**Project Overview**

Hub for IoT is a centralized system that manages and controls IoT devices. It grants network connection for those devices and controls them to play videos and music. It also checks for software update for devices and manages user access. It is implemented as a web app and users can interact with it through a web browser.

**Motivation**

- Number of IoT devices is rapidly increasing
- There lacks an easy and secure way to add new bought IoT devices to home network
- IoT devices are prone to cyber attacks (e.g. IoT DDos Botnet)
- People find it hard to manage dozens or hundreds of devices

**Contribution**

- Built a system to configure, manage and control multiple IoT devices
- Used EAP-NOOB protocol to grant network access to IoT devices
- Designed Device Metadata Protocol to identify and configure new device
- Designed User Access Control Protocol to define human-device relationship

**Future Work**

- Accelerate the process of QR code scanning and authentication.
- Group multiple devices of the same type in device page
- Refactor the system using React framework

**Acknowledgement**

Special thanks to Prof. Jason Hong, Dr. Mohit Sethi, Prof. Mahadev Satya, Prof. Dan Siewiorek, Prof. Asim Smailagic, participants in our user study and all the people helped us in the project

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**System Architecture**

**Hub for Internet of Things**

**Mentor:** Jason Hong and Mohit Sethi

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**Challenge**

**Scalability**

- System should be capable of handling a large number of users and devices
- Make the protocols as simple as possible to support low-end devices

**Compatibility**

- We want our system to work on different kinds of devices

**Usability**

- System should be easy to operate even for users without technology background

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**Design Decisions**

**Mobile Web Application (Compatibility)**

- Platform independent with high portability

**Stateless Client (Scalability)**

- Allow multiple users to control the same device
- Mitigate consistency problem

**Centralized Device Management (Usability)**

- Provide user with an overview of status of all devices
- Provide a venue for monitoring behaviors of devices

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**Extensibility**

- Make the system open for new features and new devices/applications

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**User Interface Implementation**

**First Iteration**

Draft UI design and a Low Fidelity User Study with 5 participants to gather feedbacks.

**Second Iteration**

Improvement based on the feedback from the user study

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**System Operation**

**Figure A:** Add a new device  
**Figure B:** Play YouTube video  
**Figure C:** Check software update for device

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**Design**

- Platform independent with high portability

**Stateless Client (Scalability)**

- Allow multiple users to control the same device
- Mitigate consistency problem

**Centralized Device Management (Usability)**

- Provide user with an overview of status of all devices
- Provide a venue for monitoring behaviors of devices

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**Uniform Metadata Protocol (Extensibility)**

- Support adding devices from different manufacturers in a uniform way
- Information type is pre-defined
- Phase I: exchange device identifier
- Phase II: exchange basic information

**User Access Control (Usability)**

- Support fine grained user access control
- Provide device specific user authorization

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**User Interface**

**First Iteration**

Draft UI design and a Low Fidelity User Study with 5 participants to gather feedbacks.

**Second Iteration**

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