Statement of Work

FireStream

McMaster University
1280 Main Street W,
Hamilton, ON L8S 4L8
1280 Main St W, Hamilton, ON L8S 4L8

SOW 01 for Agreement to Perform Consulting Services to Longan Vision

Date	Services Performed By:	Services Performed For:
10/09/2019	FireStream McMaster University 1280 Main Street W, Hamilton, ON L8S 4L8	Longan Vision 175 Longwood Rd S, Hamilton, ON, CA

This Statement of Work (SOW) is issued pursuant to the Consultant Services Master Agreement between Longan Vision ("Client") and FireStream ("Contractor"), effective 10/09/2019 (the "Agreement"). This SOW is subject to the terms and conditions contained in the Agreement between the parties and is made a part thereof. Any term not otherwise defined herein shall have the meaning specified in the Agreement. In the event of any conflict or inconsistency between the terms of this SOW and the terms of this Agreement, the terms of this SOW shall govern and prevail.

This SOW # 01 (hereinafter called the "SOW"), effective as of 10/09/2019, is entered into by and between Contractor and Client, and is subject to the terms and conditions specified below. The Exhibit(s) to this SOW, if any, shall be deemed to be a part hereof. In the event of any inconsistencies between the terms of the body of this SOW and the terms of the Exhibit(s) hereto, the terms of the body of this SOW shall prevail.

Period of Performance

The Services shall commence on 10/25/2019, and shall continue through 04/01/2019.

Engagement Resources

Danny Thomas - B.Eng., Mechatronic Engineering (Anticipated April 2020)
Mansimrit Bajwa - B.Eng., Mechatronic Engineering (Anticipated April 2020)
Mithilan Muralitharan - B.Eng., Mechatronic Engineering (Anticipated April 2020)
Nishil Master - B.Eng., Mechatronic Engineering & Management (Anticipated April 2020)
Pravin Selvarajah -B.Eng., Mechatronic Engineering (Anticipated April 2020)
Shubhang Mall - B.Engr., Mechatronic Engineering (Anticipated April 2020)

Scope of Work

Contractor shall provide the Services and Deliverable(s) as follows:

The project involves creating a platform that enables live streaming of video, audio, and sensor readings from an AR device that emergency responders wear on call. The platform is run through a series of connections between the AR device and main hub. Data is accessed through a web application that is running on cloud servers. From the web application, viewers that are given access will be able to view the video, audio, and sensor readings and communicate to the firefighter in real-time. The challenges present in the project include ensuring the device works under any circumstances including remote areas where a signal tower may be nonexistent, creating encrypted channels, meeting hardware specifications.

Deliverable Materials

The deliverable materials are split into two components in this project, software running on the AR devices and the web application. The deliverables for both components are:

- Software development should be hardware independent and works seamlessly when the components are integrated into the Qt application.
- Be able to stream audio, video, and sensor readings to the web application. If one of them fails, this should not affect other data streaming.
- The software should have a good mechanism of managing the connections to the server including authentication, connect and reconnect login.
- The audio/video data should be encoded or compressed for faster transmission over the network and can let the web application receive and decode the data received.
- A web application with proper authentication of viewers and the devices. Only specific AR devices can establish a connection to and do bidirectional communication with the web applications. Only viewers with access can access the web application to view the streaming data from the devices and talk back to the firefighters using the AR device.
- The web application should be able to handle multiple device connections and managing the connection on-demand with security concerns.
- Deploy and automate the web-application on cloud servers of the application
- A basic front-end UI(web)

Project Specifications

Latency of the device:

- Streaming of the data should be as smooth as possible without delays or buffering
- Audio and visual components should be in sync
- Work around any noise interference in network while sending and receiving signals
- Strive to achieve a latency that's under 100ms.
- Sending and receiving of data should take 1 to 3 seconds in transition time

Device requirements:

- Operate under 266 degrees for 5 min, over 95 deg for 15 min
- Can be dropped multiple times from 2 meters
- Always be operational at 20 degrees
- Strive to keep the housing as light and small as possible

Contractor Responsibilities

- Providing weekly or monthly updates to the client. (This needs to be determined with client)
- Getting in touch with the Client whenever there is an issue without hesitation.
- Attending scheduled meetings with the client.
- Providing proper documentation of all processes.

