IoT Enabled Smart Inventory

Group 110
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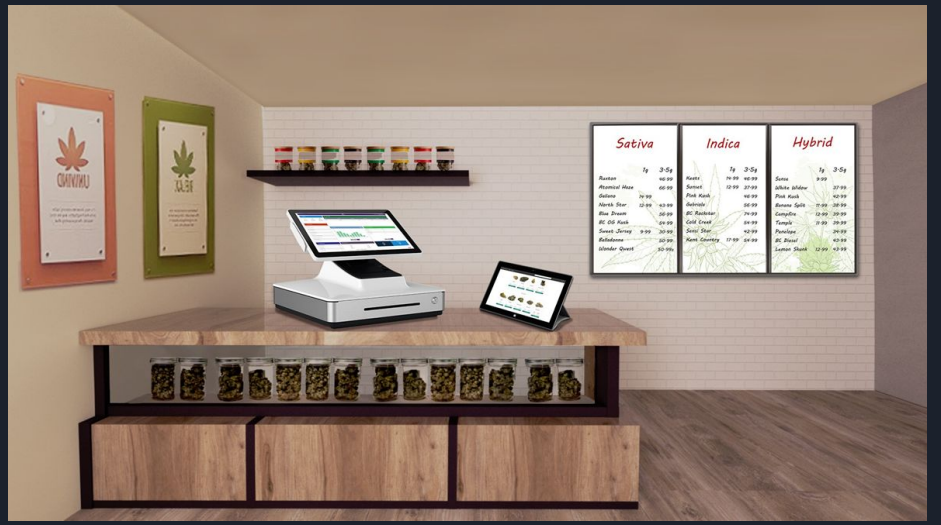
Background

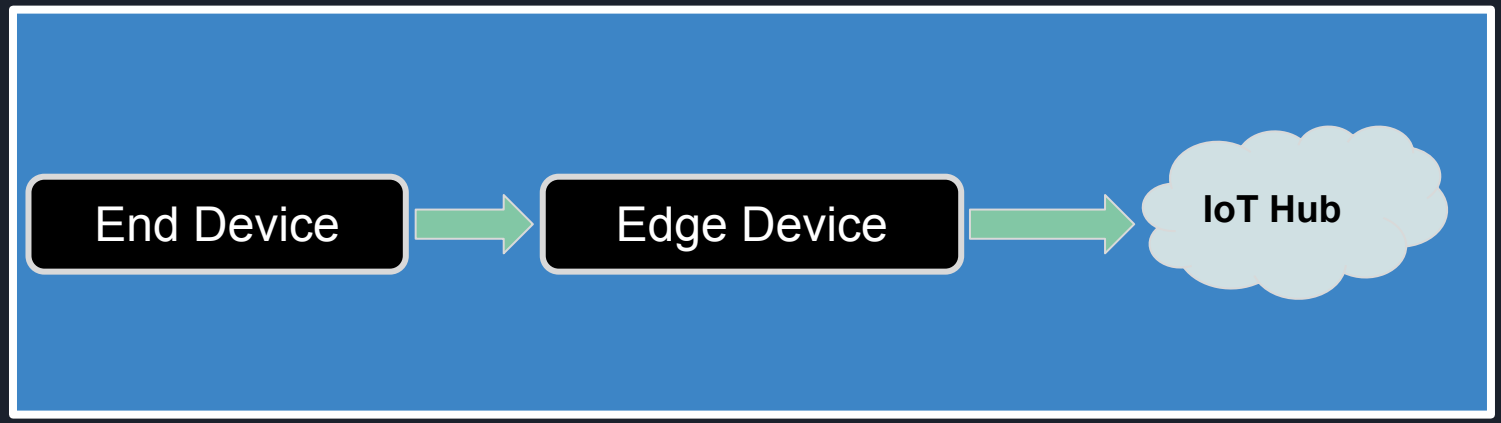
- TechPOS is a Vancouver-based startup
- IoT and Cloud-based POS systems for small to medium businesses
- Primarily targeting cannabis industry



Outcome

- Mitigate human error using IoT Inventory System
- Scalable prototype for further development

General Overview of Product



RCGs

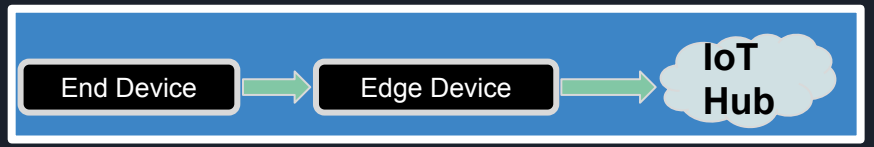
Requirements

- Weight Sensor
  - Sensor must be able to handle an upper limit of 700g -2250g (upto 150 items).
- End Device(s)
  - Must communicate to edge device(s) via a low bandwidth communication protocol
  - Configuration of product weight and type.

Requirements

- Edge Device (s)
  - Must communicate to end device(s) via a low bandwidth protocol.
  - Must communicate to cloud via a high bandwidth protocol.

- User Interface
  - Must be simple to non-technical end users



Constraints

- Weight Sensor
  - Sensor must have 1 mg of sensitivity.

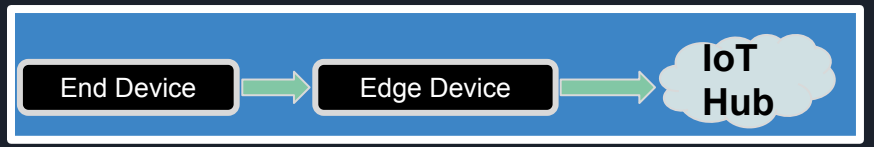
- Data Transfer
  - Data transfer between end and edge devices must be wireless.
  - Data transfer between edge devices to cloud must be wireless.

Constraints

- User Interface
  - Must be developed with Azure

- Cost
  - Production cost of final product must be kept as low as possible

    (this does not include prototyping costs where the client is willing to provide some resources)



Goals

- Scalable platform for production and future development
  - E.g. addition of new sensors in the future
  - E.g. multiple device integration
- Simplistic
- Robust data handling

Evaluating Our Success

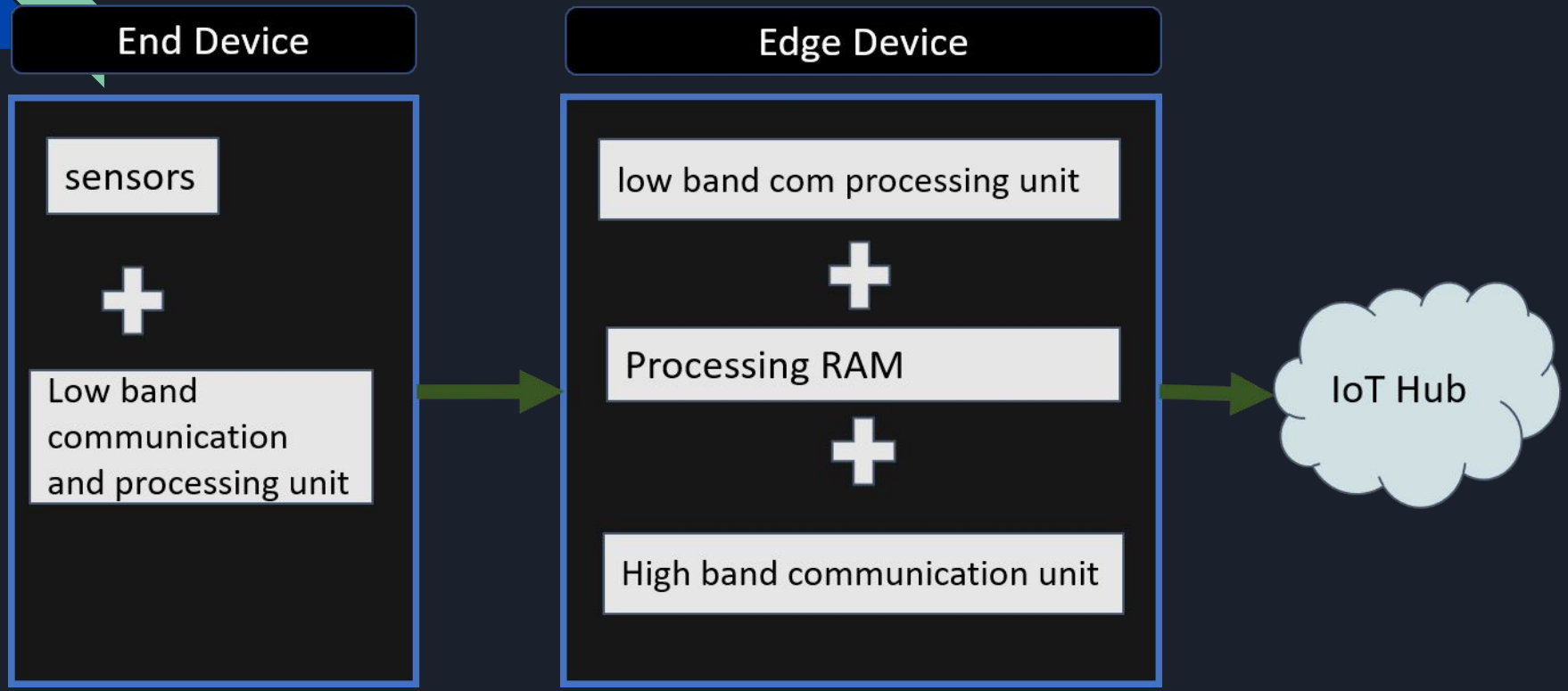
Basis for Evaluating Success

- Make a cheap yet robust product.
- The product must be able to count up to 150 items and store this information in a database in the cloud.
- Retailers should be able to add and remove products and containers from the system.

Basis for Evaluating Success

- Targets:
  - Our first target will be to get all the individual components to a functioning level.
  - Our second target will be to integrate all components into one system
  - Our third target will be to create a robust, scalable, with a user friendly interface product ready for manufacturing for the client to take into production

Technical Solution Path

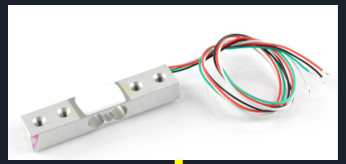

End Device
sensors
Low band communication and processing unit
Edge Device
low band com processing unit
Processing RAM
High band communication unit
IoT Hub

Sensors

Low band communication and processing unit

End Device

Load sensor



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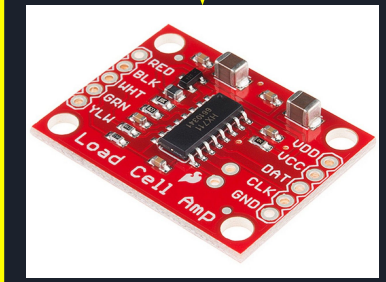

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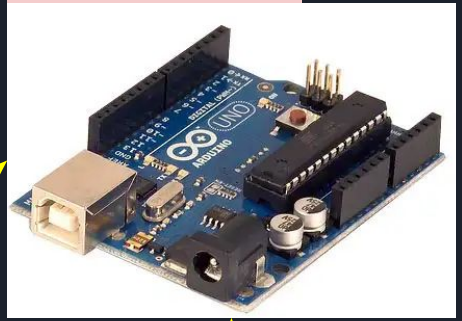
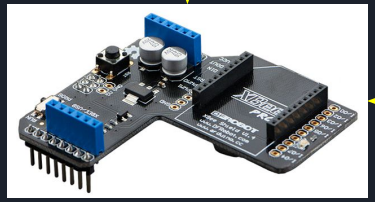
Load cell amplifier

