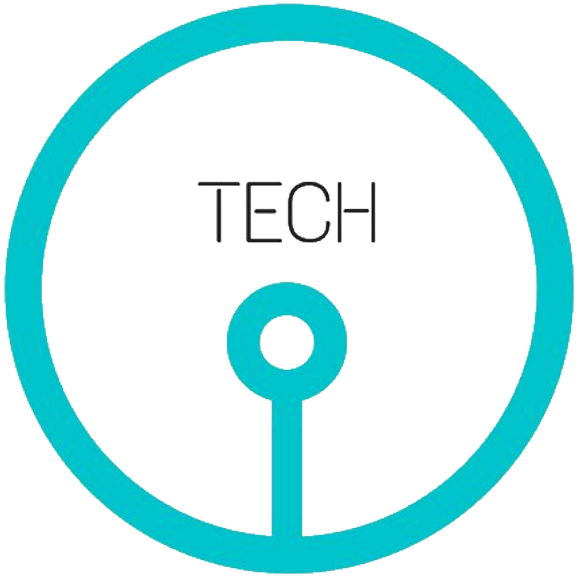
IoTECH*

*Internet of Things Extensible Car Hub

PDR Presentation



Meet the Team

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CSE

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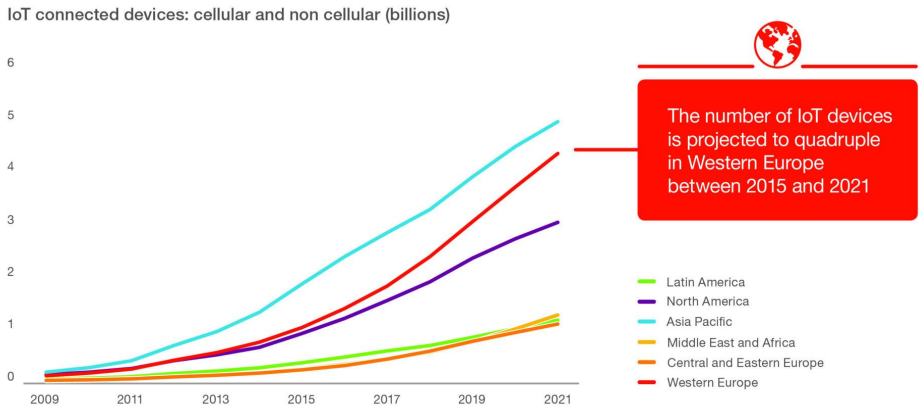
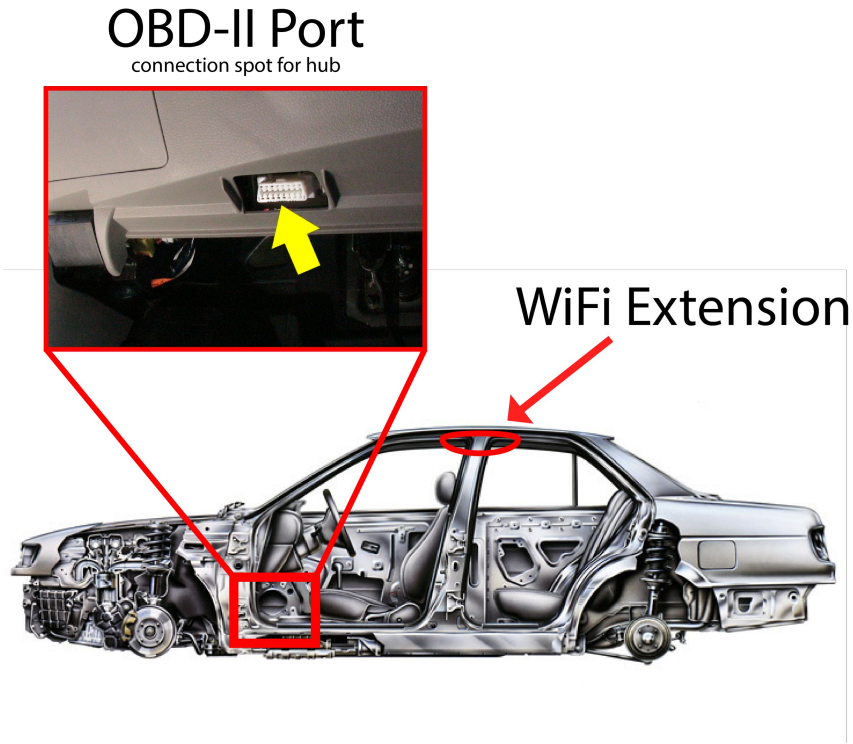
Prof. Jay Taneja
Advisor

Problem Context

- IoT devices in vehicles are proliferating
  - All use the OBD-II port
- OBD-II Port (On-Board Diagnostic)
  - Every car since 1996 has one
  - Often used in vehicle maintenance
  - Located underneath steering wheel
- Limited usability



IoTECH



- “Smart Hub” - IoT Device
- Interface with OBD-II Port
- Extendable WiFi Extension
    - Additional sensors on ceiling of car
- Applications use data from OBD-II and external sensors
- 3G/WiFi data transfer

Potential IoT Car Applications

Temperature Alert System

- *Detect motion inside car and report abnormally high temperatures (e.g. pets, kids, etc.)*
- Sensors: IR Motion, Wide-Angle Camera OBD Data: Ambient Temperature

Parked Collision Detection System

- *Detects spikes in acceleration caused by a collision when parked*
- Sensors: Accelerometer, HD Camera OBD Data: Parked Mode

Theft Detection System

- *Detects unexpected changes in vehicle location (e.g. being towed or a theft)*
- Sensors: GPS, HD Camera, Wide-Angle Camera

IoT Car Applications - Parental Supervision

Speed Detector

- *Detects speed, notifies if goes over threshold speed based on location speed limit (parental monitoring)*
- Sensors: GPS, OBD Data: Velocity

Contaminant Detection

- *Detects presence of carbon monoxide, smoke, and alcohol in vehicle*
- Sensors: Gas

Alternatives

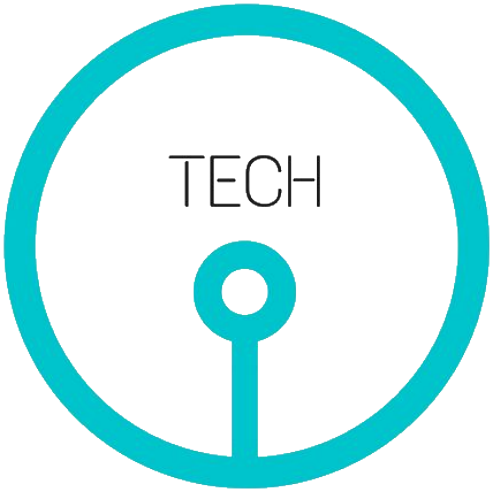
- T-mobile SyncUp
- Progressive Snapshot
- AUT-350C Pro
- CellAssist

Alternatives

- Tracks driving behavior
- Live Data
- Car battery health analysis
- Detailed description about check engine light
- Hotspot

Why IoTECH is different ?

- The next best thing!
- Extends abilities of OBD2 technology
- Communicate with other boards that are placed in the car
- Infinite number of applications



Requirements: Specifications

- Small and lightweight
  - Hub: (~100g) (2.5 x 2.5 x 2 in)
  - Extension: (~200 g) (5 x 2.5 x 3 in)
- Extensible
  - Ability to expand and potentially open-source the IoTECH smart hub through hard-wired or wireless connections
- Modular
  - Able to interface with multiple sensors
- Speed & Reliability
  - Relay information immediately (i.e. alerts)
  - Make sure alerts are seen by the user

Requirements: Input/Output

Inputs:

- OBD-II Port (Data/Power)
- Sensor Data
- Read in data obtained by network of sensors

Output:

- Display information and notifications on user's cell phone
    - Notification, SMS, Twitter, etc.

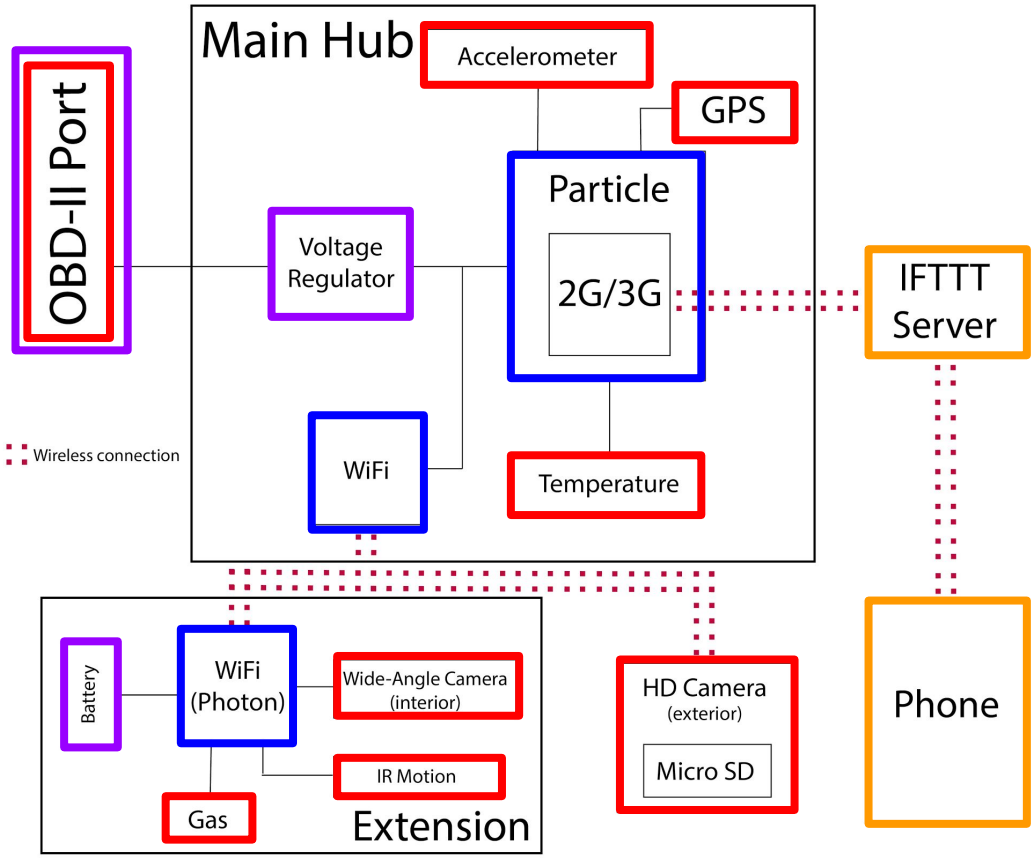
Block Diagram: Overview

= Sensors

= Software

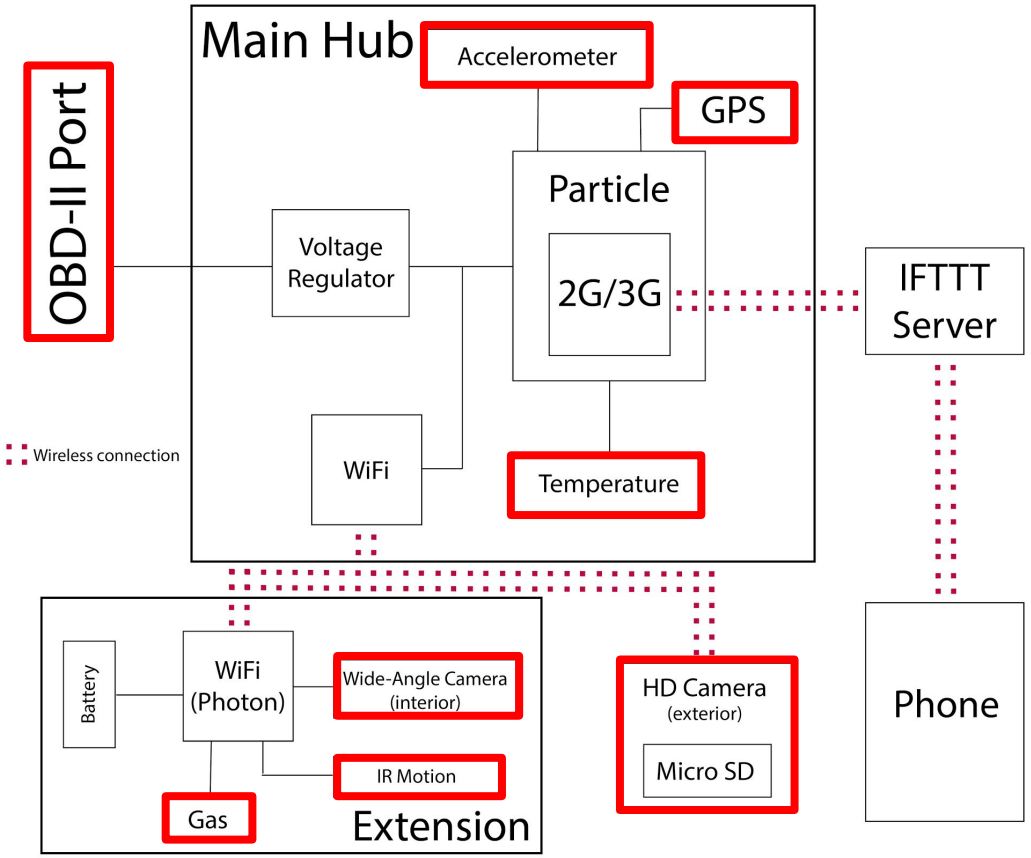
= Communication Modules

= Power Electronics



Block Diagram: Overview

= Sensors

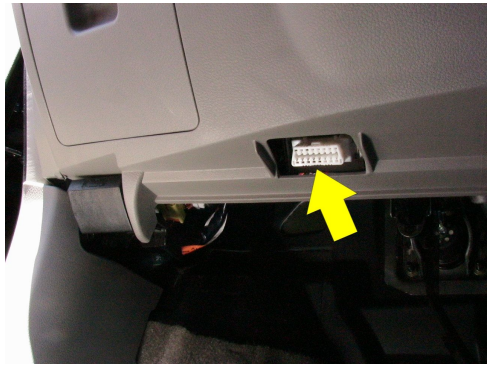


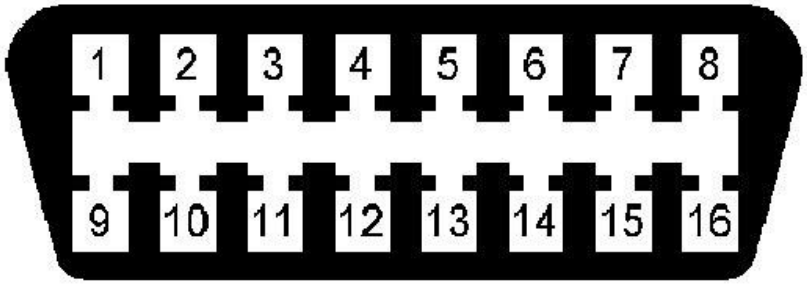
IoTECH Sensors: OBD-II Port

= Data Outputs

= Power

= Ground





PIN	DESCRIPTION	PIN	DESCRIPTION
1	Vendor Option	9	Vendor Option
2	J1850 Bus +	10	j1850 BUS
3	Vendor Option	11	Vendor Option
4	Chassis Ground	12	Vendor Option
5	Signal Ground	13	Vendor Option
6	CAN (J-2234) High	14	CAN (J-2234) Low
7	ISO 9141-2 K-Line	15	ISO 9141-2 Low
8	Vendor Option	16	Battery Power

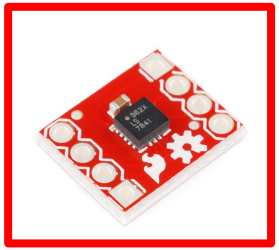
OBD-II Connector and Pinout

IoTECH Sensors: Everything Else

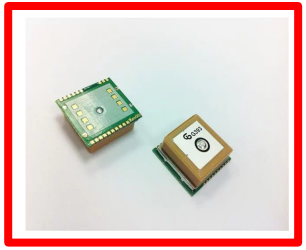
= Hub

= Extension

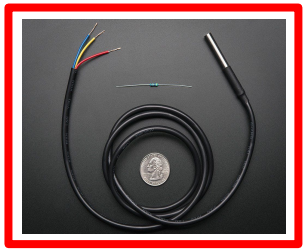
= External



Accelerometer



GPS Module



Temperature

HD Camera w/ microSD

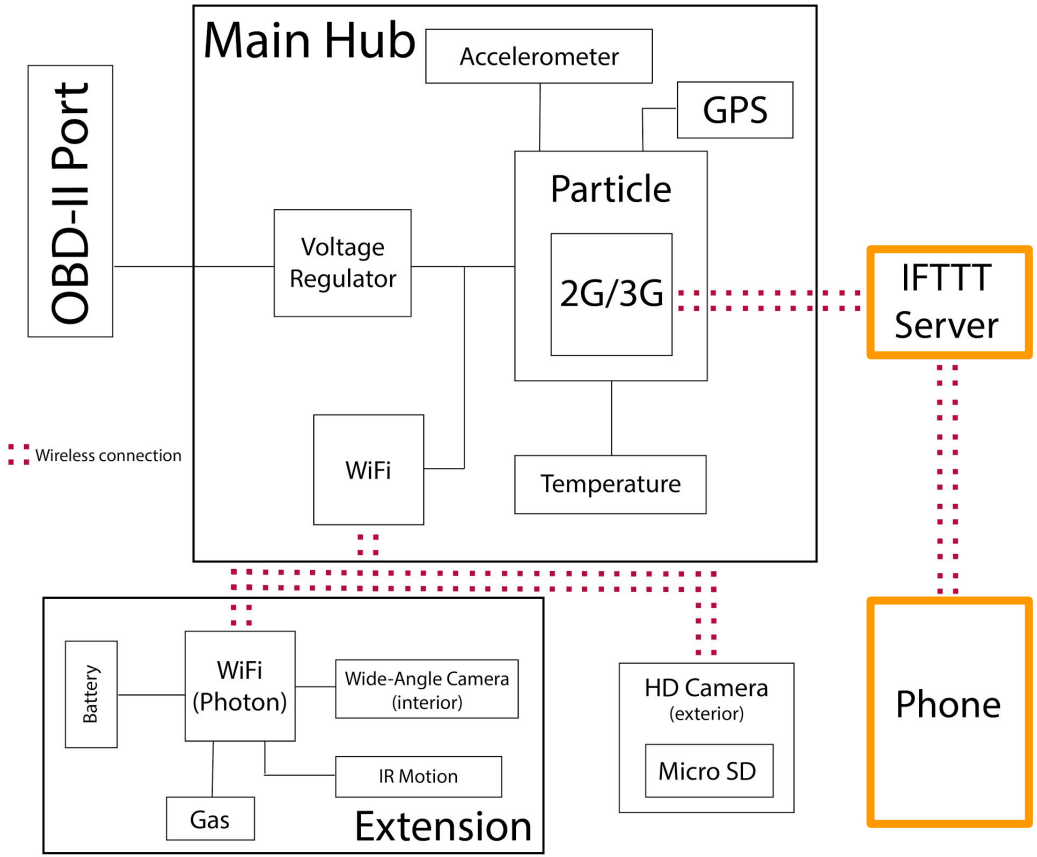
Wide-Angle Camera

IR Motion Detector

Gas (Alcohol, Smoke, etc.)

