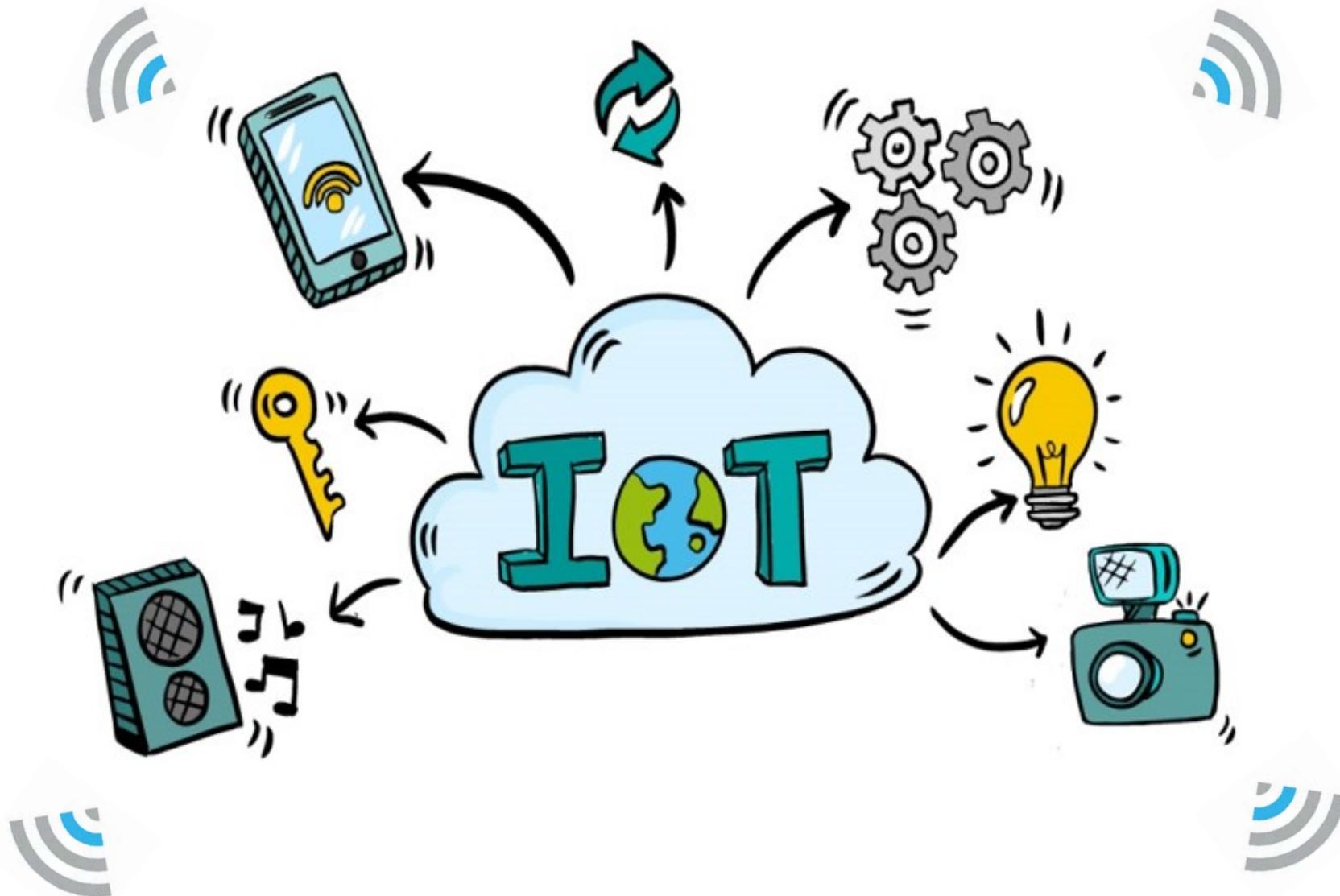


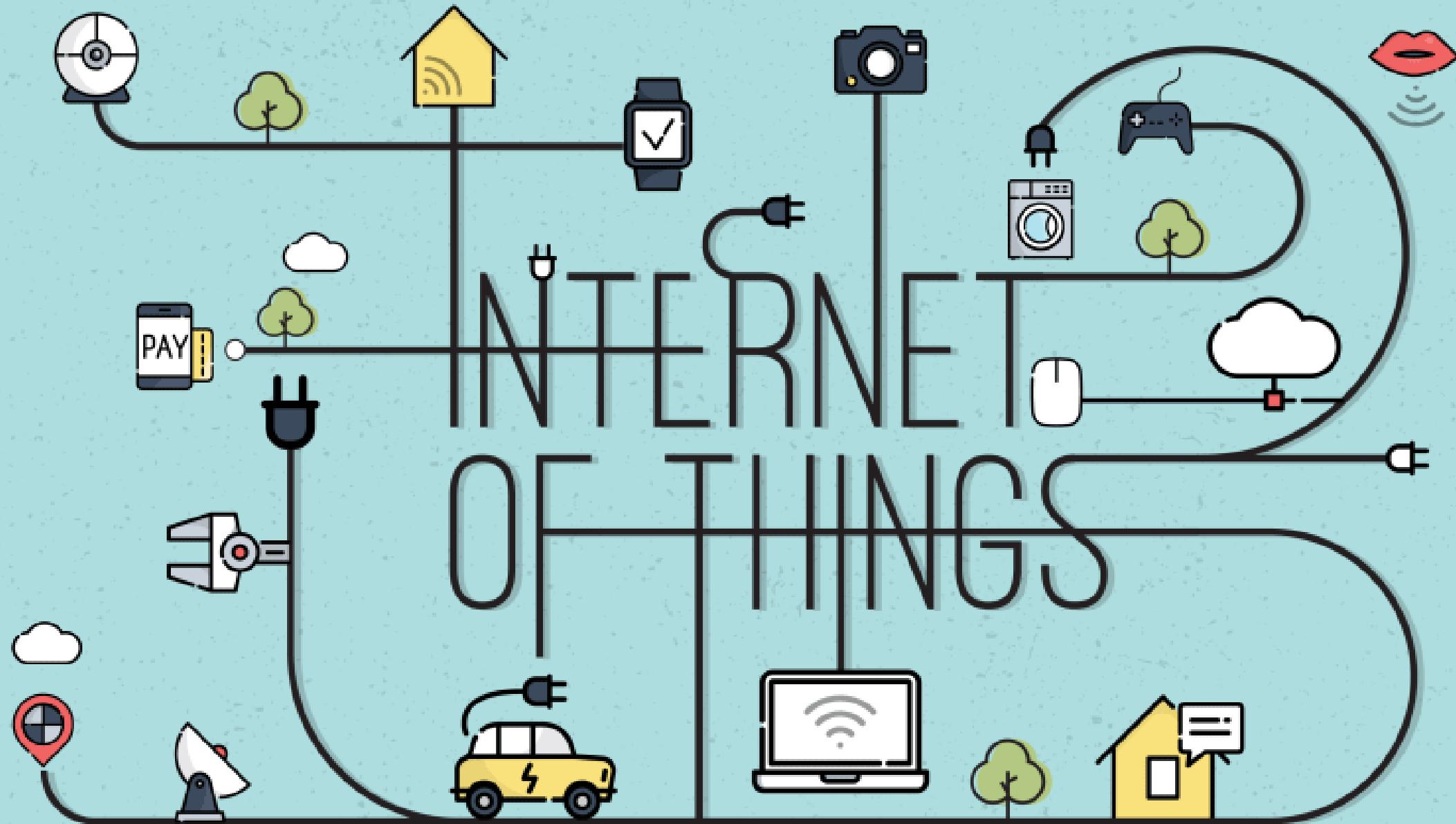
# Internet de las Cosas (IoT)

Marco Teran

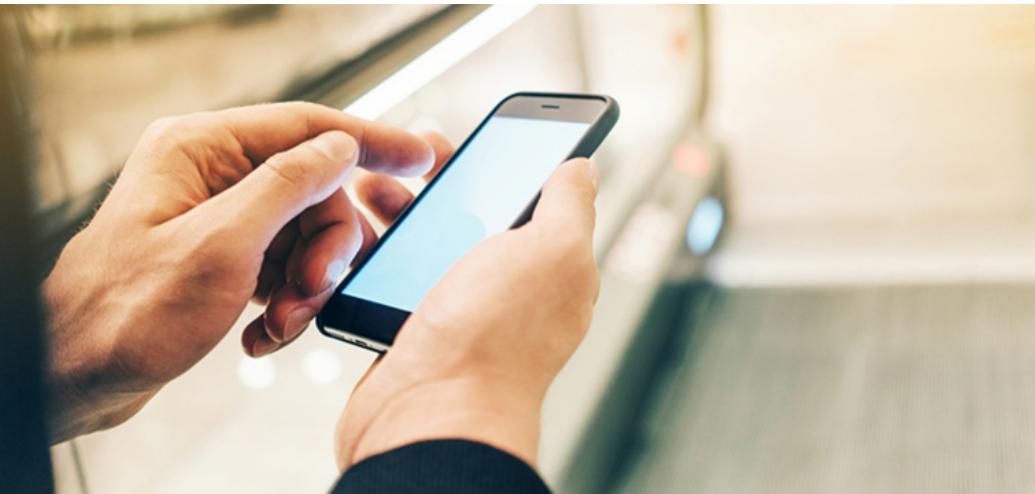


# ¿Qué es el IoT ?





# Introducción al IoT



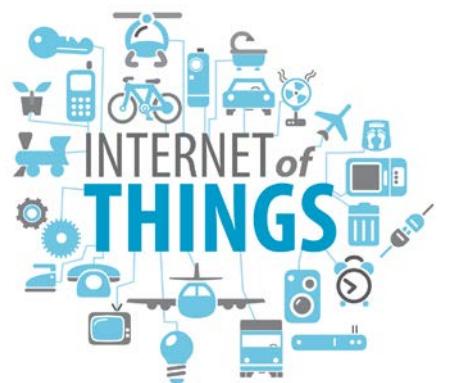
La idea de la Internet de las Cosas es que en lugar de tener un pequeño número de poderosos dispositivos de computación en tu vida, tienes un gran número de dispositivos de computación de bajo consumo energético y omnipresentes.

# Varios nombres, un concepto

## M2M (Machine to Machine)

# “Internet of Everything” (Cisco Systems)

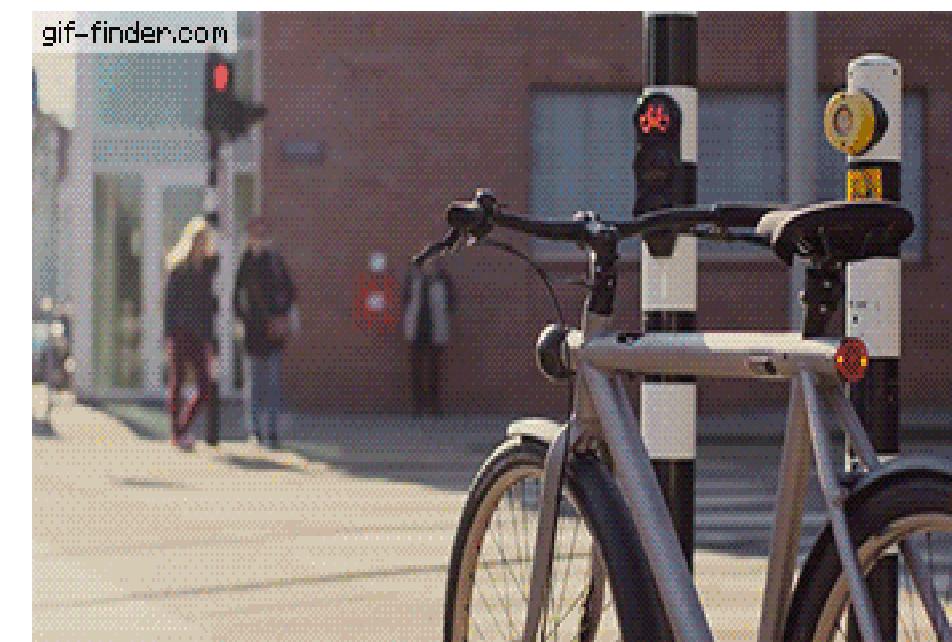
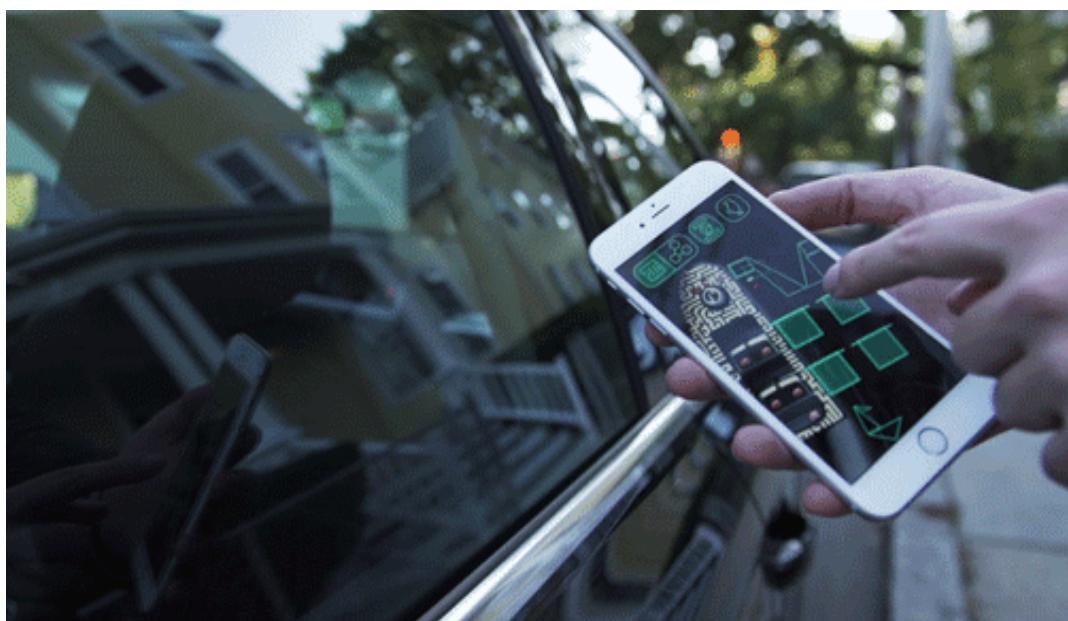
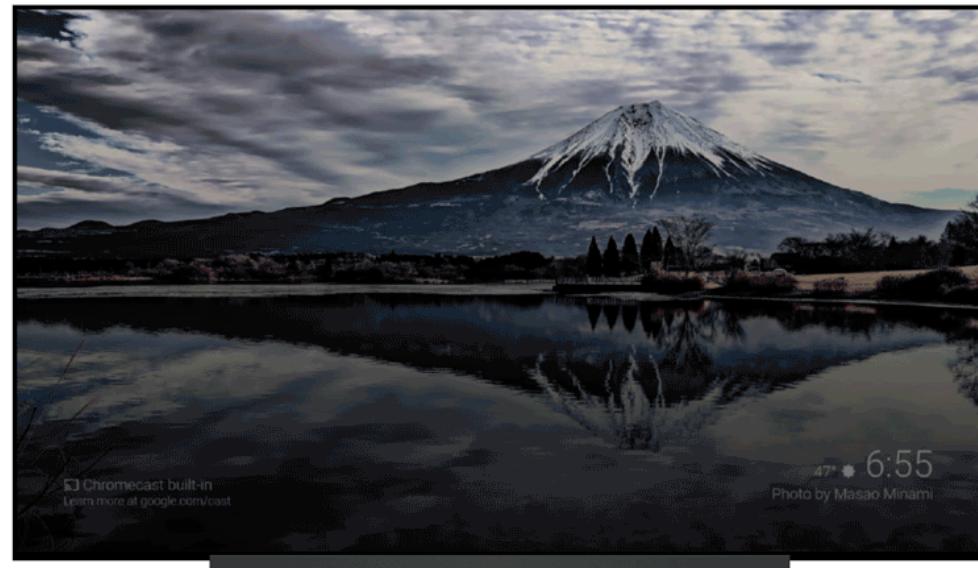
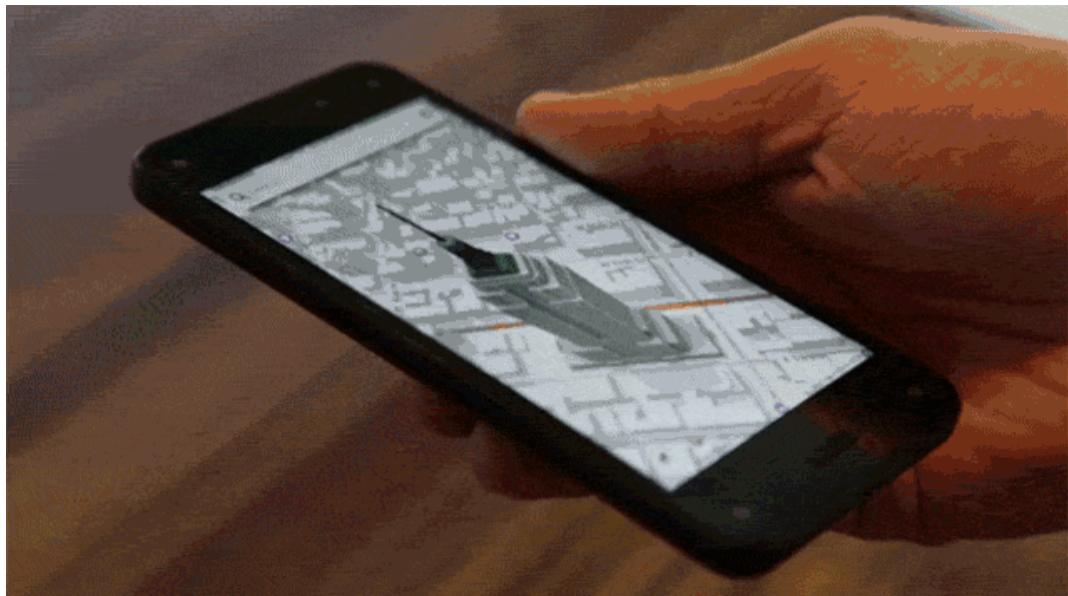
## “World Size Web” (Bruce Schneier)











