MODULE 6: CUSTOMIZE THE DOORBELL

RING & RUN STEM EVENT.

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3D Printed Cases

- Working with Ken Kowalski to add house your prototype in a 3d printed case
  - Discussion
    - Printer types
    - Background and skills/tools required
      - Solid Works
      - Tinker CAD

Ideas for Customizing the Doorbell …

- Investigate your own creative interests:
  - If you have ideas you want to test/try to get doorbell to do something we haven't discussed, then now is your chance:
    - Here are some suggestions (only suggestions) for ways to customize your Doorbell
      1. **Create a custom "Theme"**: Modify the CSS styles and/or the HTML code of Client (Web) Application
         - Change the colors (the background, text, page layout, etc.) etc. to be consistent with your team's preference
      2. Implement a new command argument in ring_server.py to enable **custom doorbell ring tones** whenever the button is pressed, or motion is detected.

         Note: You should be able find and download mp3 ring tones from the internet.

Ideas for Customizing the Doorbell …

3. The doorbell should have a way to **store video clips to the Cloud** so they can be viewed at later time.

- When the doorbell detect motion and/or when the button is pressed the doorbell should record video for a specified period of time and transmit recorded video to Cloud storage.

    - This would allow video to be shared and reviewed remotely, at a later date by authorized individuals.
        - Work with your team members to develop a concept for how you might extend the doorbell design to support storing and viewing video in the Cloud.
            - Research Cloud Computing storage services (there are many):
                - Examples include AWS S3 Buckets and Azure BLOB storage

Ideas for Customizing the Doorbell …

4. Experiment with AI services. Do some reading in the OpenAI documentation, search online, or "ask" GPT for ways to fine tune vison model for best results.

- Hint: read the community forums, consider how the system role can influence the systems behavior in terms of the results it provides: https://community.openai.com/t/the-system-role-how-it-influences-the-chat-behavior/87353
  - Nice Tutorial: https://www.datacamp.com/tutorial/gpt4o-api-openai-tutorial

- Search the (alternative) as well as open source and free services (similar) to OpenAI) to use in its place
  - LLMs with Vision: https://roboflow.com/model-feature/llms-with-vision-capabilities
  - Vison LLM: https://github.com/OpenGVLab/VisionLLM
  - Google's Gemini: https://ai.google.dev/gemini-api/docs/vision?lang=python

5. We did not discuss, nor implement authentication. This has significant security implications.
   - See the next slide for discussion about authentication versus authorization

User Authentication? Really?

- We used PKI / TLS (certificates) to “authenticate” that a server is the server it proclaims to be (i.e., the identity of the server)

- We can also use certificates to authenticate clients, and users alike.
  - Personal certificates (browser)
  - smart cards

- A common way to authenticate people is using “username” and “password” approach

- Note: Authentication is <u>not the same as authorization.</u>
  - The later deals with managing the level of access a user has within a system
    - Often with a “role-based” approach

- Note: We did not implement “user” authentication for the “Smart” doorbell

  …meaning someone else can likely connect to, and control your Doorbell

Setting Mosquitto MQTT Broker Authentication

- Follow the link an GPT-4o chat for setting up authentication for
  - https://chatgpt.com/share/df72014c-90d3-444e-9b35-eda1711dcd94

