ILLINOIS TECH

Application Software Design

ECE 528

Project 6

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Solutions

1 Overview

This project creates a web interface for the Internet of Things Hub that allows users to monitor and control smart plugs and their groups using RESTful services provided by the underlying infrastructure. The interface is accessible via any modern web browser and multi-user real-time synchronization is supported. The interface design strictly follows the CSS and HTML templates provided in the project specification.

2 Given User Stories

2.1 Plugs and PlugStates

As an end-user, I want to see available plugs and their states, so that I can know what plugs are there and whether they are on or off.

2.2 Control a Single Plug

As an end-user, I want to click a button on the web page to switch on/off or toggle a plug of my choice, so that I can easily control it.

2.3 Groups and Plugs

As an end-user, I want to see available groups, as well as plugs belonging to a group of my choice and their states, so that I can know what groups have been defined, and the state of a group.

2.4 Group Management

As an end-user, I want to add groups and modify their members on the web page, so that I can easily manage them.

2.5 Control Plugs in a Group

As an end-user, I want to click a button on a web page to switch on/off or toggle all plugs belonging to a group of my choice, so that I can easily control them together.

2.6 Multi-User Synchronization

As an end-user, I want to see the state update for plugs in all places if someone else switches on/off or toggles plugs from another browser so that multiple users can use the web application together.

3 Implementation Summary

1. A user interface was designed using HTML, CSS, and JavaScript, as stated earlier.
2. RESTful API calls are made to the backend to fetch plug or group details and to send control commands.
3. State updates are handled via polling or WebSocket (depending on backend support) to ensure multi-user synchronization.
4. The interface carefully conforms to the prescribed style standards to avoid any grading deductions.

4 Testing Procedures

Here are the sequential testing protocols, each relating to a specific user story, as per the project requirements. Each protocol outlines the operational procedure and the expected outcomes.

4.1 Plugs and PlugStates

4.1.1 Steps

1. Launch a web browser and go to the main page of the web interface.
2. All the designations on the plugs currently available are listed on the left-hand side of the page.
3. Choose a plug name on the left.
4. On the right-hand side, the active/inactive operating condition and the metric of the selected plug are shown.
5. Choose a different plug.
6. The page has a right-hand side that gets updated to indicate the status of the newly selected plug.

4.1.2 Screenshots

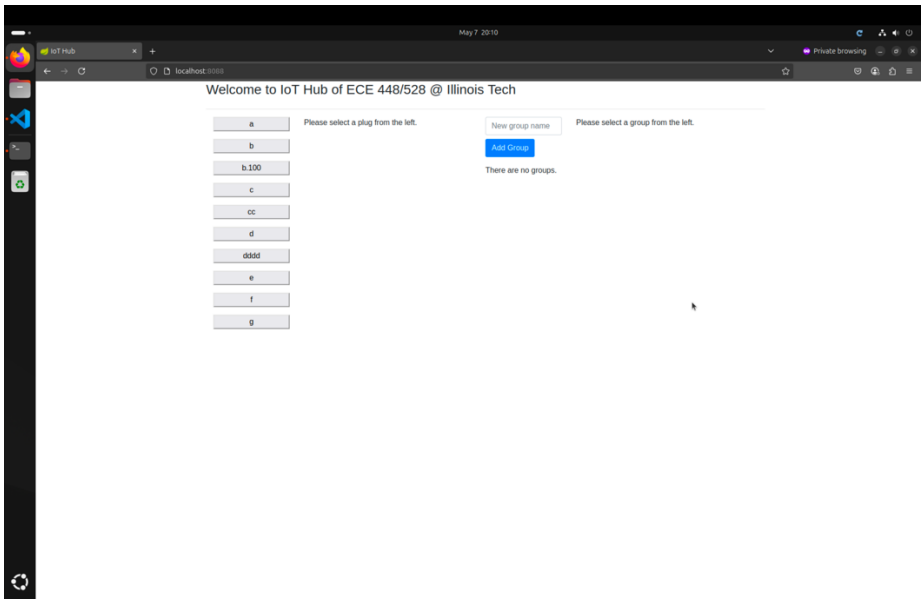

Figure 1: Homepage UI.