# Dispositivos Inteligentes

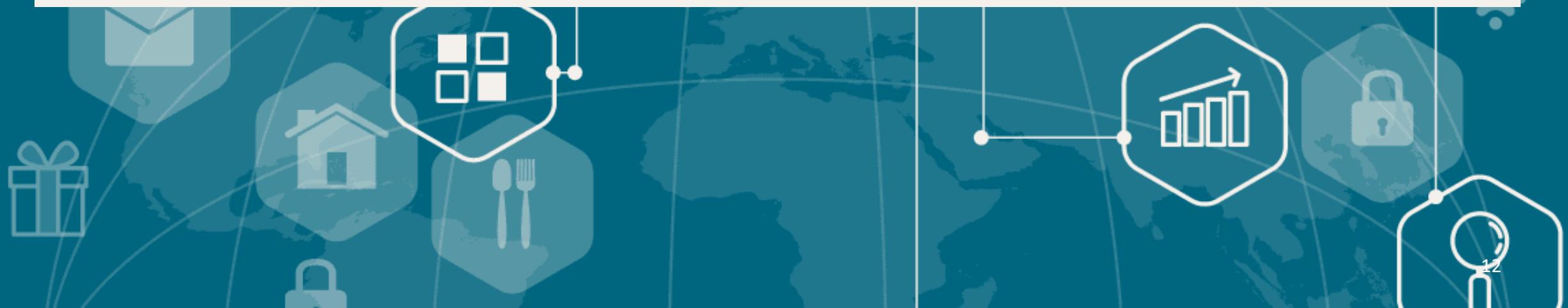


# Definición de IoT

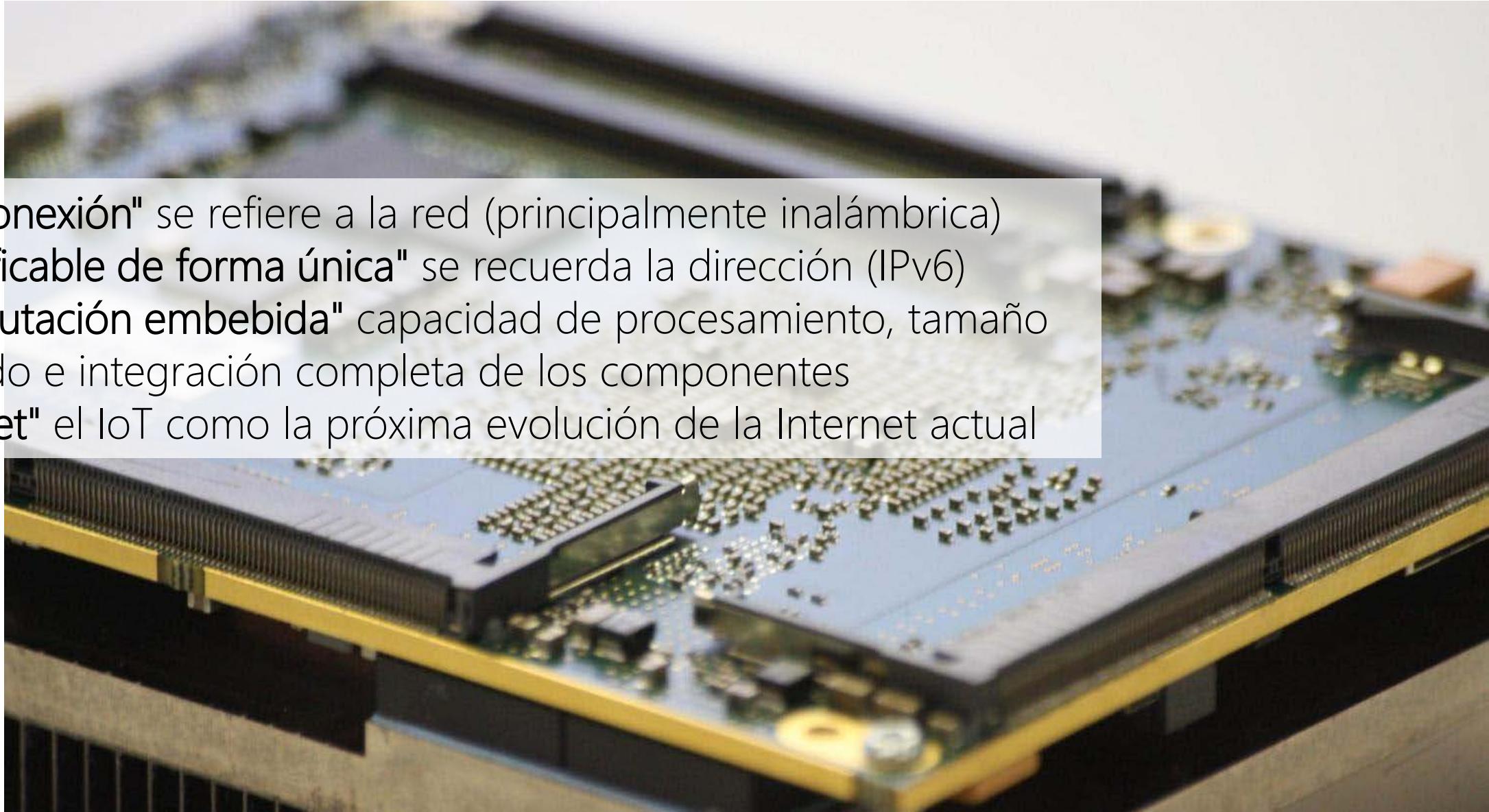
# Definición de IoT



El Internet de las Cosas (IoT) es la **interconexión** de dispositivos electrónicos **embebidos** identificables de manera única dentro de la infraestructura de **Internet** existente.



- "Interconexión" se refiere a la red (principalmente inalámbrica)
- "Identifiable de forma única" se recuerda la dirección (IPv6)
- "Computación embebida" capacidad de procesamiento, tamaño reducido e integración completa de los componentes
- "Internet" el IoT como la próxima evolución de la Internet actual

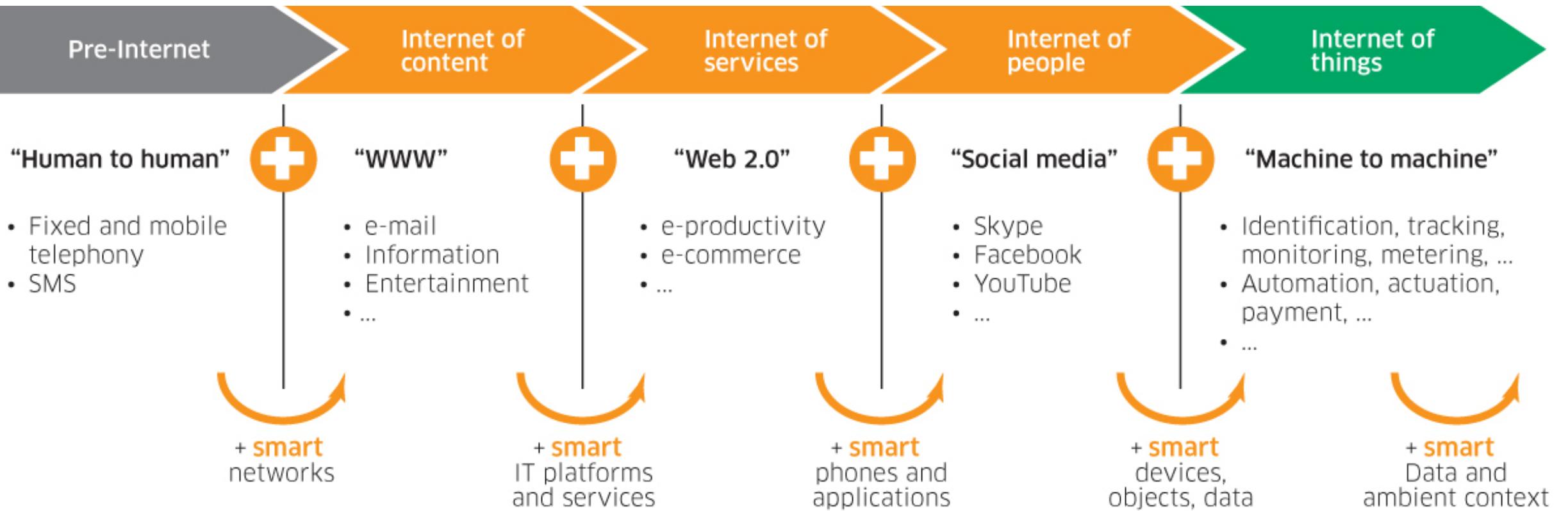


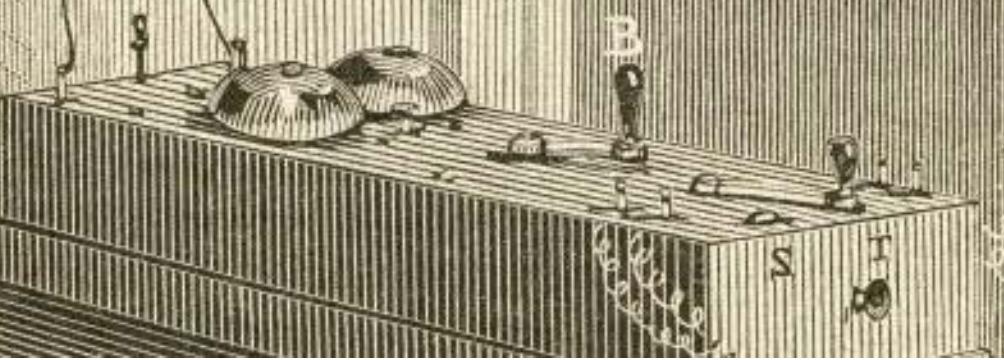


# THE NETWORK OF THINGS

No es una Red de humanos

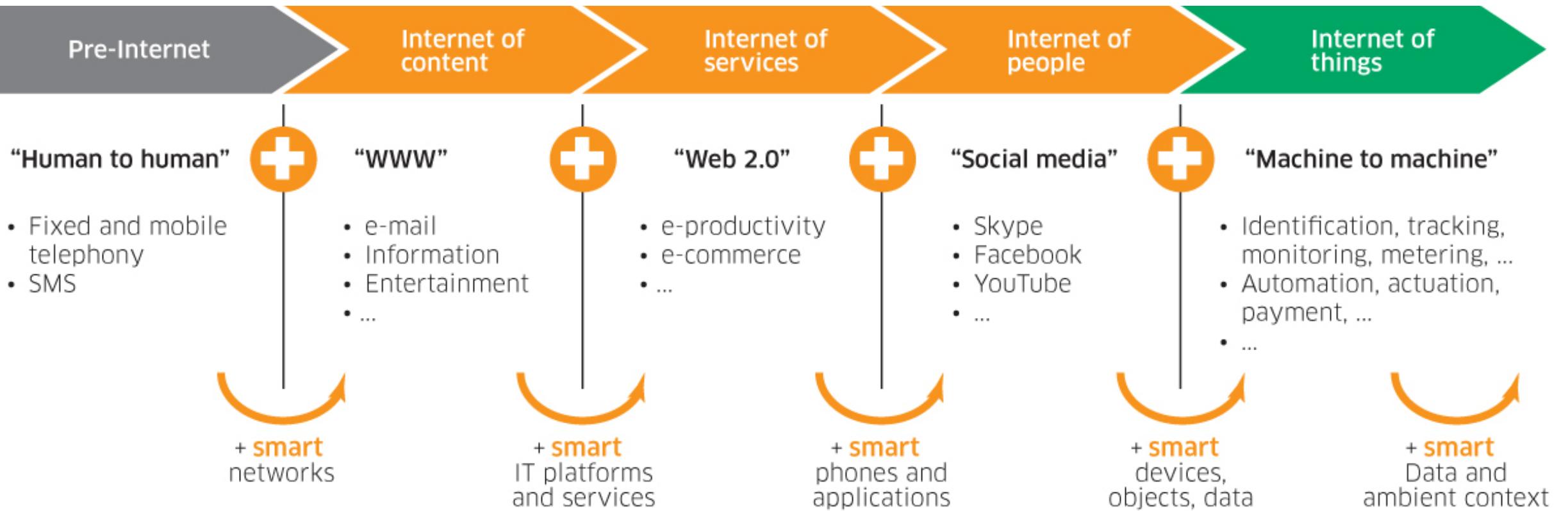
Del Internet de la gente a la Internet de las cosas





881/1  
abc

It is great fun  
to type in





Home • About • Help

Ask about CORPORATE SER

**May I Suggest:**

- MONEY
- TRAVEL
- HEALTH
- COMPUTERS
- ENTERTAINMENT
- FAMILY
- SHOPPING
- ASK JEEVES FOR KIDS!
- JUST CURIOUS, JEEVES

How can the web connect my Family? [MyFamily.com](#)

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Have a Question? Just type it in and click Ask!

