Sensors/IOT

INFO319 – Research Topics in Big Data

Session – 4

20.09.2019

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Lecture Outline

- Introduction to Internet of Things (IoT)
  - What is it?
  - Why do we need it?
  - Benefits of IoT
  - IoT features
- IoT Architecture
- IoT Applications
- Presentations by you
- Practical session

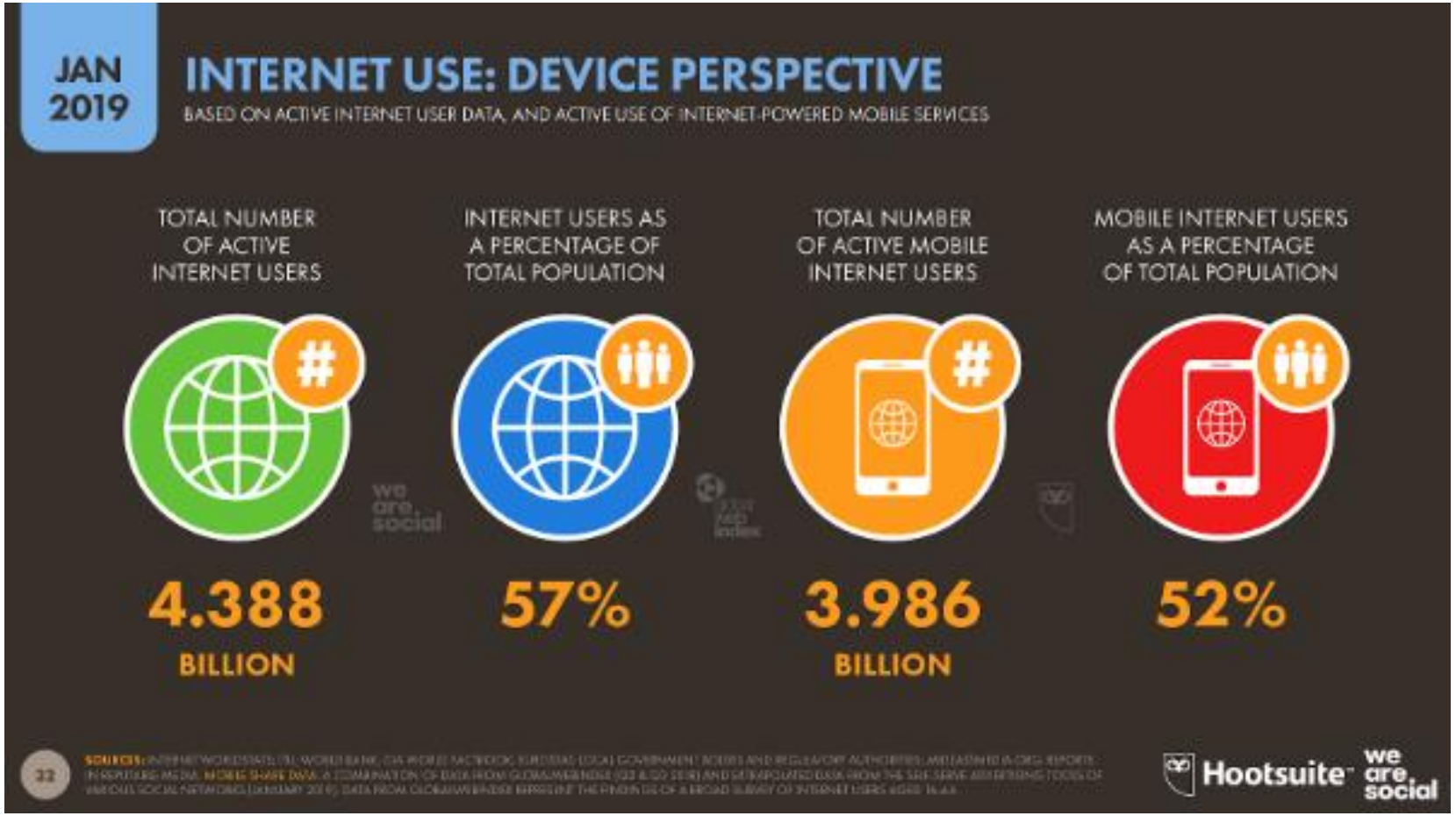
What is IoT?

- Internet of Things (IoT), Kevin Ashton, in 1998

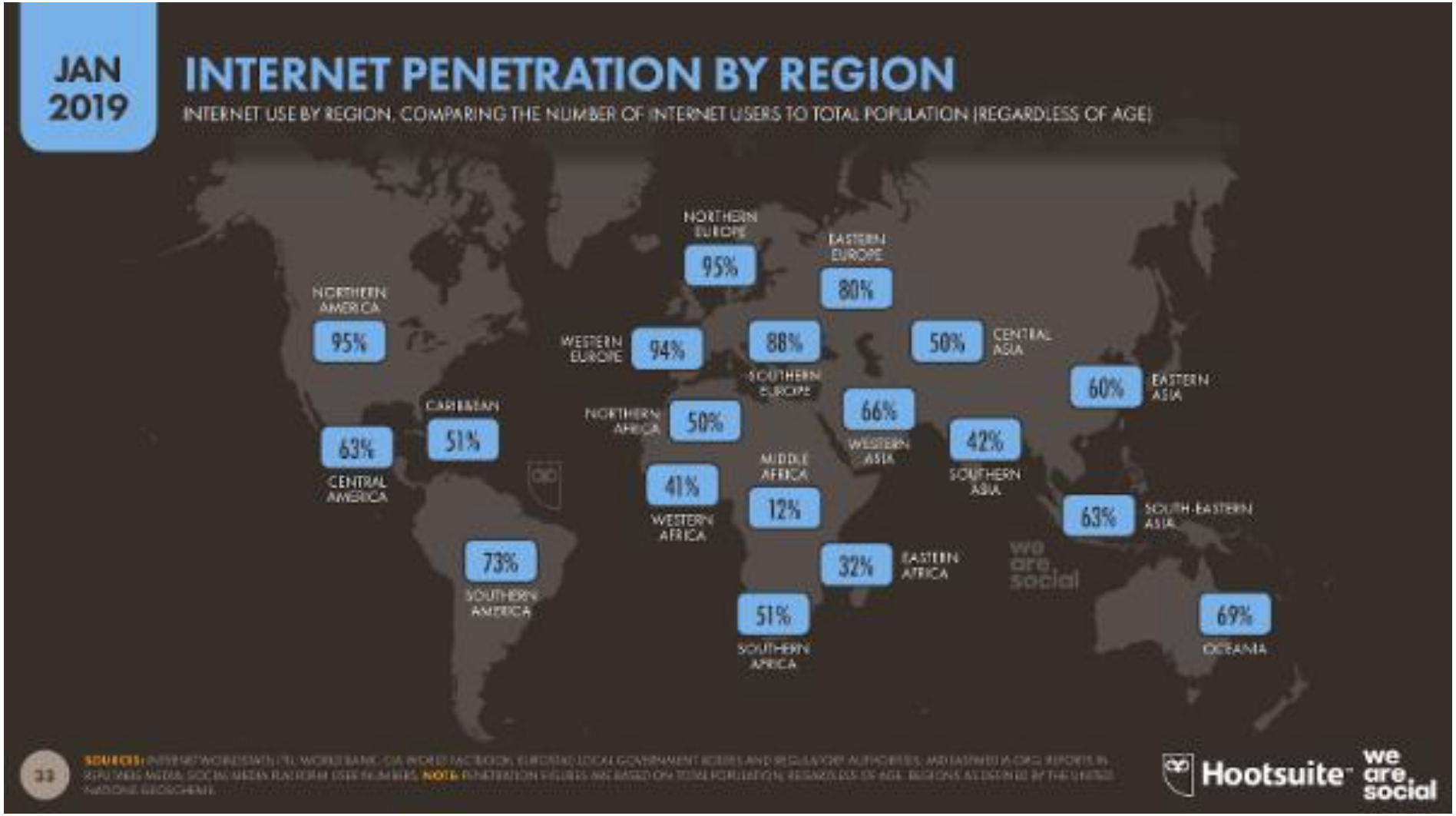
- "IoT is a **network of devices** which can sense, accumulate and transfer data **over the internet** without any human intervention".
"world-wide network of interconnected objects uniquely addressable, based on standard communication protocols".

