



## **INTERNET OF THINGS**

Dr. A K VERMA

Professor, CSED

THAPAR INSTITUTE OF ENGG & TECH. PATIALA

# AGENDA

- ❖ History of Internet
- ❖ Definition
- ❖ History of Internet of Things (IoT)
- ❖ Industry 4.0
- ❖ IoT Architecture
  - Horizontal View
  - Vertical View
- ❖ Applications
- ❖ Challenges

# History of the Internet

1957

**USSR launches Sputnik into Space**  
In response the USA creates DARPA (Defense Advanced Research Project Agency) to start work of becoming the leading nation in new science and technological discoveries.



1972 @

**Email is introduced**  
Ray Tomlinson Created what was to become the standard internet email address format, using the @ sign to separate user names from host's.

1974

**Transmission Control Protocol/Internet Protocol (TCP/IP) is designed**  
A proposal was published to link Arpa-like networks together into a so-called "Internetwork", which would have no central control and would work around a transmission control protocol.



1989

**AOL is launched and www proposal**

When Apple pulled out of the AppleLink program in 1989, the project was renamed AOL Online was born, AOL - still in existence today, later on made the Internet popular amongst the average Internet user. Also in that same year the proposal for the World Wide Web, was written by Tim Berners-Lee to convince CERN that a global hypertext system was in their best interest.

**Wikipedia is launched**

one of the websites that paved the way for collective knowledge content generation/social media.

2001

1977

**The first PC Modem**  
The development of the first PC modem, by Dennis Hayes and Dale Heatherington, was introduced and initially sold to computer hobbyists.



1988

**Internet Relay Chat (IRC) is developed**

Internet Relay Chat (IRC) paved away for real-time chat and the instant messaging programs we use today.

1990

**First commercial dial-up ISP and WWW protocols finished**

The first commercial dial-up Internet provider, The World, was launched with it. Arpanet ceased to exist. Also, the code for the World Wide Web was written by Tim Berners-Lee, based on his proposal from the year before, along with the standards for HTML, HTTP, and URLs.

Google

1998

**Google! and Napster are launched**  
Google is brought online, revolutionising the way people search for information through its pioneering ranking system that uses links to assess website popularity. Also in the same year, Napster launched, opening up the gates to mainstream file-sharing of audio files over the internet.

YouTube

2005

**YouTube is launched, bringing free online video hosting and sharing to the masses.**

1965

**The first wide area computer network was created**  
A TDC-2 Massachusetts computer to another computer based in California using a relatively low speed dial up telephone line.

ARPANET



1969

**The Arpanet is born**  
linking four nodes: University of California at Los Angeles, Stanford Research Institute, University of California at Santa Barbara, and University of Utah. The network was wired together via 50 Kbps circuits. First message sent across the network was supposed to have been "Login", but crashed when the letter "G" was typed in.



1970

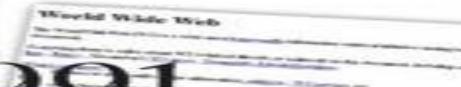
**Network Control Protocol (NCP) is designed**  
Allowing connections and flow control between processes running on different computer hosts.

1978

**The Bulletin Board System (BBS) is developed, and Spam is born**

1984

**Domain Name System (DNS)**  
DNS servers allowed Internet users to type in an easy-to-remember domain name and then converted it to the IP address automatically. It made addresses on the Internet more human-friendly compared to its numerical IP address counterparts.



1991

**The first website and first content based search Protocol**

The first web page was created and its purpose was to explain what the World Wide Web was. It was purely text based site with lots of highlighted links embedded into text which linked users to other addresses and pages. In the same year, the first search protocol that examined file contents instead of just file names was launched, called Gopher.



1996

**Hotmail is introduced**  
The first webmail service, to launch on the internet.

1982 II

**The first emoticon is born and use of the term Internet instead of the Arpanet**

Scott Fahlman invents the first emoticon and kick starts internet social trend by suggesting the use of =) and =( to convey emotion to other users.

1993

Mosaic – first graphical web browser for the general public was introduced. Also in the same year marked the beginning of the .gov and .org domain names for government and UN users.

eBay Amazon

1995

**Commercialisation on the Internet and Javascript are introduced**

The first SSL (Secure Sockets Layer) encryption was developed by Netscape, making it safe to conduct financial transactions which involved credit card payments online. This saw the introduction of eBay and Amazon, two of the biggest e-commerce business names on the internet. Java and JavaScript was first introduced to the public in 1995, originally called LiveScript it was deployed as part of Netscape.

2007

Hulu was first launched a joint venture between ABC, NBC, and Fox to make popular TV shows available to watch online. Also the iPhone was launched too which renewed interest in mobile web applications and design.

2003

**Skype and Myspace are launched**  
Skype is released to the public, giving a user friendly interface to voice over IP calling. Myspace becomes most popular social site.



2004

**Facebook is launched by Mark Zuckerberg**

# Definition

The term "Internet of Things" has come to describe a number of technologies and research disciplines that enable the Internet to reach out into the real world of physical objects.



# KEVIN ASHTON – “FATHER OF THE IOT”



Kevin Ashton coined “Internet of Things” during his job at MIT Auto-ID Center

He believed IoT could “turn the world into data” that could be used to make macro decisions on resource utilization.

“Information is a great way to reduce waste and increase efficiency, and that’s really what the Internet of Things provides”

# History of Internet of Things

**1800s**



The first electronic communication devices are created, including the telegraph, fax machine, and radio

**1989**



Tim Berners-Lee proposed the **World Wide Web**

**MID 1990s**



The **rise of the Internet** and more experimental devices

1993 Trojan Room Coffee Pot  
 1998 InTouch Project  
 1998 Mark Weiser's Stock Market Water Fountain

**1999**



Kevin Ashton coins '**Internet of Things**' and founds the **MIT Auto-ID Center**

**1926**



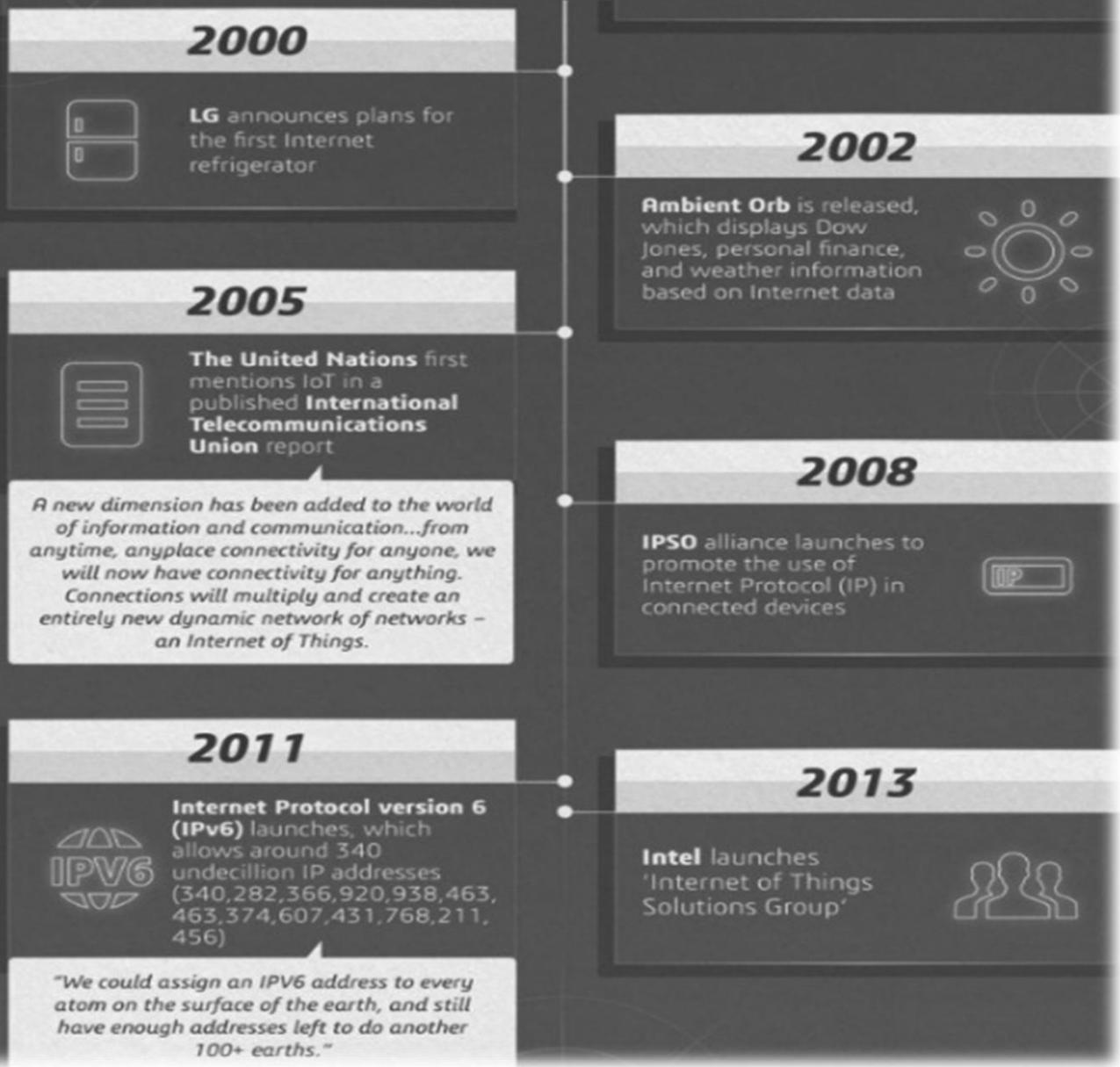
Nikola Tesla envisions a wirelessly interconnected world

*"When wireless is perfectly applied the whole earth will be converted into a huge brain."*