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Hello! Shopping at Amazon.com is 100% secure--gu... Already a customer? [Sign in](#).

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Scenic views from space

Make the connection

- Top wireless phones
- Anxiety at social eve...
- Send a holiday e-ca...

D.COM AOL NetFind

Control of Finances: help, savers and calculators.

Take control of your finances: help, advice

eBay categories

Automotive Antiques (69718) Books, Movies, Music (423766) Coins & Stamps (119881) Collectibles (962821) Computers (97268)

Tuesday Maps & I Don't ge find your with city regional Wet, Wil Outside: featured

Timex Indiglo Mens Watch \*Dutch Epson Sc 400/500/600/700 Blk, Ink NEW! ChessMaster 6000 w/ Bruce 1999 Black Corvette 6500 Choice Uncirculated Old Whe Sapphires, Emeralds, & Rubies - Be more see all featured....

ebay Visa

TALES of the EARLY INTERNET.

Move over, speed of light. Introducing

great collections Visit eBay Great Collections.

# Google! BETA

Search the web using Google

Google Search I'm feeling lucky

More Google!

Copyright ©1999 Google Inc.

YAHOO! What's New Check Email

New! South Park Movie Trailer beep beep Yahoo! Pager now works with chat

Search advanced search

Yahoo! Auctions - 100,000's of items to bid on - [Star Wars](#), [Pokemon](#), [Hot V](#)

Shopping - Yellow Pages - People Search - Maps - Travel Agent - Classifieds - Personals - Ga Email - Calendar - Pager - My Yahoo! - Today's News - Sports - Weather - TV - Stock Quote

Arts & Humanities Literature, Photography...

News & Media Full Coverage, Newspapers, TV...

Business & Economy Companies, Finance, Jobs...

Recreation & Sports Sports, Travel, Autos, Outdoors...

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Entertainment Cool Links, Movies, Humor, Music...

Science Biology, Astronomy, Engineering...

Government

Social Science

In the

- NATO bombing embassy in B...
- Jenny Jones' negligent in g murder
- NHL Playoff...
- Market
- Shop for Mot...
- Top selling vi...
- Inside Y...
- Y! Movies - previous info...



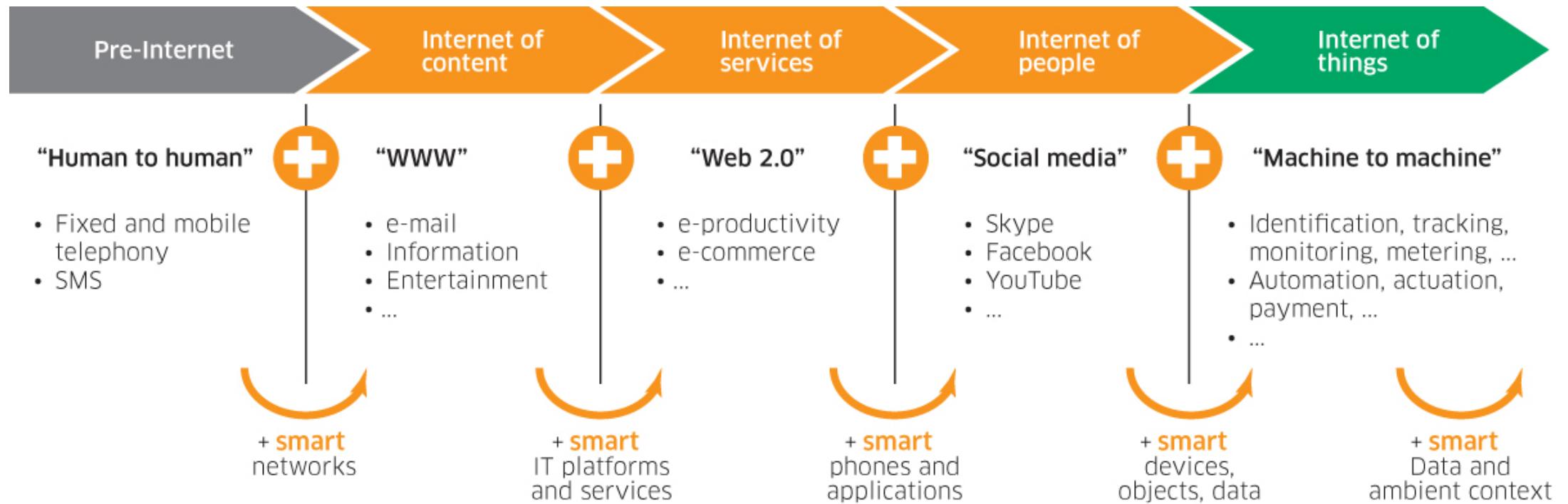
**EN MIS TIEMPOS**

**SE USABA MSN Y LATINCHAT**

memegenerator.net

# Características del Internet de las cosas

- Altamente conectado
- Inteligente
- Cosa = No necesariamente un ordenador/teléfono/tableta
- Red/interfaz del mundo físico



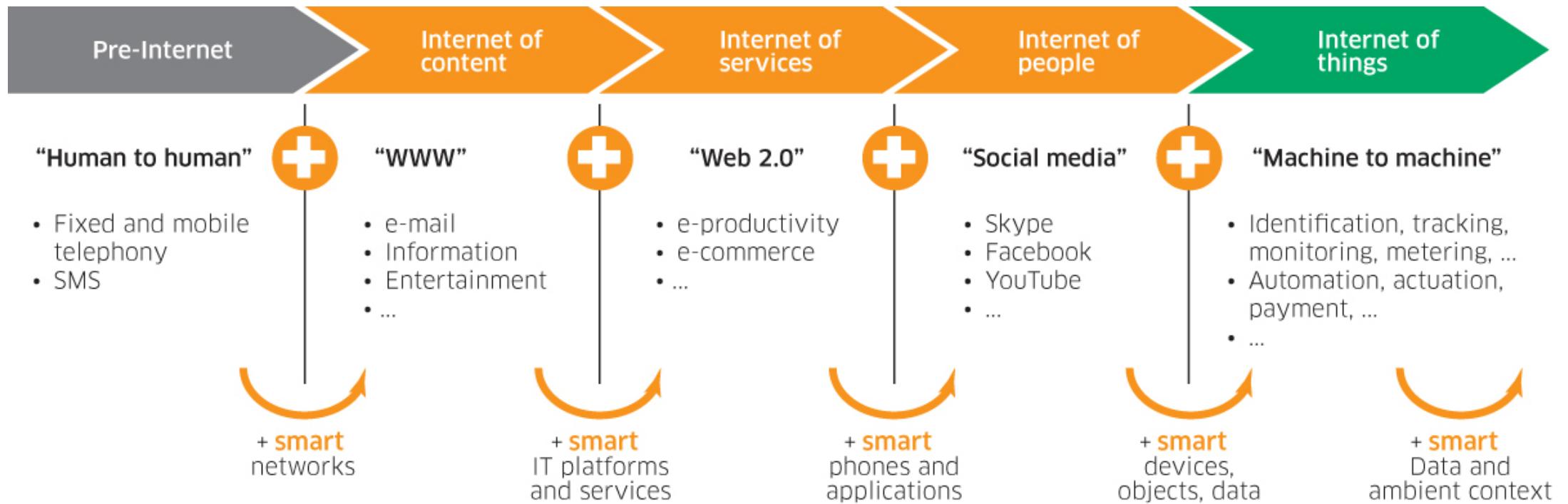


The word "moodle" is written in a large, bold, orange sans-serif font. The letter "m" is unique as it features a black graduation cap resting on its top left stroke. The cap has a dark gray or black cap and a white tassel.

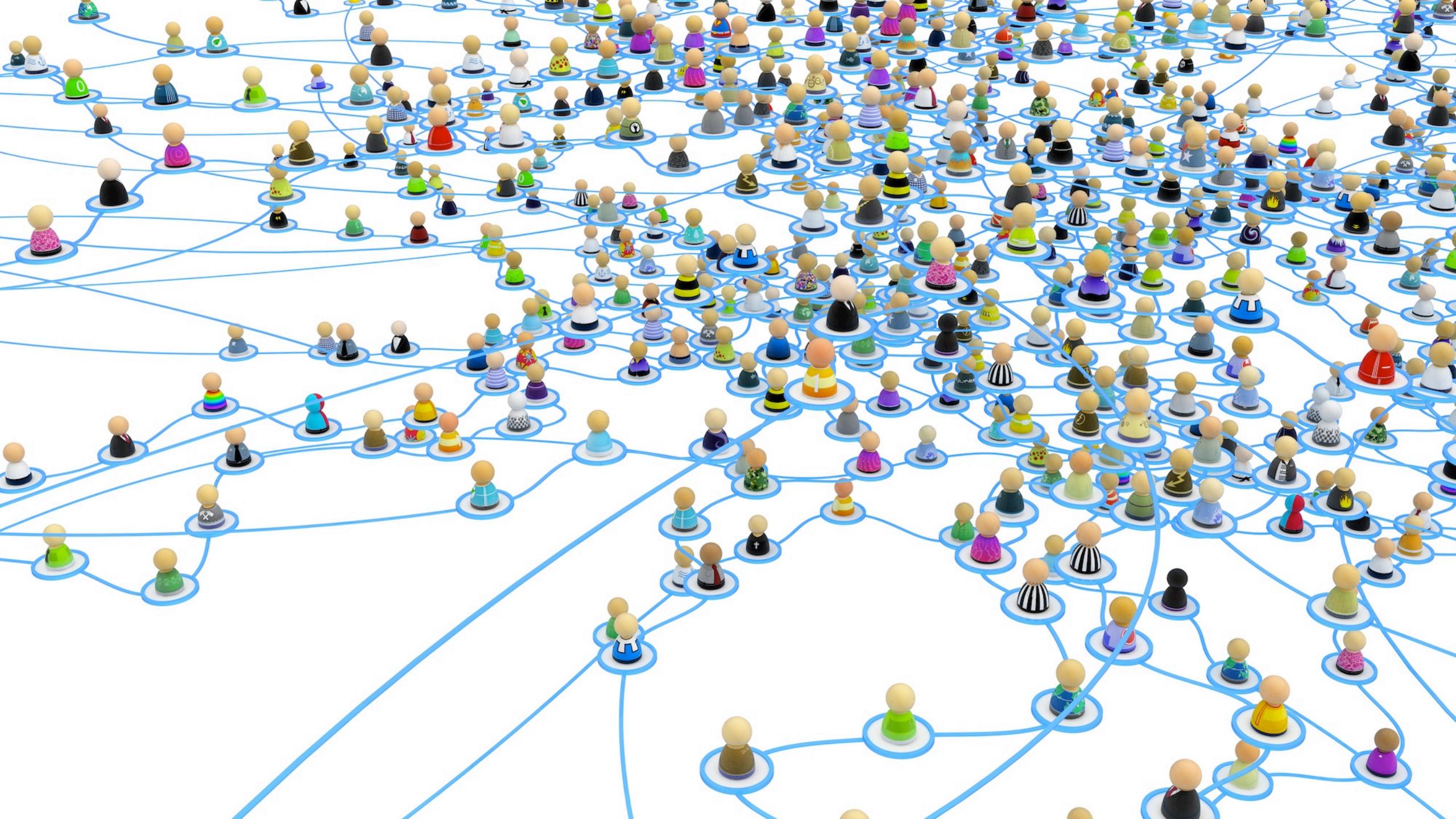
moodle

# Características del Internet de las cosas

- Altamente conectado
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- Red/interfaz del mundo físico





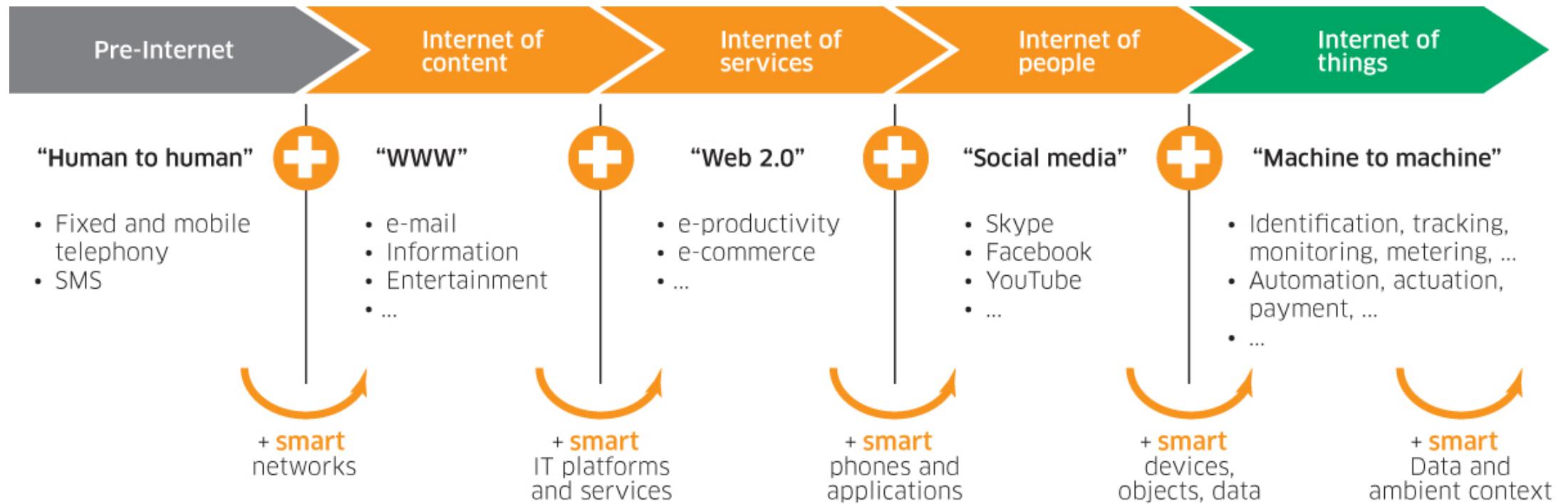


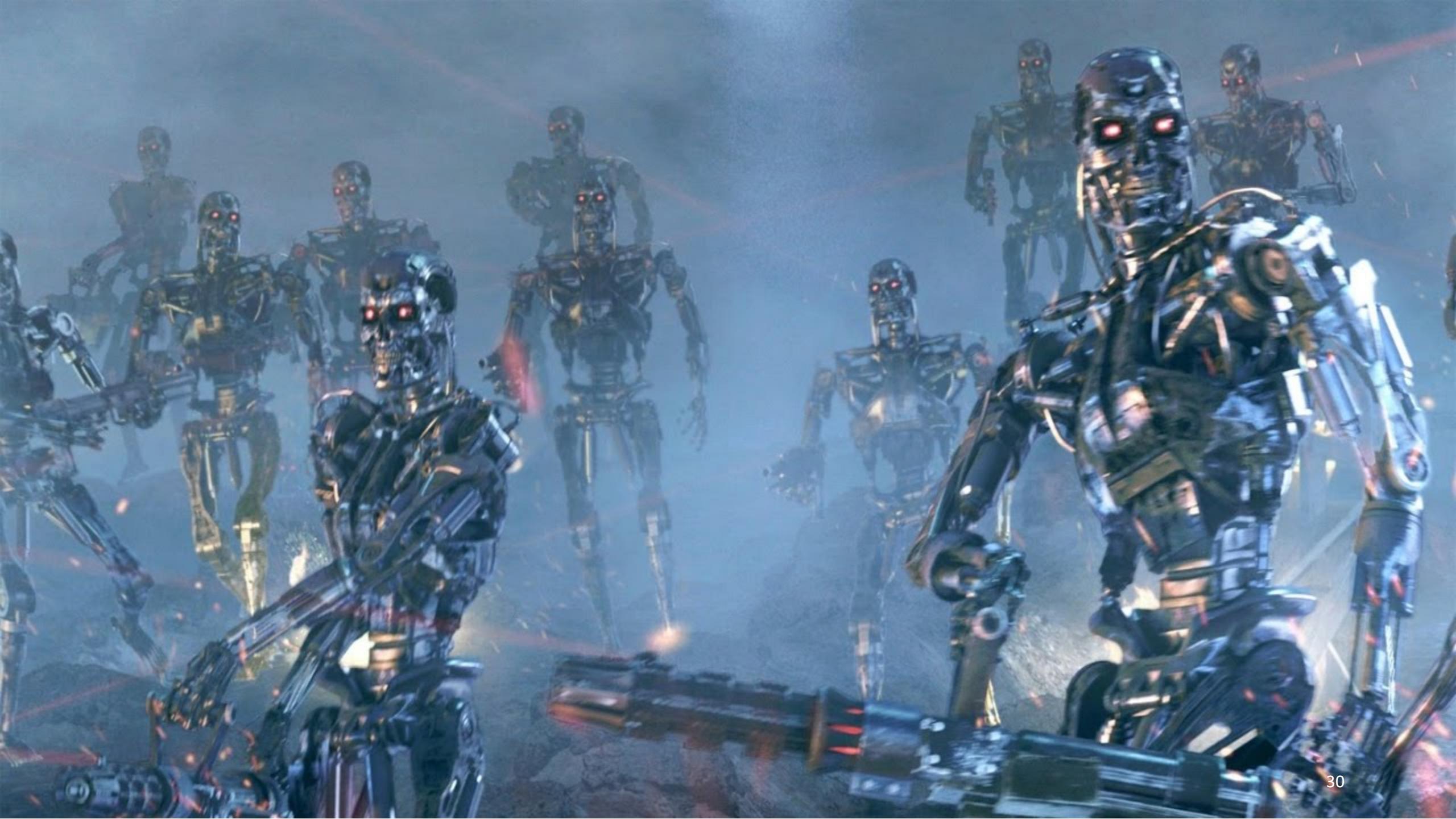
∞ Meta



# Características del Internet de las cosas

- Altamente conectado
- Inteligente
- Cosa = No necesariamente un ordenador/teléfono/tableta
- Red/interfaz del mundo físico





# Características del IoT

Población mundial: 7,2 mil millones

Población de usuarios de Internet: 3.000 millones

Para 2020, se esperaba que los dispositivos conectados:

- 26.000 millones según Gartner
- 30.000 millones según ABI
- 50.000 millones según Cisco



**50 billion**  
Connected devices in the Internet of Things by 2030<sup>1</sup>



**53.8%**

Drop in average cost of sensors over last 10 years<sup>2</sup>



**60x**  
Reduction in cost of processing over last 10 years<sup>3</sup>



**40x**  
Reduction in cost of bandwidth over last 10 years<sup>4</sup>

01001010111010010  
10100101000101010  
01001010001011101  
00101010010100010  
101001001010100010

Big Data is doubling every **18 months**<sup>5</sup>

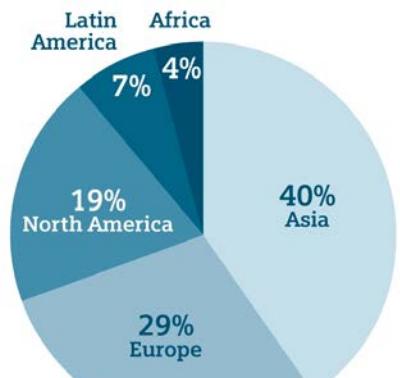


**1.87 billion**

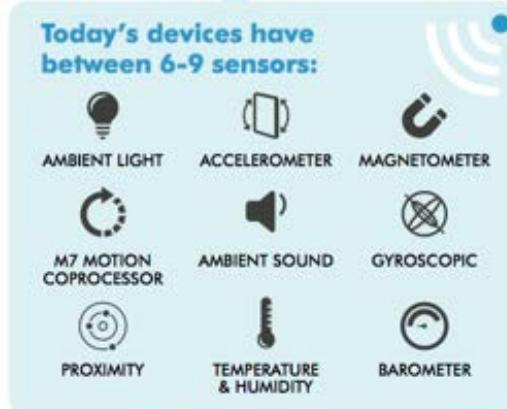
Global shipments of smartphones predicted by 2018<sup>6</sup>

## Machine to Machine Communication: Asia is leading

M2M-Market Share worldwide (2013)



Source: GSMA

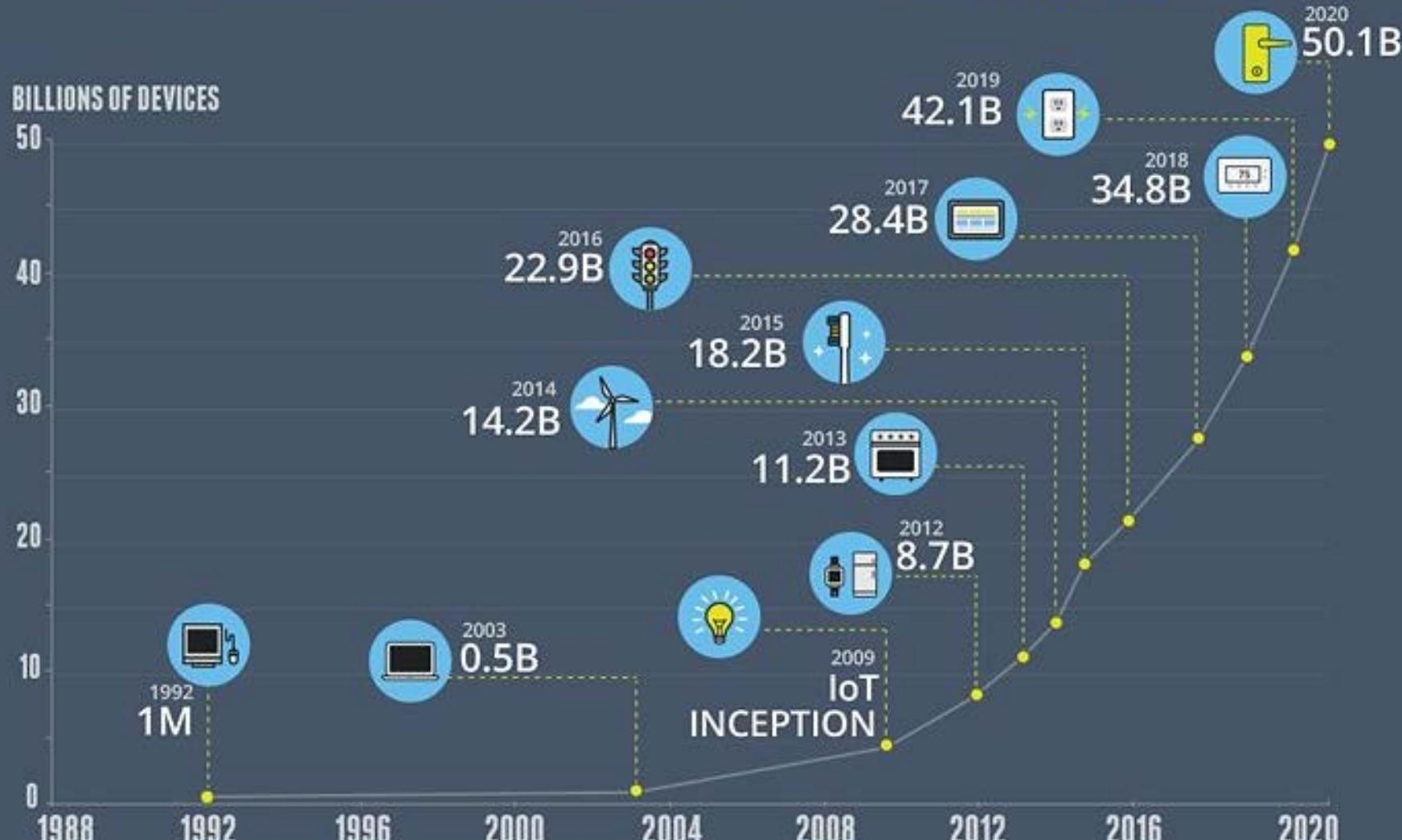


**The Rise of Sensors**  
Sensors enable IoT. Every object, even the human body.

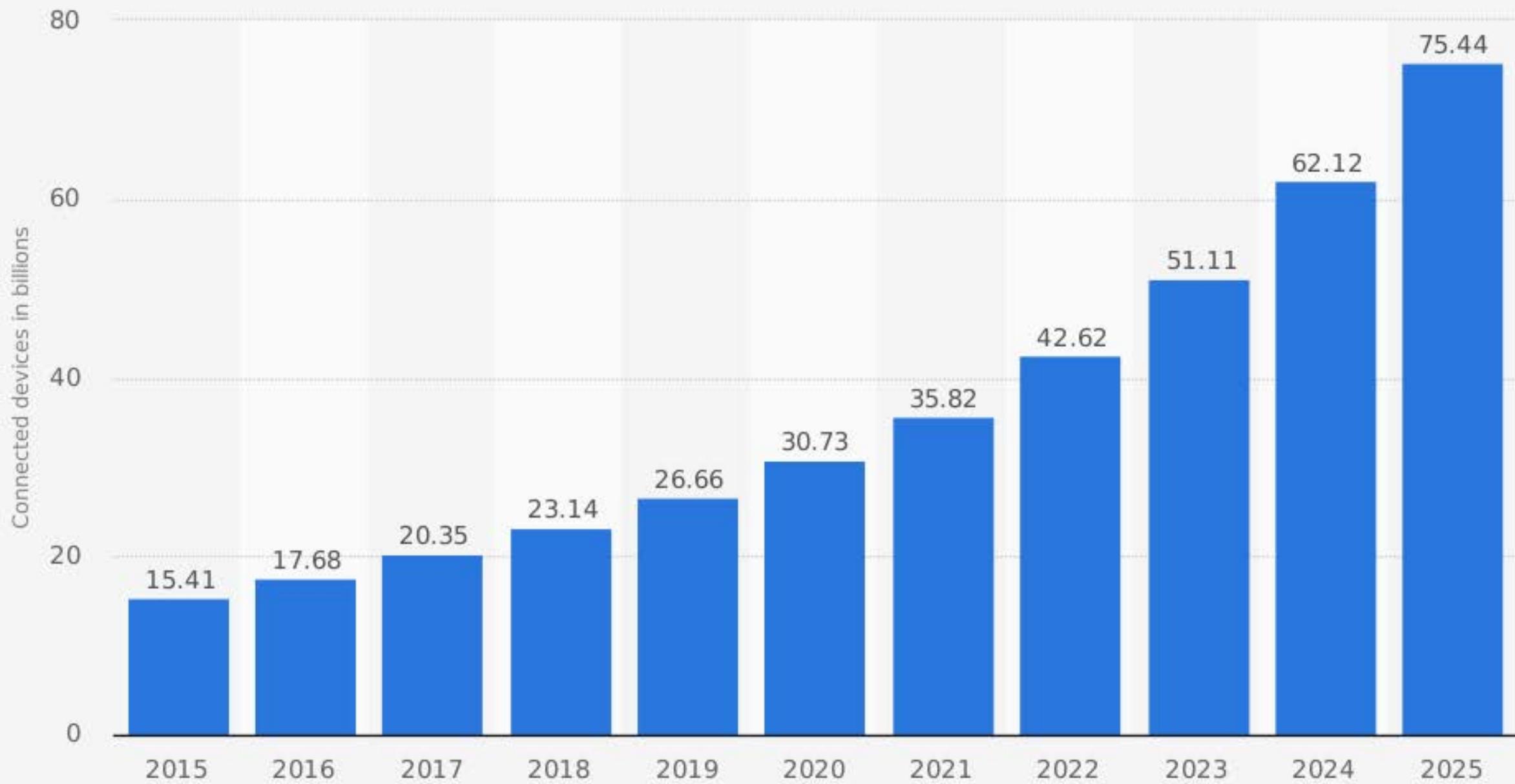


# GROWTH IN THE INTERNET OF THINGS

THE NUMBER OF CONNECTED DEVICES WILL EXCEED 50 BILLION BY 2020

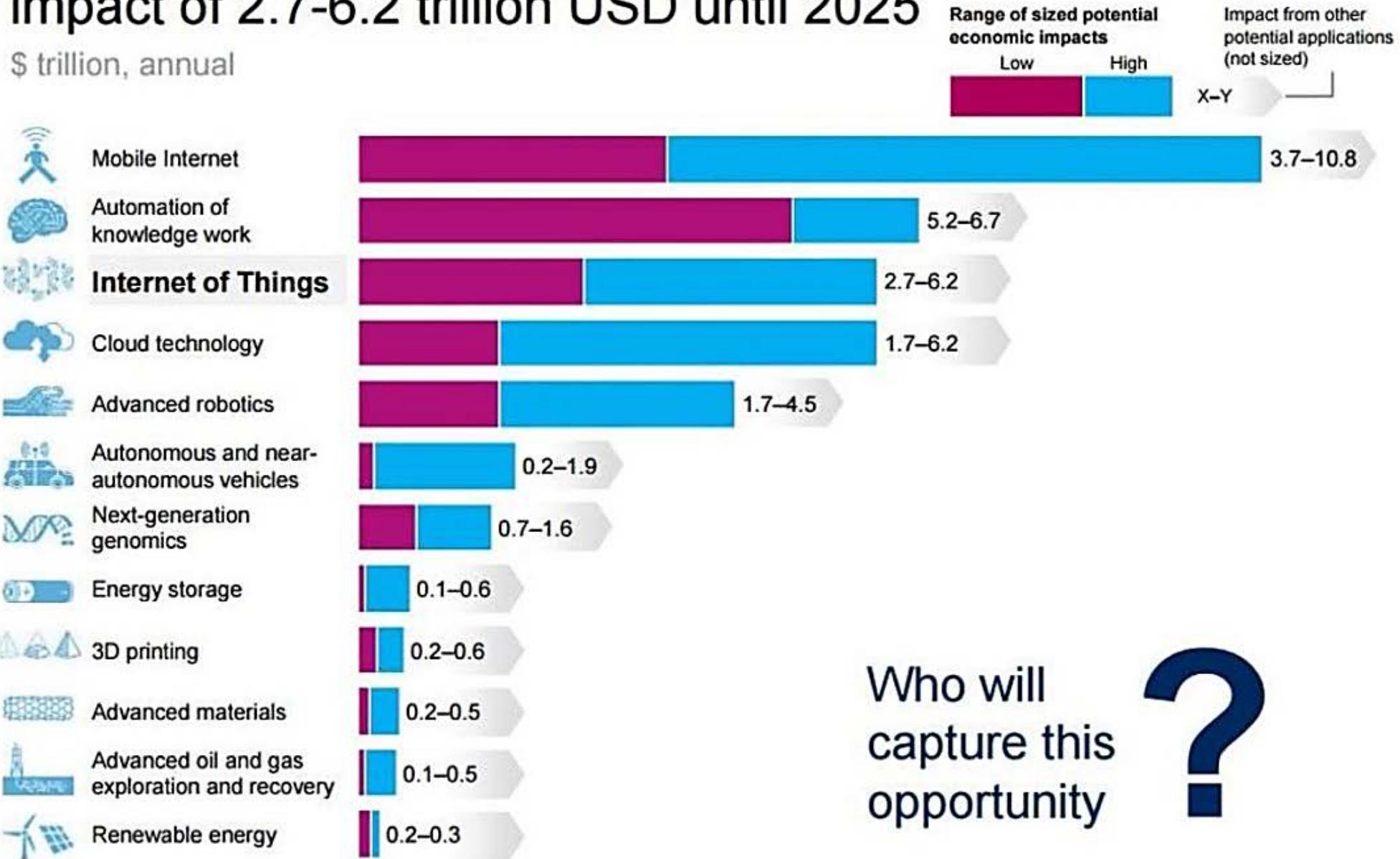


Source: Cisco



# The Internet of Things (IoT) has a potential economic impact of 2.7-6.2 trillion USD until 2025

\$ trillion, annual



Who will capture this opportunity



# ¿Explosión del IoT?

Costo sensores



Costo conectividad

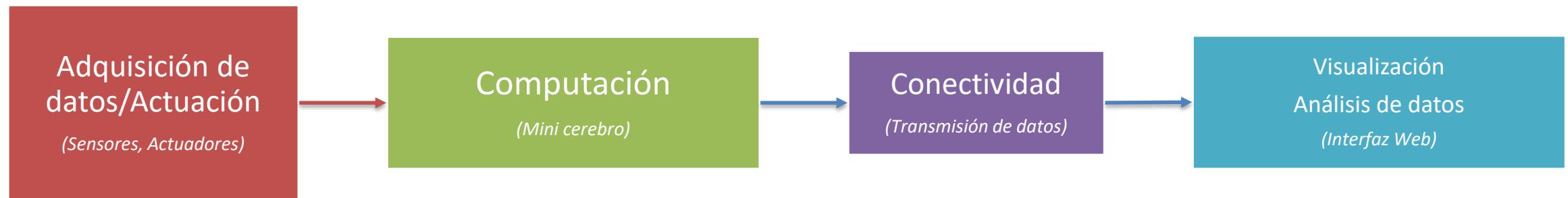


Costo procesamiento

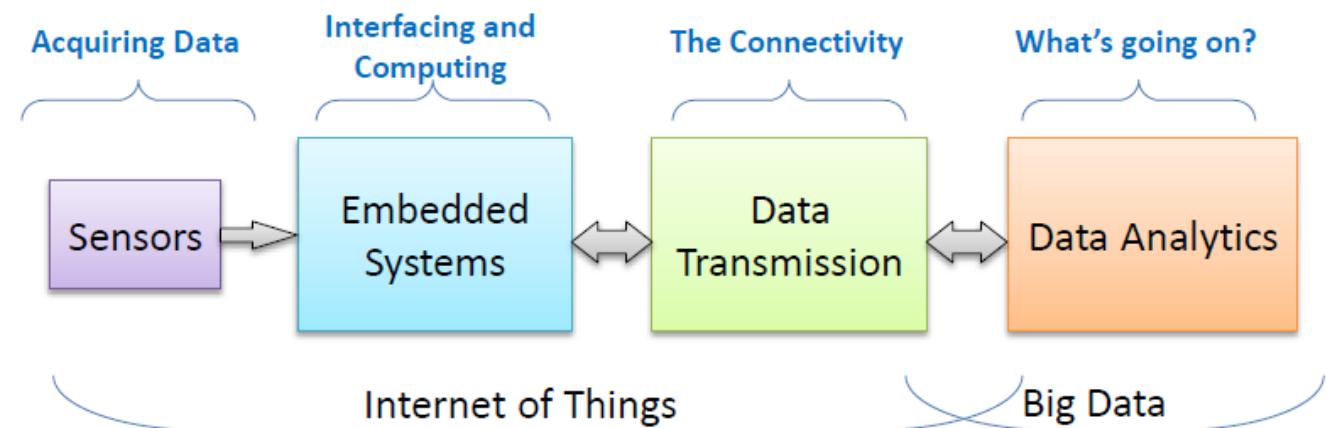
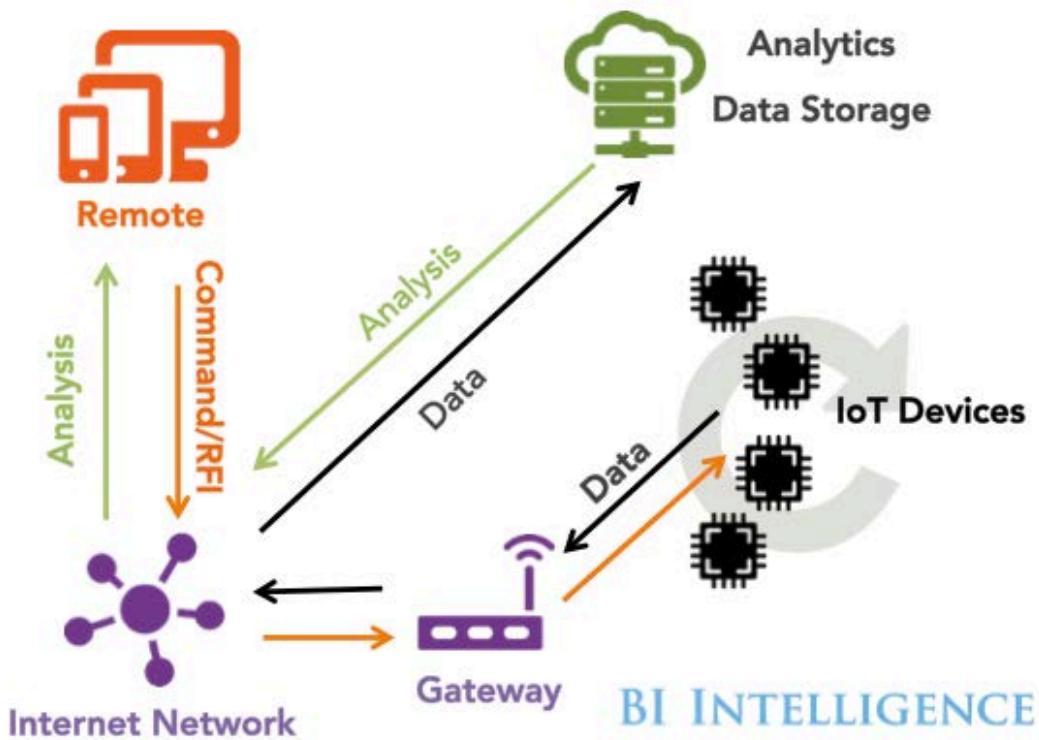
# Modelo básico de IoT

# Un modelo básico de IoT

Un modelo simple IoT contemplaría los siguientes módulos:



# The Internet of Things Ecosystem



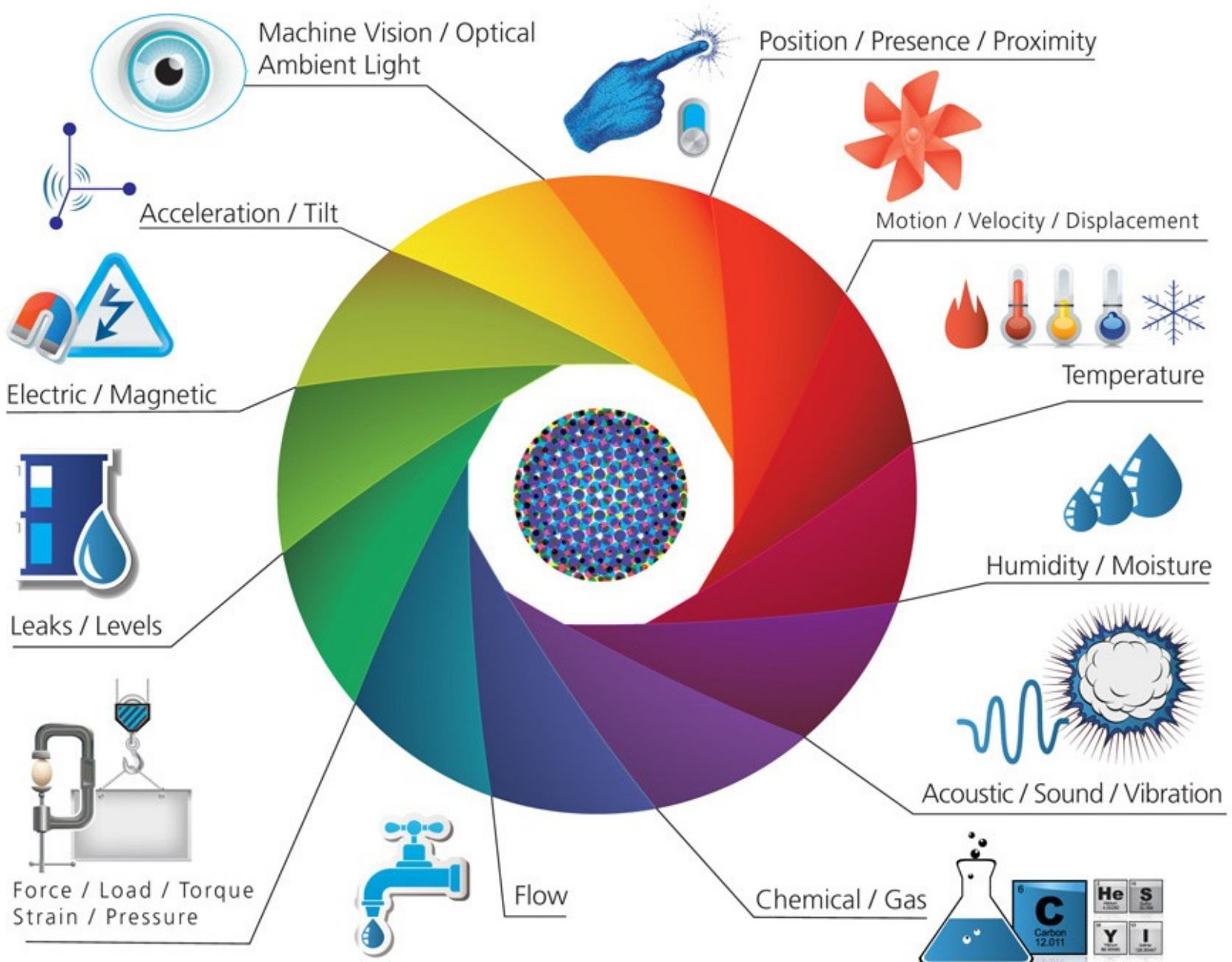
# Sensores y actuadores

- “Dispositivo electro-mecánico que puede detectar y medir magnitudes físicas o química”
- Transforman las magnitudes en señales eléctricas

Pueden medir:

- Temperatura/humedad/presión
- Posición/presencia/proximidad
- Movimiento/velocidad/acceleración
- Niveles de líquidos/filtraciones
- Gases....







**Moisture**



**Flex**



**Touch**



**Solar light**



**Metal detection**



**RTC**



**Vibration**



**Thermistor**



**Infrared**



**Ultrasonic**



**Gyro**



**Accelero  
meter**



**Color**



**PIR**



**GAS**



**Smoke**



**Temperature**



**LDR**



**Rainfall**



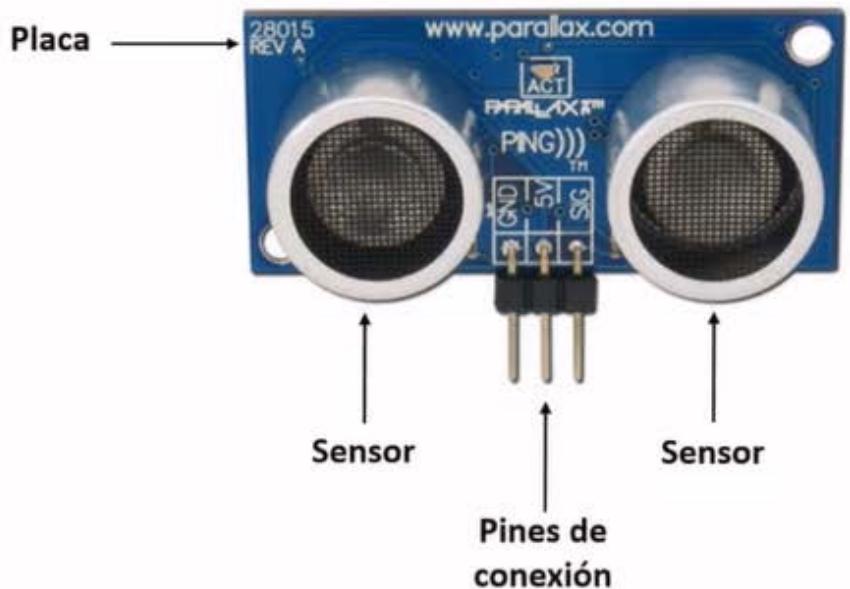
**Soil  
Moisture**

# Sensores y actuadores

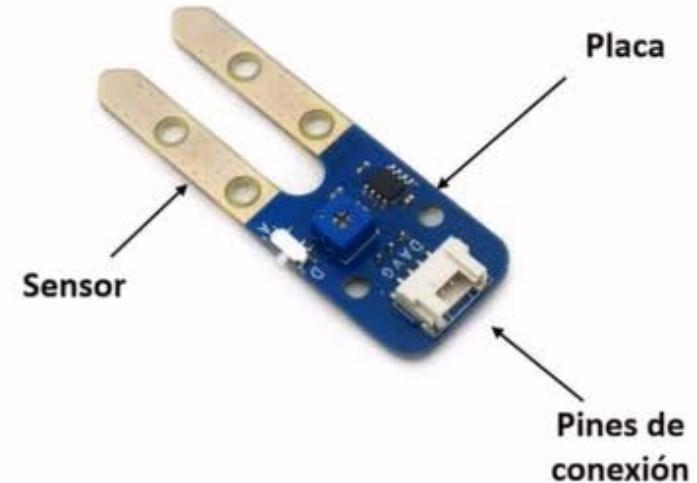


# Sensores y actuadores

- Proximidad

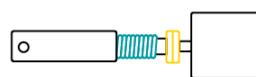


- Humedad



# Sensores y actuadores

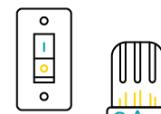
"Dispositivo que convierte una señal eléctrica en una acción o movimiento que afecta su entorno"



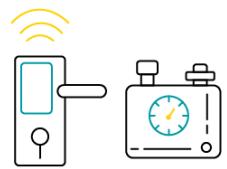
Linear actuators



Motors



Relays



Solenoids

Ejemplos:

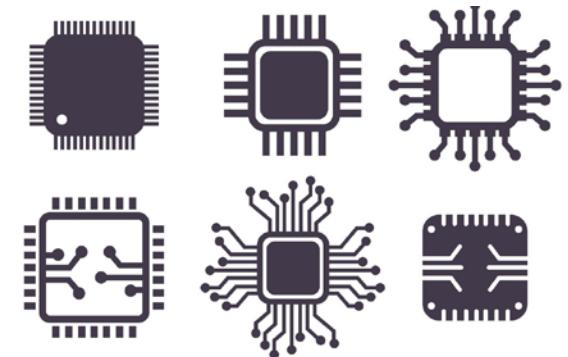
- Motores
- Servos
- LEDs/Displays
- Resistencias
- Válvulas
- Ventiladores....

# Computación y Conectividad

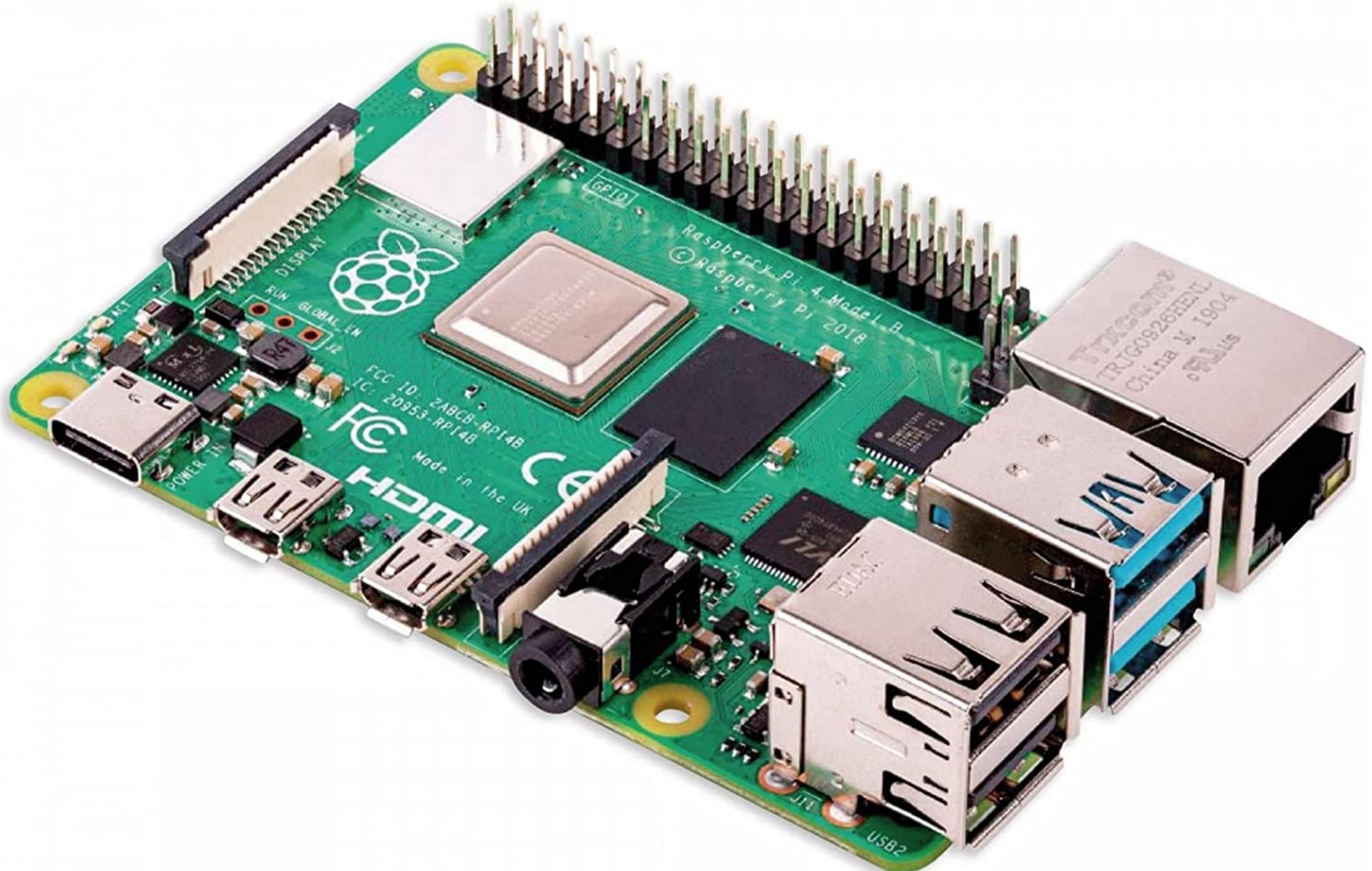
- “Dispositivo electrónico que recibe la señal de uno o varios sensores”
- “Toma decisiones de acuerdo a su programación”
- “Activa o acciona los actuadores”

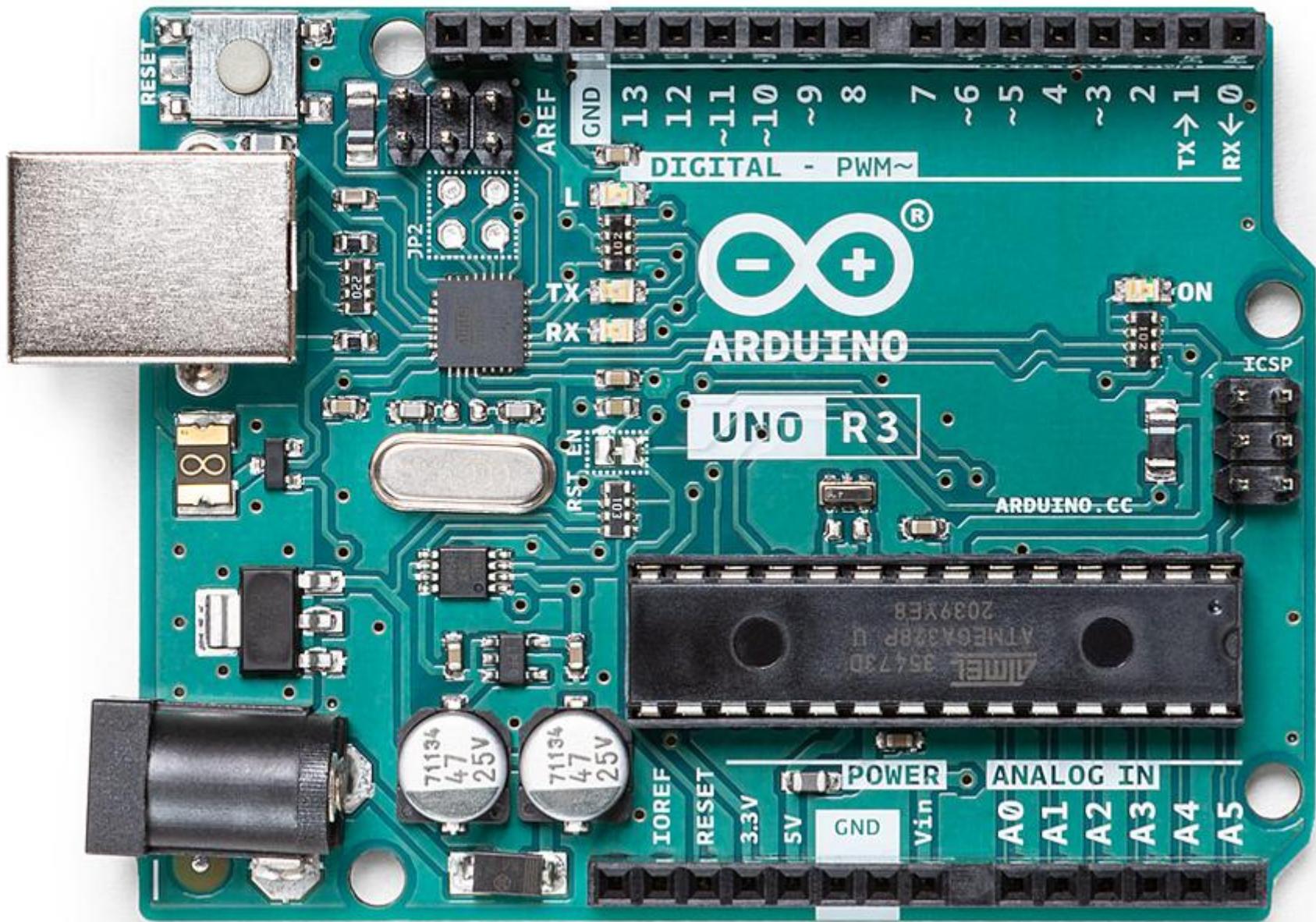
# Características de los Sistemas embebidos

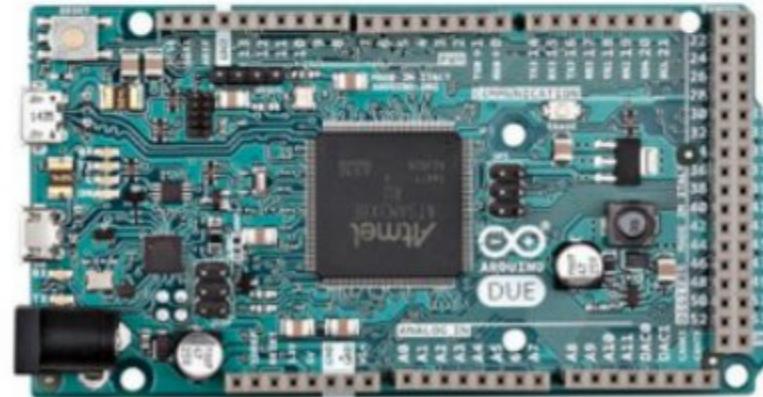
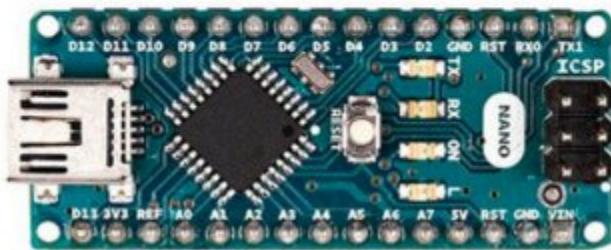
- Aplicación específica
- Fiabilidad
- Con una sola función (sistema dedicado)
- Con restricciones estrictas (eficiente)



- A menudo se interconectan con sensores para obtener información de los parámetros del proceso
- Diseñado para funcionar en entornos difíciles
- Reactivo y en tiempo real

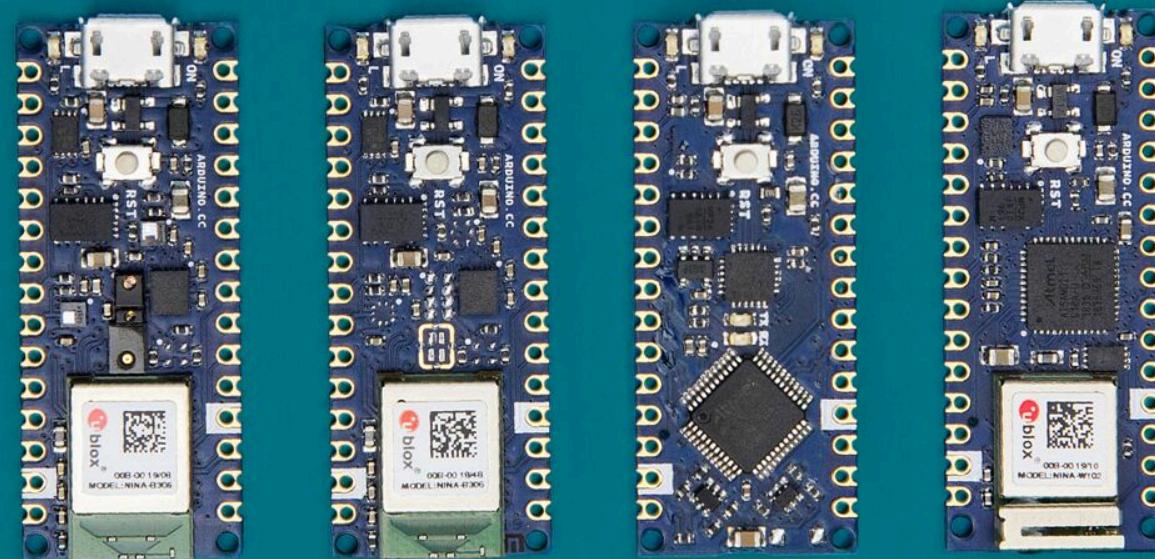








Let's make big ideas real.  
Pre-Order Now!