Block Diagram: Overview

= Software



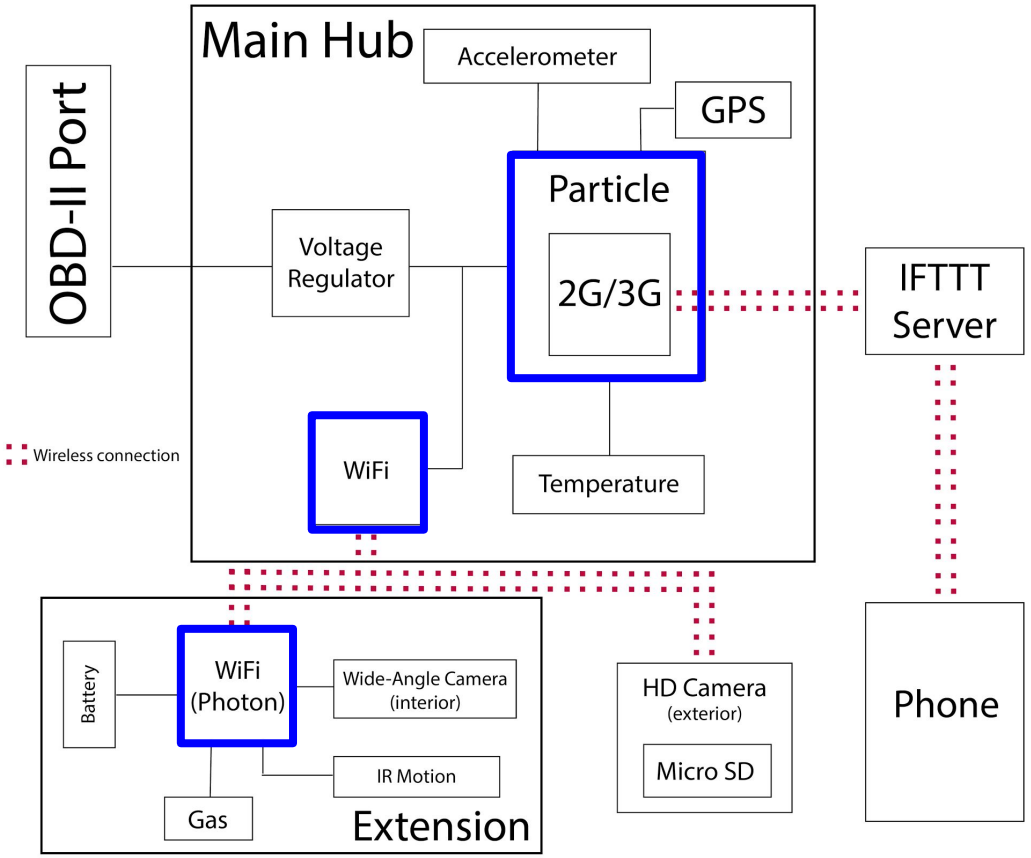
IoTECH Software

If This Then That (IFTTT)

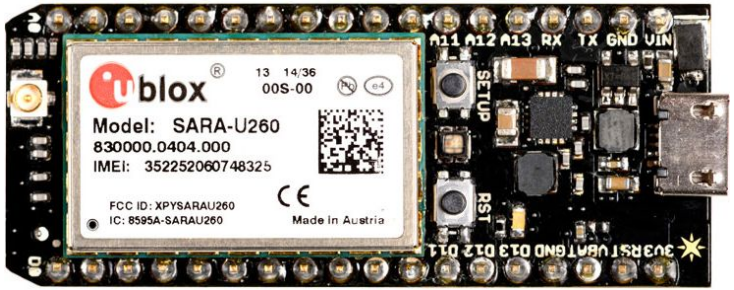
Phone (3G enabled)

