



CS3243: IoT Devices and Applications

Introduction to the IoT World

What is IoT

IoT: Internet of Things



IoT is a new concept that is based on existing and matured technologies

It focuses on the value addition in a network (**Internet**) of sensors and actuators (**Things**)
Sometimes also referred to as a “System of Systems”

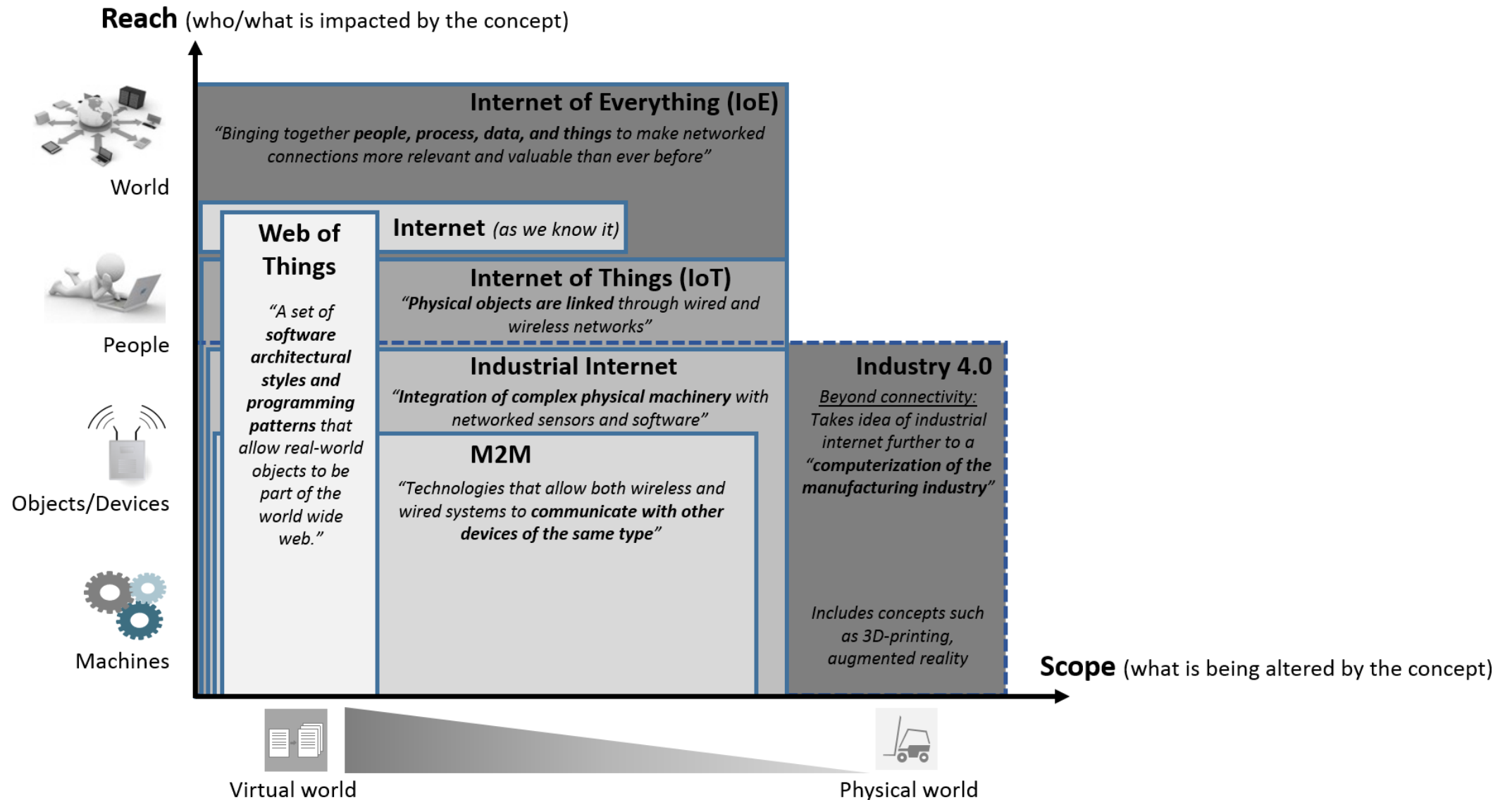
A brief history of IoT development

- *Initial concepts on devices with embedded “smartness” started to appear even in the late seventies with the popularity of microprocessors and microcontrollers.*
- *In 1989 a modified Coca-Cola vending machine at Carnegie Mellon University became the first embedded system (Thing) to be connected to the ARPANET (Internet).*
- *In early 2000, new technologies such as RFID (Radio frequency identification) and cellular communication networks provided momentum for IoT applications – by solving two key issues, continuous power and communication.*
- *The term “Internet of Things (IoT)” was introduced by Kevin Ashton 1999.*
 - *Initially, the Internet was for People-to-People communication. Later, when devices started to become more intelligent it became also a platform for “Machine-to-Machine” communication*
- *Availability of low-cost, high powered embedded processors make IoT to reach consumer device market in the second decade of the current century.*
 - *Popularity and availability of mobile data communication networks too a contributing factor.*
- *IOT has become a common household-thing, that we use everyday either knowingly or unknowingly.*

