

SENSOR NETWORKS

Java

EMBEDDED

# Safe Harbor Statement

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.



MONITOR

TEMPERATURE

SENSOR

NETWORK

# SENSOR NETWORK

- Built of sensor nodes
- Different network topologies
- Small and wide range networks possible
- Data is passed to a gateway node
- Sensor nodes running on batteries

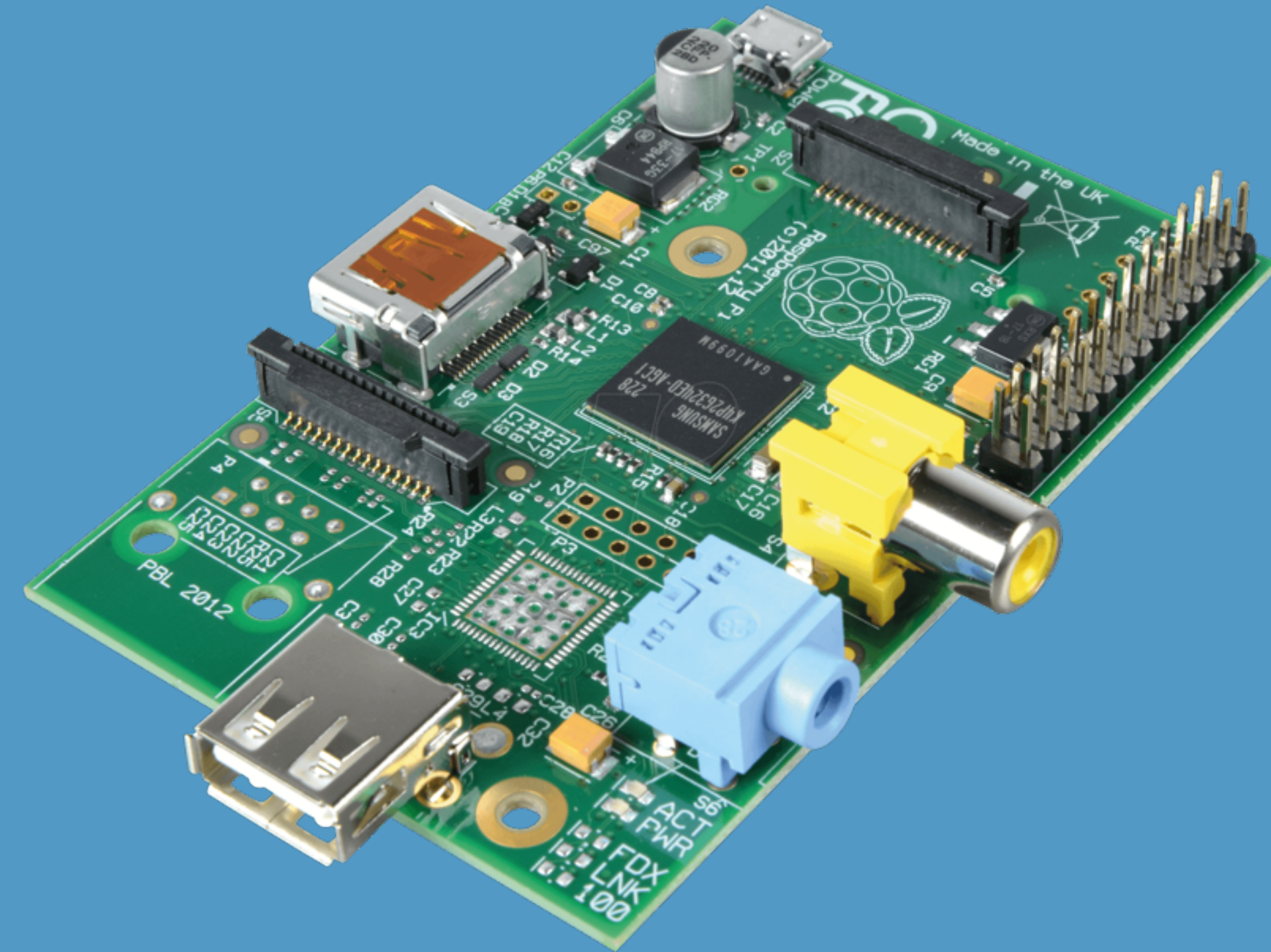
POSSIBLE

SENSOR NODES



# RASPBERRY PI

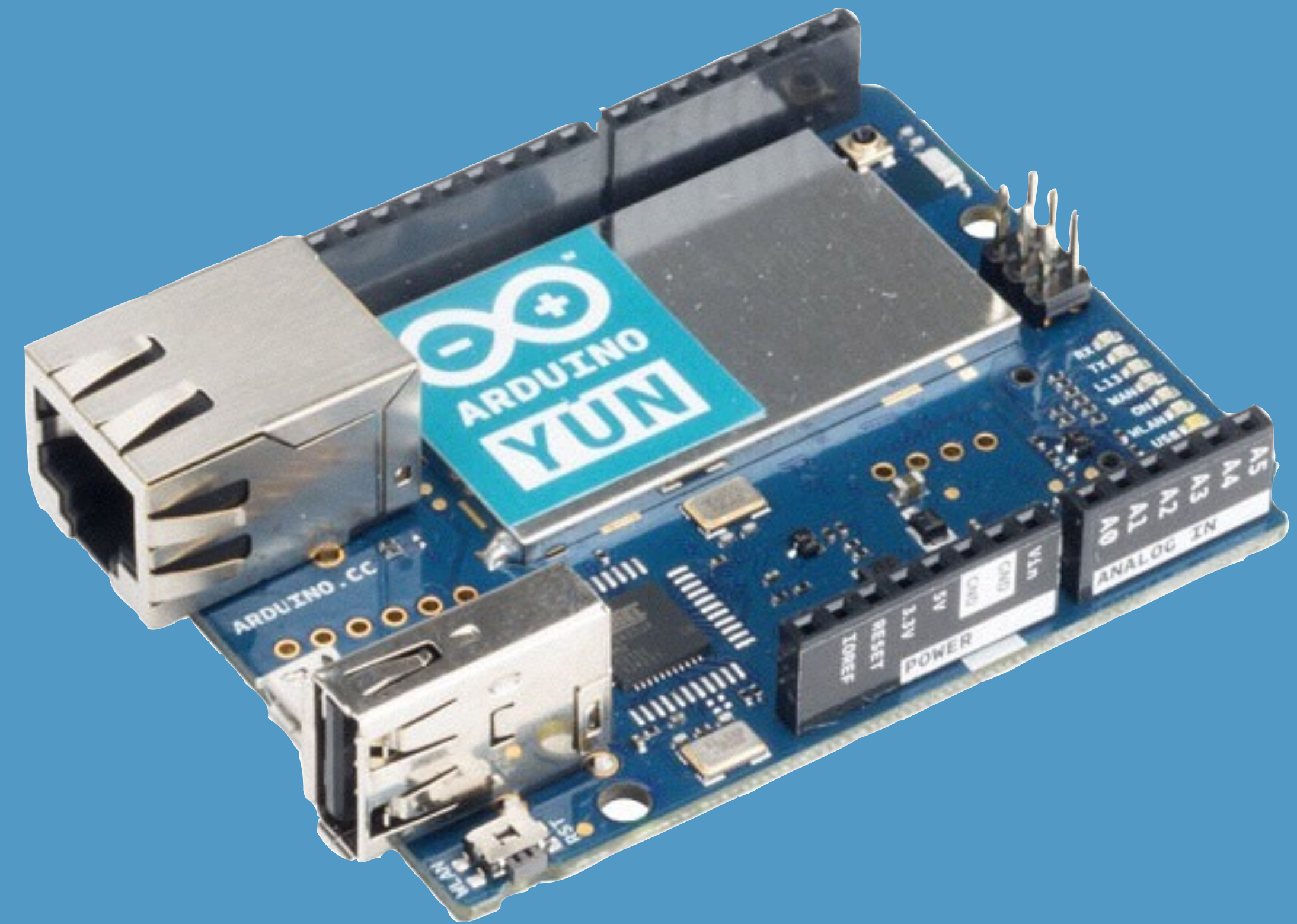
- Needs Power Supply
- 300 - 600 mA
- Form Factor
- Limited I/O
- Overkill





