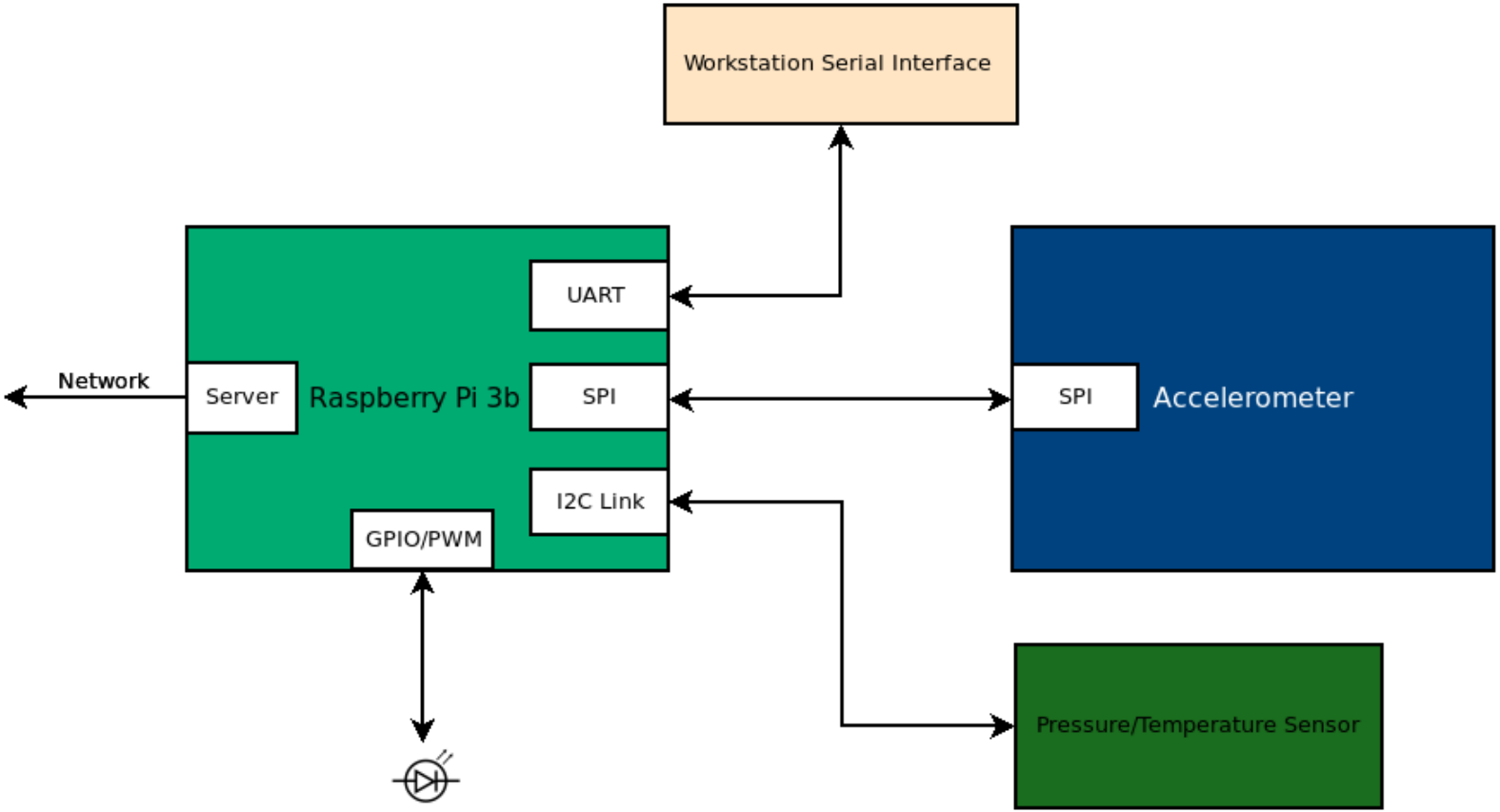
E210 Engineering Cyber-Physical Systems

CPS Wrap-up

Bryce Himebaugh

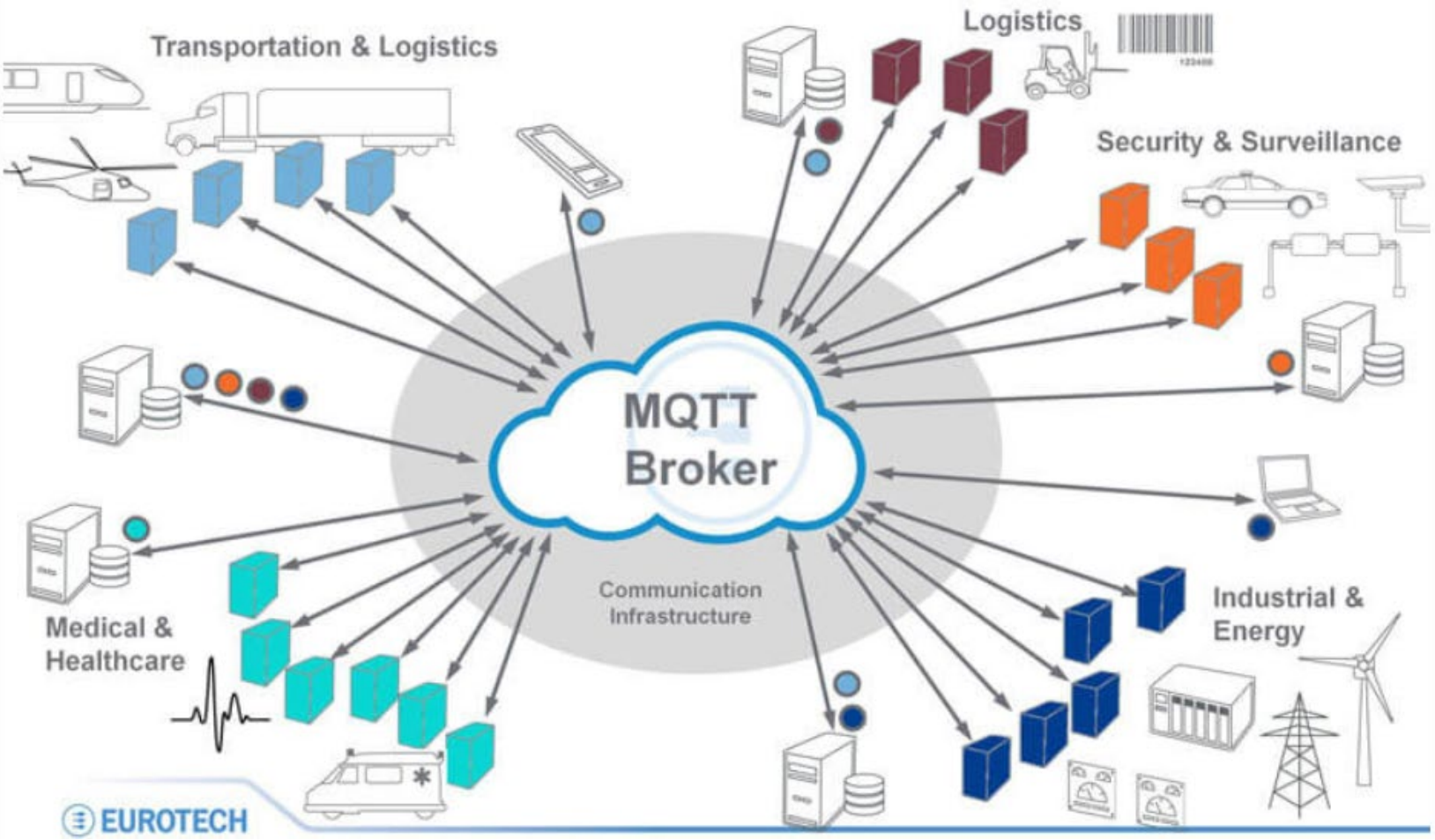
Weekly Focus	Reading	Monday	Wed	Lab
CPS Intro/UART		**1/10:** CPS Introduction	**1/12:** Pi Intro/UART Bus	**Project 0 Raspberry PI Setup**
I2C Bus		**1/17:** MLK Day	**1/19:** I2C Bus Overview	**Project 1 I2C Pressure/Temperature Sensor**
I2C and SPI Bus		**1/24:** Pressure Sensor	**1/26:** SPI Bus Overview	**Project 2 SPI Accelerometer**
SPI/Networking		**1/31:** Accelerometer	**2/2:** MQTT	**Project 3 MQTT Sensor Data Server**
Networking		**2/7:** GPIO/LED	**2/9:** Flask	**Project 4 Sensor LED Output**
Web Server		**2/14:** No Class	**2/16:** CPS Wrapup, Exam Review	**P5 Demultiplexer**
Evaluation		**2/21:** Exam 1	**2/23:** CE Intro/ Logic	**P6 ALU**

