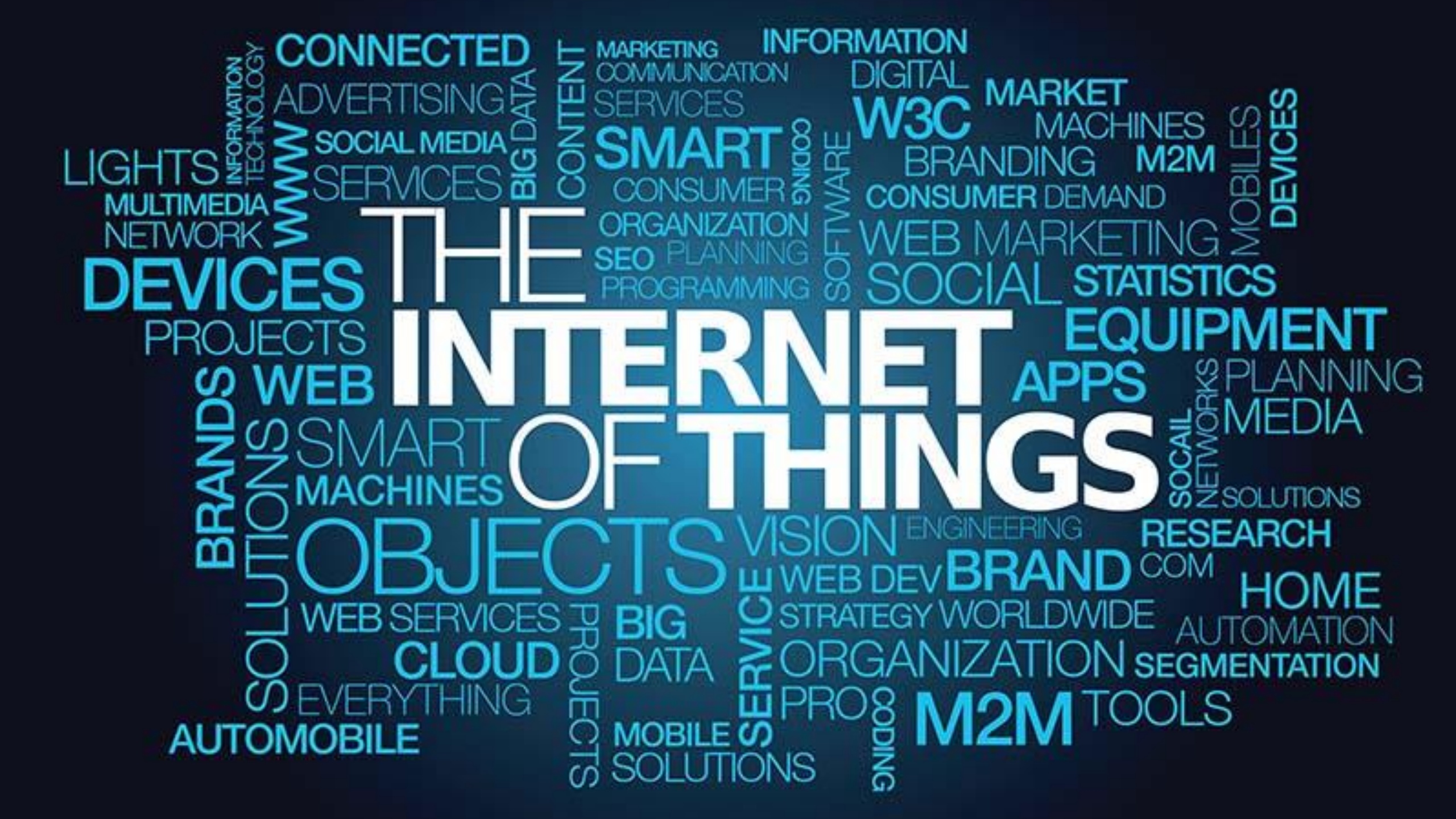

THE INTERNET OF THINGS
CONNECTED
INFORMATION
MARKETING
COMMUNICATION
DIGITAL
SERVICES
ADVERTISING
MARKET
W3C
MACHINES
SMART
SOCIAL MEDIA
BRANDING
M2M
LIGHTS
SERVICES
CONSUMER
CONSUMER DEMAND
MULTIMEDIA
NETWORK
ORGANIZATION
WEB MARKETING
DEVICES
SEO
PLANNING
PROGRAMMING
SOCIAL
STATISTICS
EQUIPMENT
PROJECTS
WEB
APPS
PLANNING
MEDIA
SMART
MACHINES
OBJECTS
VISION
ENGINEERING
RESEARCH
BRANDS
SOLUTIONS
WEB DEV
BRAND
COM
HOME
WEB SERVICES
BIG
STRATEGY
WORLDWIDE
AUTOMATION
CLOUD
DATA
ORGANIZATION
SEGMENTATION
EVERYTHING
PRO
M2M
TOOLS
AUTOMOBILE
MOBILE
SOLUTIONS
WWW
BIG DATA
CONTENT
SOFTWARE
CODING
MOBILES
DEVICES
SOCAIL NETWORKS
INFORMATION TECHNOLOGY
SERVICE
PROJECTS

What is Internet of Things?

A proposed development of the internet in which everyday objects have network connectivity, allowing them to send and receive data

Sensors and actuators embedded in physical objects are linked through wired and wireless networks

Smart World

Air Pollution
Control of CO_2 emissions of factories, pollution emitted by cars and toxic gases generated in farms.

Forest Fire Detection
Monitoring of combustion gases and preemptive fire conditions to define alert zones.

Wine Quality Enhancing
Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar in grapes and grapevine health.

Offspring Care
Control of growing conditions of the offspring in animal farms to ensure its survival and health.

Sportsmen Care
Vital signs monitoring in high performance centers and fields.

Structural Health
Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.

Quality of Shipment Conditions
Monitoring of vibrations, strokes, container openings or cold chain maintenance for insurance purposes.

Smartphones Detection
Detect iPhone and Android devices and in general any device which works with Wifi or Bluetooth interfaces.

Perimeter Access Control
Access control to restricted areas and detection of people in non-authorized areas.

Radiation Levels
Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.

Electromagnetic Levels
Measurement of the energy radiated by cell stations and WiFi routers.

Traffic Congestion
Monitoring of vehicles and pedestrian affluence to optimize driving and walking routes.

Water Quality
Study of water suitability in rivers and the sea for fauna and eligibility for drinkable use.

Smart Roads
Warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

Smart Lighting
Intelligent and weather adaptive lighting in street lights.

Intelligent Shopping
Getting advices in the point of sale according to customer habits, preferences, presence of allergic components for them or expiring dates.

Noise Urban Maps
Sound monitoring in bar areas and centric zones in real time.

Water Leakages
Detection of liquid presence outside tanks and pressure variations along pipes.

Vehicle Auto-diagnosis
Information collection from CanBus to send real time alarms to emergencies or provide advice to drivers.