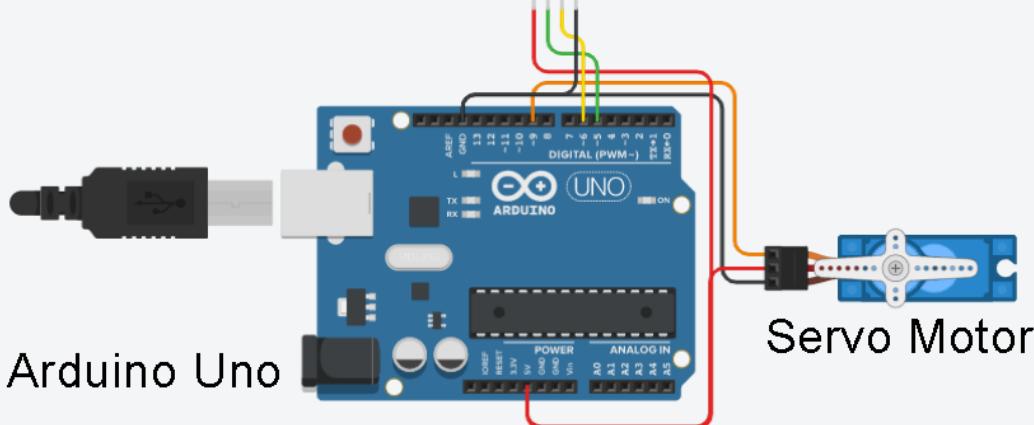


 ARDUINO  
**NANO**  
FAMILY

**JUST  
A DIY**



Ultrasonic  
Sensor

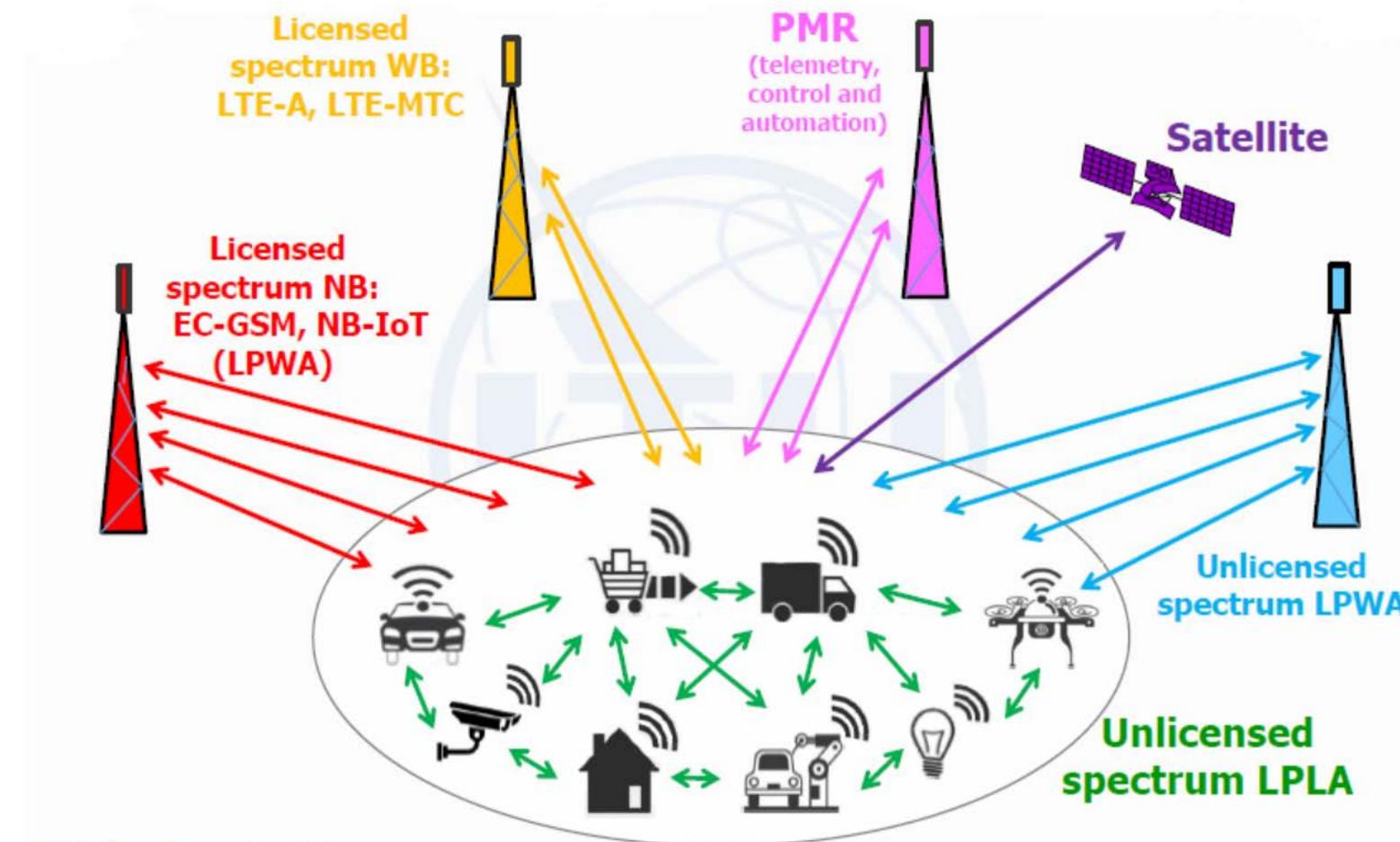


Arduino Uno

Servo Motor

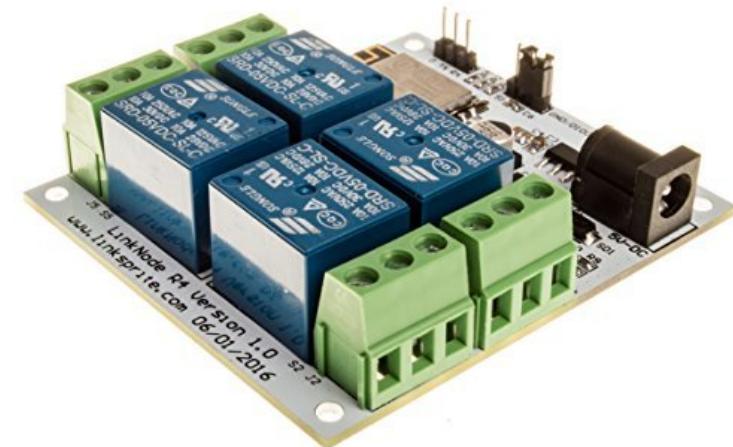
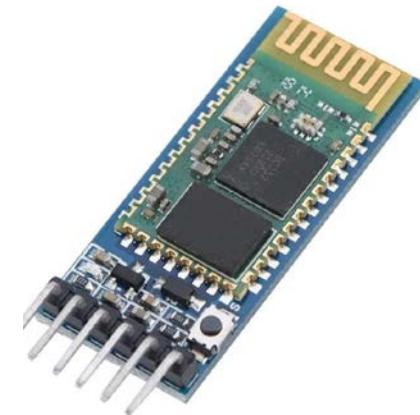
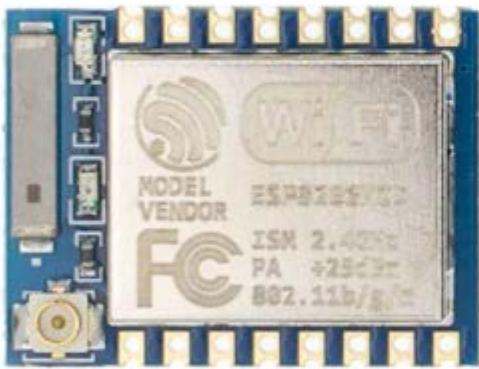
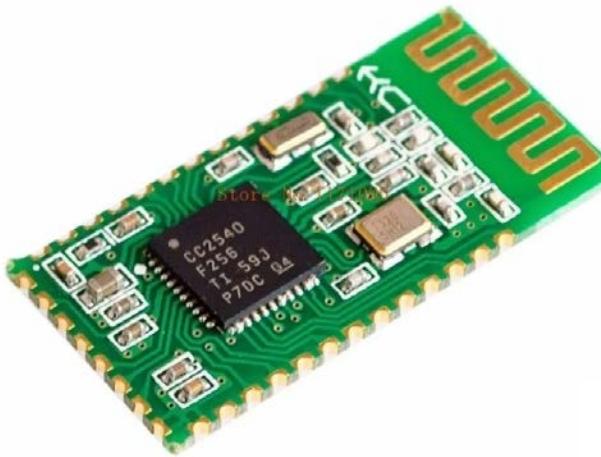
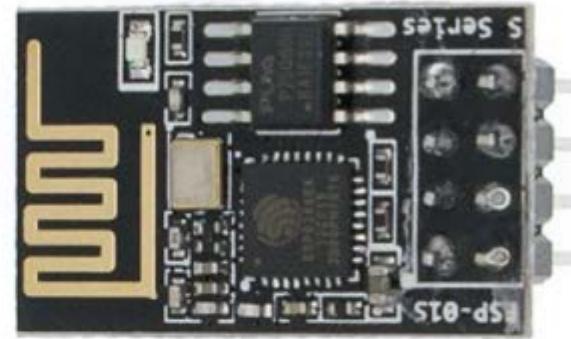


# Comunicaciones IoT

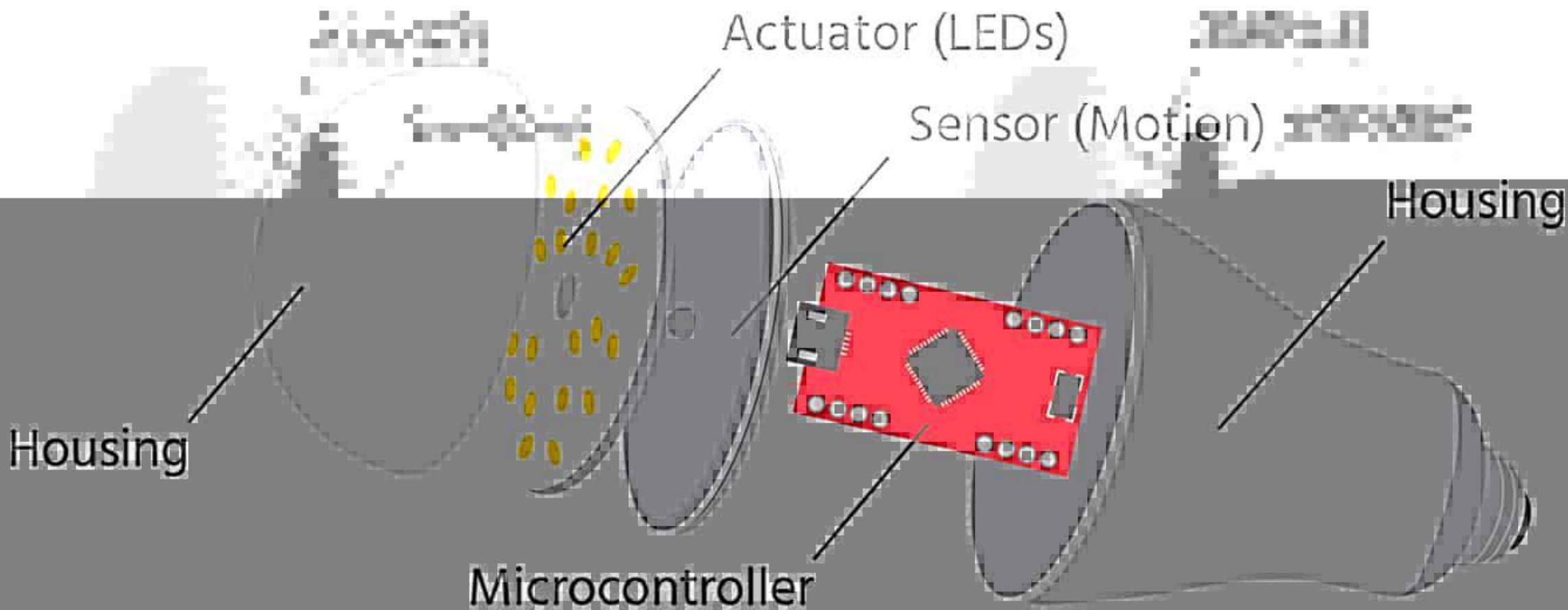




Standard	ZigBee (WPAN)	Low Power Wi-Fi (WLAN)	LoWPAN (LPWAN)	LoRaWAN (LPWAN)	NB-IoT (LPWAN - cellular)	LTE-M (LPWAN - cellular)	5G (cellular)	Wi-Sun (WNAN)
<b>Nominal range</b>	10 -100 m	70 m - 225 m	25 - 50 m	2 - 15 Km	1 - 15 Km	1 - 11 Km	up to 100 km	5 - 10 km
<b>Max Data Rate (Kbit/s)</b>	250 Kbps	15 Mbps	250 Kbps	50 Kbps	250 Kbps	1 Mbps	599 Mbps	300 Kbps
<b>Power consumption</b>	Medium	Low to medium	Low	Low to medium	Low	Low	Low to medium	Medium to high



WiFi



# Dispositivos IoT



## 1) Sensores

- Nivel de agua
- Presencia del vaso
- Temperatura

## 2) Actuadores

- Válvulas de café y agua caliente

## 3) Mini-cerebro

- Arduino "potente"

## 4) Conectividad

- WiFi, Bluetooth

## 5) Interfaz de usuario

- Celular

## 6) "Inteligencia"

- Aprende nuestros gustos de café
- Conoce nuestros horarios de café
- Prepara nuestro café sin órdenes

# El Poder de la Nube





# Google Cloud Platform



# Azure





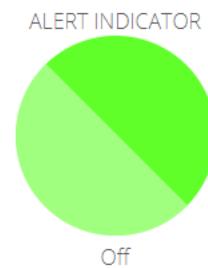
## Main Dashboard

## WATER USAGE



## ALERT INDICATOR

## ALERT INDICATOR



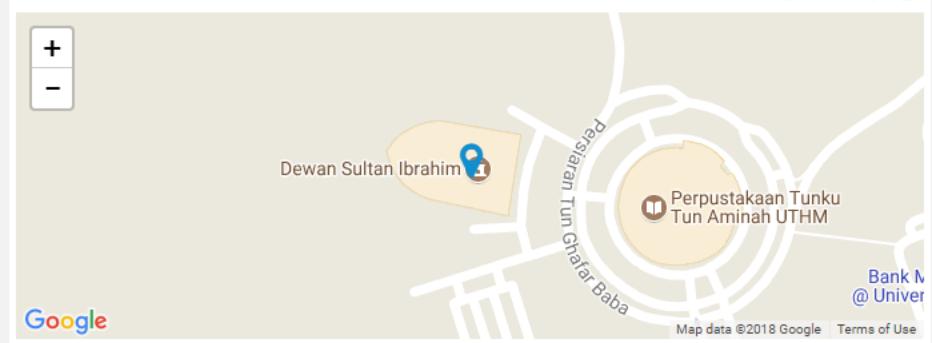
The WATER USAGE today was

# 23.85

litre



## SYSTEM LOCATION



## DISTANCE APPROXIMATE



Pipe Leakage **Detected**

# 0.00

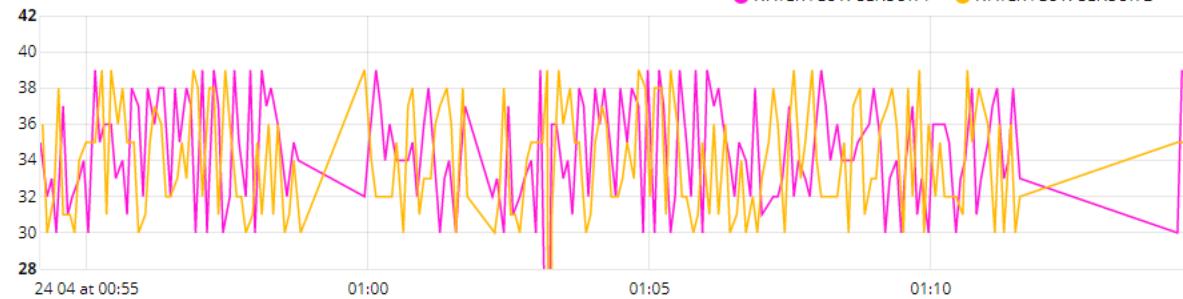
meter

from **System Node 1**

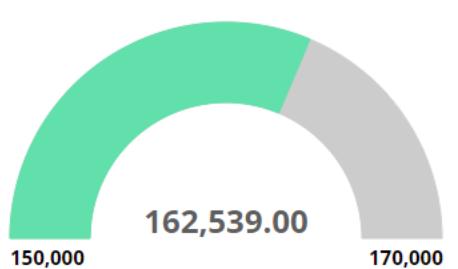
## WATER FLOW SENSOR 1 , WATER FLOW SENSOR 2