Other concepts similar to IoT

- Cisco has been driving the term Internet of Everything (IoE). Intel initially called it the “embedded internet”.
- Other terms that have been proposed but don't mean exactly all the same are:
 - M2M (Machine to machine) communication
 - Web of Things
 - Industry 4.0
 - Industrial internet (of Things)
 - Smart systems
 - Pervasive computing
 - Intelligent systems

IoT And Other Concepts



The world of IoT

Smart home

Smart Grid

Wearables

Industrial
Internet

Smart City

Connected
Vehicles

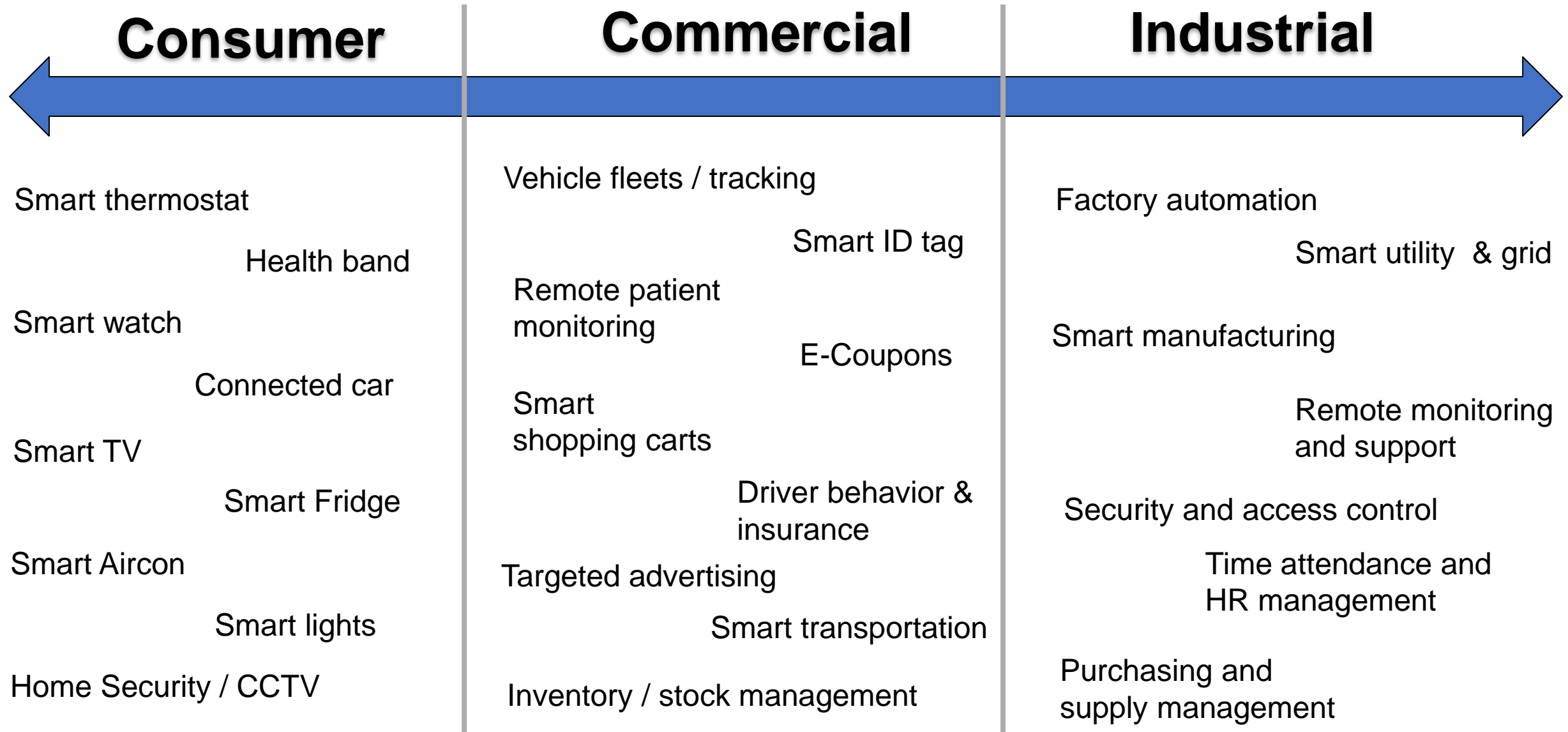
Connected
Health

Smart Retail

Smart
Supply
Chain

Smart
Farming

IoT Sub domains



Common IoT Applications

Energy

- Smart meters
- Distribution automation
- EV charging Mgt
- Solar power
- Battery Storage Mgt

