The Cratus CRTS-308
A case study of developing a BLE sensor board

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What is a “development board” ?

- represents company product line in a demo-able/ testable manner
- intended for use by skilled/experienced engineers for testing/evaluation of components
- Not usually intended to be part of a finished product
- Some components/tech might lag current offerings

This sounds familiar…

What's the difference ?

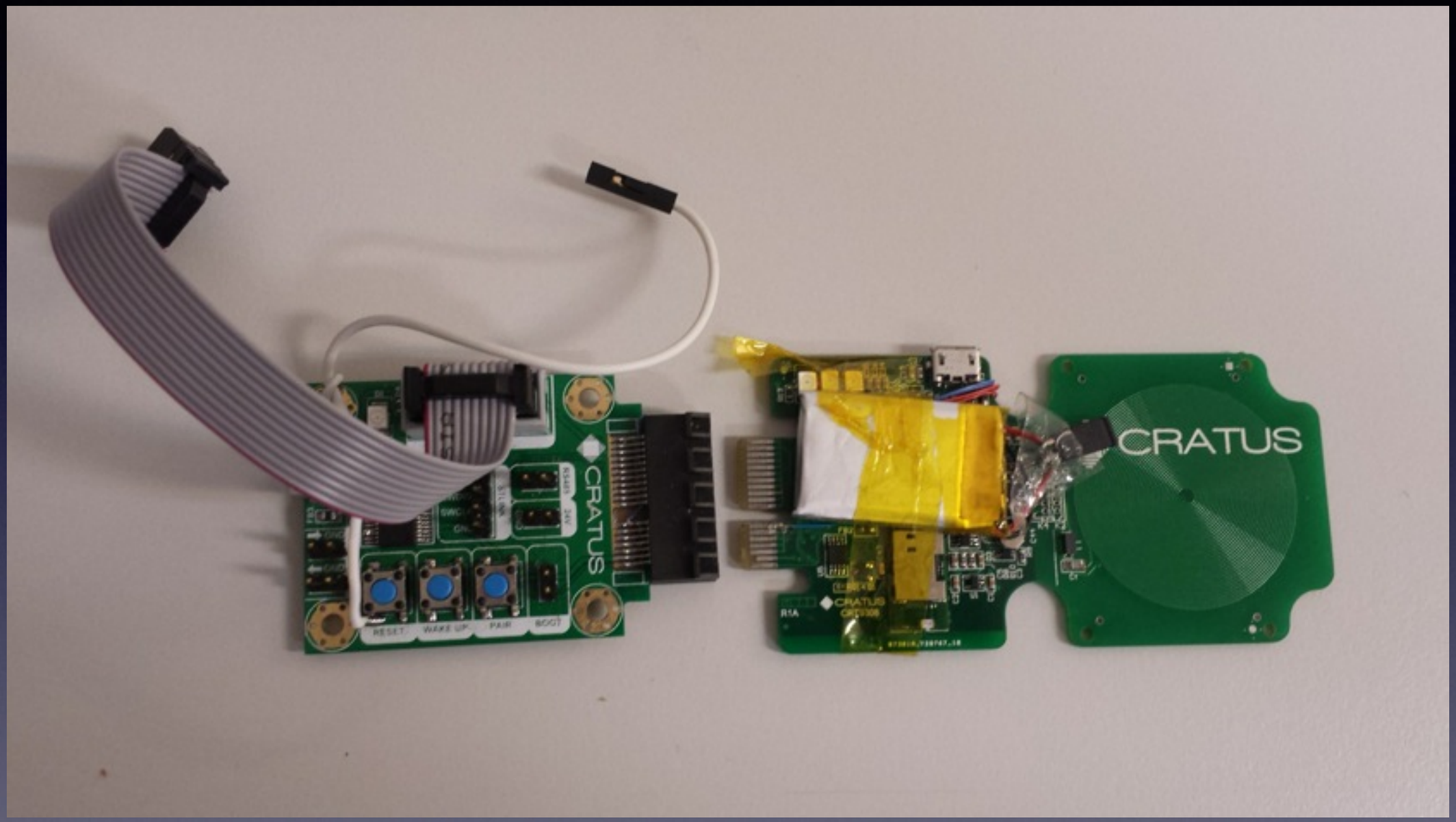
VS

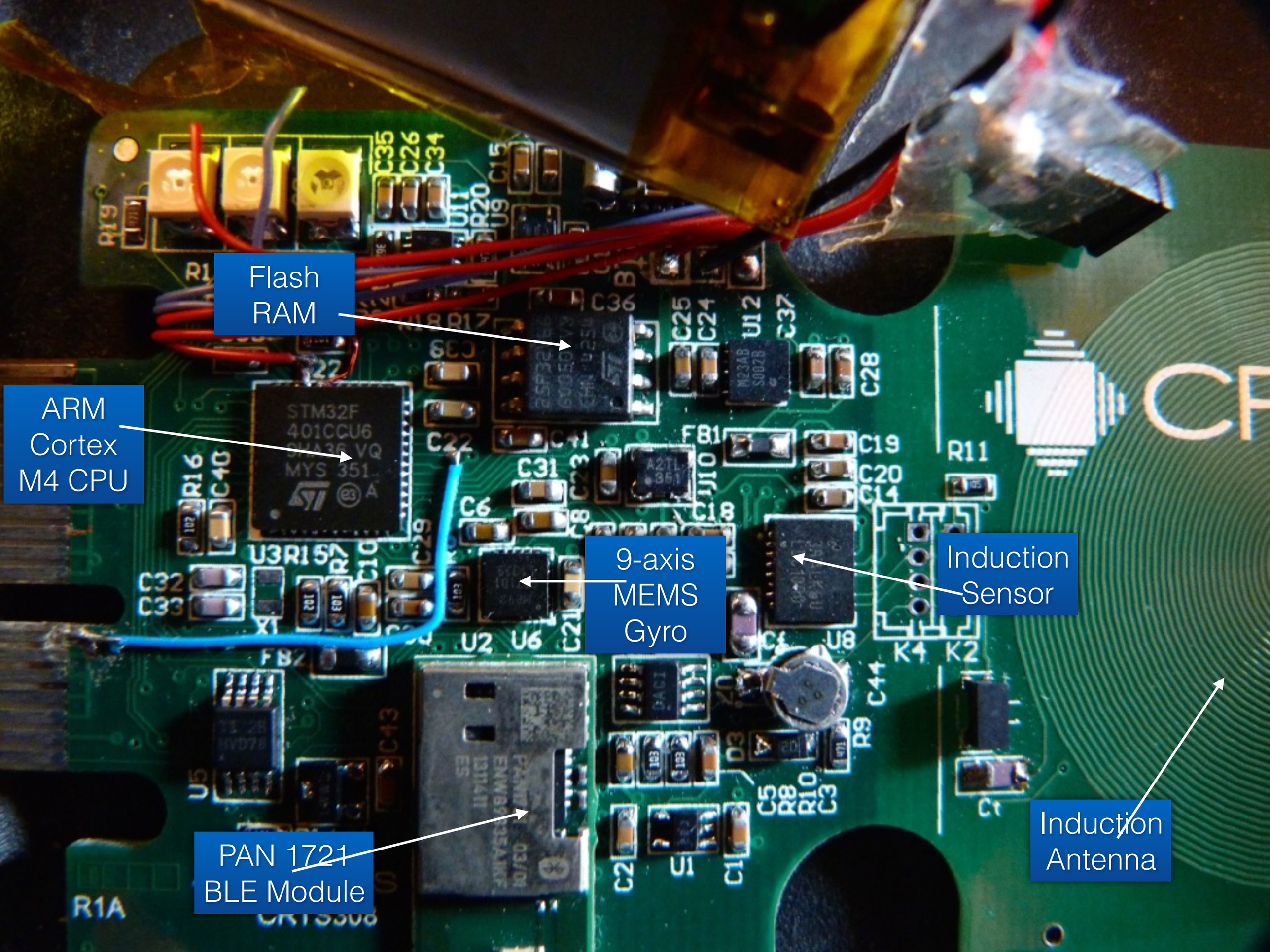
Board	Purpose	Features	Cost
Arduino	General Hobbyist/ Prototyping	Low-cost,all-in-one micro-controller board	$15-70
CC2541	BLE prototyping/ component demonstrator	TI-specific BLE and sensors	$25-40
CRTS-308	Sensor prototyping & demonstrator	BLE,M4 CPU,temp,inductio n,IMU	N/A