TEAM PRESENTATIONS

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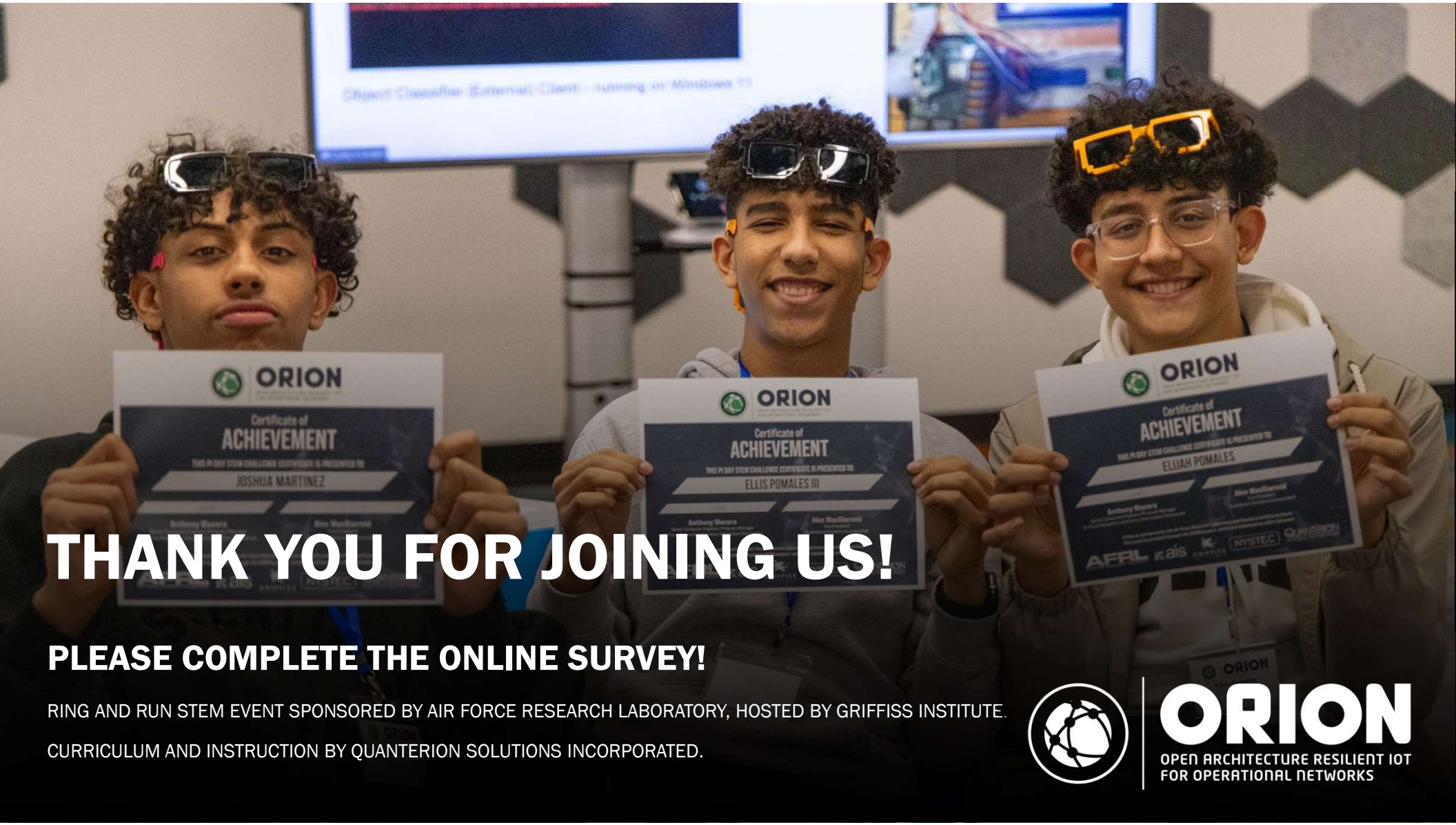
Team Presentations

- Each team take to time build a 10-minute presentation
  - discussion, or demo whatever you would like
- Describe in some way what you team identified and perhaps decided to try for a customization to the Doorbell
- Describe what inspired you most about your time here are the Ring and Run camp
  - What did you take away?
  - What did you find most interesting and helpful?

Where do we go from here?

- Other STEM camps, competitions, etc.
  - https://www.griffissinstitute.org/who-we-work-with/afrl/stem
- Online based learning resources
  - https://randomnerdtutorials.com/getting-started-with-raspberry-pi/
  - https://projects.raspberrypi.org/en
  - Let's Learn .NET - IoT (Internet of Things) (youtube.com)
- College Preparation course work
  - Computer Science/Programming/Cybersecurity offered
    - Math courses are a critical part of the rigor for Computer Scientists and Engineers of all sorts
  - College careers
    - Computer Science, Computer/Electrical Engineering
      - Speak to your teachers/guidance counselors
      - Reach out to us, anytime!



THANK YOU FOR JOINING US!

PLEASE COMPLETE THE ONLINE SURVEY!

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Ring & Run STEM Camp Takeaways

The following slides contain resources that you can use to build your presentation or use for future reference.

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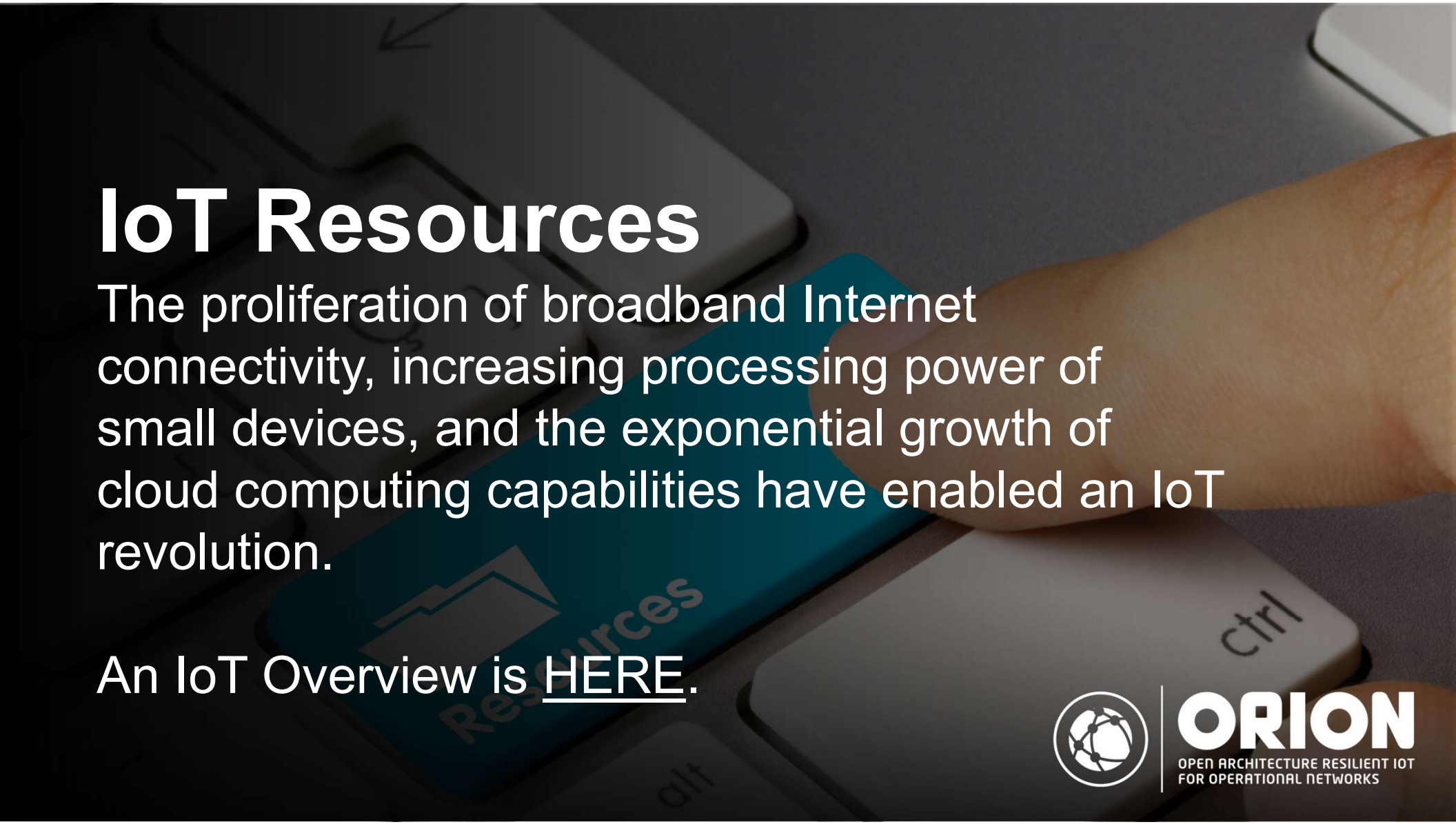

IoT Resources

The proliferation of broadband Internet connectivity, increasing processing power of small devices, and the exponential growth of cloud computing capabilities have enabled an IoT revolution.

An IoT Overview is HERE.

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Message Protocol Resources

The IoT realm involves many disparate devices, services, and user applications. One messaging protocol that has emerged as a leader for IoT applications is the Message Queueing Telemetry Transport (MQTT).