Client Responsibilities

- Providing space to work on the project if needed
- Attending scheduled meetings for milestone updates
- Providing resources such as equipment, hardware, and software that may be needed
- Providing access to dedicated test facilities if needed such as the 5G test bed.

Resource Schedule

This engagement will be conducted on a Time & Materials basis. The total value for the Services pursuant to this SOW shall not exceed $1000 unless otherwise agreed to by both parties.

Item Description	Product	Number of Resources	$Price/unit	Date
Microcontrollers	Raspberry Pi 4 Kit	3	$99.99	10/25/2019
Cameras	Raspberry Pi Camera - 8 Megapixel (V2)	3	$31.45	10/25/2019
Temperature Sensors	SunFounder DS18B20 Temperature Sensor Module	4	$10.99	10/25/2019
USB microphone	USB 2.0 Mini Microphone	3	$9.99	10/25/2019

Milestone Timetable

By the end of October	• Buy all the hardware equipment (2 cameras, 2 micro-controllers, temperature sensor) • Conduct preliminary research & get a better understanding of the components that we are working with. • Reach out to professors who have expertise in the fields that we are looking at.
November 1st - November 25th	• Work on incorporating hardware aspects (Microcontroller to Camera)
November 25th - January 25th	• Data transmission of audio, video and sensor data over the cloud will begin. • Creating the web application to view the live stream data will begin. • Generating designs for the housing compartment
January 25th - February 25th	• Begin working on a way to encrypt the data transfers. • Continue working on the housing compartment to satisfy the design requirements listed above. • Begin working on researching ways to add another camera to the network.
February 25th - March 25th	• Continue working on a way to encrypt the data transfers. • Continue working on the housing compartment to satisfy the design requirements listed above. • Continue working on adding an additional camera to the network.

Detailed Project Procedure

1. Identify, purchase, and collect required resources while complying with desired specifications and budget constraints.
    1.1 Research and compare several models of requested microprocessors and thermal imaging cameras using various sources including bricks and mortar stores, online delivery, and e-commerce platforms.
    1.2 Discuss and confirm with sponsoring project manager if chosen components are able to be integrated with the pre-existing FireStream model.
    1.3 Use feedback received to reach consensus on selected parts, else repeat steps 1.1 and 1.2 before moving forward.
2. Use thermal imaging camera(s) to transmit data via cloud computing services and control the network traffic using a command terminal.
    2.1 Conduct research and identify key concepts on the utilization of mesh networking, data storage on the cloud, and directing short-wave radio signals to correctly assigned recipients.
    2.2 Choose a suitable cloud service able to securely store and transmit vast amounts of data; choose an appropriate command terminal interface.
    2.3 Stream live video feed from thermal imaging camera using the command terminal through data transmission over the cloud.
    2.4 Identify and optimize the relationship between network strength and the number of mesh nodes existing during live streaming and data transmission.
    2.5 Figure out how to conduct a cyber "handshake" of the feed to ensure the correct recipient between source and destination.
3. Securely encrypting the video from thermal imaging camera(s).
    3.1 Identify the failsafe encryption method for the live video feed.
    3.2 Ensure the stream cycle MUST meet the specified range of time to complete one clock cycle. (camera-terminal-feed-terminal-camera).
4. Protection from Surroundings and Nearby Environment
    4.1 latency testing, heat, drop tests, etc.
    4.2 materials improvements/parts replacement if needed
5. Prototype Testing in Real-Life Applications

IN WITNESS WHEREOF, the parties hereto have caused this SOW to be effective as of the day, month and year first written above.

Longan Vision

_____

Name:

_____

Date:

FireStream

_____ _____

Name: Name:

_____ _____

Date: Date:

_____ _____

Name: Name:

_____ _____

Date: Date:

_____ _____

Name: Name:

_____ _____

Date: Date: