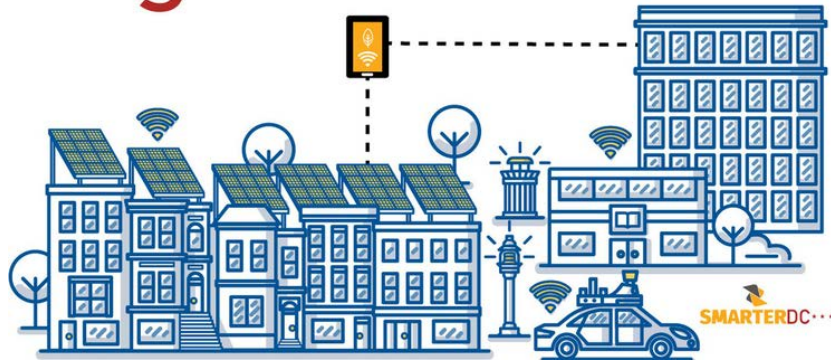# Corner BOI Concept

Budget Proposal to GigabitDCx- Team: KGW Group

Date:
7/40/19
Version: 2.0
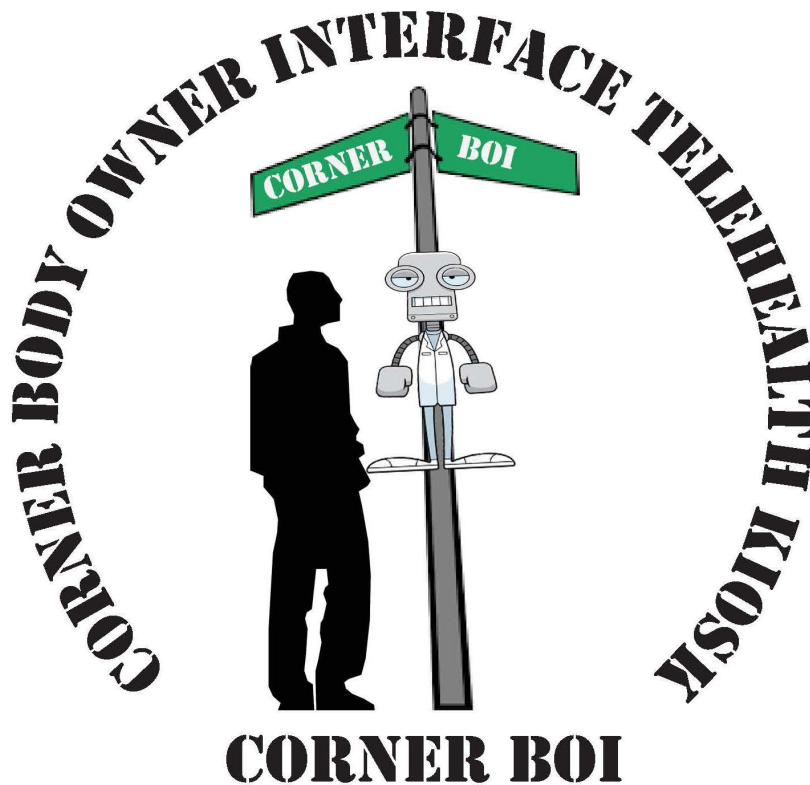
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Team Contacts

Corner BOI

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Engineering Programming	Robin Walton	Robin_Walton@Verizon.net
Project Management	KGW Group	Robin_Walton@Verizon.net

1 Overview

This project supports Mayor Bowser's commitment to transform a "20th century health care system into a 21st century fully integrated system that is responsive to the needs of Washingtonians."

To give you some background on the project. We have developed an approach that looked to build "User Trust" necessary to Capture Public Biometric Data for improving the overall health in under-served communities. We focused on Smart City / Information and Communications Technology with a solution goal of:

• Saving Lives

• Saving Money, and

• Improving Health

• Providing potential income to the homeless community

To meet that goal we decided to focus on the homeless community for a test bed for a number of reasons. Based on interviews we identified three areas of concern, Housing, Healthcare, and Jobs. All three are major issues, but healthcare was the best fit for a Smart City 4G and 5G ICT/IoT solution.

The range of health problems in the homeless and indigent communities are large due to issues like drug and alcohol abuse, exposure, poor diets. When looking at their "Journey" we noticed a lot of pressure is added to existing healthcare systems like public health clinics and ER's.

Appointment waits can be several weeks long at clinics, and ER's are stressed to their limit with indigent care... the cost impacts on Medicaid add up to more than $16 billion dollars per year to tax payers. Did you know that 44000 citizens Die Each Year Because They Cannot Afford Healthcare? And that the Cost of Uninsured Citizens to Tax Payers is more than $30 Billion.

