the digital data accessible to your product?
- Could your product transmit real-time data on its usage ? On its user ?
- Could these data be valuable ? For your product ? For you ? For others ?
- Is your product linked with external data ? Are these data streams socialized (Linked to external events or data or people)
- Could or would you react to yo… external data to impro… or service ?
- How wou… …vacy of my customer …
- Would your product still comply with your Ethics ?

Power On/Off

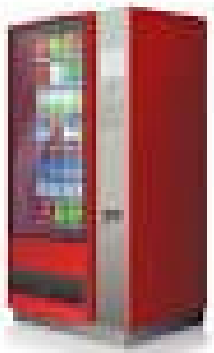
…



Leti Creativity offer

Privacy?

… applied to a…



Services,
Value

- Video surveillance
- Comarketing
- Wifi access sharing

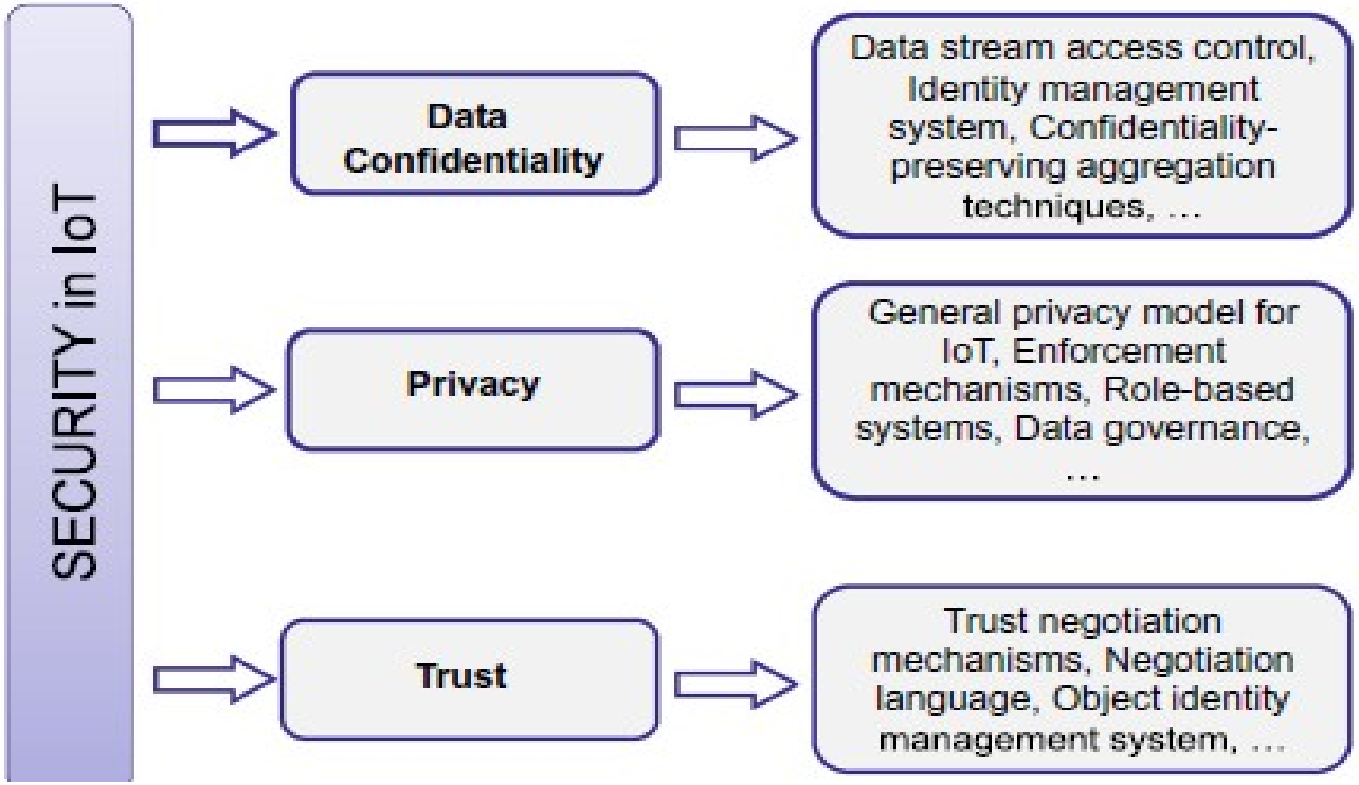
- Customer satisfaction measurement
- Analytical marketing
- SmartCity integration

- Web Localization
- Referencing in mapping systems
- Social web payment
- Anticipation of consumption /events