- Almost every area, device, sensor, software, etc are connected to each other.
- Access through a smartphone or through a computer and from a distance.
- Example: air conditioner's sensor, refrigerators sensors

Active mobile Internet users

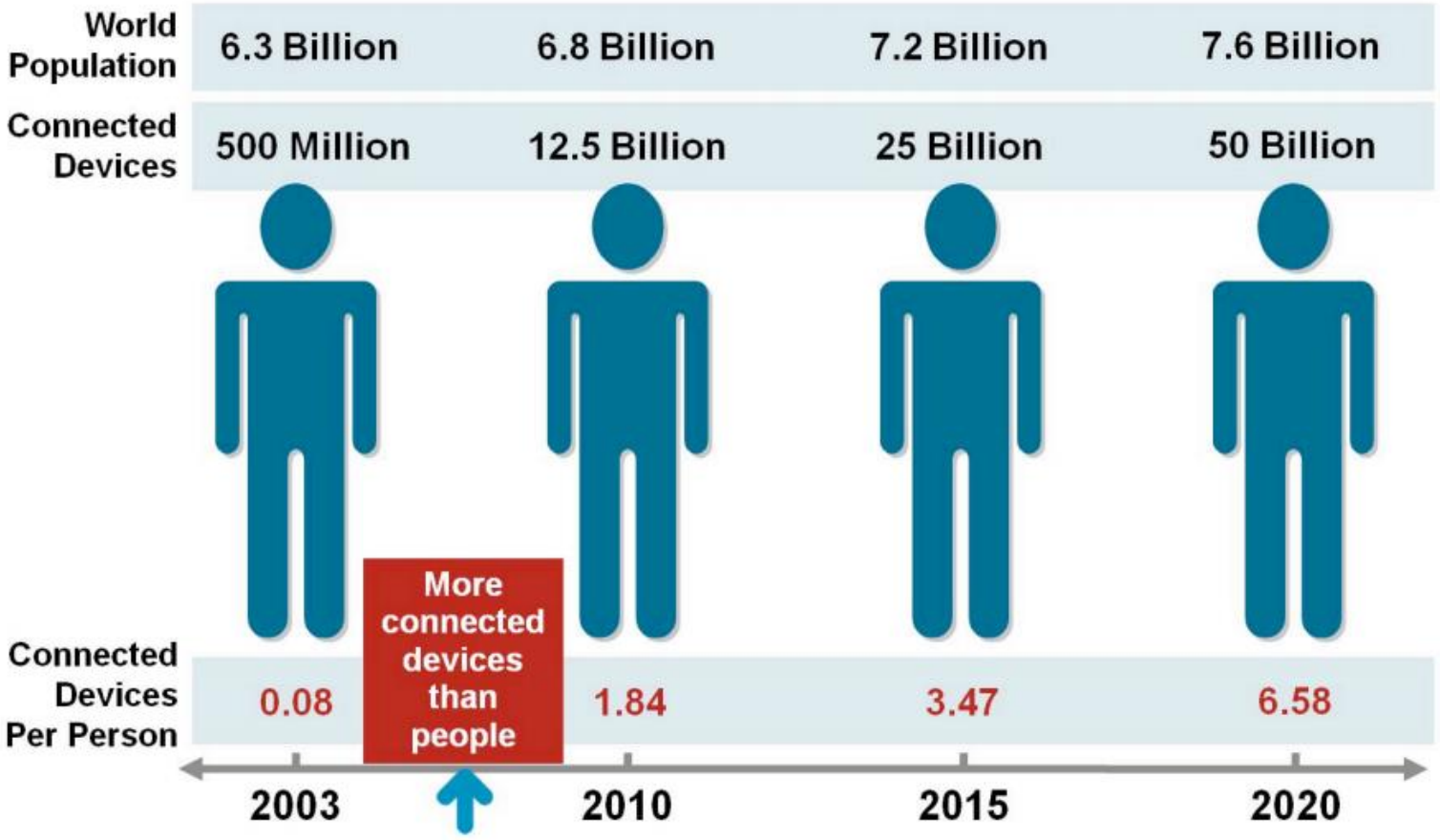


Statistics by Region



Around the world

Connected devices vs world population

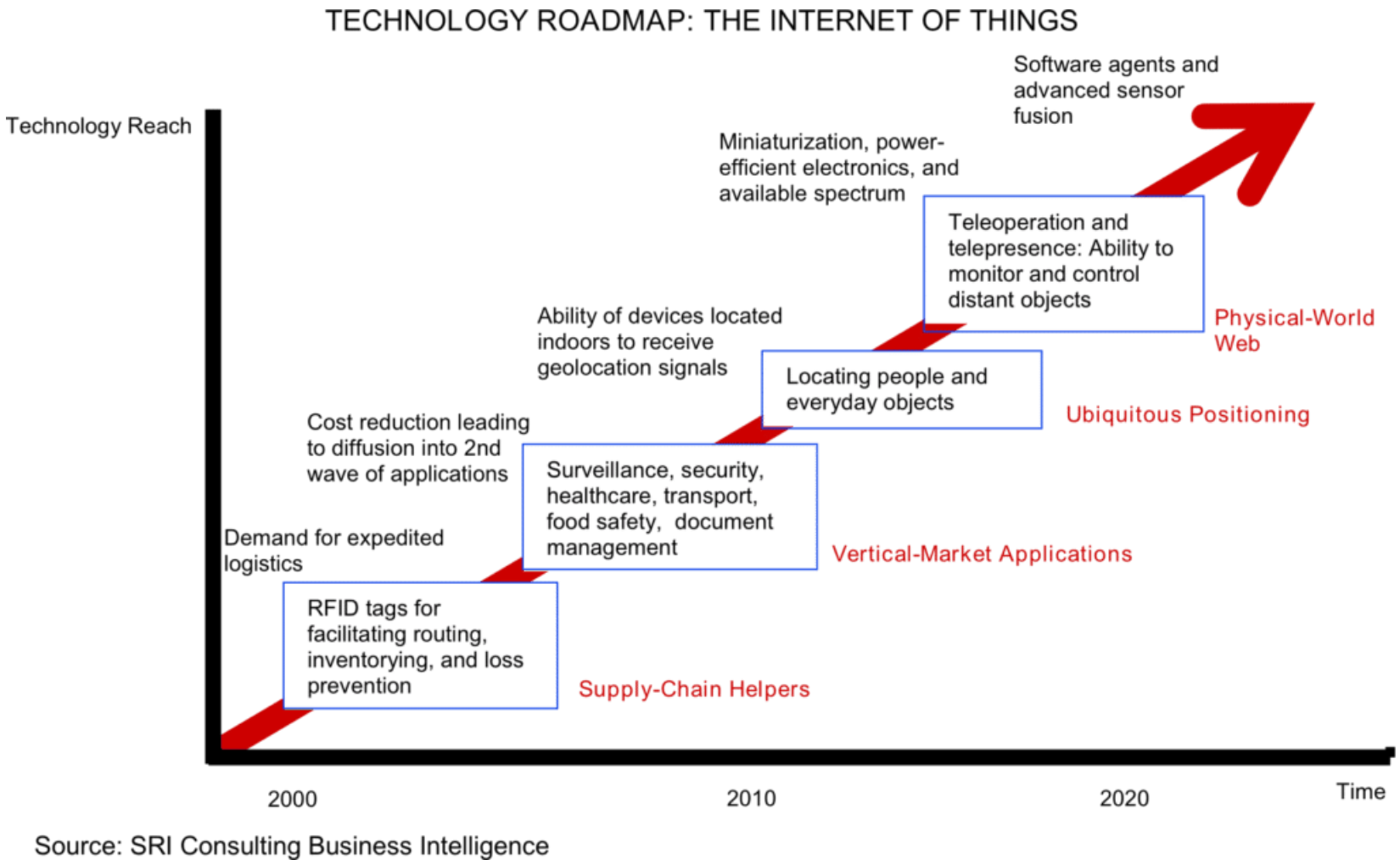


Source: Cisco IBSG, April 2011

Sensor statistics

- The global market for sensors reached nearly $138.8 billion in 2017 and is expected to increase from nearly $240.3 billion in 2022 at a compound annual growth rate (CAGR) of 11.8% for 2017-2022.
- Image and chemical sensors market is expected to grow from nearly $34.7 billion in 2017 to $65.9 billion at a CAGR of 13.7% from 2017 through 2022.