Automotive

- Navigation
- Tolling
- Traffic management
- Parking systems
- Drive assistance systems
- OBD and assistance

Cities & Communities

- Public transport
- Smart buildings
- Smart government
- Utility and power supply
- Healthcare and emergency assistance
- Public access services

Healthcare

- Implants
- Vitals monitoring
- Telemedicine
- Remote diagnostics
- Equipment tracking
- Equipment status monitoring

Industrial

- Asset utilization
- Inventory and stock management
- Just-in-time manufacturing
- Location aware safety
- Smart tags & production monitoring
- Smart pumps / valves etc.
- Energy management

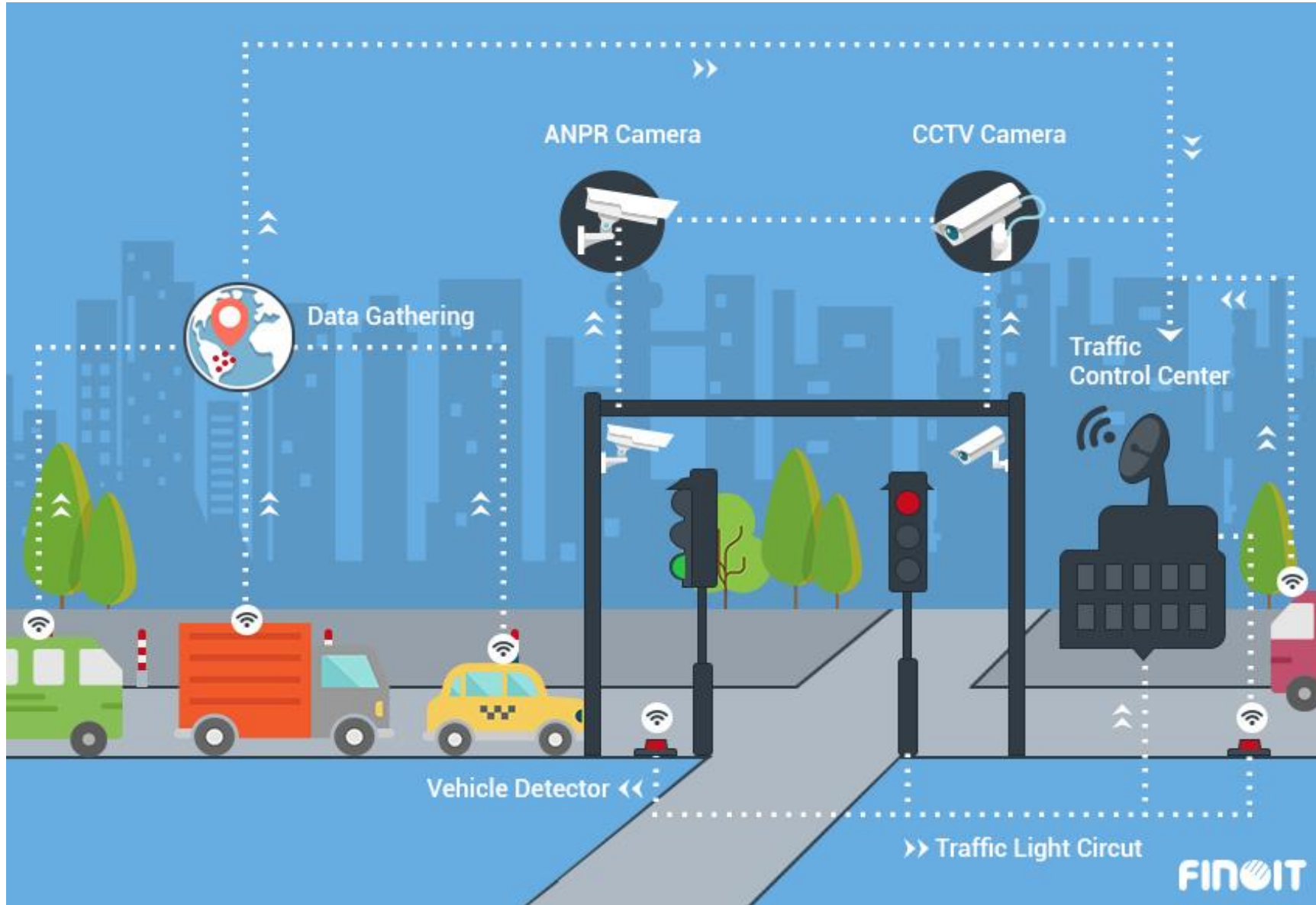
Security

- Surveillance & tracking
- Access control
- Emergency services
- Environmental Monitoring
- Disaster management and response