Block Diagram: Comm. Modules

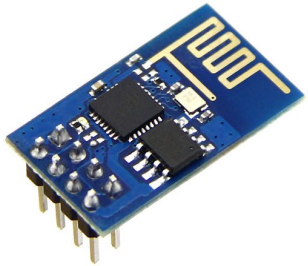
= Communication Modules



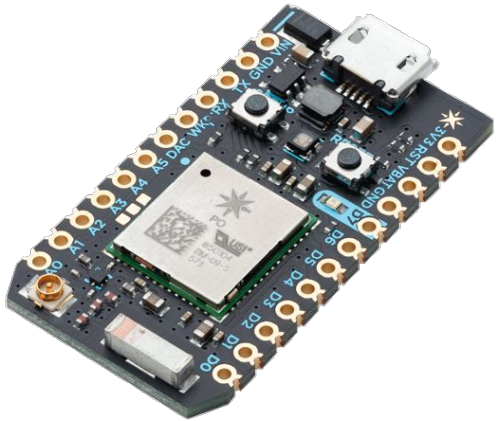
IoTECH Communication Modules



Particle Board (Electron) - 3G

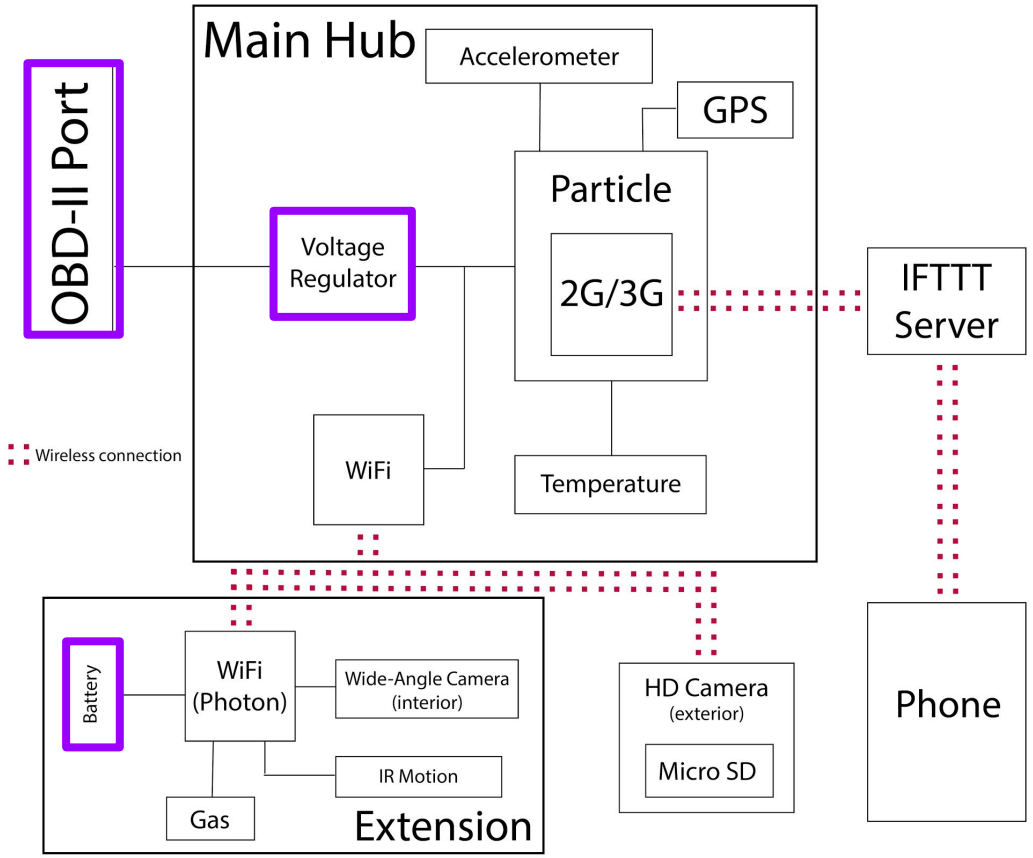


Wifi Module



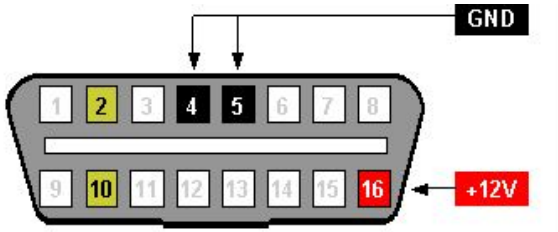
Wifi (Photon)

Block Diagram: Power Electronics



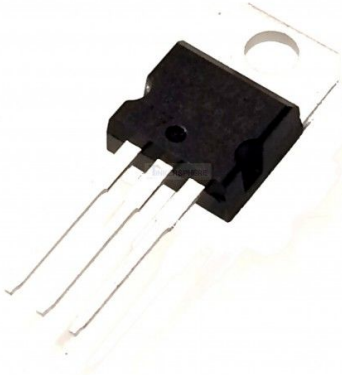
= Power Electronics

IoTECH Power Electronics



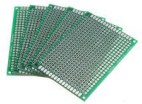
OBD-2 Port

Lithium Battery

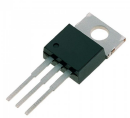


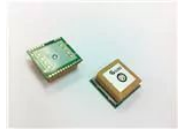
Voltage
Regulator Circuit

IoTECH Budget



- Sensor Kit ($149)
- Photon ($20)
- 3D Printing Supplies (~$50)
- 3G Data (Particle)($1/MB)
- Wide-Angle Camera Module (~$30)
- GPS Module(~$20)
- Power Circuitry Components (~$20)
- PCB Supplies (~$20)
- **Total (~$310)**





MDR Deliverables

- Power electronics circuit built
- Ability to read OBD-II data from car
- Ability to read other sensor data
- Breadboard prototype circuits
- Display data from sensors on computer

MDR Timeline

MDR Timeline							
Hardware Order	x						
Power Circuit Construction		x	x	x			
Hub Breadboard			x	x	x		
Extension Breadboard			x	x	x		
OBD-II data tests			x	x			
Hub data tests				x	x		
Extension data tests					x	x	
MDR Presentation						x	x
	10/19	10/26	11/2	11/9	11/16	11/23	11/30

Questions?

Thank you

Extra Specs

Photon: https://store.particle.io/products/photon

Electron/Sensors: https://store.particle.io/products/sensor-kit

ARM Processor, Programmed in C/C++ or Arduino

1MB Flash, 128KB RAM

3G Data: 1900 MHz cellular frequency, most major cell-phone carriers (Verizon, T-mobile, AT&T, etc.)

WiFi: 802.11 b/g/n (2.4 or 5GHz band)

Max WiFi data rate is 600 Mbps (or 75 MBps)