https://engr210.github.io/


Workstation Serial Interface
UART
Network
Server
Raspberry Pi 3b
SPI
SPI
Accelerometer
I2C Link
GPIO/PWM
Pressure/Temperature Sensor

Connecting P5-P8 to CPS

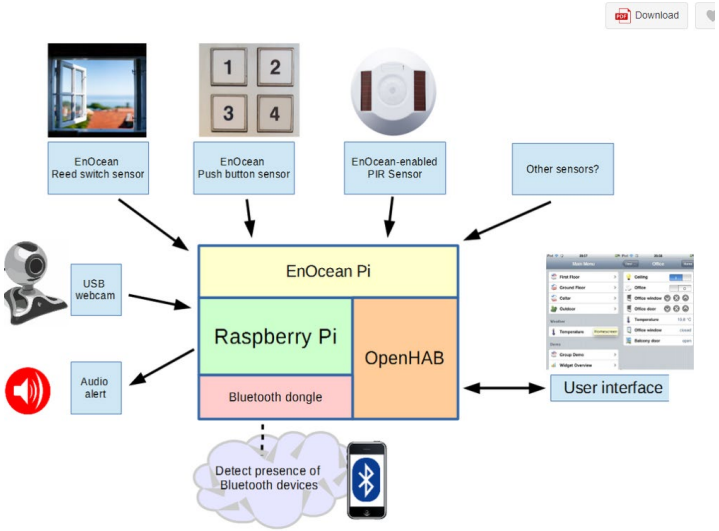
CPS Use Cases

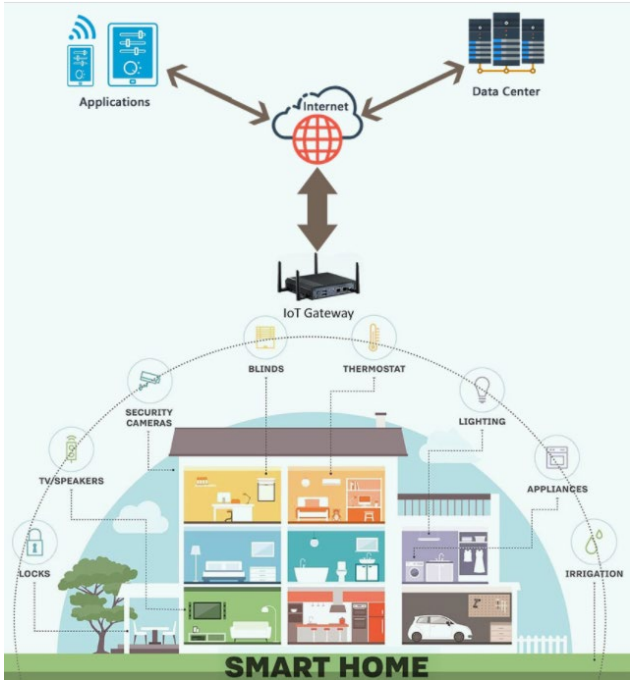

Transportation & Logistics
Logistics
Security & Surveillance
MQTT
Broker
Communication
Infrastructure
Medical &
Healthcare
Industrial &
Energy
EUROTECH