Arduino board





RF TXRX evaluation board

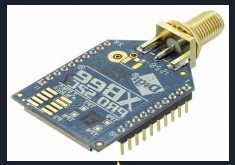
RF TXRX module

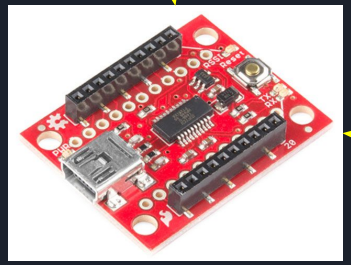
Low band communication unit

High Band Communication Unit + Processing RAM

Edge Device

RF TXRX module





RF TXRX USB expansion board

Raspberry Pi

Azure IoT Hub

Type	Product name	Product Description	Distinguishing feature	Quantity	unit Price	Total
dev board - edge	Raspberry Pi 3 B+	Quad Core 1.4GHz 64-bit CPU and 1GB RAM, 4 USB Ports	Wireless LAN (WiFi) on board	1	56.99	56.99
dev board - end	Arduino Uno	R3 ATMEGA328P EVAL	End libraries available	1	31.48	31.48
RF com chip - Zigbee	XBP24CZ7SIT-004	802.15.4 Zigbee® Transceiver Module 2.4GHz	Arduino and pi compatible	2	49.62	99.24
xbee Breakout board pi	WRL-11812	XBEE EXPLORER USB	convenient compatibility	1	37.13	37.13
xbee breakout board arduino	DFR0015	XBee Expansion Board	convenient compatibility	1	15.9	15.9
load/ weight sensor	0.78 Kg Micro Load Cell	micro load cell	0.1g accuracy	3	7.99	23.97
load cell wheatstone bridge/breakout	HX711 Load Cell Amplifier	Two-wire Clock and Data. Four-wire wheatstone bridge	compatible with micro load sensor	3	13.31	39.93
power	Raspberry Pi 3 Power Supply 5V3A	Wall plug power cable	-	1	15.99	15.99
cable	Ethernet Cable	-	-	1	5.99	5.99
memory - need for operating system	SanDisk 16GB Ultra microSDXC	-	-	1	9.32	9.32
					BOM Total	**335.94**

Technical Solution Risks

End Device Risks

- High Quality load sensor with 1mg of sensitivity and high max limit is rare
  - Common application of this kind of sensor is pharmaceuticals, which don't require very high tolerance
- Current part research; load sensors with 1 mg sensitivity, from reputable source, has a max limit of 780g
  - Custom built ones are possible but are expensive
- Might not meet the current communicated max case scenario
  - 150 Packages x 15 g = 2250 g

Edge Device Risks

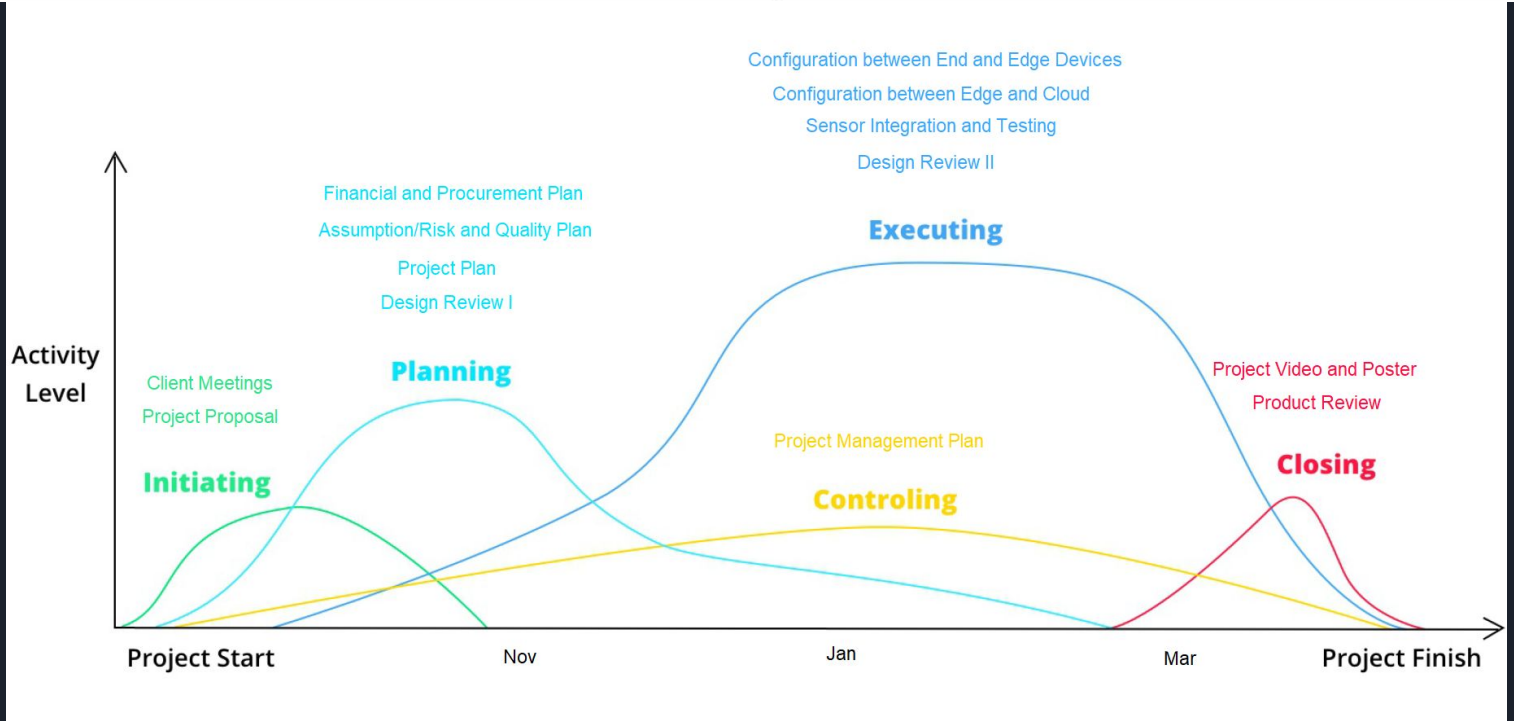
- Wireless (wifi) cloud connection might be unstable with the pi
- Low band and high band processing being performed by one unit (pi) may cause stability issues