Retail & Finance

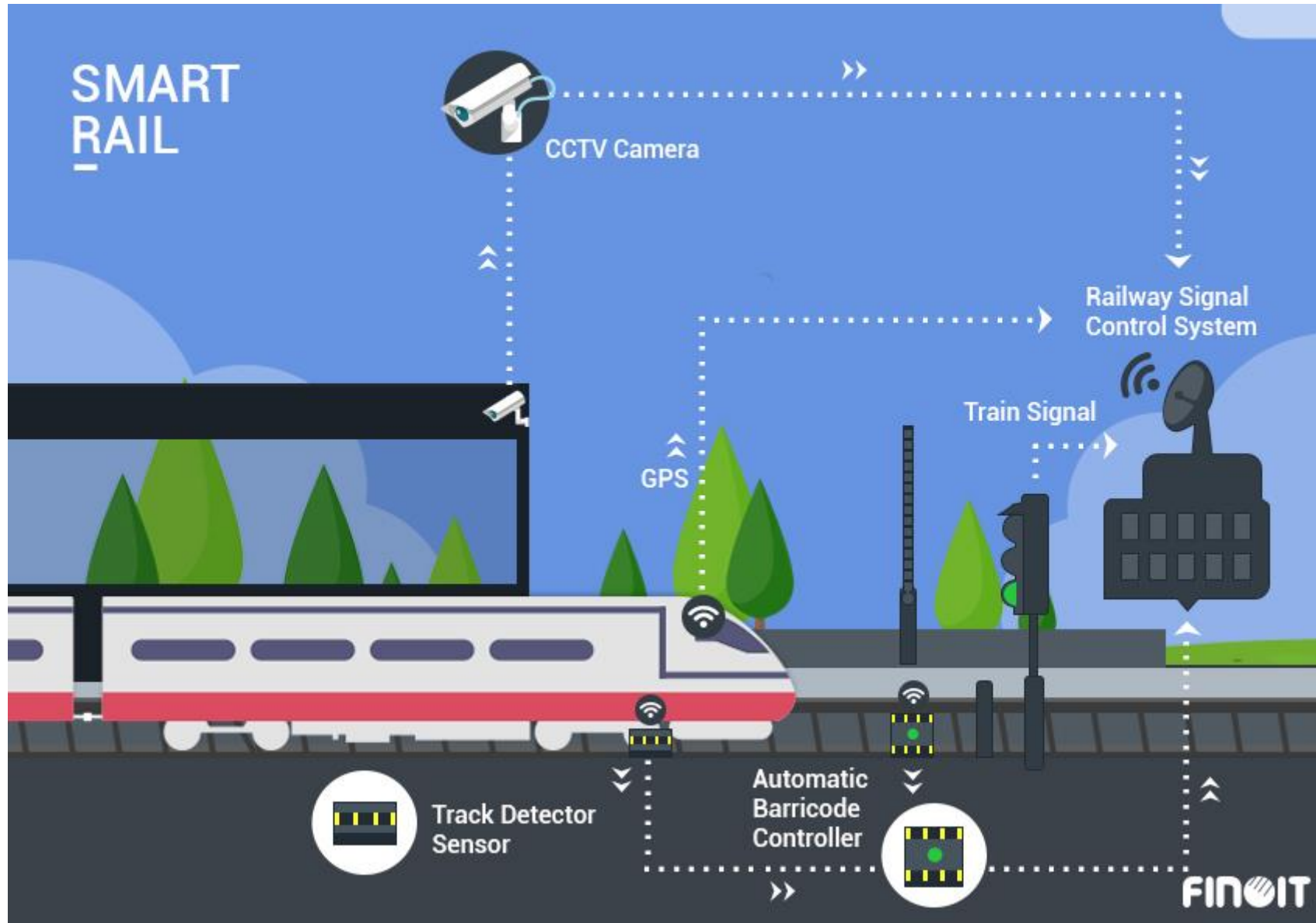
- Fuel stations
- Supermarkets
- Vending machine
- ATM/CDM/CRMs
- Self service checkouts
- Customer Relations Mgt

