

# Living on the Edge (of computing) IoT Systems / Applications

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# IOT Mantra

→ any device which  
can be connected  
will be connected ←

year 2025: > 30 BILLION devices!



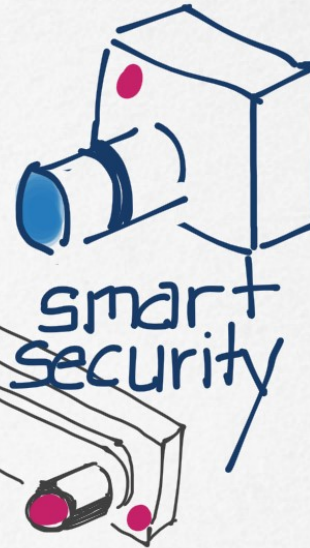
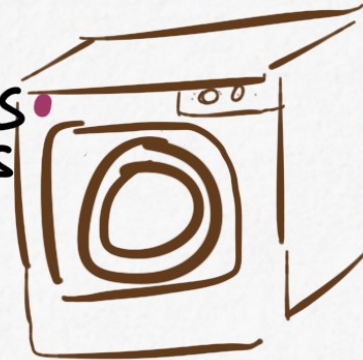
smart  
thermostat



smart  
lights  
&  
smart  
appliances



✓ reminders  
✓ recommendations  
✓ lowered expenses  
✓ time savings



smart  
security

smart  
assistant  
(Alexa/  
Google/  
Siri)

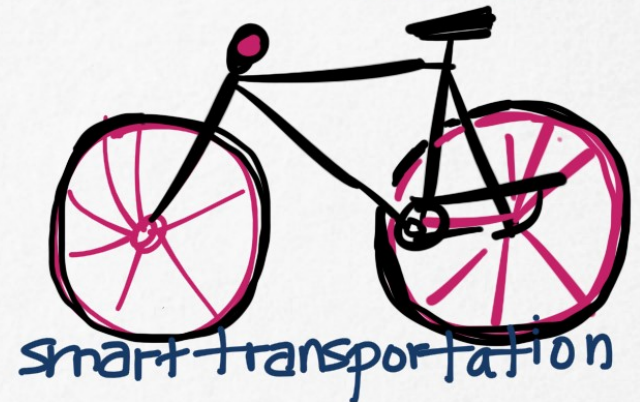


YOUR IOT  
LIFE



wearable  
smarts

connected  
e-bike

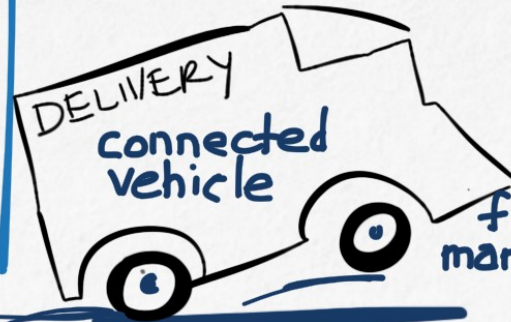


smart transportation



# IOT in Industry

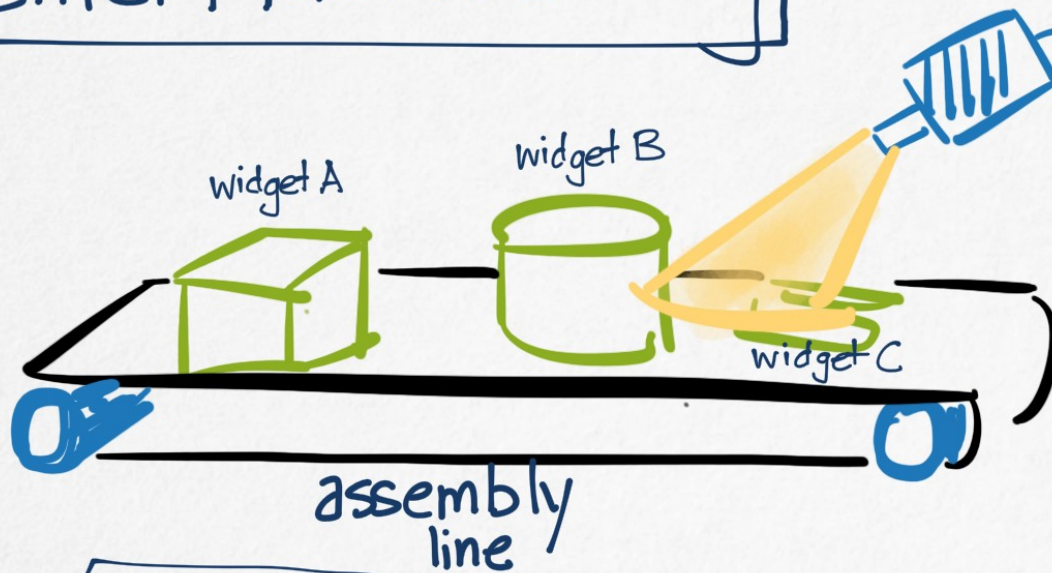
supply chain



optimization:

- ✓ minimize inventory
- ✓ improve production
- ✓ reduce shipments

smart manufacturing



→ flexible manufacturing  
→ predictive analytics  
→ cost optimization

Security a priority

→ many industrial operations are apprehensive about being "connected"

→ existing security technologies can be adapted to IOT applications, fortunately!