# ARDUINO YUN

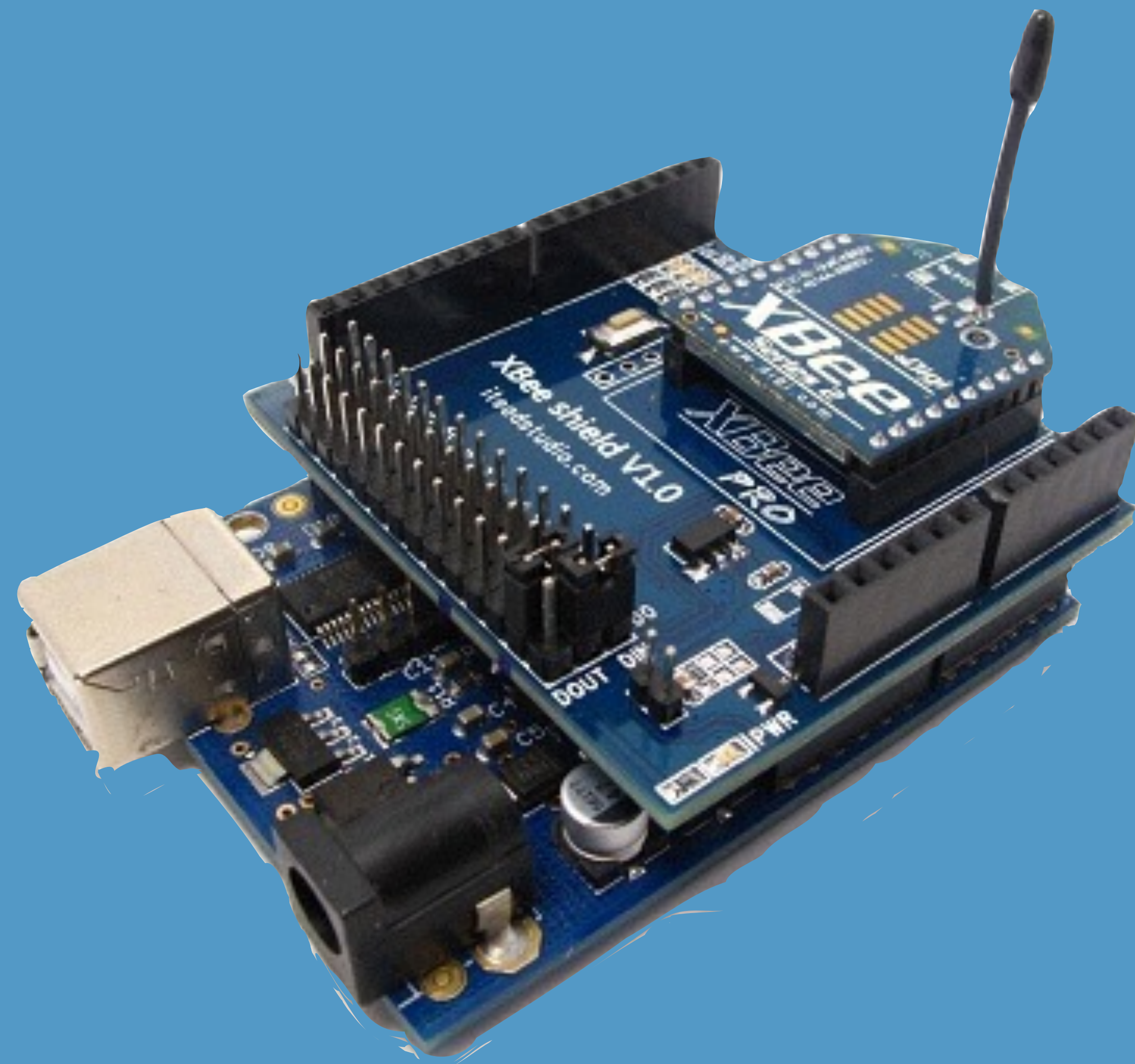
- Needs Power Supply\*
- 250 - 300 mA
- Pricy
- A bit Overkill





