# Technologies for Internet of Things

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# Trends in Computing Technology

**1970s**

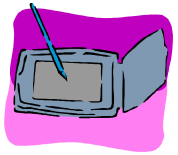
**Many persons 1 computer**

**1990s**

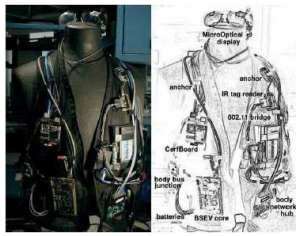
**1 person 1 computer**

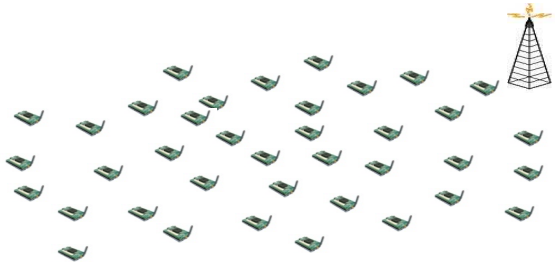
**2000**

**1 person many computers**



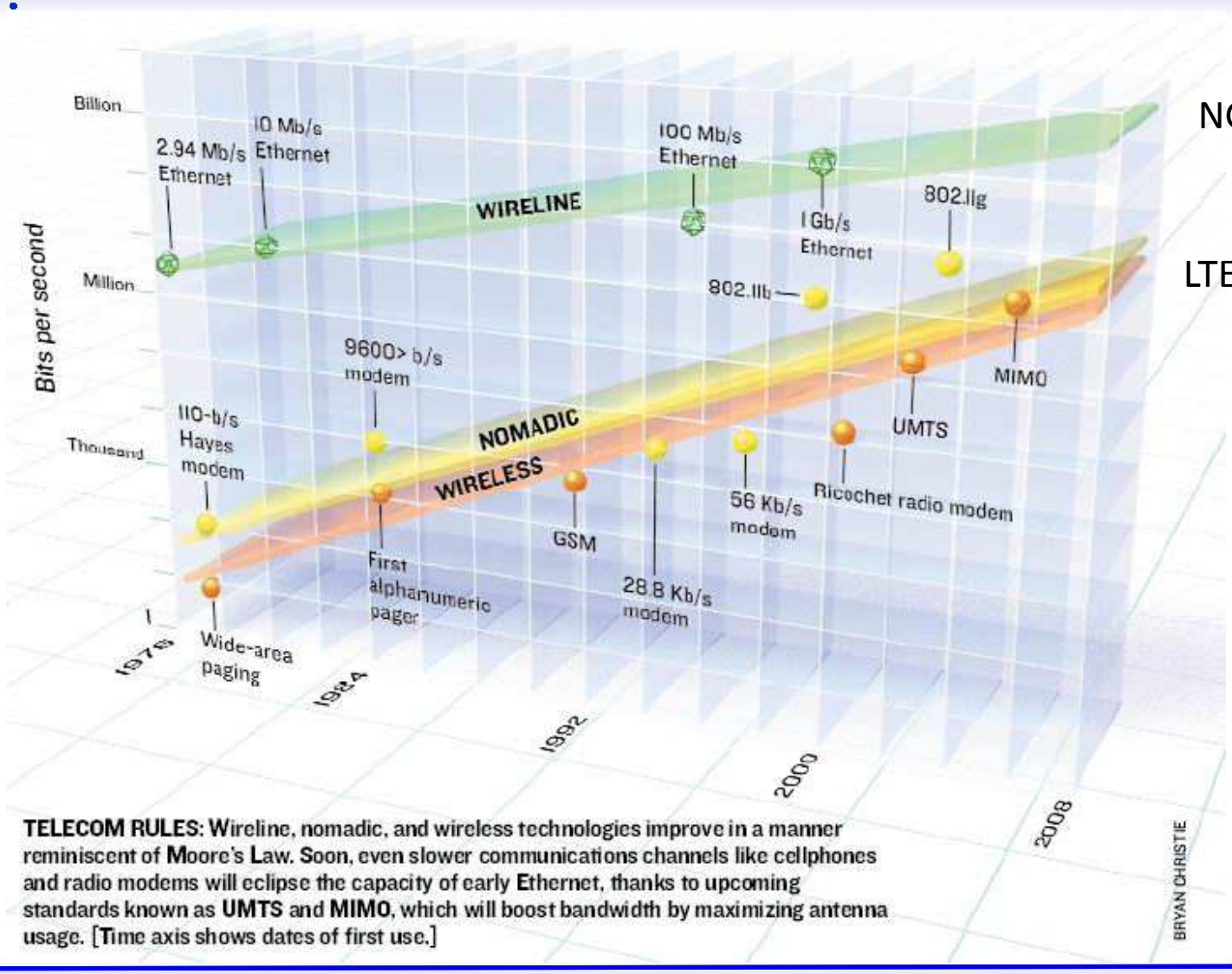