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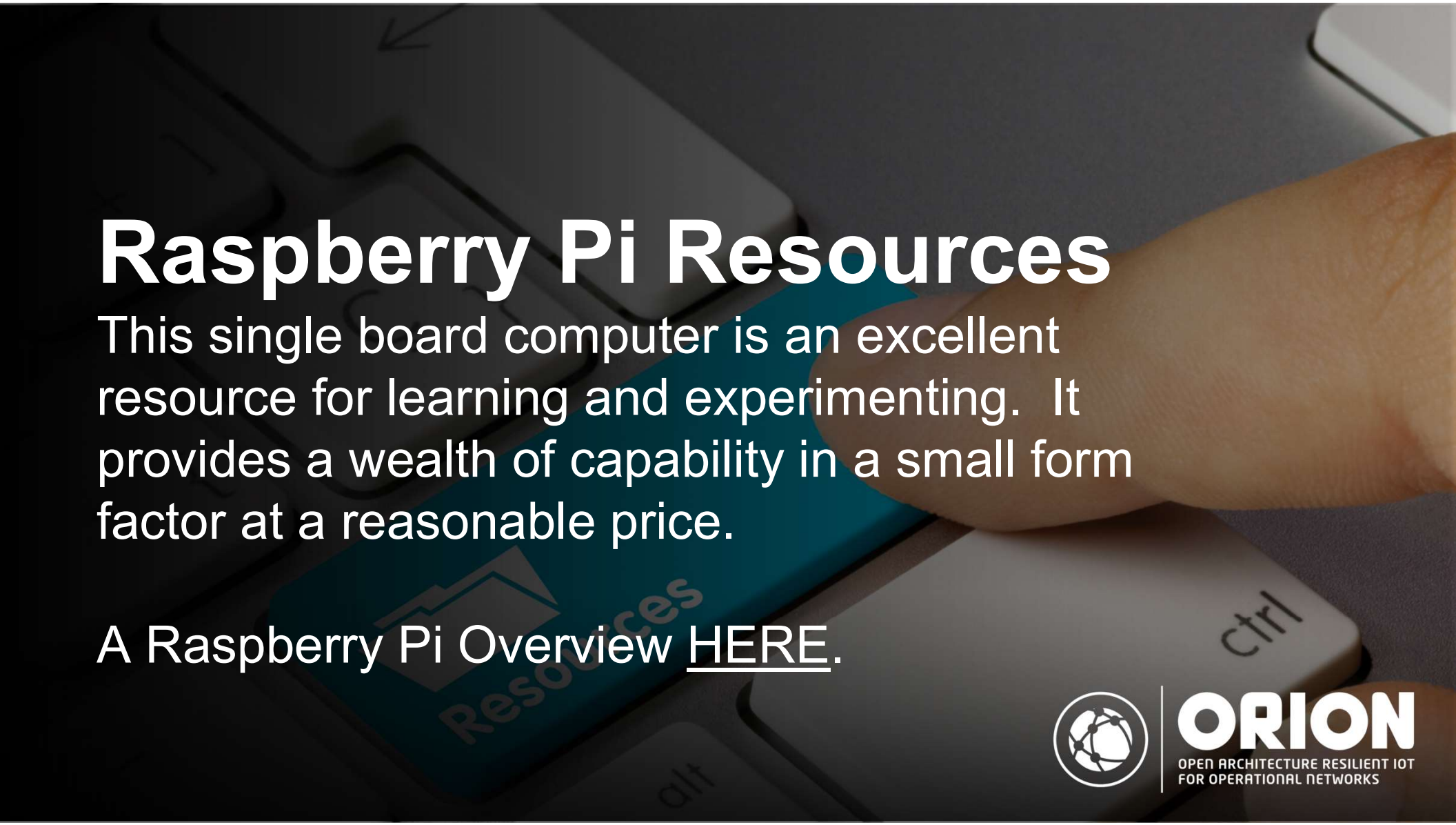

Raspberry Pi Resources

This single board computer is an excellent resource for learning and experimenting. It provides a wealth of capability in a small form factor at a reasonable price.

A Raspberry Pi Overview HERE.

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Electronic Components

IoT solutions typically interface with electronic components to sense some environmental condition and then perform some sort of action in response.

For your continued exploration:
Physically Interfacing with a Raspberry Pi IoT Prototypes Using a Breadboard

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