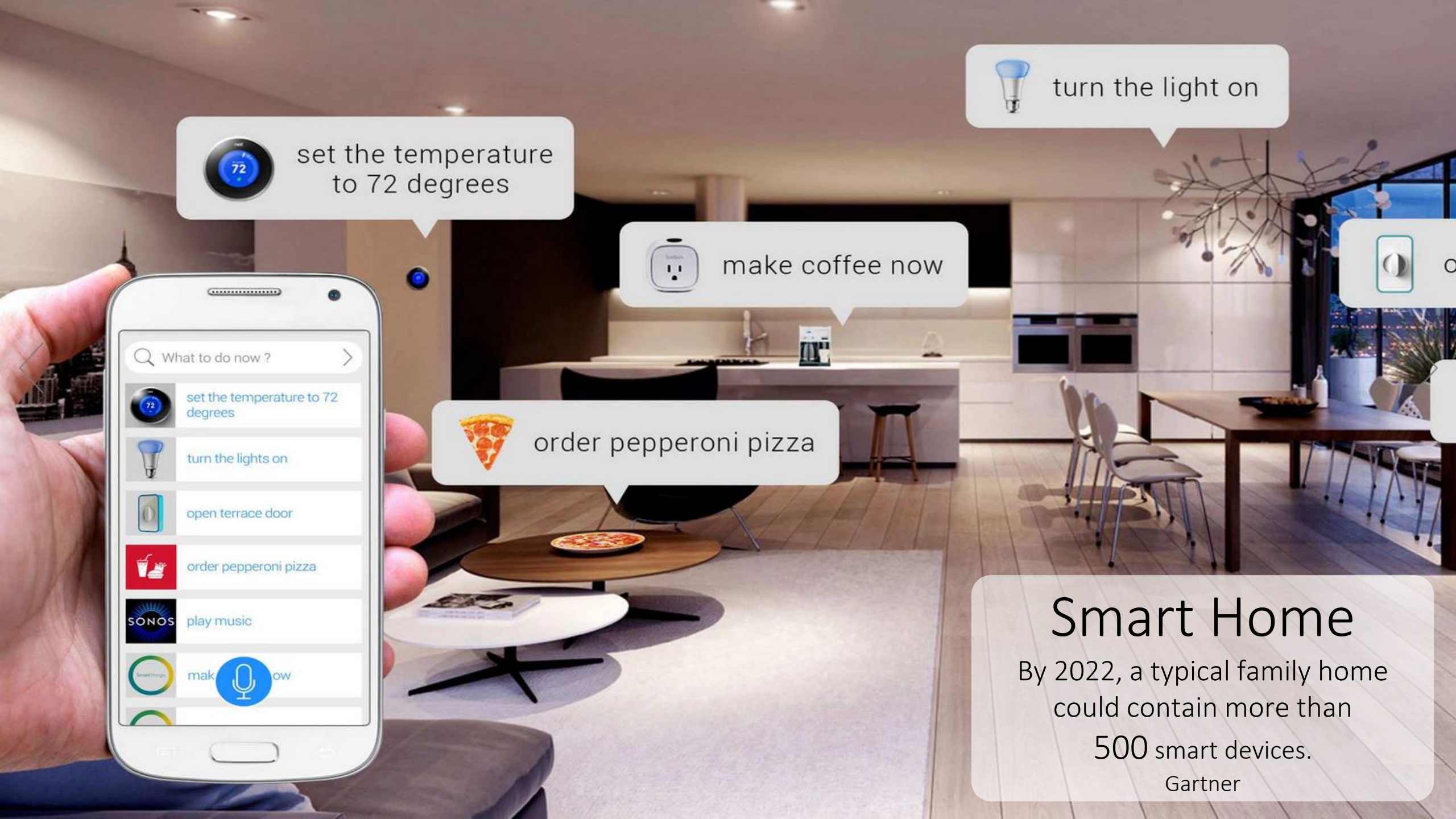
Item Location
Search of individual items in big surfaces like warehouses or harbours.

Waste Management
Detection of rubbish levels in containers to optimize the trash collection routes.

Smart Parking
Monitoring of parking spaces availability in the city.

Golf Courses
Selective irrigation in dry zones to reduce the water resources required in the green.

libelium
www.libelium.com



Smart Home

By 2022, a typical family home could contain more than **500** smart devices.

Gartner

Smart Mobility

Smart Grid/ Smart Energy

Smart Health

Cities will spend $41 trillion

In the next 20 years on infrastructure upgrades for IoT

Smart Wate r

Smart Agriculture

Education

SOFTWARE AND SERVICES

Source: Intel

SMART THERMOSTATS

nest

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

CAR 2GO

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

ACTIVITY TRACKERS

BASIS

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

SMART OUTLETS

belkin

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

PARKING SENSORS

STREETLINE
CONNECTING THE REAL WORLD

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.

50,000,000,000

IoT

BY 2020, THE NUMBER OF **INTERNET-CONNECTED THINGS** WILL REACH OR EXCEED **50 BILLION**

BY 2020 **250,000,000**

VEHICLES WILL BE CONNECTED TO THE INTERNET

[IoT]

WILL ADD

$15 TRILLION

TO

GLOBAL GDP

IN THE NEXT 20 YEARS

IN 2015

223%

THE GLOBAL MARKET FOR **WEARABLE DEVICES**

27,000,000,000

M2M

MACHINE-TO-MACHINE CONNECTIONS

BY 2024

Sources: General Electric, Cisco, Google, IEEE Spectrum

The Internet of Things

It's not about things. It's about service.

And It's real, not hype. See the Impact It's having on businesses and our lives.

50 billion

connected devices by 2025

Internet-connected devices are expected to quadruple from 12.1 billion in 2013 to nearly 50 billion by 2025.

Source: IHS Quarterly, Q1 2014, The Internet of Things Explodes

The global market for IoT solutions will grow from $655.8 billion in 2014 to $1.7 trillion in 2020.[1]

$655.8 billion

$1.7 trillion

Products will continue to exist, but only as portals into valuable service offerings.[2] More businesses will launch new connected services to differentiate themselves and engage with customers.

Sources: 1. IDC, Worldwide Internet of Things Forecast, 2015-2020, May 2015

2. Harbor Research, June 2014, Markets: Where Will Value Be Created in The Internet Of Things & People?

89%

of the new cars sold worldwide will have embedded connectivity by 2024.

95%

of CxOs surveyed say they plan to use IoT in their business within 3 years.

Source: The Economist, Q1 2013, The Internet of Things Business Index: A Quiet Revolution Gathers Pace