IoT Examples: Smart Traffic Management



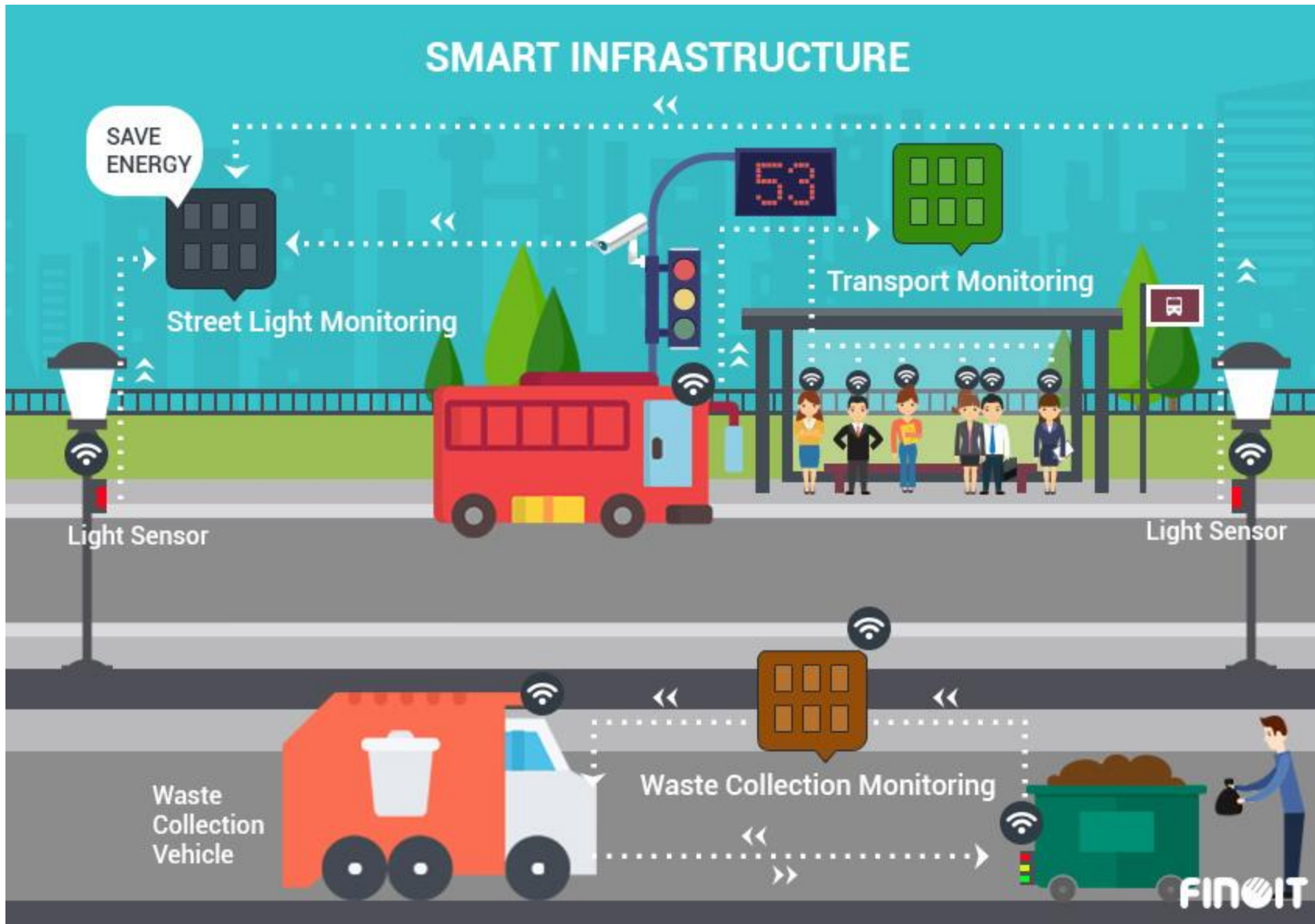
- Fewer traffic jams
- Less accidents
- Optimal road usage
- Reduced travel times
- Enhanced security
- Less pollution

IoT Examples: Smart Railway



- Shorter passenger waiting times
- Safer journeys
- Less energy usage
- Increased security
- More revenue for the operator
- Convenience to the public