- Preventive maintenance
- Optimization of refilling process

Sensors, Data communication

Security in IoT



Data on User | Data on Usage

IoT functions

Applications

Internet

Power and performance

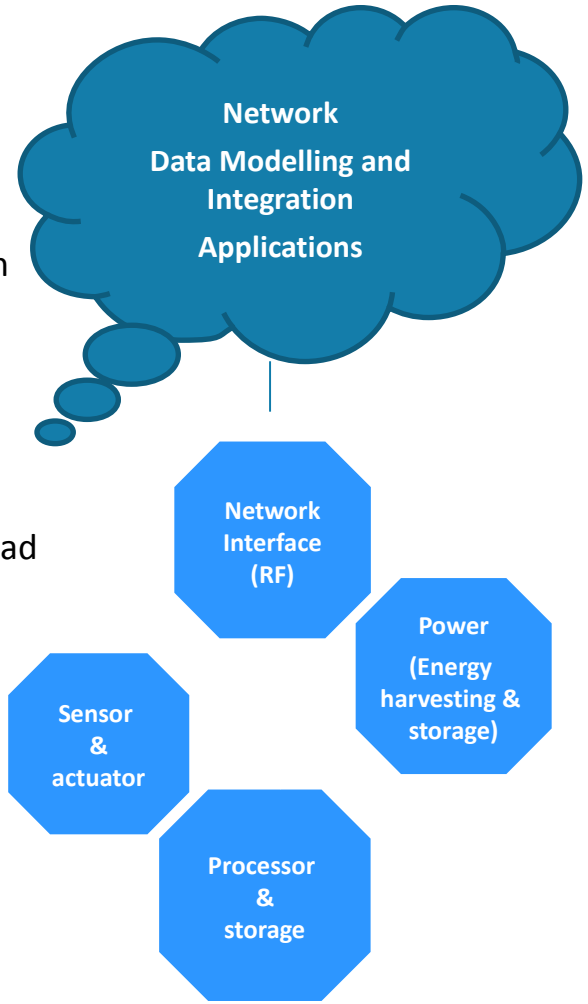
Leti contributes to Optimize & Enhance value by:

Autonomously,
Discreetly,
Sense & Control,
Securely Communicate,
Connect,
Things

Real World

IoT technology ruptures in LETI

- Autonomous / Power efficient:
  - More efficient and powerful devices with new silicon and assembly technologies (FDSOI, 3D, Photonics..) for things and BigData
  - Energy harvesting, management & storage
- Discreet / miniaturized:
  - Technology acceptance is directly linked to its nanoscale integration
  - Mutulalization of functions (e.g. : RF module for localization & communication (Zigbee, UWB)
- Sense&control :
  - Highly integrated NEMs/MEMs
  - Vast new sensing capabilities (THz, LabOnChip…) for a small overhead
  - New Micro-actuators
- Securely Communicate :
  - New IoT communication standards, new network topologies
  - Dedicated secure & low power protocols
  - Ensuring the integrity and anonymousness of the data
- Connect :
  - Integrate devices in a holistic approach with Cloud Services
  - Make sense from the content : data fusion
  - Enable the valorization / monetization of data and functions



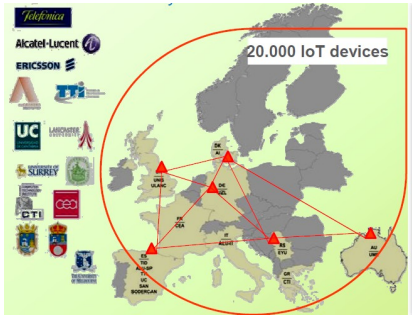
New Challenges for SmartCities

- User Interface
  - Smart environment requires ease of use and transparency to the user
  - Extensive use of RFID, BT, other low-energy wireless protocols.
- Heterogenous networks
  - Smart cities will assemble a very large number of sensors which are sharing different networks and using different protocols
  - A high level of semantic translation is required
- Security and Privacy
  - Smart Cities should provide a safer environment, resilient to ill-intentioned use and attacks
  - Pervasive, it should not jeopardize citizen privacy
- New sensing capabilities
  - The progress in the sensor capabilities and integration will generate new services and revenues
    - Pollution tracking (Gaz sensing, nano particule sensing, allergens sensing.), humidity…
    - Safety for food, water treatment
    - People /car counting, activity monitoring, structural monitoring for buildings…
- Power aware
  - Ubiquitous technology requires low power connectivity and energy harvesting capabilities
  - Interfaces and Security solutions should be power aware

SmartCities : a wide background in Leti

Smart Santander

http://www.smartsantander.eu
architectures, key enabling technologies, services and applications for IoT



Smart Santander Highlights

- Targeting:
  - Researchers
  - End users
  - Service providers
- Duration
  36 months
- Consortium
  15 Organisations
  8 EU countries + AU
- Budget / Funding
  8.67 M€ /6.69 M€
- Resources
  854.9 PM

Vitro

http://www.vitro-fp7.eu

OUTSMART

Future Internet enabled eco-system for cities.
Innovative services and applications

SCUBA

FP 7 ICT project, 8 partners . Novel architecture, services, and engineering methodologies for robust, adaptive, self-organizing, and cooperating monitoring and control systems.