Remote Patient Monitoring

1. Low Latency
2. Security
3. Scalability
   - Topics organized by patient

Home Energy Monitoring and Control





Surveillance Systems

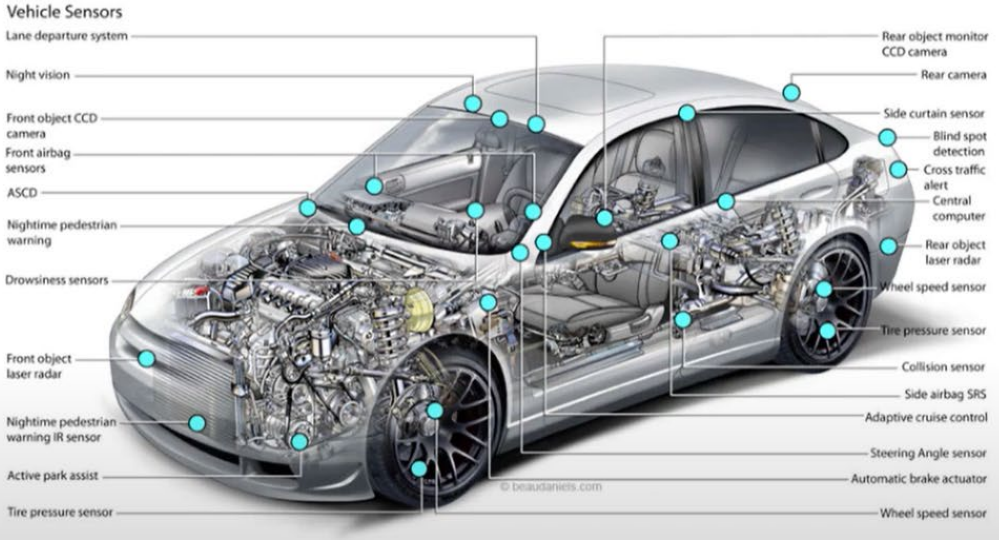
Agriculture

Automotive

By 2020, there will be **250 Million** connected vehicles on the road globally
– Gartner & Connected Vehicle Trade Association

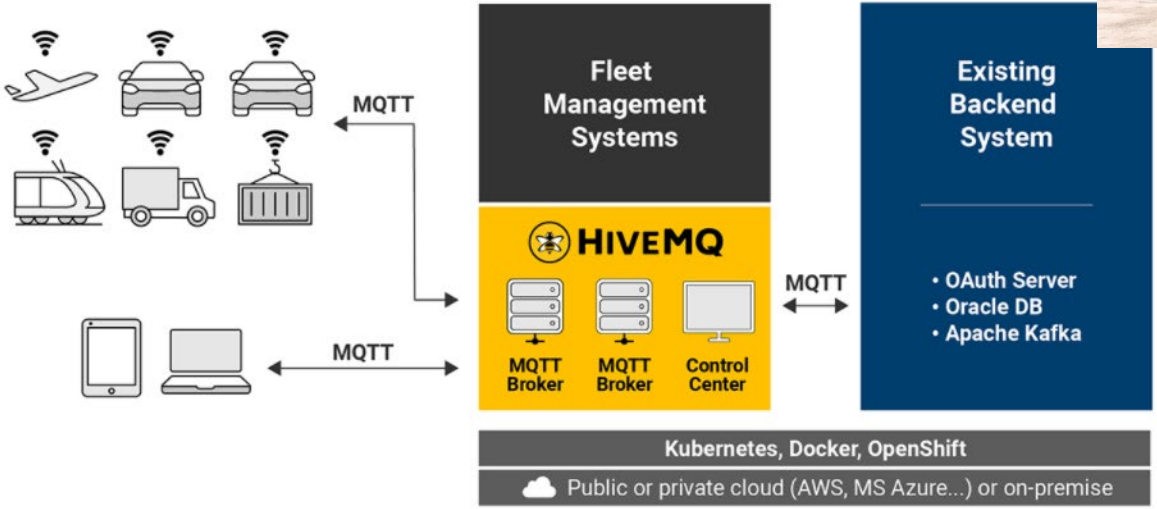
75% of new cars shipped in 2020 will have internet connectivity
- Business Intelligence