# ARDUINO + XBEE

- Power Supply\*
- 75 - 140 mA
- Form Factor
- A bit Overkill





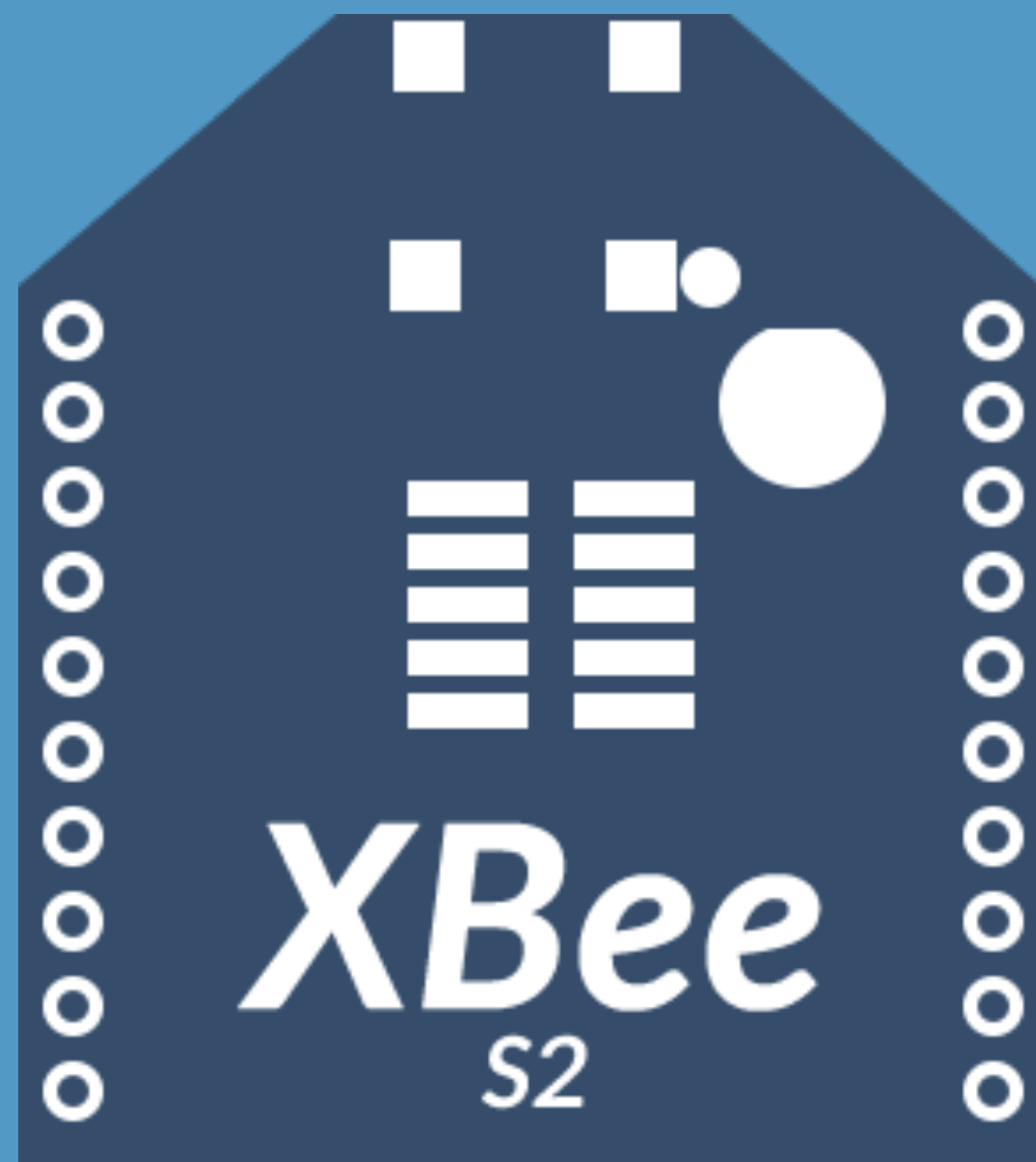
# XBEE

- Runs on batteries
- 45 - 90 mA
- Very small
- Cheap



XBEEE

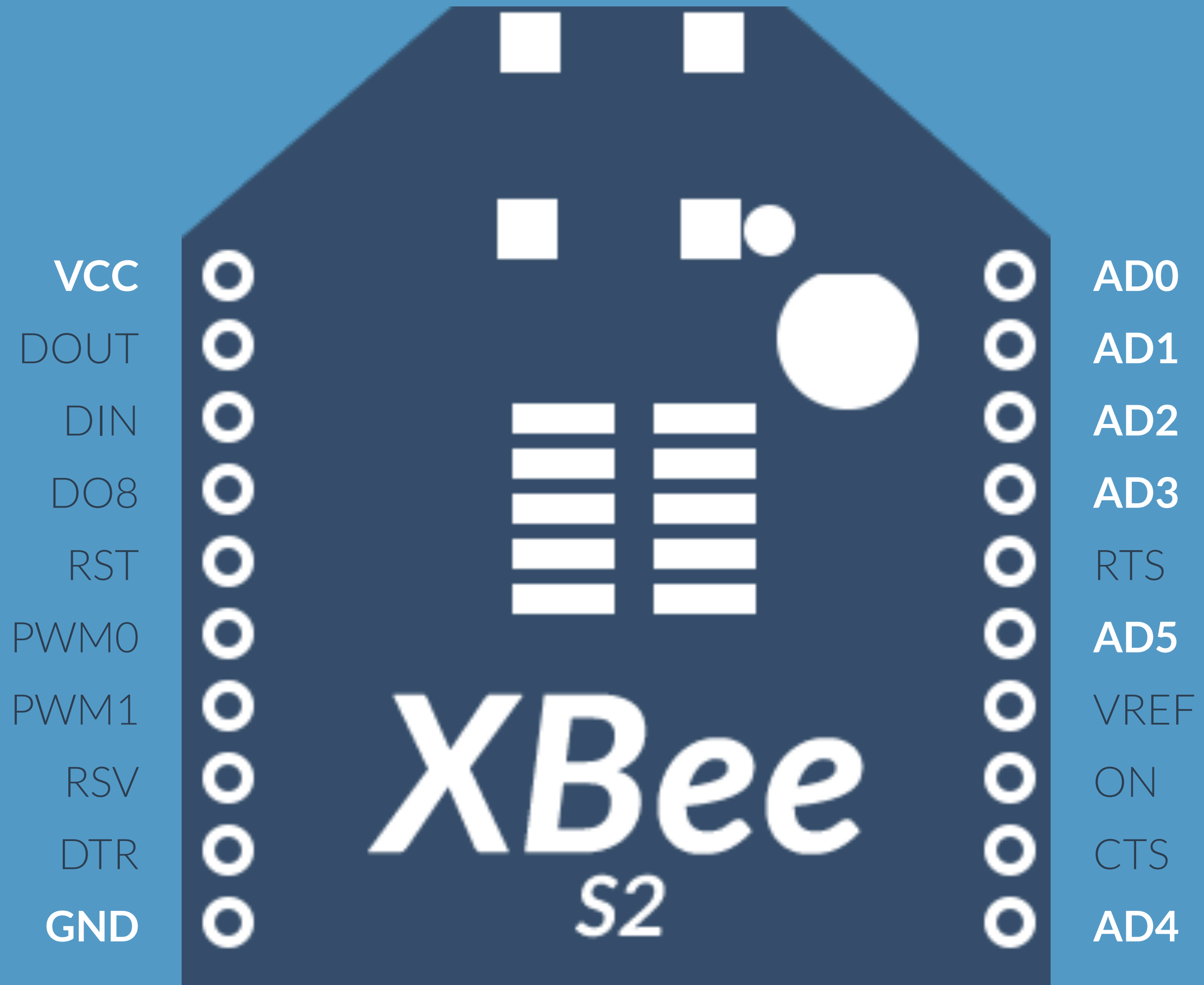
# XBEE



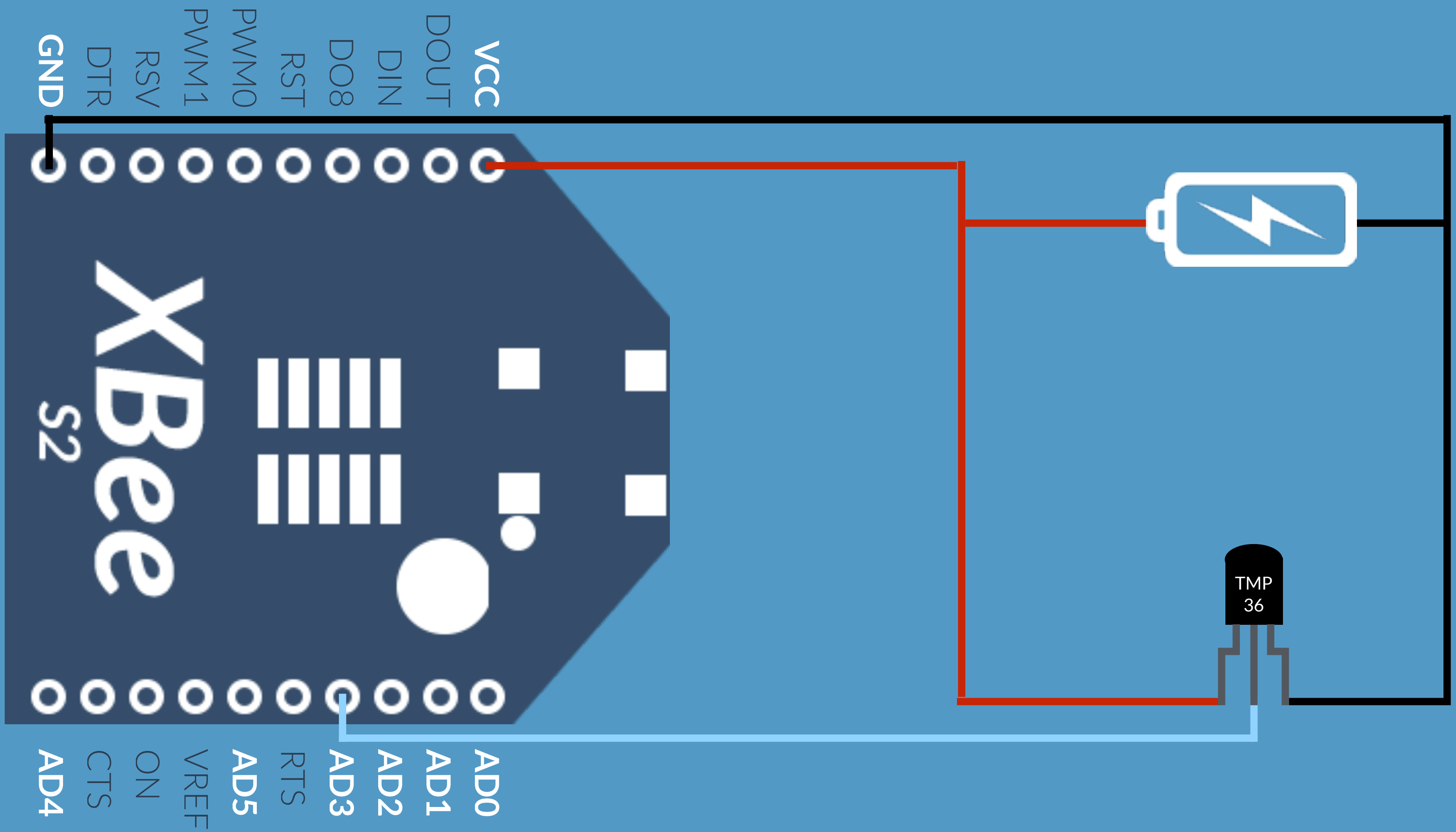
- 2.4 GHz at 2mW
- Indoor range up to 40m
- Outdoor range up to 120m
- 2.8 - 3.6 Volt
- -40 - 85°C operation temperature
- Tree, Star and Mesh support
- Programmable via AT cmd
- Wake-up time ~30ms
- ZigBee standard (IEEE 802.15.4)



# XBEE



# XBEE SETUP

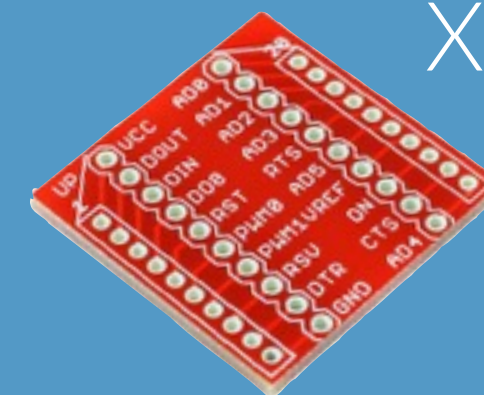




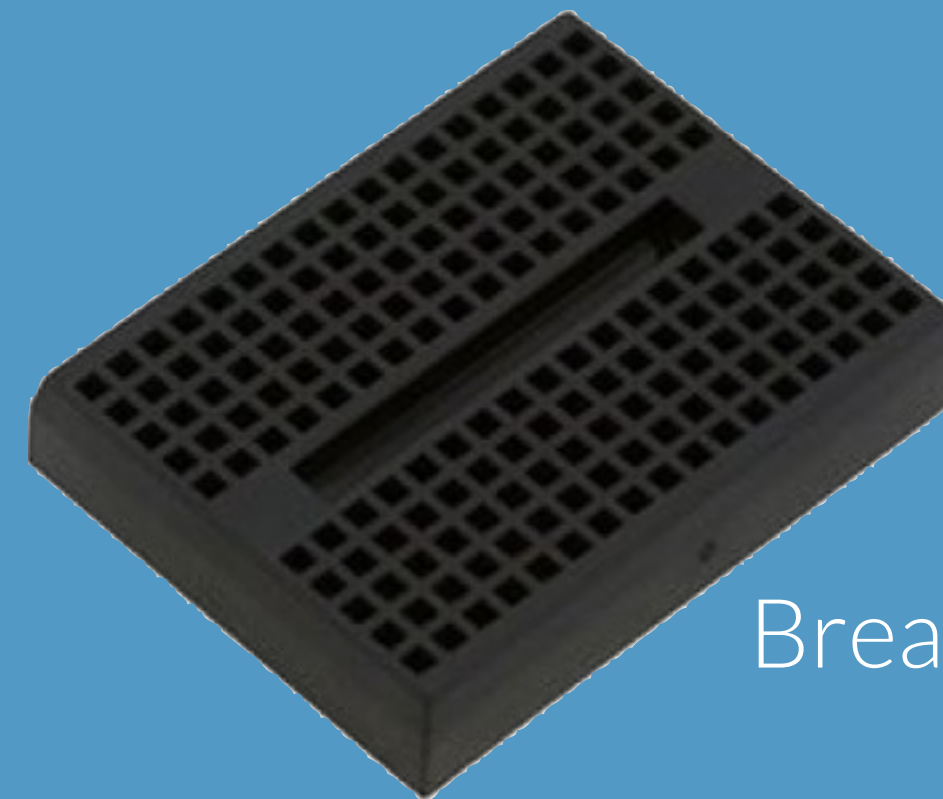
# SENSOR NODE



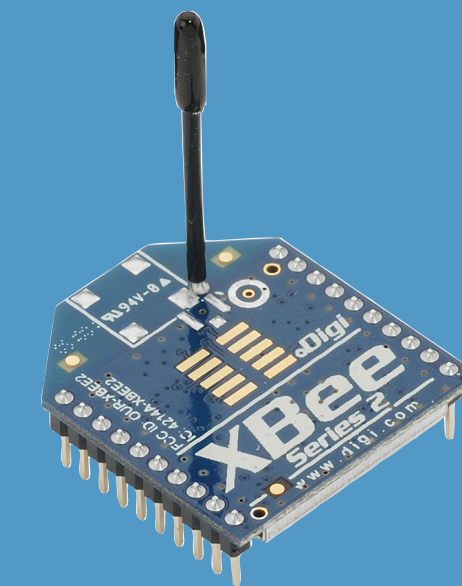
Case



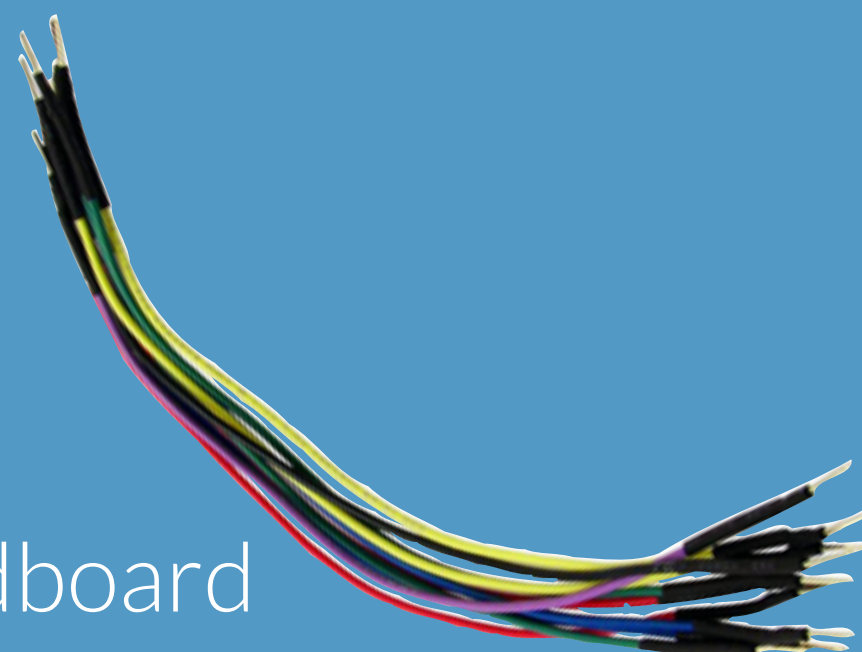
XBee adapter



Breadboard



XBee S2



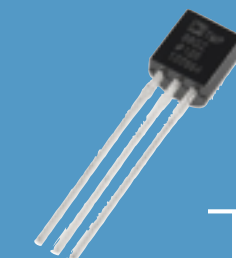
