



EEM602 Internet of Things

Lecture # 1

(IOT Course Intro + IOT Applications)

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mangoud.com

Lecture Outlines

1. Course Introduction and Objectives
2. Why and What is IoT ? When AI meets IoT?
3. Cool Applications !!
4. IoT Technologies and Development Tools
5. Conclusions / Discussion / Q & A

All about

Prof. Mohab Abd-Alhameed Mangoud @

mangoud.com

EEM602 course material and announcements @

<https://www.mangoud.com/eem-602-internet-of-things/>



University of Bahrain
Deanship of Graduate Studies & Scientific Research

MSc. in Artificial Intelligence Systems

Total Fees

BD
5,040



Now
Admission
Open

STUDY IN ENGLISH COLLEGE OF ENGINEERING ISA TOWN

Admission

- 1 The applicant needs to have a Bachelor's degree from a recognized university, with a GPA of 2.67 and more.
- 2 Applicants must have a Bachelors degree in Engineering, Science or Technology from the UoB or an equivalent degree.
- 3 The applicant needs to pass the personal interview.
- 4 The applicant needs to submit two academic references.
- 5 The applicant needs to have IELTS/ TOEFL score in accordance with department regulations.
- 6 In case of not having any certificate equivalent to TOEFL, the applicant needs to take an English language test for (50 BD).
- 7 Interview to be assigned later.

Academic programs
At the University of Bahrain
www.uob.edu.bh



+973 16 633366

studentcc@uob.edu.bh



uobedubh



University of Bahrain
Deanship of Graduate Studies & Scientific Research

MSc. in Telecommunications and Networks

Total Fees

BD
5,040



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College of Engineering

Master of Science in Artificial Intelligence Systems

Year I - Semester 1		
Course Code	Course Title	CH
EEM 600	Principles of Artificial Intelligence	4
EEM 601	Statistical Data Analysis and Research Methods	4
EEM 602	Internet of Things (IoT)	4

Year I - Semester 2		
AIE 603	Machine Learning	4
AIE 604	Deep Learning Applications	4
AIE 605	Special Topics in Artificial Intelligence	4

Year II - Semester 3-4		
EEM 699	Thesis	12

Total Credit Hours 36



College of Engineering

Master of Science in Telecommunications and Networks Engineering

Year I - Semester 1		
Course Code	Course Title	CH
EEM 600	Principles of Artificial Intelligence	4
EEM 601	Statistical Data Analysis and Research Methods	4
EEM 602	Internet of Things (IoT)	4

Year I - Semester 2		
TNE 603	Modern Telecommunications Systems	4
TNE 604	Advanced Communication Networks	4
TNE 605	Special Topics in Communications	4

Year II - Semester 3-4		
EEM 699	Thesis	12

Total Credit Hours 36

Course Description:

This advanced course delivers an understanding of Embedded Systems and Internet of Things and their enabling smart everywhere applications, like smart grid, smart city, smart home, industrial automation, telemetry, etc. Typical architectures of IoT systems are introduced, including microcontrollers and sensors. It is industrially focused, tailored to the demands of companies that design and manufacture mobile electronic equipment which interfaces with wireless networks and applications. **Students will also learn how to use typical IoT enabling communications technologies,**

<https://www.mangoud.com/eem-602-internet-of-things/>

EEM602: IoT Course Overview

1. What is the Internet of Things : Concept

2. IoT Applications

1. Sustain (Smart cities)
2. Move (Self driving cars)
3. Heal (Healthcare)
4. Feed (Agriculture)
5. Make (Manufacturing and packaging)

3. Internet and Computer networks Fundamentals

EEM602: IoT Course Overview

3. Sensors + Actuators

Ultrasonic fill-level sensor , Light and motion sensors , Infrared- and magnetic based vehicle detection sensor , Camera

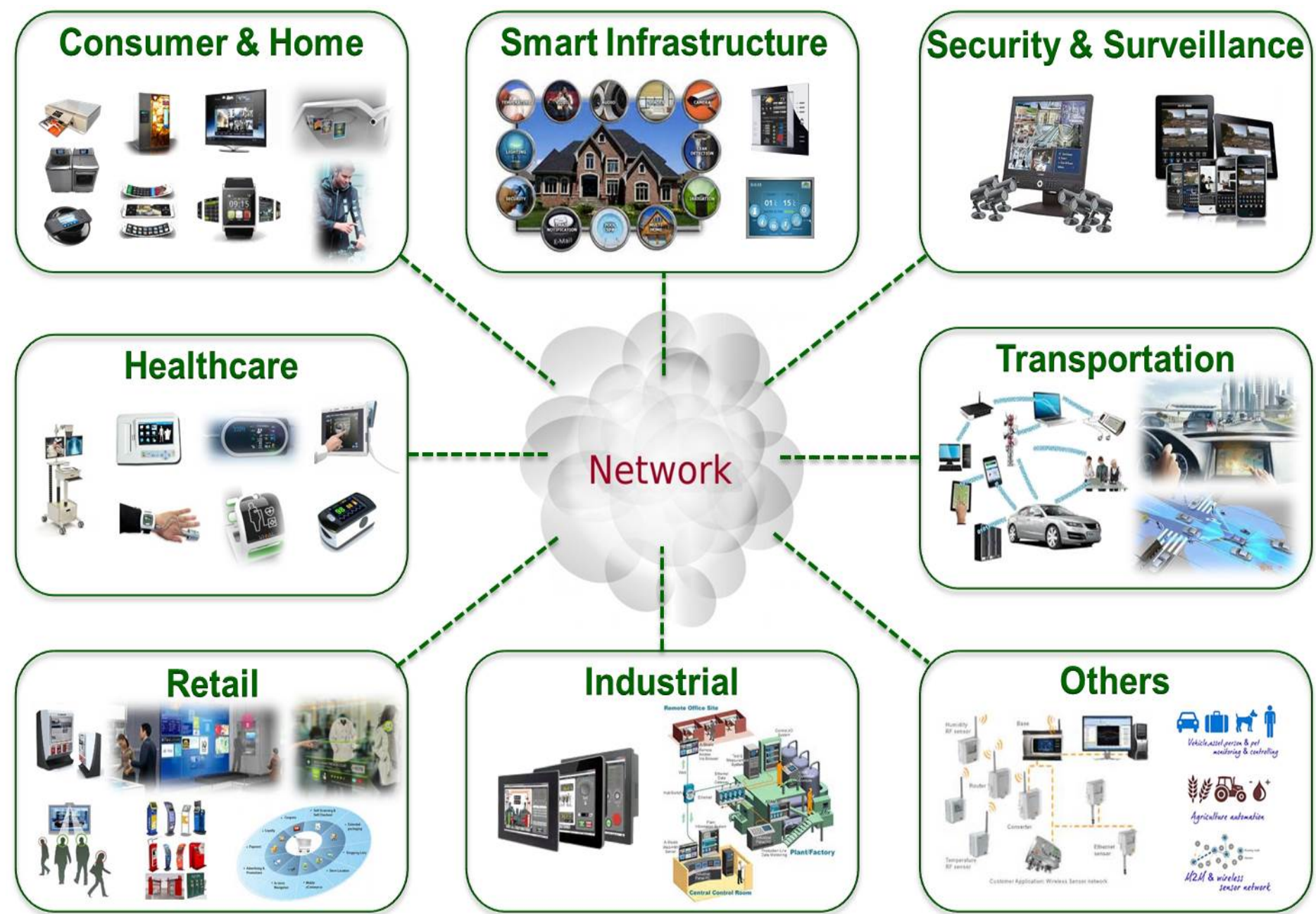
4. Enabling Technologies for the IoT (Digital and Wireless Communications Technologies)

WiFi , Cellular IoT (LTE Cat-M1 and NB-IOT) , Zigbee, LoRa, LoRaWAN , V2X

5. Communications Protocols : MQTT

6. IoT Design and Prototyping with Examples

Why IoT??



Dawn of the 5G and IoT Era

Internet of Things

is considered the next big technology revolution after the invention of the Internet.

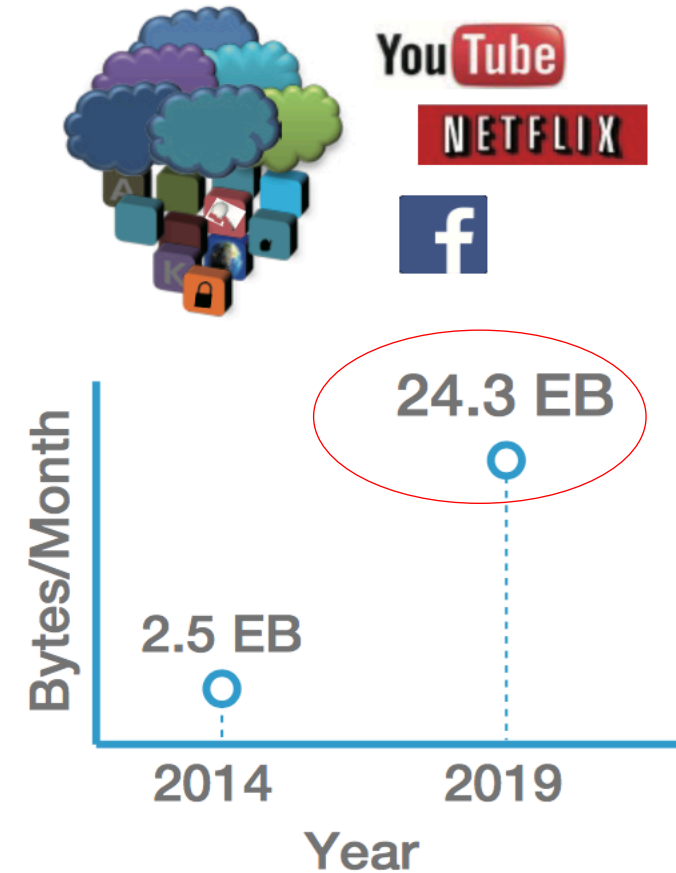
It is supposed to make tremendous impacts on our everyday lives and may possibly lead to the betterment of millions of lives throughout the world.

According to Cisco, over 50 million devices are expected to be connected to IoT by 2020.

Things Connected



Mobile Data Traffic



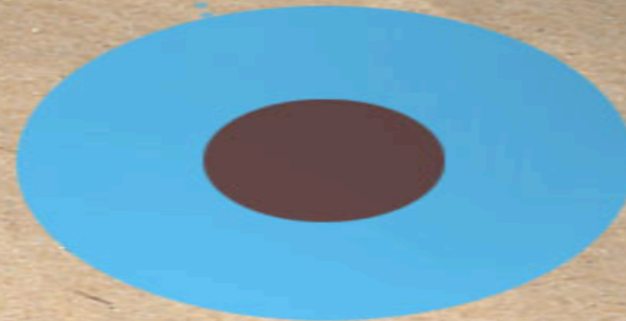
Concept of The IOT

The INTERNET of THINGS



Thanks to IPV6

During 2008, the number of things connected to the Internet exceeded the number of people on earth.



These things are not just smartphones and tablets.



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 is IoT?

Cool applications

Locomotive for innovation and economic growth

Big data

Sensors

Internet

Security

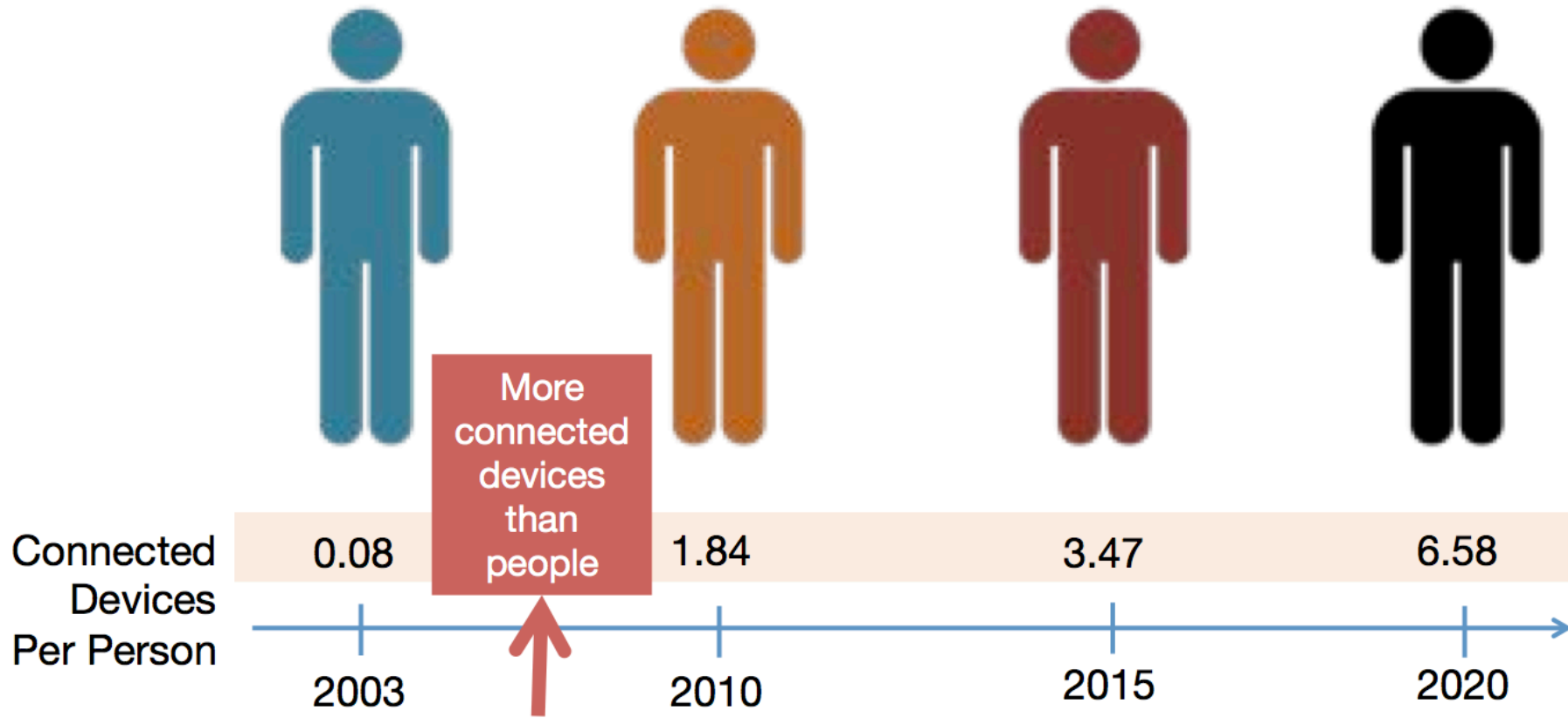
Circuits

Sensors

Sensors

More Connected Devices Than People

World Population	6.3 Billion	6.8 Billion	7.2 Billion	7.6 Billion
Connected Devices	500 Million	12.5 Billion	25 Billion	50 Billion



[Source: Cisco IBSG, April 2011]

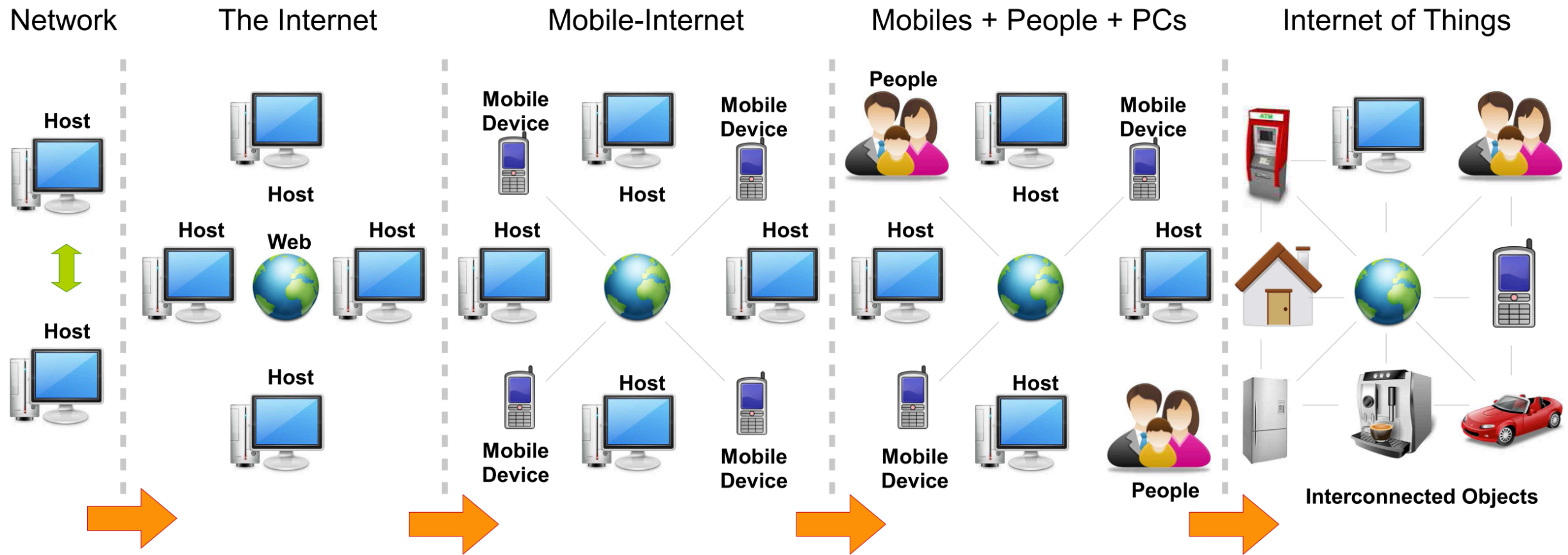


FIGURE 4. Evolution of the Internet in five phases. The evolution of Internet begins with connecting two computers together and then moved towards creating World Wide Web by connecting large number of computers together. The mobile-Internet emerged by connecting mobile devices to the Internet. Then, peoples' identities joined the Internet via social networks. Finally, it is moving towards Internet of Things by connecting every day objects to the Internet.

A Survey on Internet of Things From Industrial Market Perspective

CHARITH PERERA, (Member, IEEE), CHI HAROLD LIU, (Member, IEEE),
SRIMAL JAYAWARDENA, (Member, IEEE), AND MIN CHEN, (Senior Member, IEEE)

Corresponding author: C. H. Liu (chiliu@bit.edu.cn)

This work was sponsored by National Natural Science Foundation of China under Grant 61300179. This work was also supported in part by the International Science and Technology Collaboration Program (2014DFT10070) funded by China Ministry of Science and Technology.



A Connected Future

The Internet of Things

The Internet of Things (IoT) is transforming the way we interact with our devices at home, at work, and throughout our cities.

This network of connected devices gathers vast amounts of data about our online activities.

Daily Data
Generated from IoT Devices

5 quintillion bytes
(1 BILLION GIGABYTES, OR 5 EXABYTES)

SOURCE: CISCO

IoT is empowered by
three key technologies:

**Artificial
Intelligence (AI)**



Programmable intelligence enabling devices to learn, reason, and process information like humans

5G Networks



5th generation mobile networks with extremely fast, near-zero latency for real-time data processing

Big Data



Volumes of data from numerous Internet-connected sources, that are too large for normal processing methods

Together, AI and IoT merge to create AIoT — a smart, connected network of devices that seamlessly communicate over powerful 5G networks — unleashing the power of data better and faster than ever.

IOT Applications

1. Smart cities / Smart Homes
2. Healthcare
3. Agriculture
4. Manufacturing and logistics
5. Wearables and Everyday Life

Smart City

Smart cities that integrate all levels of municipal services are becoming safer, more convenient places to live. Applications include open data for better urban planning, optimized energy consumption, and increased public safety through smart traffic surveillance.



Smart energy grids



Smart streetlights



Smart public transportation



1. Smart cities

2017 Stanford University



INTEGRATED REPORTING AND ANALYTICS: ACTIONABLE INSIGHT

CITY INTELLIGENCE | SMART OPERATIONS | CITIZEN RELATIONSHIP MANAGEMENT

ENERGY

- SMART BUILDINGS
- CONDITION BASED MAINTENANCE
- REMOTE OUTAGE NOTIFICATION
- SMART WASTE MANAGEMENT

UTILITY

- WATER TREATMENT
- WATER MANAGEMENT
- EQUIPMENT MONITORING/CONTROL
- HAZARDOUS MATERIALS
- EMERGENCY RESPONSE

VEHICLE

- SMART PARKING
- PARKING ENFORCEMENT
- VEHICLE DETECTION
- MOBILE PAYMENTS
- EV CHARGING

TRANSIT

- INTELLIGENT RAIL AND TRANSIT SOLUTIONS
- FLEET MANAGEMENT
- ASSET TRACKING
- MOBILE PAYMENTS
- SMART ROADS

PUBLIC SAFETY

- VIDEO SURVEILLANCE
- REMOTE SECURITY MONITORING
- EMERGENCY RESPONSE
- SMART STREET LIGHTS
- MASS NOTIFICATIONS

Source: Verizon. Smart Cities Solutions, 2014

Smart Waste Management



Dublin Airport

<http://ecubelabs.com/>



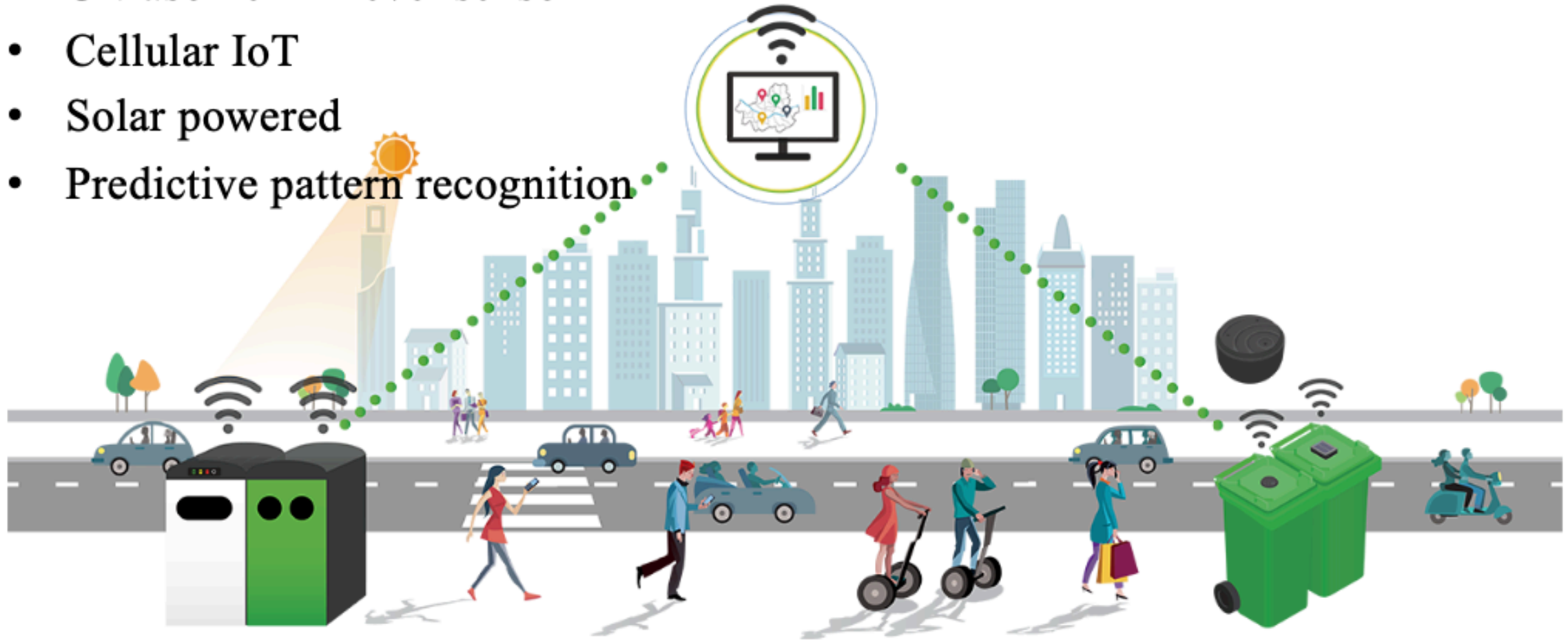
New York City

<http://bigbelly.com/>

2017 Stanford University

Smart Waste Management

- Ultrasonic fill-level sensor
- Cellular IoT
- Solar powered
- Predictive pattern recognition



<http://ecubelabs.com/integrated-waste-management/>

Smart Waste Management



- Go from collecting 840 containers 4 times a day to collecting 80 containers a day.
- Increase waste collection efficiency by 90%.

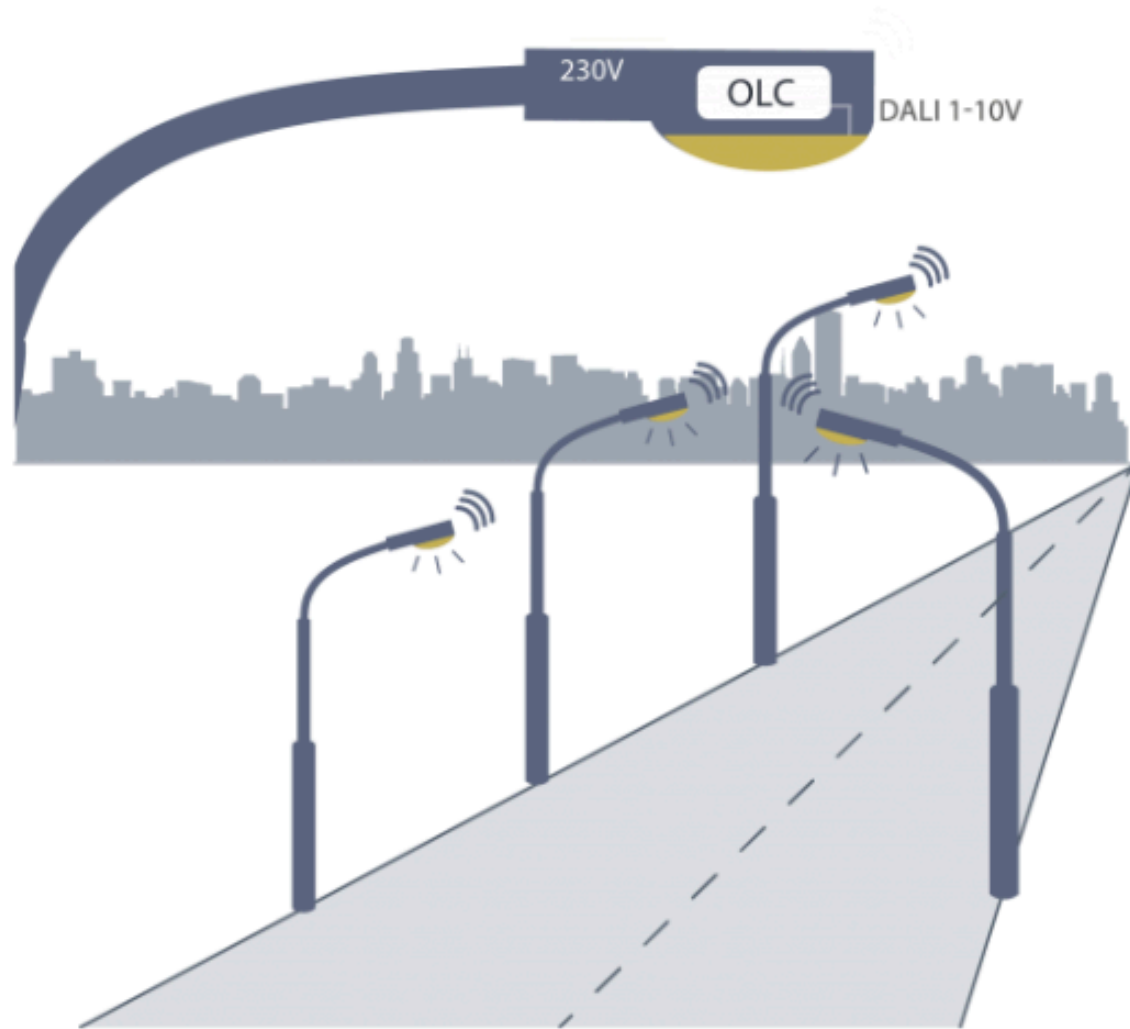
<http://ecubelabs.com/case-studies/dublin-airport/>

Smart Street Lights

- Save energy
- Reduce light pollution
- Faster replacement



Smart Street Lights



- Light sensor, motion sensor
- Cellular IoT
- Real-time mesh network

Street Lighting System (SaaS)



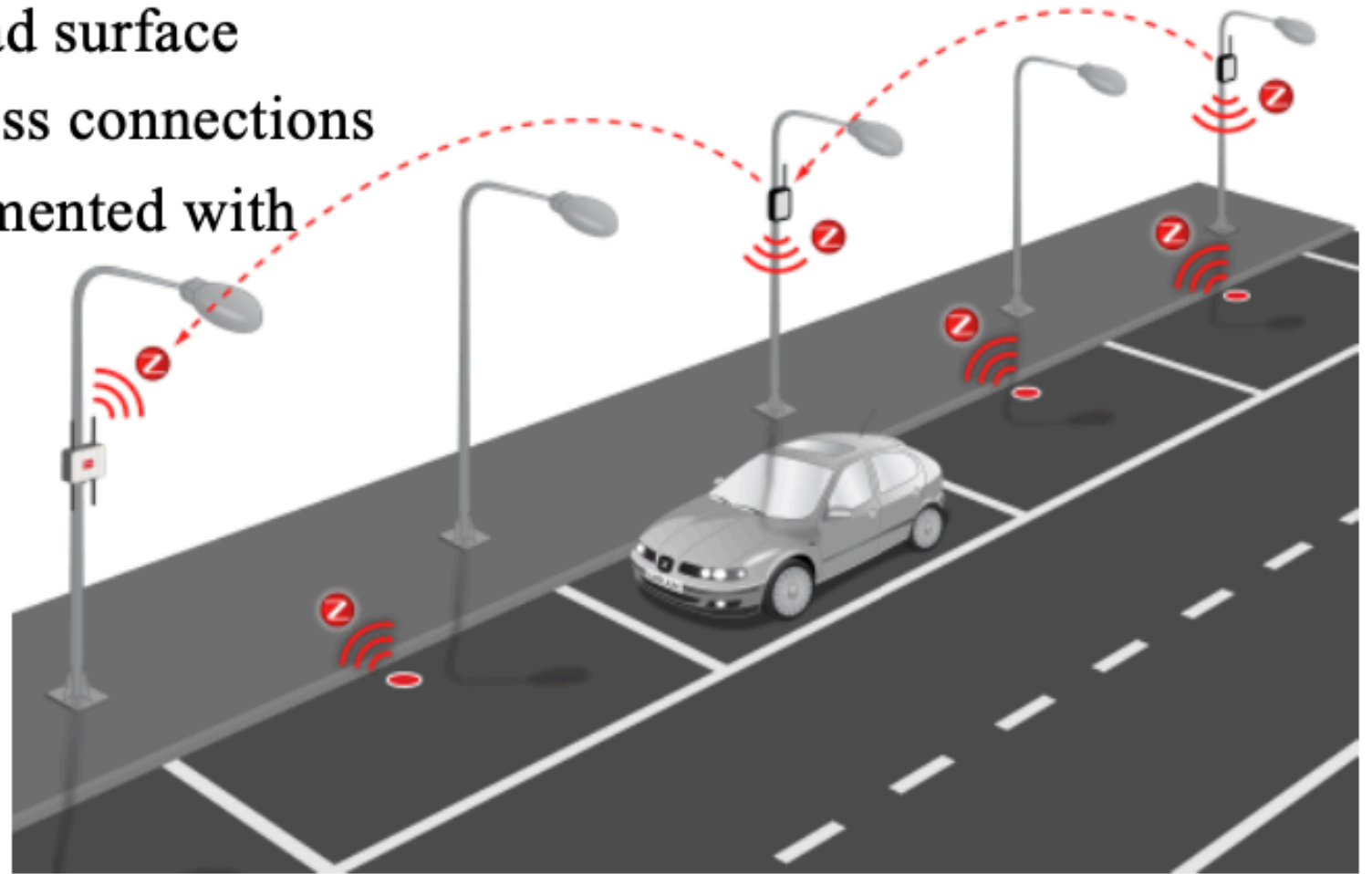
<https://chess-wise.eu/en/smart-street-lighting/>

Smart Street Parking

- In the past year, how many times did you give up when looking for a parking space in cities? How many times did you argue with someone about a parking spot? On average, how long did you take to look for a parking spot?
- More than 30% of a city's traffic is caused by drivers searching for a parking spot.
- In New York City, 29% of commuters said that they spent 20 minutes on average looking for a parking spot and 10% spent more than 40 minutes.

