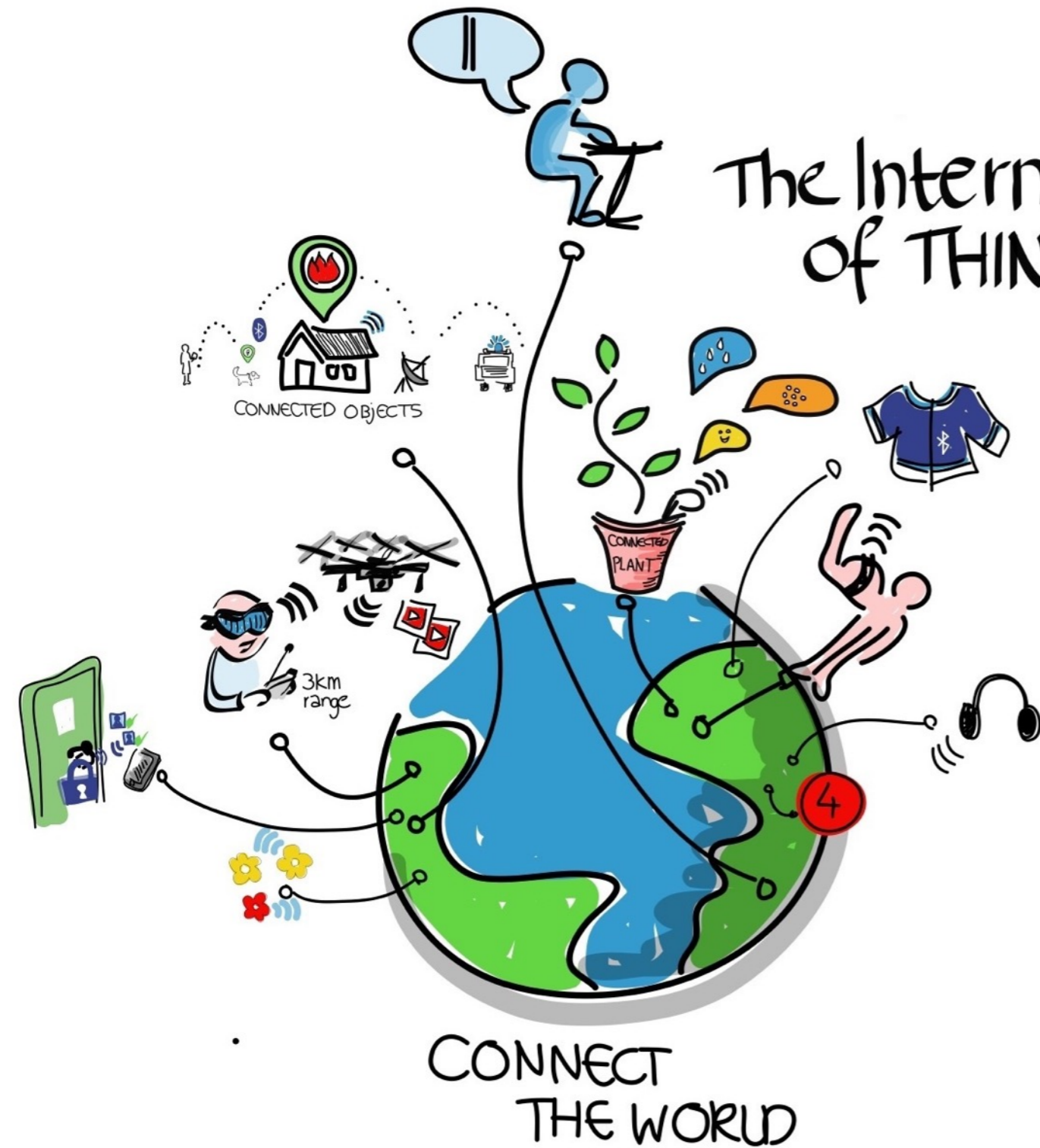
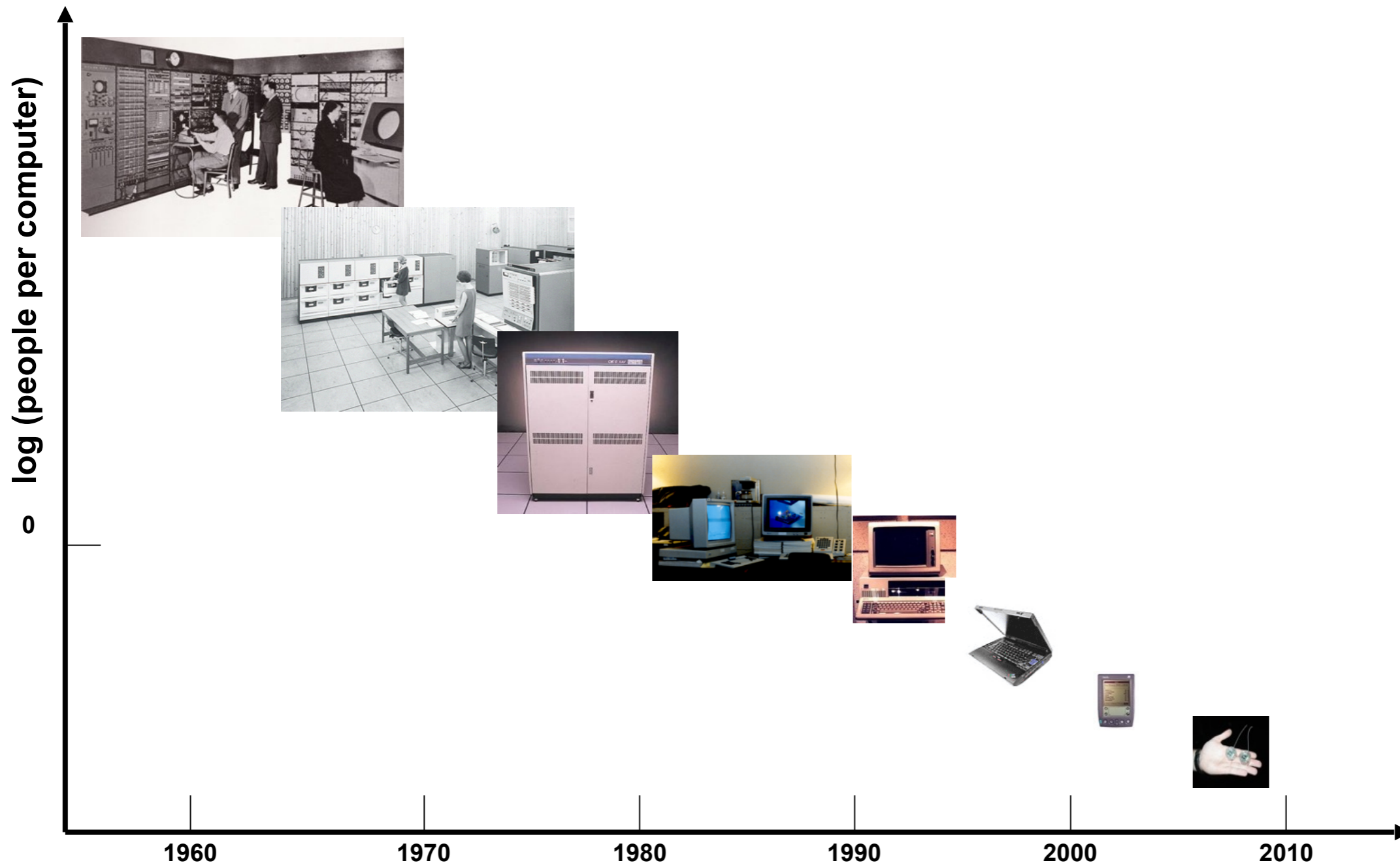