Breadboard cables



Li Battery



Battery holder

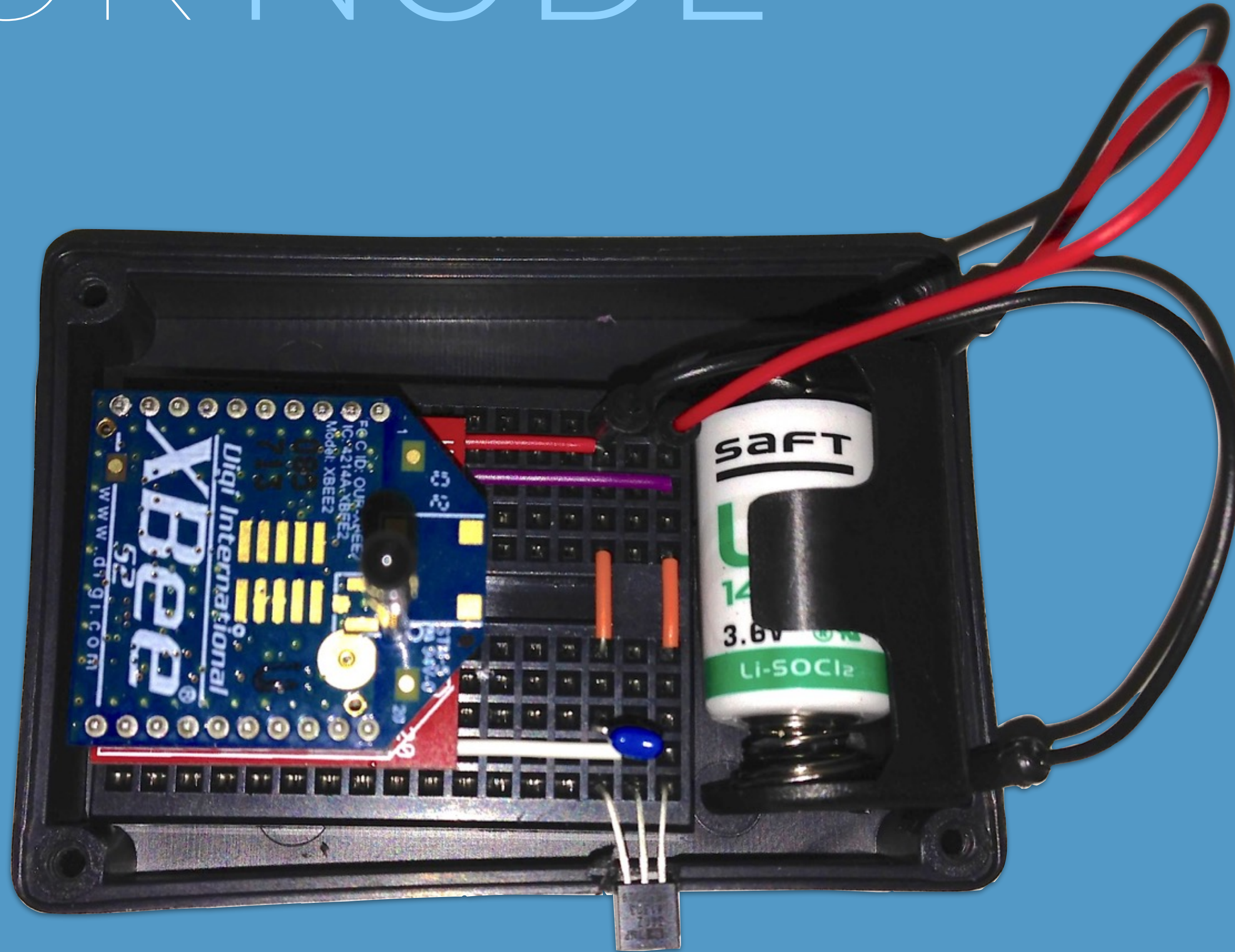


TMP36



# SENSOR NODE

5 cm





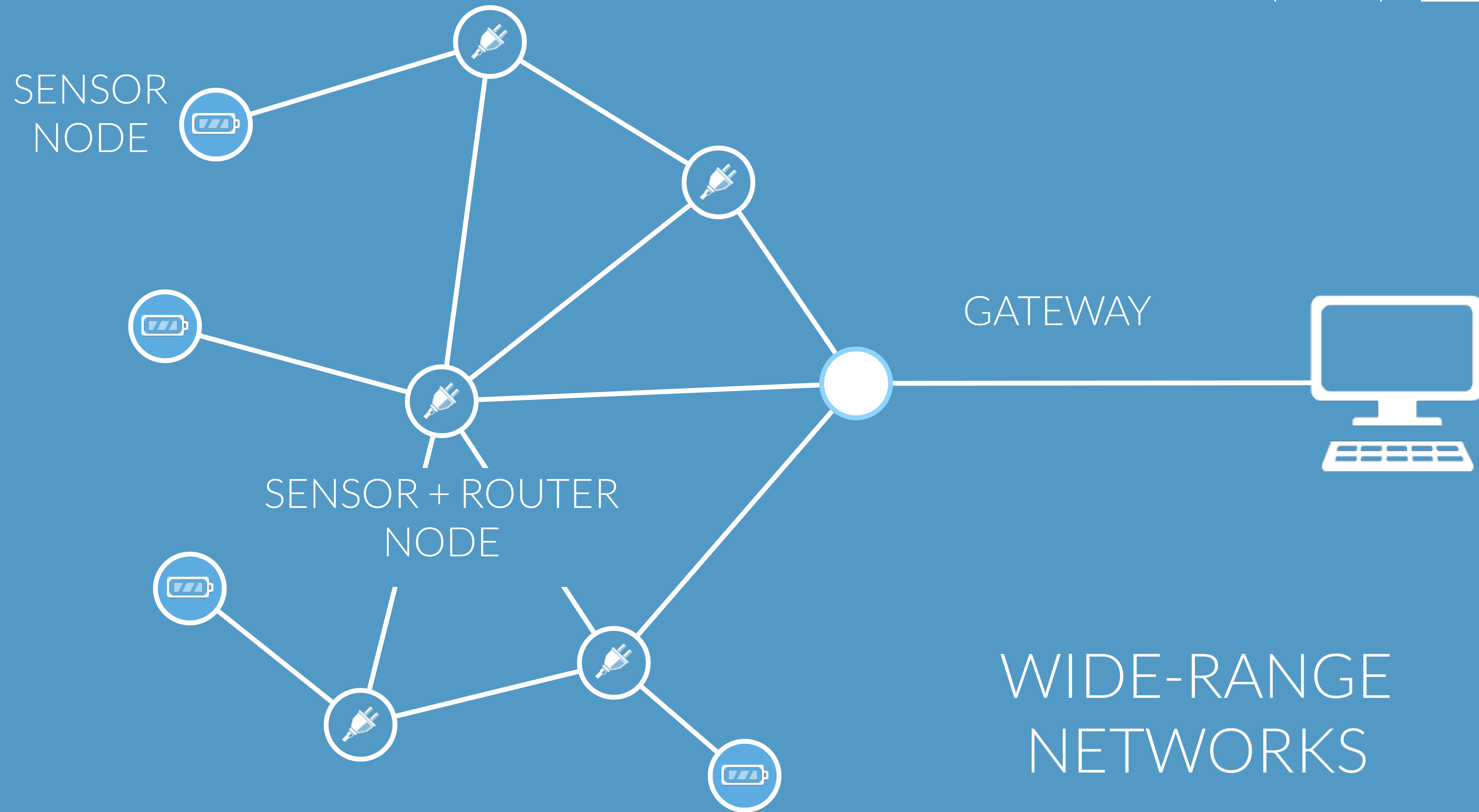
SENSOR NODE

35 €

POSSIBLE NETWORK

# TOPOLOGIES

# MESH



# MESH TOPOLOGY

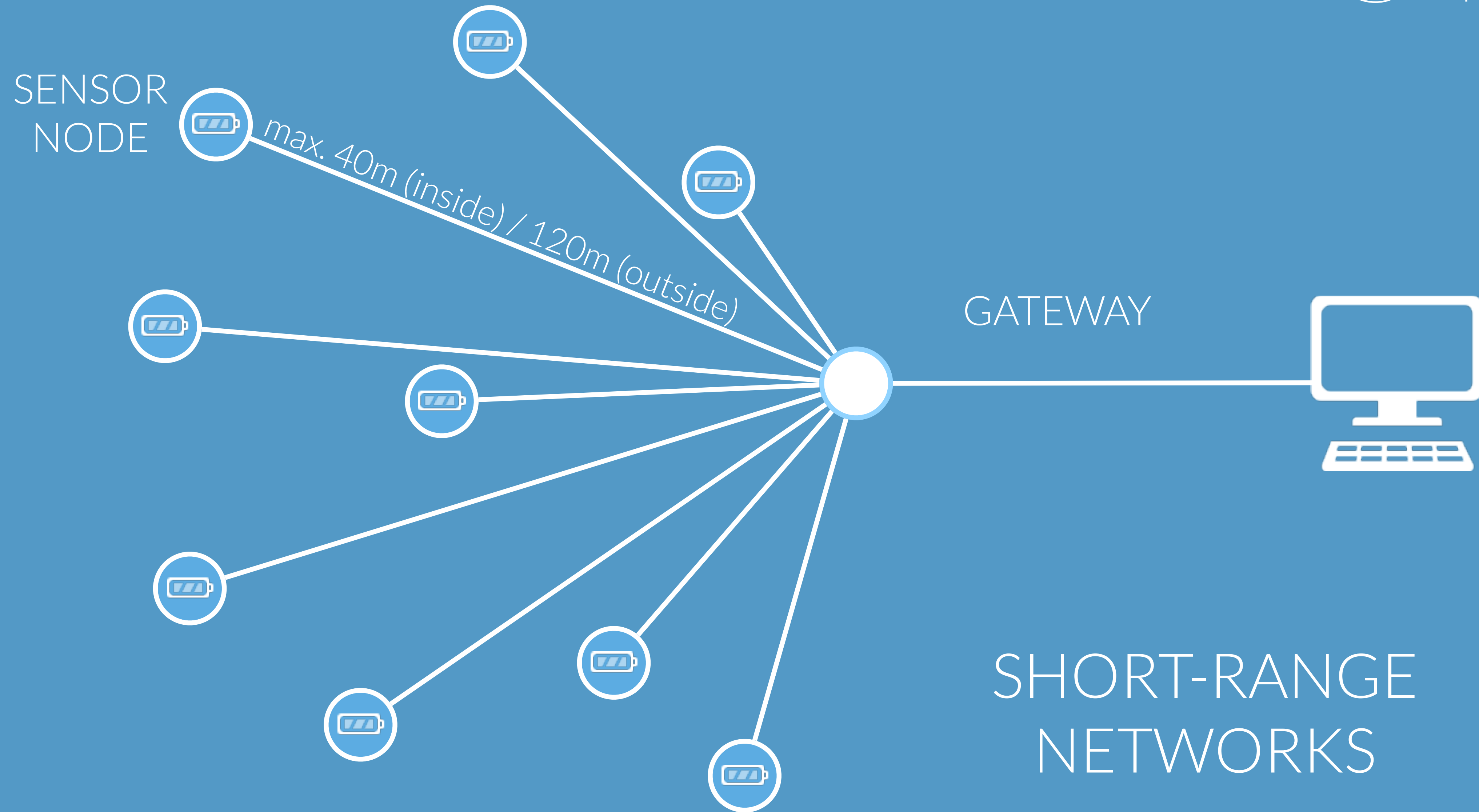


- Self healing
