



Universidade Federal da Bahia
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Internet of Things (IoT): Uma Revolução Silenciosa

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Conceito de Internet of Things (IoT)

- São objetos e dispositivos conectados à Internet
- “Tudo que pode ser conectado à Internet, será conectado”



Número de Dispositivos IoT

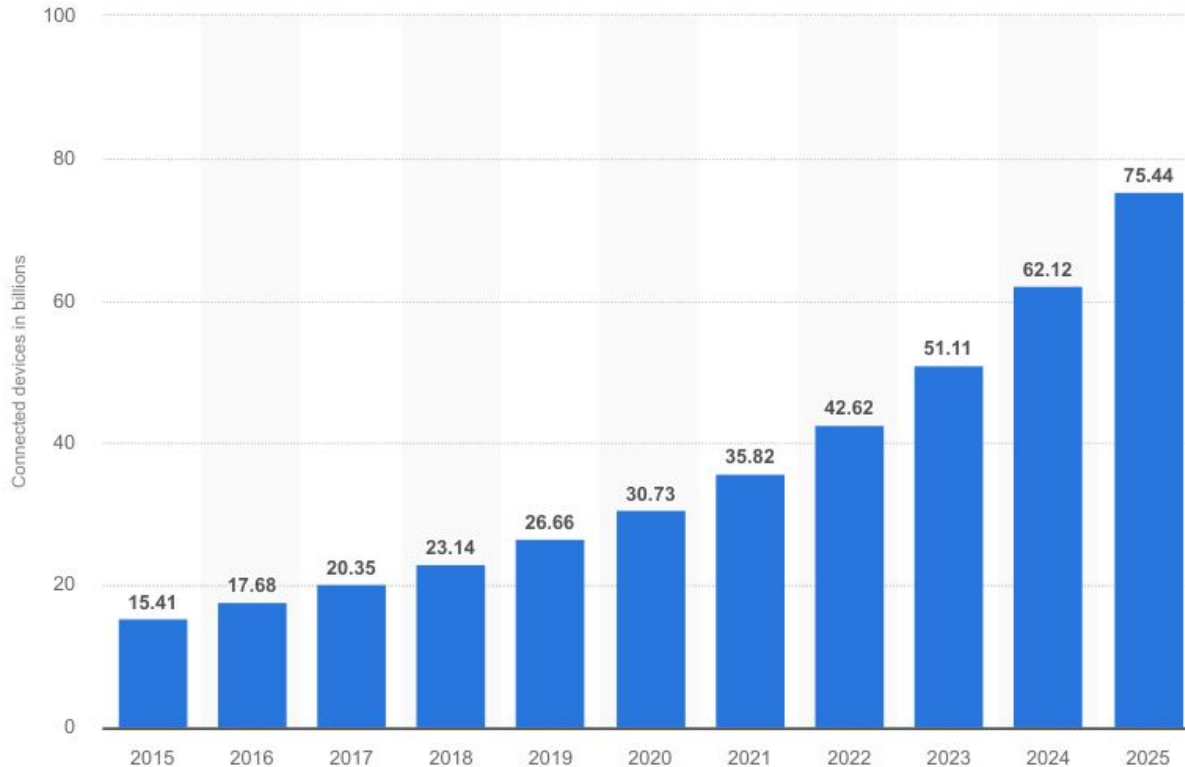


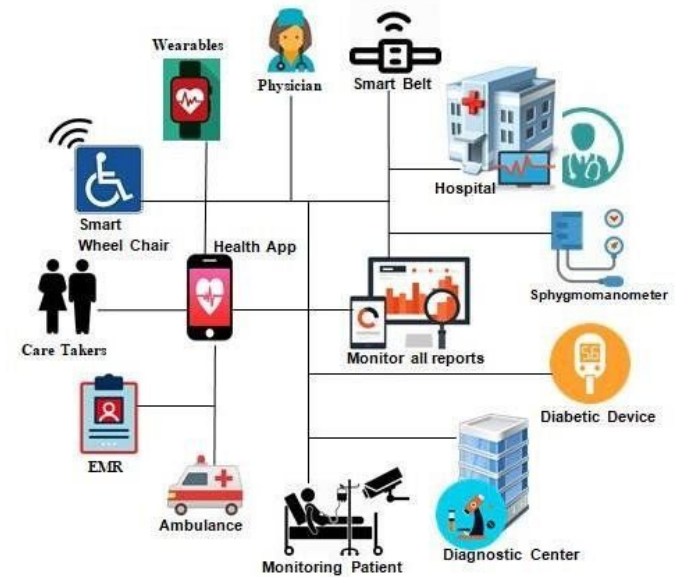
Figura 1: Número de Dispositivos IoT Conectados

Fonte:

<https://www.statista.com/statistics/471264/iot-number-of-connected-devices-worldwide/>

Aplicações de IoT

- Smartphones
- Internet of Wearable Things (IoWT)
- Internet of Medical Things (IoMT)
- Smart Cities



Libelium Smart World

Air Pollution

Control of CO₂ 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.

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 CarBus 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.

Water Quality

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

Desafios para Implantação do IoT

- Elevado Número de Dispositivos
- Grande volume de dados a serem transmitidos
- Segurança dos Dispositivos e dos Dados
- Privacidade dos Usuários
- Complexidade

Redes IoT - PAN


- Bluetooth Low Energy (BLE)
- Bluetooth Mesh Network (BMN)
- Near Field Communication (NFC)
- Radio Frequency IDentification (RFID)
- **Light Fidelity (Li-Fi)**
- ZigBee

Redes IoT - LAN / MAN

- Wireless Mesh Network (WMN)
- Wi-Fi 802.11 n / ac
- 4G (LTE)
- 5G
- **LoRa (Low Radio)**
- WiMAX

Redes IoT - Protocolos

- ZigBee
- 6LoWPAN (IPv6 simplificado)
- ZeroMQ e **MQTT** (redes publish / subscribe)
- ICN (Information-Centric Networks)
 - **NDN** (Named-Data Networks)
- Múltiplos Protocolos Proprietários (Cisco)



OBRI GADO !