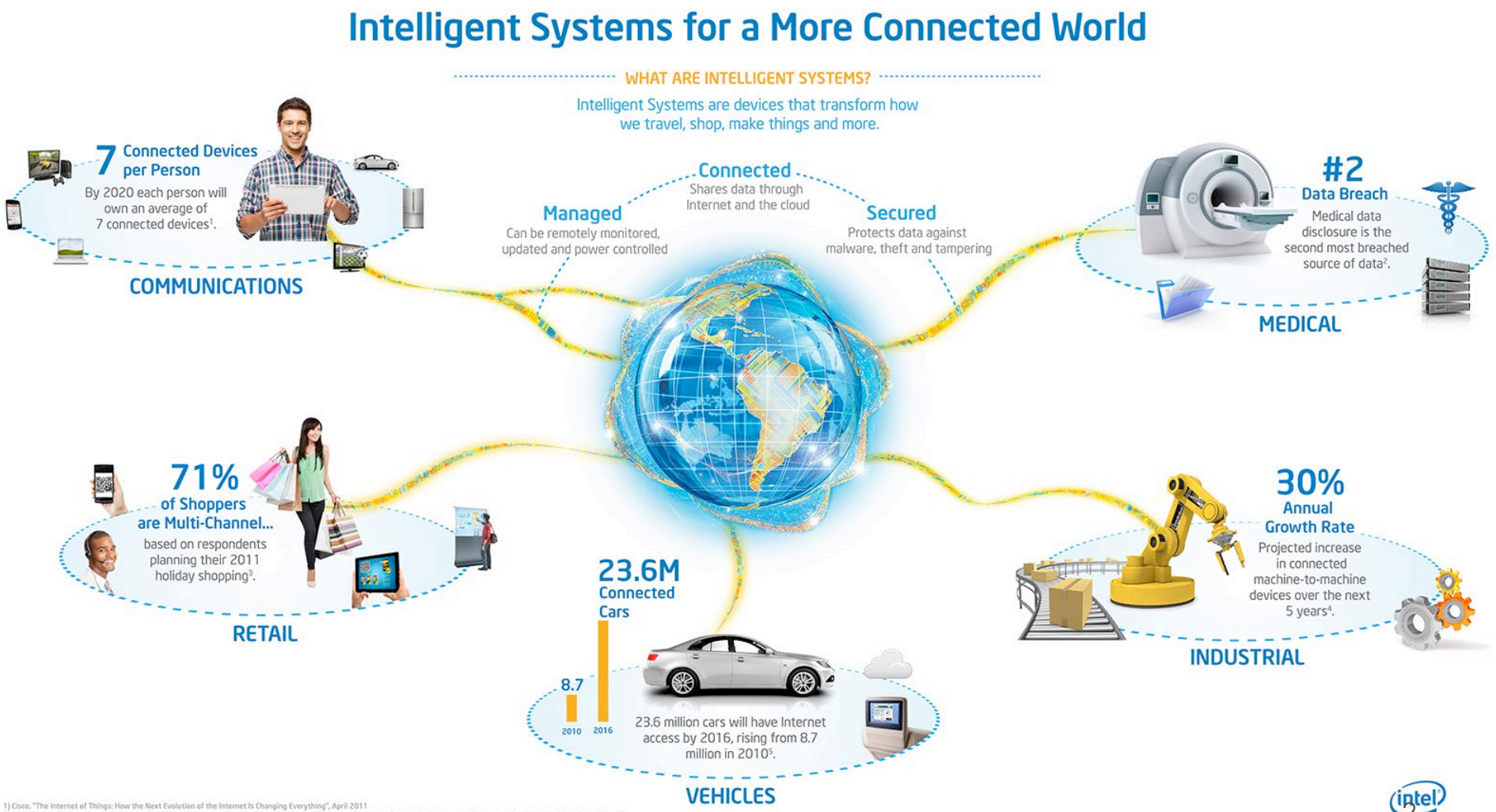
Haute école d'ingénierie et d'architecture Fribourg
Hochschule für Technik und Architektur Freiburg