The Internet of THINGS



Marco Zennaro, PhD
T/ICT4D Laboratory
The Abdus Salam International Centre for
Theoretical Physics

Vision for IoT

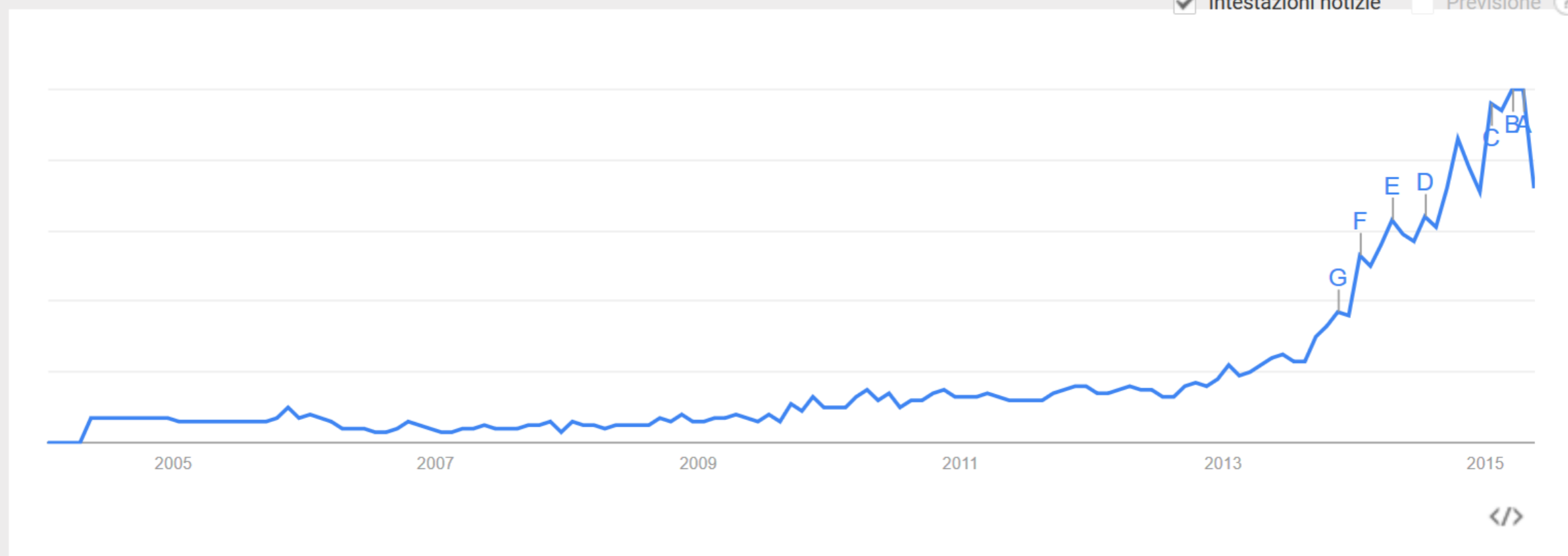


[Culler:2004]

Google Trends for IoT

Interesse nel tempo ?