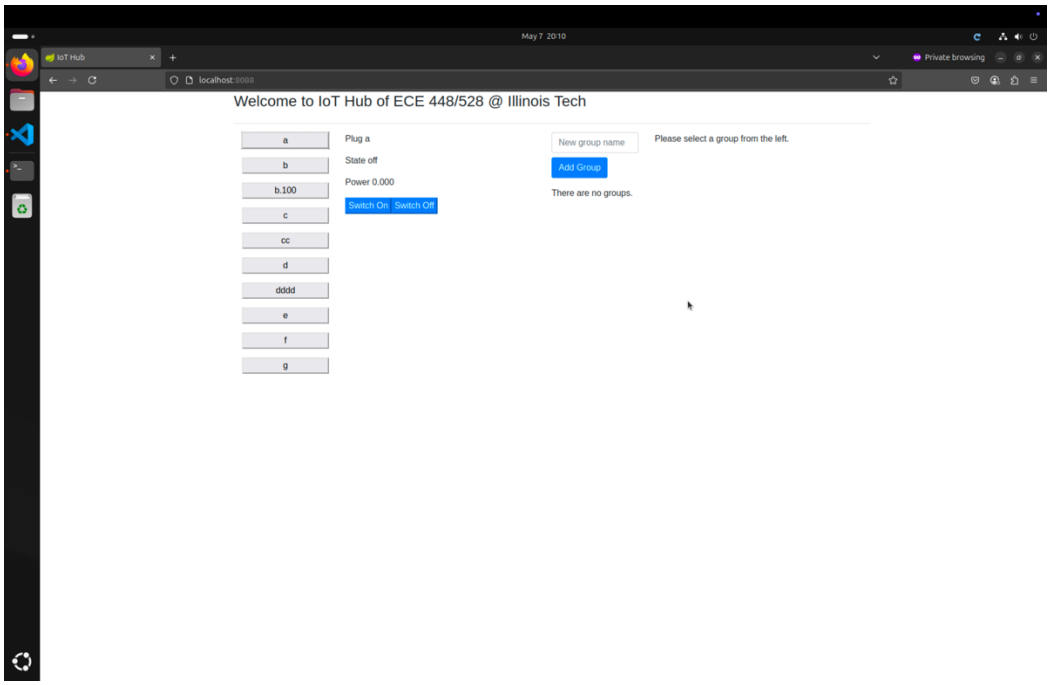

Figure 2: Choosing a Plug.

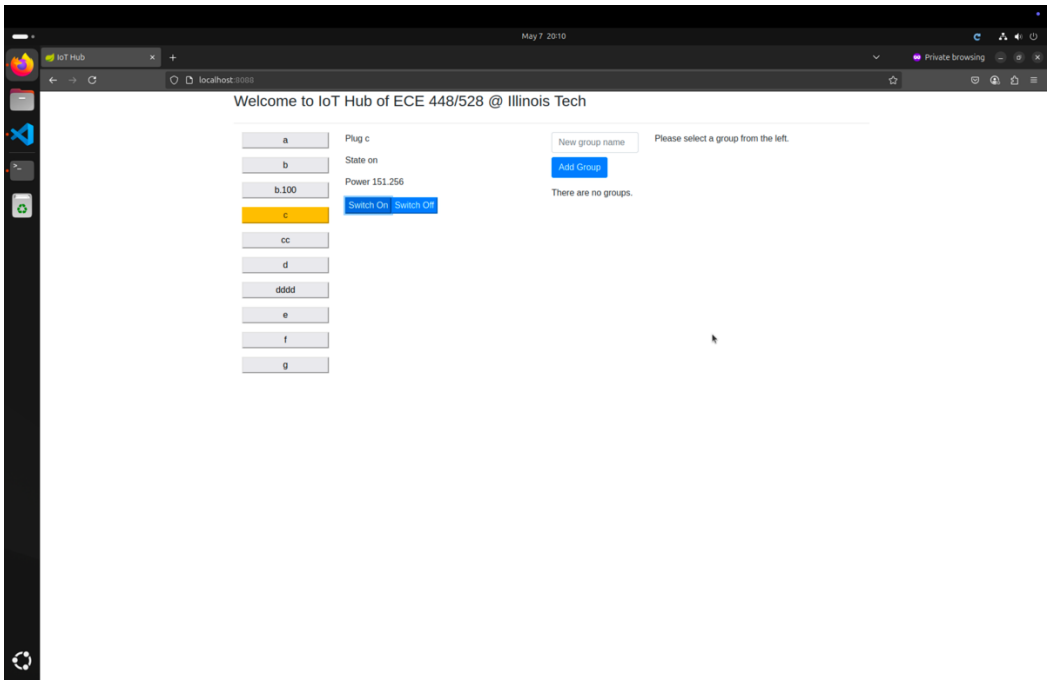

Figure 3: Choosing a different plug.