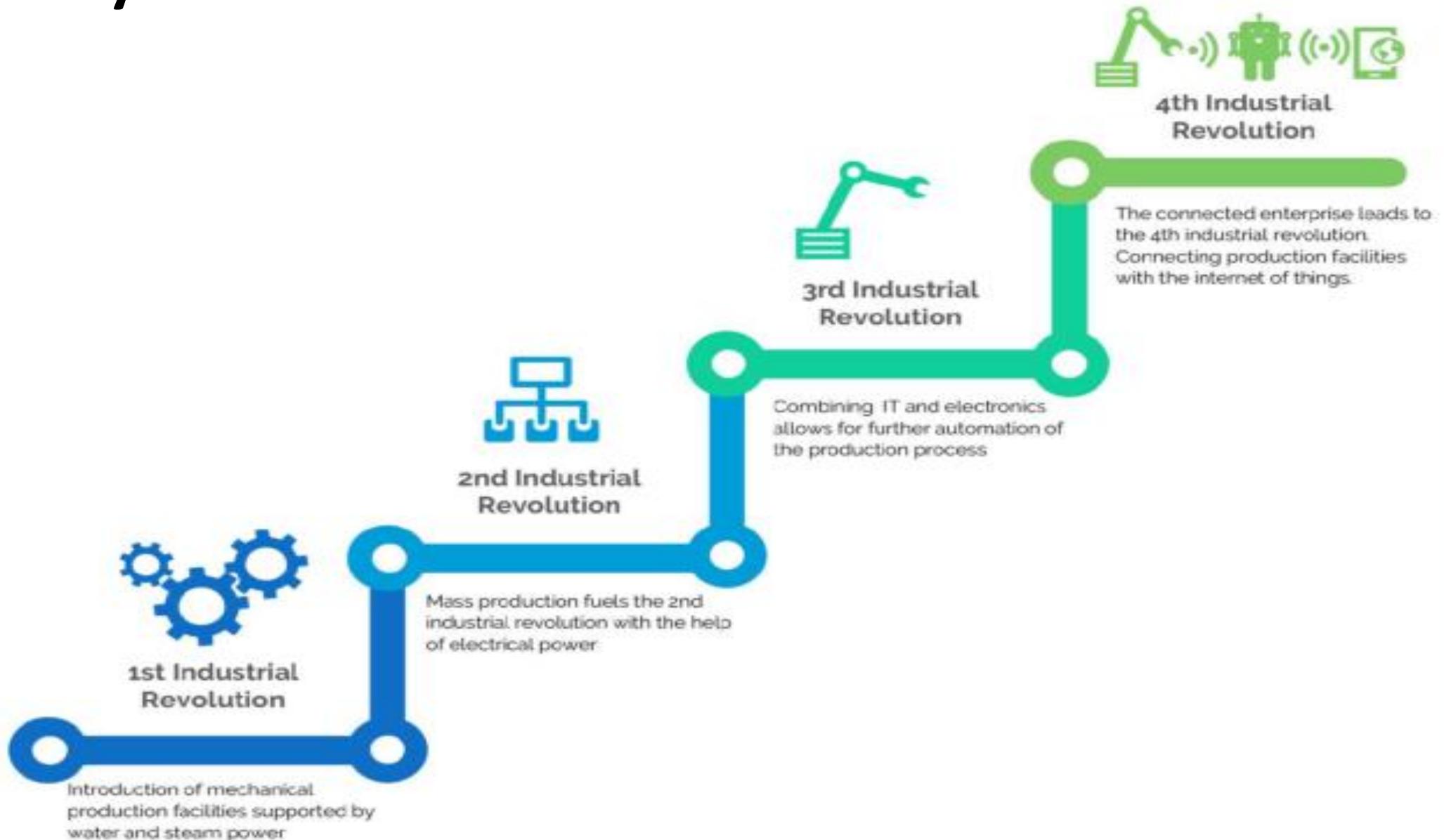
**1990**



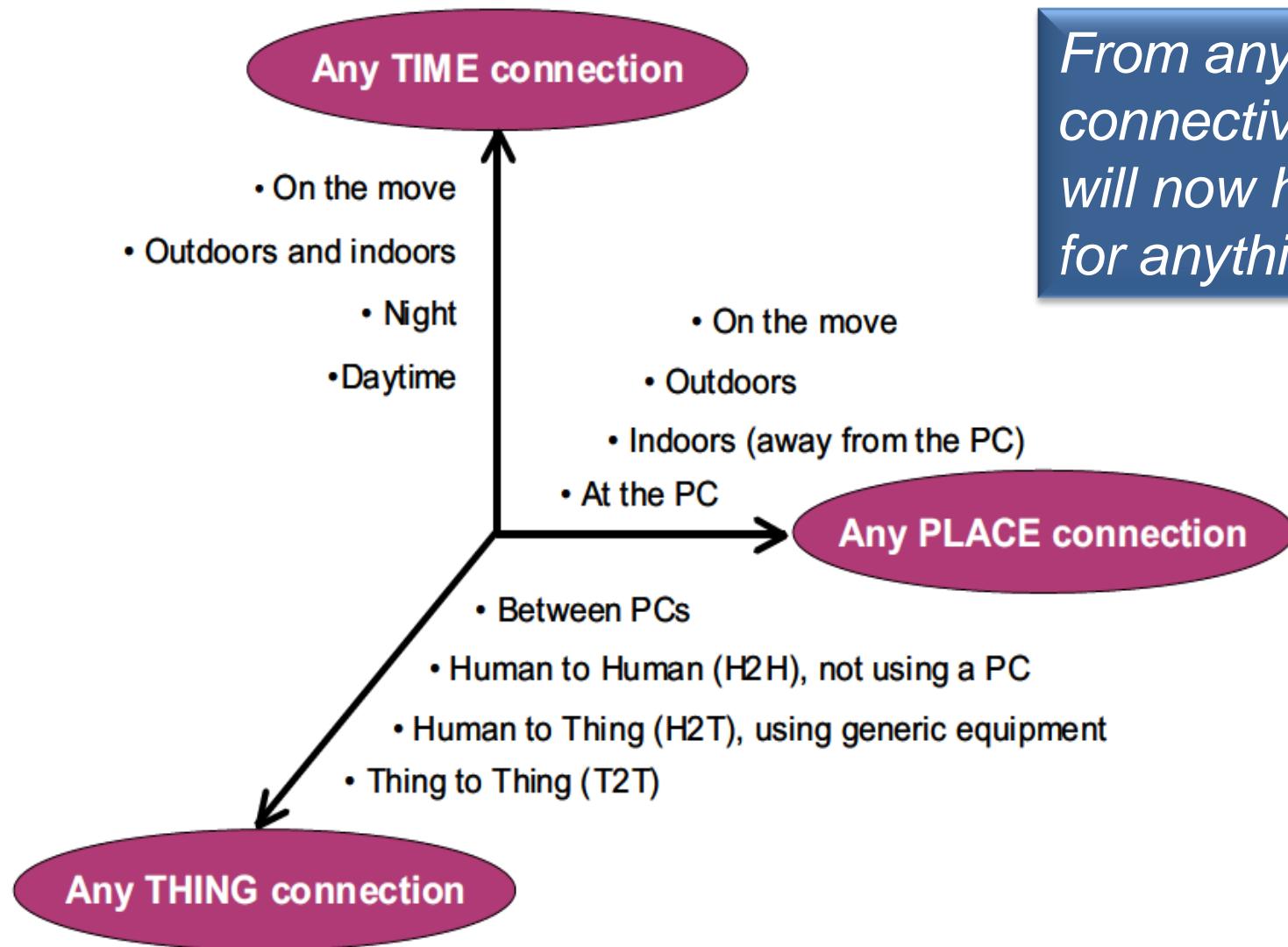
The first connected devices are created – a toaster and drink machine



# Industry 4.0



# What is Internet of Things



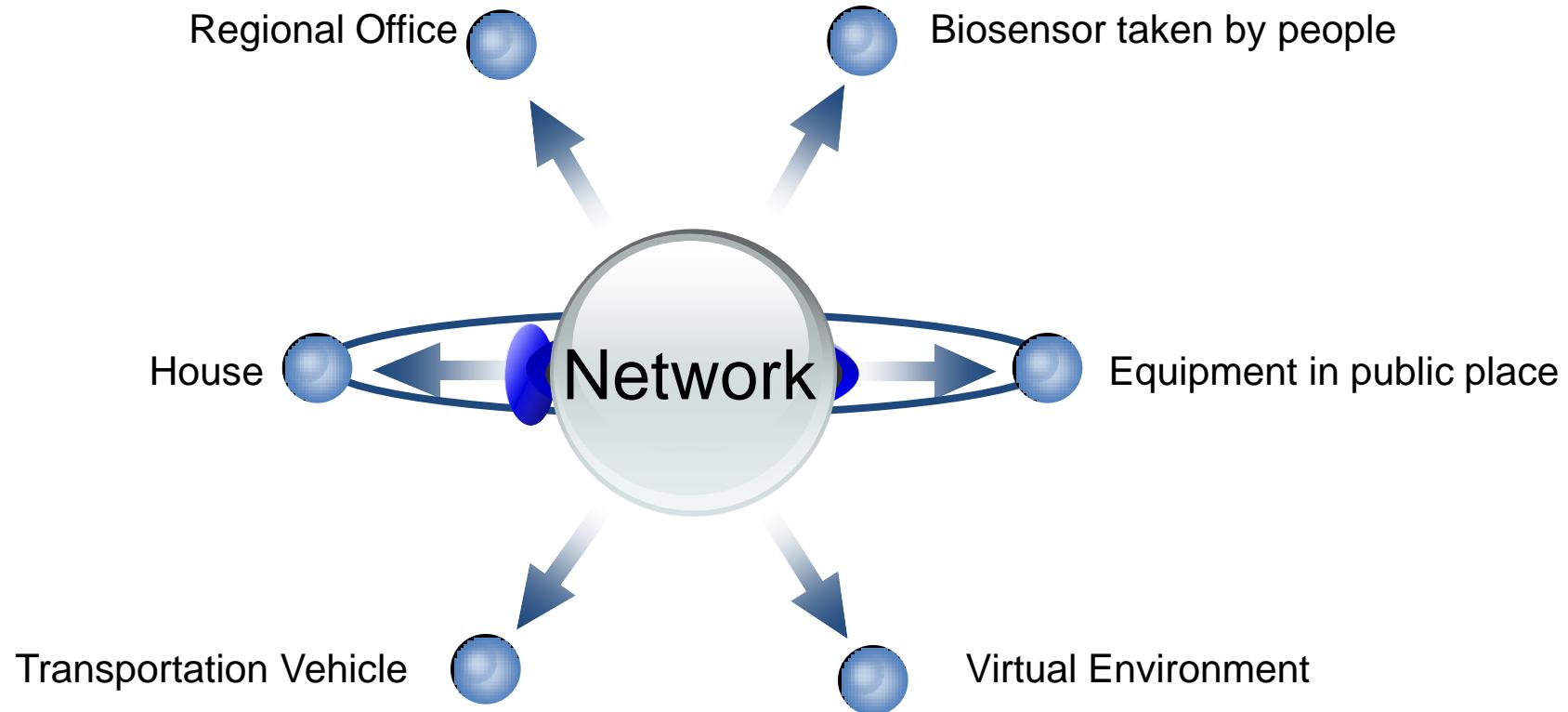
*From any time ,any place connectivity for anyone, we will now have connectivity for anything!*

Anything and  
Everything!

# What are these “things”?



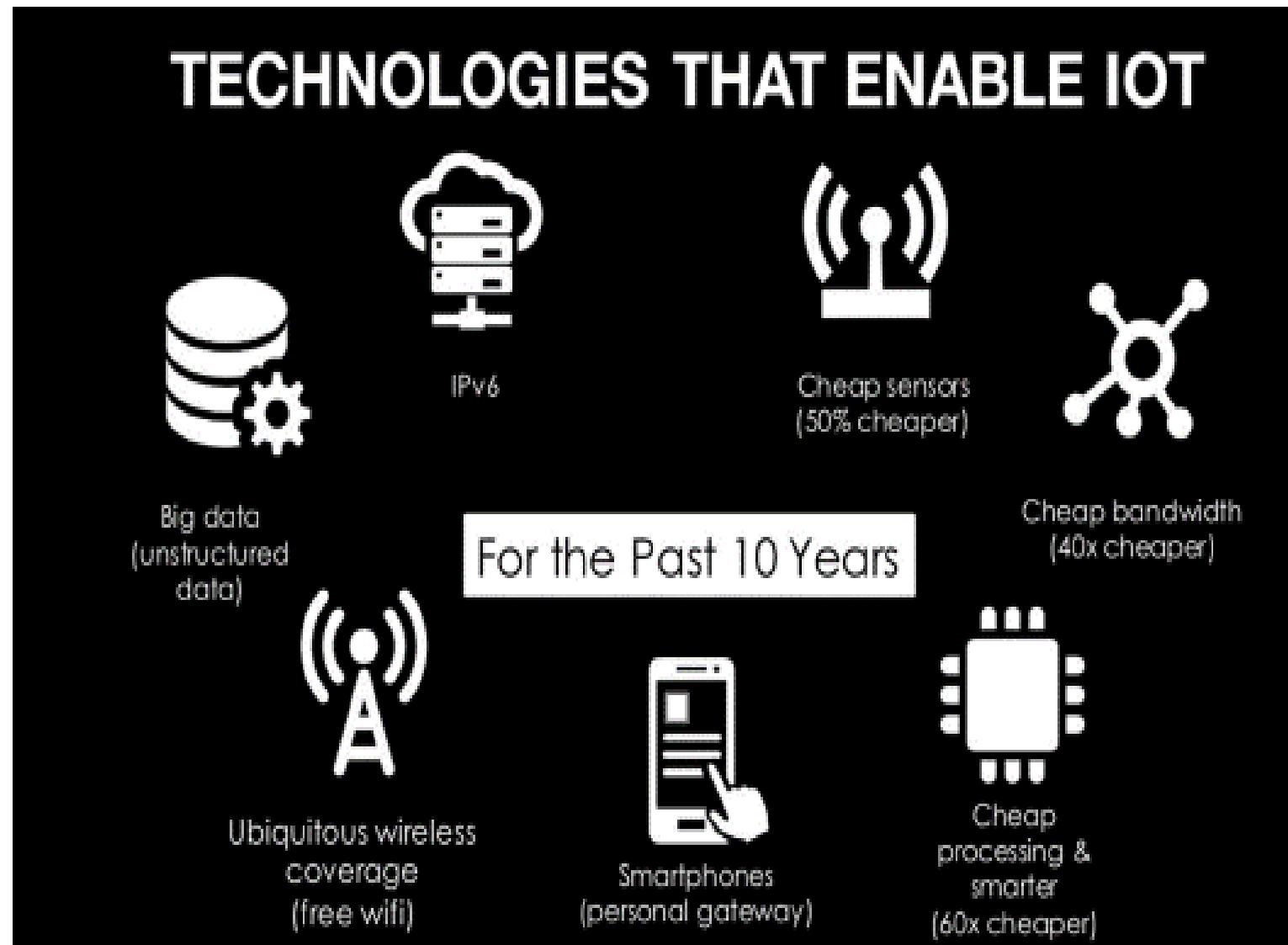
# The application of IoT(1)





# Enabling Technologies

- ❖ RFID
- ❖ Sensors
- ❖ Smart Technology
- ❖ Nano Technology
- ❖ WiFi
- ❖ Cloud Storage
- ❖ IPV6
- ❖ Bigdata



# RFID

- Radio frequency identification is a technology that is being used all over the world for identification purposes.
- Passports, security systems, debit cards, automobiles are all such modern examples that use RFID in one way or another.





# Sensors

- Sensors collect data from their environment, generating information and raising awareness about context.



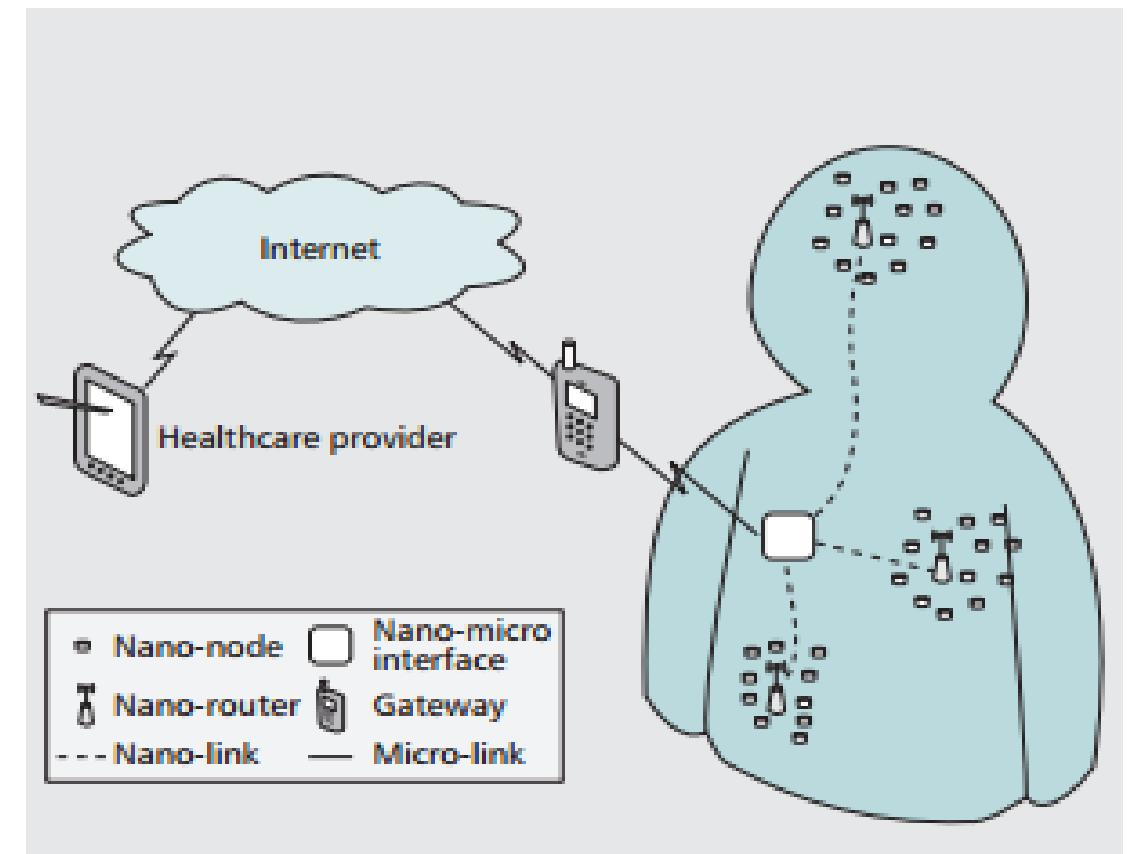
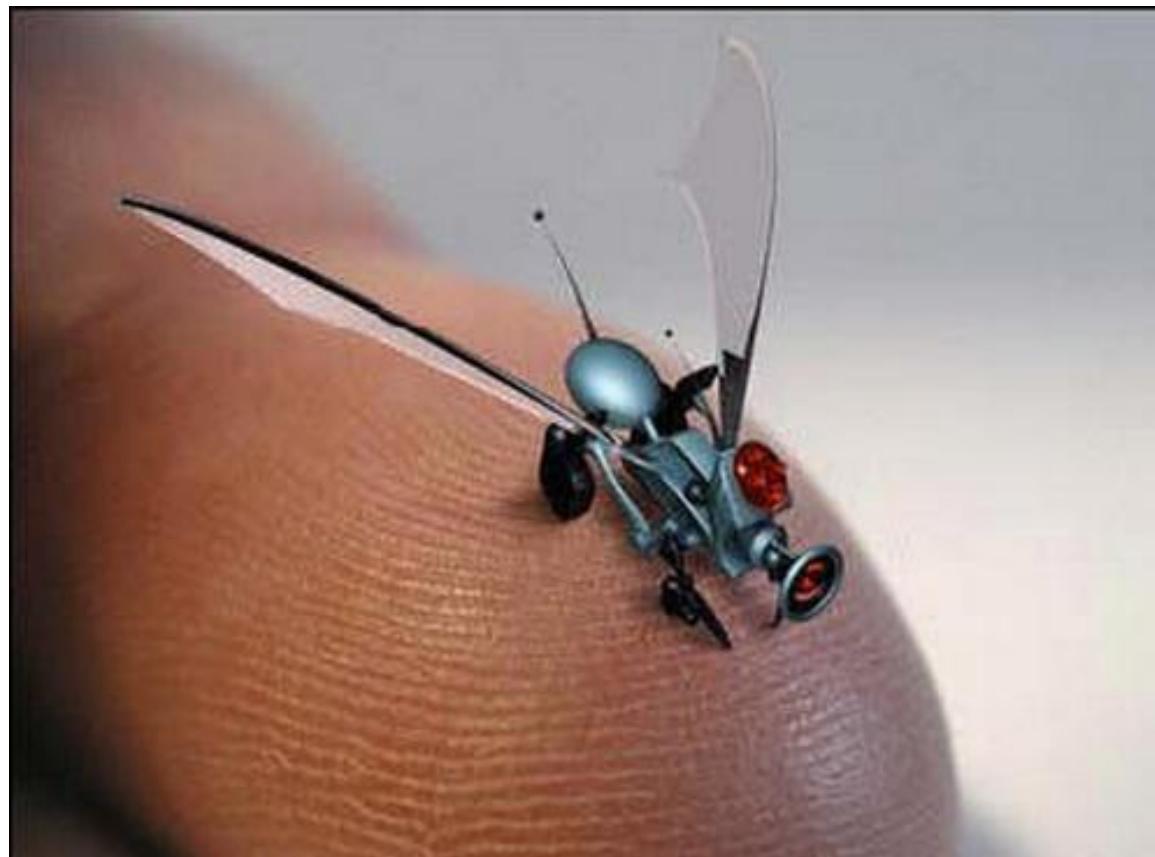
# Smart Technology