87%

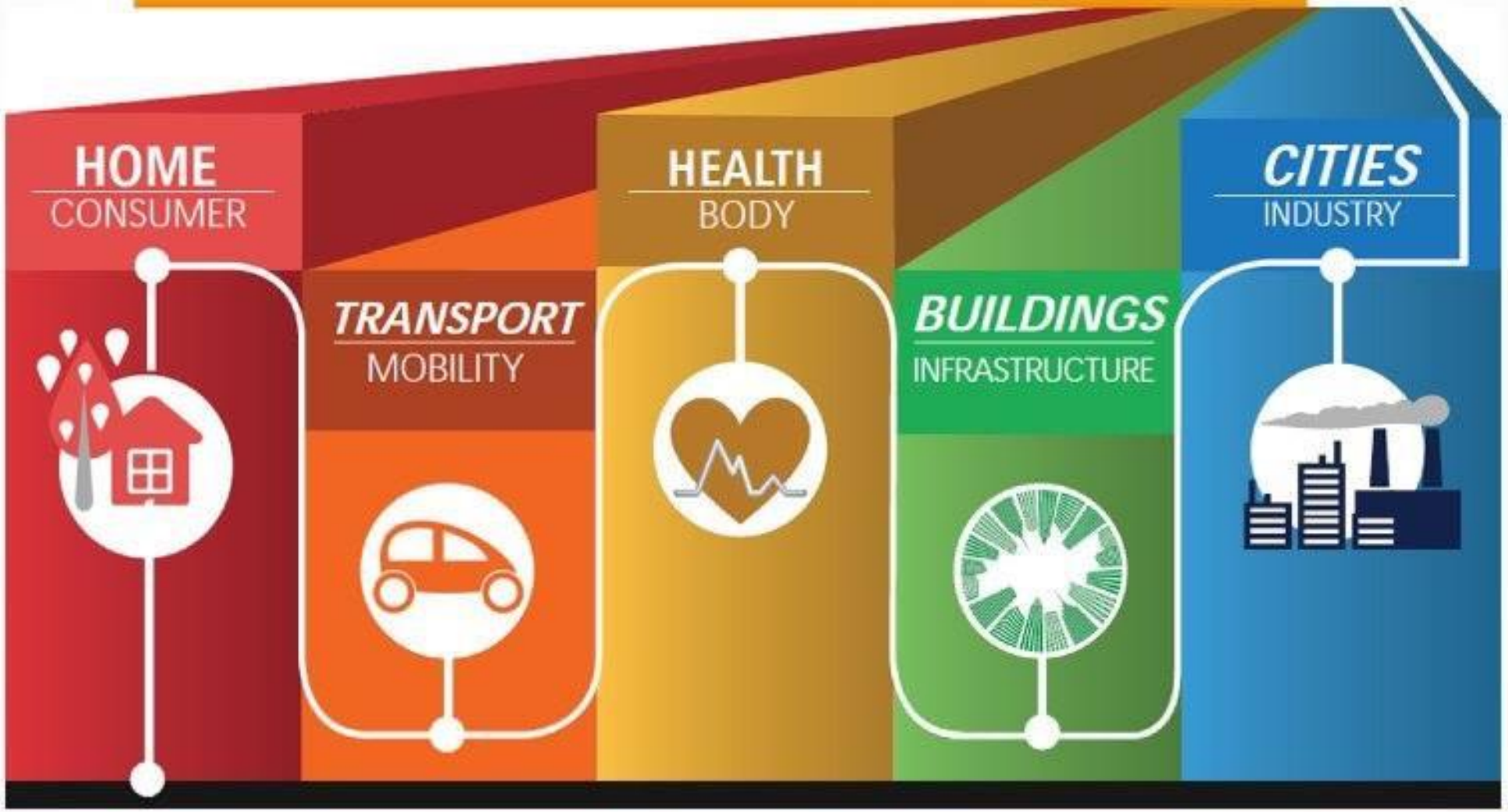
of manufacturers surveyed have not yet taken advantage of IoT to transform their facilities.

Source: American Society for Quality (ASQ), Dec. 2013, ASQ Manufacturing Outlook Survey

+82% efficiency

Among the 13% of manufacturers who did implement IoT solutions:

IoT Applications & impact on Job Market



50 B = (50 B/1000) = 250 Million

Devices — Applications — SW Jobs (5 jobs per app)


END DEVICES
OBJECTS
CONSUMERS
NETWORK
BIG DATA
INTERNET
OF THINGS
STANDARDS
INNOVATION
BUSINESS
SECURITY

The Internet of Things

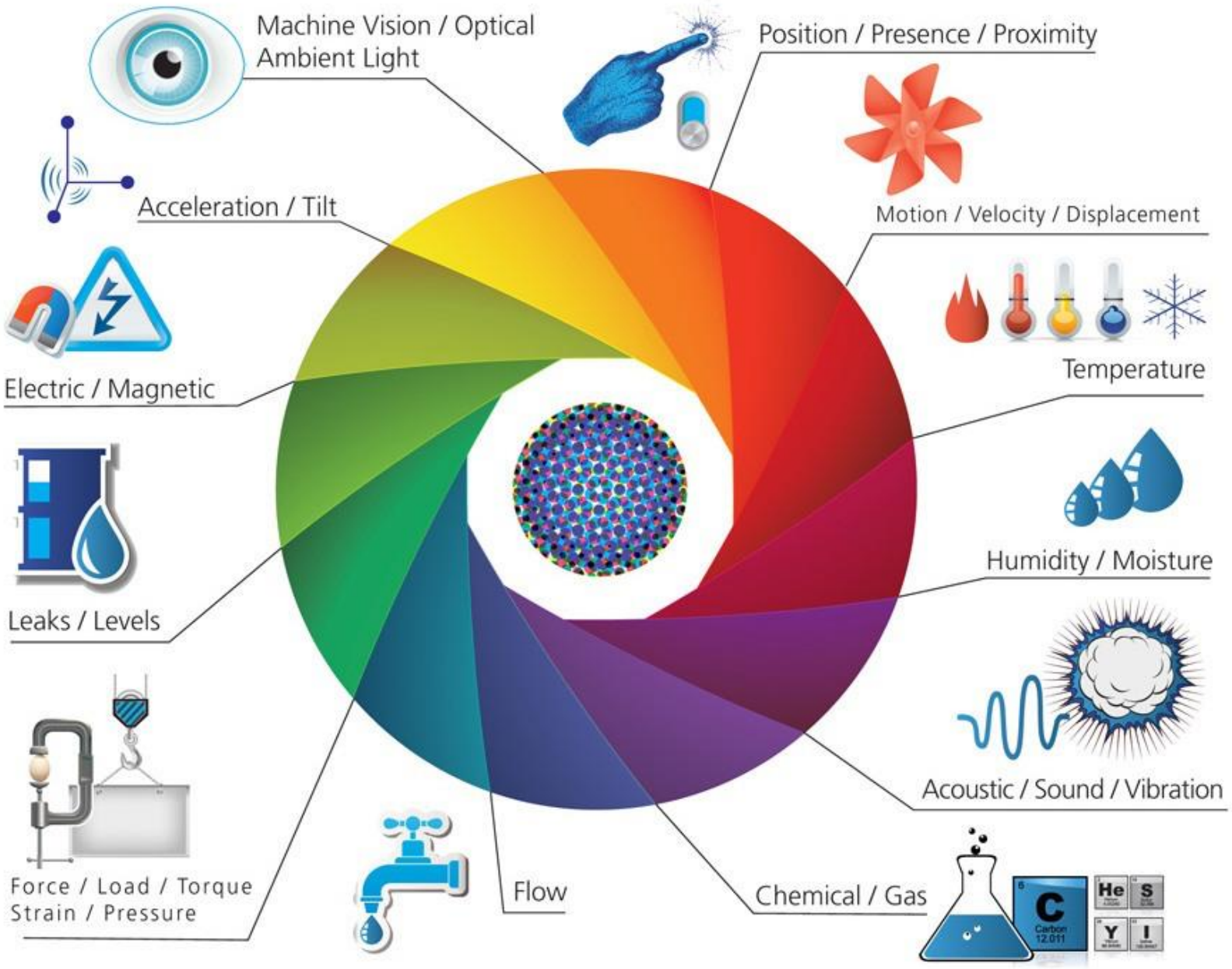
Get in on the next big thing

WHAT IS THE INTERNET OF THINGS (IoT)?

The IoT has three main parts:

1. The things, which are embedded with sensors
2. The networks that connect them.
3. The systems that process data to/from the things.