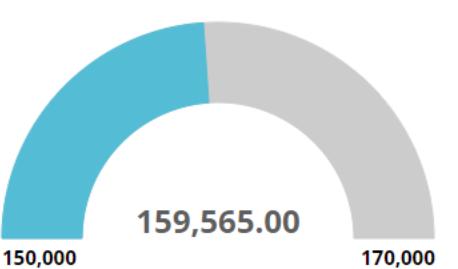
● WATER FLOW SENSOR 1    ● WATER FLOW SENSOR 2



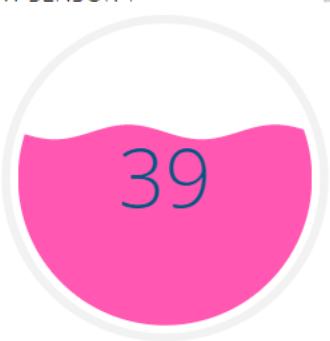
## WATER PRESSURE SENSOR 1



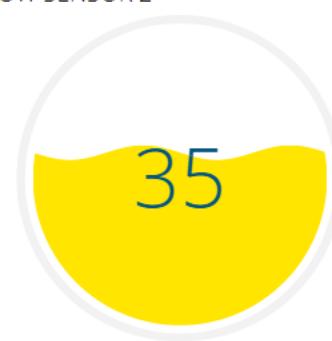
## WATER PRESSURE SENSOR 2



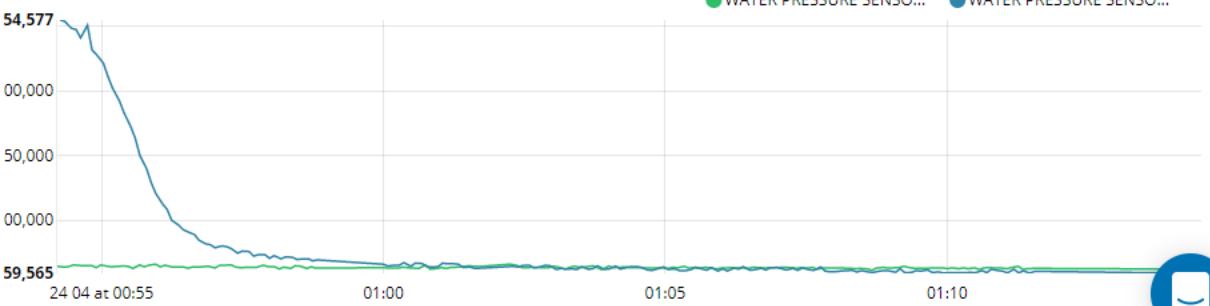
## WATER FLOW SENSOR 1

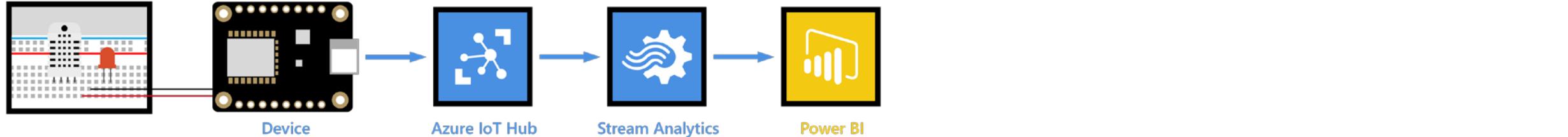


## WATER FLOW SENSOR 2



## WATER PRESSURE SENSOR 1 , WATER PRESSURE SENSOR 2





## CSC IOT ANALYTICS

**STORE COUNT**  
**14**

**4.45K**  
**VOLUME TOTAL**

**63.91K**  
**WEIGHT TOTAL**

**NOT DELIVERED**

DEL_SEQ	CURRENT_STATUS	ETA_DELIVERY	ADJUSTED_ETA
6	Next Delivery	6/8/2016 2:05:19 AM	6/8/2016 4:41:46 AM
7	On It's Way	6/8/2016 2:43:27 AM	6/8/2016 5:08:46 AM
8	On It's Way	6/8/2016 2:52:17 AM	6/8/2016 5:40:46 AM
9	On It's Way	6/8/2016 3:28:45 AM	6/8/2016 6:02:46 AM
10	On It's Way	6/7/2016 9:54:52 PM	6/8/2016 6:26:46 AM

**DELIVERY COMPLETED**

DEL_S...	ETA_DELIVERY	ARRIVE_DATETIME	DEPART_DATETIME	DURATION (TOTAL ...
5	6/8/2016 1:28:57 AM	6/8/2016 1:06:11 AM	6/8/2016 1:33:46 AM	27.58
4	6/8/2016 12:52:49 A...	6/8/2016 12:30:16 A...	6/8/2016 12:51:06 AM	20.83
2	6/8/2016 12:02:22 A...	6/7/2016 11:40:50 PM	6/7/2016 11:59:32 PM	18.70
3	6/8/2016 12:26:57 A...	6/8/2016 12:03:41 A...	6/8/2016 12:20:26 AM	16.75
1	6/7/2016 11:31:50 PM	6/7/2016 11:10:21 PM	6/7/2016 11:23:23 PM	13.03

**DURATION (TOTAL MINS) by ADDR\_NAME**

ADDR_NAME	DURATION (TOTAL MINS)
Starbucks #360	28
Starbucks #361	21
Starbucks #8138	19
Starbucks #3342	17
Starbucks #10477	13

**Cases by Region**

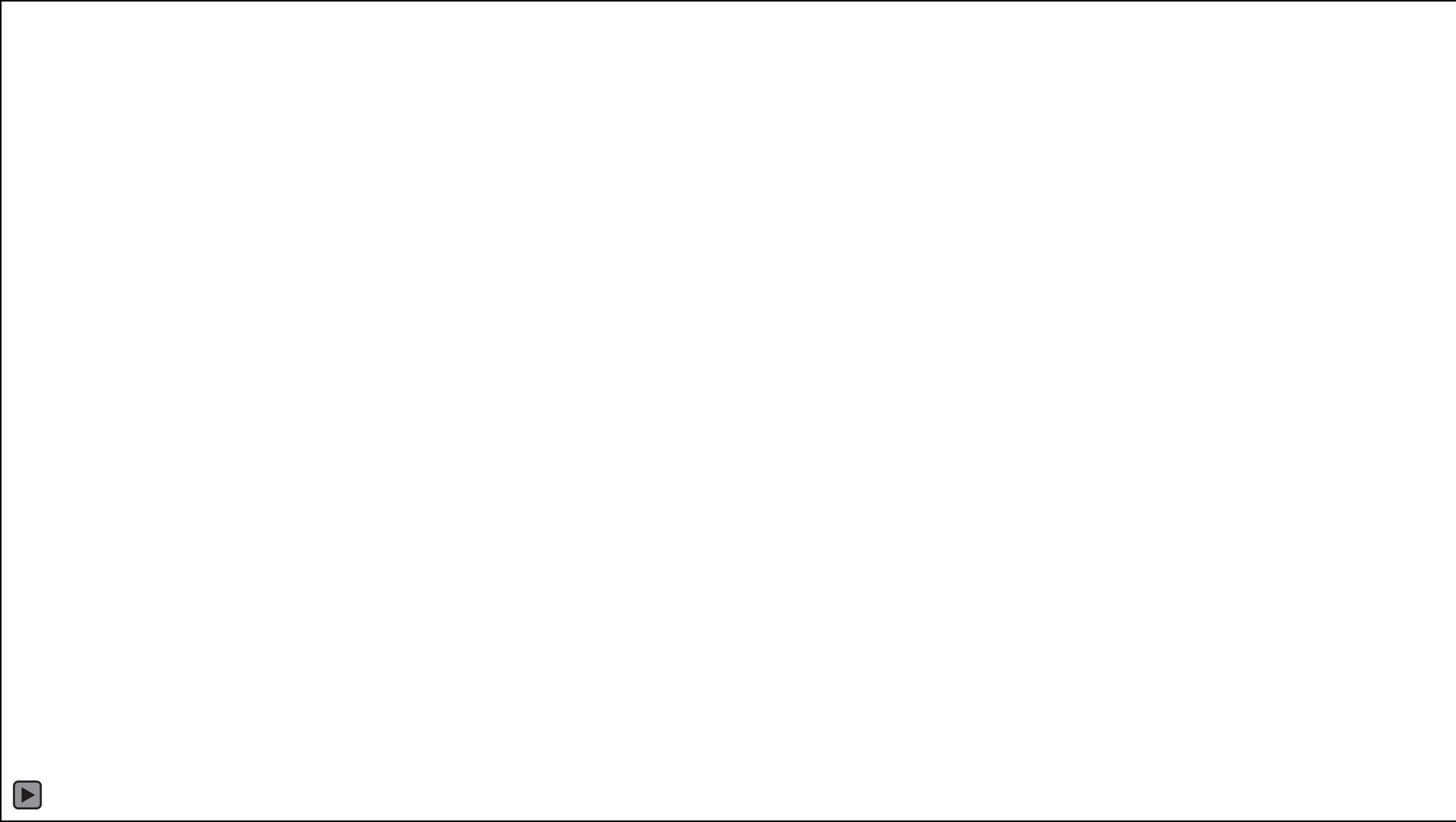
● Delivered ● Next Delivery ● On It's Way

**ROUTE NUMBER & VEHICLE ID**  
**42 - 844787**

**CURRENT\_STATUS**  
**All**

**ADDR\_NAME**   **ADDRESS\_L1**   **STOP\_NUM**

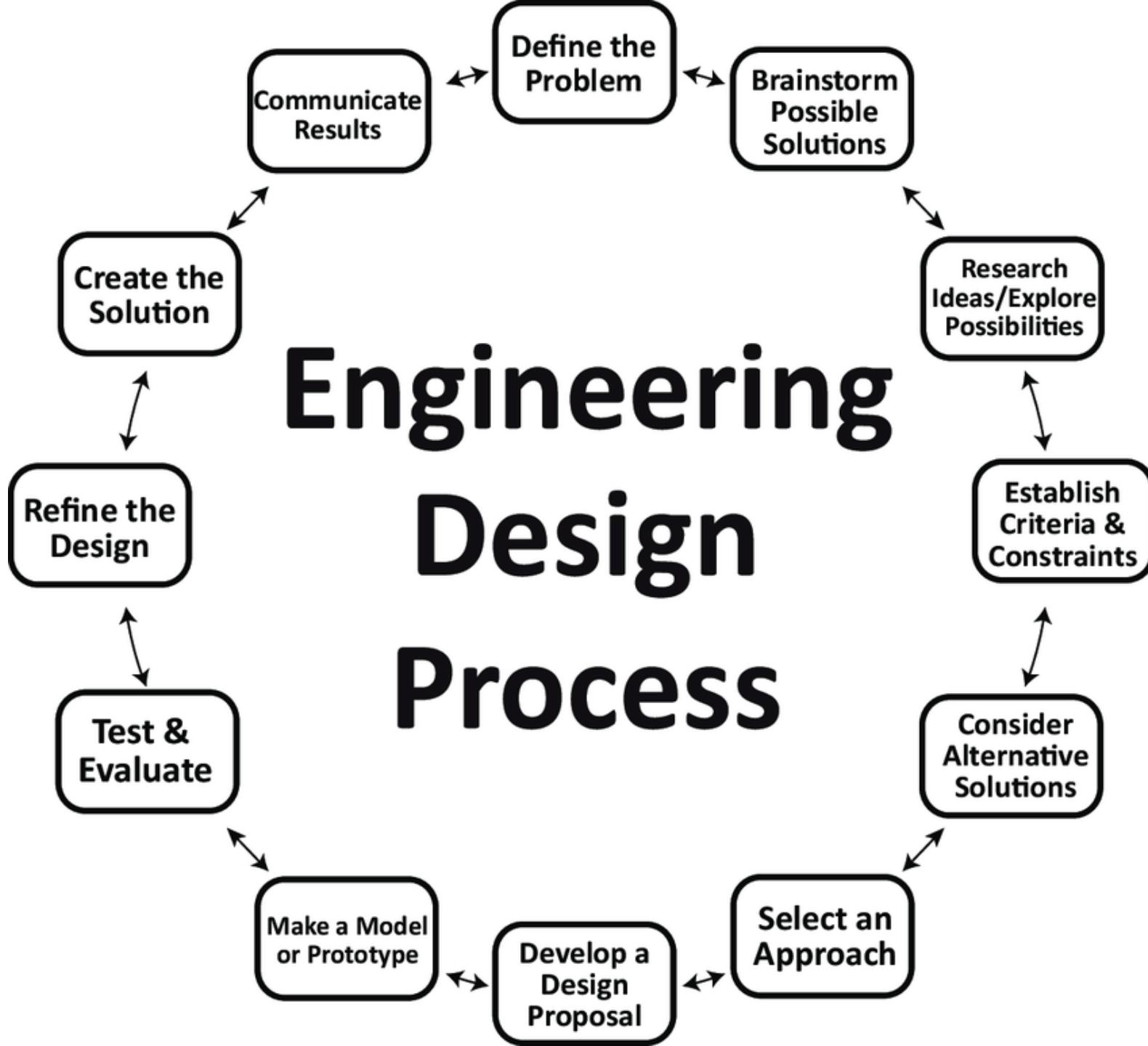
Starbucks #3284	506 N. SULLIVAN	114
Starbucks #27399	1605 N GREENE STREET	113
Starbucks #3200	1217 N. HAMILTON	112
Starbucks #8655	170 S. DIVISION ST	111
Starbucks #3269	721 W. MAIN	110
Starbucks #3450	2703 N. DIVISION STREET	109
Starbucks #14719	NORTHTOWN SQUARE 4727 N. DIVISION ST	108





# Diseño de una solución IoT

# Engineering Design Process



# Propuesta de solución IoT

1. Identifique y analice un dispositivo que ahora es un dispositivo IoT, pero que en el pasado era un dispositivo **no IoT**.
  - Compare las funciones del dispositivo en el pasado con las funciones del dispositivo en la actualidad
  - Enumere las mejoras, o las disminuciones si existen
  - ¿Hay alguna limitación que esté presente en la nueva versión IoT del dispositivo?
  - ¿Hay problemas que no existían en la versión original del dispositivo?
2. Proponga una solución IoT que de acuerdo a su opinión optimizaría en alguna etapa de su área de desempeño laboral u otra que relacionada a su vida diaria.