- Wide range
- Alternative routes



- Broadcast
- Complex setup
- Higher power consumption

# STAR





# STAR TOPOLOGY

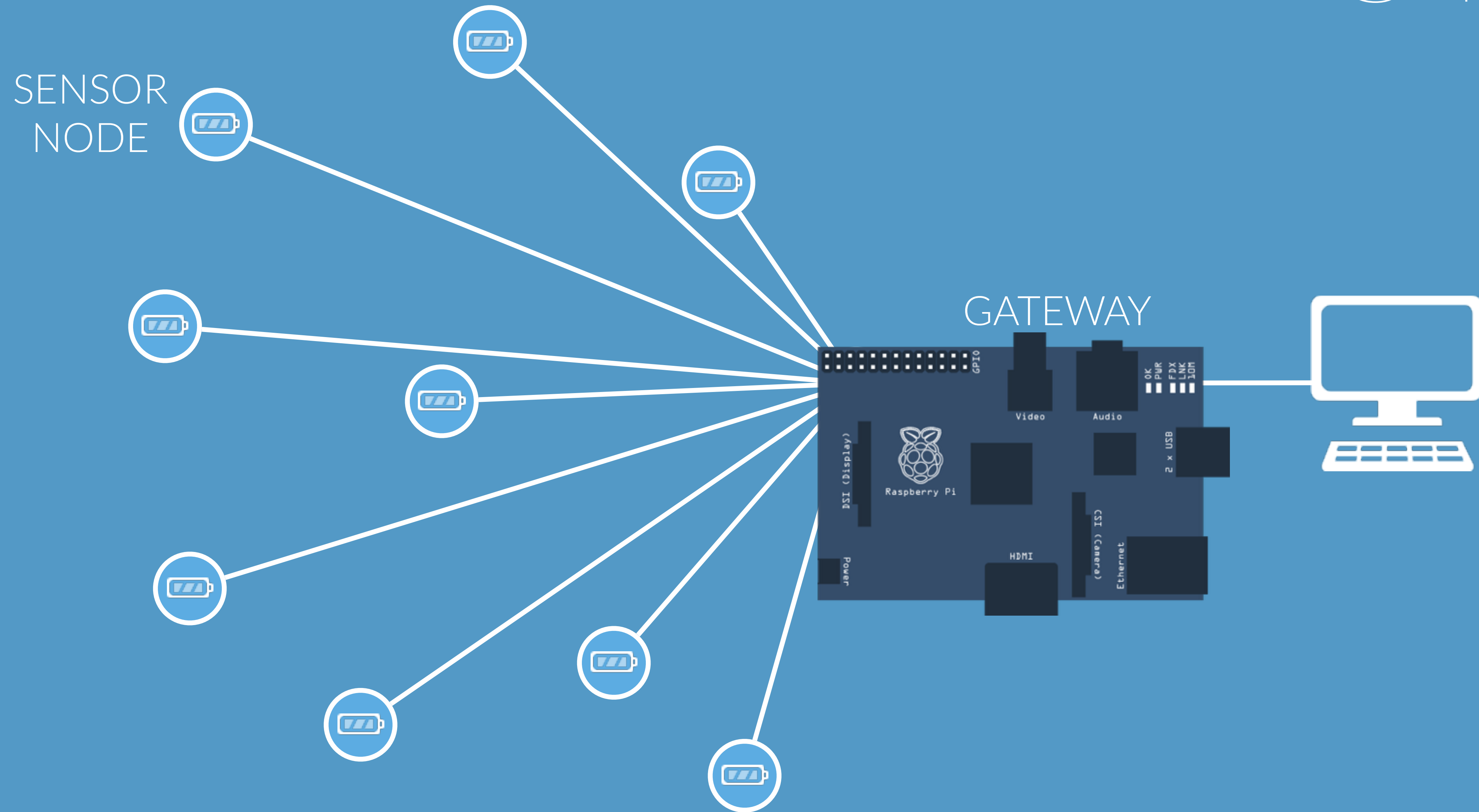


- Easy setup
- Low power consumption
- Easier to maintain

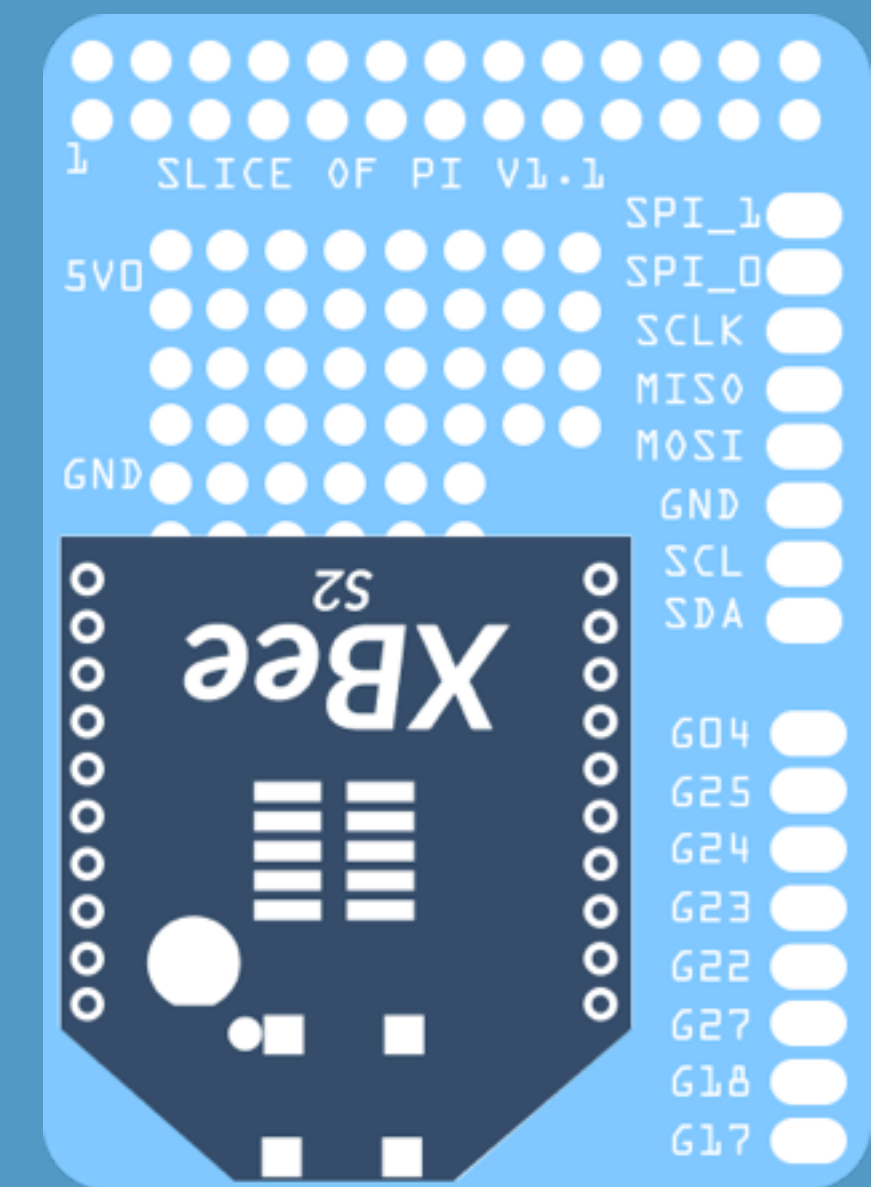
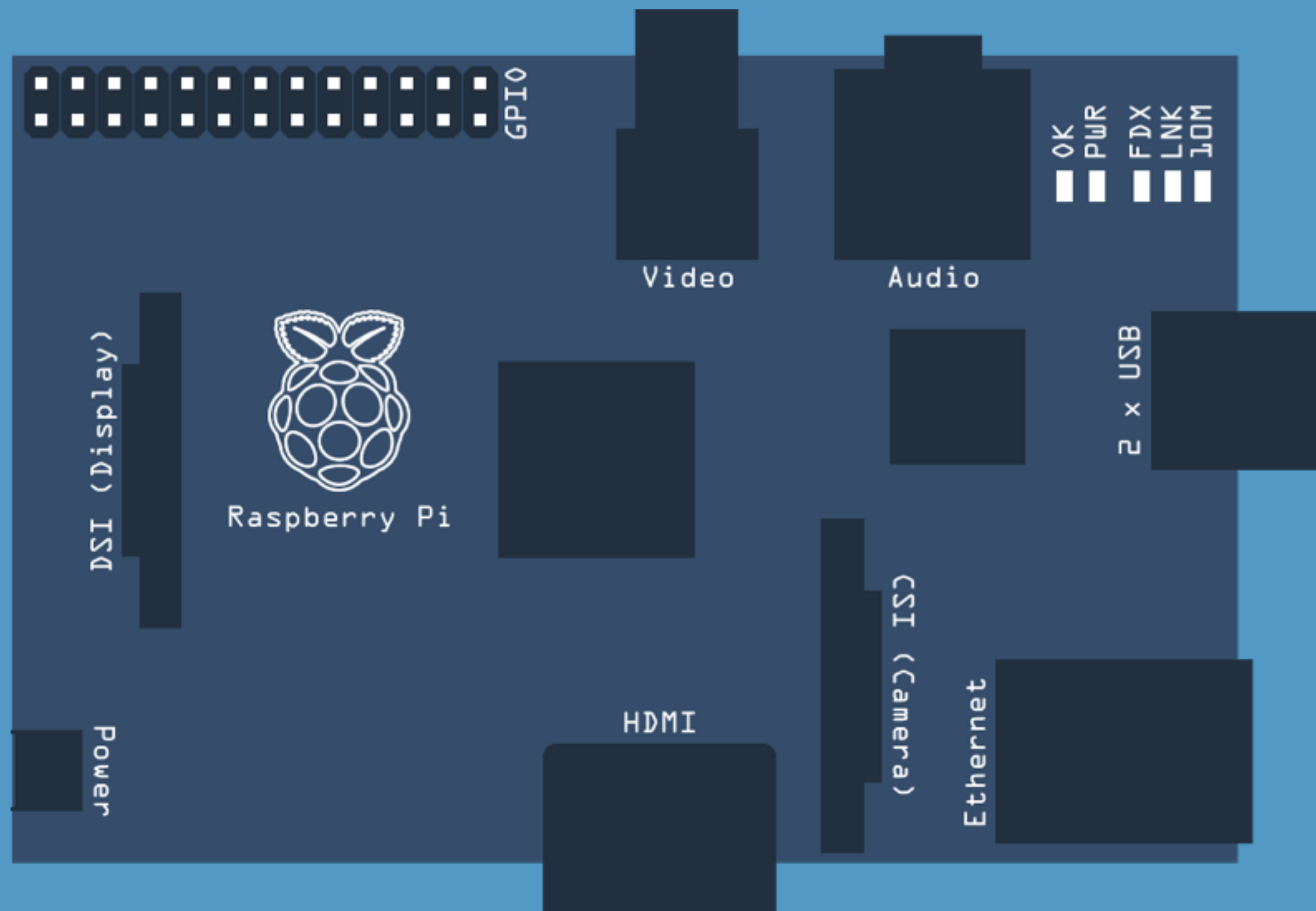