INTERNET DES OBJETS

INTRODUCTION

SERGE AYER - HEIA-FR – TÉLÉCOMMUNICATIONS
CLASSES ISC-2D // 2024-2025

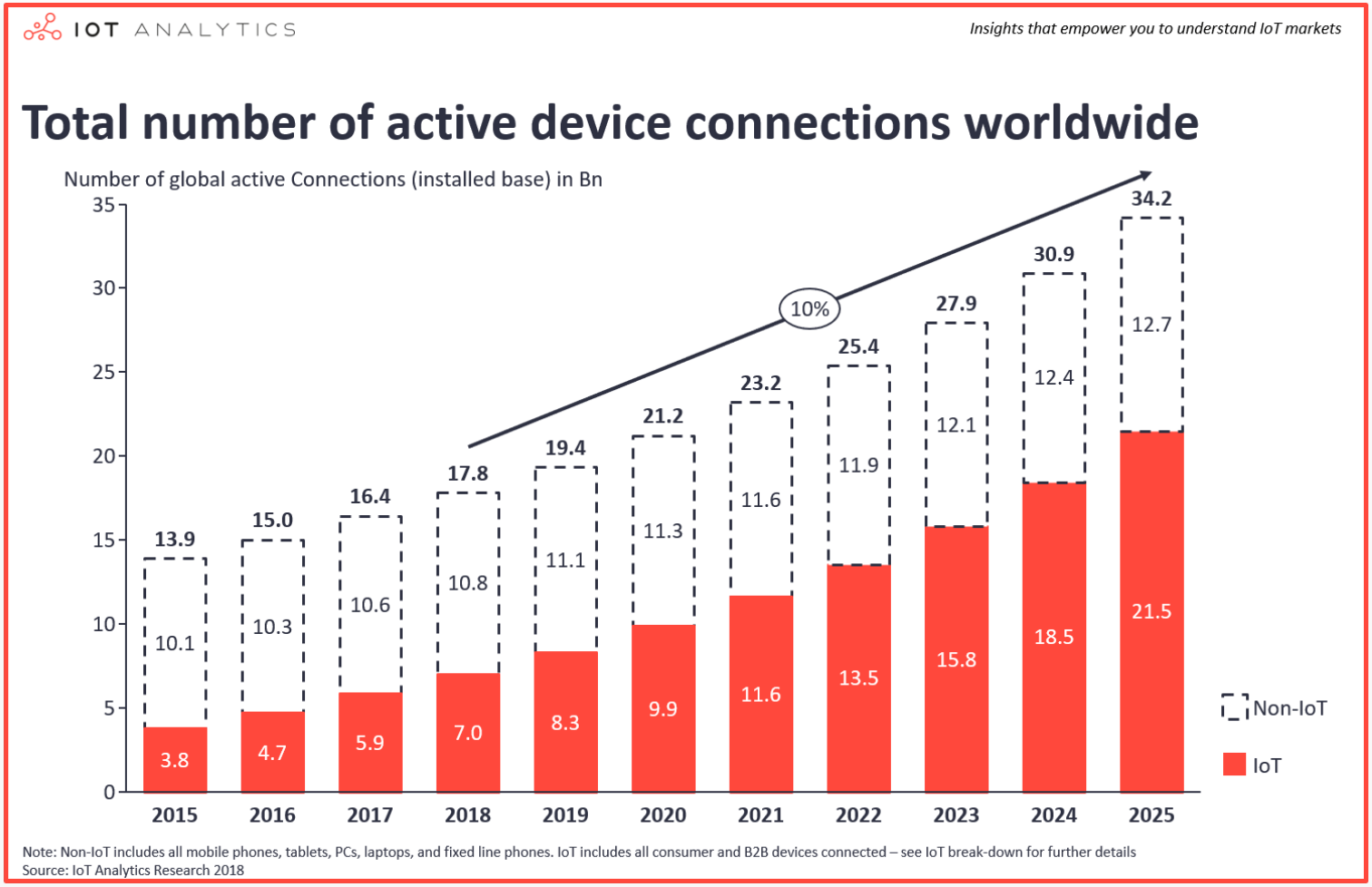
INTERNET OF THINGS



1) Cisco, "The Internet of Things: How the Next Evolution of the Internet Is Changing Everything", April 2011
2) Bloor Research, "Security challenges in the US healthcare sector" White Paper, December 2010, http://www.mcafee.com/us/resources/white-papers/wp-bloor-healthcare-security.pdf
3) Deloitte U.S., 2011 Annual Holiday Survey, http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/Consumer%20Business/us_retail_AnnualHolidaySurvey_2011_pr_102611.pdf
4) McKinsey Global Institute analysis, "Big data: The next frontier for innovation, competition, and productivity", June 2011)
5) Wall Street Journal, http://online.wsj.com/article/SB10001424052702304066504576349763614933844.html, estimate from research firm, Frost & Sullivan

intel Intelligent Systems

INTERNET OF THINGS



Source: Iot analytics.com

INTERNET OF THINGS: THE CONCEPT

- Internet:
  - Send and/or receive information
  - To other objects or machines
- Thing:
  - Designed for a precise goal: has a function as an object
  - Is usually not multipurpose
  - Can sense and control (through sensors and actuators)
  - Can be a human being (equipped with sensors)