**Today**





**Tomorrow ?**

# Trend in TLC technology

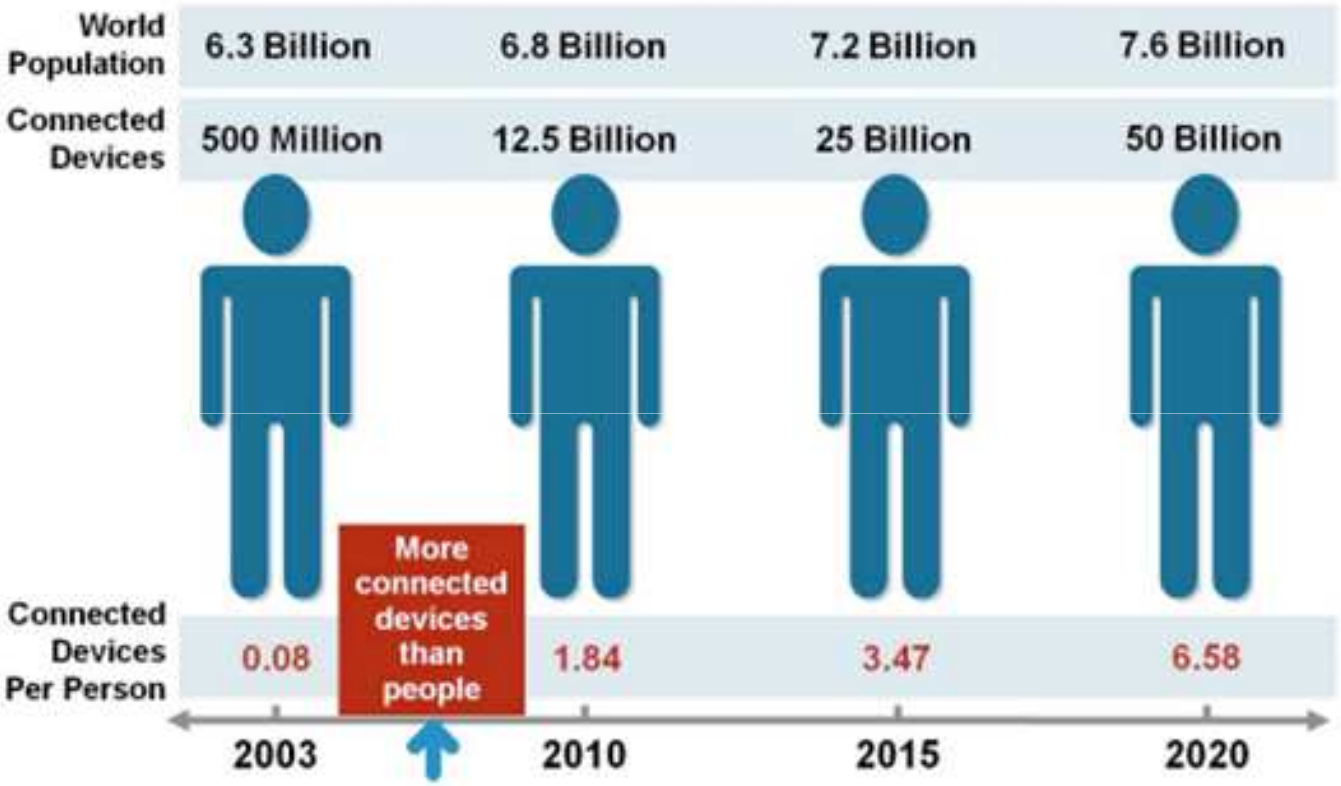



**TELECOM RULES:** Wireline, nomadic, and wireless technologies improve in a manner reminiscent of **Moore's Law.** Soon, even slower communications channels like cellphones and radio modems will eclipse the capacity of early **Ethernet**, thanks to upcoming standards known as **UMTS** and **MIMO**, which will boost bandwidth by maximizing antenna usage. [Time axis shows dates of first use.]