Vehicles currently on the road have **60 – 100** sensors onboard. This number is projected to increase to **200+** by the year 2020.

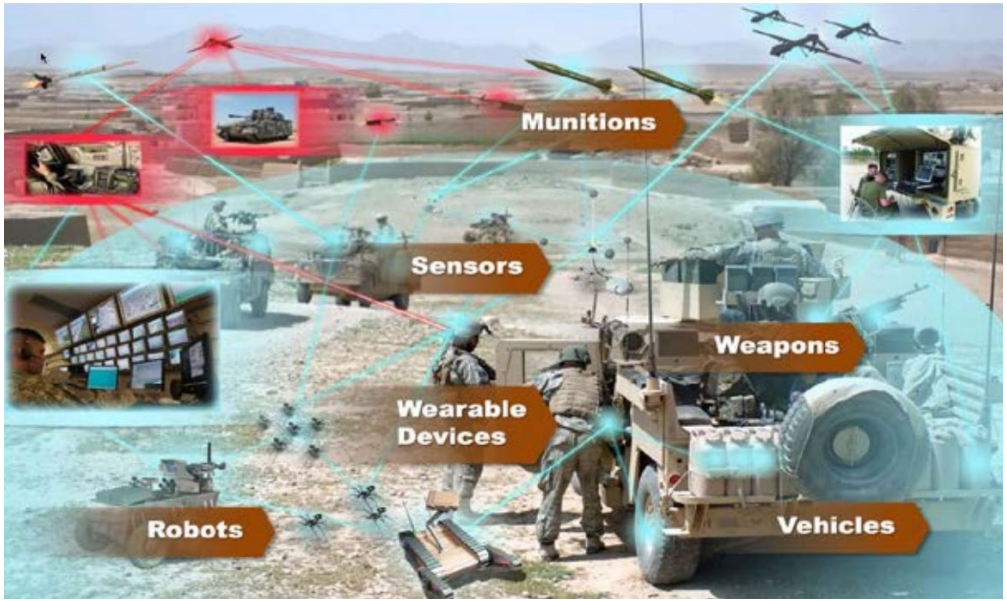


- Sources: Gartner, Strategy&, Mems Journal

Logistics

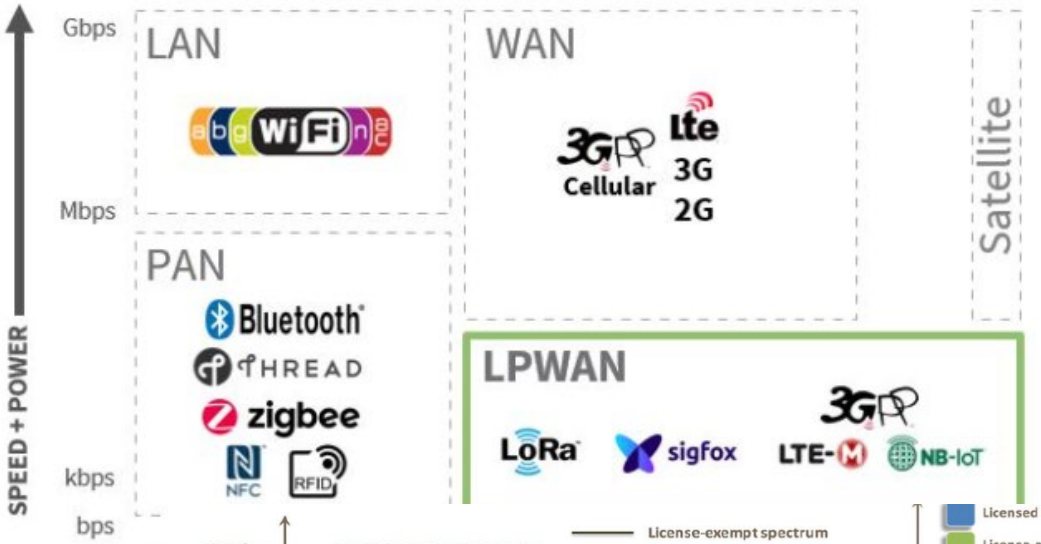

MQTT
MQTT
Fleet Management Systems
HIVEMQ
MQTT Broker
MQTT Broker
Control Center