- Smart Technologies help us use available resources in a better way.
- Designed to improve the function of everyday objects, such as watches or key chains, through the injection of software.



# Nano Technology

- Engineering that deals with the design and manufacture of extremely small electronic circuits and mechanical devices built at the molecular level of matter.



# WiFi

Allows an electronic device to exchange data or connect to the internet wirelessly using radio waves.



# Cloud Storage

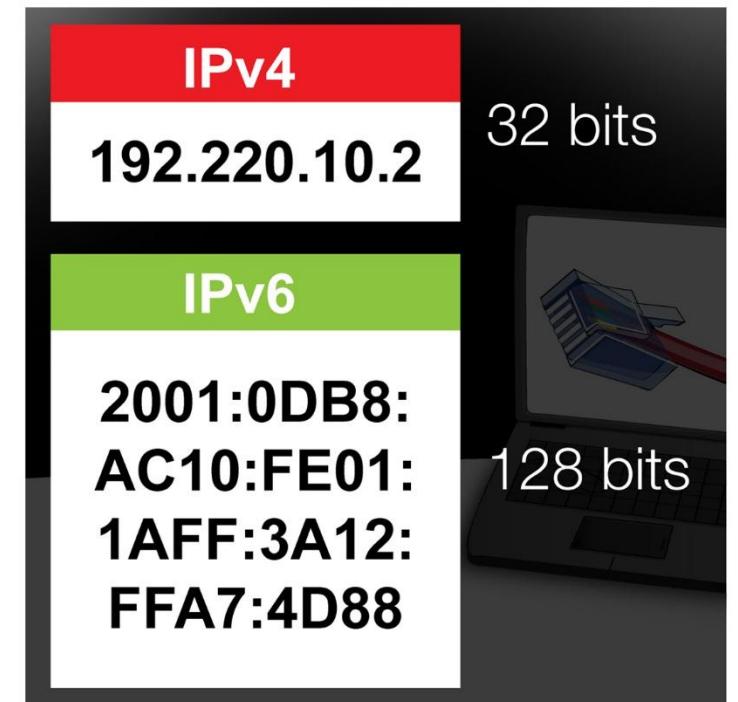
A model of networked enterprise storage where data is stored not only in the user's computer, but in virtualized pools of storage which are generally hosted by third parties, too.





# IPV6

- Latest revision of the Internet Protocol (IP).
- Developed by the Internet Engineering Task Force (IETF) to deal with the long-anticipated problem of IPv4 address exhaustion.



# Main Features of IPv6

- Restores the original **end-to-end connectivity** at the network layer
- Leverage next-generation **application protocols**
- Rich transition mechanisms
- **Any way, anytime, anywhere interconnectivity**

# IP4

Deployed 1981

*Address Size:*

32-bit number

*Address Format:*

Dotted Decimal Notation:

192.149.252.76

*Prefix Notation:*

192.149.0.0/24

*Number of Addresses:*

$2^{32} = \sim 4,294,967,296$

# IP6

Deployed 1999

*Address Size:*

128-bit number

*Address Format:*

Hexadecimal Notation:

3FFE:F200:0234:AB00:0123:4567:8901:ABCD

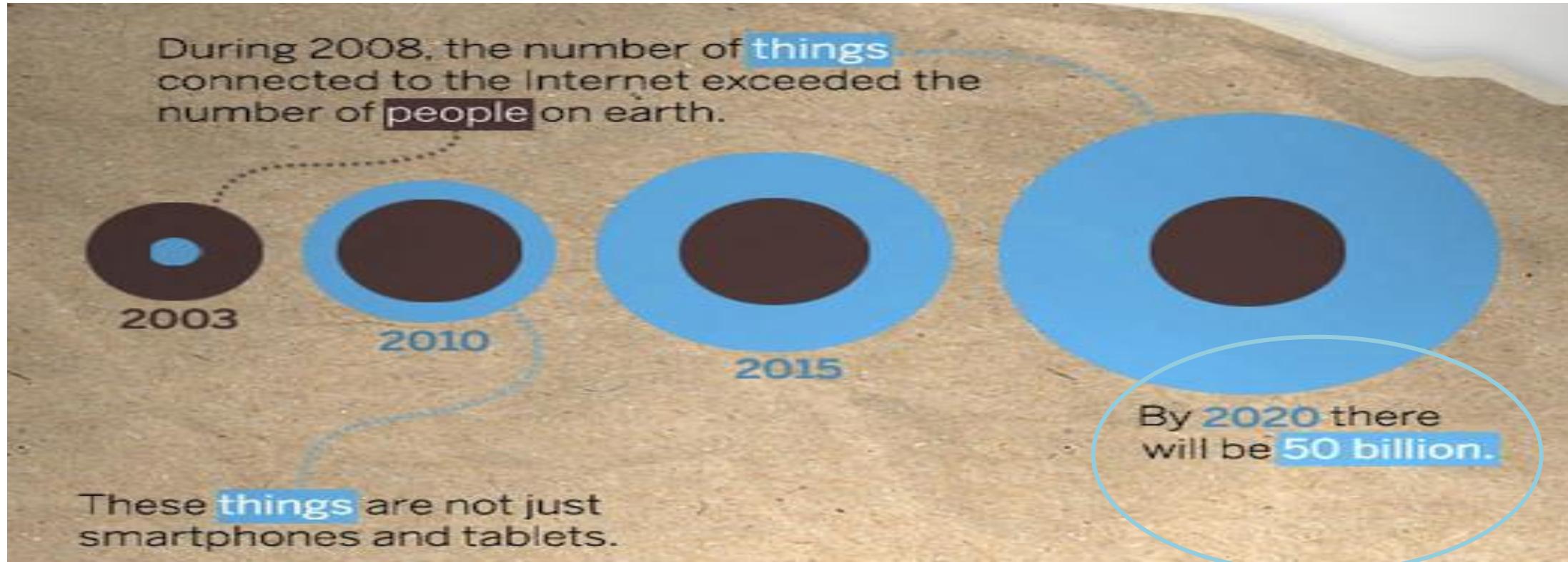
*Prefix Notation:*

3FFE:F200:0234::/48

*Number of Addresses:*

$2^{128} =$   
 $\sim 340,282,366,920,938,463,463,374,$   
 $607,431,768,211,456$

# The Future of Internet - The Internet of Things



50 billion IP  
addresses  
required by  
2020!

# Scenarios

# Shopping



# Daily Grind



# Looking Ahead

## Driverless Cars

Edition: International | U.S. | MÉXICO | ARABIC  
TV: CNN | CNN en Español  
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**Nissan: We'll have a self-driving car on roads in 2020**

Mashable By Todd Wasserman, Mashable August 28, 2013 — Updated 0143 GMT (0943 HKT) | Filed under: Innovations

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Nissan: Self-driving cars by 2020

**Amanpour**

TUE - SAT 18:00 HKT / 22:00 HKT

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# Looking Ahead

## Smart Cities



### World's First 'Smart City' To Be Completed By 2015: 'Songdo' The Orwellian Control Grid

[Grant J. Kidney](#)  
July 29, 2012



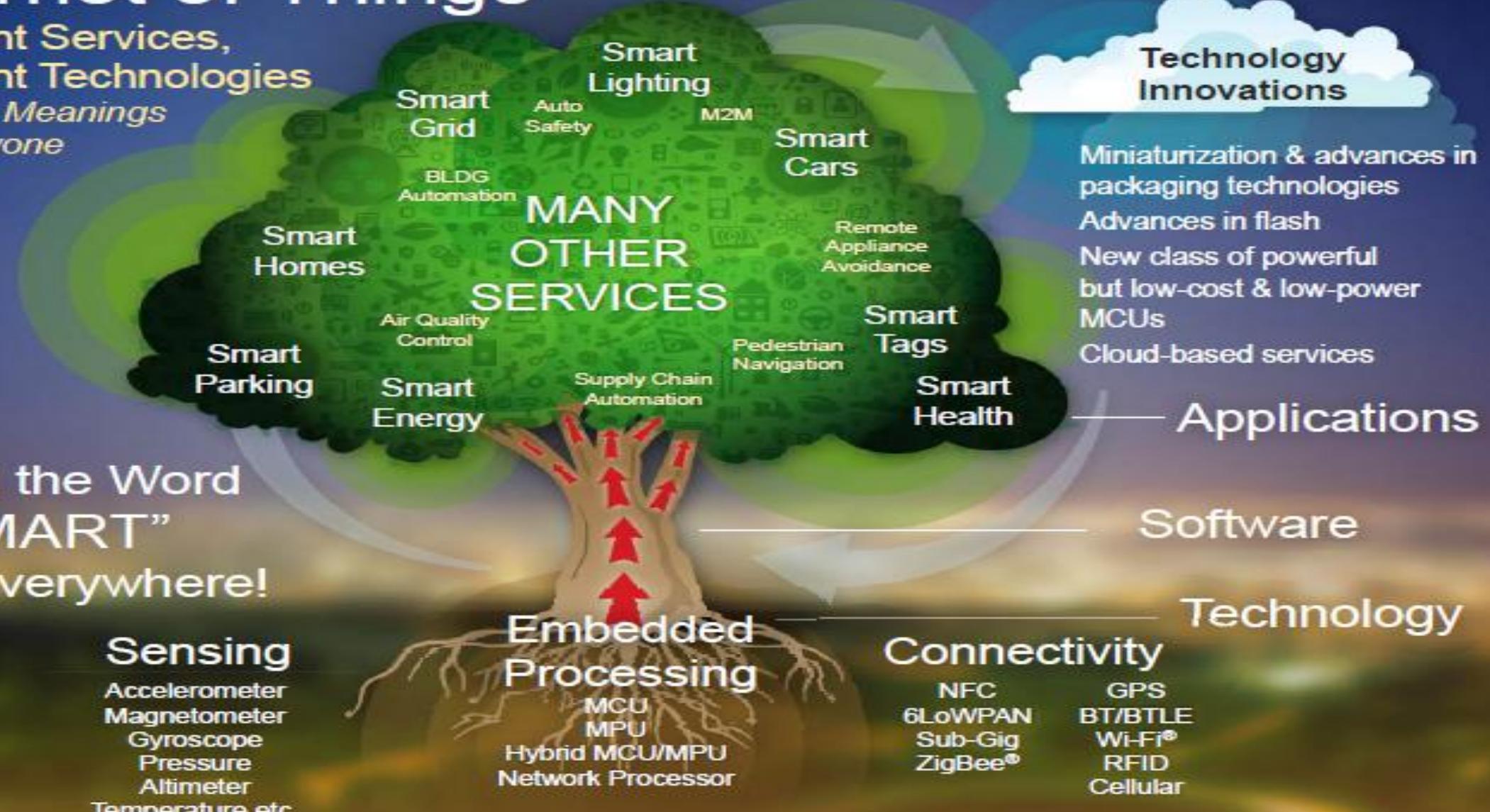
The world's first 'smart city' is being built in Asia- and it promises to serve as an experiment for the high-tech tyranny that is surely to come about as a response to the collapse of this present era of human industrial civilization.

Dubbed 'Songdo', the city will rest upon a wholly man made island in the Yellow sea and will incorporate just about every aspect of an Orwellian 'super state' imaginable.

Millions of wireless sensors and microchips will be embedded throughout the sprawling city-scape. 'Smart appliances' such as refrigerators that let you know when you're running low on certain foods and bathroom mirrors that inform you of your physical health will be evident in every home.