- Biosensor and fingerprint sensors market is expected to grow from $29.1 billion in 2017 to nearly $55.5 billion in 2022 at a CAGR of 13.8% from 2017 through 2022.

Technology Roadmap - IoT



Source: SRI Consulting Business Intelligence

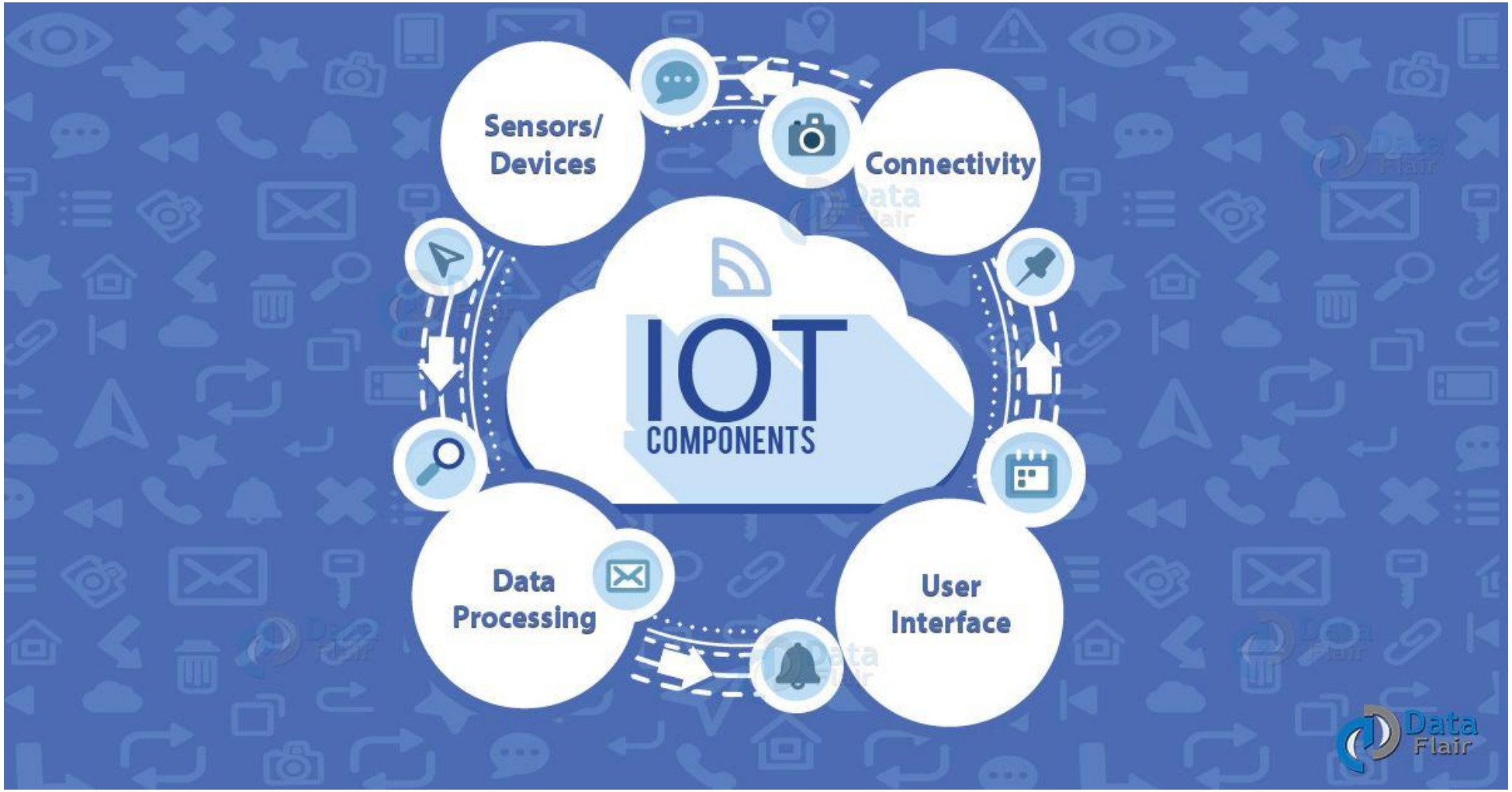
Big Data and IoT

- Handling, storing, and utilizing data from new IoT devices need a broad range of hardware and software infrastructure.
- IoT can provide “big data” from which Big Data analytics can gather information and generate the insights required to make the IoT device better.
- With Big Data tools, IoT organizations are able to analyze the evolving data sets and therefore adapt to changing consumer trends.

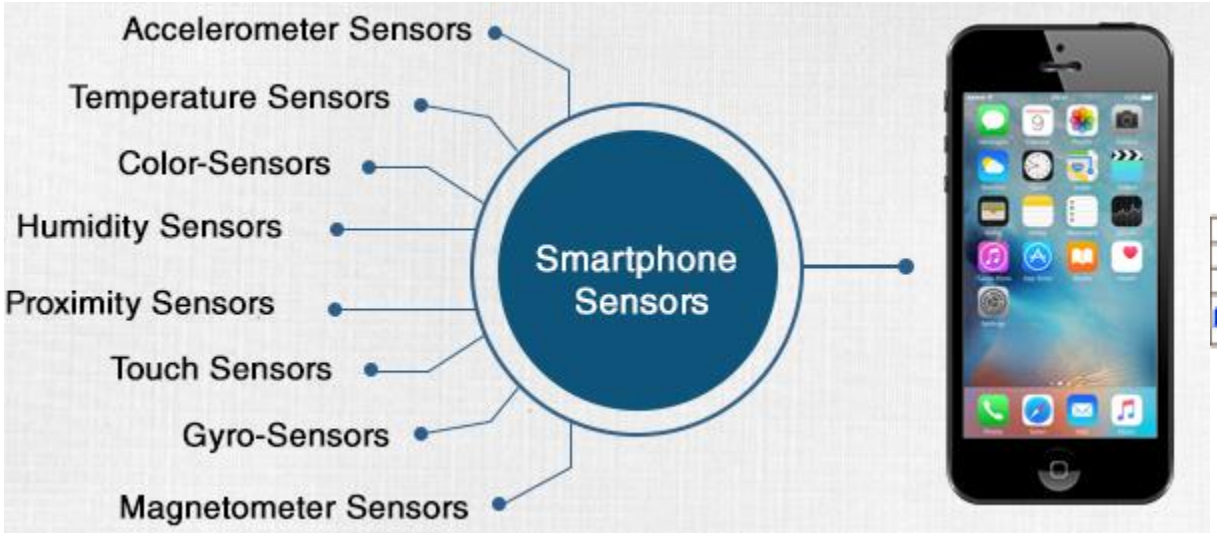
How IoT Works?

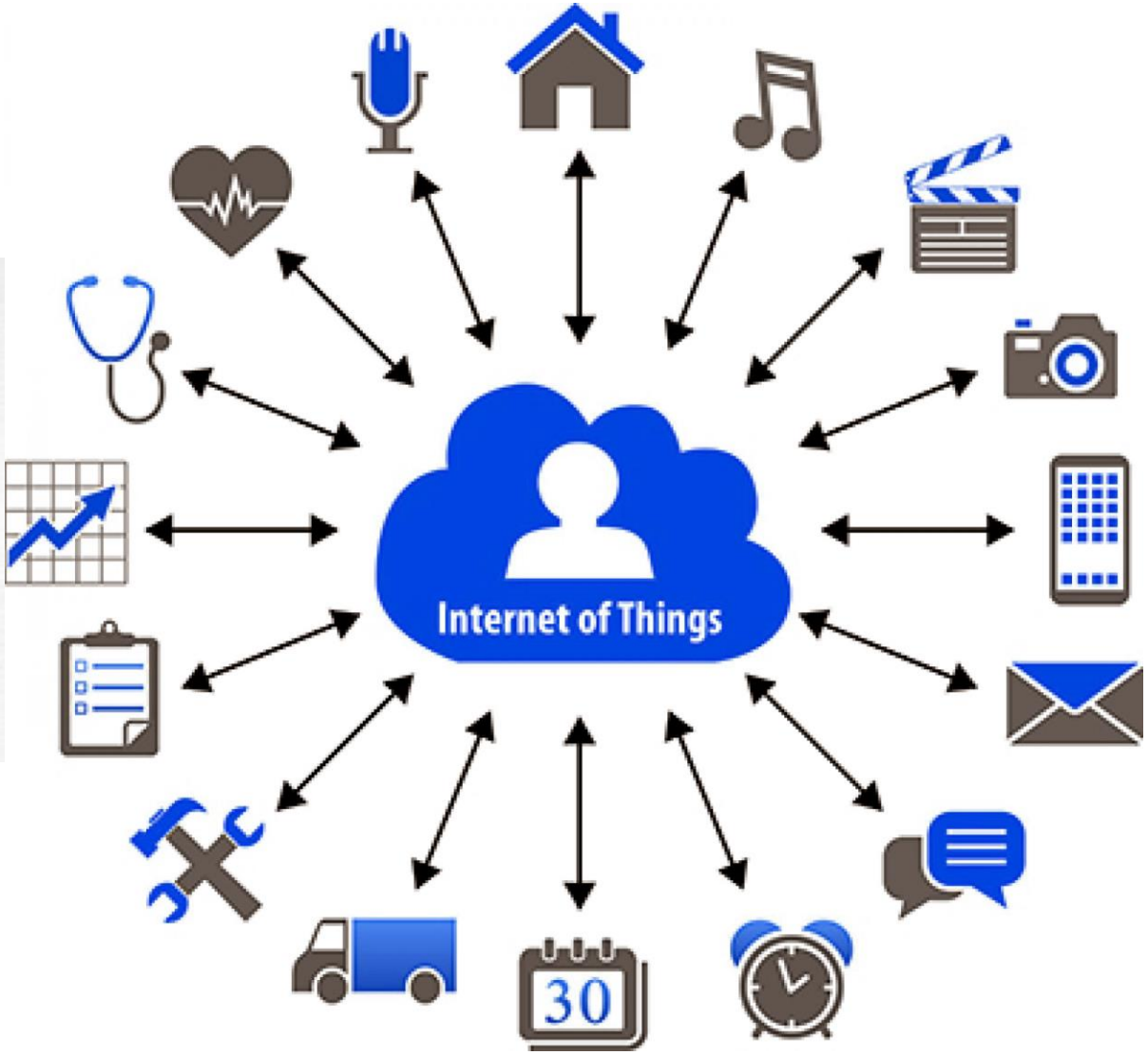
- Connecting multiple devices at a time to the internet
- Facilitate **man to machine** and **machine to machine** interactions.

IoT System


Sensors/
Devices
Connectivity
IOT
COMPONENTS
Data
Processing
User
Interface
Data
Flair