MQTT
Existing Backend System
• OAuth Server
• Oracle DB
• Apache Kafka
Kubernetes, Docker, OpenShift
Public or private cloud (AWS, MS Azure...) or on-premise

Military Application



Enabling Technologies

Wireless Networks



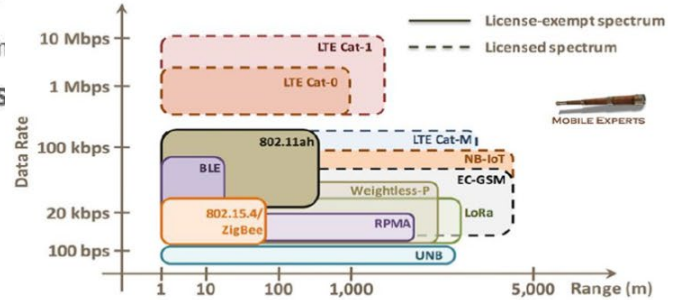
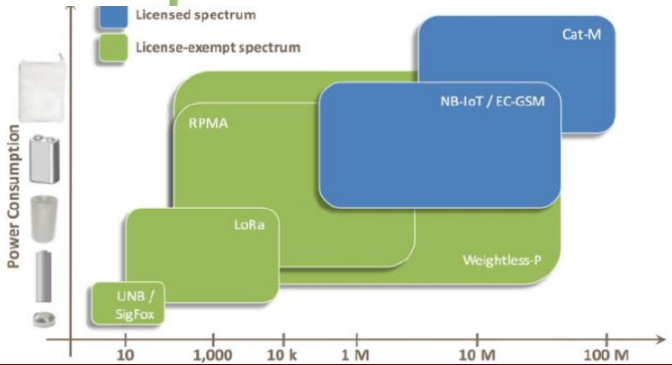
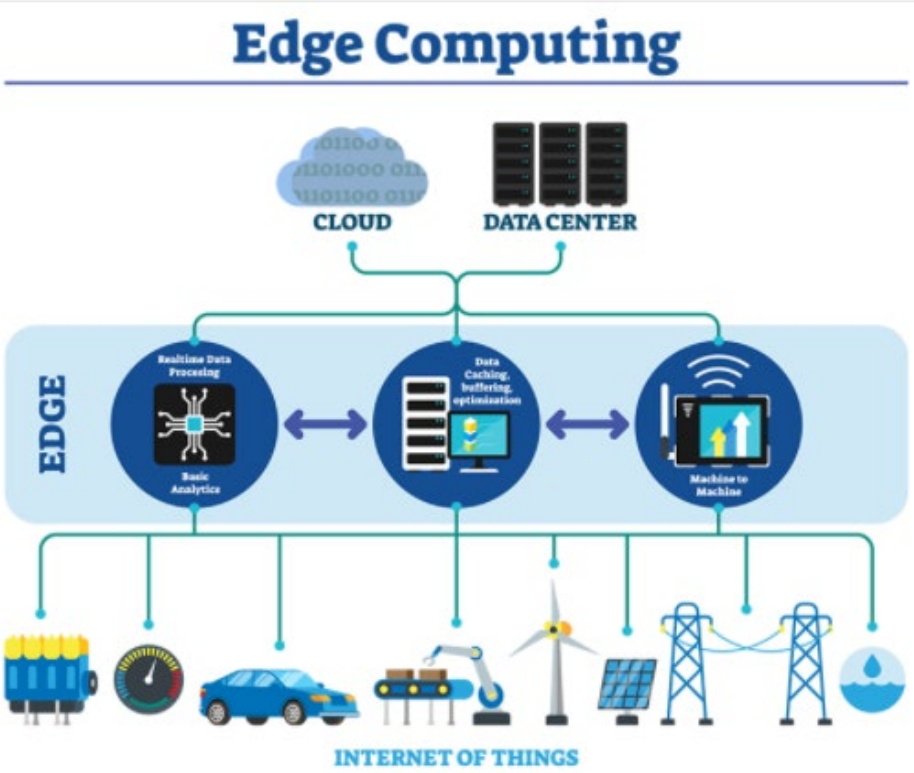


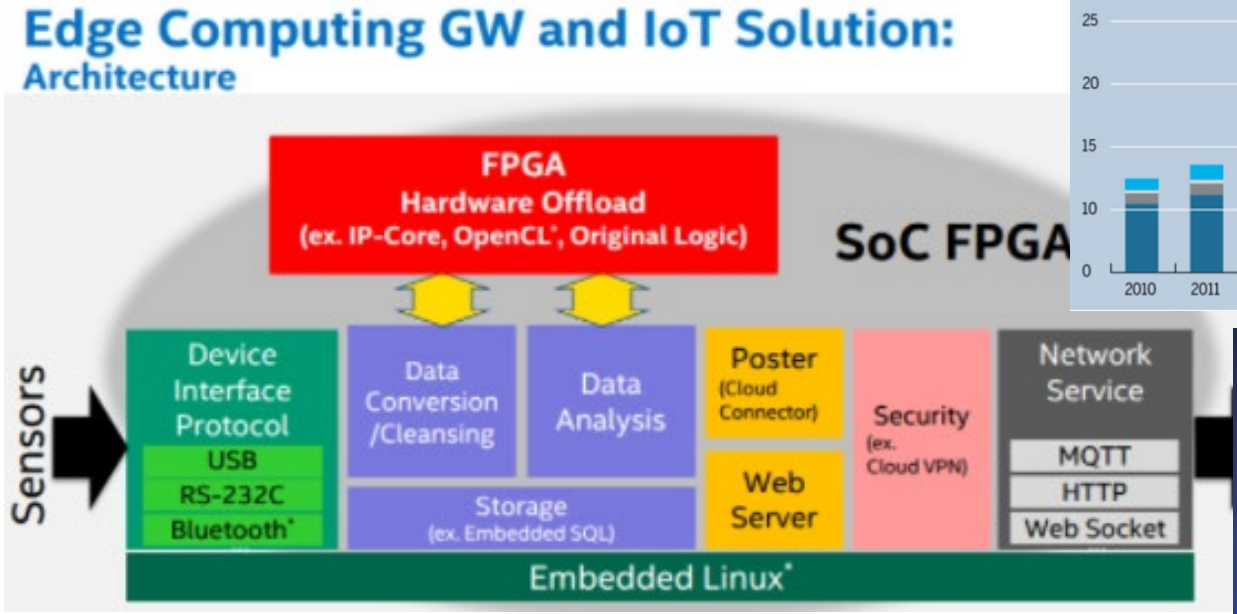
Figure 1 Range vs. data rate for IoT connectivity technologies.

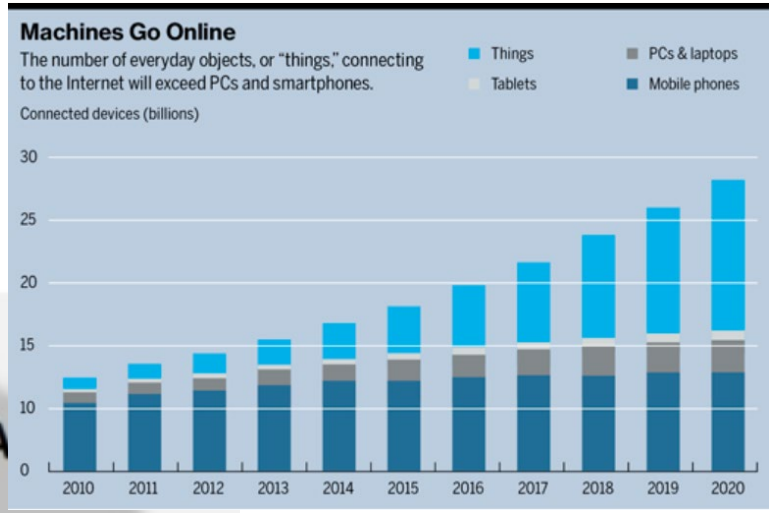


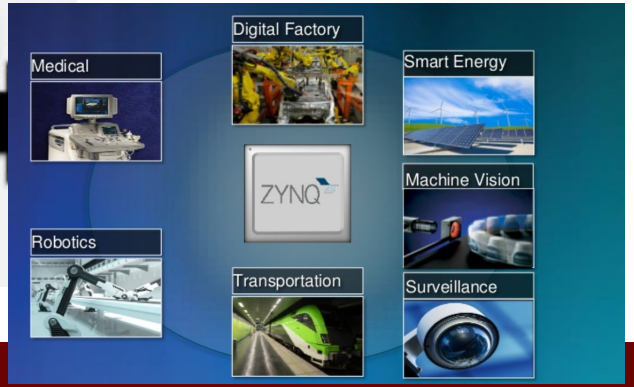
Cloud Computing



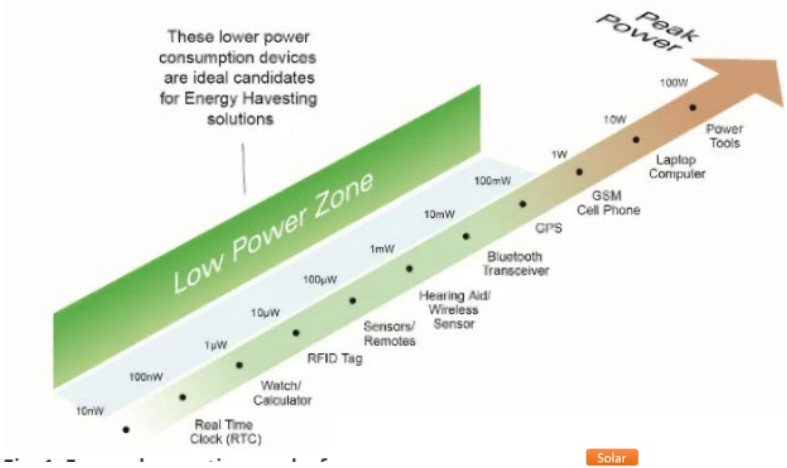
Advanced Hardware

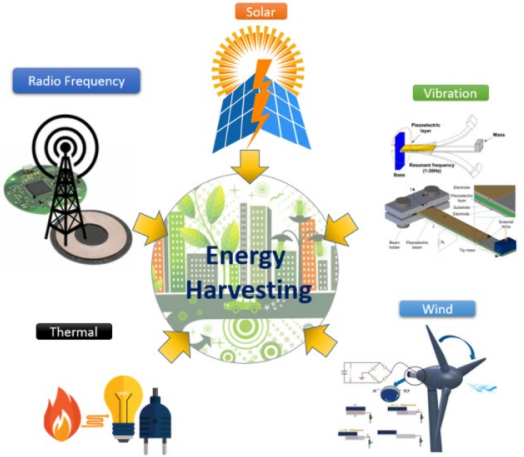






EnergyTechnologies





AI Technology