1 SENSORS



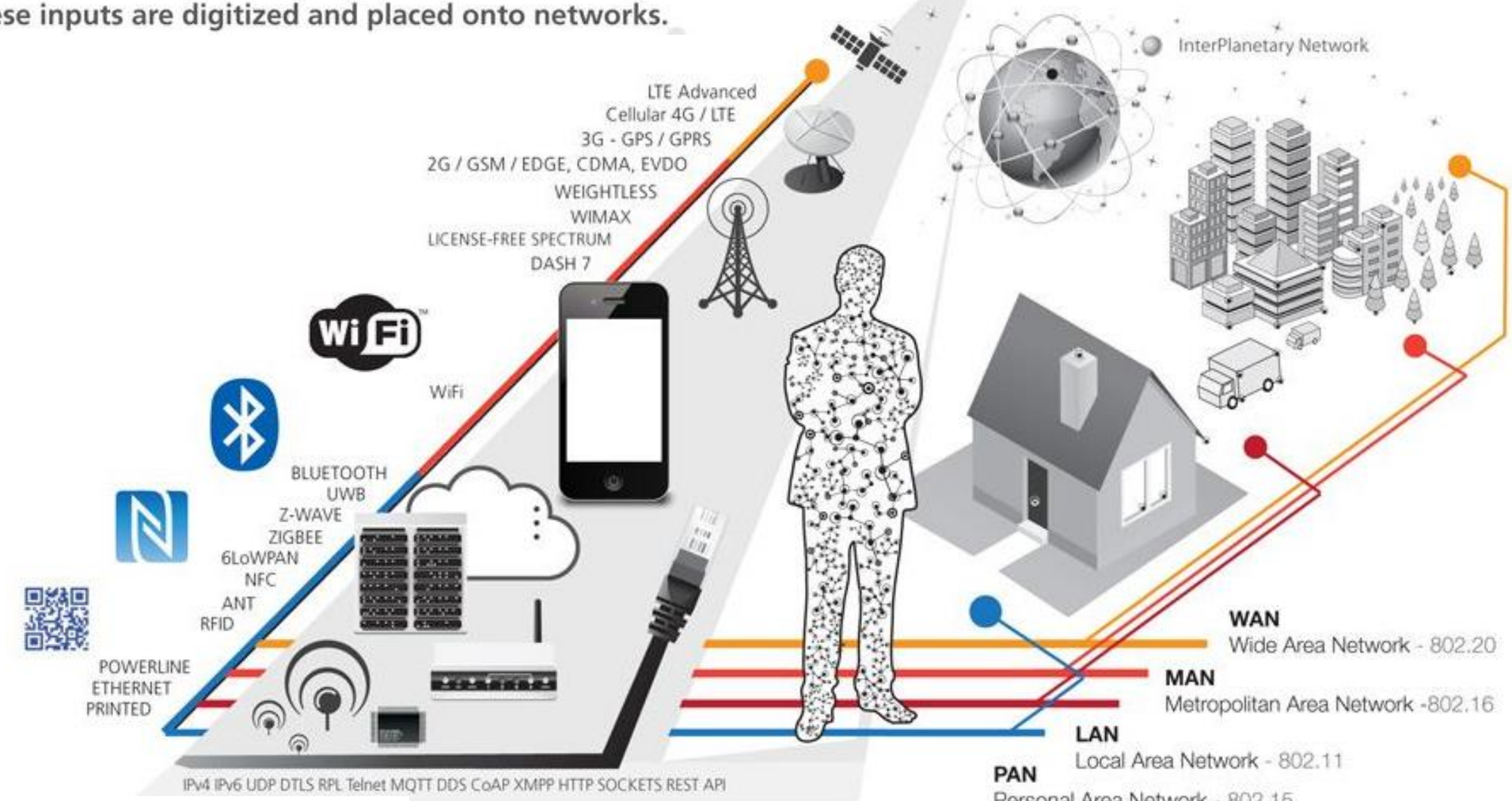
Source:

Postscapes™
Postscapes.com // tharwood@postscapes.com // 720.306.1214

Harbor Research
HarborResearch.com // aglaser@harborresearch.com // 303.786.9000

2 CONNECTIVITY

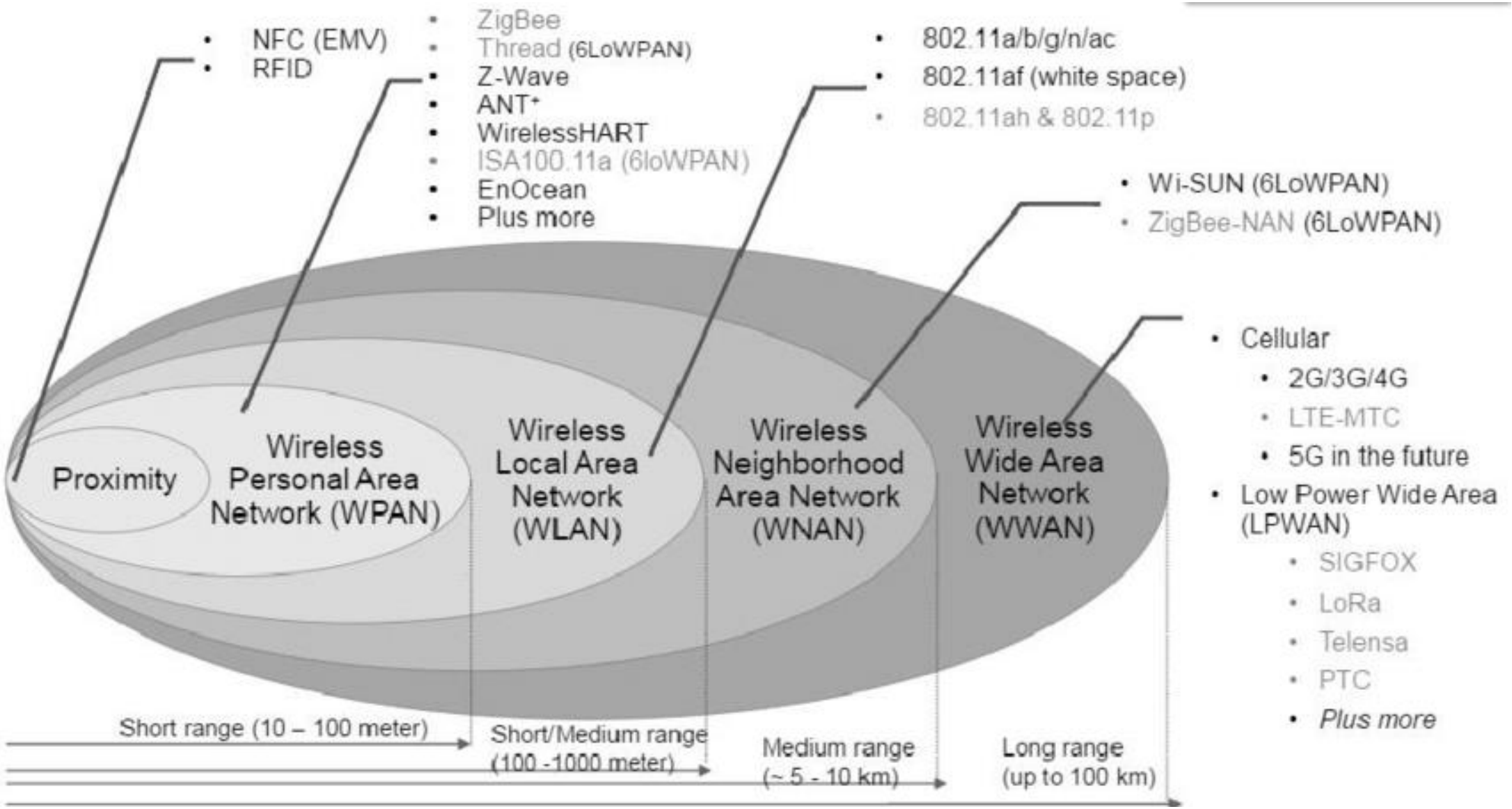
These inputs are digitized and placed onto networks.