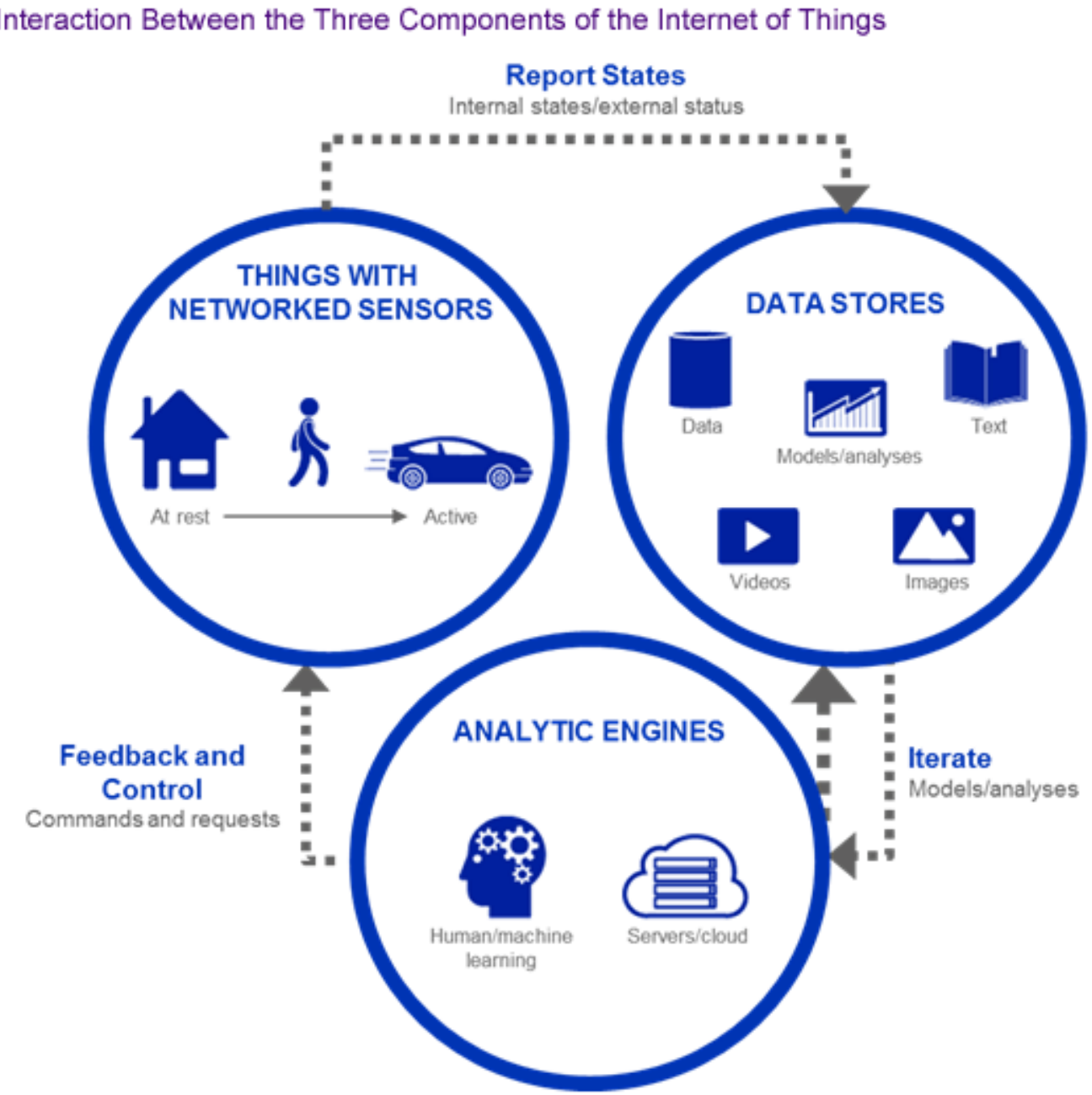
Sensors /Devices



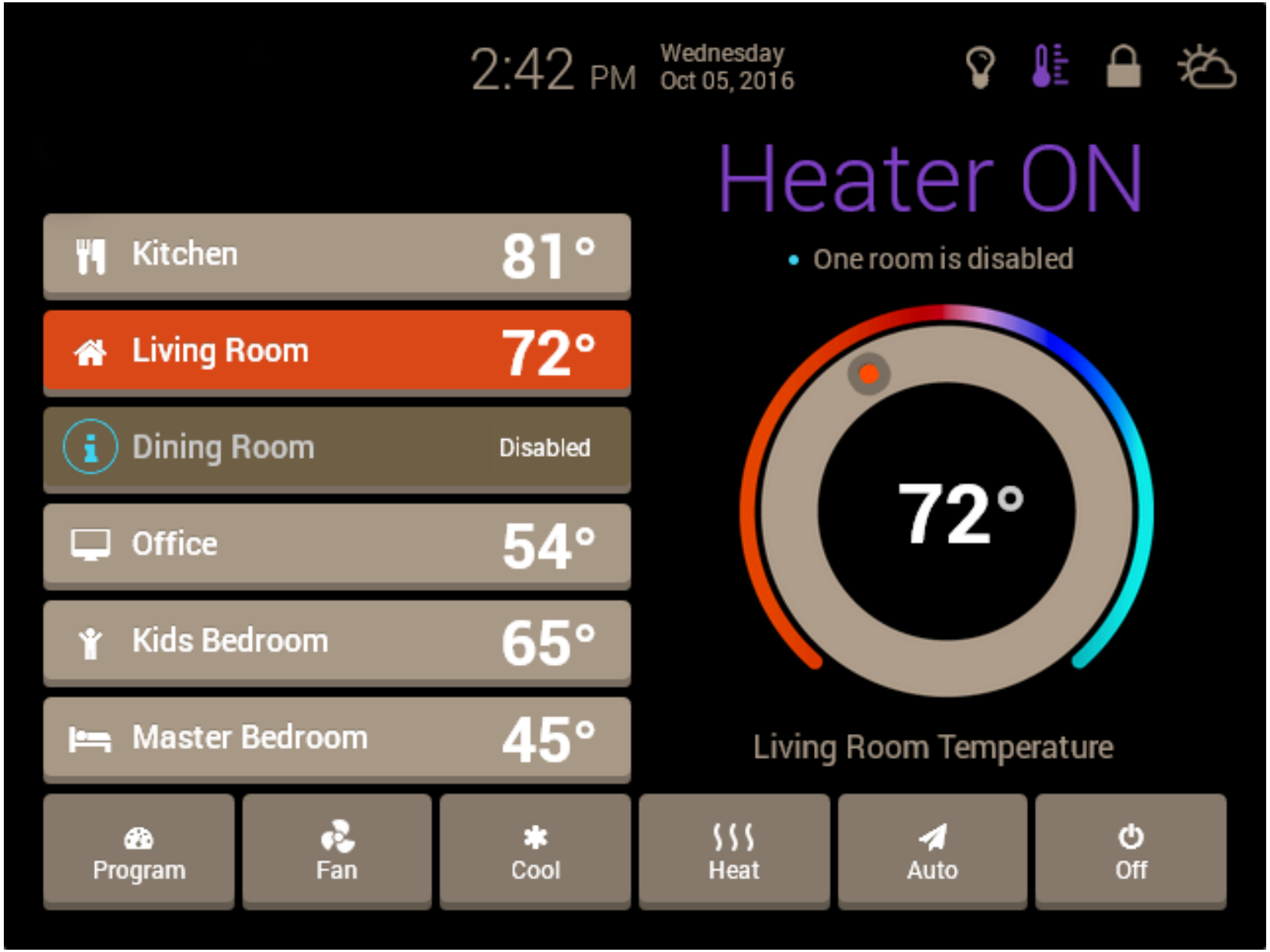


Connectivity

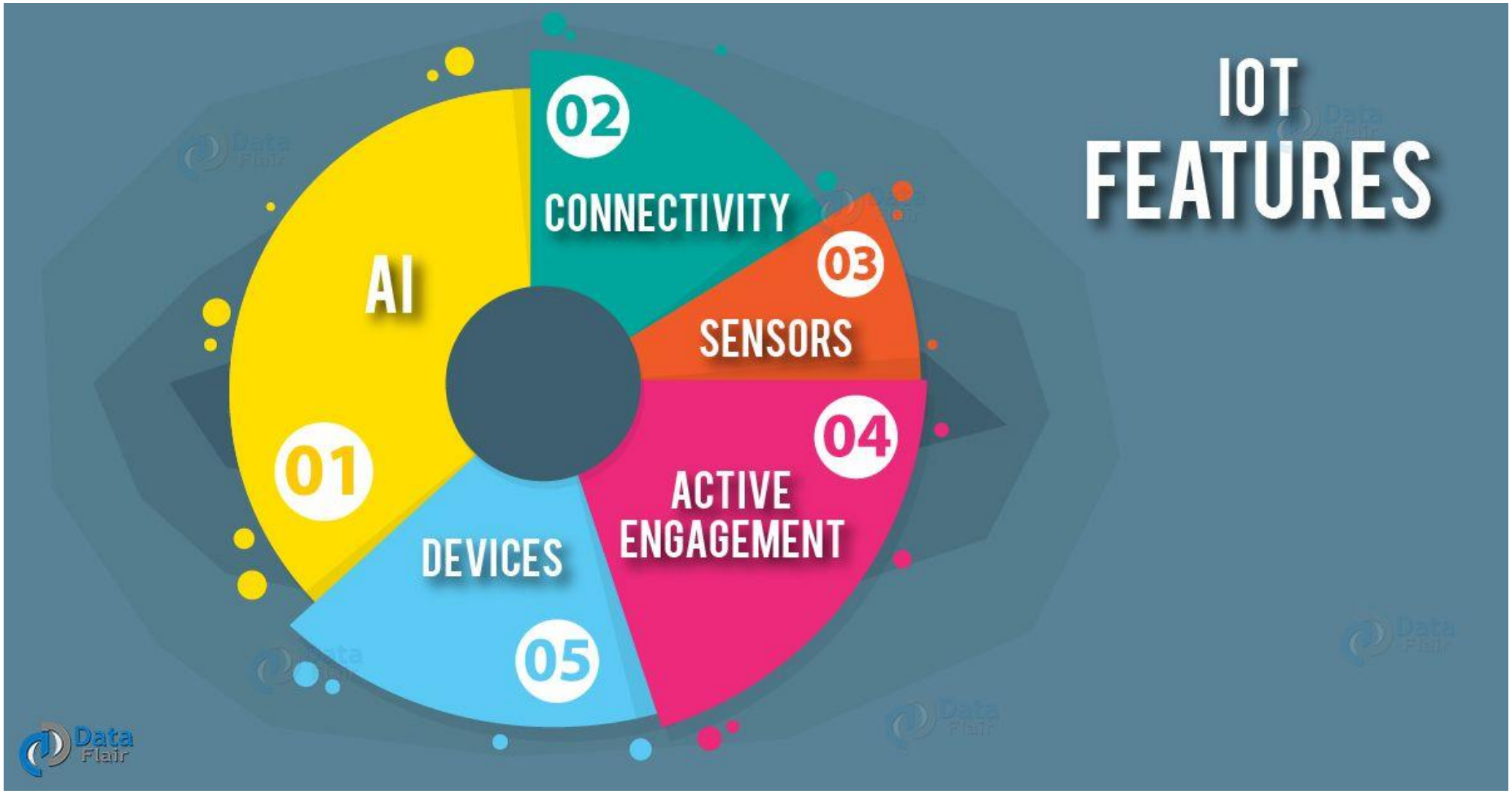
Data Processing