IoT Examples: Smart Cities

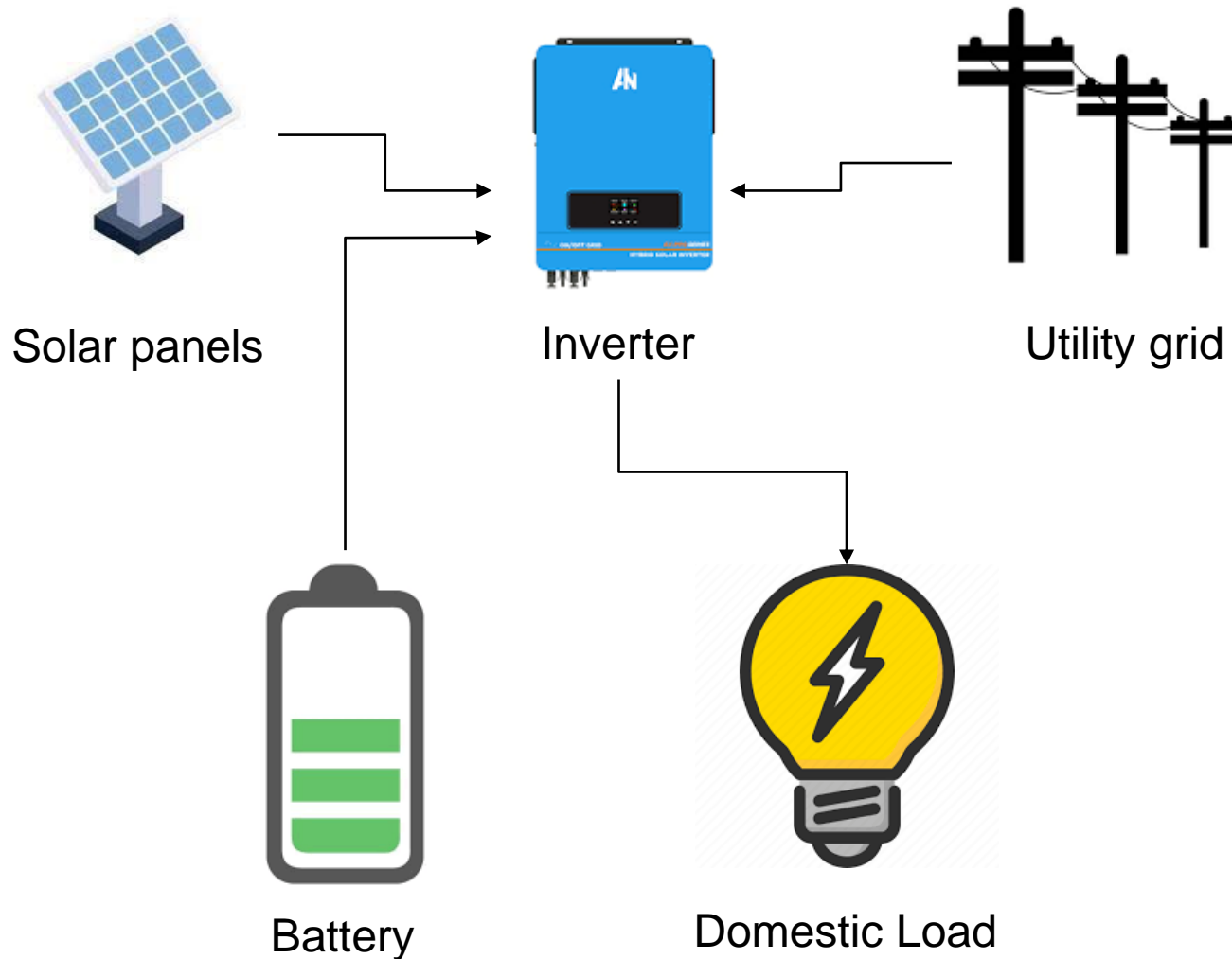


- Save energy
- Less pollution
- Optimal service usage
- Passenger convenience
- Enhanced security
- Less waiting time
- Less traffic