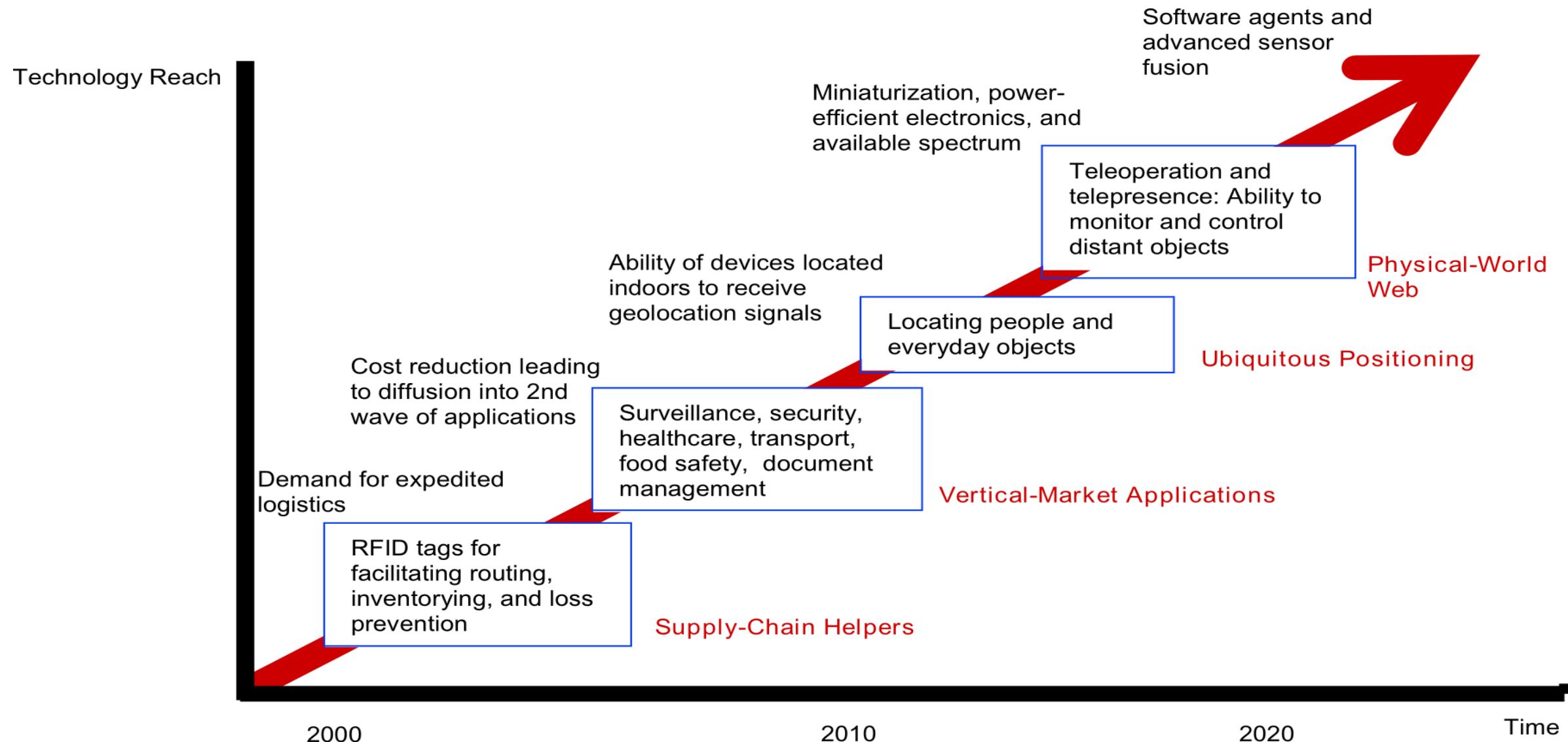
# Internet of Things

Different Services,  
Different Technologies  
*Different Meanings  
for Everyone*

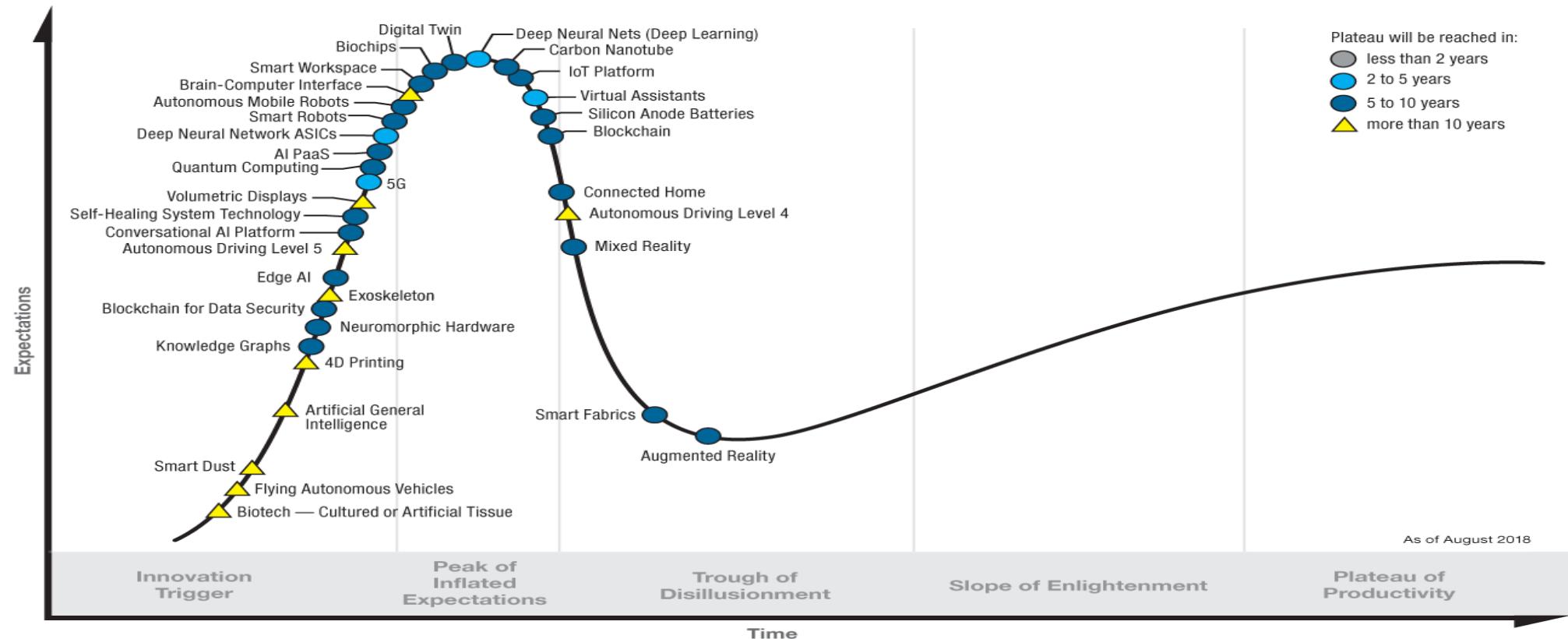


And the Word  
“SMART”  
Is Everywhere!

## TECHNOLOGY ROADMAP: THE INTERNET OF THINGS



## Hype Cycle for Emerging Technologies, 2018



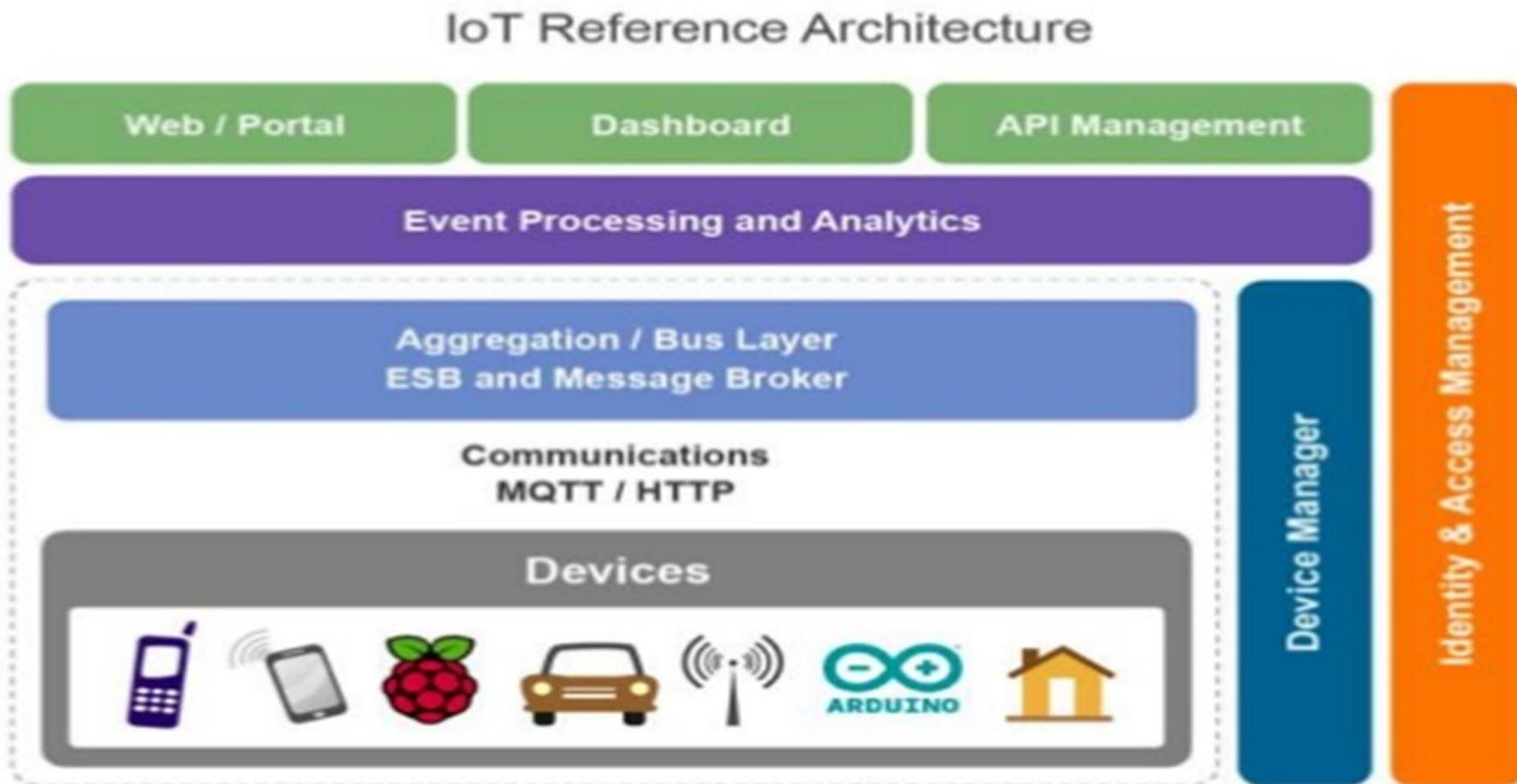
[gartner.com/SmarterWithGartner](http://gartner.com/SmarterWithGartner)

Source: Gartner (August 2018)  
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**Gartner**<sup>®</sup>

# IoT Architecture

## IoT Architecture



## IoT Architecture

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An IOT platform has basically three building blocks

1. Things
2. Gateway
3. Network and Cloud

# IoT Gateway

## IoT Gateway

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Beaglebone Back



Raspberry Pi



Intel Galileo

The heart of a cloud platform could use open source boards like the Raspberry Pi, Beaglebone Black, Intel Galileo etc. These are usual Linux boards that run different flavours of Linux like Raspbian on the Raspberry Pi, Angstrom on the Beaglebone etc. These boards interface with devices on the one hand and the cloud platform on the other.

# IoT Sensor Interfaces

## Sensor Interfaces

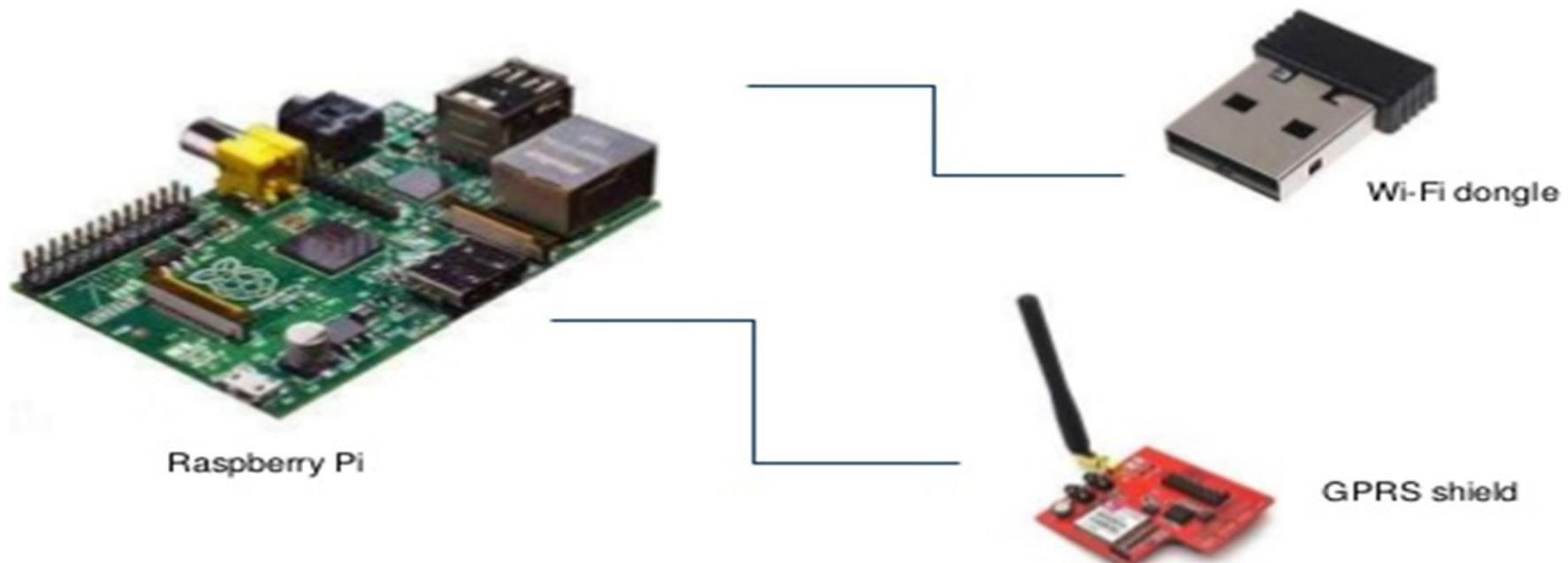


Let's take a look at the device interfaces. So for example, devices could interface with the Raspberry Pi over RS-485, and XBee. An RS-485 network allows a multi-dropped serial wired network allowing a host of devices to connect. The XBee creates a wireless mesh network allowing large number of wireless devices to connect. These are open source interfaces and allows creation of a large sensor network. We could also use the GPIO on the Raspberry Pi for physical inputs.

# IoT Network Interfaces

## Network Interfaces

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The next interface we look at is the cloud interface. This is achieved using a simple WiFi dongle or a GPRS shield. The WiFi dongle interfaces over USB and the GPRS shield uses the serial interface. Also available is the Ethernet port which could be used for interface.