NGAN

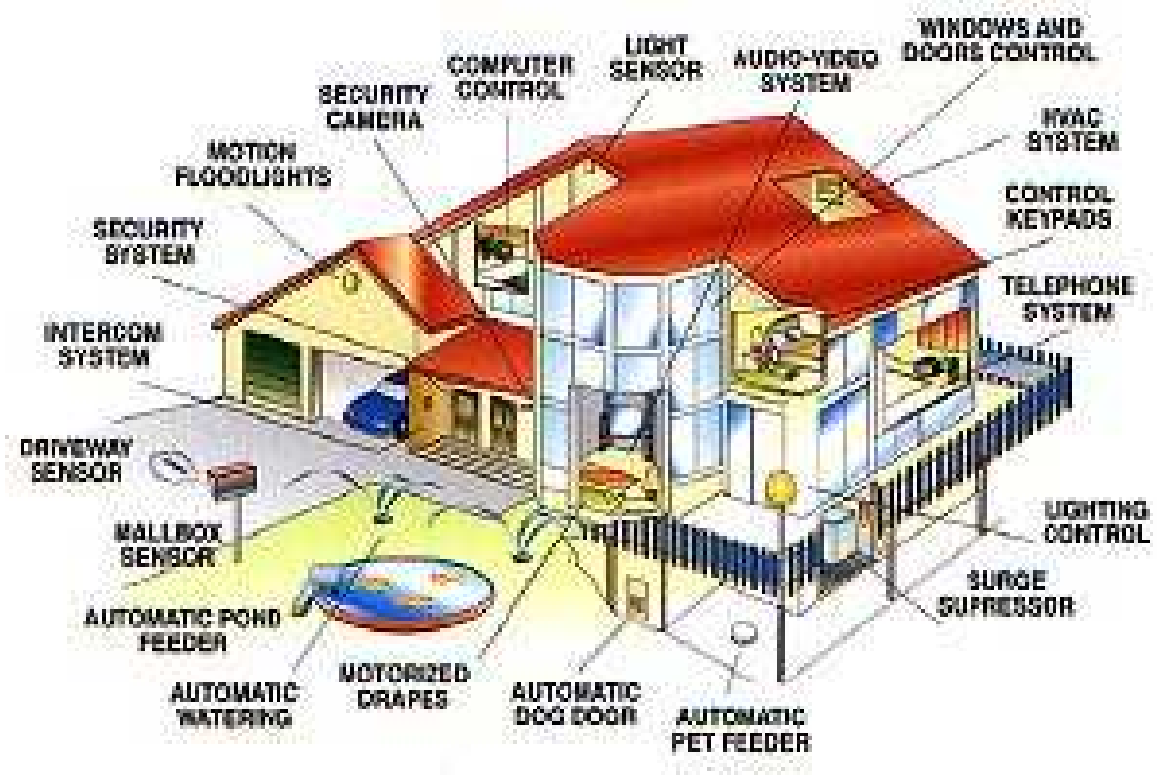
LTE

# Internet of Things – 1




Source: Cisco IBSG, April 2011

# Internet of Things – 2




Home of the future

# Infomobility

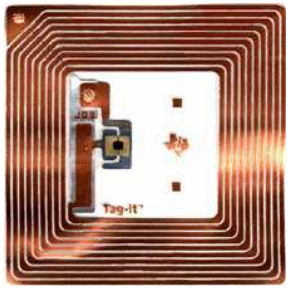
# Objects Identification Technologies


General Product Type identifier


Electronic shelf label

QR- Quick Response

## RFID




Passive RFID

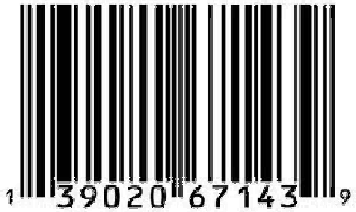

Semi-passive RFID


Active RFID

# Electronic Product Code (EPC)

In 1999 at the **Auto-ID Center** of the Massachussets Institute of Technology, the **EPC (Electronic Product Code)** was born.

Massachusetts Institute of Technology



*The barcode technology allows to item topology identification .*

*The EPC allows **single** item identification.*

01.0000A4F.001AD.000000001

- **HEADER** (8 bit)
- **EPC MANAGER** (28 bit)
- **OBJECT CLASS** (24 bit)
- **SERIAL NUMBER** (36 bit)

- HEADER defines the EPC length (from 64 to 256 bits).
- EPC MANAGER indicates tag producer
- OBJECT CLASS indicates tag topology
- SERIAL NUMBER indicates the unique identification number for each tag

# Near Field Communication (NFC)

**The Near Field Communication (NFC) was born from RFID system with the aim to create a reliable communication among two nearby devices (distance<10 cm).**

- **Working frequency=13.56 MHz (HF)**
- **Both devices can transmit «Active mode»**
- **Only one device transmits «Passive mode»**

***Applications***

*NFC pairing*
*(peer-to-peer communication)*

*As alternative to QR codes*


*NFC card*
*(payment, ticketing, access control)*

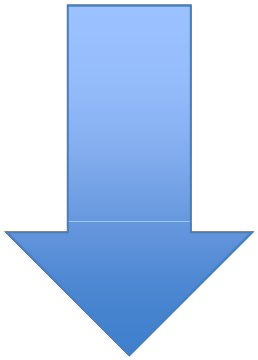
*NFC reader*
*(local data)*

# Testing RFID Systems


# Wireless Innovation Lab

## System Prototyping and Industrial Optimization

# Data acquisition by distributed sensors



# Analysis of Big Data