

REU@CSU: An REU Site in Security for Mobile Sensing and the IoT



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<http://www.reucusu.org>



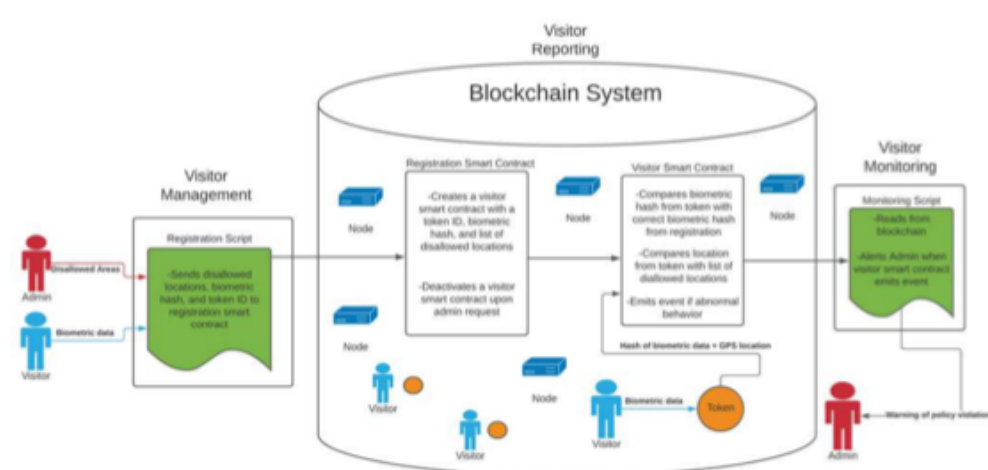
In this REU we have the following objectives:

- Increase the number of students from undergraduate institutions with limited access to research opportunities and from URM groups
- Increase the cybersecurity and CS workforce to protect the U.S. cyberspace through the retention and graduation of participants from URM groups and students from non-research institutions
- Develop the participants' skills to conduct research in computer science and cybersecurity through research projects focused on the security and privacy of mobile sensing systems and the Internet of Things
- Implement best-practices during the summer program and throughout the year to support the participants' research and career goals

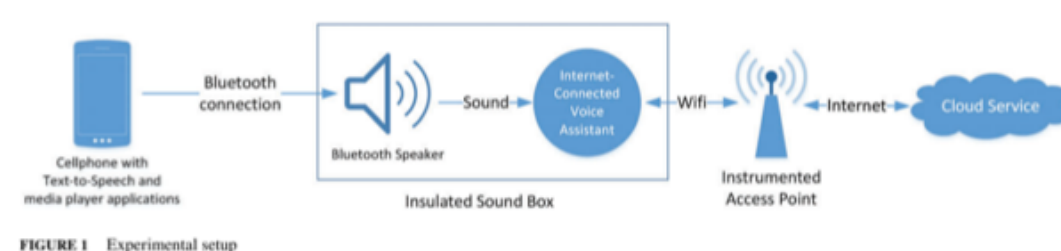
Research conducted in our REU may generalize to different classes of IoT and wearable devices in aspects related to privacy, security, authentication, authorization and malware detection

Development of new protocols and countermeasures to protect devices and users

We have conducted research in different aspects of security and privacy of IoT and wearables