User Interface



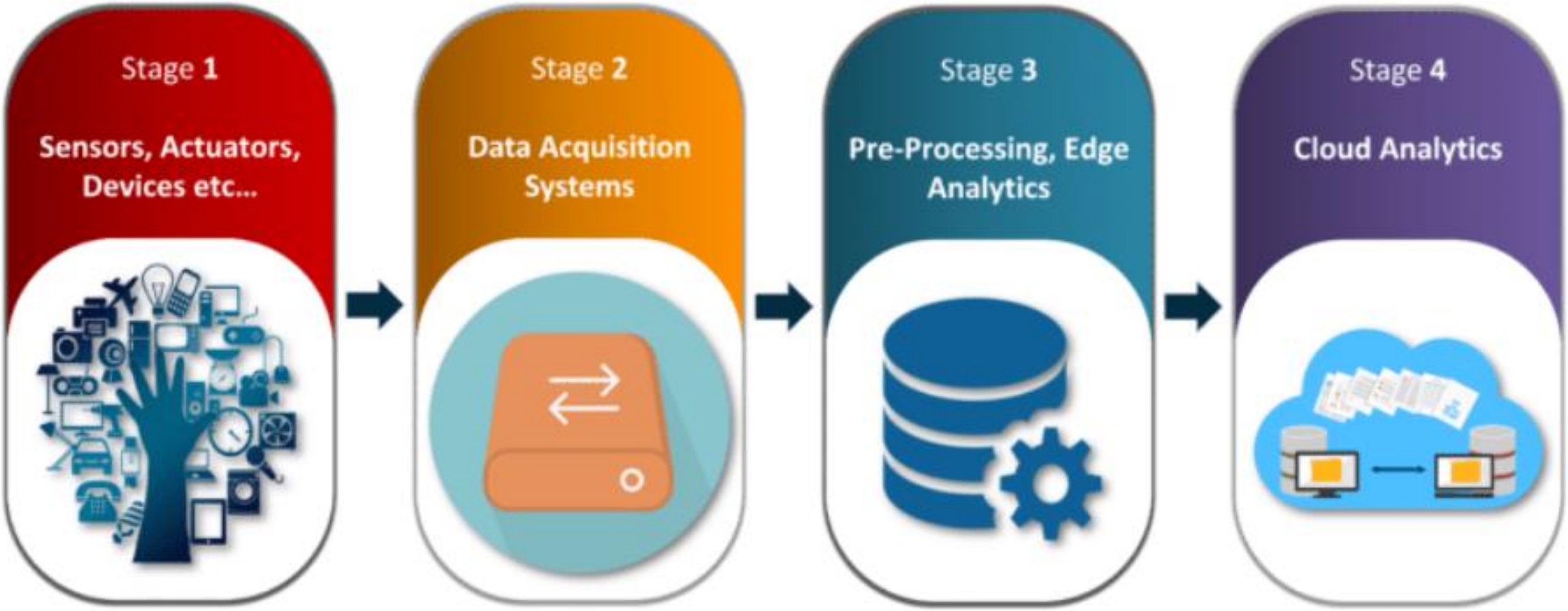
IoT features



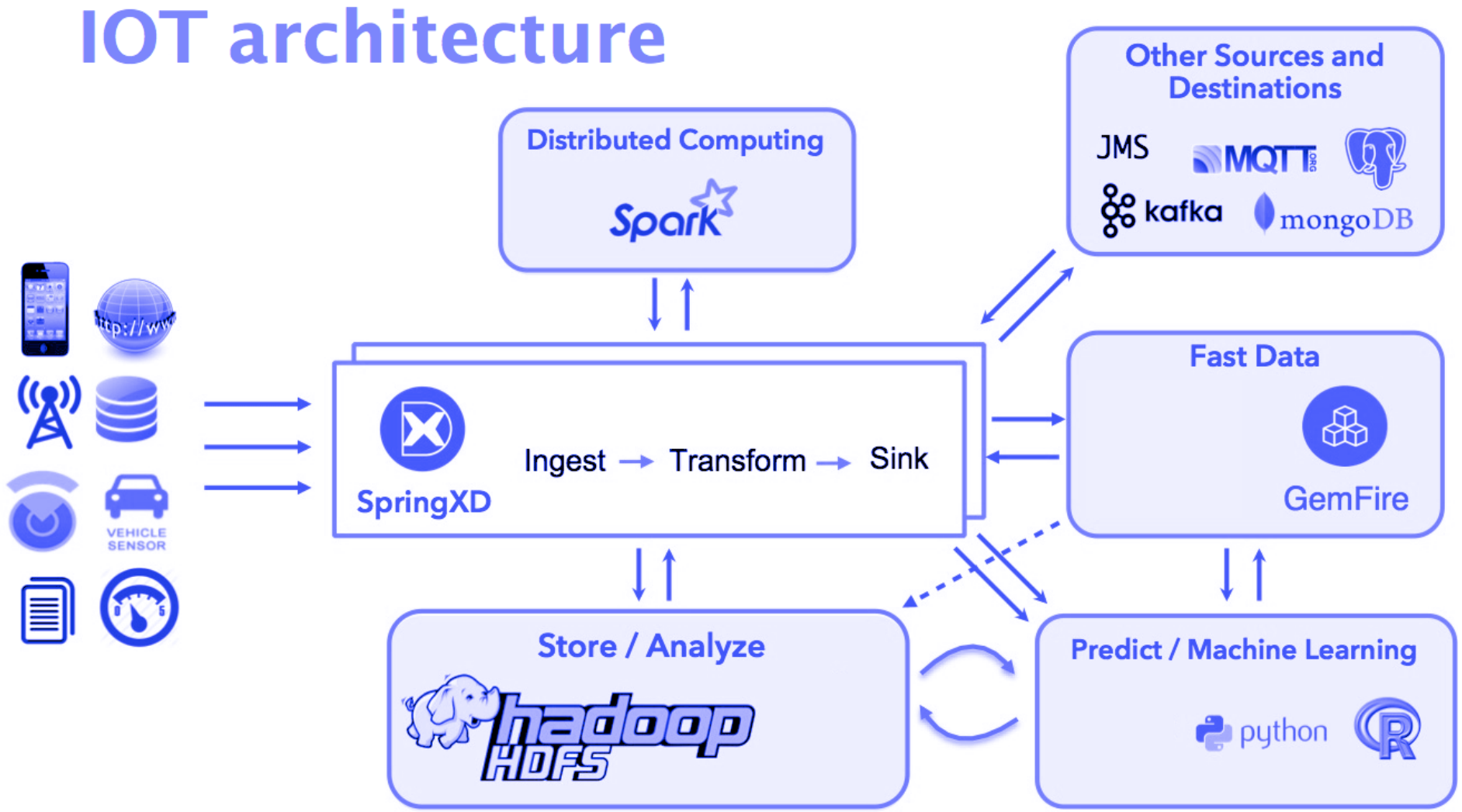
Key Technologies Involved in Internet of Things