- Short range
- Gateway is bottleneck
- No Interaction between nodes

# STAR

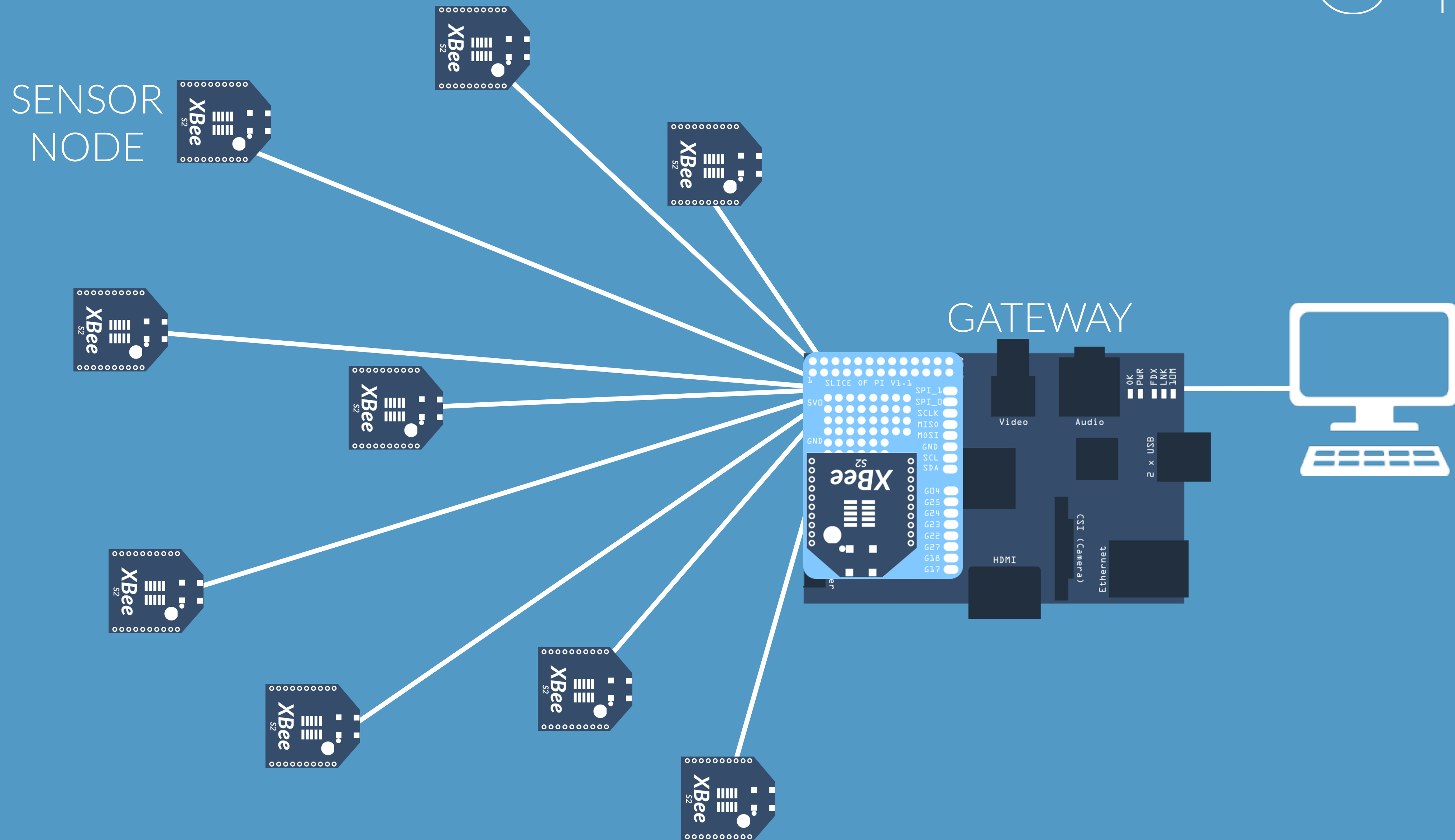


# GATEWAY



Slice of Pi

# STAR



# RASPBERRYPI SETUP

- Debian Wheezy Linux hard float
- JDK 8 for ARM
- Slice of Pi add on board
- XBee Series 2 (configured as gateway)
- Access Xbee using Java xbee-api



# RASPBERRYPI SETUP

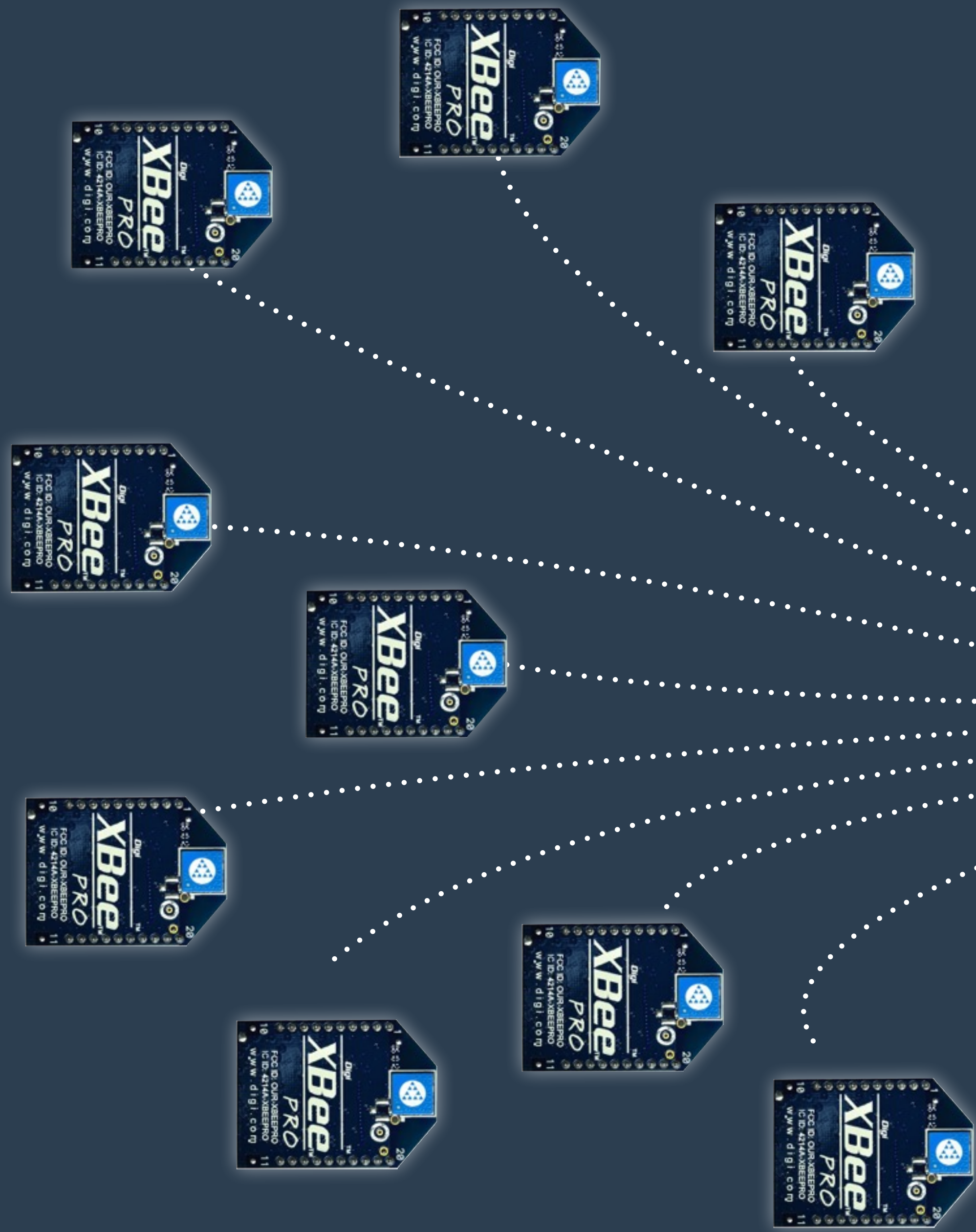
- Store every 10 minutes to database
- Publish live Xbee data via MQTT
- Push notifications to mobile clients every hour
- Tweet Xbee data every hour
- Populate Xbee data via XMPP on demand