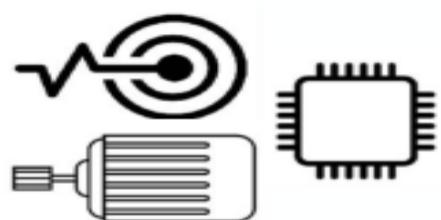
# **Smart Systems and the Internet of Things are driven by a combination of:**

**1 SENSORS  
& ACTUATORS**

**2 CONNECTIVITY**

**3 PEOPLE &  
PROCESSES**

**Internet of Things**



## **Things**

(Sensors, actuators, MCU/MPU,  
network, energy, firmware)



## **Connectivity**

(PAN, LPWAN, Cellular)

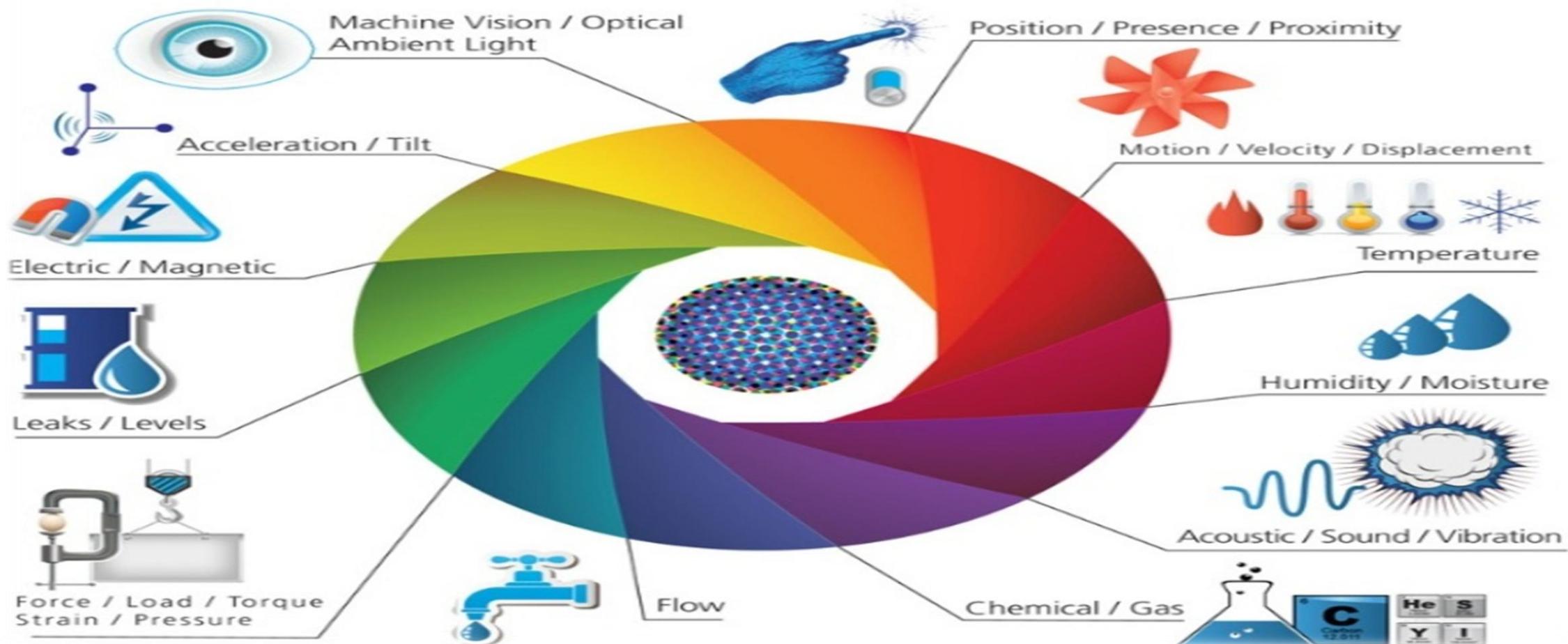


## **People & Processes**

(IoT Cloud, Machine Learning, AI)

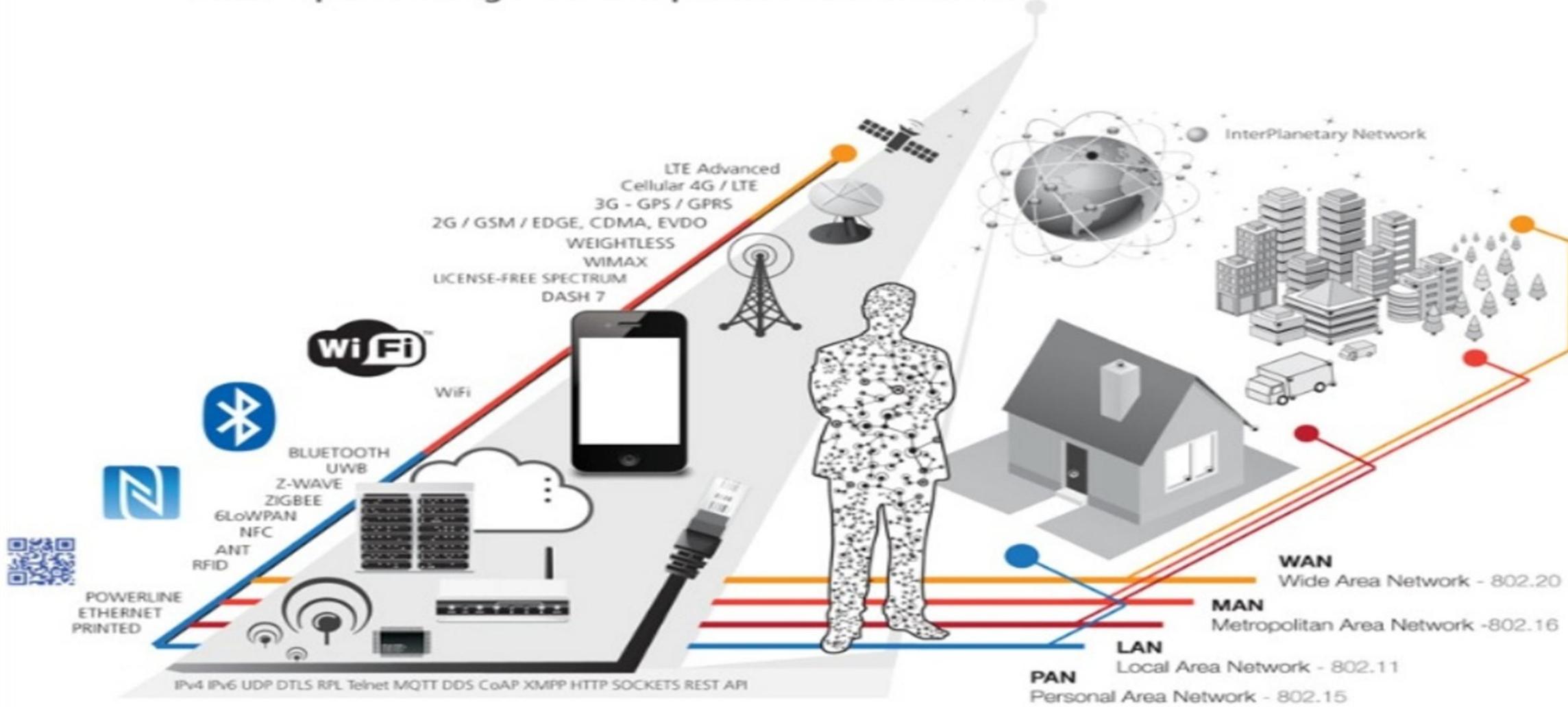
# 1 SENSORS & ACTUATORS

We are giving our world a digital nervous system. Location data using GPS sensors. Eyes and ears using cameras and microphones, along with sensory organs that can measure everything from temperature to pressure changes.

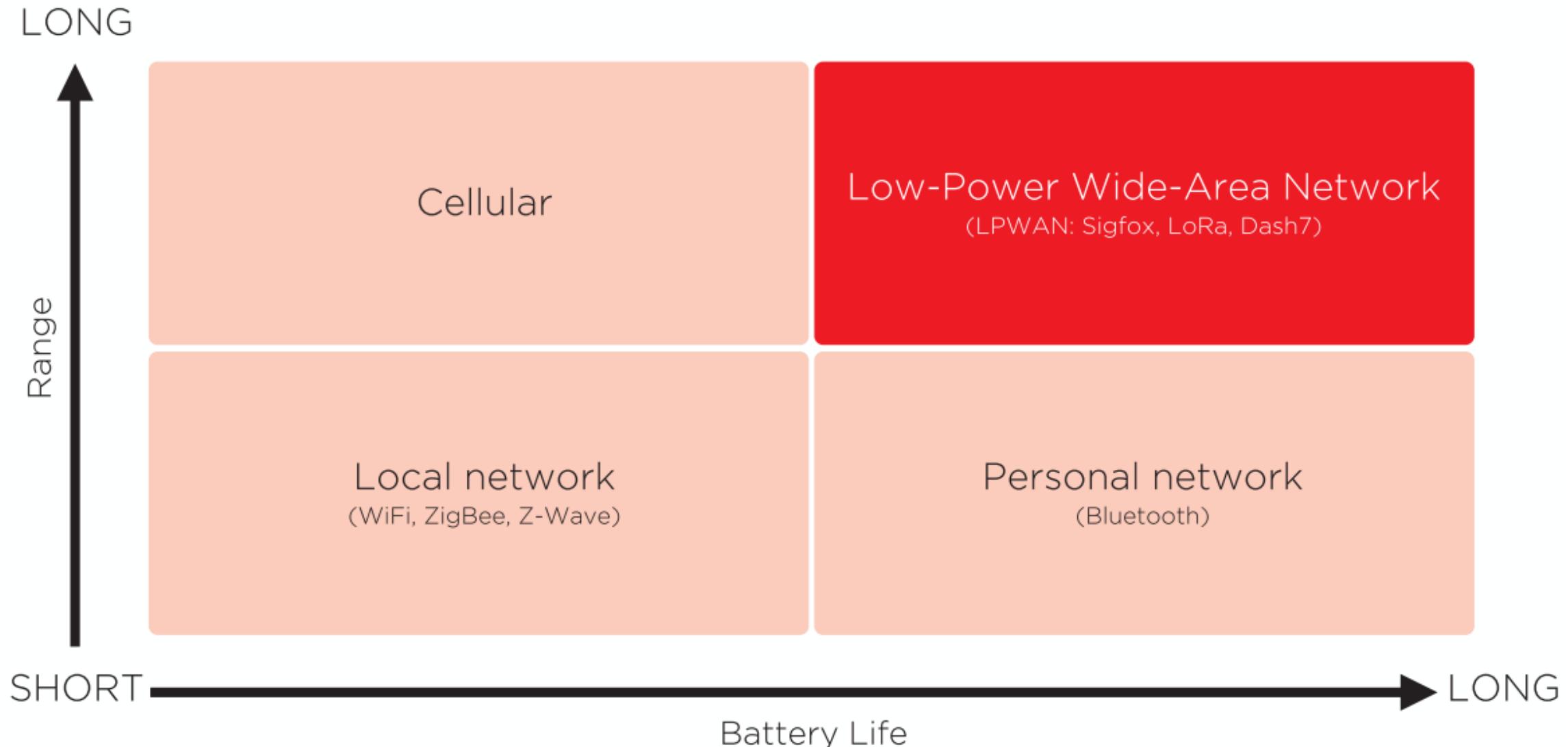


## 2 CONNECTIVITY

These inputs are digitized and placed onto networks.

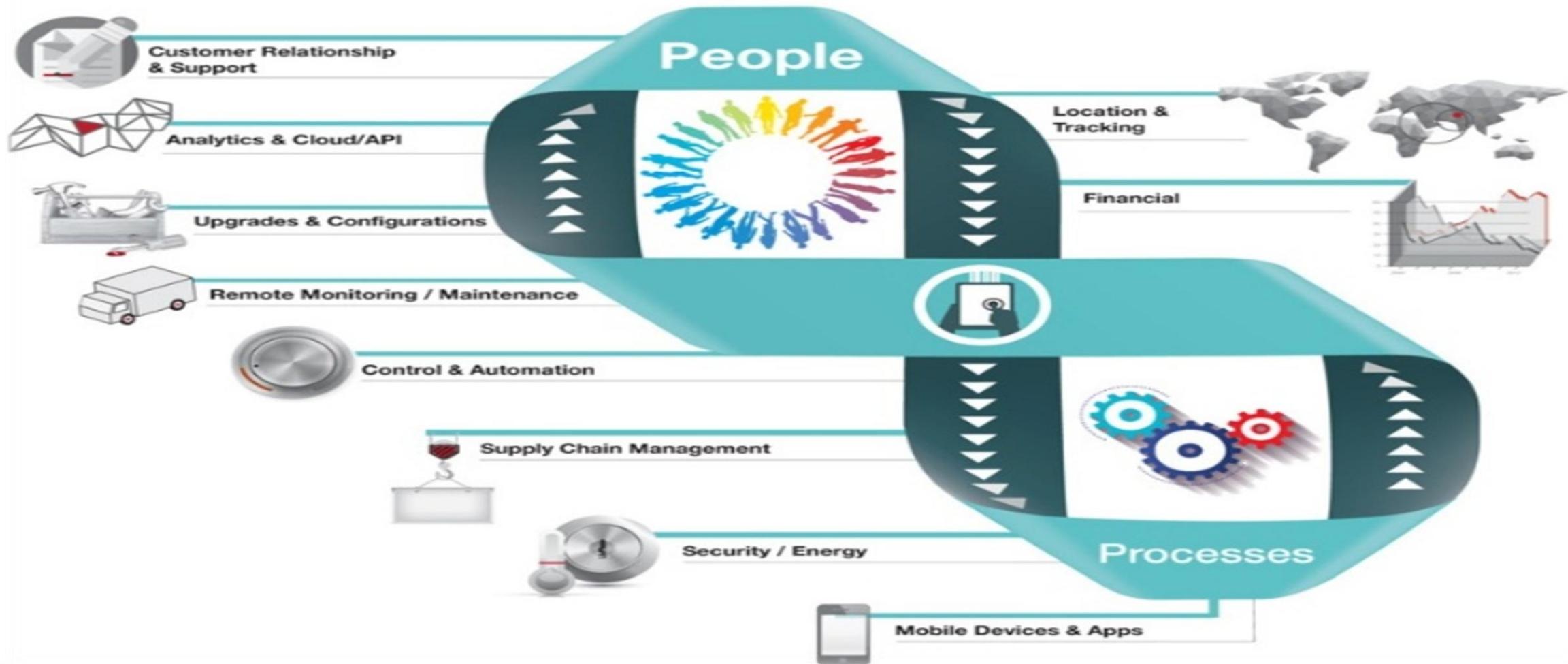


# IoT Connectivity : Range Vs Power



### 3 PEOPLE & PROCESSES

These networked inputs can then be combined into bi-directional systems that integrate data, people, processes and systems for better decision making.



# The interactions between these entities are creating new types of smart applications and services.

Starting with popular connected devices already on the market



## SMART THERMOSTATS



Save resources and money on your heating bills by adapting to your usage patterns and turning the temperature down when you're away from home.

## CONNECTED CARS



Tracked and rented using a smartphone. Car2Go also handles billing, parking and insurance automatically.

## ACTIVITY TRACKERS



Continuously capture heart rate patterns, activity levels, calorie expenditure and skin temperature on your wrist 24/7.