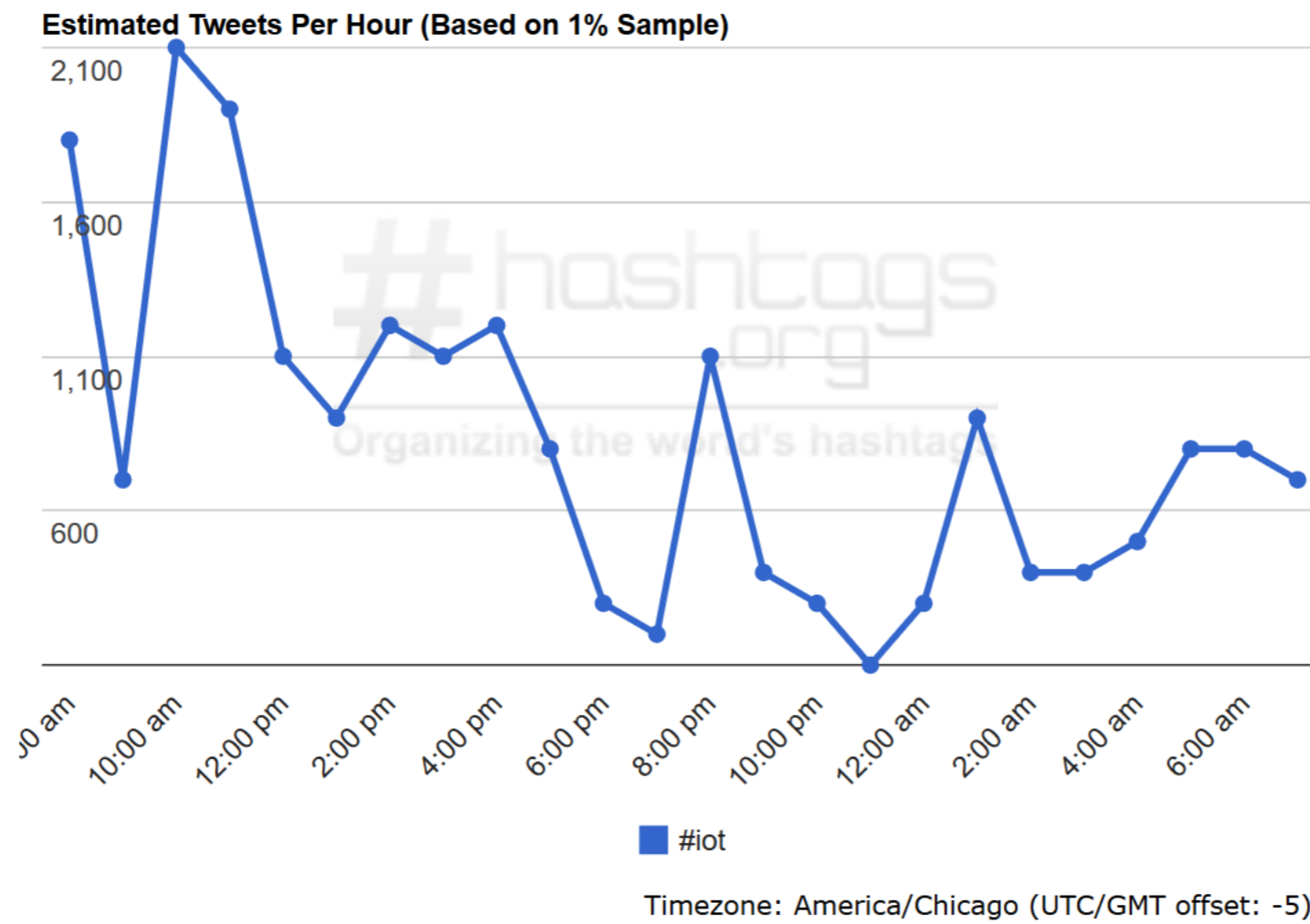
Intestazioni notizie Previsione ?




Twitter #IoT

#iot 24-Hour Trend Graph

[Upgrade Analytics](#)



Connected Devices



In 2014 nearly **2 billion** connected devices will be shipped

This number will grow to nearly **8 billion** devices for the year 2020

**Not including mobile phones*

Home (Consumer)

3,745.71 (Devices millions)

Transport (Mobility)

392.72 (Devices millions)

Body (Health)

360.03 (Devices millions)

Buildings (Infrastructure)

1,726.59 (Devices millions)

Cities (Industry)

1,524.70 (Devices millions)

IoT definition

- **Wikipedia**: The Internet of Things (IoT) refers to **uniquely identifiable objects** and their virtual representations in an **Internet-like structure**.

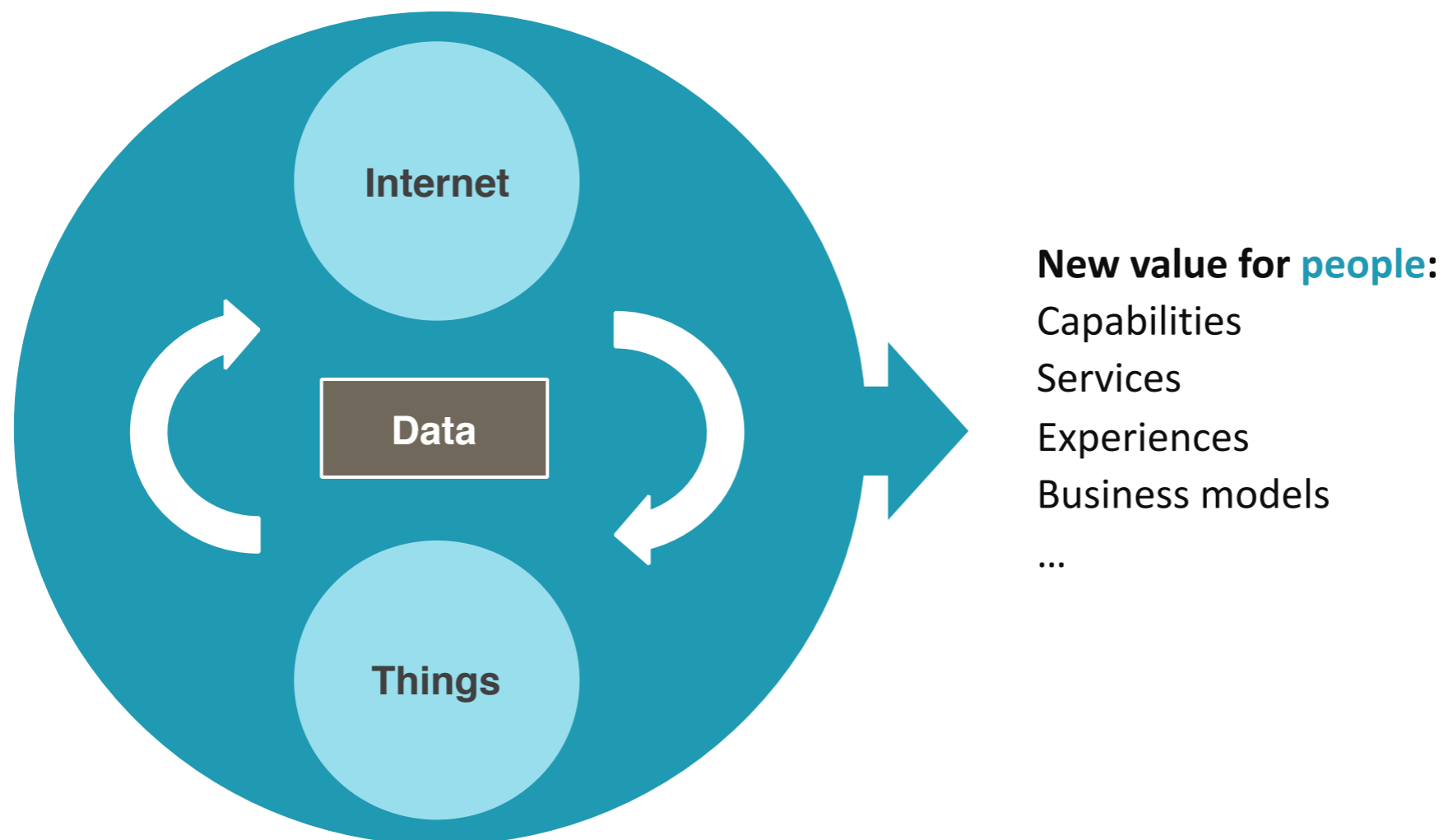
[http://en.wikipedia.org/wiki/Internet_of_things - 21-Jun-2014]