WIDGET: A  
life expectancy: 10.5 years  
predicted failure: gasket 5a  
anticipated customer rating: 3/5



# technological hurdles

- security
- privacy
- form factor
- energy
- mobility
- bandwidth

a.k.a.  
"the cloud"

global server  
network

cloud-mediated  
intelligence

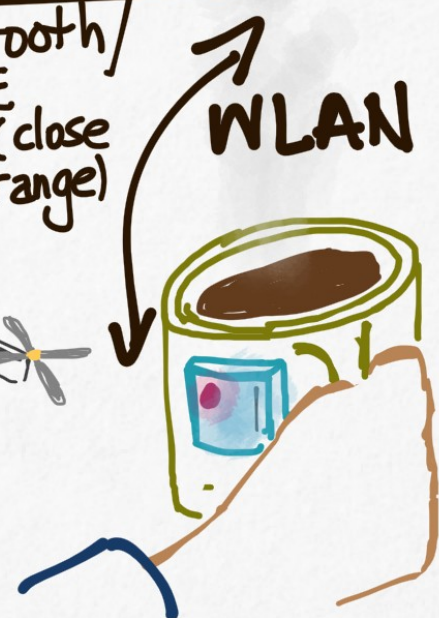
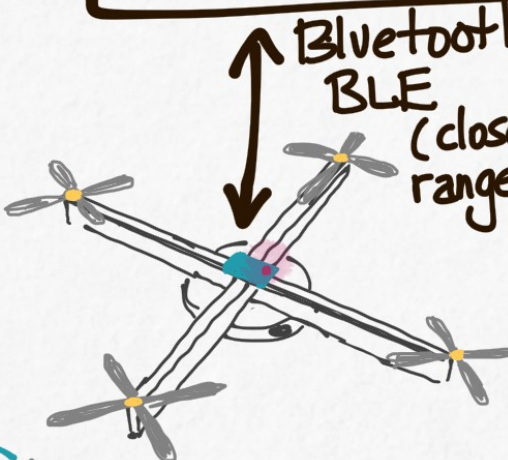
wired/optical fiber  
backbone

cellular WAN  
(long range)

wireless  
communications

Bluetooth/  
BLE  
(close  
range)

WLAN (802.11)





# an embedded IoT module

sophisticated power management

WiFi/BT/BLE/NFC communication module

substantial FLASH memory (mass storage) for Big Data

pcb

embedded processor options:

① powerful Application Processor (e.g., cortex-A arm, Intel Atom, RISC-V)  
→ Linux Capable

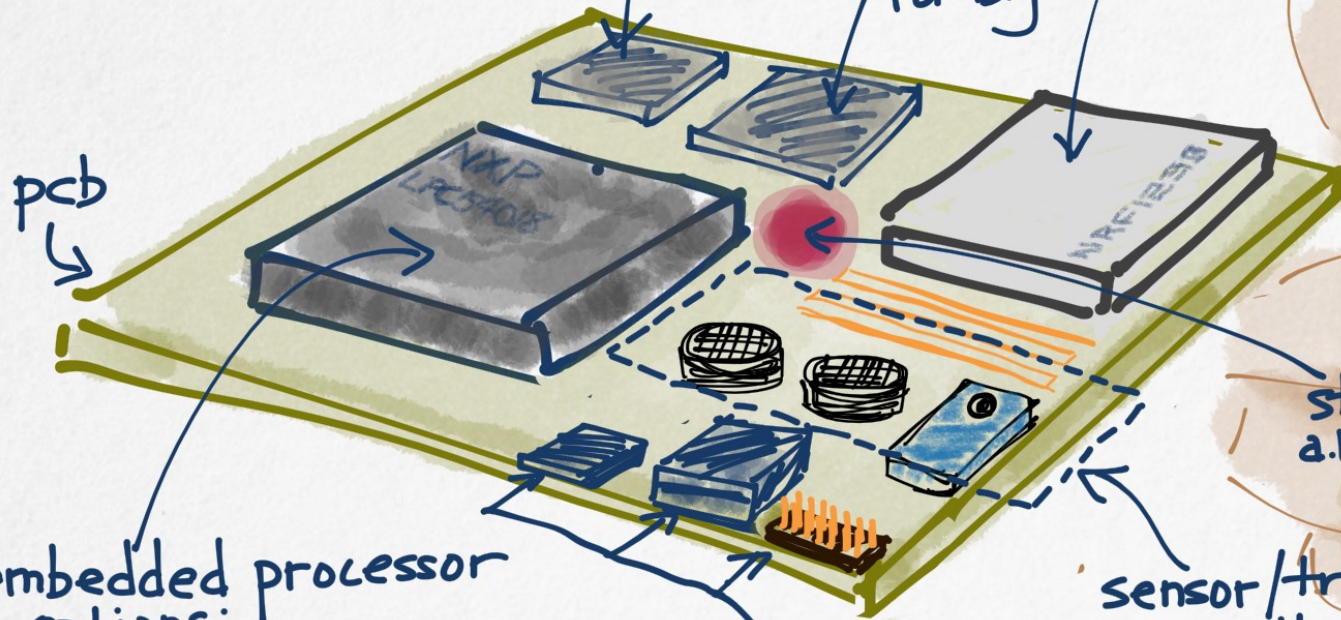
② low-power MCU (e.g., cortex-M arm, Atmel, PIC, etc.)  
→ bare metal or RTOS