4.2 Control a single plug

4.2.1 Steps

1. Select a connector from the options provided
2. Choose the option named "Switch On," "Switch Off," or "Toggle."
3. The interface correctly represents the state of the plug.
4. Select or reinstate the plug to ensure that the state change is retained.

4.2.2 Screenshots

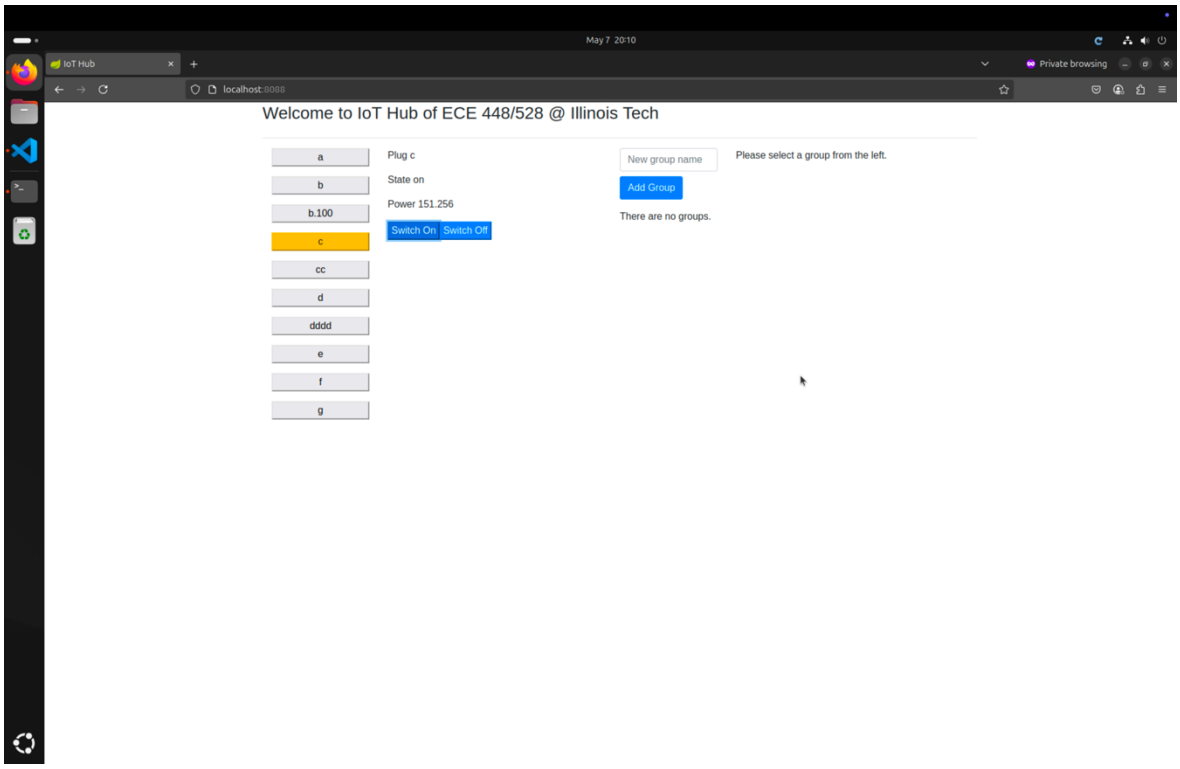

Figure 4: Switch On a plug.