FINAL

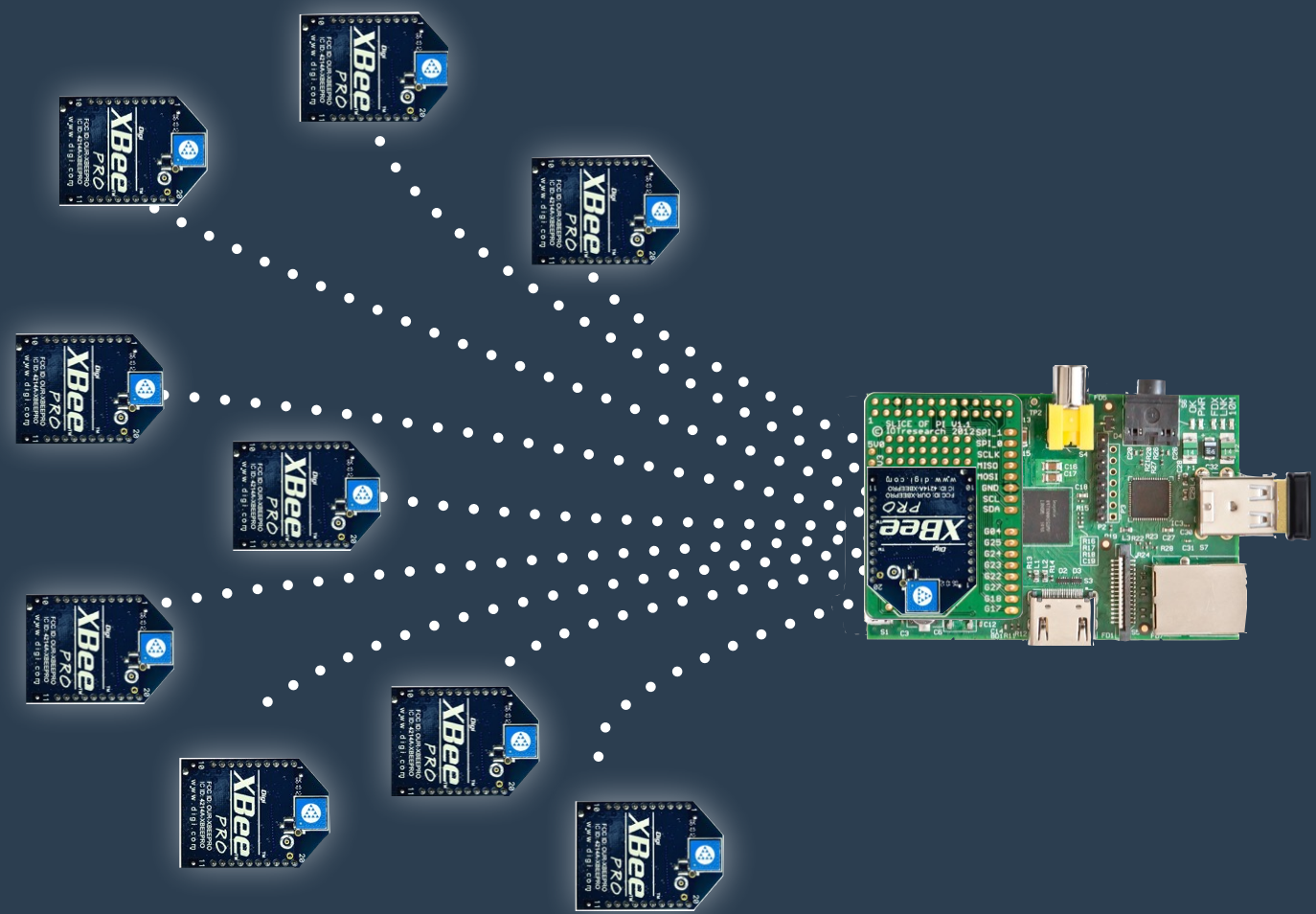
SETUP











SensorNetwork



Database Server



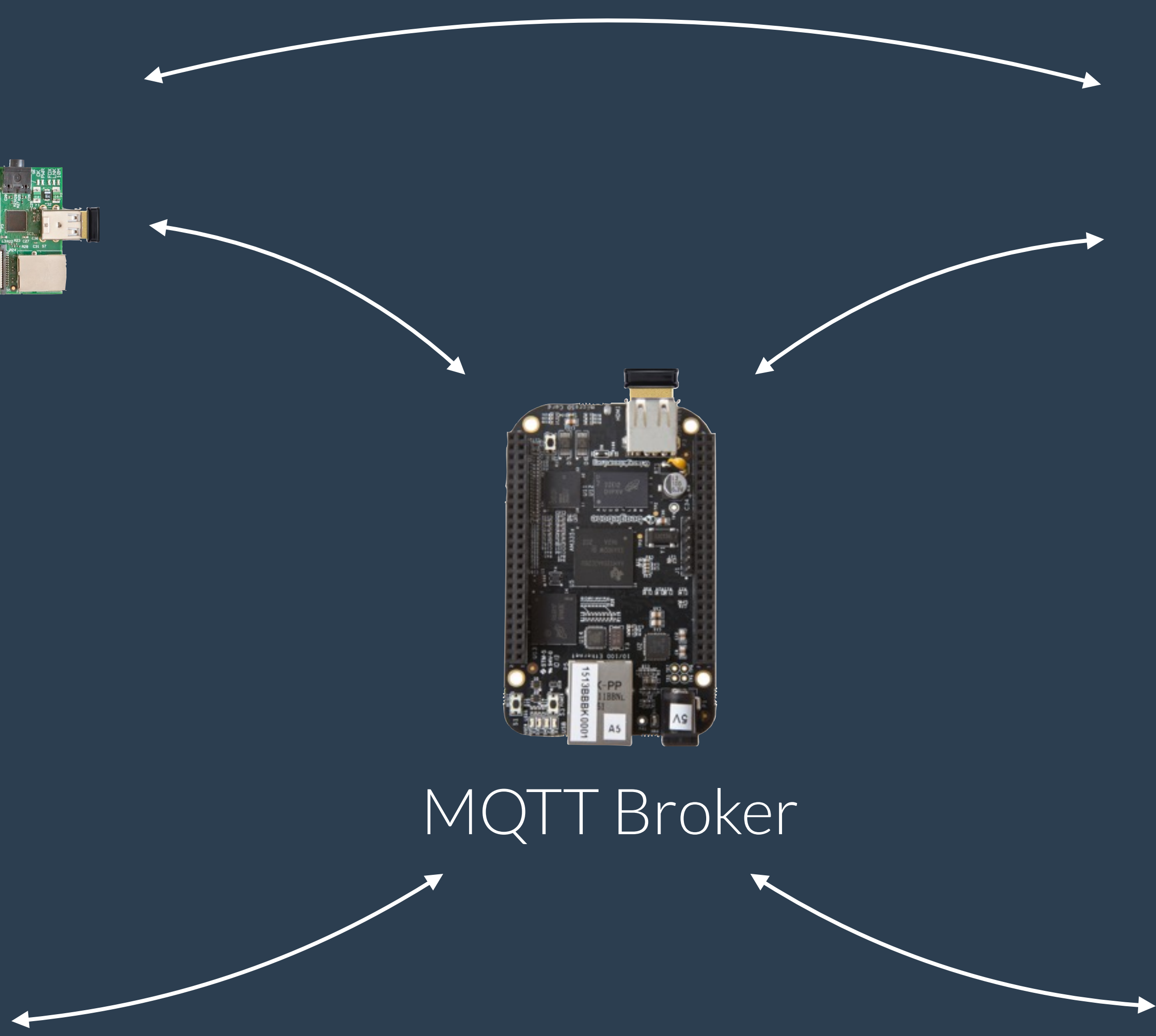
MQTT Broker



Raspberry Pi Visualization



Other Clients







# KEEP CODING