- Identification technology
- **IoT architecture technology**
- Communication technology
- Network technology
- Network discovery technology
- Softwares and algorithms
- Hardware technology
- Data and signal processing technology
- Discovery and search engine technology
- Relationship network management technology
- Power and energy storage technology
- Security and privacy technologies, and
- Standardization

IoT Architecture



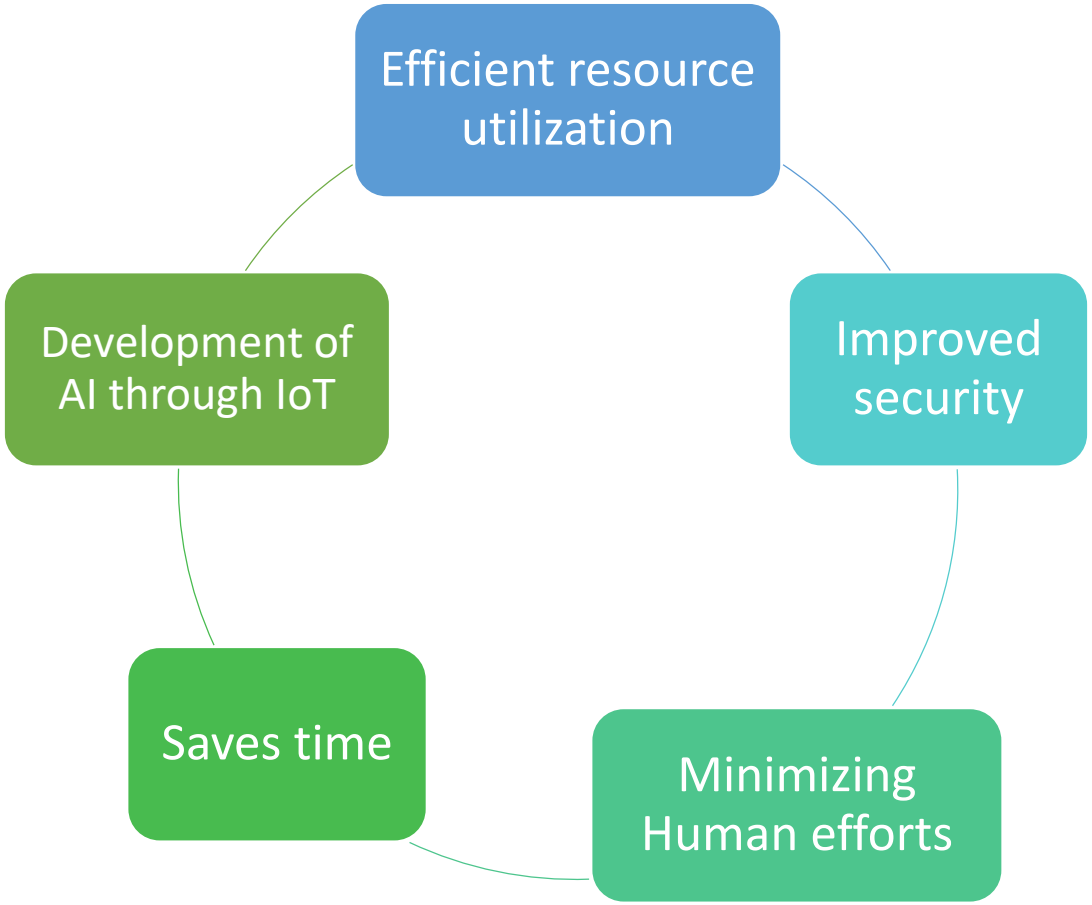
IoT Architecture



Benefits of IoT

Improved Customer Engagement	• IoT improves customer experience by automating the action.
Technical Optimization	• IoT has helped a lot in improving technologies and making them better.
Reduced Waste	• IoT provides real-time information leading to effective decision making & management of resources.