## SMART OUTLETS



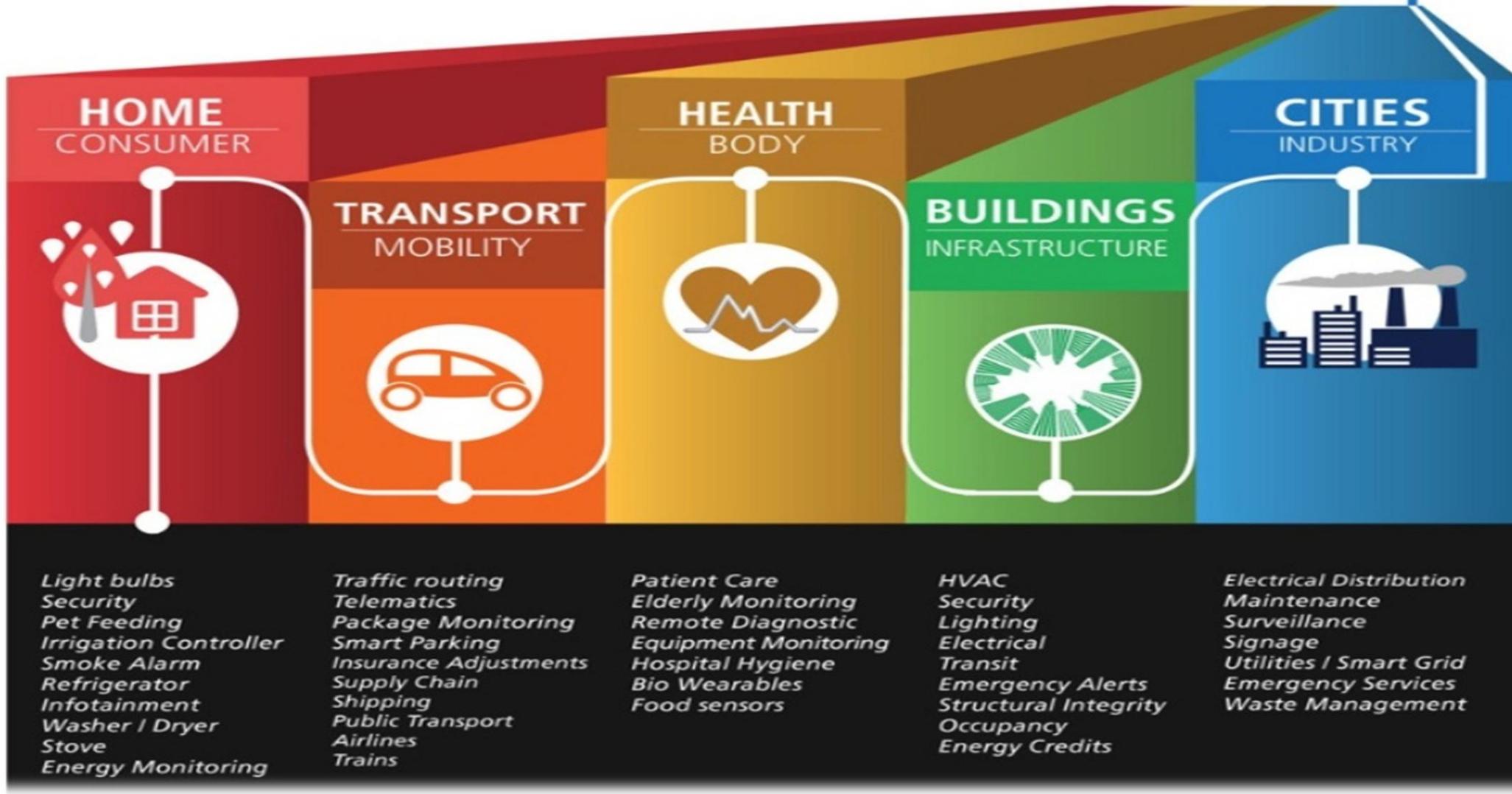
Remotely turn any device or appliance on or off. Track a device's energy usage and receive personalized notifications from your smartphone.

## PARKING SENSORS



Using embedded street sensors, users can identify real-time availability of parking spaces on their phone. City officials can manage and price their resources based on actual use.

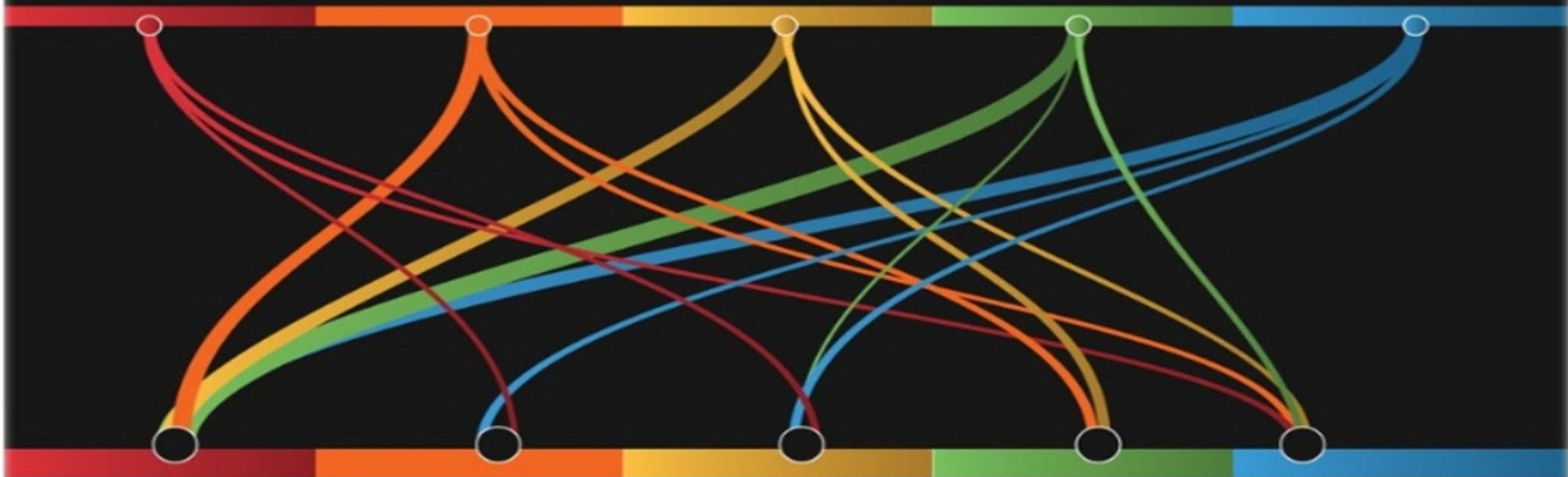
# TO ➔ DIVERSE APPLICATIONS



Things get interesting when these connected devices and services start creating

## **COMPOUND APPLICATIONS**

within their own verticals and across industries:



# FOR EXAMPLE



## TRANSPORTATION + SMART CITIES



Sofia and her son Luis are on their way Downtown for an appointment.



Wireless sensors embedded in the parking lot help direct the car to an open spot in the city while also initiating the parking fee.

Using the car's parking details the vehicle schedules a mobile mechanic to change the oil while the two are away for the afternoon.



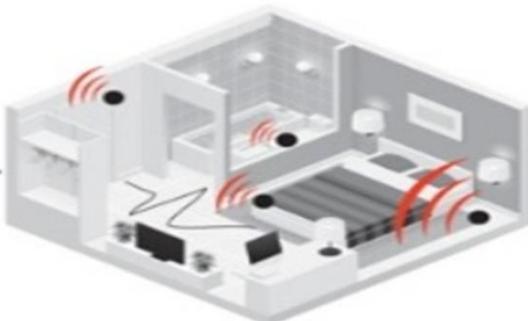
***In Downtown San Francisco 20-30% of all traffic congestion is caused by people hunting for a parking spot.***

- San Francisco Municipal Transportation Agency (SFMTA)

## HEALTHCARE + SMART HOME



Aging uncle Earl is still living isolated at his home and you are concerned about his safety.



Wireless sensors throughout his house help measure healthy activity levels, sleeping patterns and medication schedules.



Alerts are automatically sent to health care services and authorized family members if any abnormal activity is detected.

**40 million adults age 65 and over will be living alone in the U.S., Canada and Europe.**

- U.S. Department of Health and Human Services: Administration for Community Living (ACL)

## SMART BUILDINGS + MOBILITY



Anna is being pressured to reduce her company's expenses for their new corporate office.



After speaking with experts she decides to install sensors to automate energy usage according to building occupancy, people flow, temperature, and other ambient conditions – improving the building's overall efficiency.



**Energy used by commercial and industrial buildings in the US creates nearly 50% of our national emissions of greenhouse gases.**

- United States Environmental Protection Agency



Inevitably these integrations become more tightly coupled across time, location & services.

## REAL-TIME SERVICE NETWORKS

- Appliance Monitoring
- Predictive Maintenance
- Service Technician / CRM
- Waste Management / Recycling



### R Hotel Denver, Industrial Washer #GHS40-2608

Location: ID: FC-RM #00243  
Manufacturer: Appliance Park  
Louisville, KY ID: #45205343

Materials: FC / SUS  
Sensor: Vibration  
Connectivity: Wireless LAN

Connor, the Lead Maintenance Manager at the R Hotel in Denver, receives a sensor notification that the pump body O-ring #6 on washing machine #230243 is starting to fail in the housekeeping laundry room.

On his mobile, Connor prompts the machine to order a new part. This action triggers a bidding opportunity for local service technicians within the product's authorized maintenance network.

The request lays out:

- Pricing parameters
- Timing requirements
- Machine history
- Part specs
- Predictive sensor measurements & alerts

Tom from IA Appliances bids on the service request and receives a notification a few moments later that his bid was accepted.

Within 1.5 hours, a service technician from IA Appliances is on site (Using a temporary facility access code for the wireless door lock) to replace the water pump. Connor sends a brief note on the service quality and IA Appliances releases a bid request for the part's raw materials to local recycling centers.

# How large is the IoT Market?

In the not-too-distant future, hundreds of millions, then billions, of individuals and businesses with billions, then trillions, of smart, communicating devices will stretch the boundaries of current systems. Creating the potential to change the way we work, learn, entertain and innovate.

## 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





The **Internet** gave us the opportunity to connect in ways we could never have dreamed possible. The **Internet of Things** will take us beyond connection to become part of a living, moving, **global nervous system**.

*Whether you are an individual, technology developer, or adopter of these technologies, the Internet of Things will stretch the boundaries of today's systems. Are you prepared for the changes in the way we will learn, work, and innovate?*



## Smart Devices



# HAPIfork

The HAPIfork is an electronic fork that helps you monitor and track your eating habits. It also alerts you with the help of indicator lights and gentle vibrations when you are eating too fast.



<http://www.hapi.com/products-hapifork.asp>

# MyVessyl Cup

It can hold 13 ounces of liquid.  
The battery takes 60 minutes to  
fully charge and will last for 5-7  
days. Also has wire-free charging.

<https://www.myvessyl.com/>



# Smart Tooth Brush

The Beam Brush is a connected toothbrush that engages users with their daily hygiene routine.



<http://www.beamtoothbrush.com/toothbrush/>

# Smart Egg Tray

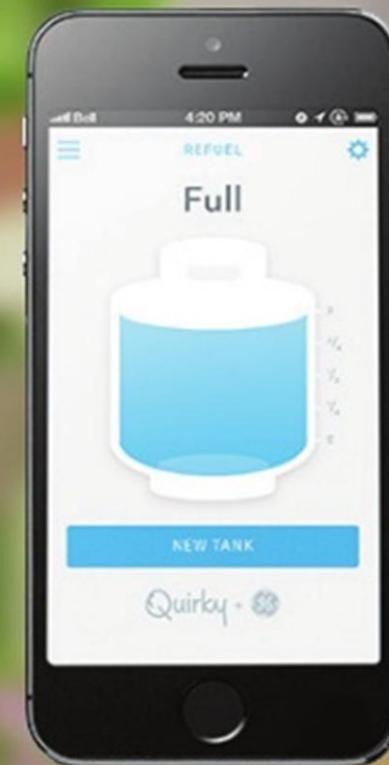
Egg Minder syncs with your smartphone to tell you how many eggs you've got at home (up to 14 eggs) and when they're going bad.

<http://www.quirky.com/shop/619>



# Smart Propane Tank

This super smart propane tank gauge connects to an app on your mobile device so no matter where you are, you'll always know when it's time to refuel.



<http://www.quirky.com/shop/732-refuel-smart-propane-tank-gauge>

# Glucose Monitoring

A cellular-powered glucose meter transmits each test result to a secure server and provides instant feedback and coaching to patients. This equips doctors, nurses, diabetes educators with real-time clinical data.



<http://www.telcare.com/>

# Smart Piggy Bank

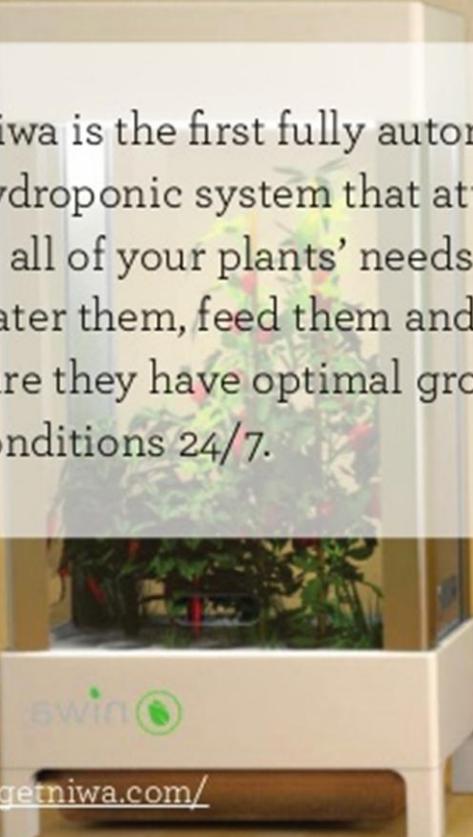
The Porkfolio wirelessly connects to an app on your device so you can track your balance and set financial goals from afar. Its nose lights up in celebration every time a U.S. coin is inserted and it holds up to \$100 in quarters.

<http://www.quirky.com/shop/607-porkfolio-save-big-with-this-pig>



# Hydroponic System

Niwa is the first fully automated hydroponic system that attends to all of your plants' needs and water them, feed them and make sure they have optimal growing conditions 24/7.



