



WELCOME TO ORION RING & RUN STEM CAMP (SUMMER 2024)

RING & RUN STEM EVENT.



ORION
OPEN ARCHITECTURE RESILIENT IOT
FOR OPERATIONAL NETWORKS

Objective: Build a “Smart” Doorbell from Scratch...

- That will...
 - Display streaming video in a Web App when the doorbell button is pressed, or when motion is detected
 - Play a customizable doorbell chime
 - Provide an intercom system to allow remote communication between the App and the person at the door
 - Use Advanced Artificial Intelligence to describe “who” or “what” is at the door
 - Ensure secure/encrypted communication between the Doorbell and the Web App.
 - Whatever else you can make it do...
- Using...
 - Raspberry Pi 4B
 - Electronic components the make up the doorbell
 - OpenAI Advanced Artificial Intelligence
 - Software that you develop to make it all work

Goals and Outcomes : Learn, Get Inspired, and Get Involved

✓ Learn about advanced technology...

- Raspberry Pi single board computer (SBC) and common uses
 - The basics of the Linux operating system
 - Basic fundamentals of the electronic device prototyping
 - Internet of Things (IoT) Systems
- Explore/discover programming concepts
 - Python, JavaScript, CSS (Cascading Style Sheets), and HTML 5
- Discover network protocols and methods for ensuring computer/network security
 - TCP/IP, HTTP, HTTPS, MQTT, PKI, TLS, etc.
- Exposure to the latest OpenAI Chat GPT (Artificial intelligence) services and models

✓ Get inspired, discover your talents, perhaps go to university and pursue a high technology career.

✓ Do Great things!

✓ Enjoy what you do!

Schedule/Project Breakdown

Module 1: (Day 1): Provision The Raspberry Pi for Use

- Write the Raspberry Pi OS (operating system) Image and configure the services
- Spend time getting familiar with the Pi and Linux environment

Module 2: (Day 1): Build the Doorbell device

Module 3: (Day 1 and 2): Implement Doorbell Software

- Implement the Software (front-end web application and server back-end)
- Use the standard IoT communication protocol (MQTT) to interact with and control the Doorbell device

Module 4: (Day 2): Implement PKI SSL/TLS (Transport Layer Security) into the Doorbell Design

- Discuss and implement public key infrastructure.
- Generate x509 standard certificates to establish verified and encrypted between clients and servers

Module 5: (Day 2): Making the Doorbell “Smart”

- Discuss the latest OpenAI Chat GPT (Artificial intelligence) services and models, and how integrate these services into the Doorbell Project

Module 6: (Day 2): Time Permitting) Discuss User Authentication/Authorization

- Consider authentication with the Mosquitto MQTT Broker

Module 7: (Day 2 and 3): Customize the Doorbell in anyway you wish

- Change colors, themes
- Experiment with new/missing features of interest etc.
- Each group 15-20 minute discussed of what they learned, found most interested, and present what you decide to do in Module 6

Drawing and Wrap up (Day 3)

Day 1: Tuesday (7/23)



9:45-12:00 : “Smart” IoT Doorbell Prototype Introduction

➤ **9:45-10:45 : Module 1: Provisioning the Raspberry Pi for Use**

➤ **10:45-11:00 : Break (restrooms, stretch, questions)**

➤ **11:00-12:00 : Module 2: Construct the Device**

12:00-1:00PM : Lunch and Demo

➤ **12:30 – 1:00 : Special Demo**

1:00-2:00 : Module 3: Implementing the Software (Front-end and Back-end Code)

Day 2: Wednesday (7/24)



9:00-11:00: Module 3 and Module 4

10:45-11:00 : Break (restrooms, ready for tour)

11:00-12:30: Innovare Tour

12:30-1:00PM : Lunch

1:00-2:45 : Module 4 and 5

Day 3: Thursday (7/25)



9:00-11:00: Module 5

11-11:15 : Break (restrooms, questions)

11:15 – 12:00 : Module 6

12:00-12:45pm: (Lunch/Demo: VICEROY Team)

12:45-1:45 : Module 7

1:45 – 2:45 (10-minute group presentations, 5 groups)

2:45-3:00pm – drawing and wrap up



RASPBERRY PI DOOR PRIZE!

PI DAY STEM EVENT.



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Drawing (Day 3): Thursday 2:30

- All camper's names entered in a drawing for chance to win the latest Raspberry Pi 5

**Raspberry Pi 5 Starter Kit PRO -
Turbine Black (128GB Edition)
(8GB RAM)**





ICEBREAKER

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Icebreaker

- Pick a team name (Air Force Aircraft Theme)
 - F-15 Eagle
 - F-16 Viper
 - F-18 Hornet
 - F-22 Raptor
 - F-35 Lightning
 - A-10 Warthog
 - B-21 Raider,
 - B-52 Stratofortress
- Pick a team representative
- Question: Nest vs. Ring doorbell?





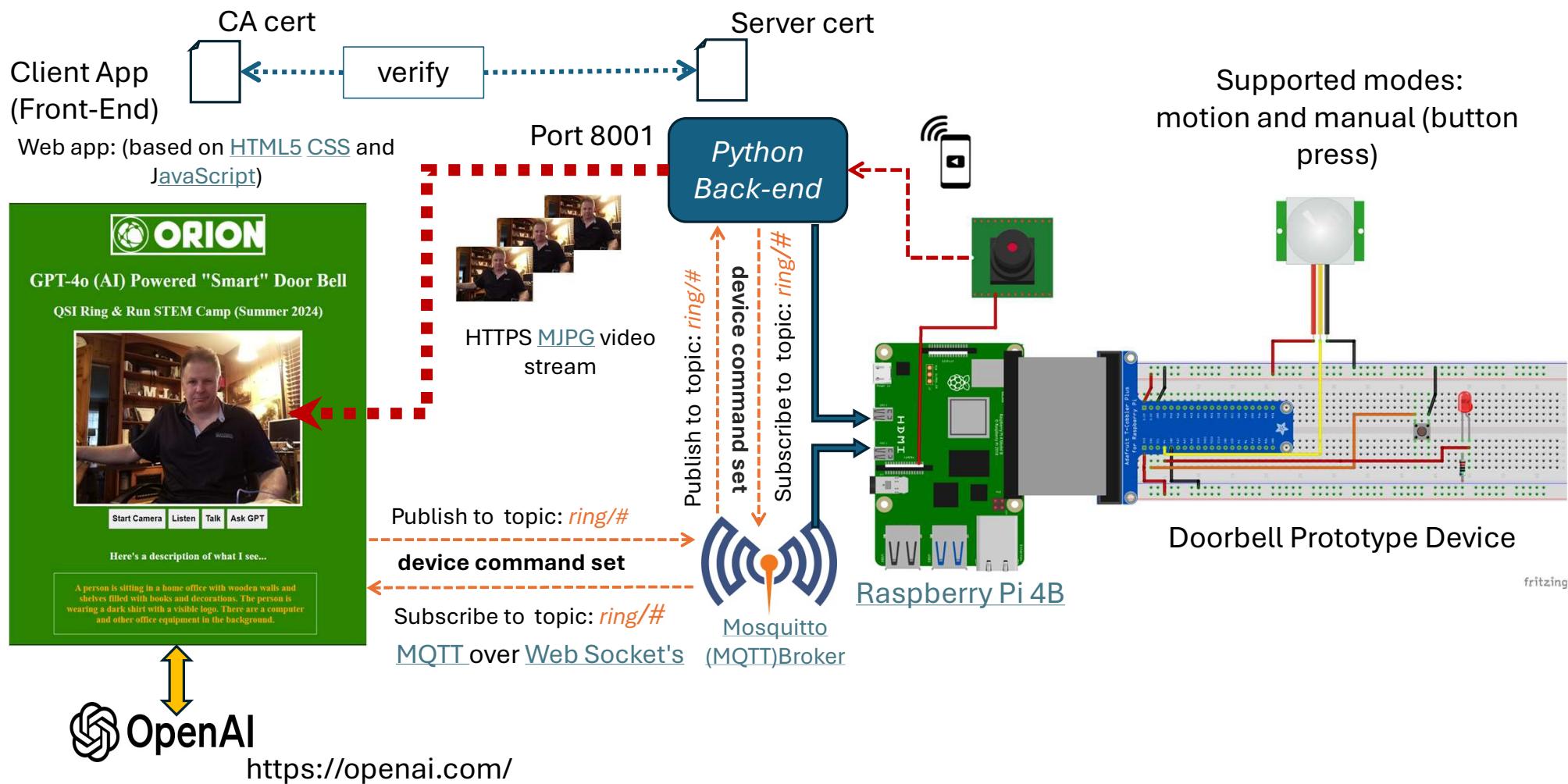
HANDS-ON PROJECT

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IoT enabled “Smart” Doorbell Concept



BACKGROUND AND ENABLING TECHNOLOGIES

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Background and Enabling Technologies

- What is a Raspberry Pi?
 - <https://www.youtube.com/watch?v=eZ74x6dVYes>
 - Board version comparison:
 - <https://socialcompare.com/en/comparison/raspberrypi-models-comparison>
 - Common Uses ...?
 - Home , “Maker culture”
 - <https://www.raspberrypi.com/for-home/>
 - <https://www.tomshardware.com/features/best-raspberry-pi-projects>
 - Education
 - <https://www.raspberrypi.org/app/uploads/2018/08/Raspberry-Pi-Computers-in-Schools-2018.pdf>
 - <https://www.raspberrypi.org/teach>
 - Industry
 - <https://www.raspberrypi.com/for-industry/>
 - <https://www.raspberrypi.com/for-industry/space/>
 - industrial automation
 - applications for prototyping
 - embedded systems
 - low-cost process controller
 - Air Force: <https://www.newsweek.com/artificial-intelligence-raspberry-pi-pilot-ai-475291>

Background and Enabling Technologies

- Raspberry Pi versus Arduino
 - <https://www.youtube.com/watch?v=p40OetppIDg>
 - <https://webbylab.com/blog/arduino-vs-raspberry-pi-key-differences-comparison-table/>
- Raspberry Pi 5 (latest version)
 - <https://www.raspberrypi.com/news/introducing-raspberry-pi-5/>
- What is Internet-of-things (IoT),
 - <https://www.youtube.com/watch?v=uEsKZGOxNKw>
 - <https://www.youtube.com/watch?v=6mBO2vqLv38>
- Technology stacks: Python, JavaScript, HTML5, CSS
 - Network communication Protocols: TCP/IP, HTTPS, MQTT, etc.