Smart Street Parking

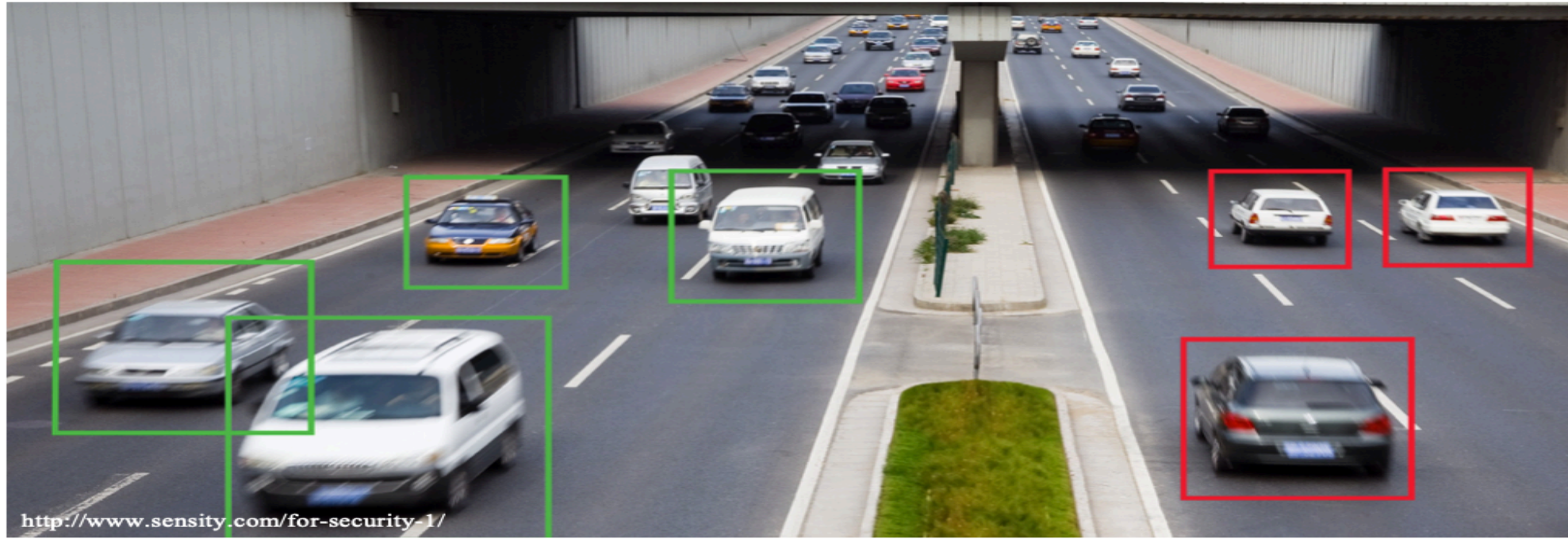
- Infrared- and magnetic-based vehicle detection sensor mounted on the road surface
- Zigbee, LoRaWAN wireless connections
- Mesh networks are implemented with in street lights.
- Apps to direct drivers to empty spaces
- Dynamic parking prices



Smart Street Parking in Poland



Security without Surveillance



Security without Surveillance

- Real-time analytics rather than human-monitored surveillance
- Edge-based analytics rather than cloud-based analytics
 - All videos are stored locally.
 - This also reduces the requirement on datarate.
- Resultant analytics sent to central cloud database for issuing alerts

Connected Vehicles



1

You call your (autonomous driving) car to pick you up



2

You enter your destination and are dynamically routed to work based on traffic flows through the system



4

You are connected to everything you need while you travel in a car personalized for you



3

Your car travels down an automated roadway with platooned vehicles

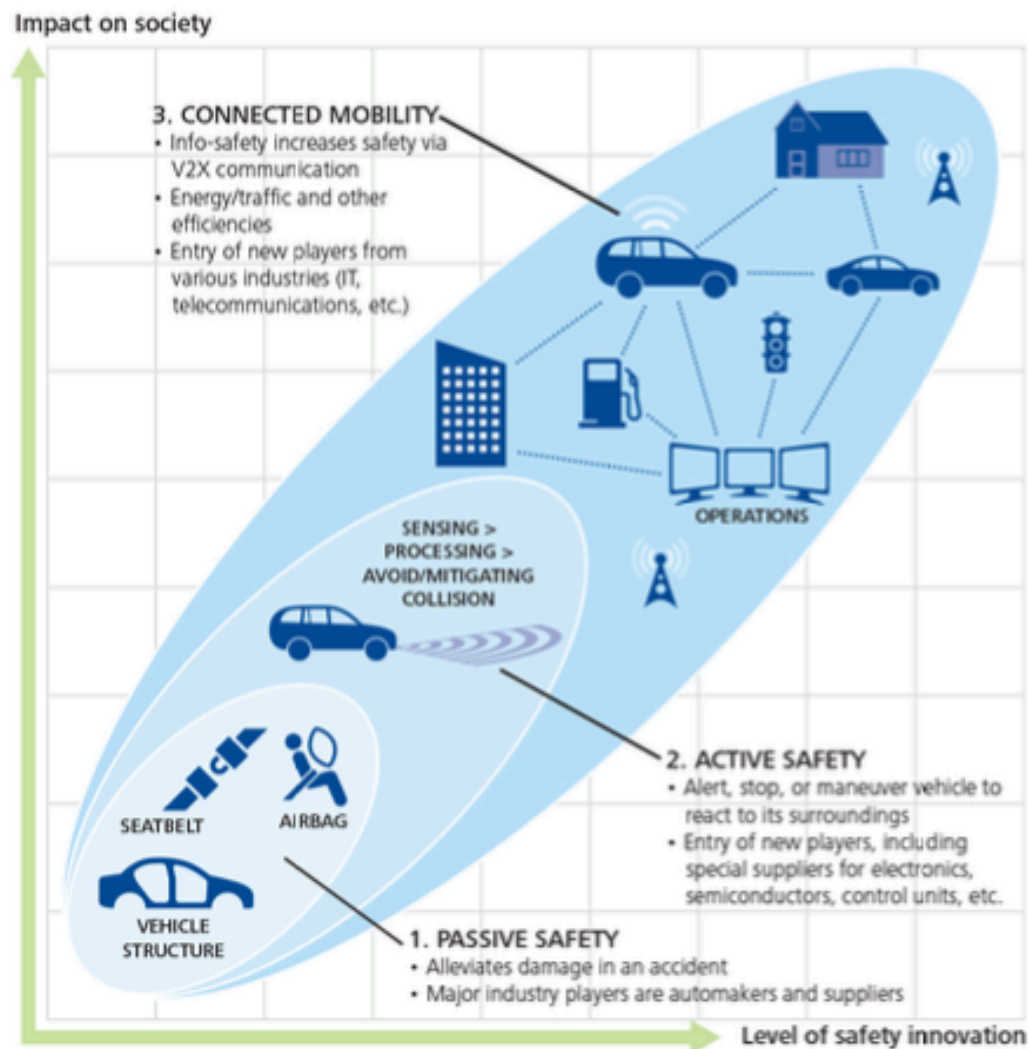


5

You are dropped off at the doorstep and the car parks itself



Connected Vehicles – Stages of Safety Innovation



- Passive vehicle safety uses sensors to take the vehicle's immediate surroundings into consideration.
- Recent efforts enable the sharing of information gathered by the sensors between vehicles, and between vehicles and their surroundings to increase safety further.
 - V2X (vehicle-to-X, where X represents other vehicles, infrastructure, roads, and so on)
 - A step towards autonomous driving

Graphic: Deloitte University Press | DUPress.com

<https://aupress.deloitte.com/aup-us-en/deloitte-review/issue-12/the-rise-of-safety-innovations-in-intelligent-mobility.html>

SMART CITIES

- 01 Smart Parking**
Monitoring of parking spaces availability in the city.
- 02 Structural health**
Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.
- 03 Noise Urban Maps**
Sound monitoring in bar areas and centric zones in real time.
- 04 Smartphones Detection**
Detect iPhone and Android devices and in general any device which works with Wifi or Bluetooth interfaces.
- 05 Eletromagnetic Field Levels**
Measurement of the energy radiated by cell stations and and WiFi routers.
- 06 Traffic Congestion**
Monitoring of vehicles and pedestrian levels to optimize driving and walking routes.
- 07 Smart Lighting**
Intelligent and weather adaptive lighting in street lights.

Smart City technology investment will total \$108 billion by 2020.

Pike Research



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FALLO
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A110:0810:2729:9560::

3010:4DA7:AC10:ED02::

1732:BC11:A4E1:2DE4:2286::

751-5555

BCN 6578

BCN 138

Smart Cars will speak
/communicate/interact about
traffics and emergencies





أعد النظر RETHINK

أعد النظر
RETHINK



أعد النظر
RETHINK



وفاة سببها
السرعة في
2014

18

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إصابة خطيرة في
المملكة في 2014

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وفيات سببها
الإنحراف و التجاوز
الخاطيء في 2014

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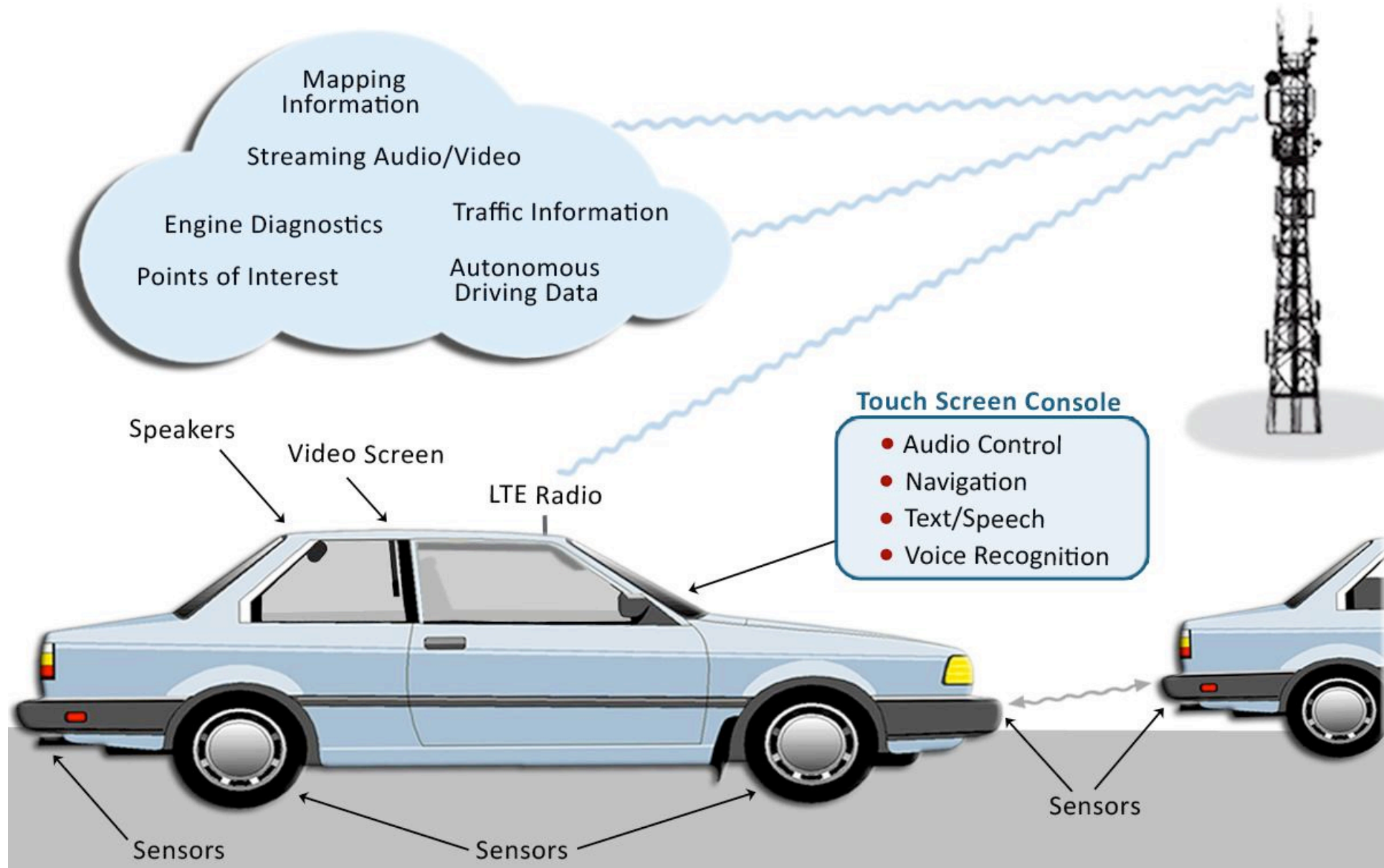


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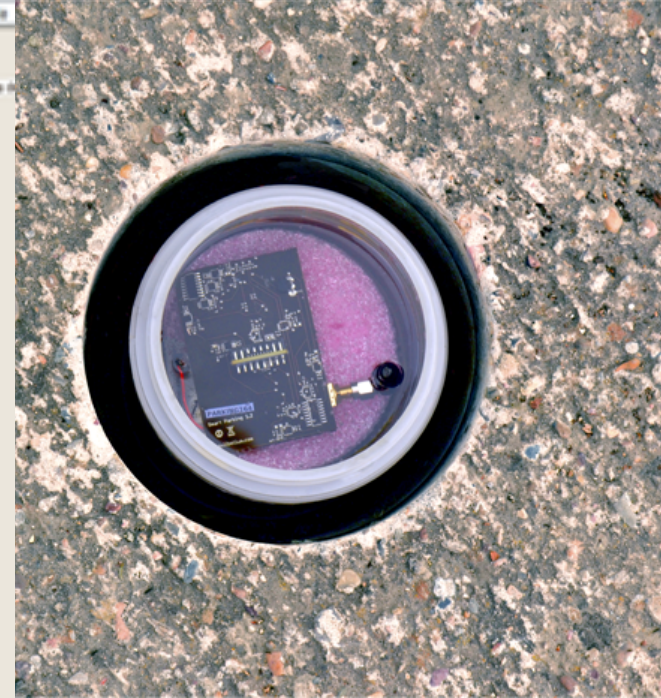
شخص مُقدوا
بسبب الحوادث
المرورية في
2014

#rethinkbh أعد النظر
www.rethink.com.bh

Smart Cars



Smart City project in Santander to monitor Parking Free Slots





Smart Home

Smart home devices such as thermostats, coffee makers, lights, and smart TVs learn a user's habits to develop automated home "support" for everyday tasks. Applications include energy efficiency, safety, entertainment, access control, and personal comfort.



Smart speakers



IoT appliances



Smart thermostats

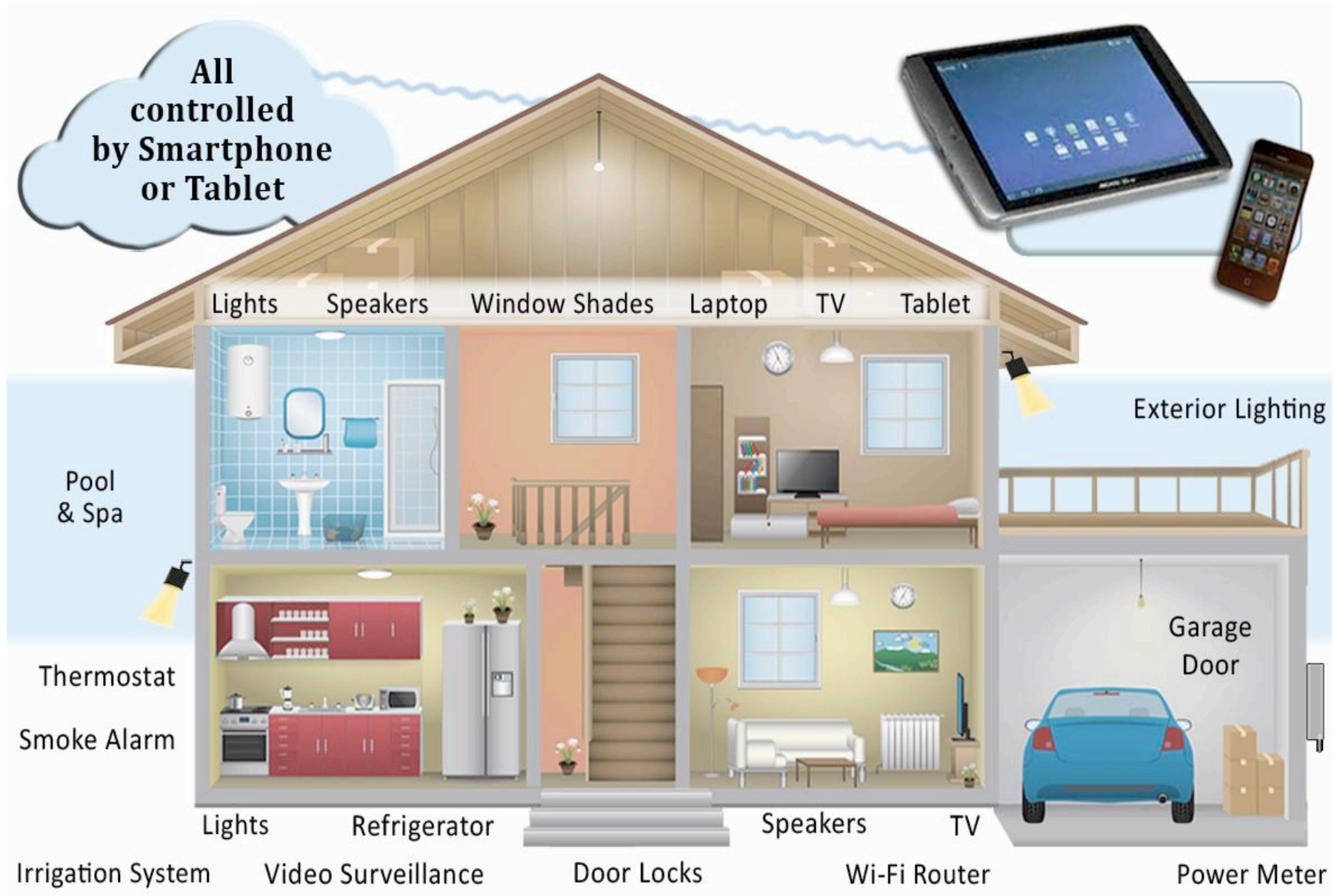




Domotic & Home Automation

European Union homes should cut energy consumption by 20% by 2020 according to Kyoto Protocol.

Smart Home



What Can Smart, Connected Things Do?

Monitoring

Control

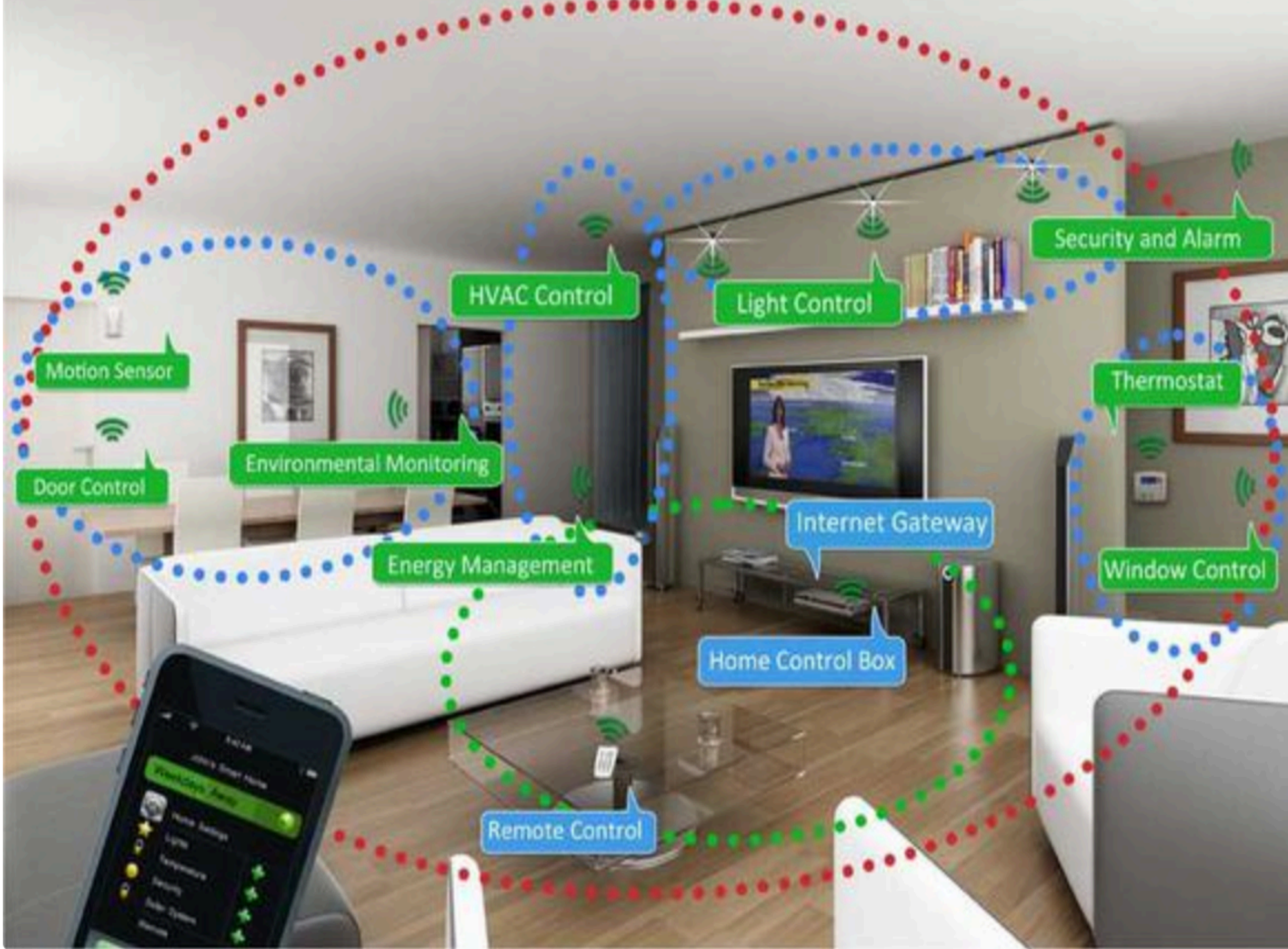
Optimize

Autonomy



Examples : <https://nest.com>

<https://www.apple.com/shop/accessories/all-accessories/homekit>









Lower Oven

mode	menu option	temp	probe	weight	cook time
Guided Cooking	Beef Tri-Tip Roast	375°	140° Med Rare		

OK	<	125	135	145	155	165	175	185	>
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We recommend using the center oven rack for best results

HOME

RIGHT

LIGHT

LEFT

BACK

START
CONTINUE

CANCEL LEFT

CANCEL RIGHT

Save to My Modes

Delay Start

Start

4:08

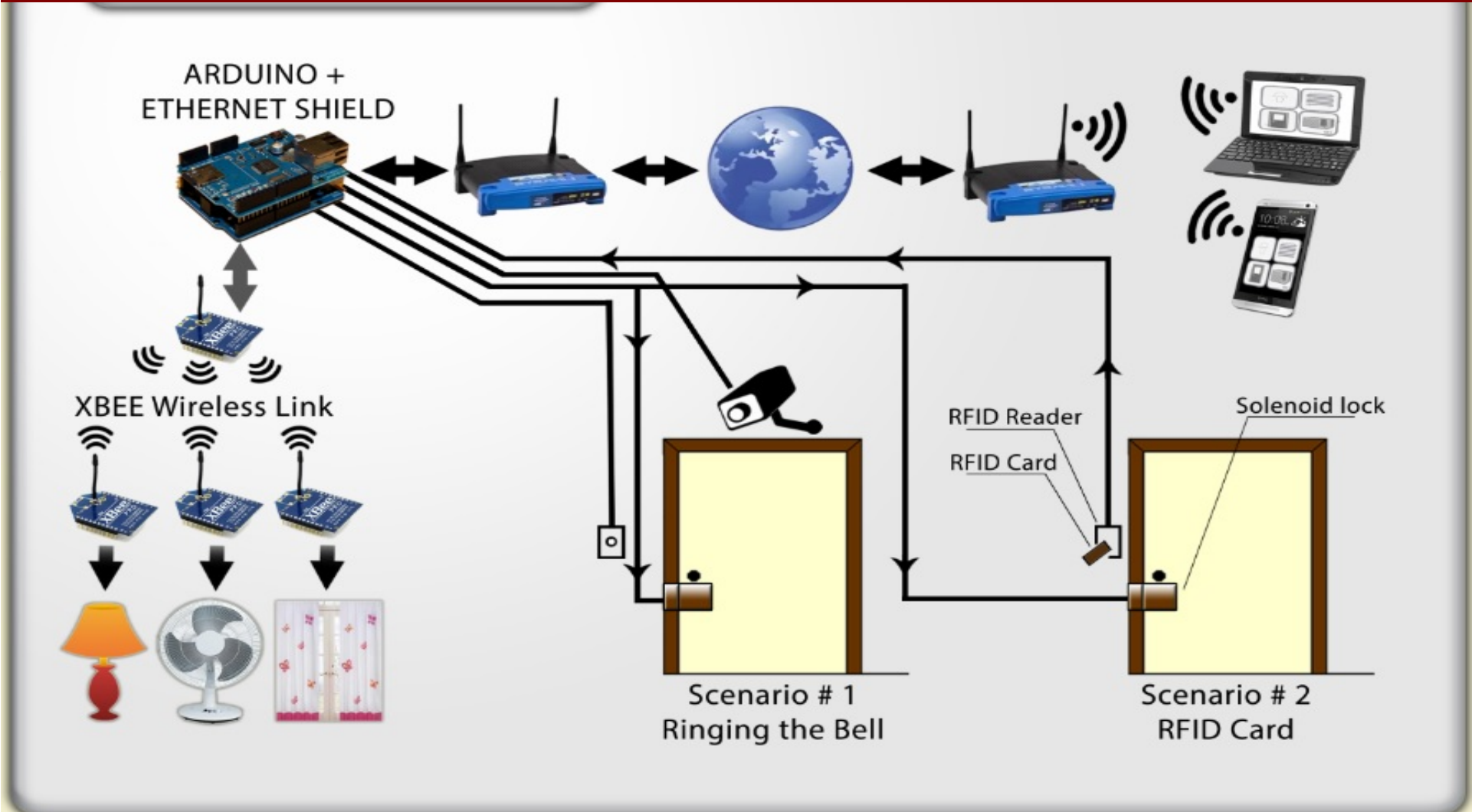


MIT Technology Review





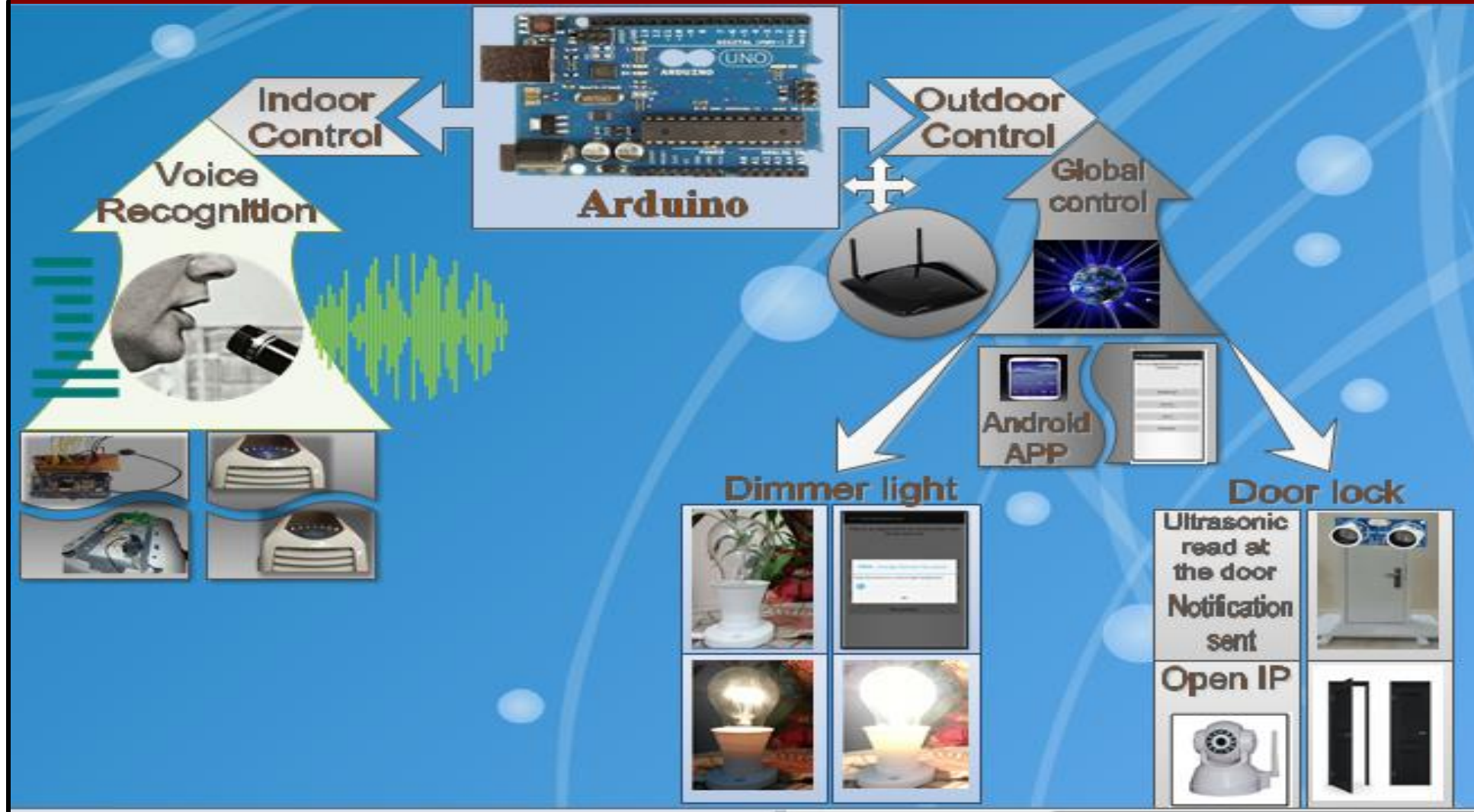
Advanced Wireless Home Automation Using Smartphone and Voice Recognition



(B.SC Graduation Projects # 1

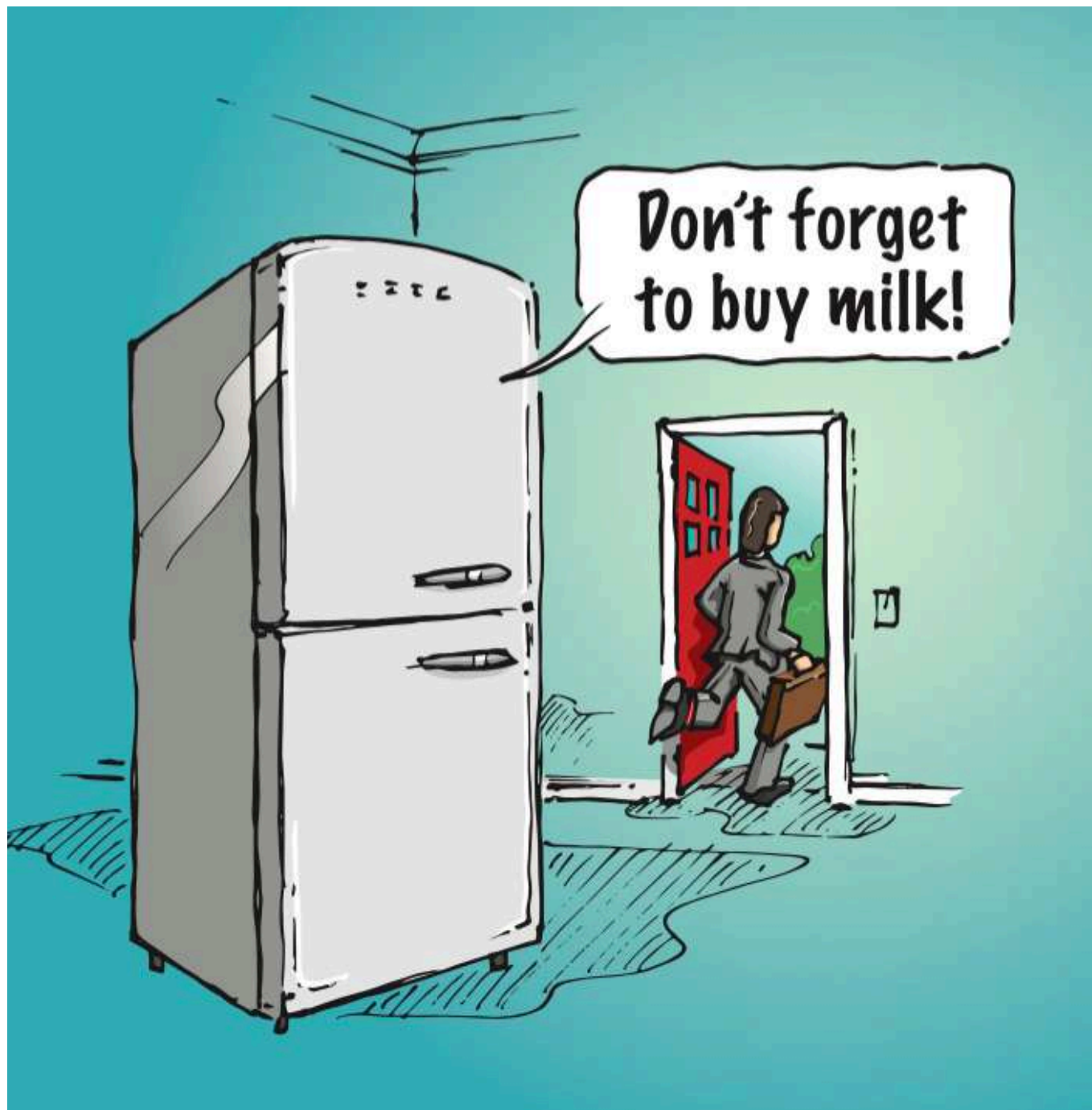
@ UOB- under Dr. Mohab Mangoud Supervision)

Advanced Wireless Home Automation Using Smartphone and Voice Recognition



(B.SC Graduation Projects # 2

@ UOB- under Dr. Mohab Mangoud Supervision)



Don't forget
to buy milk!

IOT Applications

1. Smart cities
2. Healthcare
3. Agriculture
4. Manufacturing and logistics
5. Wearables and Everyday Life

- **Healthcare**

- Baby monitoring

- Elderly monitoring

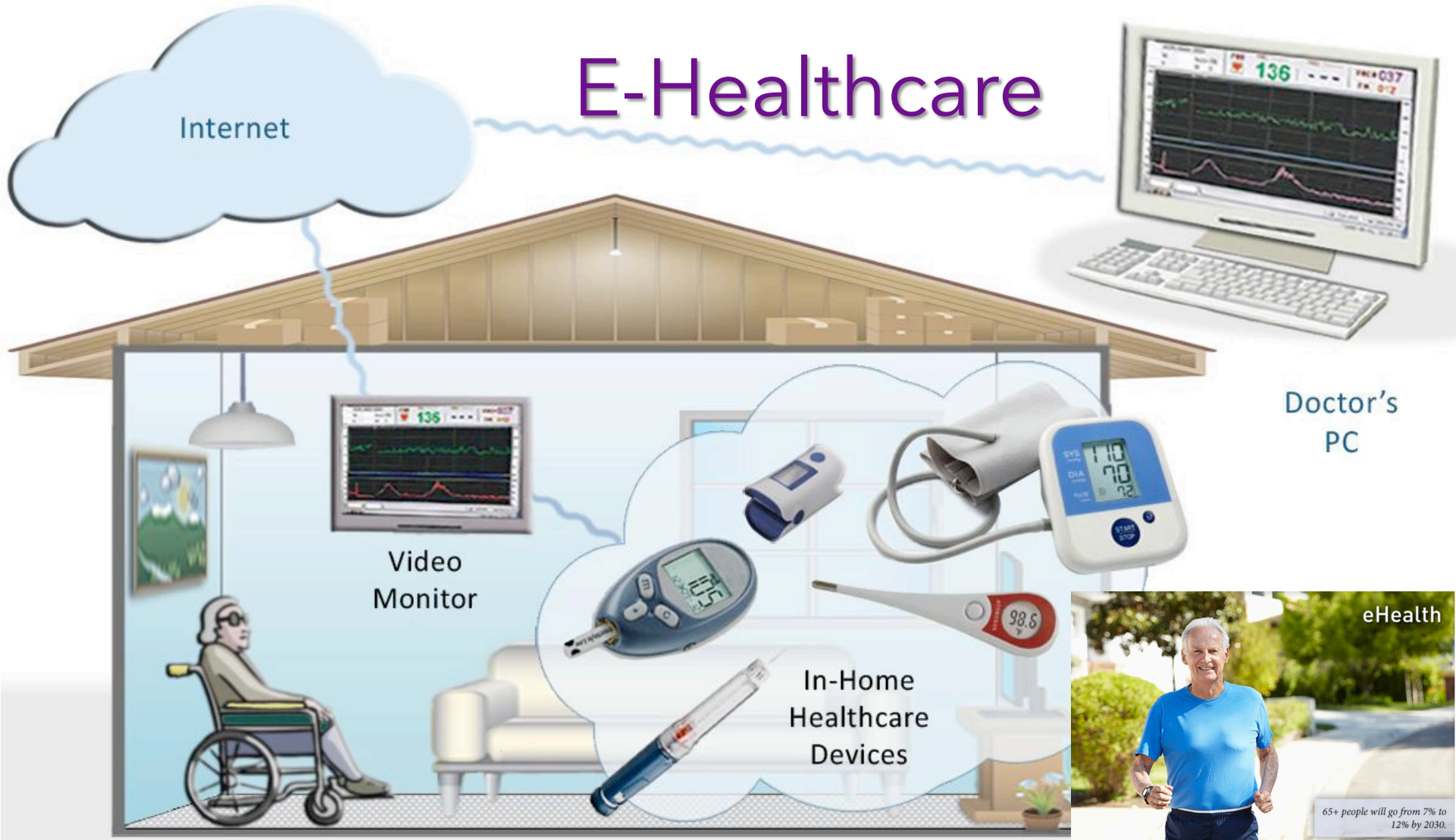
- Mood enhancement

- Disease treatment and progression monitoring

- Enhance adherence

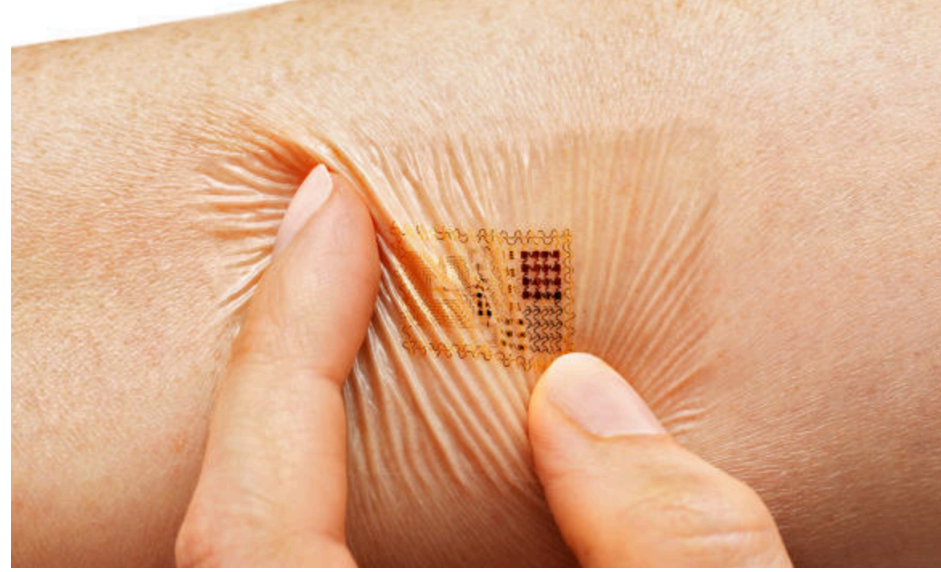
Internet of Health (IoH)

<http://www.startuphealth.com>



IOT & wearable medical devices,

Wearable biomedical devices will be able to take decisions for for your health



This wearable pulse oximeter is just one of the new devices that iHealth unveiled at CES on Monday.

Digital-pills-make-their-way-to-market

Digestible microchips embedded in drugs may soon tell doctors whether a patient is taking their medications as prescribed.



The VeriChip is the size of a grain of rice

implantable technology.

Food and Drug Administration(FDA)
approved for medical use

Smart Wireless Pill Bottles

Improve and Track Adherence in Real-Time.

[Contact Us for Orders or Questions](#)





The Kolibree toothbrush, billed as the world's first Internet-connected toothbrush, monitors dental hygiene.

Baby Monitoring – Activity Tracking

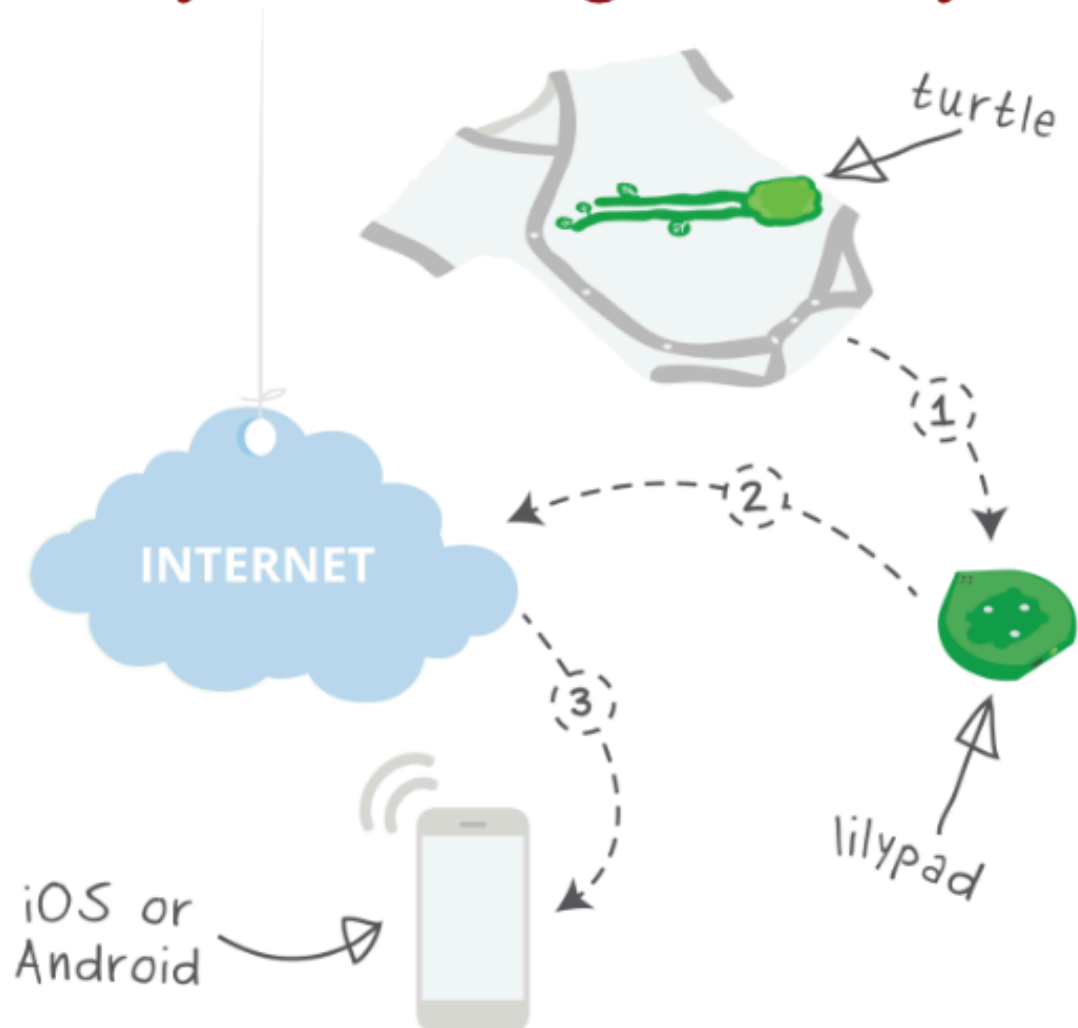


<http://mimobaby.com/>



<http://www.owletcare.com/smart-sock-2/>

Baby Monitoring – Activity Tracking

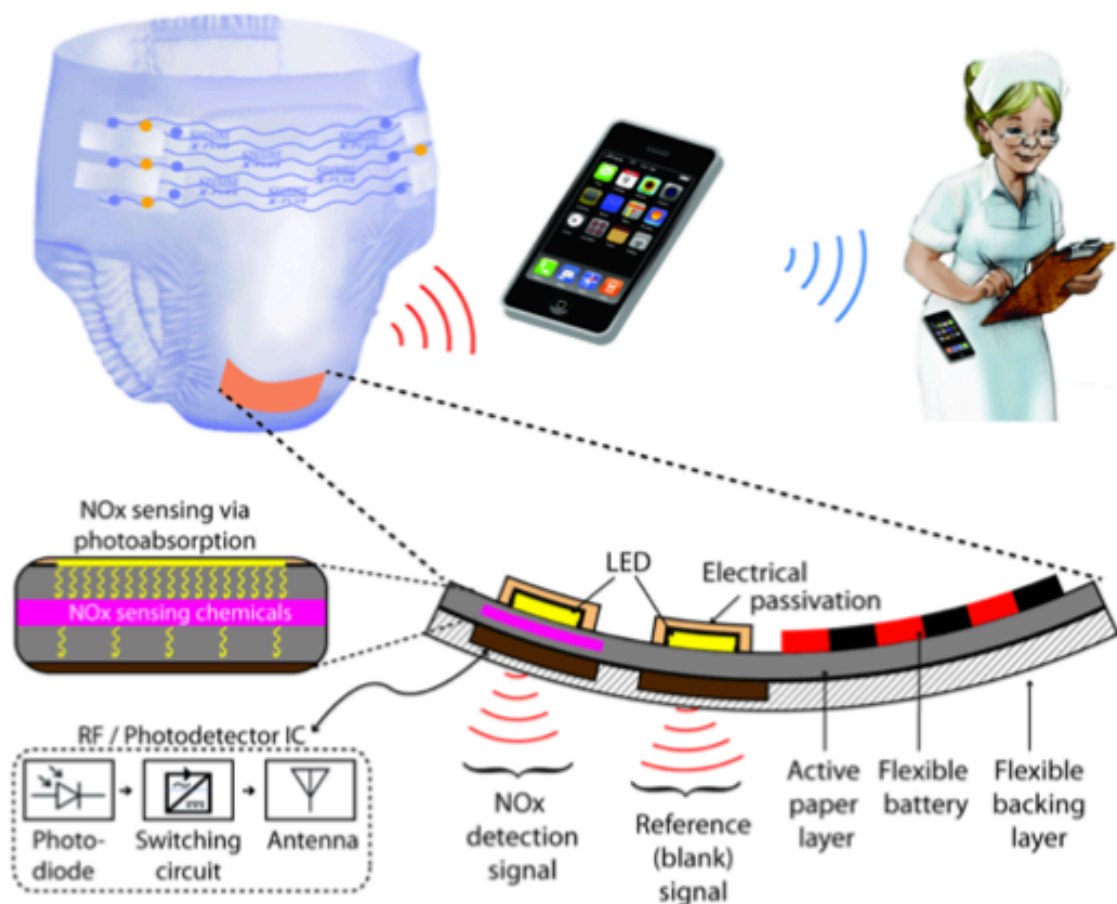


1. The turtle sends information about the baby's breathing, body position, sleep activity, and skin temp to the Lilypad via Bluetooth LE.
2. The Lilypad streams data and live audio to the cloud via WiFi.
3. Parents receive real-time insight about their baby on their smartphone.

Elderly Monitoring – Fall Detection

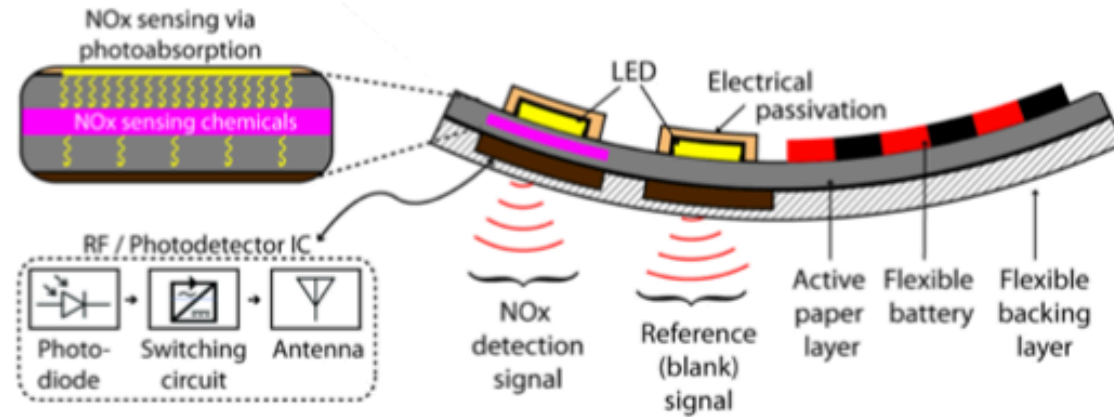
- One-fourth of Americans aged 65+ falls each year.
- Every 11 seconds, an older adult is treated in the emergency room for a fall; every 19 minutes, an older adult dies from a fall.
- Falls are the leading cause of fatal injury and the most common cause of nonfatal trauma-related hospital admissions among older adults.
- Falls result in more than 2.8 million injuries treated in emergency departments annually, including over 800,000 hospitalizations and more than 27,000 deaths.
- In 2013, the total cost of fall injuries was \$34 billion.
- The financial toll for older adult falls is expected to increase as the population ages and may reach \$67.7 billion by 2020. (The medicare budget is \$584 billion in 2016.)

Baby Monitoring – Urinary Tract Infection Monitoring



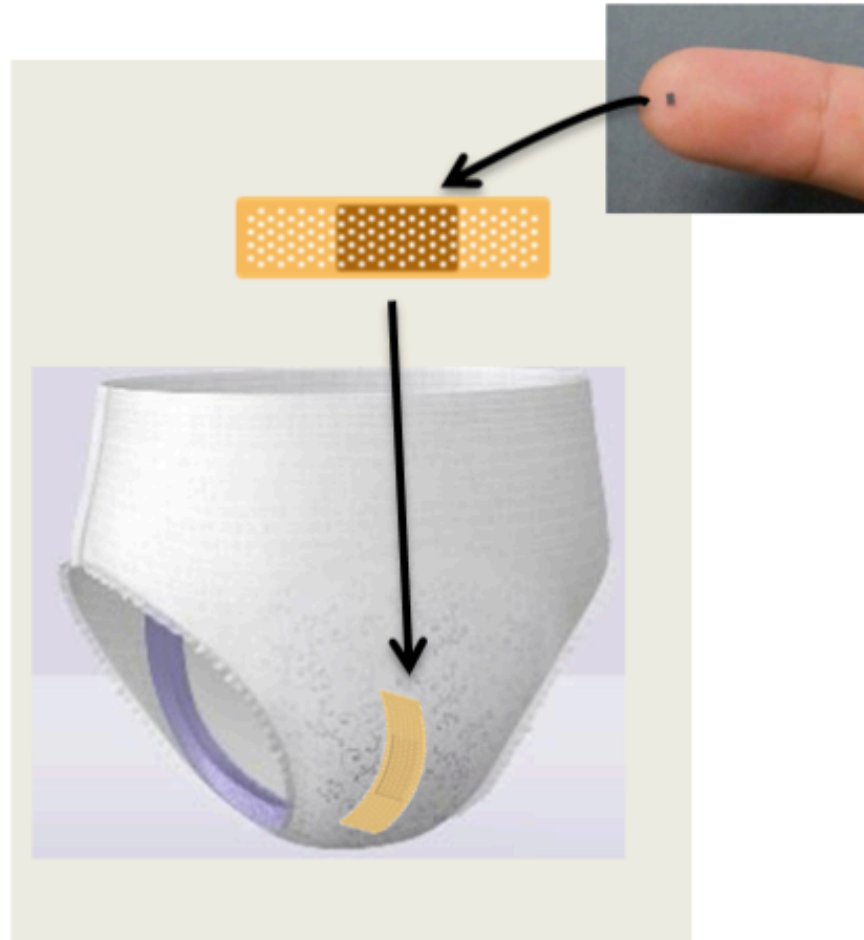
- Urinary tract infection (UTI) is the second most common infection in the US accounting for 7M hospital visits and 100,000 hospitalization per year.
- It is easy to cure if detected and treated in early stage.
- Urine culture test is accurate but time consuming. Dip stick test is fast but high false alarm rate.

Baby Monitoring – Urinary Tract Infection Monitoring



- Urine-activated paper battery (self-powered)
- Paper-based colorimetric nitrite sensor consisting of an LED, a urine-absorbing strip, a reagent strip, an active photodiode, and a reference photodiode.
- Sensor signal is converted into a PWM waveform.
- BLE module transmits the PWM signal to the caregiver.

Elderly Monitoring – Incontinence Management

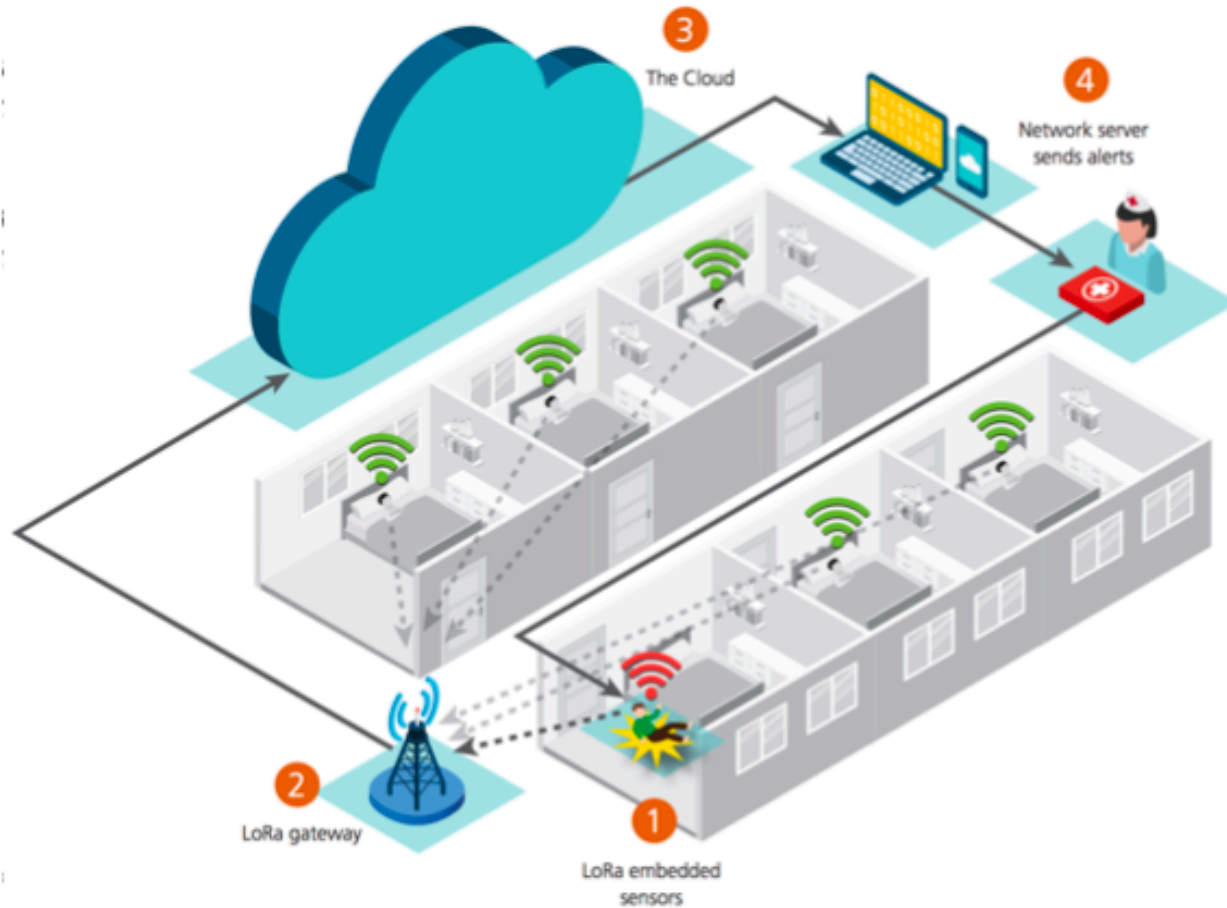


- In most nursing homes, between 40% and 60% of residents suffer from urinary incontinence.
- Smart diaper allows caregivers to remotely detect if an incontinence event has occurred.
- Improved quality and dignity of care by not having to disturb the elderly.

<http://rfmicron.com/health-care/>

<http://www.medisens.com/news/press-release-1>

Elderly Monitoring – Fall Detection

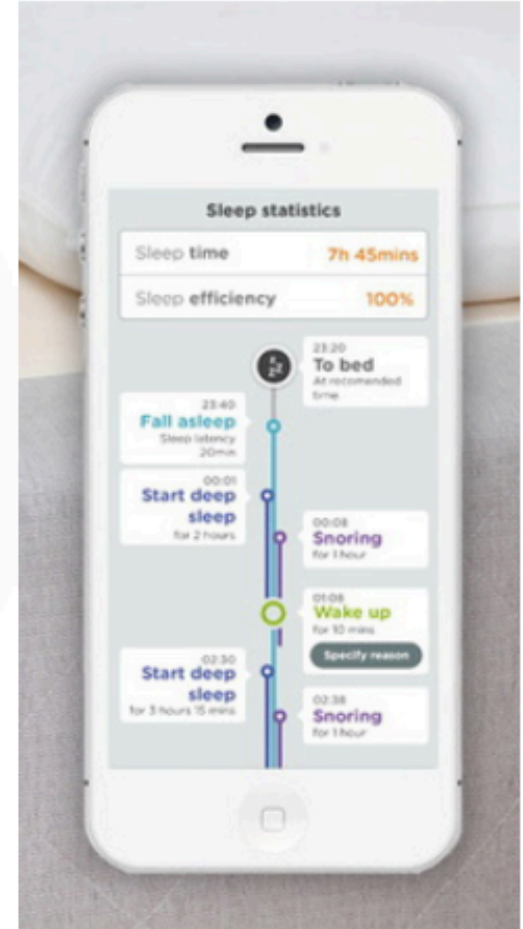


- 1 Fall/movement data collected by sensors embedded with LoRa Technology
- 2 Data from all sensors is sent to a LoRa gateway as person moves
- 3 Gateway sends information to the Cloud where the data is analyzed by an application to determine what is normal and what is a fall
- 4 Application server sends reports and alerts on the fall and location of the person to a computer or mobile device

Mood Enhancement

- Relaxing music could be cued to ease stress.
- Window shades could be programmed to let in the maximum amount of natural light.
- Use IoT to encourage healthy behaviors.
 - Automatically dim the lights in the home at a recommended bedtime.
 - Automatically turn off the TV to encourage exercise.

Mood Enhancing – Sleep Monitoring



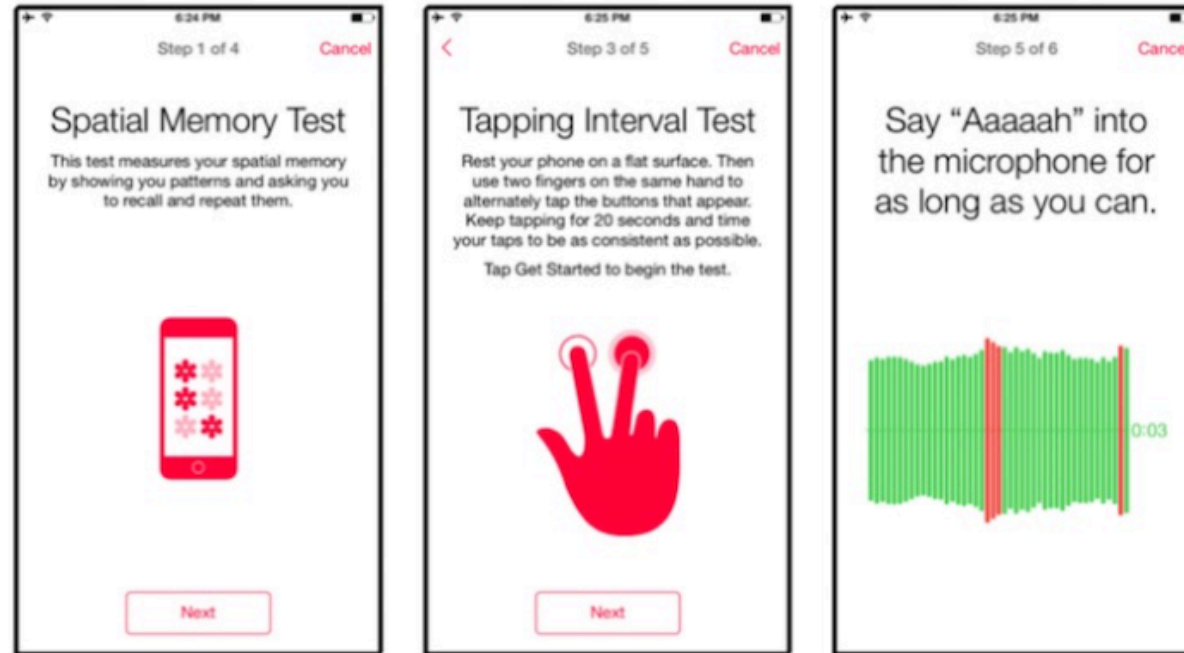
<https://www.beddit.com/>

Disease Treatment and Progression Monitoring – Parkinson's



Patients with Parkinson's disease must be continually assessed in order to keep up with their symptoms. This becomes potentially problematic as symptoms fluctuate on a constant basis, and a monthly check in with their doctor may not be representative of their experience.

Disease Treatment and Progression Monitoring – Parkinson's



Instead of patients actively performing certain tasks, could we monitor disease progression passively in the background?

Disease Treatment and Progression Monitoring – Parkinson's

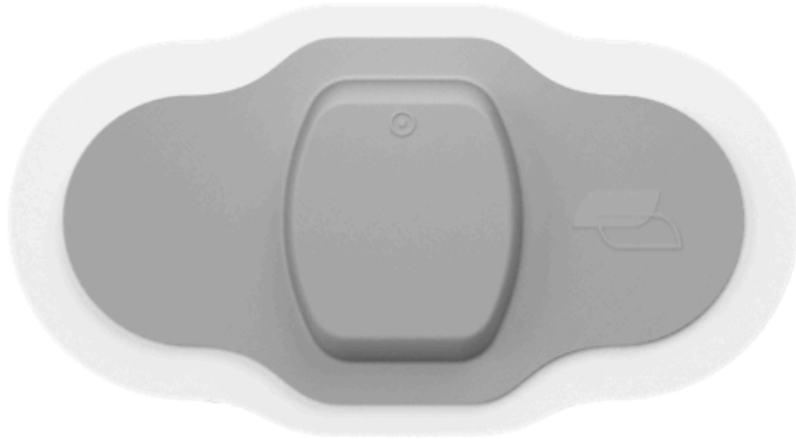
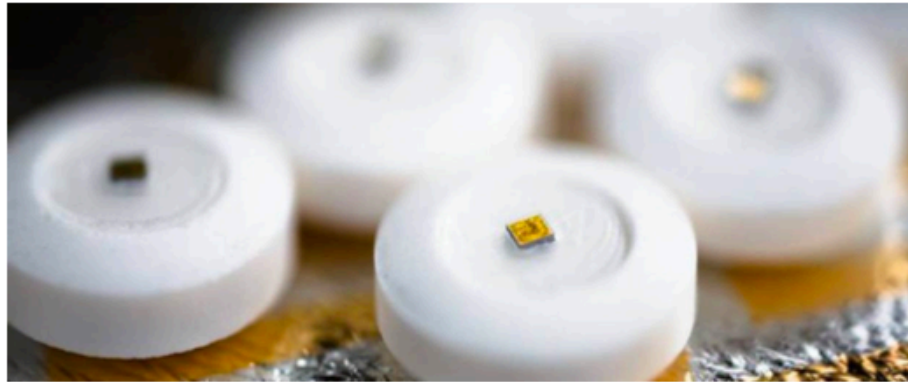
- IoT opens up new possibilities for disease treatment through remote monitoring. Using sensors, mobile devices, and advanced machine learning capabilities, a patient could keep track of a host of valuable data from mobility to sleep patterns all in real time. This information will give practitioners a more complete look into the progression of their patient's disease states.
- Intel and Michael J. Fox Foundation for Parkinson's Research, and Pfizer and IBM are individually collaborating on this idea. The collaboration involves planned clinical trial.

Enhance Adherence

- 84% of U.S. healthcare spending is on patients with chronic conditions.
- More than 50% of prescribed medications are not taken as directed.
- Reasons why people are not able to take their medication as directed:
 - They may forget.
 - They may not be convinced of the medication's effectiveness or be unsure that it is working.
 - They may fear the side effects or have difficulty taking the medication.
 - The rising cost of prescription medications is a barrier for many.

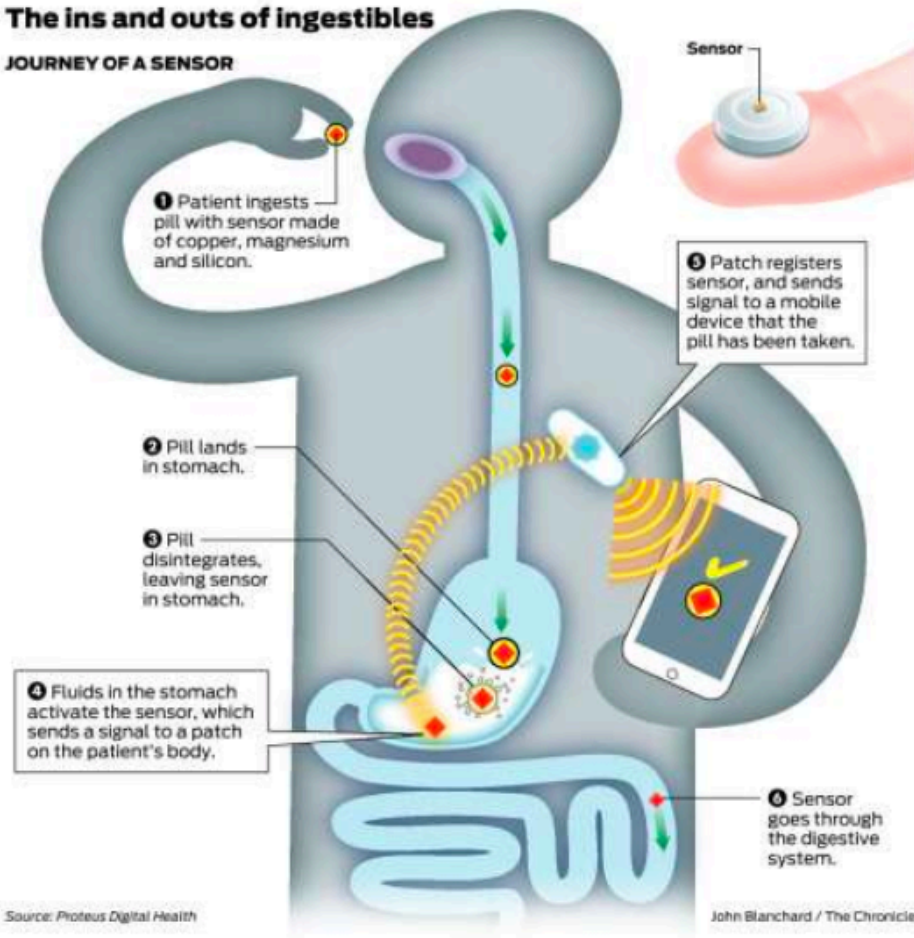
Anderson G. Chronic conditions: making the case for ongoing care. Baltimore, MD: Johns Hopkins University, 2010.
Sabate E. Adherence to long-term therapies: evidence for action. World Health Organization, 2003.

Enhance Adherence – Ingestible Sensors



The ins and outs of ingestibles

JOURNEY OF A SENSOR



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

<http://www.sfchronicle.com/business/article/Did-you-take-your-pill-Ingestible-sensors-can-11206980.php>

IOT Applications

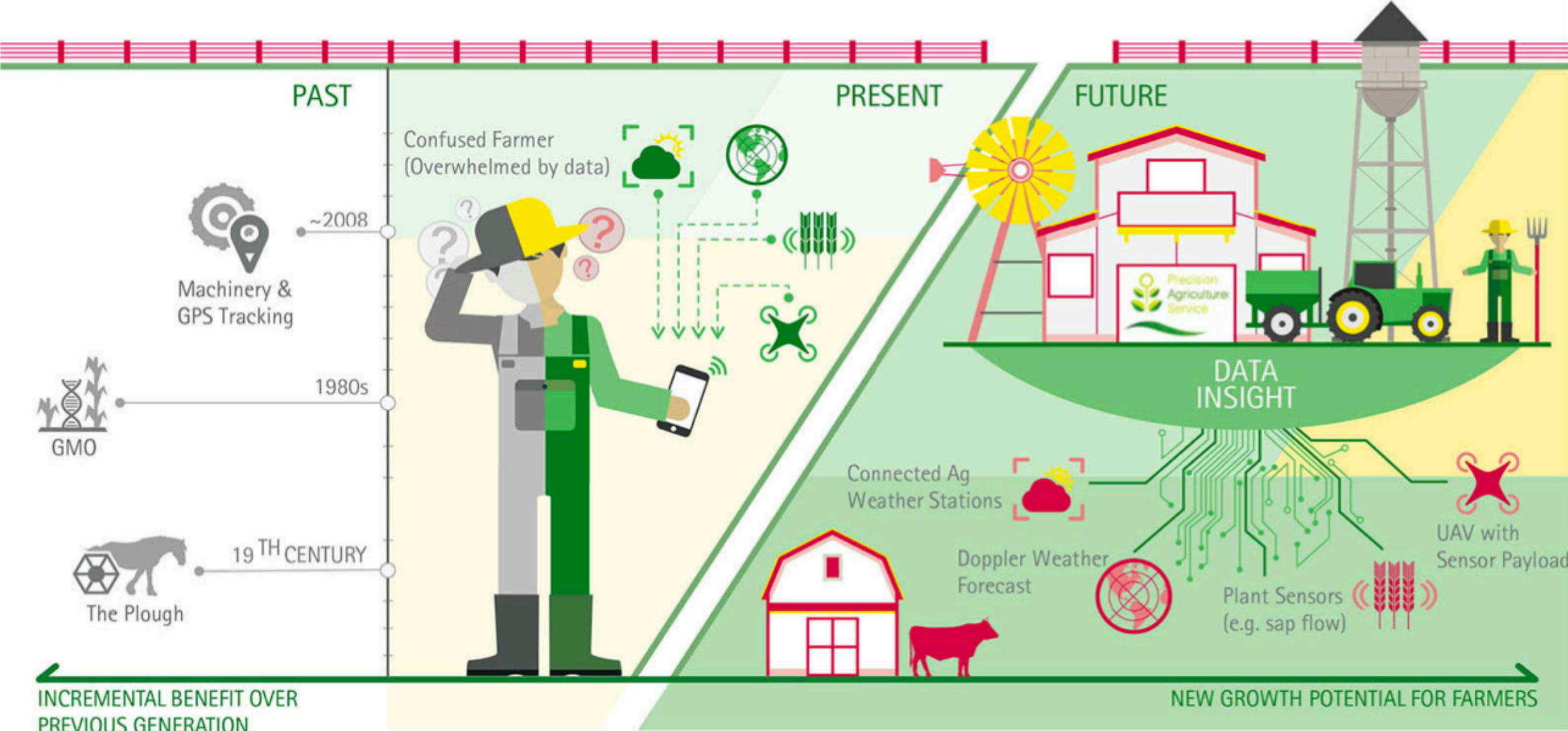
1. Smart cities
2. Healthcare
3. Agriculture
4. Manufacturing and logistics

Precision agriculture
Connected livestock
Food safety

Precision Agriculture

- A farming management concept based on observing, measuring and responding to inter and intra-field variability in crops.
- In the past, precision agriculture technology was implemented by big agribusinesses due to high costs.
- IoT technologies – which include everything from GPS services, sensors, and big data calculation – have made precision agriculture affordable by many farmers.
- Farmers don't have to rely as much on their gut. Instead, they can make decisions based on detailed information about water, climate changes, soil quality, the health of their crops and livestock, and the conditions of their machinery.

Precision Agriculture



Precision Agriculture



Opportunities for vertical integration

Connected Livestock

- Around 1.4 billion cattle around the world
- Animals can't tell you when they first get sick. It can be hard for humans to tell a cow is ill until there are visible signs of sickness.
- IoT sensors cannot diagnose an illness but it will let the farmer know when something needs attention.

Connected Livestock

- pH measurement
 - Early detection of fermentation disorders
- Activity level measurement
 - Early, automatic oestrus detection
 - Onset illness
- Temperature measurement
 - Early detection of onset of diseases such as feverish disorders, metabolic disorders, post-calving disorders
 - Early detection of start of calving

Connected Livestock



All messages

Wednesday April 27, 2016

> 45 3:00 PM **Temperature increase**
Health

Sunday April 24, 2016

> Kelly 11:00 AM **Temperature drop**
Health

> 7 12:00 AM **Temperature increase**
Health

Saturday April 23, 2016

> 66 2:00 PM **Temperature drop**
Health


04/22/2016

> 66 12:00 AM **Less drinking cycles**
Health

04/21/2016

> Kelly 5:00 AM **Temperature increase**
Health

Smart Animal Farming

A photograph of several brown cows lined up in a dark wooden barn stall. They are eating from a pile of yellow hay. The cows have yellow ear tags. The stall is made of dark metal bars.

The CH₄ emissions from animal farming in the U.S. have increased a 17% during the past decade.
U. S. Environmental Protection Agency

Food Safety



- Wifi or cellular connectivity
- When a produce recall is initiated, the juice machine will check the packs and prevent the machine from pressing affected packs.

How the Internet of Things Is Making Food Safer !!



With advances in wireless technology and cloud computing, the IoT has the potential to make food safer **from the farm** all the way **to the customer's dinner**


Can the food tell the story of its journey? (IoT app.)



What kind of soil \ pure
water or not

How long it takes from the
farm to the shop

In which temperature



Retail

Failure to restock supermarket shelves costs the FMCG industry 4 billion € each year.
ECR Europe



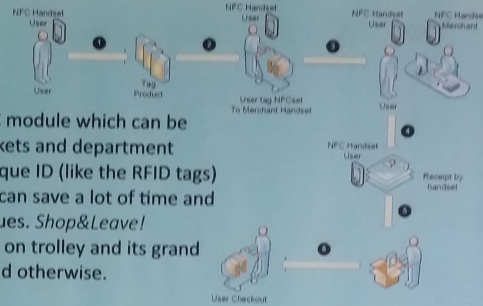
UNIVERSITY OF BAHRAIN
COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL & ELECTRONICS



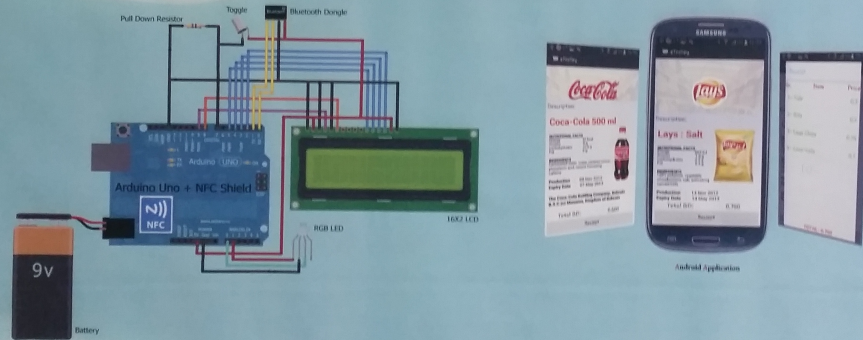
eTrolley using NFC

OBJECTIVE

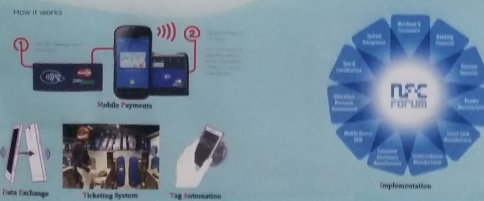
The main objective of this project is to build a NFC module which can be mounted on the shopping trolley in the hypermarkets and department stores. Every product in the market will have a unique ID (like the RFID tags) which can then be scanned as you shop. Doing so can save a lot of time and you will never find yourself in long frustrating queues. *Shop&Leave!* Moreover one can actually keep track of the items on trolley and its grand sum to avoid any embarrassment at the cashier end otherwise.



SCHEMATIC



APPLICATIONS



STATION AIRPORT	VEHICLE	OFFICE	STORE RESTAURANT	THEATRE STADIUM	EMPLOYEE
Pass gate	Access card	Employee access	Pay for goods	Access gate	Employee access
Access control	Access control	Access control	Access control	Access control	Access control
Access control	Access control	Access control	Access control	Access control	Access control
Access control	Access control	Access control	Access control	Access control	Access control
Access control	Access control	Access control	Access control	Access control	Access control
Access control	Access control	Access control	Access control	Access control	Access control
Access control	Access control	Access control	Access control	Access control	Access control
Access control	Access control	Access control	Access control	Access control	Access control
Access control	Access control	Access control	Access control	Access control	Access control

Done by:
Mohammed Muneer (20095052)
BSc. Electronics Engineering

Supervised by:
Dr. Mohab Mangoud
Associate Professor



Batelco

Muna Al Hashemi, GM Consumer Division, is listening to students demonstrating their award-winning university projects — with Taqwa Salaheldin and Shaikh Muneer at Bahrain International Exhibition Center

Batelco Tech Show 2013 · February 22, 2013 · [View Full Size](#) · [Send as Message](#) · [Report Photo](#)



IOT Applications

1. Smart cities
2. Healthcare
3. Agriculture
4. Manufacturing and logistics
5. Wearables and Everyday Life

Smart Industry

Smart industry devices—the Industrial Internet of Things (IIoT)—use real-time data analytics and machine-to-machine sensors to optimize operations, logistics, and supply chain. Data generated from these devices helps industries foresee challenges—preventing costly errors and workplace injuries.



Autonomous
manufacturing
robots



Automated
supply chain
management



Predictive
maintenance
sensors



While AIoT technology is still in its infancy, these segments represent a direct impact in our daily lives.

- Smart manufacturing
- Smart packaging

Smart Manufacturing

- The use of IoT devices to improve efficiency and productivity of manufacturing operations. Typically, it involves retrofitting sensors to existing manufacturing equipment. But new manufacturing equipment often comes with IoT sensors pre-installed.
- According to IDC data, published early 2017, the manufacturing industry was good for a total IoT spending of \$178 billion in 2016, which is more than twice as much the second largest vertical market, transportation.
- Manufacturing operations accounts for 57.5% of the total IoT spending on manufacturing.

Smart Packaging

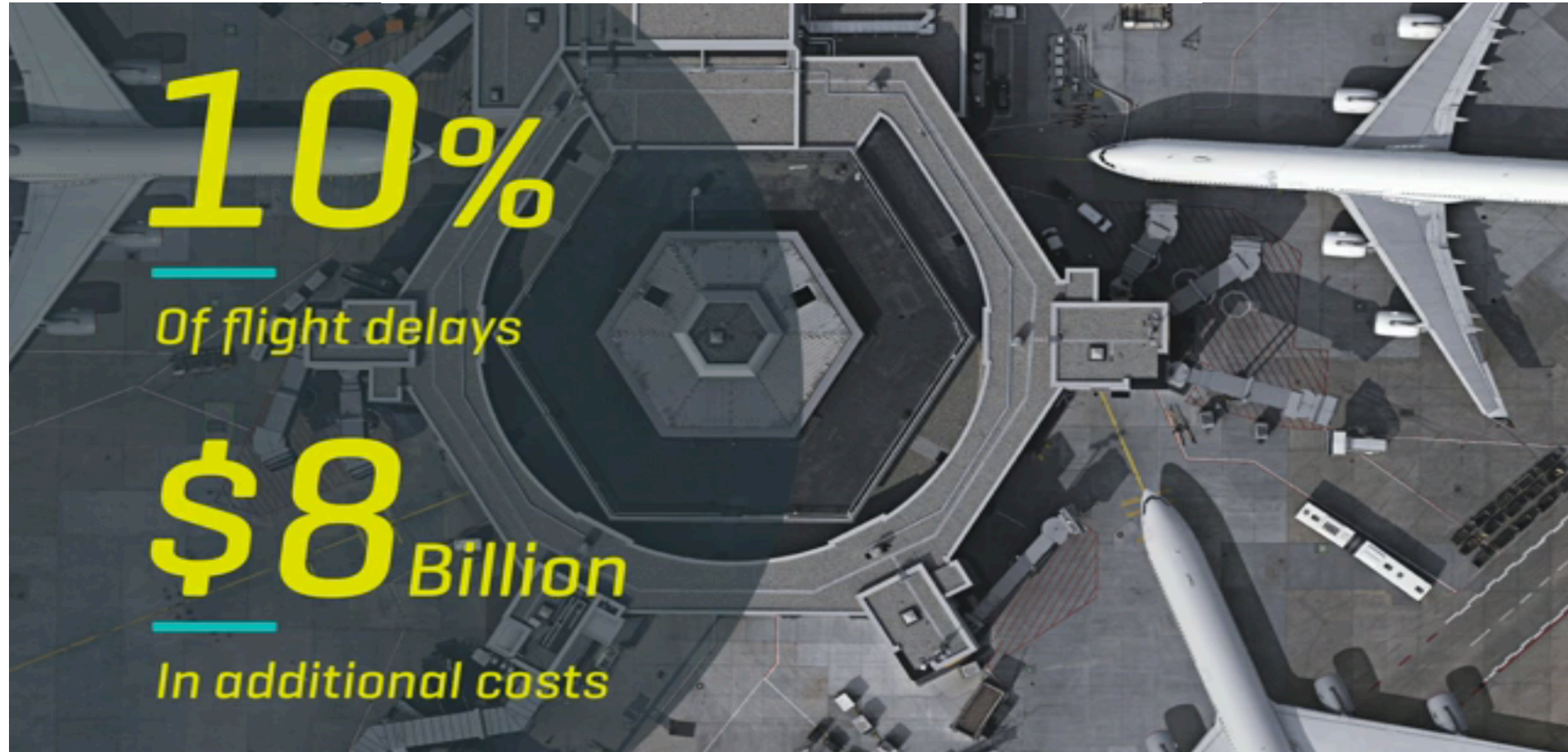
- Packaging systems used with food and pharmaceutical that help extend shelf life, monitor freshness, display information on quality, improve safety, and improve convenience.
- Usually involve active functions beyond the inert passive containment, for example, the ability to sense or measure an attribute of the product, the inner atmosphere of the package, or the shipping environment. This information can be communicated to users or can trigger other active packaging functions.

Marco Annunziata: Welcome to the age of the industrial internet



Marco Annunziata
Economist

The Chief Economist at General Electric, passion for technology. [Full bio](#)



airplane parts that send an alert when they need to be serviced,

Marco Annunziata: Welcome to the age of the industrial internet



Marco Annunziata: Welcome to the age of the industrial internet



Marco Annunziata: Welcome to the age of the industrial internet



wind turbines that communicate with one another to generate more electricity

IOT Applications

1. Smart cities
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IOT & Sports



Textile Sensors



Each smart sock is infused with three proprietary textile sensors under the plantar area (bottom of the foot) to detect foot pressure.

Conductive Fiber



The conductive fibers relay data collected by the sensors to the anklet. The sock has been designed to function as a textile circuit board.

Magnetic Attachment



Each sock features magnetic contact points below the cuff so you can easily connect your anklet to activate the textile sensors.

The Tennis Racket Of The Future Is Here



has gyroscopes, accelerometers and a piezoelectric sensor in the handle. These sensors pick up a variety of data, including where the ball hits the strings, how much power goes into a shot and how much spin a player puts on a ball.

Challenges

- A lack of Electronic Health Record (EHR) integration and concerns about data security may prevent healthcare from fully adopting the IoT technology.
- The need to adopt an integration-first mindset instead of keep building interesting/fun gadgets. Sometimes, a dump gadget can be as useful if it could integrate seamlessly with the EHR.



Figure 4. Internet of things applications and market [27].

Value of the Internet of Things

Industrial IoT dwarfs all others in predictions of value increase.
World Economic Forum 2016



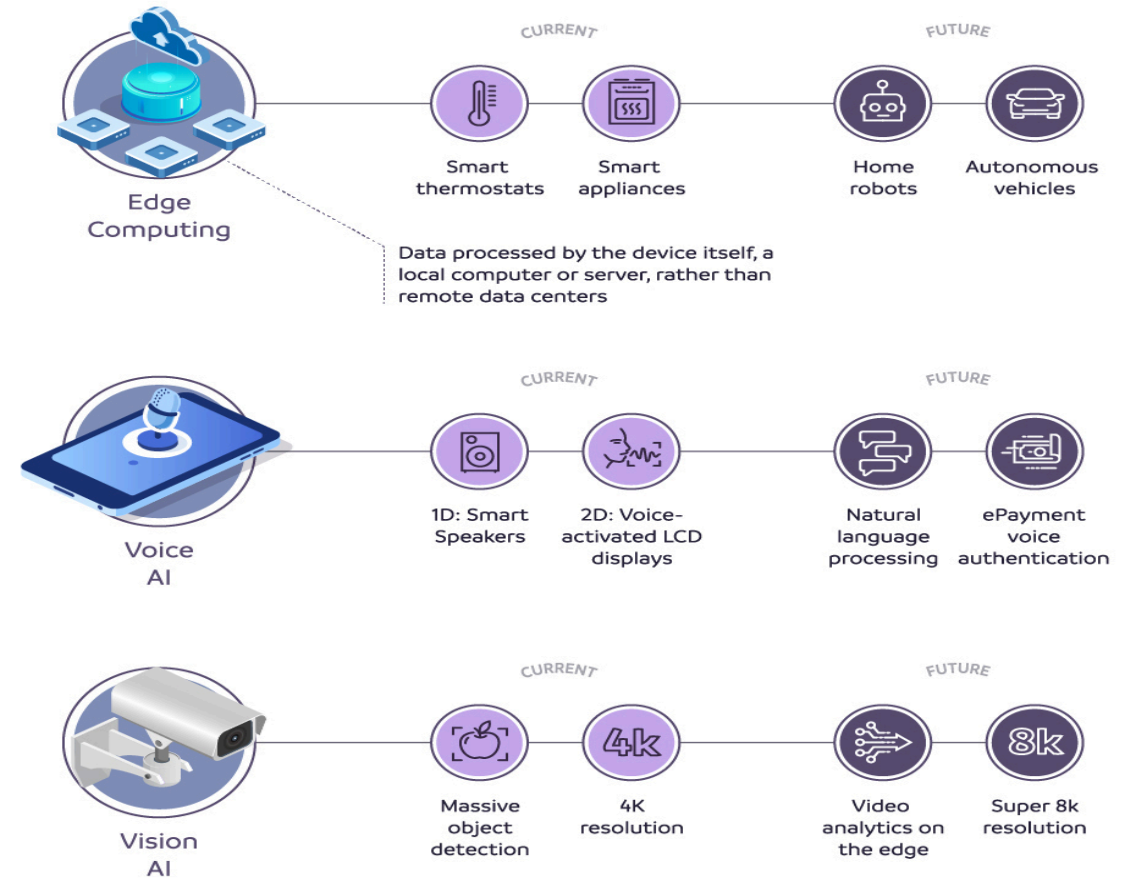
When Artificial intelligence meets IoT (AIOT)

AI enabled **IoT** creates intelligent machines that simulate smart behavior and supports in decision making with little or no human interference. While **IoT** deals with devices interacting using the internet, **AI** makes the devices learn from their data and experience.

Future AIoT Technologies

AIoT innovation *shows no signs of slowing down.*

AIoT will test how much data our devices can process, future advancements will push the boundaries of processing and learning.

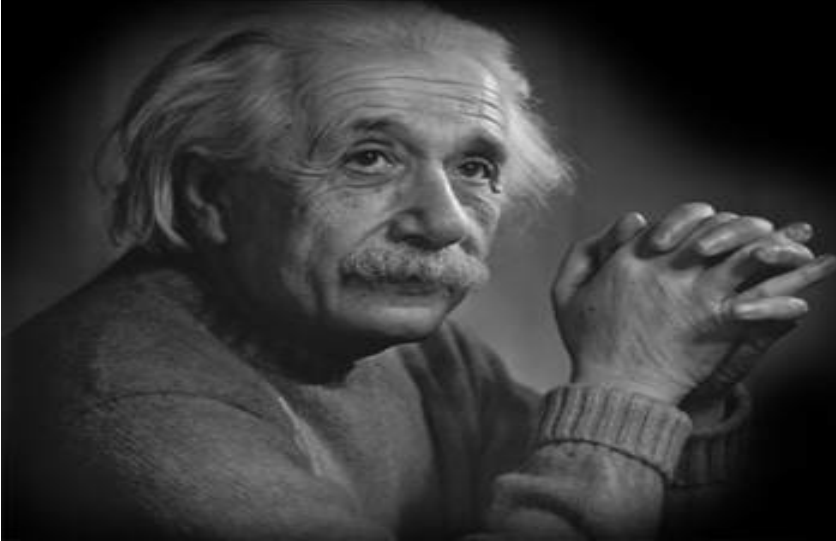


AIoT promises to radically transform how we interact with our homes, offices, and cities every day.

Thoughts- Challenges

- Investment for big data and its analysis
- Robust cyber security & privacy issues
- Education system (needs to evolved to make sure students are equipped with the right skills)

**I NEVER THINK OF
THE FUTURE - IT
COMES SOON
ENOUGH.**



Albert Einstein

German Theoretical-Physicist

(1879-1955)

QuoteHD.com