We want to improve the Convenience, Cost and Quality of this community's health experience while lowering the cost impacts on Medicaid and improving the customer's healthcare Journey. These numbers, and data lead to our solution.

The Corner Body Owner Interface, or (Corner BOI)....This a Patient Navigator. Patient navigators foster empowerment, and provide information that enhances the ability for patients to make good health care decisions and receive better medical care.

"According to Health and Human Services.... patient navigators save 4.4 billion dollars /per year."

2.0 Make Use of Existing Public Wi-Fi

Use the existing pervasive mesh Wi-Fi access along the 1700 and 1900 block of Pennsylvania Ave (PA 2040) for the Corner BOI Pilot prior to the implementation of. This pervasive mesh Wi-Fi supports basic Free Public Wi-Fi accessible by residents, visitors or businesses that are in the Wi-Fi range. It also supports Secure Wi-Fi services to support access for public safety and government personal. In addition, it can support uture high-bandwidth wireless applications Like Corner BOI that are to be deployed along this corridor to serve community needs.

SENSING
1. WAGGLE ENVIRO. SENSING PLATFORM
2. RASPBERRY PI VITAL SIGN SENSOR PLATFORM
3. GOOGLE VOICE SENSOR
4. GOOGLE VISION SENSOR
5. VOC E-NOSE SENSORS
6. ARDUINO WIFI MODULE
7. RASPBERRY PI
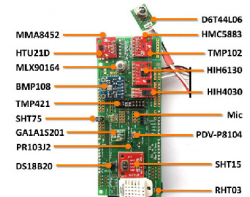8. ARDUINO (X2)
9. PROTOTYING BOARD
10. SD CARD SHIELD

Note: All Health Data to be processed at the edge.
Enviornmental Data processed is via the cloud
Data from Waggle nodes are securely pushed to a cloud-based server, which we call the "beehive". A scalable Cassandra database stores all the live data from the nodes, as well as deployment metadata such as location coordinates.

VISION HAT

VOLATILE ORGANIC COMPOUNDS E-NOSE / BREATHALYZER GAS SENSORS

VOICE HAT

OPEN SOURCE PROTOTYPE SENSOR COMPONENTS

ENVIRONMENTAL SENSING

MMA8452	D6T44L06
HTU21D	HMC5883
MLX90164	TMP102
BMP108	HIH6130
TMP421	HIH4030
SHT75	Mic
GA1A1S201	PDV-P8104
PR103J2	
DS18B20	SHT15
	RHT03

ENVIRONMENTAL SENSING

Thermistors
Real Time Clock
Heartbeat Input
Microcontroller
Humidity Temperature
Intrusion Detector
Power Input
Current Sensors
Power Outputs
Switched Power

VITAL SIGNS SENSING

PHOTOPLETHYSMOGRAM (PPG) AND SPO2: DONE WITH A NELLCOR-STYLE FINGER CLIP SENSOR PROBE
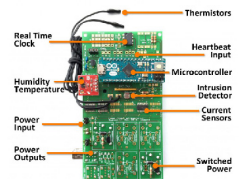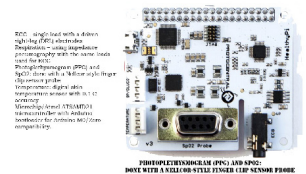
2.1 Power Requirements

There are 3 powering options for the individual outdoor access point.

- Power over Ethernet (PoE) is a technology that lets network cables carry electrical power. (preferred)
- AC power Main power Power supply: 110 to 230VAC; max 30W or 12VDC (optional)
- DC power

The table below shows the typical and maximum power consumption.

| Condition	Typical Power (Watts)	Absolute Max Power (Watts)
Power using AC input (110VAC)	25	31
Power using AC input (230VAC)	25	31
Power using 12VDC input	20	24
Power using PoE input (injector or UPoE, 42-57V)	23	27
With SFP, AC power	24	28

2.2 Pilot Area (PA 2040)

Pilot area will be between 1700 to 1900 block of Pennsylvania Ave NW and from G St to I St NW.