Dev Boards:Summary

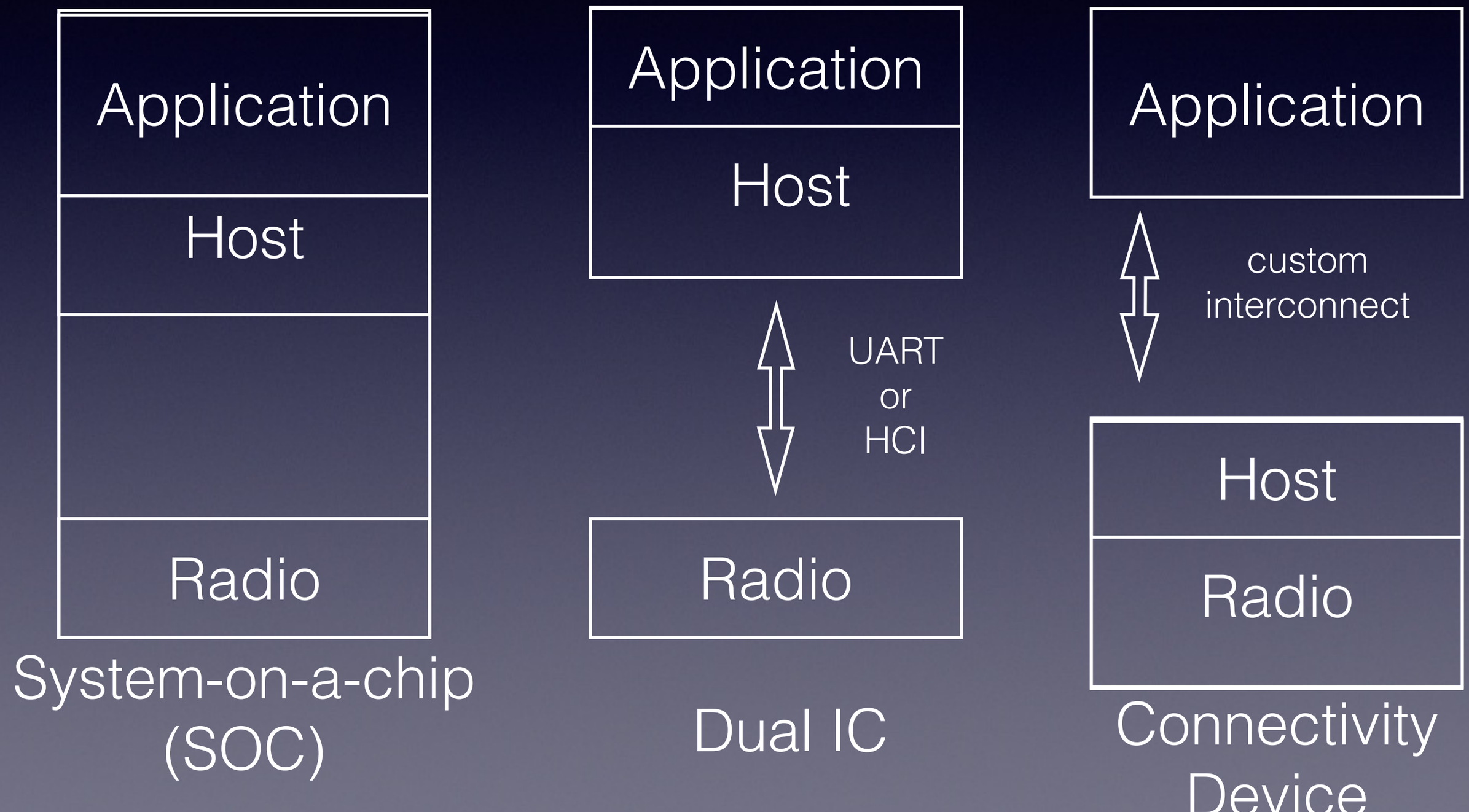
- Can be used for general prototyping and low-volume deployments
- Commercial boards are effectively advertising in hardware
- May involve or require specific/proprietary HW