- **Cisco**: The Internet of Things (IoT) is the network of physical objects accessed through the Internet, as **defined by technology analysts and visionaries**. These objects contain **embedded technology to interact** with internal states or the external environment. In other words, when objects can sense and communicate, it changes how and where decisions are made, and who makes them.

[<http://www.cisco.com/web/solutions/trends/iot/overview.html> - 21-Jun-2014]

What is IoT

- The IoT is more than connecting things to the internet, it's about bridging the physical and digital worlds **to create value for people**



What is IoT ?

Internet + **Things** + Data

Things

These **nodes** are highly constrained in terms of

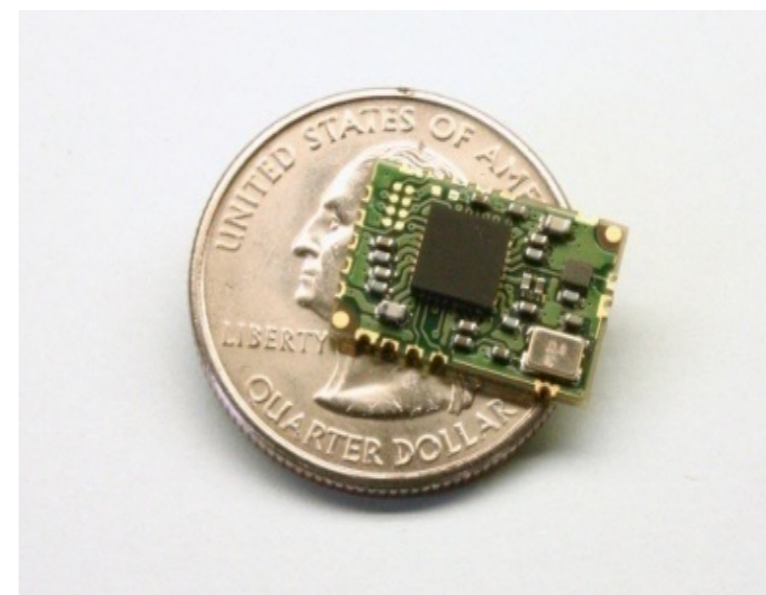
Physical size

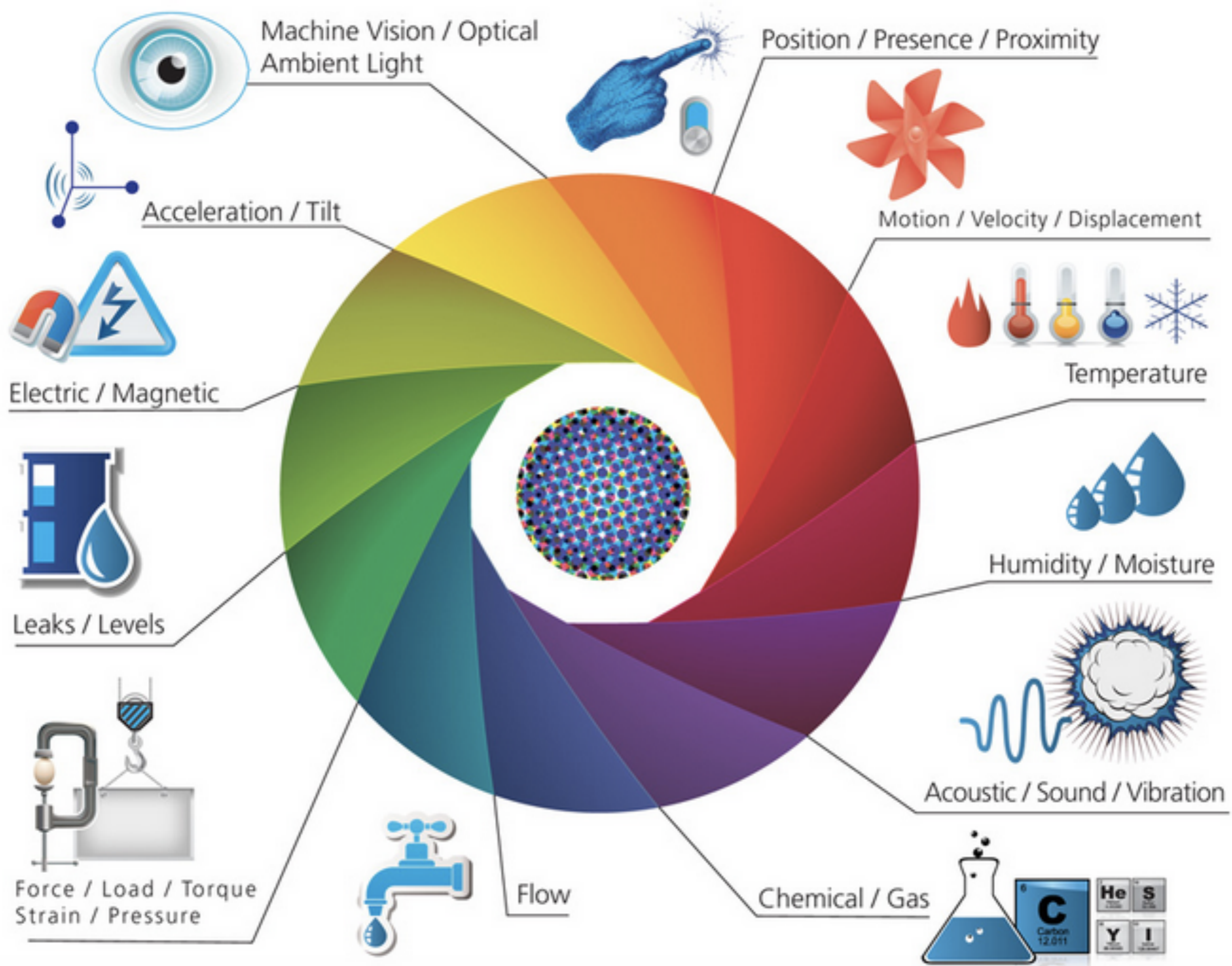
CPU power

Memory (few tens of kilobytes)

Bandwidth (Maximum of 250 KB/s, lower rates the norm)

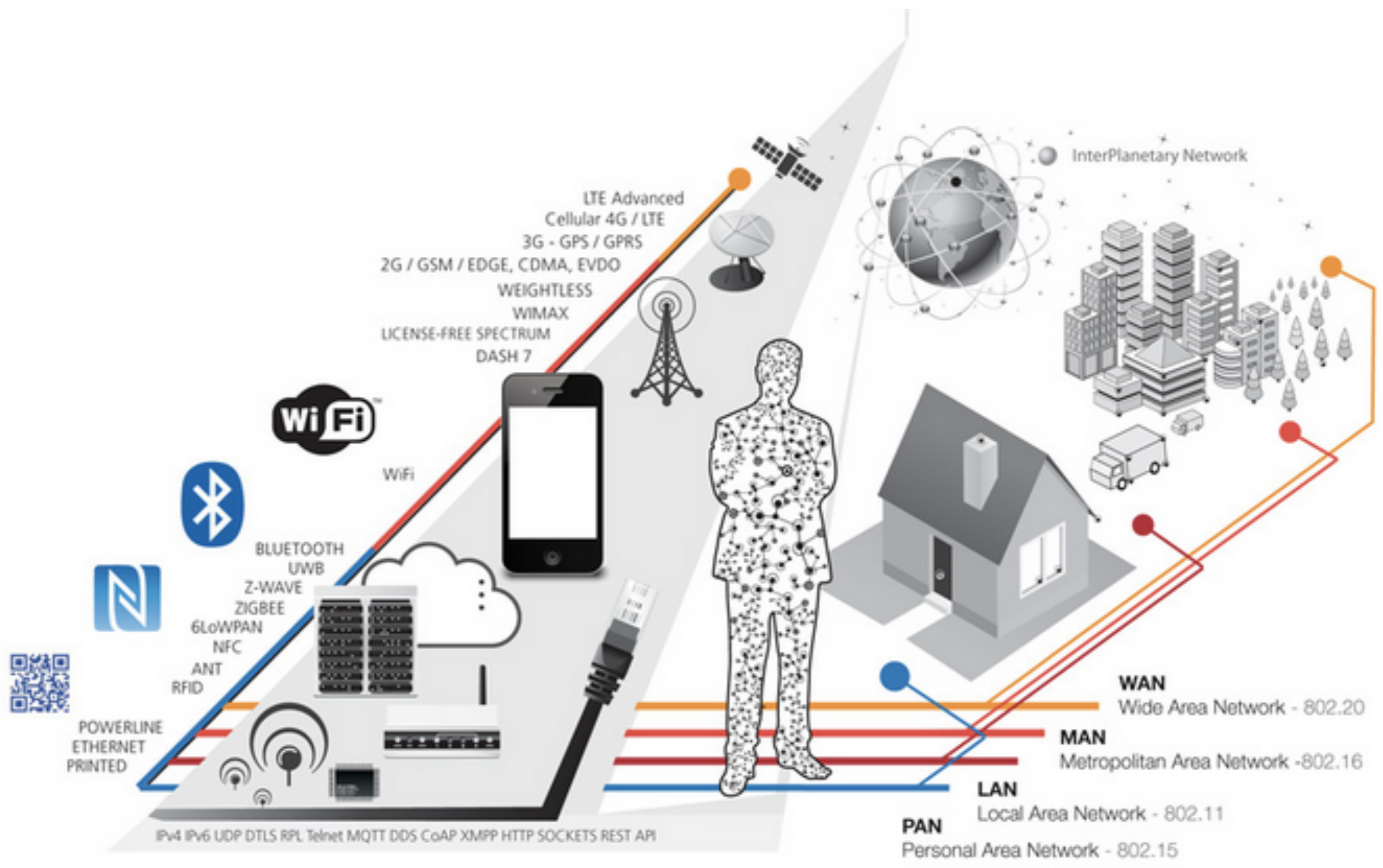
Power consumption is critical, if battery powered then energy efficiency is paramount





What is IoT ?