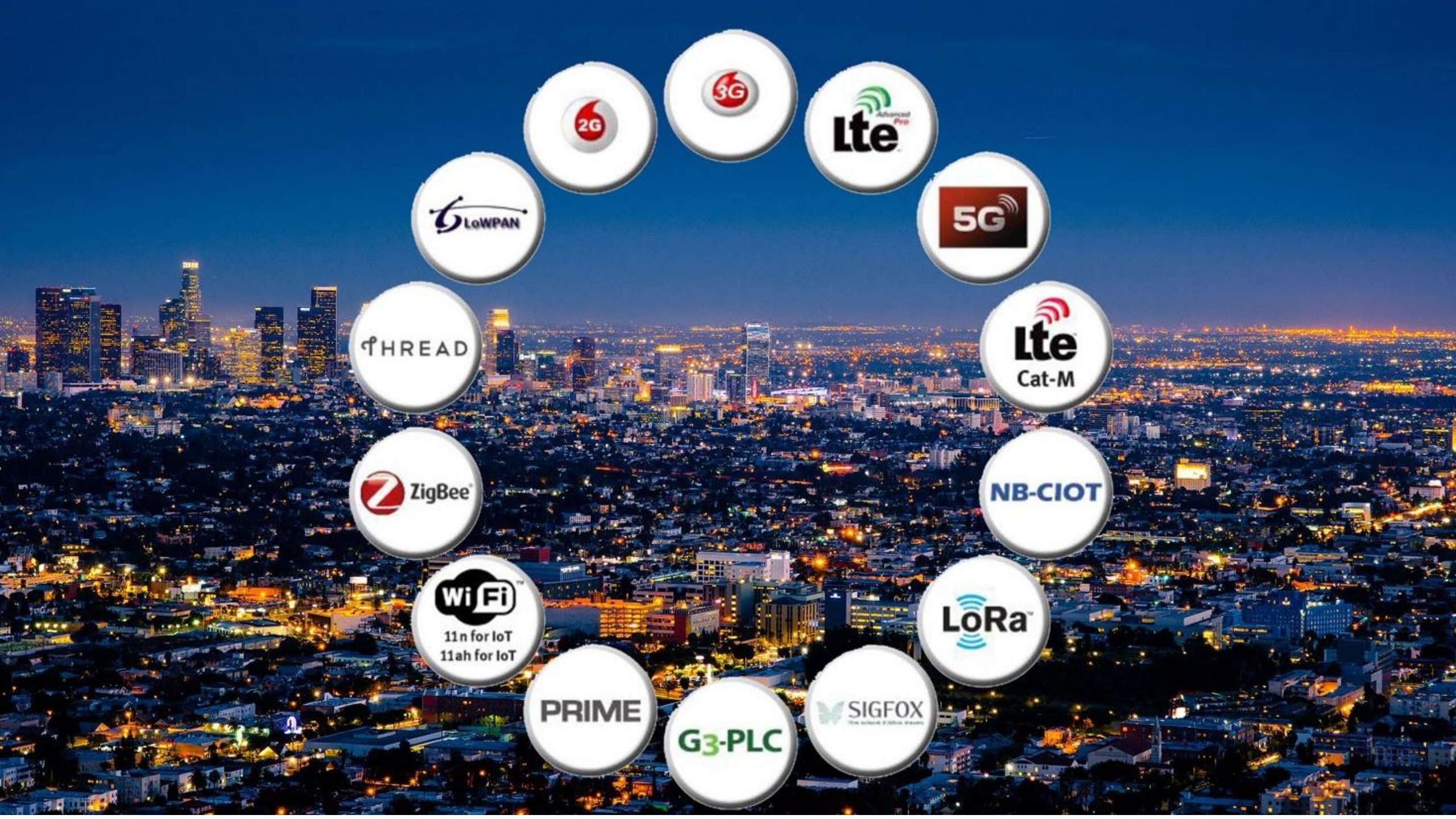


Source:

Postscapes™ Postscapes.com // tharwood@postscapes.com //

Harbor Research HarborResearch.com // aglaser@harborresearch.com // 303.786.9000


NFC (EMV)
RFID
ZigBee
Thread (6LoWPAN)
Z-Wave
ANT+
WirelessHART
ISA100.11a (6loWPAN)
EnOcean
Plus more
802.11a/b/g/n/ac
802.11af (white space)
802.11ah & 802.11p
Wi-SUN (6LoWPAN)
ZigBee-NAN (6LoWPAN)
Cellular
2G/3G/4G
LTE-MTC
5G in the future
Low Power Wide Area (LPWAN)
SIGFOX
LoRa
Telensa
PTC
Plus more
Proximity
Wireless Personal Area Network (WPAN)
Wireless Local Area Network (WLAN)
Wireless Neighborhood Area Network (WNAN)
Wireless Wide Area Network (WWAN)
Short range (10 – 100 meter)
Short/Medium range (100 -1000 meter)
Medium range (~ 5 - 10 km)
Long range (up to 100 km)

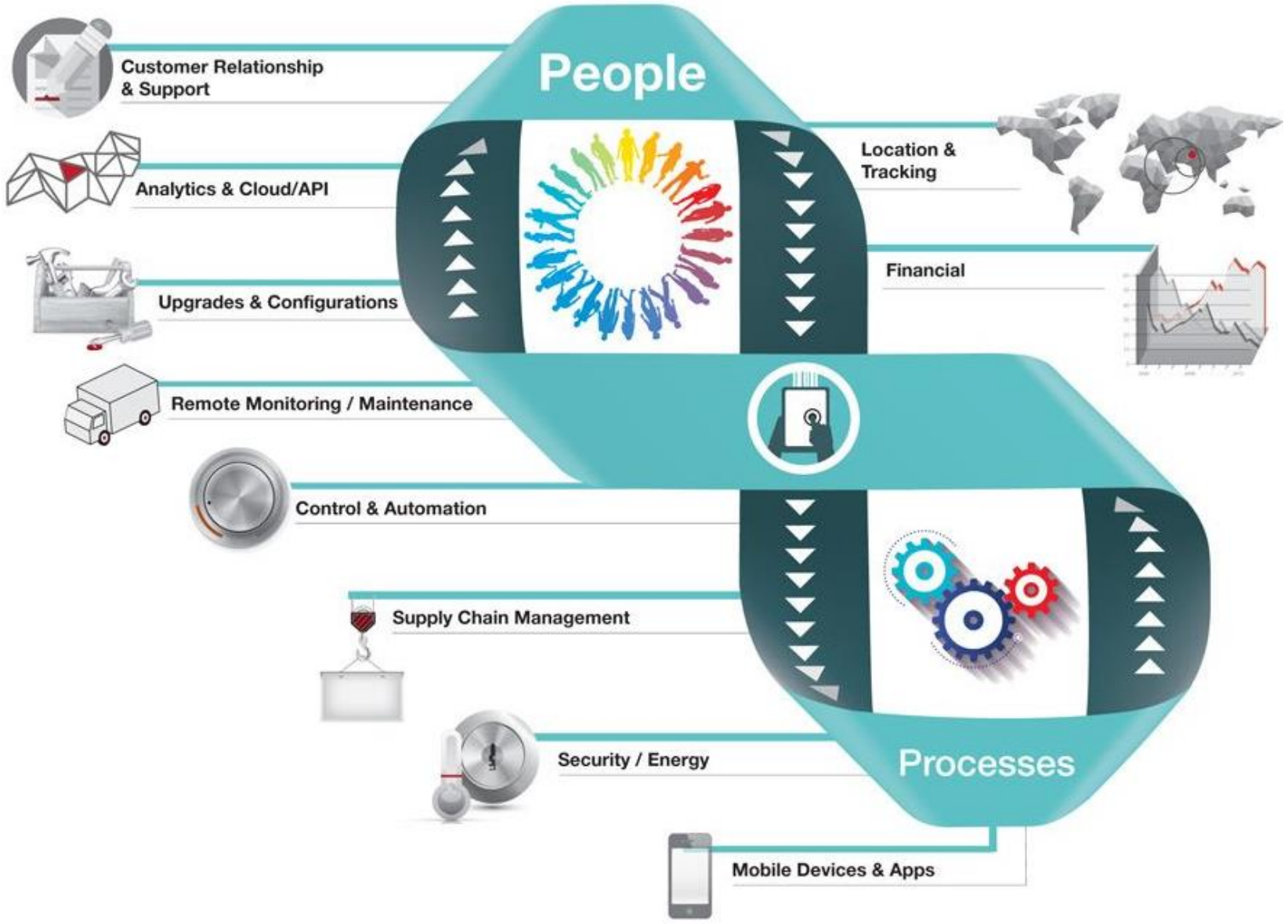

2G
3G
Lte Advanced Pro
5G
6LoWPAN
THREAD
Lte Cat-M
ZigBee
NB-CIOT
Wi Fi
11n for IoT
11ah for IoT
LoRa
PRIME
G3-PLC
SIGFOX