Figure 1: Pilot Area

3.0 Corner BOI AR Interface Components
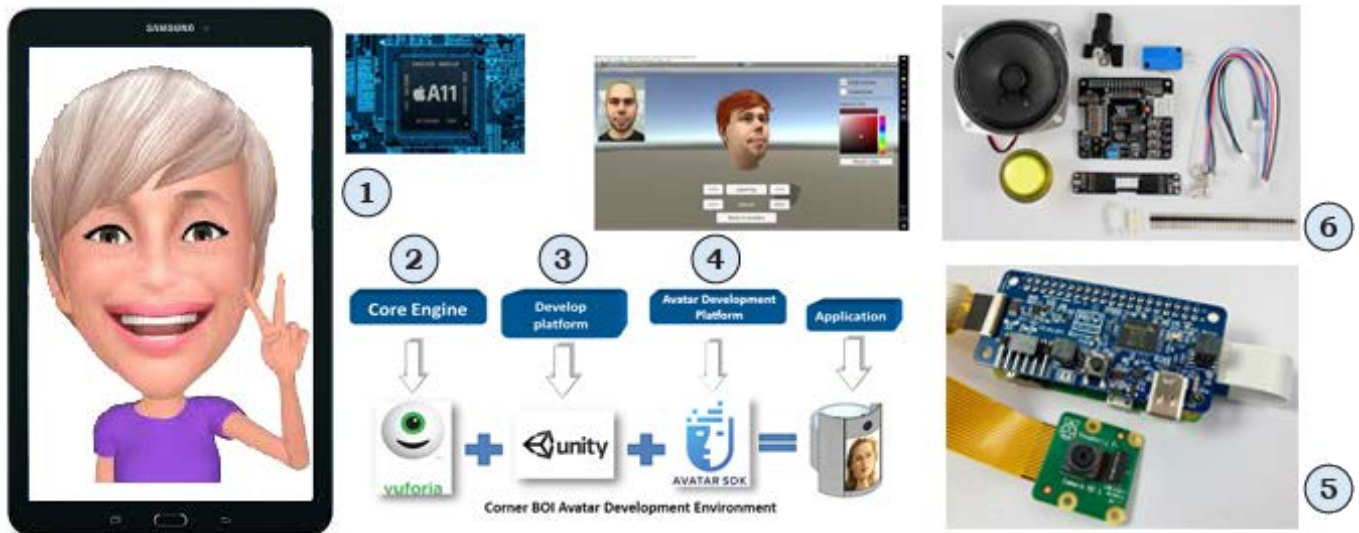
1) Tablet that Enables Facial Recognition: The A11 Bionic chip can accurately map and recognize a face by working with the a tablets advanced 3D camera system. 3D Camera employs a dot projector, infrared camera (IR) and flood illuminator to make precise face measurements.

2) Vuforia Augmented Reality Studio users can leverage the richness of 3D and the insights from IoT to deliver compelling augmented reality experiences that help improve efficiencies.

3) Unreal Engine is a suite of integrated tools for game developers to design and build games, simulations, and visualizations.

4) Avatar SDK: Allows for the generation of avatars directly on the target device without the access to the cloud.

5) Google AIY Vision: The AIY Vision Kit from Google allows for the development of intelligent camera that can see and recognize objects using machine learning powered by a Raspberry Pi

6) Google AIY Voice Speech Recognition:Provides the ability to create scripts for the dialog between the user and Alexa. Develop interactions where everything works well and the user gets what he or she needs.

3.1 Corner BOI AI Interface Components

Watson Studio- Building and training AI models, and prepare and analyze data, in a single, integrated environment. Extract, transform and load archived IoT event data from the IBM Watson IoT Platform using IBM Cloud Object Storage.
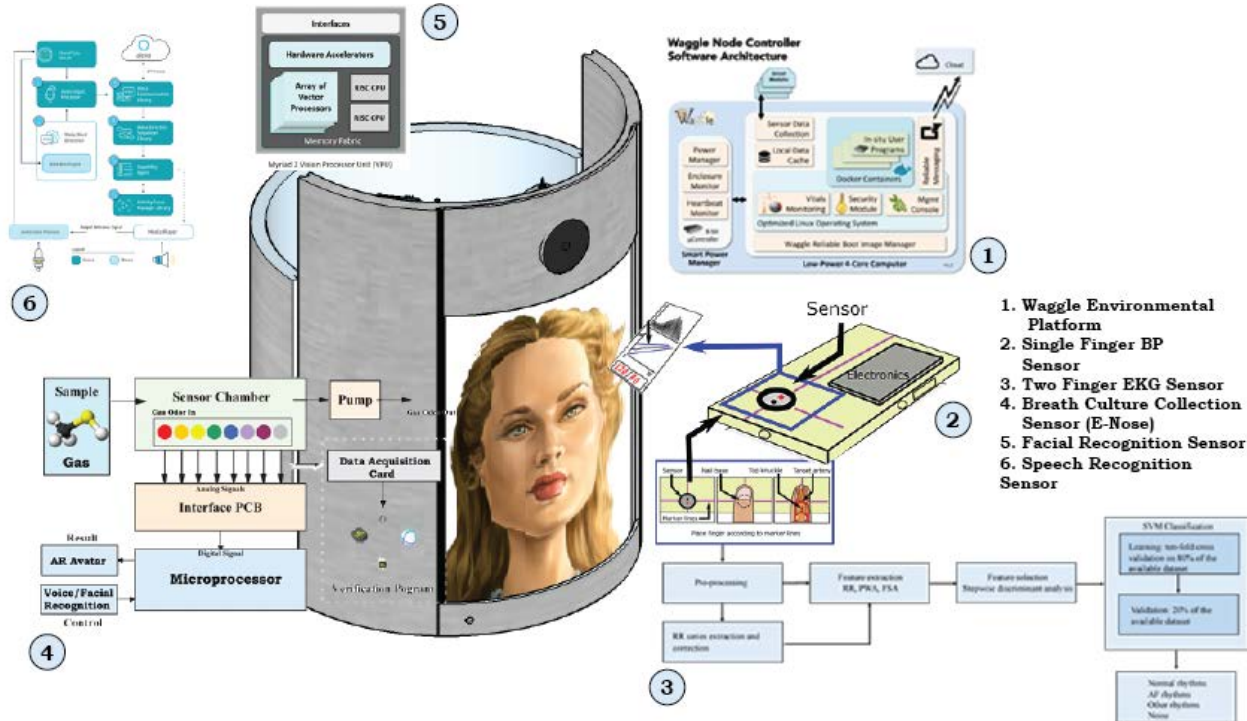