Benefits of IoT



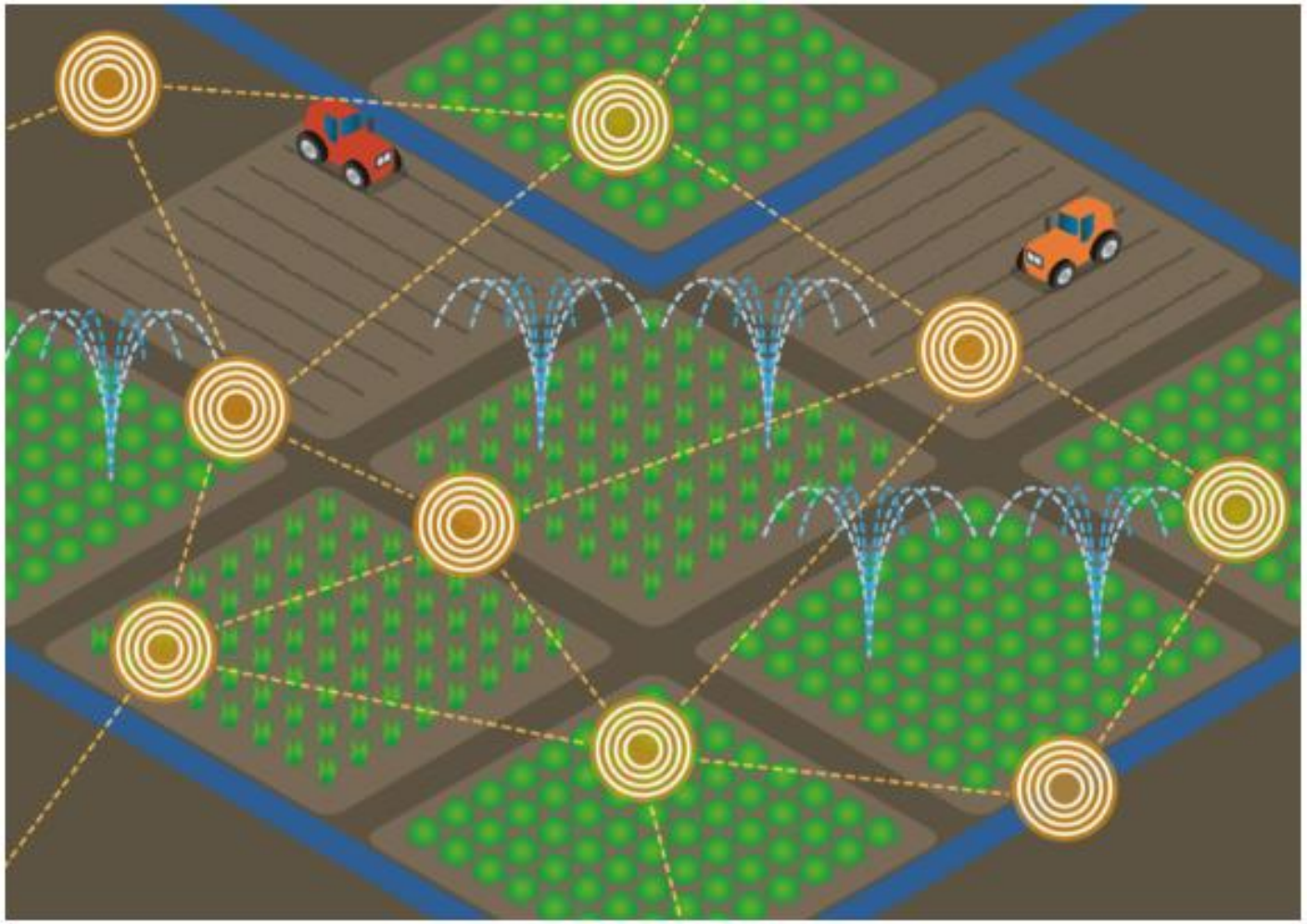
Disadvantages of IoT

- Security
- Privacy
- Complexity
- Flexibility
- Compliance

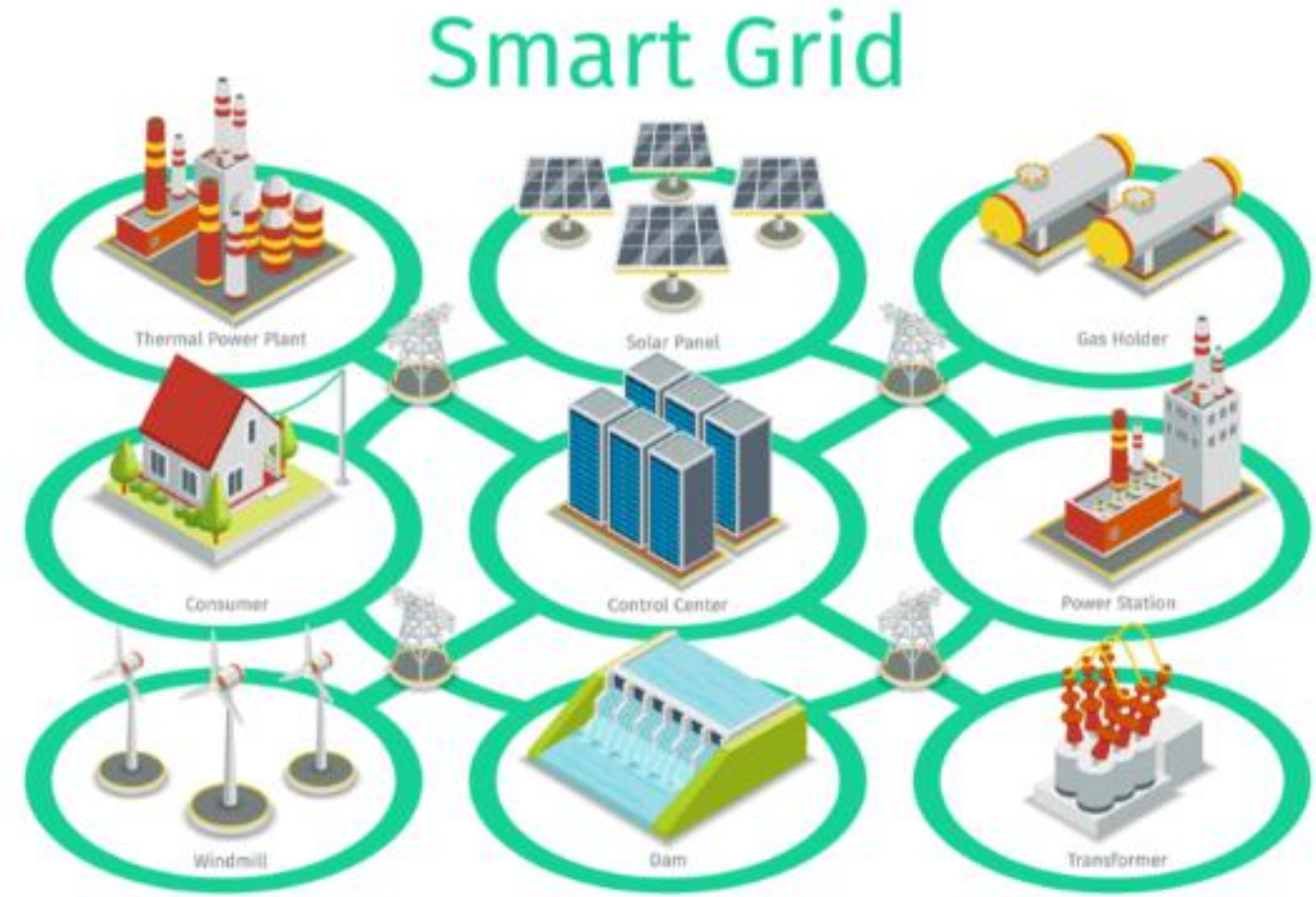
Applications of IoT

Better Health-Care with IoT

Smart Farming with IoT



Smart Energy Management with IoT



Pollution Control with IoT

Disaster management with IoT

Forest fires

- Sensors on trees can take measurements that indicate when a fire has broken out, or there is a strong risk, e.g. temperature, moisture, CO2 and CO levels.
- Alert local population and request help.

Earthquakes

- Microwave sensors that can be used to measure earth movements before and during earthquakes

Floods

- Infrared sensors that can detect and measure floods and movements of people.

IoT for predicting next Natural Disaster

- IoT technologies can’t stop disasters from happening, but can be very useful for disaster preparedness, such as prediction and early warning systems.
- Smartphones come with built-in accelerometers.
- Other sensors can be very expensive.
- Sensors do not need to be operated by experts

IoT for Helping Relief Efforts

- In the aftermath of Typhoon Pablo, which devastated the Philippines in 2012, UN Global Pulse were able to identify and analyze the time each post was uploaded, the GPS coordinates, and the types of damages in photos.
- After Haiti earthquake, chart the movement of displaced populations using their phone's subscriber identity module or SIM number.

Tutorial: Analyzing Machine and Sensor Data with Hadoop's Hortonworks Sandbox

https://github.com/costin/hadoop-tutorials/blob/master/Sandbox/T14_Analyzing_Machine_and_Sensor_Data.md

Summary – Take way points

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What to do in Two Weeks?
...and in the meantime :-)