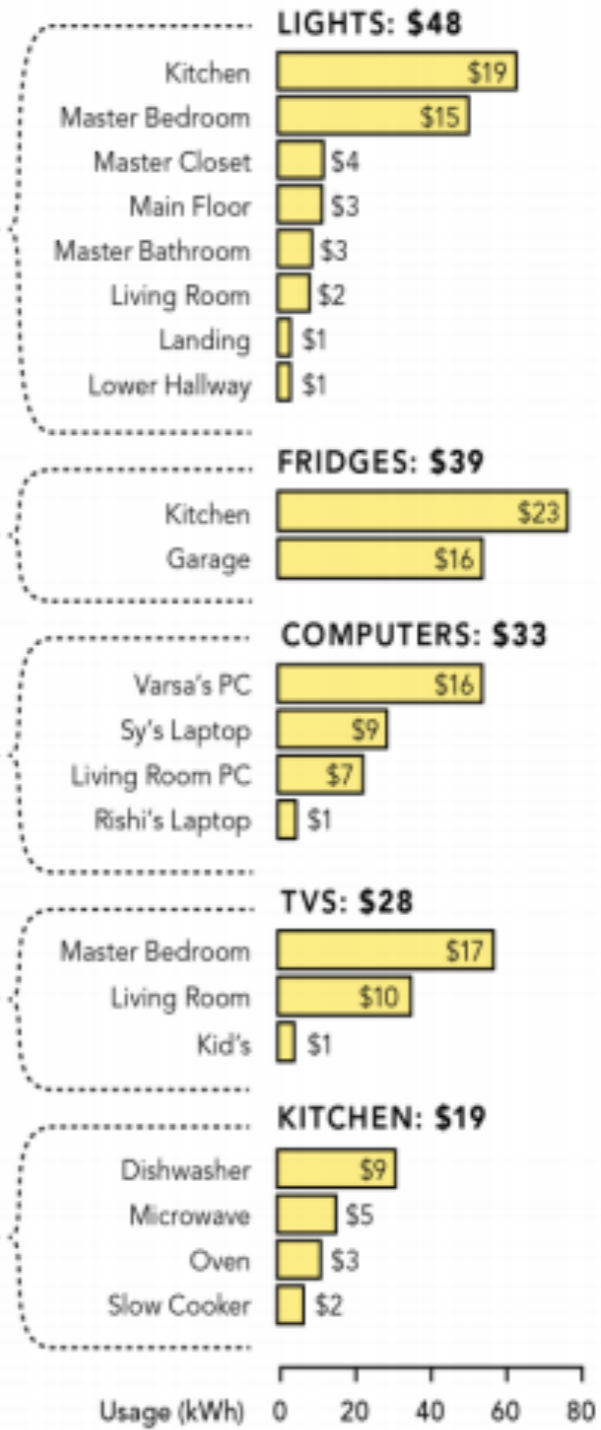
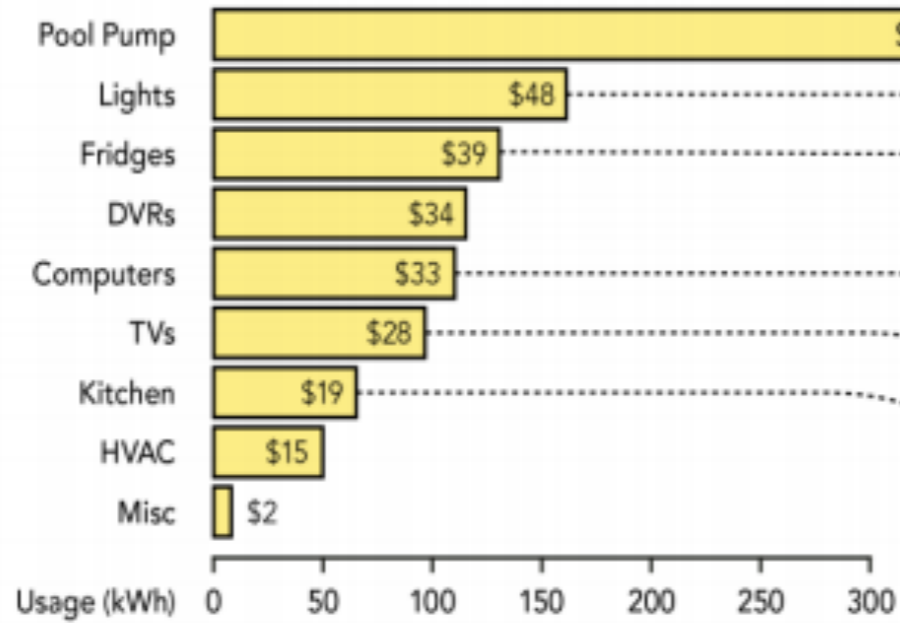
Internet + Things + Data



What is IoT ?

Internet + Things + **Data**

ELECTRICITY: \$319



These **things** are starting to talk to each other and develop their own intelligence. Imagine a scenario where.....

This is communicated to your **alarm clock**, which allows you 5 extra minutes of sleep.



...your **meeting** was pushed back 45 minutes.



...your **car** knows it will need gas to make it to the train station. Fill-ups usually take 5 minutes.



...there was an accident on your **driving route** causing a 15 minute detour.



...your **train** is running 20 minutes behind schedule.



And signals your **car** to start in 5 minutes to melt the ice accumulated in overnight snow storms.



And signals your **coffee maker** to turn on 5 minutes late as well.

What does that mean in size?