<http://getniwa.com/>



# Smart Sprinkler Control

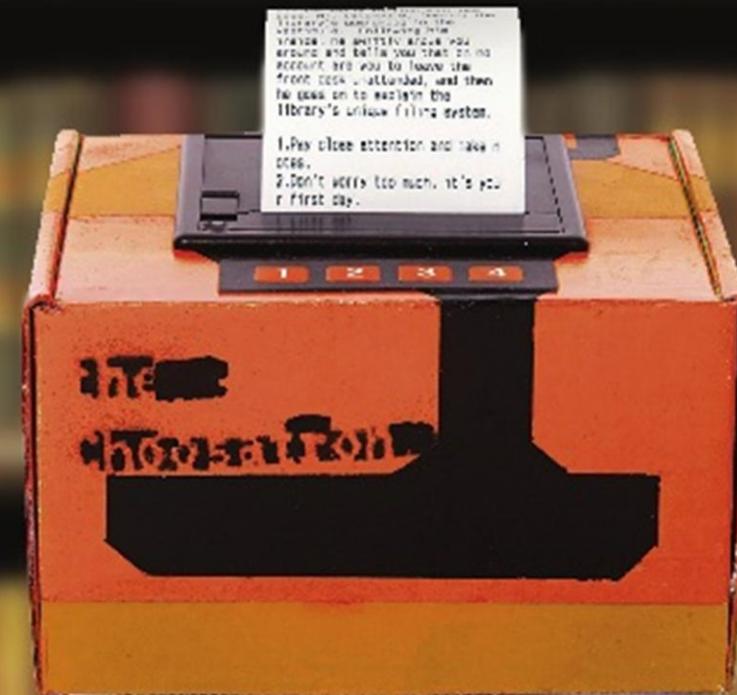
Lono lets you control your sprinkler system anywhere, anytime with your smart phone. And the things that should be automated, finally are.



<http://lono.io/>

# Fiction Arcade Machine

The Choosatron is a fun kit that assembles into a small interactive fiction game box, great for social reading and playing. As you play, you make decisions that affect the outcome of the story, and is printed on a paper scroll.



<http://choosatron.com/>

# Smart Home Security

Canary is a complete security system packed into a single, device. It adapts to your home over time and sends intelligent notifications with HD video directly to your smartphone.



<http://canary.is/>

# Smart Pet Game

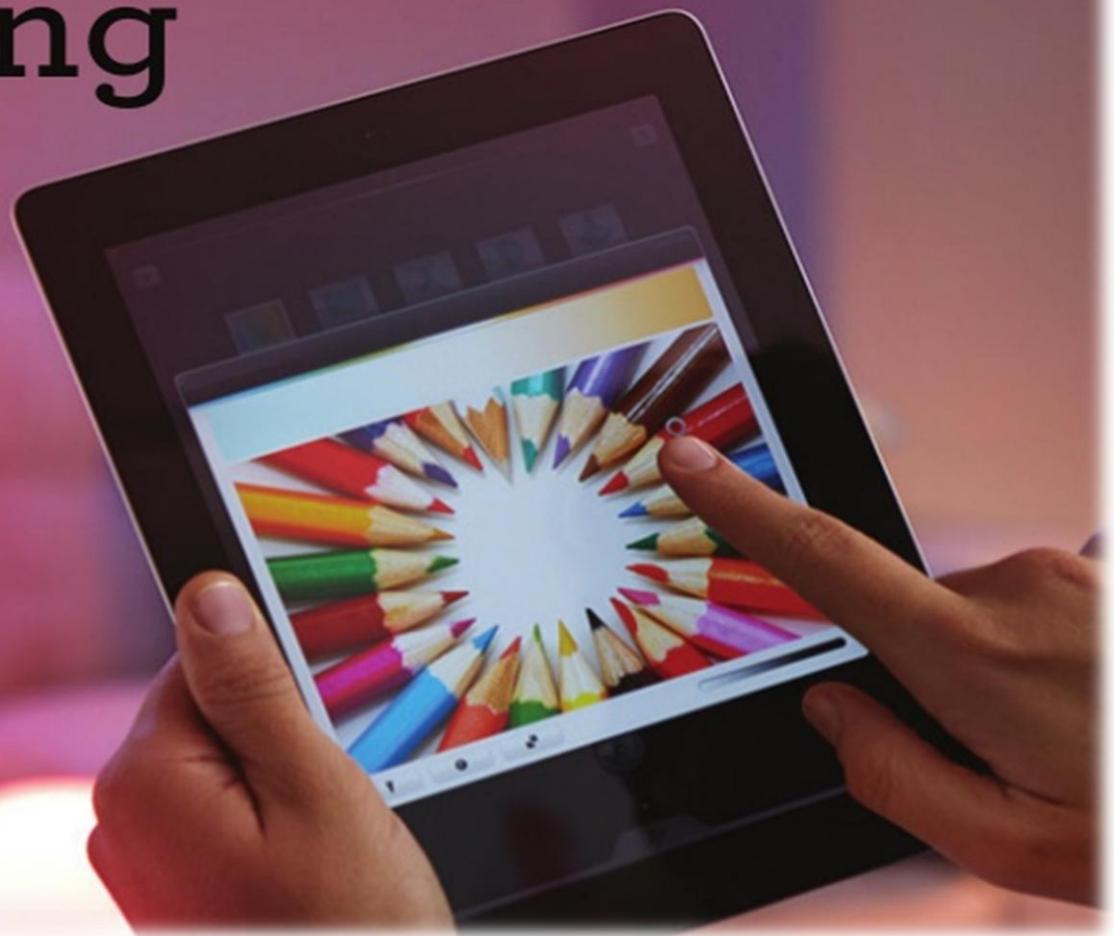
CleverPet is a smart WiFi-connected game console for your dog. Automatically entertain and educate your dog, even when she's home alone.

<http://getcleverpet.com/>



# Smart Lighting

Control your bulbs one at a time or altogether. Find just the right shade of white. Pick that perfect tone to match the moment. Or recreate any color from a photo.



# Analyze with NODE+

Analyze speed, acceleration,  
movement, direction, shock, tilt,  
magnetic fields, and more.



<http://variableinc.com>

# Smart A/C

Aros learns from your budget, location, schedule, and usage to automatically maintain the perfect temperature and maximize savings for your home.



<https://www.quirky.com/shop/752-aros-smart-window-air-conditioner>

# Bluetooth-Enabled Insoles

Shares navigation, directions and orientation.

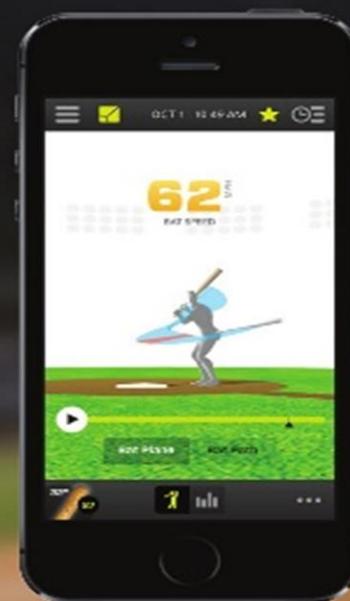


<http://lechal.com/products.html>

# Swing Analyzer

Make your Zepp Sensor multi-sport, all you need to do is purchase additional sport specific mounts and download the app.

<http://www.zepp.com/>



# Smart Sleep System

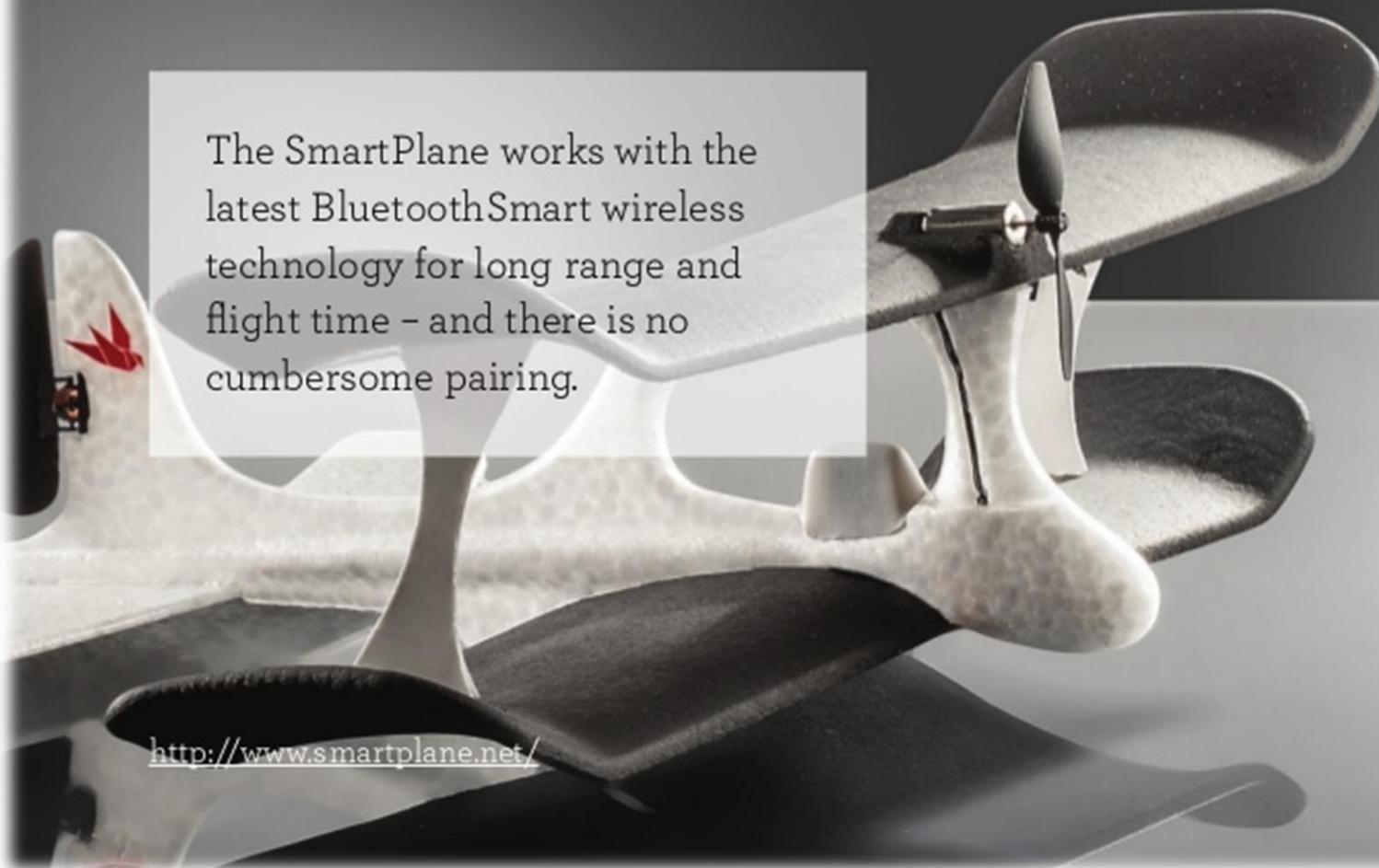
Visualize your sleep cycles, understand what wakes you up, and compare nights. From the palm of your hand you can control your personalized wake-up, and fall-asleep programs.

<http://www.withings.com/us/withings-aura.html>



# Smart Plane

The SmartPlane works with the latest Bluetooth Smart wireless technology for long range and flight time - and there is no cumbersome pairing.



<http://www.smartplane.net/>



# Sense Mother

Sense Mother is at the head of a family of small connected sensors that blend into your daily life to make it serene, healthy and pleasurable.

<http://sen.se/store/mother/>



# Blood Pressure Monitor

Simply slip on the cuff, turn on the Wireless Blood Pressure Monitor and the Health Mate app will automatically launch.



<http://www.withings.com/us/blood-pressure-monitor.html>

# Smart Weather Station

The Netatmo Weather Station allows you to use indoor temperature, relative humidity and CO<sub>2</sub> readings to live in a healthier home.



<http://www.netatmo.com/en-US/product/weather-station/>

# Internet-Connected Mirror



We are looking to bring a product to market that can make your life easier, while doing something you already spend time doing each day, looking at a mirror.

<https://www.kickstarter.com/projects/860592058/imirror>



# Smart Tennis Racket

Track your game with Babolat's breakthrough innovation. See where you stand in the global ranking and by category within your online community.



<http://en.babolatplay.com/>

# Smart Bike

Valour by Vanhawks gives directions, reroutes to avoid traffic, and tracks riding metrics.



<http://www.vanhawks.com/>

# Smart Garbage Cans

BigBelly alerts when it needs to be emptied so smarter collection decisions can be made.

<http://www.bigbelly.com/solutions/stations/smартbelly/>



# Drop

Baking assistant that gives  
recipes, directions, substitutions,  
shopping lists, etc.



<http://getdrop.co/>

# Petnet

Petnet will control your pet's feeding from anywhere and tracks their nutrition.

<http://www.petnet.io/>



# Smart Mirror

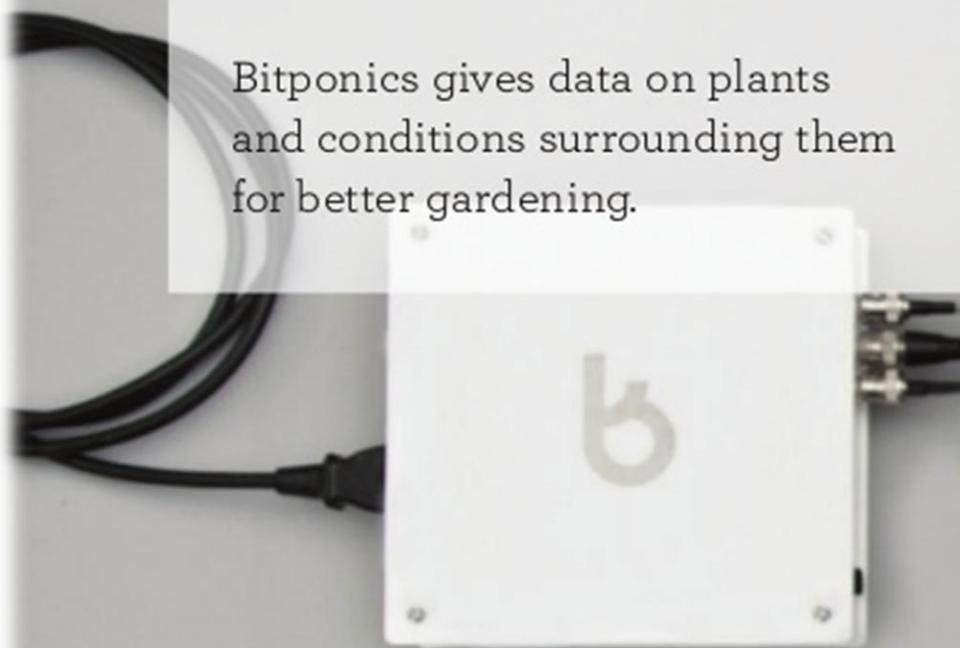
A reflective mirror with programmable applications and digital display for the home, office and public environments (hotels, hospitals, retail shops).