SocIoTal

Creating a socially aware citizen-centric Internet of Things

Butler

http://www.iot-butler.eu/
FP7 project focused on the Internet of Things researches

ClouT: Cloud of Things

for empowering the citizen clout in smart cities

Internet of Things is laying the foundations of our future lives …

Smart Homes & Buildings

Intelligent transport system

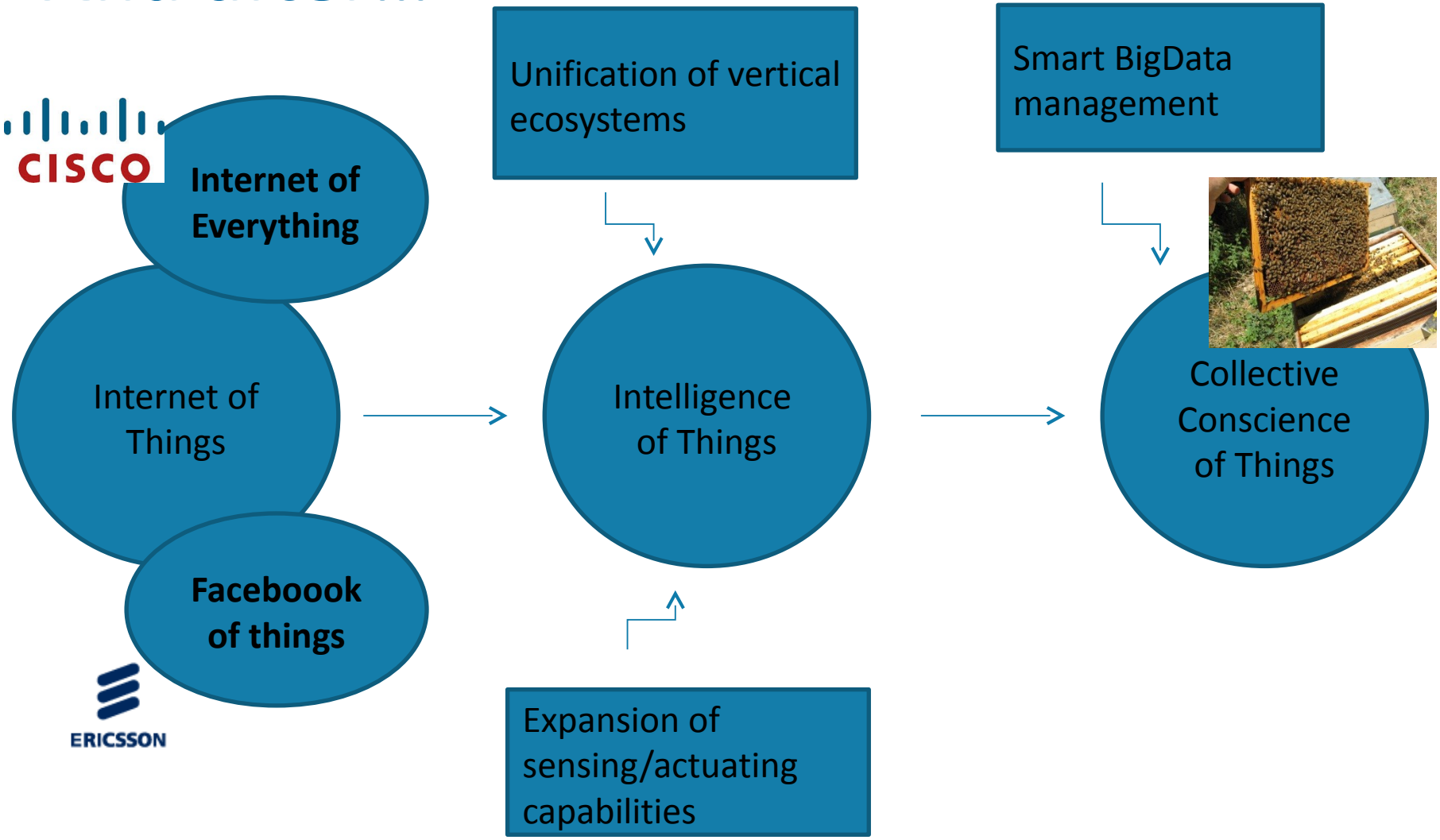
Business environment

Logistics and retail environment

Health monitoring system

… in smart environments

And after…



Conclusion : main benefits on IoT

- Leti will :
  - fuel your connected objects with disruptive technologies on the main IoT enablers :
    Power, Integration, sensing capabilities, secured communication, and sociability
  - Enable a quick and easy qualification of your products
  - Enable the generation of new services through the integration of your connected product in the IoT
  - Generate new use cases for new products

- You will :
  - Be able to design and produce better products (power consumption, efficiency, connectivity)
  - Gain an increased return on experience from your product and increased knowledge from your customers.
  - Be able to valorize your product through new cross-segment services
  - Create a stronger link with your customers

Save the date now!

www.leti.fr

leti Days

Grenoble • Paris • San Francisco • Tokyo

June 23-27, 2014 | MINATEC, **Grenoble**

leti

leti

LABORATOIRE D'ÉLECTRONIQUE
ET DE TECHNOLOGIES
DE L'INFORMATION

CEA-Leti
MINATEC Campus, 17 rue des Martyrs
38054 GRENOBLE Cedex 9
Tel. +33 4 38 78 36 25

www.leti.fr

Thank you
for your attention

DE LA RECHERCHE À L'INDUSTRIE
cea

MINATEC

INSTITUT CARNOT CEA LETI