Software Requirements:
- IBM Cloud Account
- IBM Watson Studio
- IBM DB2 Warehouse on Cloud

3.2 Corner BOI Sensing Components

This application includes remote monitoring of Environmental factors, User Blood Pressure, Automatic Detection of Atrial Fibrillation and Other Arrhythmias, Facial and Speech Recognition, Breathe Culture Collection

1. Waggle Environmental Platform
2. Single Finger BP Sensor
3. Two Finger EKG Sensor
4. Breath Culture Collection Sensor (E-Nose)
5. Facial Recognition Sensor
6. Speech Recognition Sensor

1) Waggle: An Open Platform for Environmental Edge Computing and Intelligent Sensors leverages emerging technology in low-power processors, sensors, and cloud computing to build powerful and reliable sensor nodes that can actively analyze and respond to data.

2) Finger or Cuff-less Blood Pressure Measurement: In this application, real-time BP monitoring in human subjects to evaluate usability in outdoor environment. We will also test a finger cuff device, which uses the volume-clamp method of BP detection.

3) Atrial Fibrillation and Other Arrhythmias in ECG Tester: This application uses ECG uses small sensors (electrodes) attached finger sensors to sense and record electrical signals as they travel through your heart. This test is a primary tool for diagnosing atrial fibrillation.

4) Breathe Culture Collector/Electronic Nose (e-nose): A sensor device that identifies the specific components of an odor and analyzes its chemical makeup to identify it. An electronic nose consists of sensors for chemical detection, such as an array of electronic sensors, and a mechanism for pattern recognition, such as a neural network.

5) Facial Recognition Sensor: Biometric Artificial Intelligence based application that can uniquely identify a person by analyzing patterns based on the person's facial textures and shape.

6) Speech Recognition Sensor: Provides the ability of a machine or program to identify words and phrases in spoken language and convert them to a machine-readable format.

3.4 Data Storage

IBM DB2 Warehouse on Cloud: Cloud data warehouse is managed, monitored, encrypted and backed up by IBM. In addition, Db2 Warehouse automatically receive new features and capabilities, when available.

3.5 Data Security

Db2 Warehouse on Cloud can be deployed on an isolated network that's accessible through a secure Virtual Private Network (VPN).

5 Project Budget

Outdoor Healthcare Navigator

	Task	Estimated Cost +Labor	Responsible Team Member
1.	3.0 3.0 Chatbot (Amazon Lex AWS)	$1000.00	
2.	3.1 HRI Interface Development (Soul Machine)	$2000	
3.	3.2.1 Waggle Environmental (MicroChip)	$100	KGW
4.	3.2.2 BP and EKG Sensors (MicroChip)	$500	KGW
5.	3.2.3 E-Nose Sensors (Gentag NFC CARD's)	$500	KGW
6.	3.2.4 Vision & Speech Sensors	$200	KGW
7.	3.4 Data Licensing (USC NLUP Virtual Medical Encounters	$TBD	TBD
		$0	TBD
8.	3.5 Data Security	$1400	KGW Group
9.	Fabrication	$10% total	KGW Group
10.	Project Management	$1600.00	
11.	**Task**	**Estimated Total Cost**	
	Prototype Estimated Total	$16,700.00	