status LED (RGB) a.k.a. "HAL's Eye"

sensor/transducer suite

(microphone arrays, temperature/humidity, accelerometer/gyroscope, optical/infrared/near-UV, etc.)

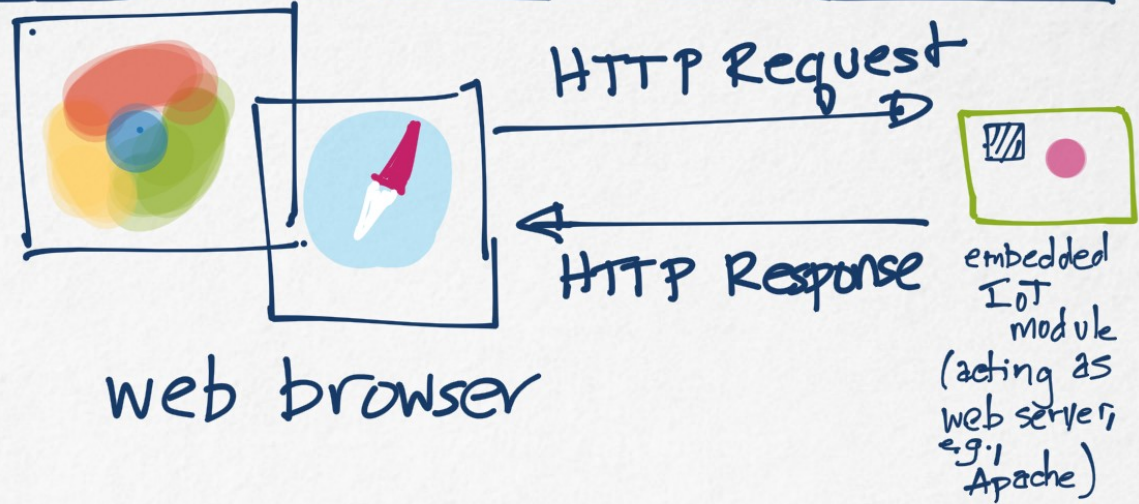
wired peripheral interfaces (USB3.1 now available!)



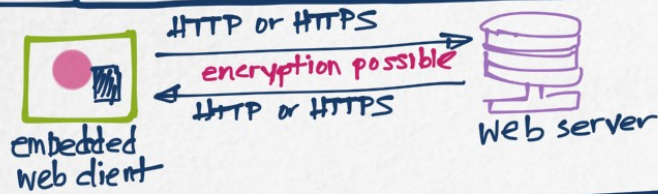


# Some IoT Communication Setups

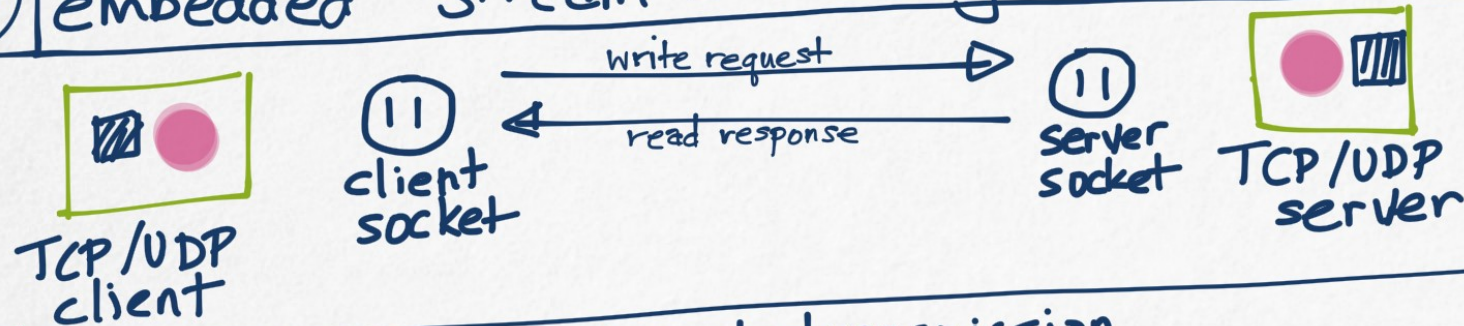
## ① embedded web server



## ② embedded web client



## ③ embedded stream and datagram sockets



## ④ secure MQTT-based transmission