IoT Examples: Smart Home

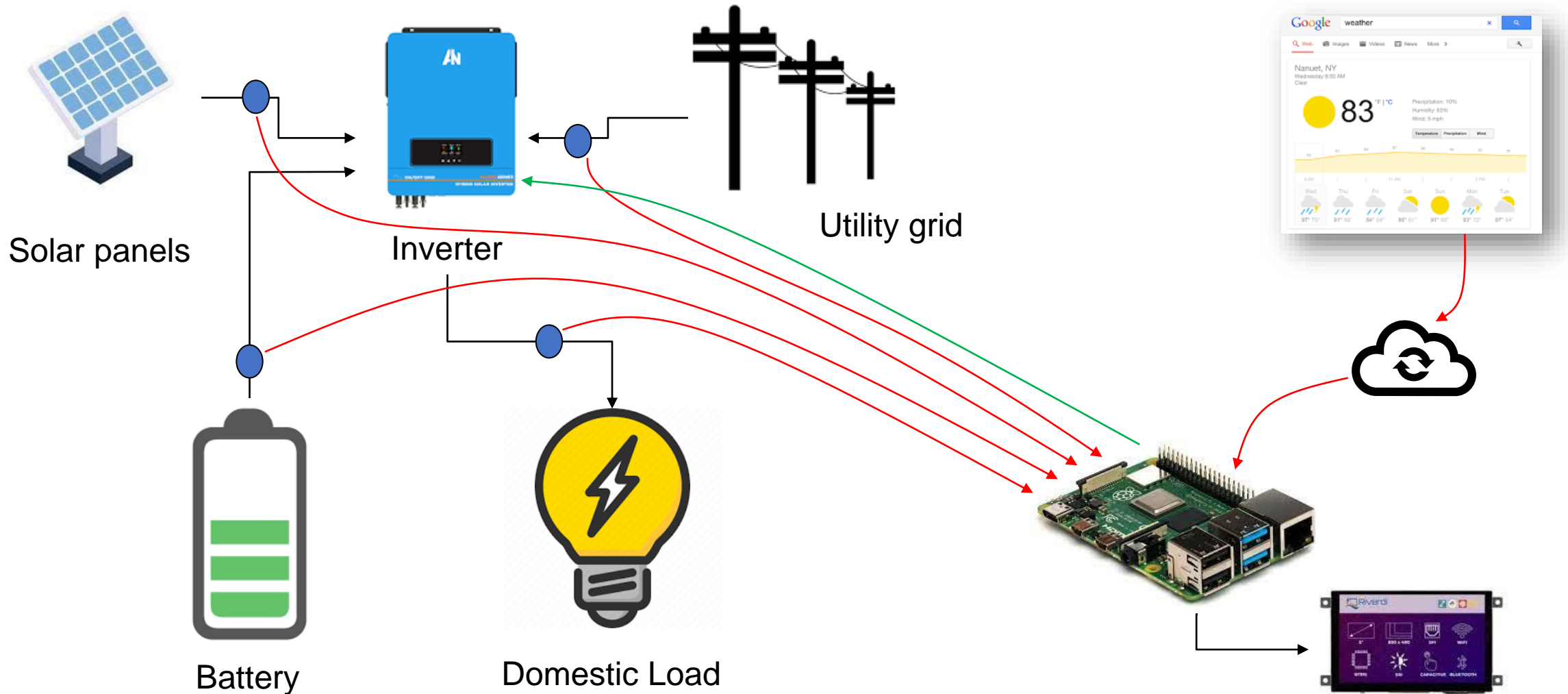


IoT Example: Off-grid solar energy

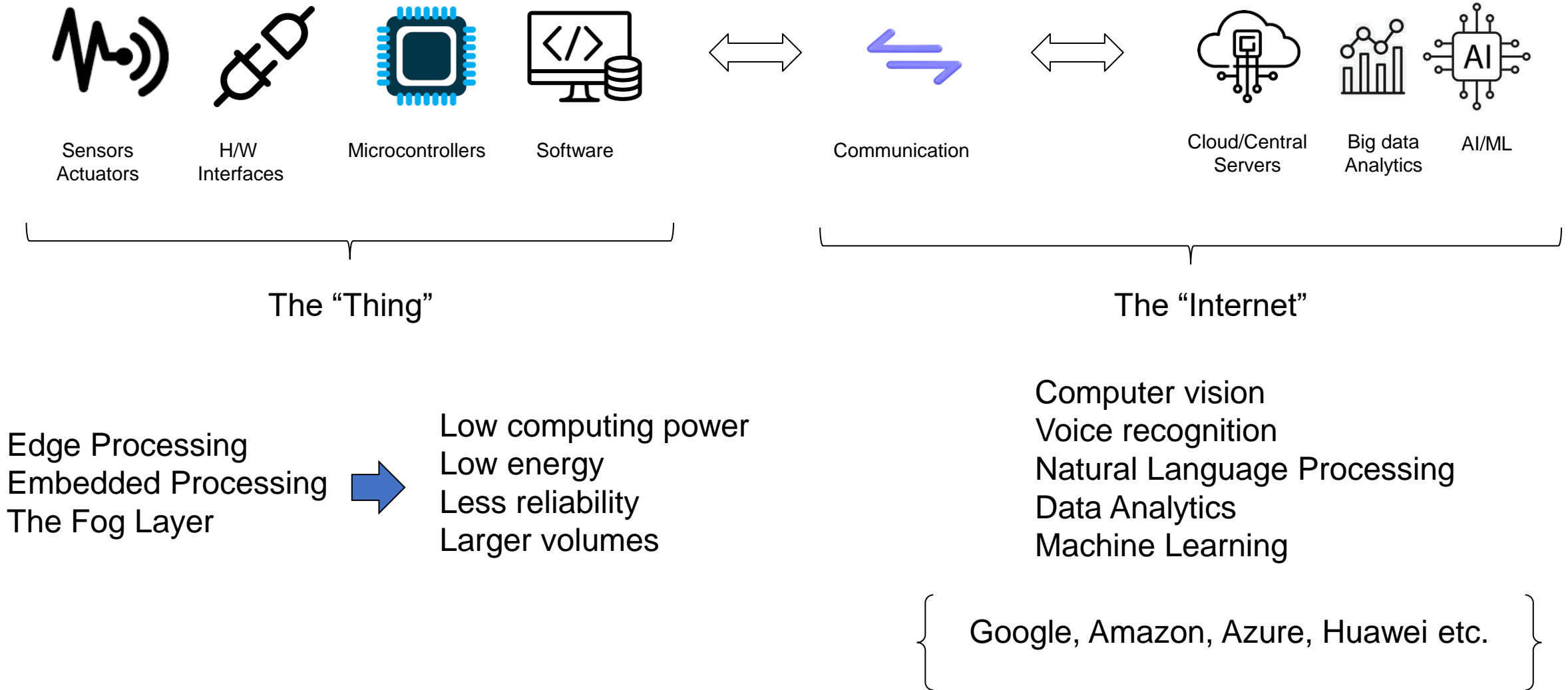


How do we manage limited battery capacity to ensure long battery life and the and minimum use of energy from the grid?