IOT WIRELESS TECHNOLOGIES

Technologies	Standards & Organizations	Network Type	Frequency (US)	Max Range	Max Data Rate	Max Power	Encryption
WiFi	IEEE 802.11 (a,b,g,n,ac,ad, and etc)	WLAN	2.4,3.6,5,60 GHz	100 m	"6-780 Mb/s 6.75 Gb/s @ 60 GHz"	1 W	WEP, WPA, WPA2
Z-Wave	Z-Wave	Mesh	908.42 MHz	30 m	100 kb/s	1 mW	Triple DES
Bluetooth	Bluetooth (formerly IEEE 802.15.1)	WPAN	2400-2483.5 MHz	100 m	1-3 Mb/s	1 W	56/128-bit
Bluetooth Smart (BLE)	IoT Interconnect	WPAN	2400-2483.5 MHz	35 m	1 Mb/s	10 mW	128-bit AES
Zigbee	IEEE 802.15.4	Mesh	2400-2483.5 MHz	160 m	250 kb/s	100 mW	128-bit AES
THREAD	IEEE 802.15.4 + 6LoWPAN	Mesh	2400-2483.5 MHz	160 m	250 kb/s	100 mW	128-bit AES
RFID	Many	P2P	13.56 MHz, etc.	1 m	423 kb/s	~1 mW	possible
NFC	ISO/IEC 13157 & etc	P2P	13.56 MHz	0.1 m	424 kb/s	1-2 mW	possible
GPRS (2G)	3GPP	GERAN	GSM 850/1900 MHz	25 km / 10 km	171 kb/s	2 W / 1 W	GEA2/GEA3/GEA4
EDGE (2G)	3GPP	GERAN	GSM 850/1900 MHz	26 km / 10 km	384 kb/s	3 W / 1 W	A5/4, A5/3
UMTS (3G) HSDPA/HSUPA	3GPP	UTRAN	850/1700/1900 MHz	27 km / 10 km	0.73-56 Mb/s	4 W / 1 W	USIM
LTE (4G)	3GPP	GERAN/UTRAN	700-2600 MHz	28 km / 10 km	0.1-1 Gb/s	5 W / 1 W	SNOW 3G Stream Cipher
ANT+	ANT+ Alliance	WSN	2.4 GHz	100 m	1 Mb/s	1 mW	AES-128
Cognitive Radio	IEEE 802.22 WG	WRAN	54-862 MHz	100 km	24 Mb/s	1 W	AES-GCM
Weightless-N/W	Weightless SIG	LPWAN	700/900 MHz	5 km	0.001-10 Mb/s	40 mW / 4 W	128-bit

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.



Source:

Postscapes™
Postscapes.com // tharwood@postscapes.com // 720.306.1214

Harbor Research
HarborResearch.com // aglaser@harborresearch.com // 303.786.9000

Embedded Systems

Description

TRACK PURPOSE

Embedded Systems Platform aims to graduate professional, world-class, and well educated Embedded Systems graduates

This track is managed by Embedded Systems Department

Job Profiles

EMBEDDED SOFTWARE ENGINEER

History

2007

THE EMBEDDED SYSTEMS DEPARTMENT HAS BEEN FOUNDED IN 2007

So far the Embedded Systems Platform has graduated more than 250 qualified Embedded System Engineers. With an Employment Rate of 90% in different prominent Companies including.

Technology

Our Courses

Advanced Microprocessor	Device Driver	Embedded Computer Architecture
Artificial Intelligence and Machine Learning	Digital Signal Processing for Embedded Systems	Embedded Linux
Automotive Bus Technology Standards	Effective Communication Skills	Embedded System Development Tools
Business Report Writing	Effective Presentation Skills	Hardware/Software Interfacing
Code of Conduct and Corporate Etiquette	Effective Team Management Skills	Innovative Thinking
Data Structures and Algorithms	Embedded C Programming	Interviewing Skills

Information Technology Institute

Our Courses

- Introduction to Embedded Systems
- Introduction to PCB Design
- Introduction to Perl
- Introduction to Programming
- Introduction to Robotics
- Introduction to Software Engineering for Embedded Systems
- Java Programming for Industrial Engineering
- Marketing Principles
- Matlab/Simulink for Embedded Systems
- Multiprocessor Communication Systems
- Object-Oriented Programming Concepts
- Operating Systems Fundamentals
- Real Time Operating Systems
- Verification and Testing of Embedded Systems
- VLSI Design – Programmable Devices
- Wireless Communication Systems

Information Technology Institute

Wireless Communications

Description

TRACK PURPOSE

Wireless Communications track is designed to prepare communications/wireless engineers to have in depth knowledge in 4G/5G LTE- advanced networks,in addition to a good practical knowledge in digital signal processing. Cognitive Radios and SDR related topics are covered. Graduates are also prepared with an embedded systems knowledge to help them implement wireless applications and a good Linux knowledge to administer mobile/wireless networks.

Job Profiles

DSP SOFTWARE ENGINEER

WIRELESS EMBEDDED ENGINEER

WIRELESS COMMUNICATIONS ENGINEER

History

2013

ESTABLISHED - INTAKE 1

Wireless Communication track was established in partnership with Intel Labs as part of an Open Innovation Lab Project. During this intake, the graduation projects produced 2 published research papers

2014

TRACK ENHANCEMENT

Embedded Courses where added, to give graduates a competitive edge in the market

Technology

Our Courses

Advanced Wireless Communication	Computer Architecture	Embedded System Development Tools
Applied DSP	Computer Networks Fundamentals	Fundamentals of Wireless Communication
Bash Shell Scripting	Data Structures and Algorithms	Innovative Thinking
Business Report Writing	Effective Communication Skills	Interviewing Skills
Code of Conduct and Corporate Etiquette	Effective Presentation Skills	Introduction to Embedded Systems
Cognitive Radio	Effective Team Management Skills	Introduction to Matlab for Engineers

Information Technology Institute

Our Courses

- Embedded System Development Tools
- Fundamentals of Wireless Communication
- Innovative Thinking
- Interviewing Skills
- Introduction to Embedded Systems
- Introduction to Matlab for Engineers
- Introduction to Programming
- Introduction to Software Engineering for Embedded Systems
- Marketing Principles
- Object-Oriented Programming Concepts
- Operating Systems Fundamentals
- Real Time Operating Systems
- Red Hat System Administration I
- Software Defined Radio

Information Technology Institute

Internet Of Things Application Developer

Description

TRACK PURPOSE

The Internet of Things (IoT) is the network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment. According to Harbor research the business value will reach 1 Trillion $. The need to understand and develop applications for this kind of business is highly important and required.