<http://www.cybertecturemirror.com/>

# Smart Gardening

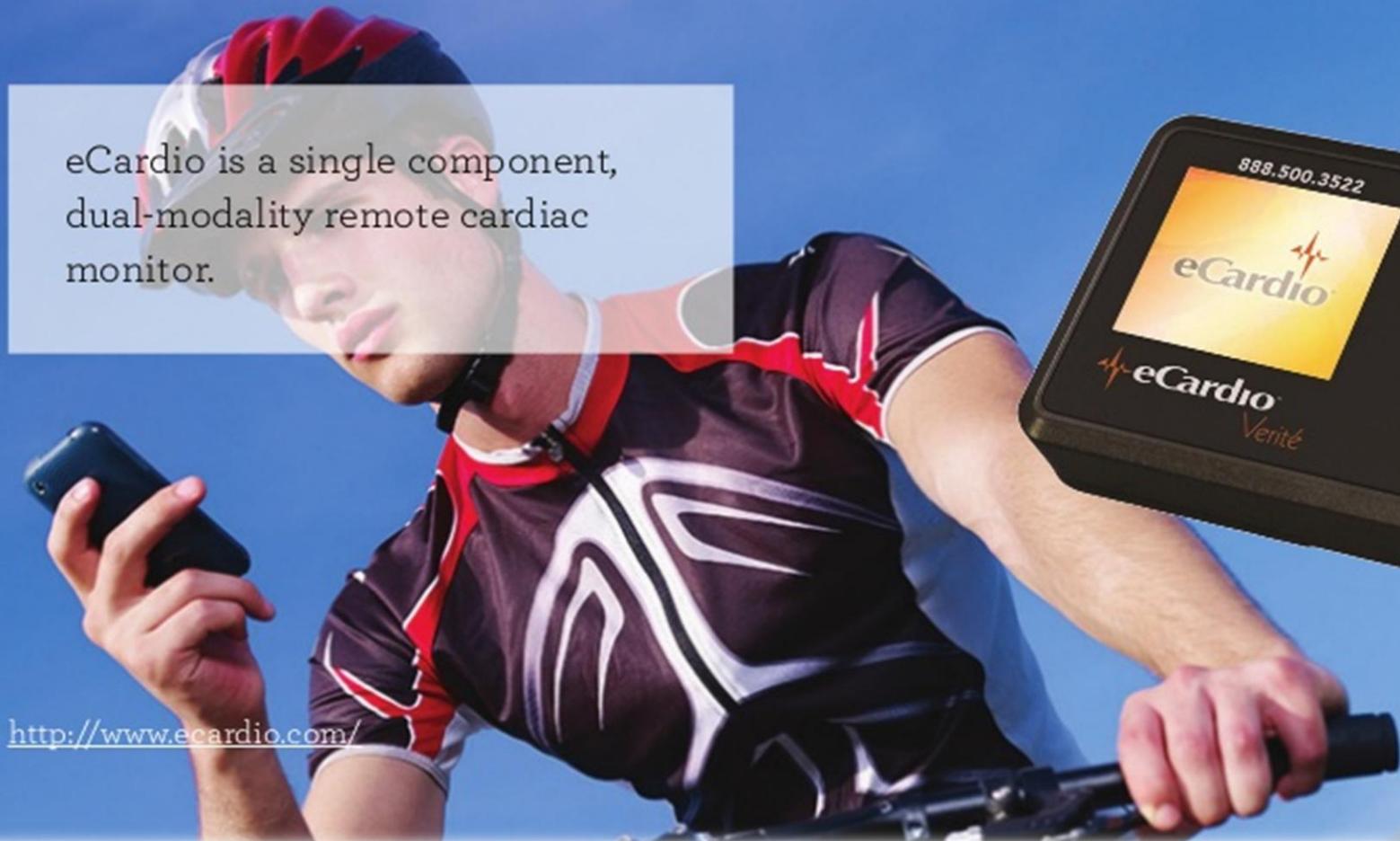
Bitponics gives data on plants and conditions surrounding them for better gardening.



<http://www.bitponics.com/>



# Smart Cardio



eCardio is a single component,  
dual-modality remote cardiac  
monitor.



<http://www.ecardio.com/>

# Smart Doorlock

The Genie Smart Lock - A door lock that allows you to lock and unlock your home using your smart phone, bluetooth keyring or computer.

<http://www.geniesmartlock.com/index.php>



# Nod

Nod transforms your movements into commands. It brings the world around you to life, as you control everything from your laptop to your living room lights with a wave of your hand.

<https://hellonod.com/>



# Smart Socks



Socks infused with proprietary 100% textile sensors. They are paired with a Bluetooth Smart cool and detachable anklet that delivers accuracy in step counting, speed, calories, altitude and distance tracking.



<http://store.sensoriafitness.com/>

# Sense by Hello

Sense makes smart devices to track sleep behavior and monitor sleeping environment.



<http://hello.is/>

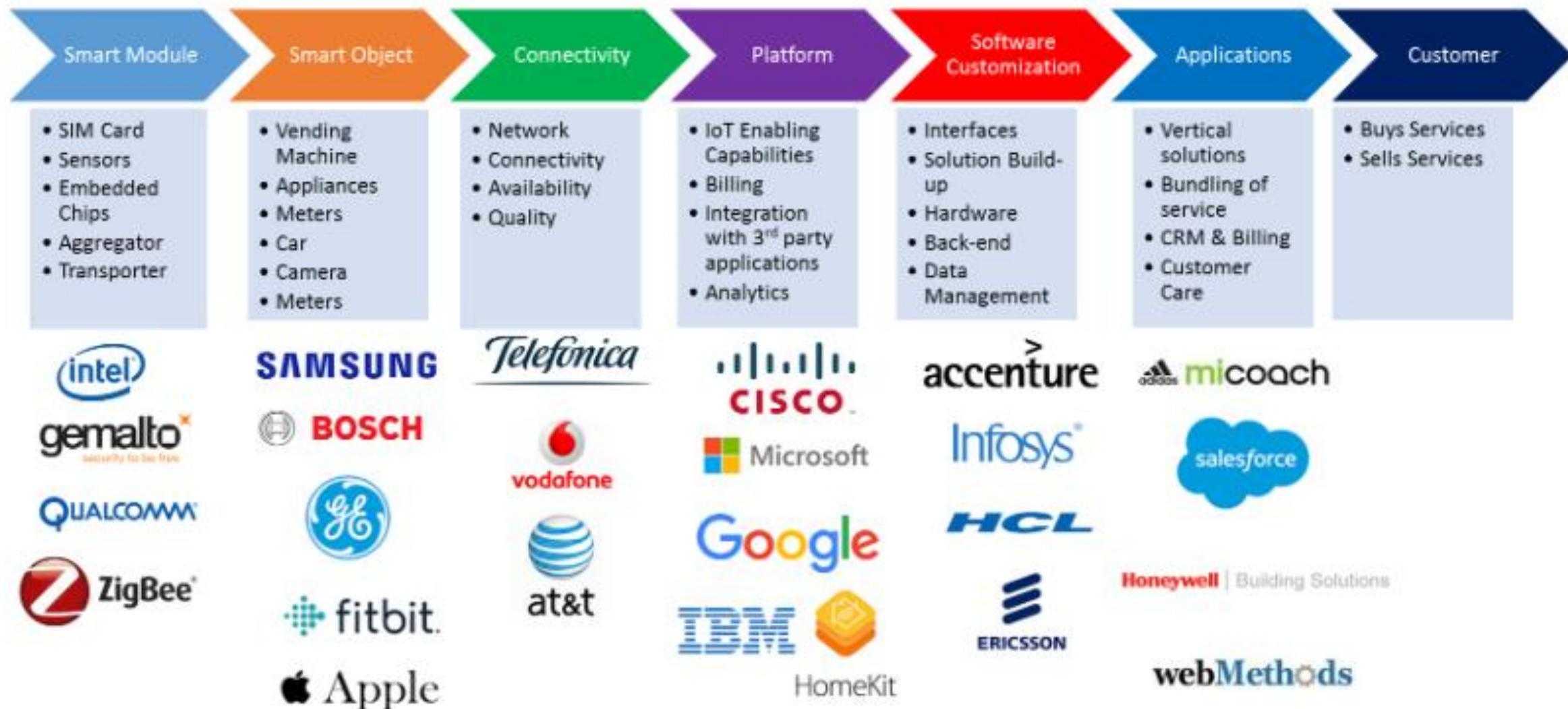
# Smart Shirt

Monitors how your body behaves over time, includes heart rate recovery and breathing at rest, to monitor improvements in health.

<http://omsignal.com/>



## Internet of Things Value Chain



Note, the above is not an exhaustive list of companies and any company may have play in more than one component of value chain  
Copyright: Telecomcircle.com

# Challenges and Issues

## Issues

- **Society: People, security, privacy**
  - A policy for people in the Internet of Things:
  - Legislation
- **Environmental aspects**
  - Resource efficiency
  - Pollution and disaster avoidance
- **Technological**
  - Architecture (edge devices, servers, discovery services, security, etc.)
  - Governance, naming, identity, interfaces
  - Service openness, interoperability
  - Connections of real and virtual world
  - Standards

# Challenges and Issues

IoT will inherit the drawbacks of the current internet on an infinitely larger, but more invisible scale

- Privacy – will be a huge issue when implementing IoT
- Identity - Online Fragmentation of Identity
- Efficiency – speed - person loses identity and is an IP address
- Decisions – do not delegate too much of our decision making and freedom of choice to things and machines
- Balancing

# Circuit Switching Vs Packet Switching

Circuit Switching	Packet Switching
Physical path between source and destination	No physical path
All packets use same path	Packets travel independently
Reserve the entire bandwidth in advance	Does not reserve
Bandwidth Wastage	No Bandwidth wastage
No store and forward transmission	Supports store and forward transmission

## Hyundai BlueLink Connectivity

Safety	Security	Remote	VRM (Vehicle Relationship Management)	LBS (Location Based Services)	Alert Services	AI (Artificial Intelligence)
Auto Crash Notification	Stolen Vehicle Tracking	Remote Engine Start/Stop	Auto DTC Check	Push Map to car from App	Geo-fence Alert	Voice Recognition – Indian English
SOS/Emergency Assistance	Stolen Vehicle Notification	Remote Climate Control	Manual DTC Check	Push Maps by Call Center	Speed Alert	
Road Side Assistance	Stolen Vehicle Immobilization	Remote Door Lock/Unlock	Monthly Health Report	Live POI Search	Time Fencing Alert	
Panic Notification		Remote Horn Honk & Light	Maintenance Alert	Live Traffic Information	Valet Alert	
		Remote Vehicle Status	Driving Information / Behavior	Share The Destination	Idle Alert	
		Find My Car		Live Car Tracking		
		Share My Car		Destination Set in Link with Schedule		
				Location Sharing		

**blueLink**

Your Connected Friend on the Go





## Safety

Equipped to handle any emergencies

SOS/Emergency Assistance



SOS

Auto Crash Notification & Assistance



RSA  
(Roadside Assistance)



Panic Notification



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HYUNDAI



## Vehicle Relationship Management

Proactively check the health of your car

Monthly Health Report



Auto & Manual  
DTC check



Driving  
Behaviour/Information





Security - Secure your car 24X7



Stolen Vehicle  
Notification



Stolen Vehicle  
Tracking



Stolen Vehicle  
Immobilisation

BlueLink

Remote  
Access your car from Any Distance



\*\* Only for AT and DCT vehicles

 HYUNDAI



**Vehicle Relationship Management**  
Proactively check the health of your car

Monthly Health Report



Auto & Manual  
DTC check



Driving  
Behaviour/Information



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**BlueLink**

**Location Based Services**  
Search and Share Live Locations



Real-Time Vehicle Tracking



Real-Time Traffic Information



Push Map from App



Push maps by call centre



Schedule Linked Destination Setting

carware  
 HYUNDAI



## Alert Services

Geo-fence Alert



Idle Alert



Time Fencing Alert

Speed Alert



Valet Alert

**blueLink**

Artificial Intelligence  
'Interactive' Voice Recognition

Voice Recognition - Indian English



180 pts



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 HYUNDAI

**Basics of computer architecture and the binary number system:** Basics of computer architecture, Computer languages, RISC and CISC architectures, Number systems, Number format conversions, Computer arithmetic, Units of memory capacity.

**Introduction to Embedded systems:** Application domain of embedded systems, Desirable features and general characteristics of embedded systems, Model of an Embedded System, Microprocessor vs Micro-controller, Example of a Simple embedded system, Figures of merit for an embedded system, Classification of Scum: 4/8/16/32 Bits, History of embedded systems, Current trends.

**Embedded Systems – The hardware point of view:** Micro-controller Unit(MCU), A Popular 8-bit MCU, Memory for embedded systems, Low power design, Pull-up and pull-down resistors.

**Sensors, Ad Cs and Actuators:** Sensors, Analog to Digital Converters, Actuators.

**Examples of Embedded Systems:** Mobile Phone, Automotive Electronics, Radio frequency identification(RFID), Wireless sensor networks(WISENET), Robotics, Biomedical Applications, Brain machine interface

**Real – time Operating Systems:** Real-time tasks, Real-time systems, Types of Real-time tasks, Real-time operating systems, Real- time scheduling algorithms, Rate Monotonic Algorithm, The Earliest deadline first algorithm, Qualities of a Good RTOS.

**Automated design of Digital IC's:** History of integrated circuit(IC) design, Types of Digital IC's, ASIC design, ASIC design: the complete sequence.

**Hardware Software Co-design and Embedded Product development lifestyle management:** Hardware Software Co-design, Modeling of Systems, Embedded Product Development Lifestyle Management, Lifestyle Models.

**Embedded Design: A Systems Perspective:** A typical Example, Product Design, The Design Process, Testing, Bulk Manufacturing.

**✓ Internet of Things: Sensing and Actuation from Devices, Communication Technologies, Multimedia Technologies, Circuit Switched Networks, Packet Switched Networks**

**Tree Plantation Drone – Search on Google/youtube**

**Dutch Police use eagles to hunt illegal drones (Search on Google/youtube )**

**Retail 2020 Technologies that will change the way you shop -  
Search on Google/Youtube**

# TRANSWHEEL – Search on Google / Youtube



## Let us Explore -

**Q1) Discuss the applications of :**

- i) I(ndustrial) IoT
- ii) IoD(rone) T
- iii) Social IoT
- iv) Io M(edical) T
- v) Io R(obotic) T

**Q2) i) What is FDMA ? What is CDMA? Importance of Walsh chips in CDMA?**

**Q3) Define -**

- i) Bluetooth
- ii) Scatternet
- iii) Piconet

**Q4) Write any two advantages and disadvantages of 5G**

**Q5) Differentiate Between – i) WiFi    ii) WiMax    iii) Zigbee**

**Q6) Compare - i) IEEE802 . 11 a    ii) IEEE802 . 11 b**

**iii) IEEE802 . 11 g    iv) IEEE802 . 11 n**

**Q7) Where do we use - IEEE802 . 15 . 4**

Thank  
You!