INTERNET OF THINGS: SOME EXAMPLES

- Connected scales (Withings, Fitbit, …)
  - Records the weight and other health indicators
  - Object = scale, with its main function
  - Sensor = weight and other body sensors
  - Actuator = screen
  - Online dashboard for health indicators tracking

INTERNET OF THINGS: SOME EXAMPLES

- Plant sensor (Gardena, others)
  - Monitors the parameters for optimal plant growth
  - Object has no other function
  - Sensors = soil moisture, sunlight, infrared light, ambient temperature
  - Actuators = light
  - Online dashboard with plant care advice (using a large plant database)

INTERNET OF THINGS: SOME EXAMPLES

- The IT bed

INTERNET OF THINGS: SOME EXAMPLES

- Home automation
  - Records and monitors parameters in your home
  - Function depending on the object
  - Sensors = moisture, sunlight, ambient temperature, air quality
  - Actuators = visualisation of some parameters
  - Remote access for monitoring and control, connection to online services

INTERNET OF THINGS: APPLICATIONS

- Tracking
  - Automatic car tracking (Dash)
  - DHL's IoT tracking and monitoring (for improved logistics)
- Industry
  - Cisco's Connected Factory
- Smart metering
  - Metering of billions of devices.
  - Analytics service for end-users that allows controlled access and exposure of data.
  - Working on cellular and non-cellular networks.
- Internet of Medical Things
  - Facilities for collecting and processing data coming from medical devices.
  - For improved diagnostics and therapeutics.

WHY NOW ?

- Cost of electronic components and computing (Moore's law)
  - What cost 1500 $ in 1980 costs < 0.5 $ in 2024
  - Add processing power and connectivity to an object is more of a design choice than an economical choice
- Processors and connectivity are integrated in almost any device

WHY NOW ?

- Web2.0:
  - Information can now be shared and processed on the cloud, which is a distributed environment
  - More and more services are offered online
  - API may be provided such that different services may be provided on different interfaces and devices

EVOLUTION AND TECHNOLOGICAL BARRIERS

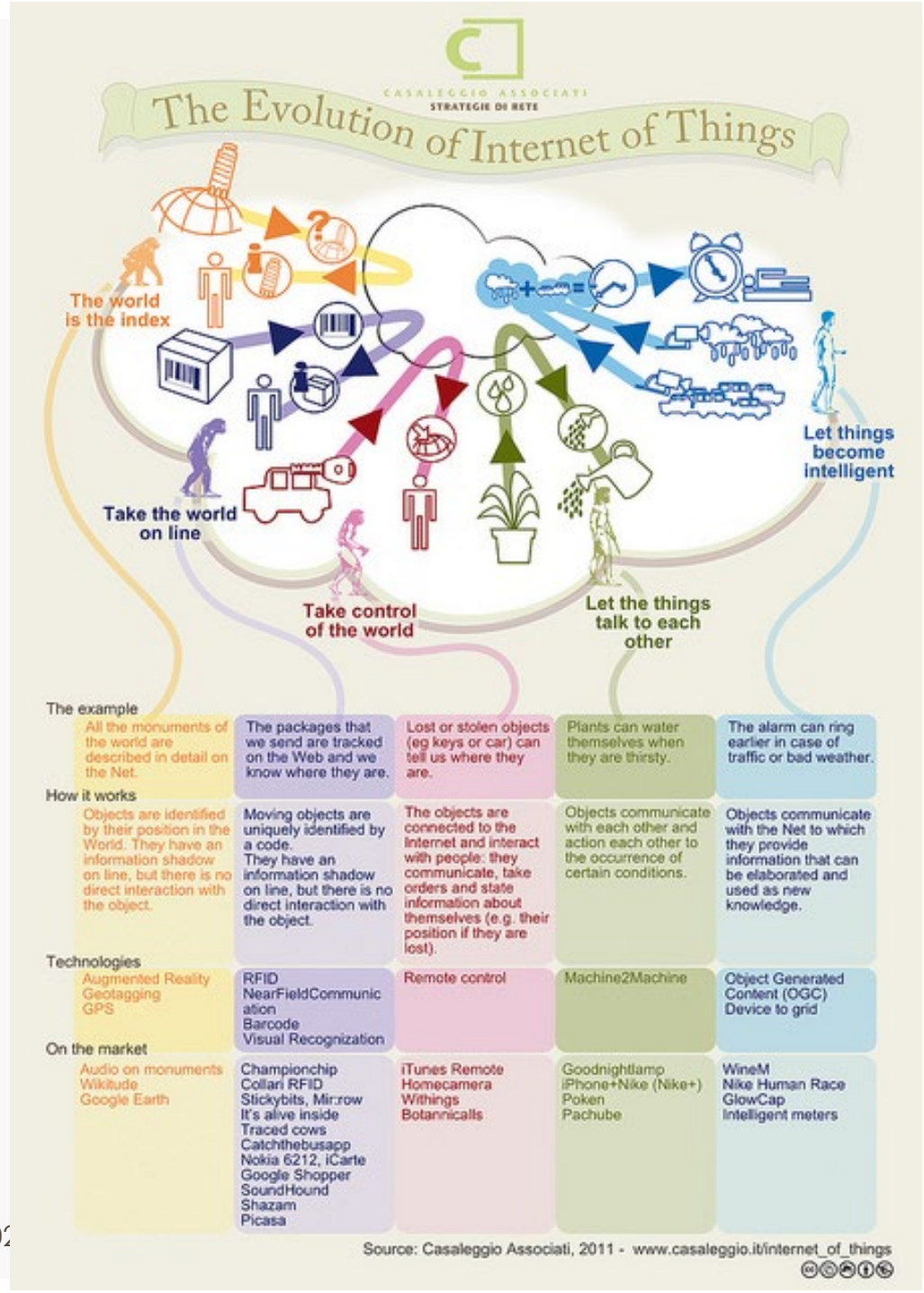
- > 15 mia connected objects in 2023
- Forecast for 2025: > 21 mia
- What is required for this to happen:
  - The technology must become invisible
  - More and more complex objects that are simpler and simpler to use

EVOLUTION AND TECHNOLOGICAL BARRIERS

- Domains for technology improvements
  - Connectivity
  - Improved power consumption
  - Security
  - Complexity

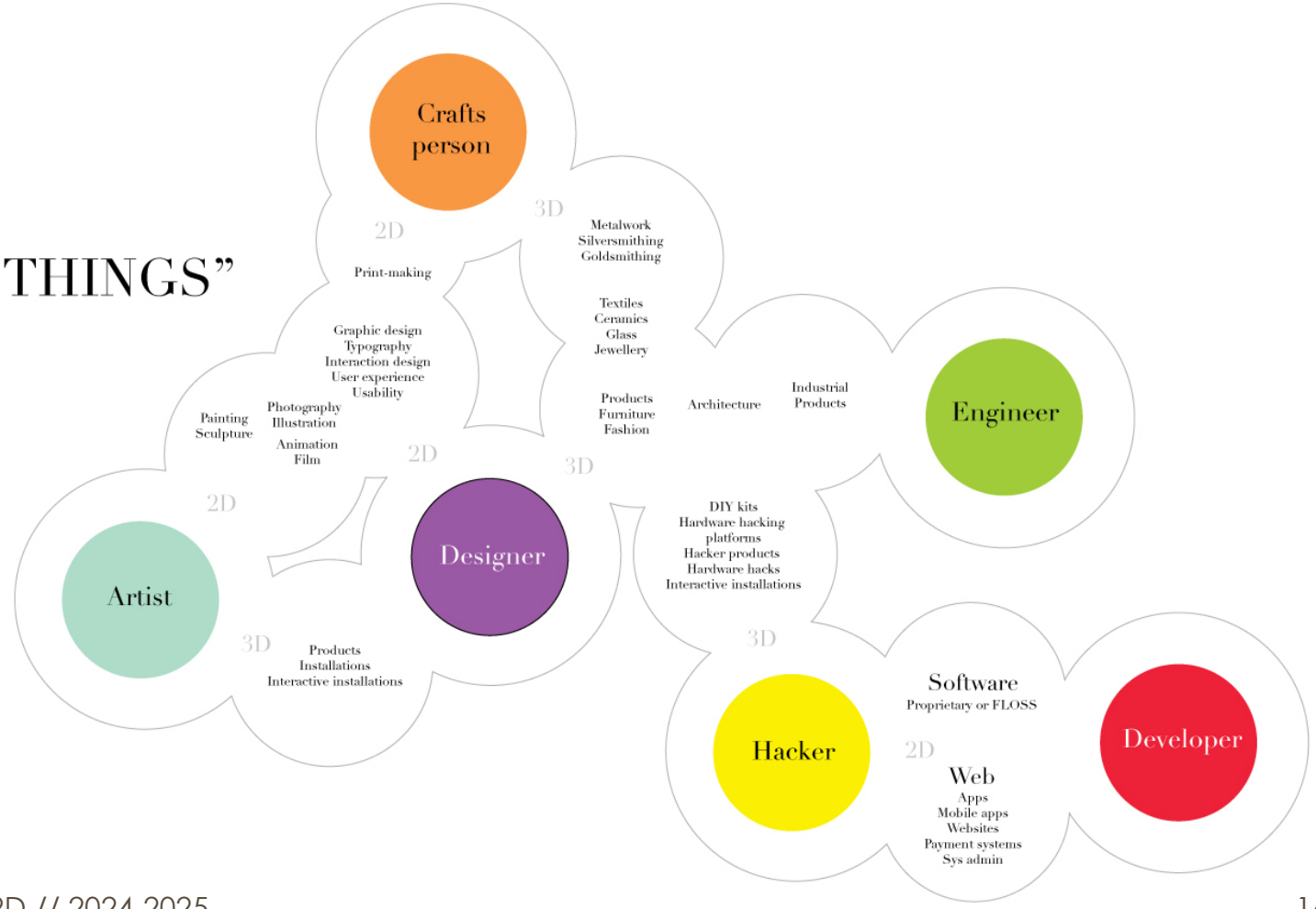
KEY SUCCESS FACTORS

- Connected objects will change the way we live, work and have fun
- Criteria for the adoption by a wide number of users
  - Improved security
    - E.g. improved driving experience
  - Improved ecological impact
    - E.g. improved energy management
  - Improved health
    - E.g. improved physiological parameter tracking
  - Improved decision making
    - E.g. improved traffic management


CASALEGGIO ASSOCIATI
STRATEGIE DI RETE
The Evolution of Internet of Things
The world is the index
Take the world on line
Take control of the world
Let the things talk to each other
Let things become intelligent
The example
All the monuments of the world are described in detail on the Net.
The packages that we send are tracked on the Web and we know where they are.
Lost or stolen objects (eg keys or car) can tell us where they are.
Plants can water themselves when they are thirsty.
The alarm can ring earlier in case of traffic or bad weather.
How it works
Objects are identified by their position in the World. They have an information shadow on line, but there is no direct interaction with the object.
Moving objects are uniquely identified by a code. They have an information shadow on line, but there is no direct interaction with the object.
The objects are connected to the Internet and interact with people: they communicate, take orders and state information about themselves (e.g. their position if they are lost).
Objects communicate with each other and action each other to the occurrence of certain conditions.
Objects communicate with the Net to which they provide information that can be elaborated and used as new knowledge.
Technologies
Augmented Reality
Geotagging
GPS
RFID
NearFieldCommunication
Barcode
Visual Recognization
Remote control
Machine2Machine
Object Generated Content (OGC)
Device to grid
On the market
Audio on monuments
Wikitude
Google Earth
Championchip
Collari RFID
Stickybits, Mir:row
It's alive inside
Traced cows
Catchthebusapp
Nokia 6212, iCarte
Google Shopper
SoundHound
Shazam
Picasa
iTunes Remote
Homecamera
Withings
Botannicalls
Goodnightlamp
iPhone+Nike (Nike+)
Poken
Pachube
WineM
Nike Human Race
GlowCap
Intelligent meters
Source: Casaleggio Associati, 2011 - www.casaleggio.it/internet_of_things

WHO WILL PARTICIPATE TO IT ?

"I MAKE THINGS"



REQUIRED COMPETENCIES

- Network of designers, artists, craft persons, engineers and developers
- Engineers and developers
  - Hardware
    - Object design
    - Embedded systems
  - Software
    - Web development (client/server)
    - Embedded software
    - Mobile development
    - Data and signal processing
  - Inventivness and creativity