This track is managed by Internet of Things Department

Job Profiles

IOT APPLICATION?S? DEVELOPER

IOT END-TO-END ARCHITECT

IOT SYSTEM INTEGRATION ENGINEER

History

Technology

Our Courses

AEP (Application Enablement Platforms) & Messaging broker platforms	CSS Frameworks	Effective Presentation Skills
Agile Software Development Methodologies	Database Fundamentals	Effective Team Management Skills
Application Security Basics	Design Patterns	Gateway to server Networks
Bash Shell Scripting	Device HW platforms	Gateways & GW providers
Client-Side Technologies	Device OS (RTOS)	HTML5 & CSS3
Code of Conduct and Corporate Etiquette	Effective Communication Skills	Innovative Thinking

Information Technology Institute

Our Courses

Interviewing Skills	IoT Testing	Operating Systems Fundamentals
Introduction to Embedded Systems	Java Programming	Python Programming
Introduction to Programming	JavaScript Libraries	Red Hat System Administration I
Introduction to Software Engineering	Marketing Principles	Red Hat System Administration II
IoT Alliances	MySQL Database	Red Hat System Administration III
IoT Security	NoSQL Databases	Sensors and Sensors Providers

Information Technology Institute

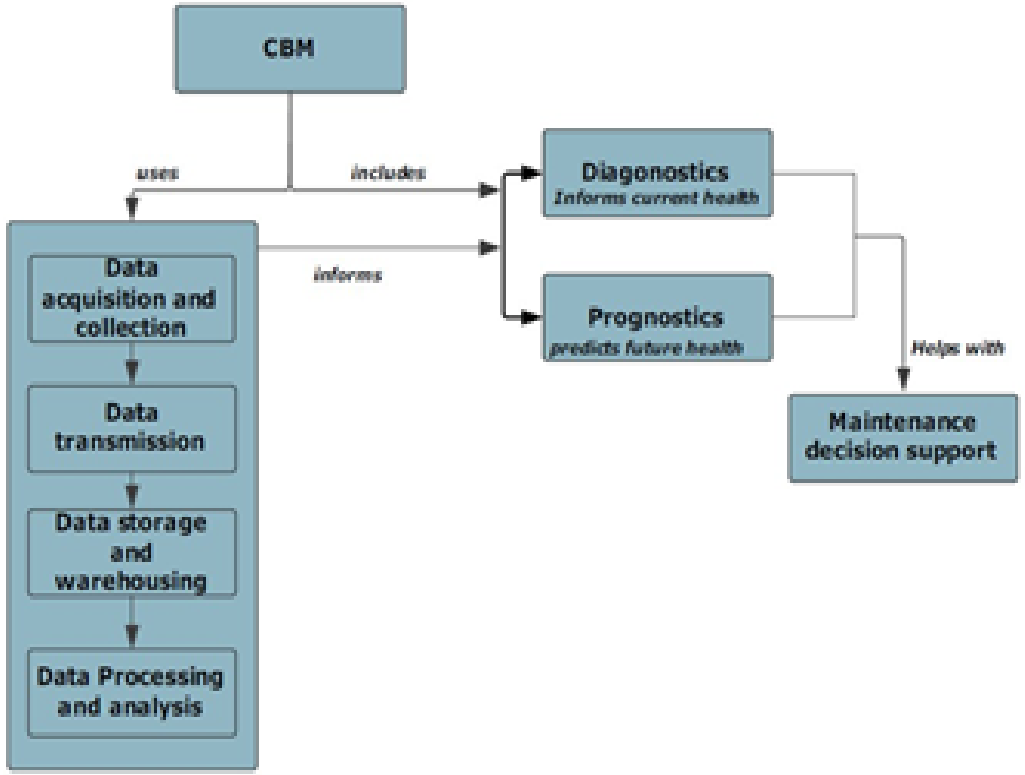
Our Courses

IoT Testing	Operating Systems Fundamentals	Software Rapid Prototyping
Java Programming	Python Programming	Unit & Automated Testing
JavaScript Libraries	Red Hat System Administration I	Version Control Systems
Marketing Principles	Red Hat System Administration II	Web Services
MySQL Database	Red Hat System Administration III	WSN Wireless Sensor Network and Communication protocols
NoSQL Databases	Sensors and Sensors Providers	

Information Technology Institute

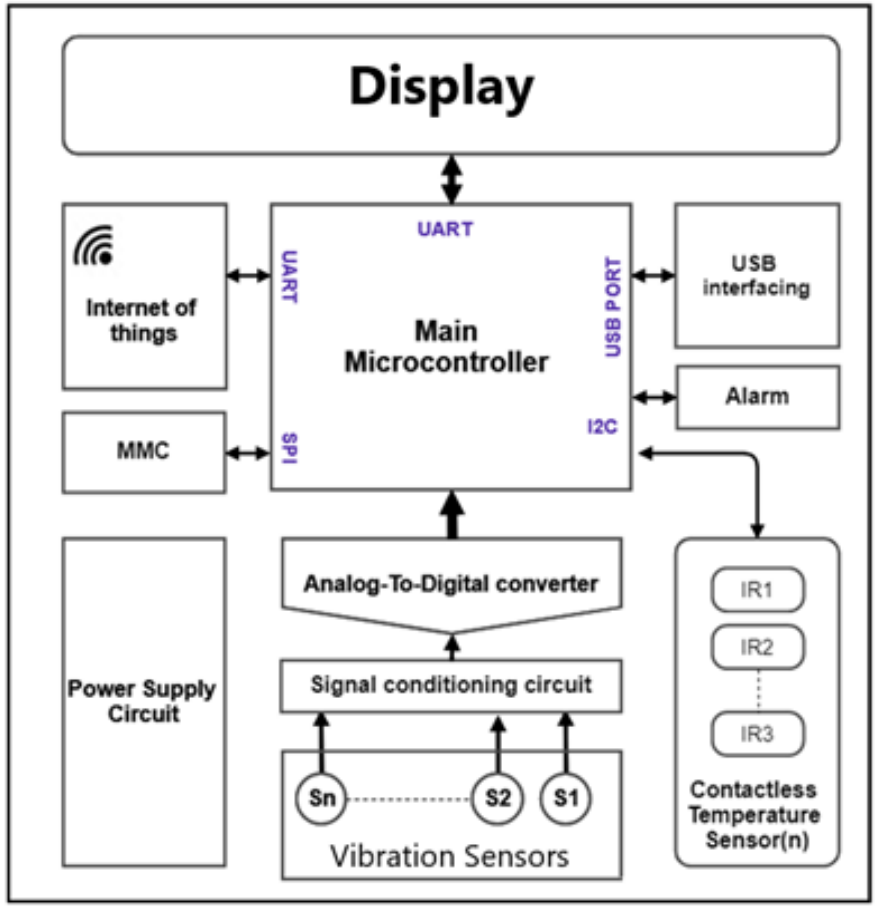
Real-life Project Example for IoT

- Objective is to design a Condition-based monitoring HW to support automated scheduler by estimating maintenance durations



Real-life Project Example for IoT

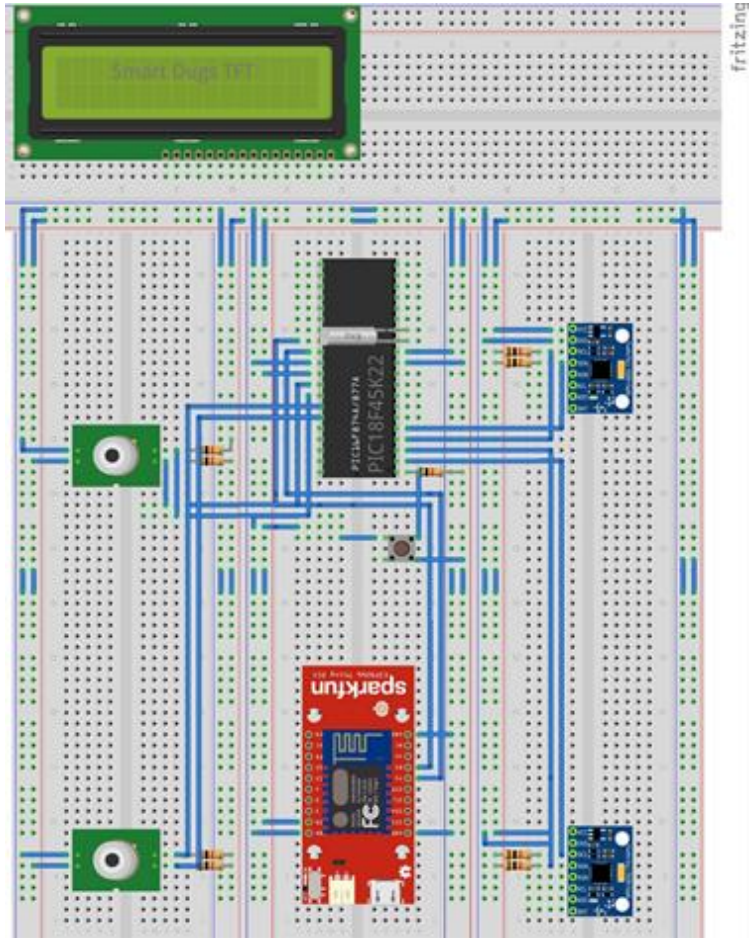
- Vibration sensors
- Signal conditioning circuit
- Analog-to-Digital converter
- Temperature sensors
- Microcontroller
- Internet of Things (IoT) module
- Display screen
- Power supply