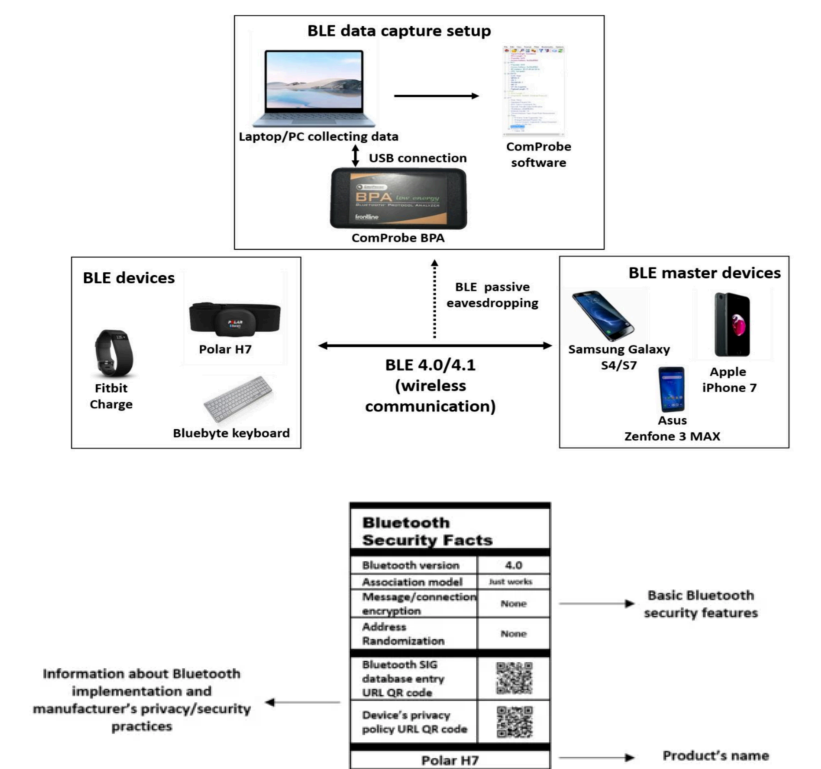
Blockchain-based access control



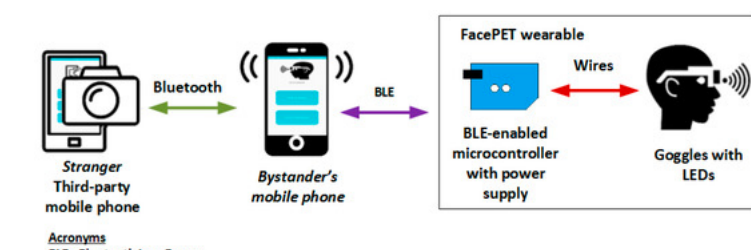
Privacy in voice-activated assistants

| Permission Category | Permission | Classified Disclosure by Android? | Description |
|----------------------|------------------------|-----------------------------------|---|
| Device Test/Function | BLUETOOTH_CONNECTIVITY | Required Permission | Requires a special capability to connect to Bluetooth devices. This permission is required for the app to connect to Bluetooth devices. |
| Device Test/Function | CAMERA | ✓ | Allows the app to take pictures and videos with the camera. This permission is required for the app to use the camera. |
| Device Test/Function | CHANGE_NETWORK_STATE | ✓ | Allows an app to change the network state, such as turning network connectivity on and off. |
| Device Test/Function | INTERNET | ✓ | Allows an app to use the Internet. |
| Device Test/Function | RECEIVE_BOOT_COMPLETED | ✓ | Allows an app to receive the boot completed broadcast. |
| Device Test/Function | RECORD_AUDIO | ✓ | Allows an app to record audio with the microphone. This permission is required for the app to use the microphone. |
| Device Test/Function | SYSTEM_ALERT_WINDOW | Special Permission | Allows an app to draw system alert windows that other apps cannot see. This permission is required for the app to draw system alert windows. |
| Device Test/Function | WAKE_LOCK | ✓ | Allows an app to prevent the phone from going to sleep. |
| Permission Class | ACCESS_FINE_LOCATION | ✓ | Allows an app to access fine location information. This permission is required for the app to use fine location information. |
| Permission Class | ACCESS_COARSE_LOCATION | ✓ | Allows an app to access coarse location information. This permission is required for the app to use coarse location information. |
| Permission Class | GET_ACCOUNTS | ✓ | Allows an app to view accounts on the device. This permission is required for the app to view accounts on the device. |
| Permission Class | READ_EXTERNAL_STORAGE | ✓ | Allows an app to read from external storage. This permission is required for the app to read from external storage. |
| Permission Class | WRITE_EXTERNAL_STORAGE | ✓ | Allows an app to write to external storage. This permission is required for the app to write to external storage. |
| Permission Class | CALL_PHONE | ✓ | Allows an app to call phone numbers without the user's intervention. This permission is required for the app to call phone numbers without the user's intervention. |
| Permission Class | READ_PHONE_STATE | ✓ | Allows an app to read phone state and determine the phone's number, network information, and other phone-related details. |
| Permission Class | READ_SMS | ✓ | Allows an app to read text messages (SMS or MMS) stored on the device. This permission is required for the app to read text messages stored on the device. |
| Permission Class | RECEIVE_SMS | ✓ | Allows an app to receive text messages (SMS or MMS). This permission is required for the app to receive text messages. |
| Permission Class | SEND_SMS | ✓ | Allows an app to send SMS messages. This permission is required for the app to send SMS messages. |

Android malware



Bluetooth security



Bystanders' facial privacy

Broader Impact

The development of new methods, algorithms and tools to protect the privacy and security of users in mobile sensing systems and Internet of Things (IoT) will help protect our cyberspace and develop new tools, techniques and protocols in aspects such as facial privacy, mobile malware, security and trust in IoT systems, and secure and efficient sensor data storage in distributed ledgers.

Broader Impact

(education and outreach)

Facilitate a greater inclusion of underrepresented minority (URM) groups and students from institutions with limited access to research opportunities to participate in mentored research experiences on cybersecurity and privacy of mobile sensing systems and the Internet of Things.

Broader Participation and Broader Impact

- 34 REUs since 2017 have participated in the REU with 64% of past REUs are members of underrepresented groups in CS. We have recruited veterans from the U.S. Army
- Seven past REUs have been accepted to graduate programs in cyber security and CS. 18 REUs have published their work in 13 publications in journals and conference papers
- More than 80% of participants recruited from non-Ph. D. granting institutions in CS/Cyber