# 6.808 Mobile and Sensor Computing

## aka IoT Systems

Lecture #5 (part 1)

Network Connectivity for IoT Systems

# BATTERY LIFETIME CALCULATION

Consider an IoT system with coin-cell battery-powered nodes
Battery: 250 mAh (milliamp-hours) capacity; 3 Volts
Recall that power = voltage * current and energy = power * time
So this battery has 0.75 amp-hour-volts = 0.75*3600 Joules = 2.7 kJ of energy

Example of BLE current draw:
Standby: 1 microAmp (typically in the 1-10 microAmp range)
Receive (RX): 3.3 mA
Transmit (TX): 4 mA

Suppose device transmits every second: how long does the battery last?

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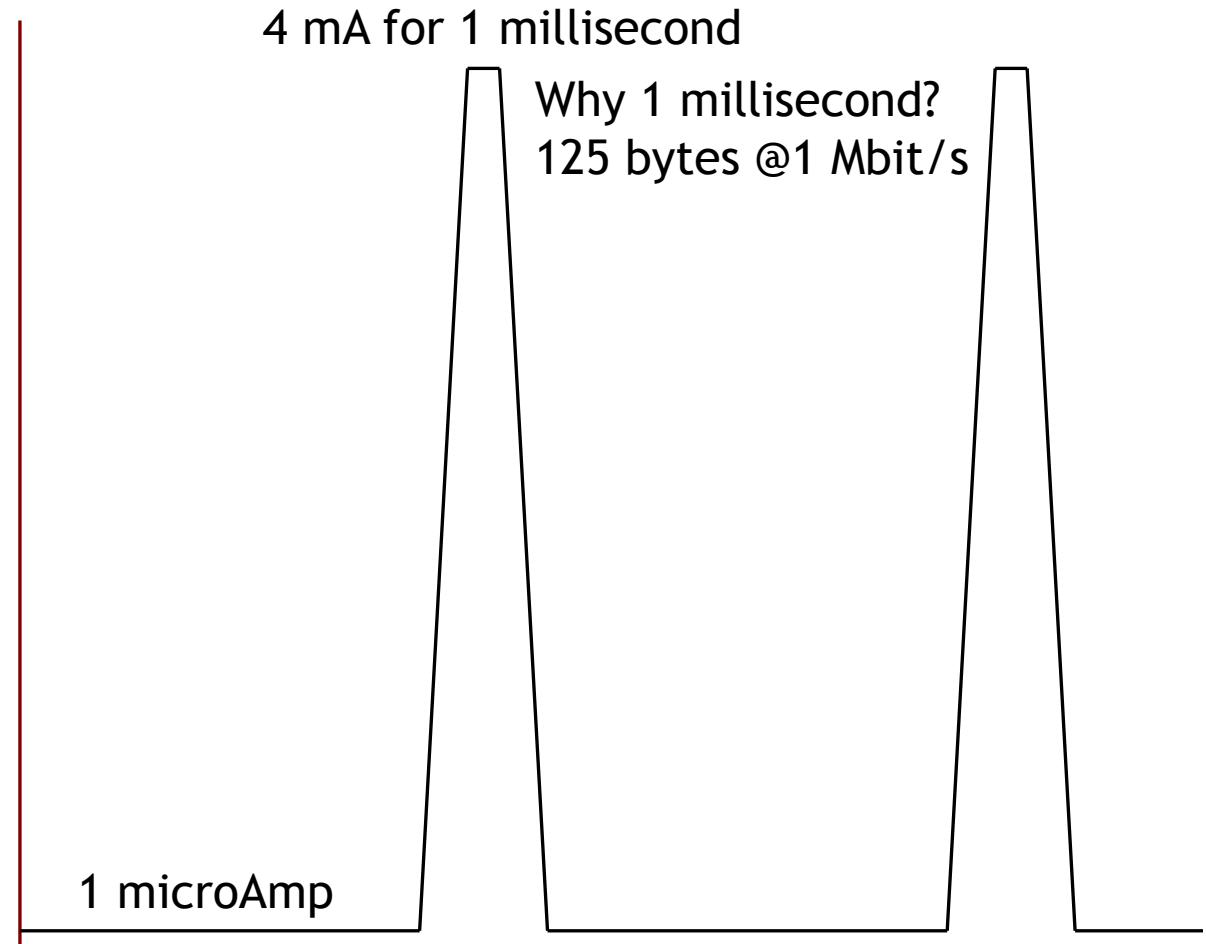
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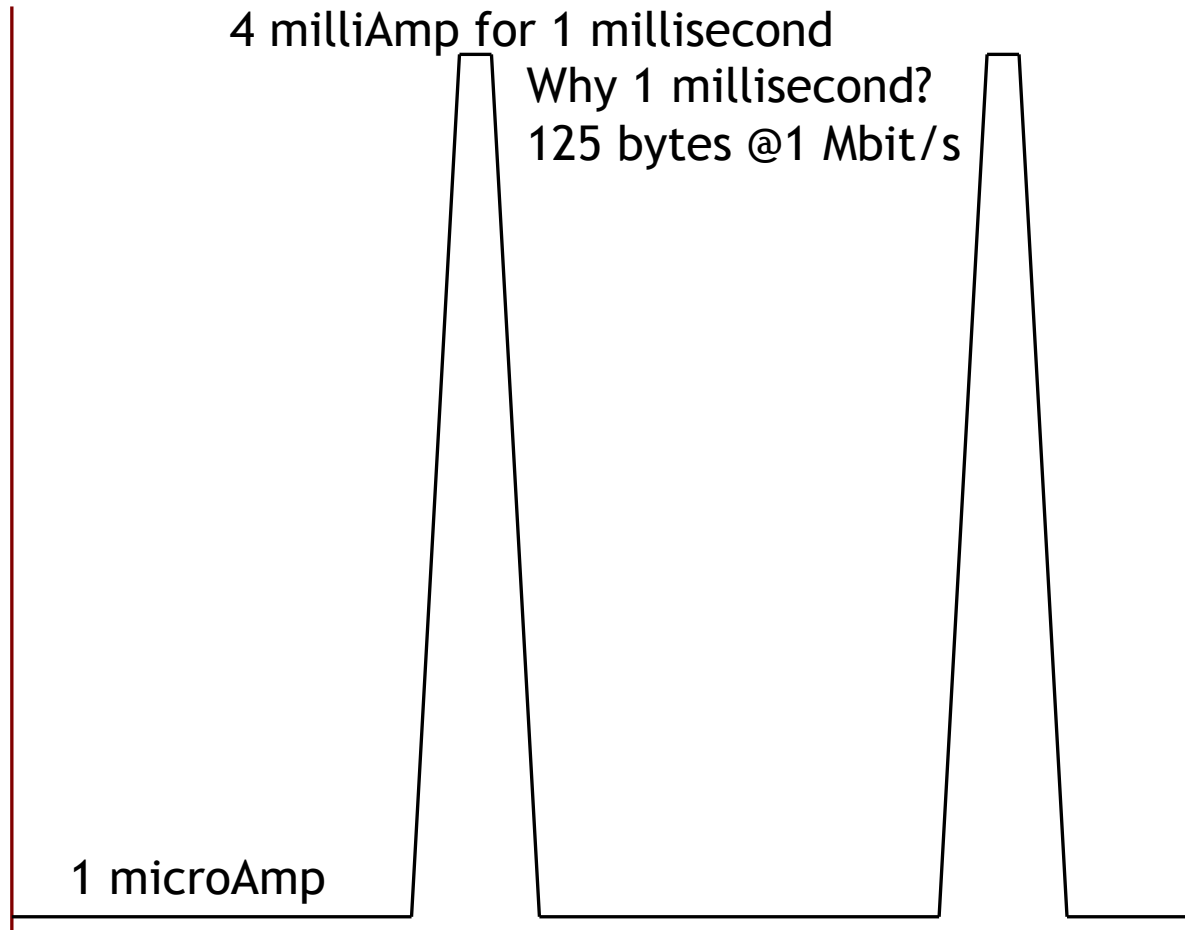Receive (RX): 3.3 mA

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4 mA for 1 millisecond

Why 1 millisecond?
125 bytes @1 Mbit/s

1 microAmp

# BATTERY CALCULATION (CONT.)

4 milliAmp for 1 millisecond
Why 1 millisecond?
125 bytes @1 Mbit/s

1 microAmp

Battery capacity: 250 mAh (milliAmp-hours)
Ramp-up and down: 1 milliAmp for 5 milliseconds

Average current drawn is:
4 microAmps (xmit) +
5 microAmps (ramping) +
1 microAmp (standby)
= 10 microAmps

Therefore, battery lifetime
= 250 mAh / 10 microAmps
= 250 mAh / 0.01 mA
= 25,000 hours
= 2 years and 10 months

Saves energy because it's sleeping most of the time!

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Any phone talking with any peripheral device via BLE

- Phone as IPv6 router for peripheral device
- Phone proxies a device's Bluetooth profile to cloud servers

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Is this a good idea? Will it work?

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Is this a good idea? Will it work?

Value is in the data, not connectivity
Incentives are a problem
  For device makers?
  For app developers?
  For smartphone users?