CBM System Block diagram

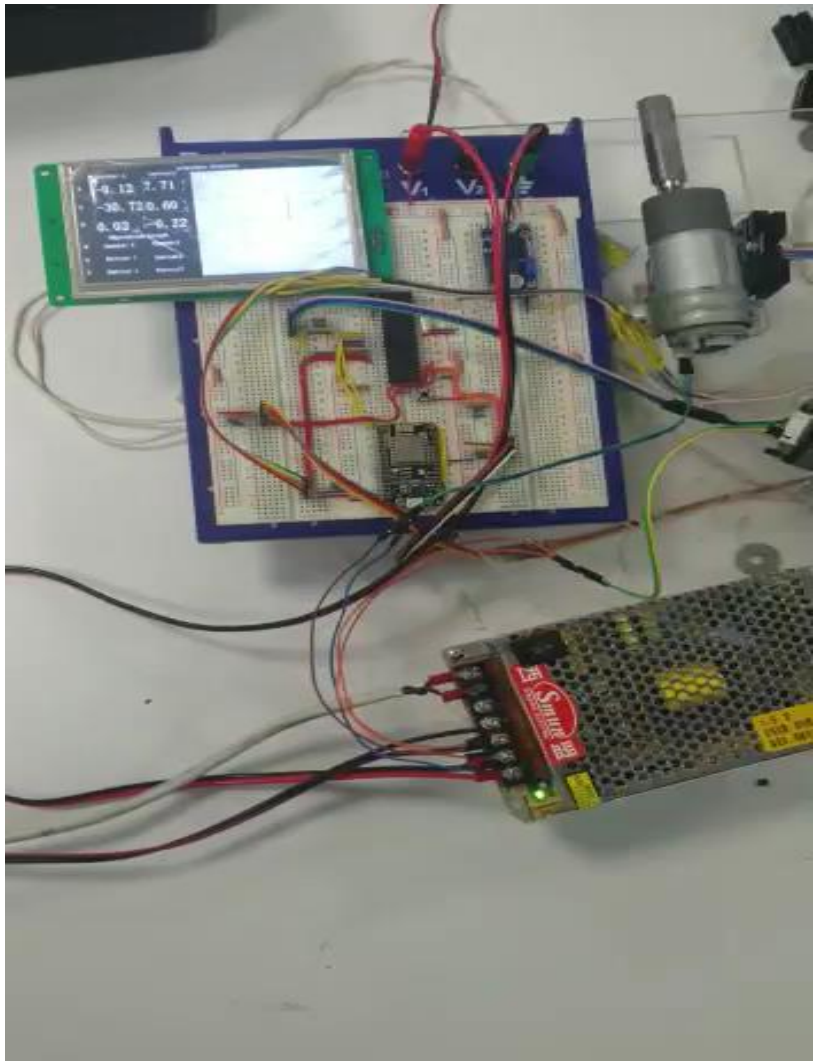
Real-life Project Example for IoT

- Vibration sensors + Signal conditioning circuit + Analog-to-Digital converter are combined in “IMU MPU6050" (3-Axis Acceleration Gyroscope 6DOF Module)
- Contactless Temperature Sensors (MLX90614)
- Microcontroller (PIC18F45K22)
- Internet of Things (IoT) module (ESP8266)
- Display screen “DWIN DGUS smart TFT”

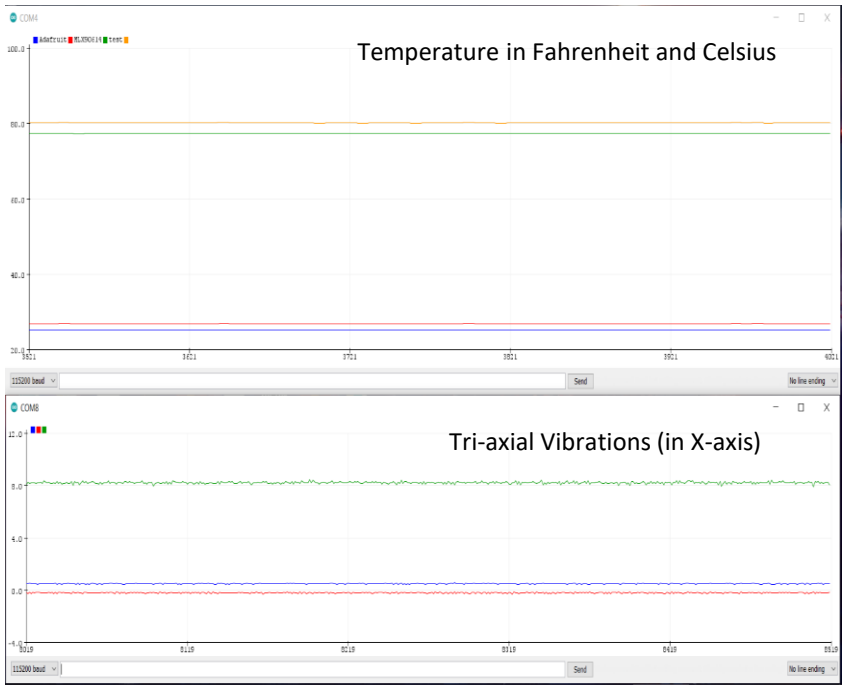


CBM System Circuit Diagram

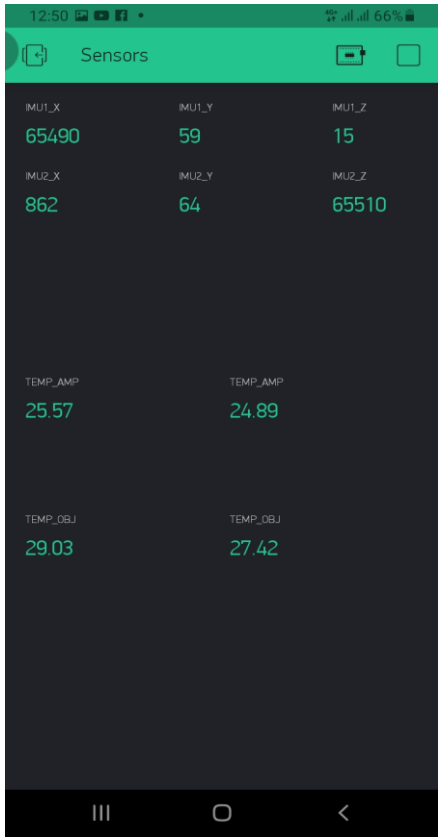
Technical documentation of HW system Description (Demo Video)



Real-life Project Example for IoT



Sensors Readings on PC



Sensors Readings on Cloud Server (Blynk)

شکرا