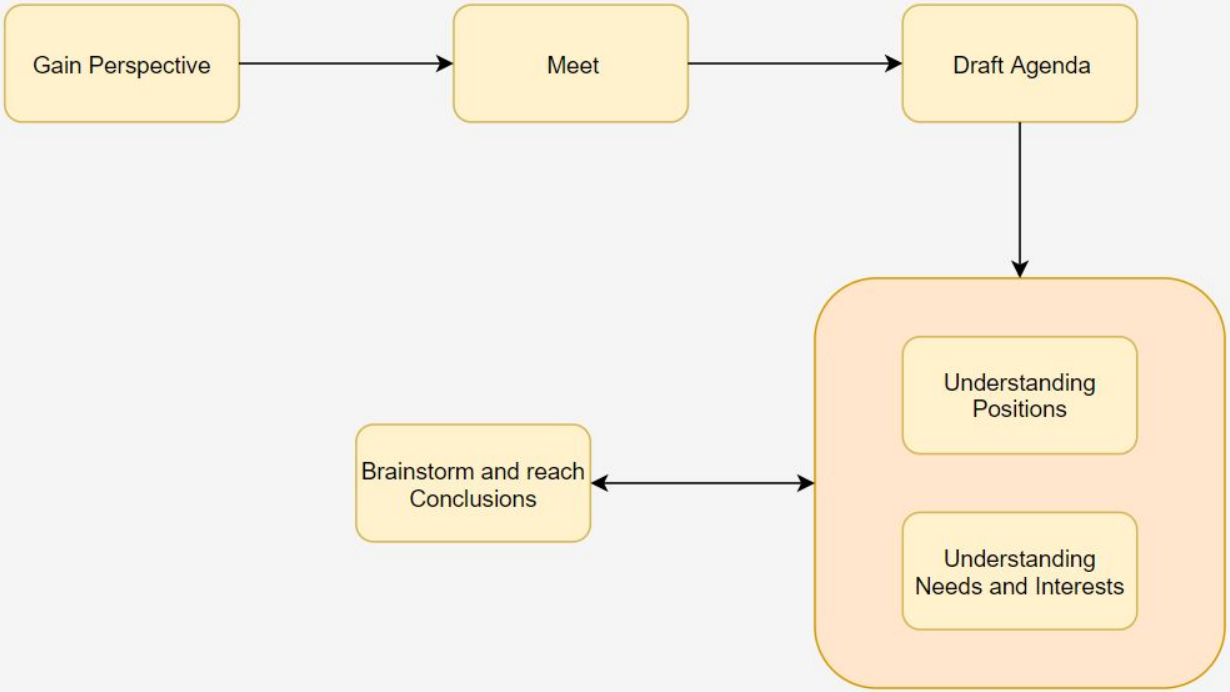
Project Management

Stakeholder concerns

Tech POS	Retailers	Team members
- Production cost - Product demand upon market availability	- Easy to use - Convenience - Purchase cost - Maintenance fees	- Availability - Part purchase from online sources arrival times - Load sensor durability

Team member	Area of responsibility
Ammar Rehan	Project management. Low bandwidth, low power communication protocols
Adil Saldanha	Hardware and software integration
Wency Go	Software data handling - software QA
Melika Salehi	Cloud integration of edge devices




Gain Perspective
Meet
Draft Agenda
Understanding Positions
Understanding Needs and Interests
Brainstorm and reach Conclusions