Designing the CRTS-308 board

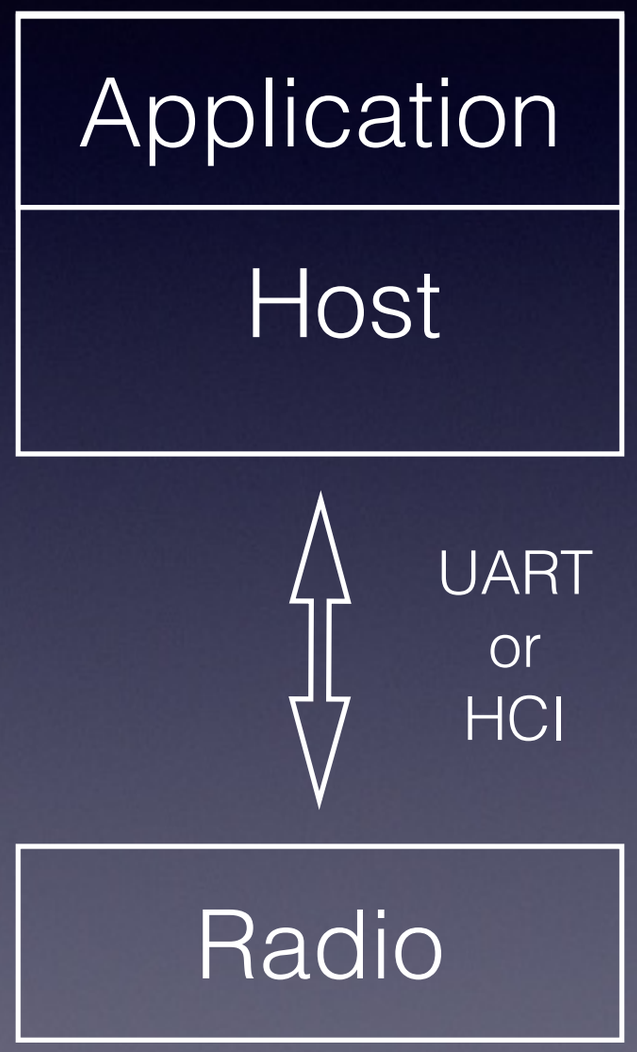



Flash
RAM
ARM
Cortex
M4 CPU
9-axis
MEMS
Gyro
Induction
Sensor
PAN 1721
BLE Module
Induction
Antenna

BLE hardware profiles

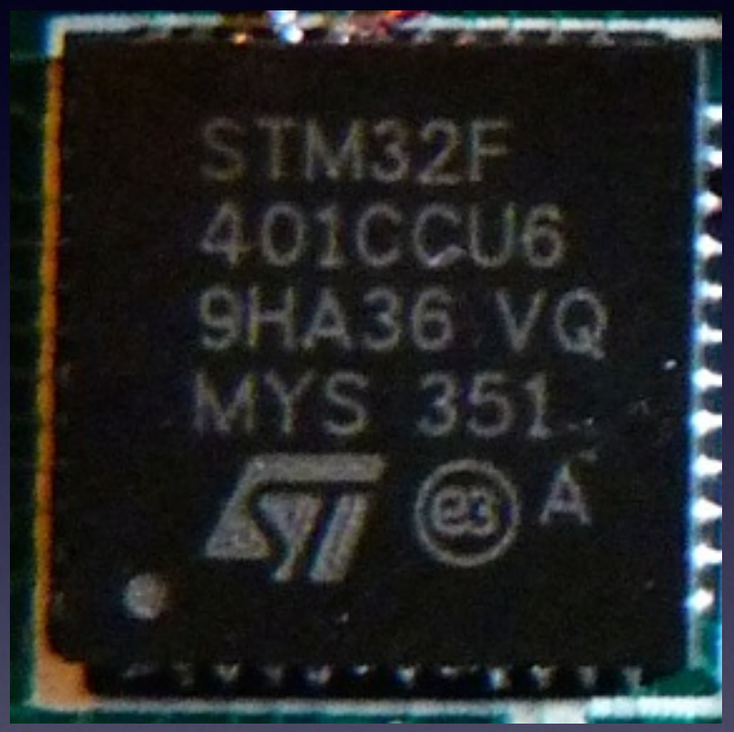


We chose…



Dual IC

Main CPU



ARM Cortex M4

Data flow through CRTS-308 board

Gyro

Temp.

Proximity/
Vibration

$$\mathbf{x}_k = \mathbf{F}_k\mathbf{x}_{k-1} + \mathbf{B}_k\mathbf{u}_k + \mathbf{w}_k$$

ARM CPU
Reads sensors,does error correction & filtering

8051 mcu

BLE Radio

Temperature & vibration can induce bias in sensor readings, so advanced filtering & fusion calculations may be necessary

PAN 1721 BLE Module

- Panasonic Bluetooth LE radio
- onboard 8051 microcontroller
  - Runs TI OSAL Firmware by default
  - Programmable in C,using Keil or IAR compilers
- integrated ceramic antenna
- TTL Serial I/O interface to external host controller

Why develop your own firmware ?

- Demo firmware is often just that, a demo.
  - Features enabled/disabled that are not suitable for your purposes
  - You want to use a different development toolchain
  - You can take full control over the lowest elements on each component
    - power management
    - I/O activity, etc.

Why use provided firmware ?

- Often good enough for most applications
  - companies want to make sure you have a good experience and will buy their products
- Don’t need to re-invent the wheel
- Skip proprietary development requirements
- Might be able to use cheaper kit

Current status of board

- BLE stack up and running
- M4 reading data from sensors
- …but there are a few board layout issues to take care of…

Further Info

- Cratus Technology, Inc:
  - www.cratustech.com
  - info@cratustech.com

Questions ?