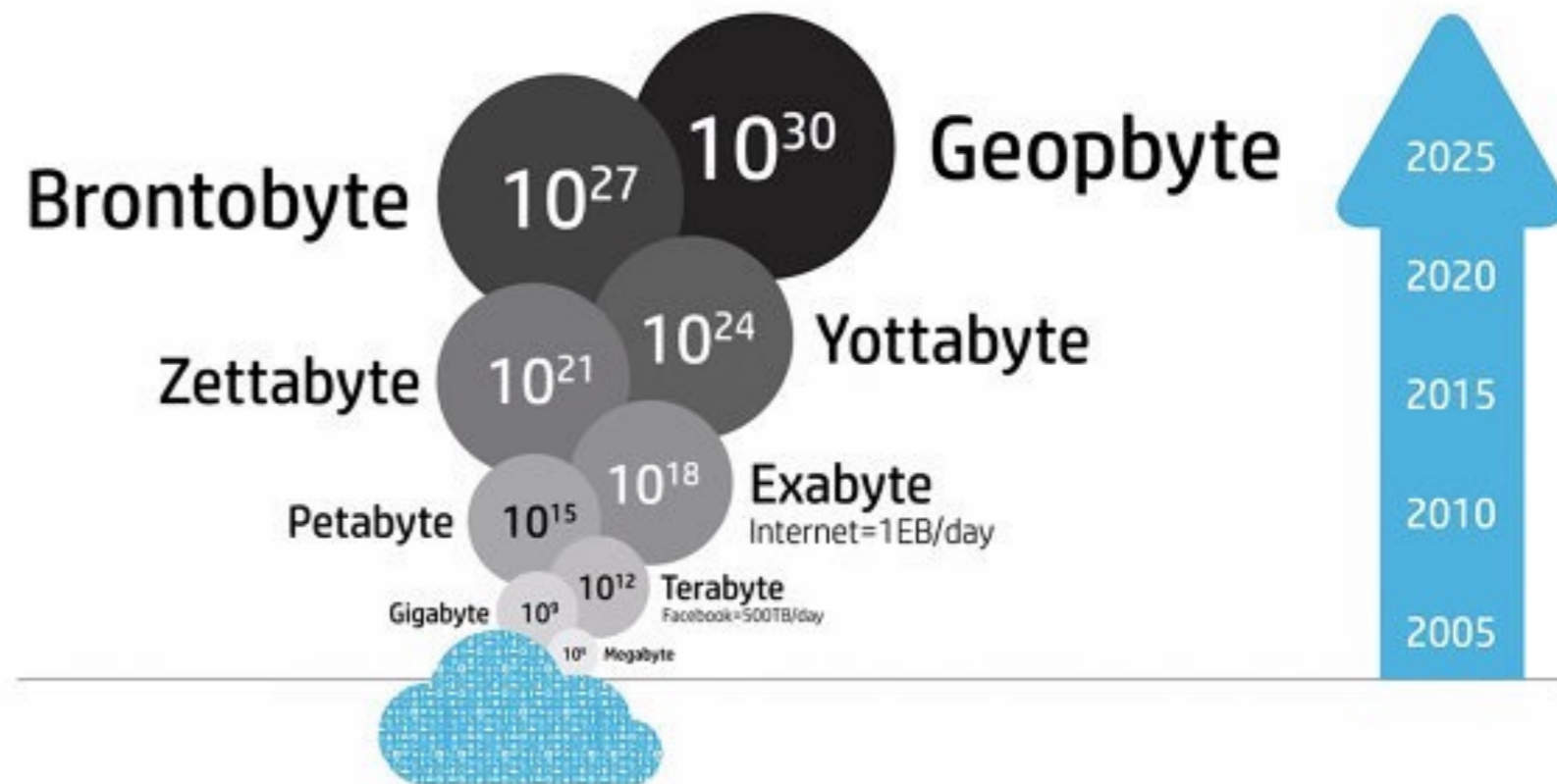
Not gigabytes

Most likely not a few terabytes

Possibly not 10's of terabytes

Probably 100's of terabytes

Definitely petabytes



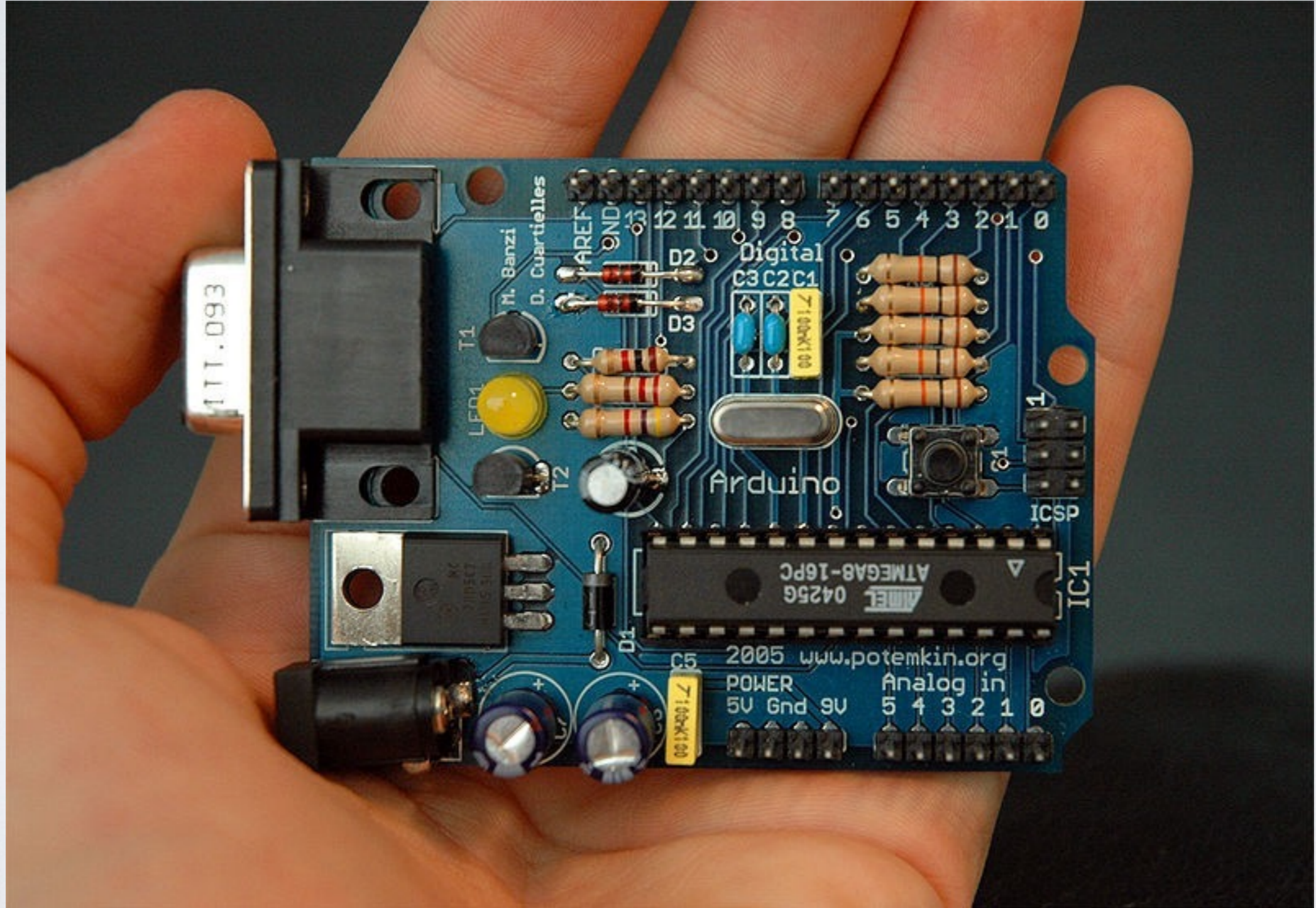
IOT



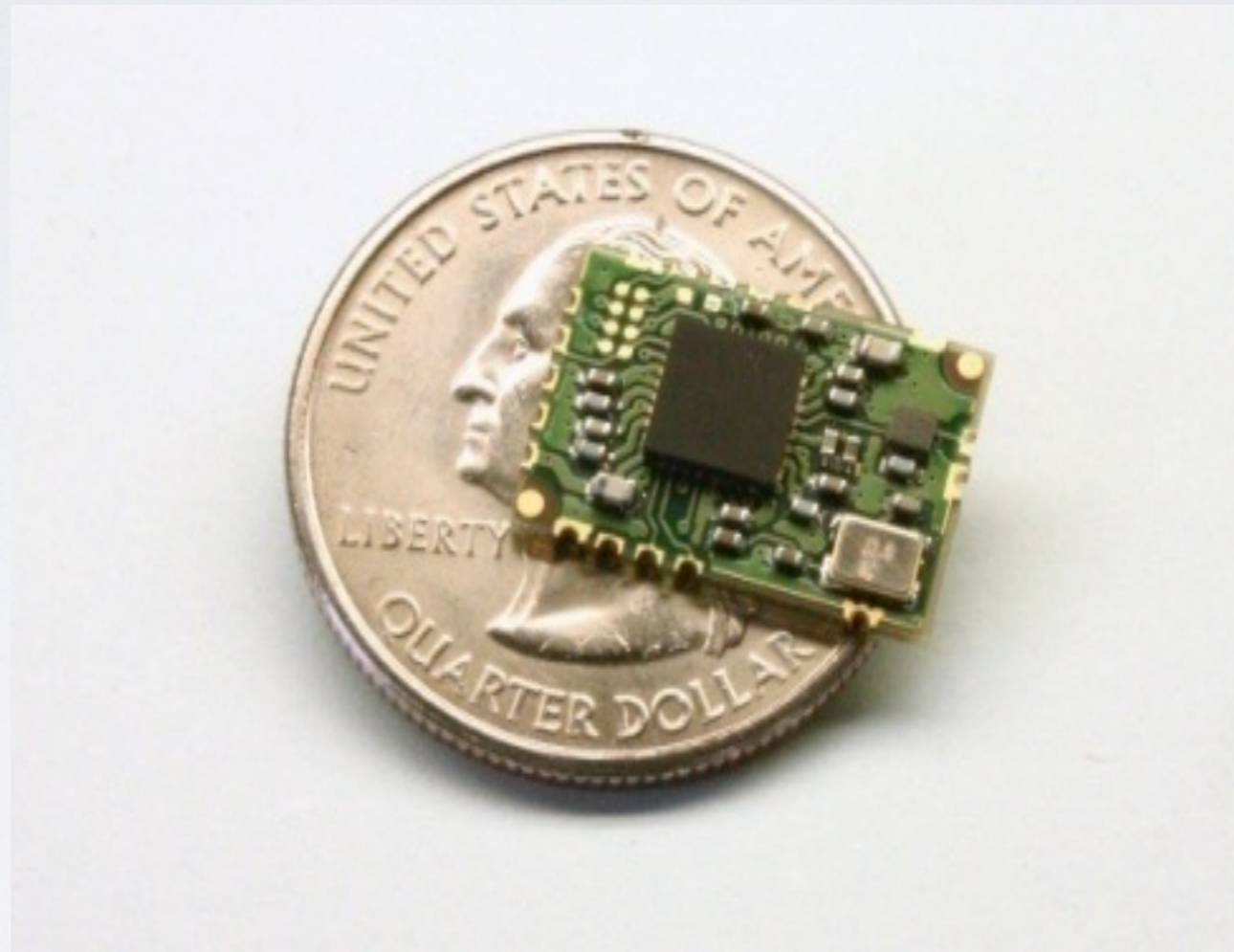
IOT



IOT



IOT



Impacts of IoT

- Economic impact
- Social impact
- Educational impact

Economic impact

BIG DATA

IBM Scores Weather Data Deal and Starts Internet of Things Unit

By STEVE LOHR MARCH 31, 2015 12:01 AM 10 Comments

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Analyzing weather data and energy consumption can **keep the lights on.** Energy and utility companies say weather causes

70% of power outages.*

*Source: Climate Central, April 10 2014, data from 2003-2012



ibm.com/ibmandweather



IBM announced a partnership with the Weather Company, whose data powers weather apps for Apple, Google, Microsoft and others.

Data partnerships are a key ingredient in IBM's long-term strategy, and the company is announcing a big one on Tuesday with the [Weather Company](#).

For IBM, the deal represents another close link with a leading data supplier for special access and joint development. Last fall, it forged a [similar arrangement with Twitter](#), the social network, whose tweets of 140 characters or fewer are a global wellspring of

Economic impact

A developed Internet of Things in Kenya will enable a 25 percent economic growth

Written by [Odipo Riaga](#) ✓



89
SHARES



ODIPO RIAGA
6 days ago

Posted: April 30,
2015 at 8:50 pm

Social impact

- Water quality
- Air quality
- Traffic monitoring
-

Social impact



Educational impact

- CS curriculum
- Hands-on at low cost
- Multidisciplinary
- Research papers

Thanks!

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<http://wireless.ictp.it>