IoT Example: Off-grid solar energy



Components of an IoT solution



IoT systems: Challenges and issues

Security

- How to protect access to devices
- Physical security of devices
- Lack of visibility
- Lack of controllability
- Malware
- DDOS

Privacy

- How to protect access by devices
- Data exposure
- Personal privacy
- Unauthorized access

Technological issues

- Relatively young concepts and technologies
- Rapidly changing environments
- Dependency on external factors (power, network, cloud etc.)
- Infrastructure dependency

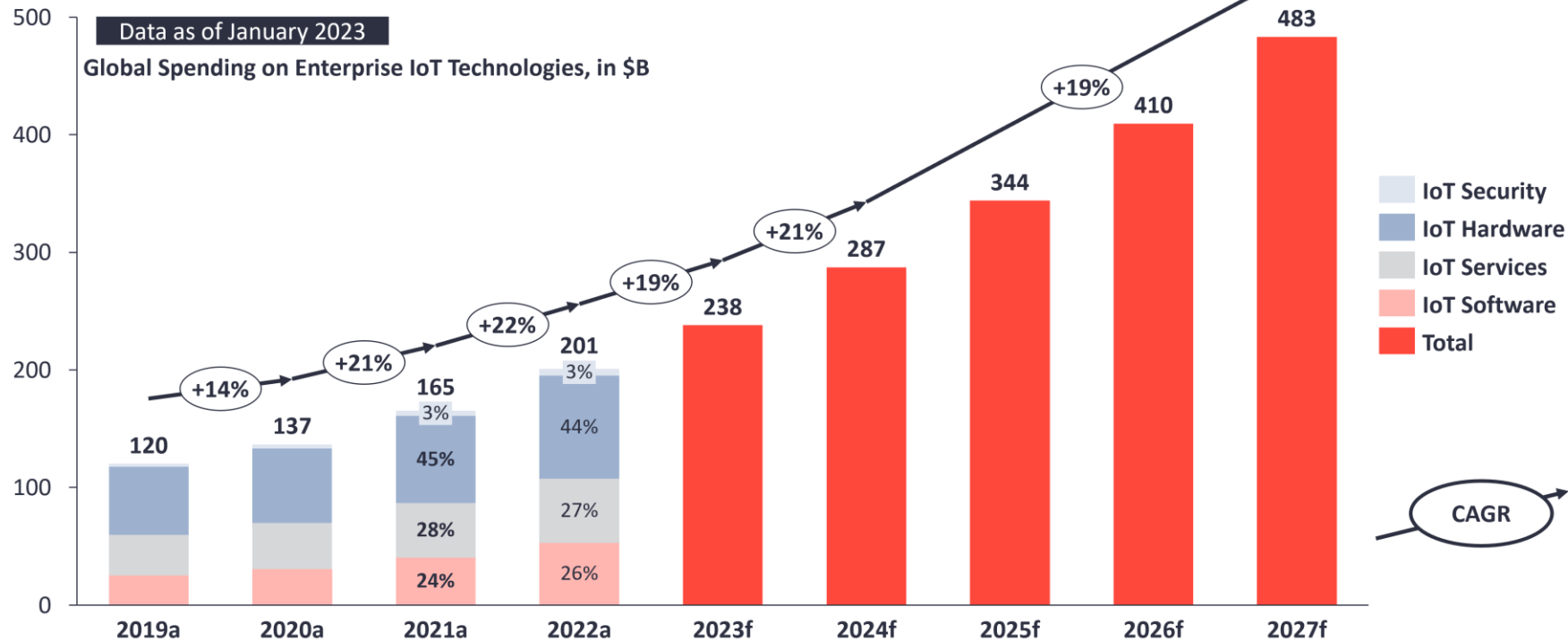
IoT: The Commercial perspective



February 2023

Your Global IoT Market Research Partner

Enterprise IoT market 2019–2027



Note: IoT Analytics defines IoT as a network of internet-enabled physical objects. Objects that become internet-enabled (IoT devices) typically interact via embedded systems, some form of network communication, or a combination of edge and cloud computing. The data from IoT-connected devices is often used to create novel end-user applications. Connected personal computers, tablets, and smartphones are not considered IoT, although these may be part of the solution setup. Devices connected via extremely simple connectivity methods, such as radio frequency identification or quick response codes, are not considered IoT devices. a: Actuals, f: Forecast

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QUESTIONS?