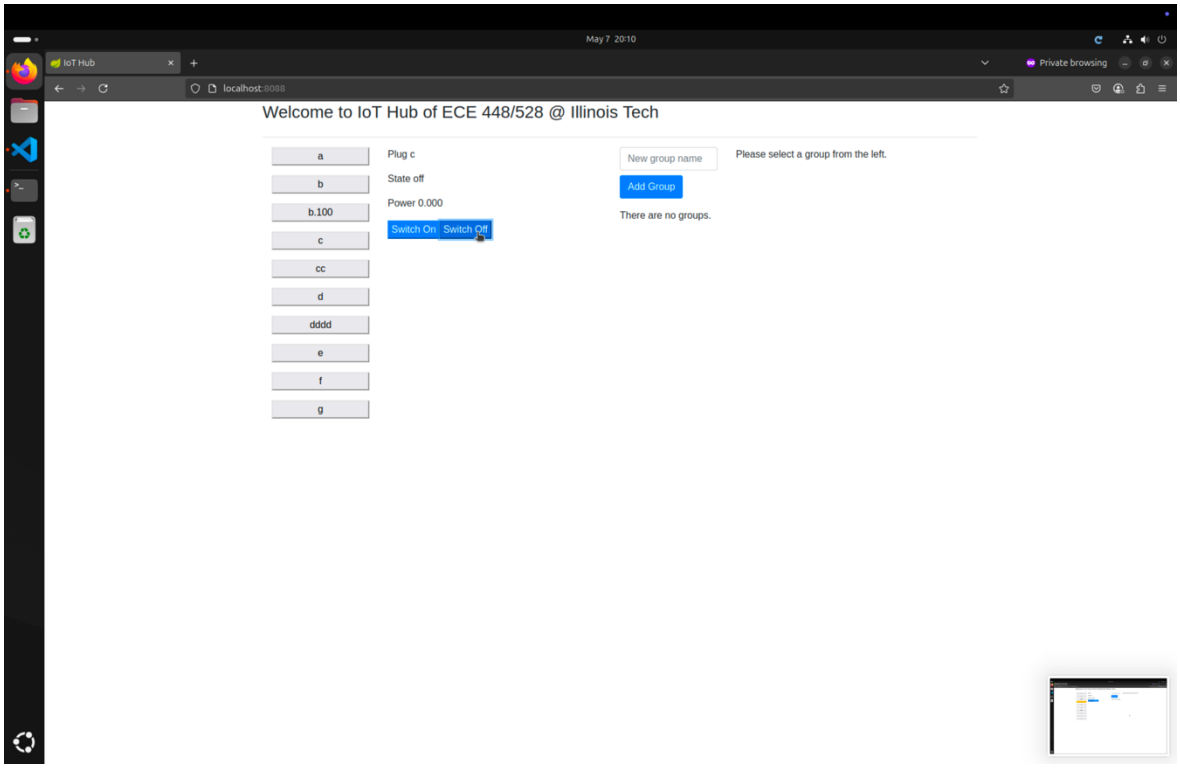

Figure 5: Switch Off a plug.

4.3 Groups and Plugs

4.3.1 Steps

1. Analyze the collection of categories provided within the interface.
2. All of the listed groups are shown.
3. Select a group.
4. It comprises corresponding plugs, each with a demarcation of their respective states.
5. Select another group to verify the correct updates.

4.3.2 Screenshots

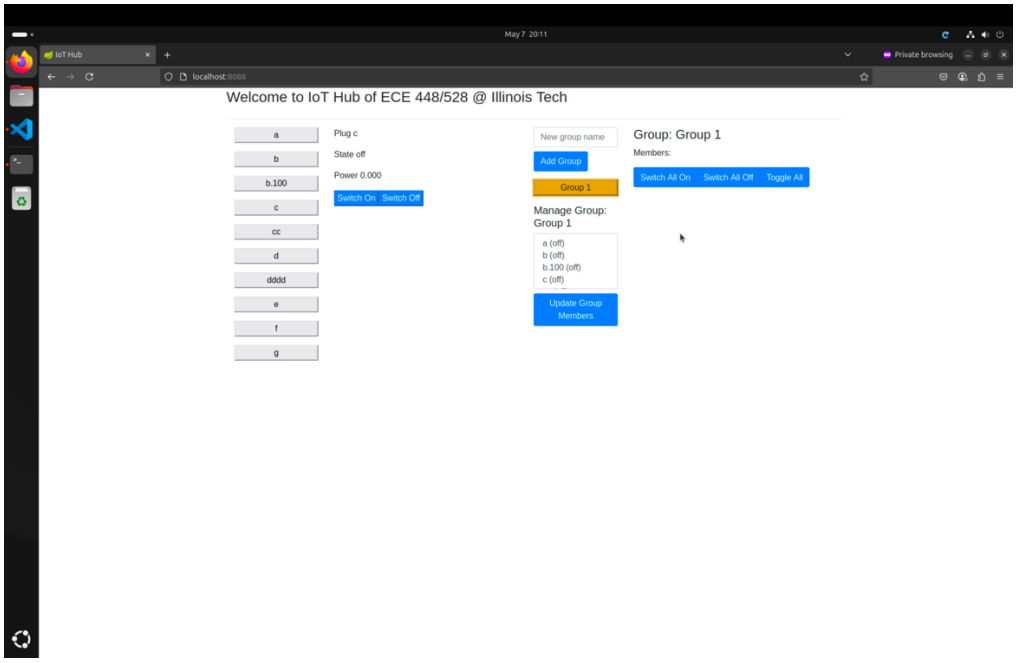

Figure 6: Group Creation.

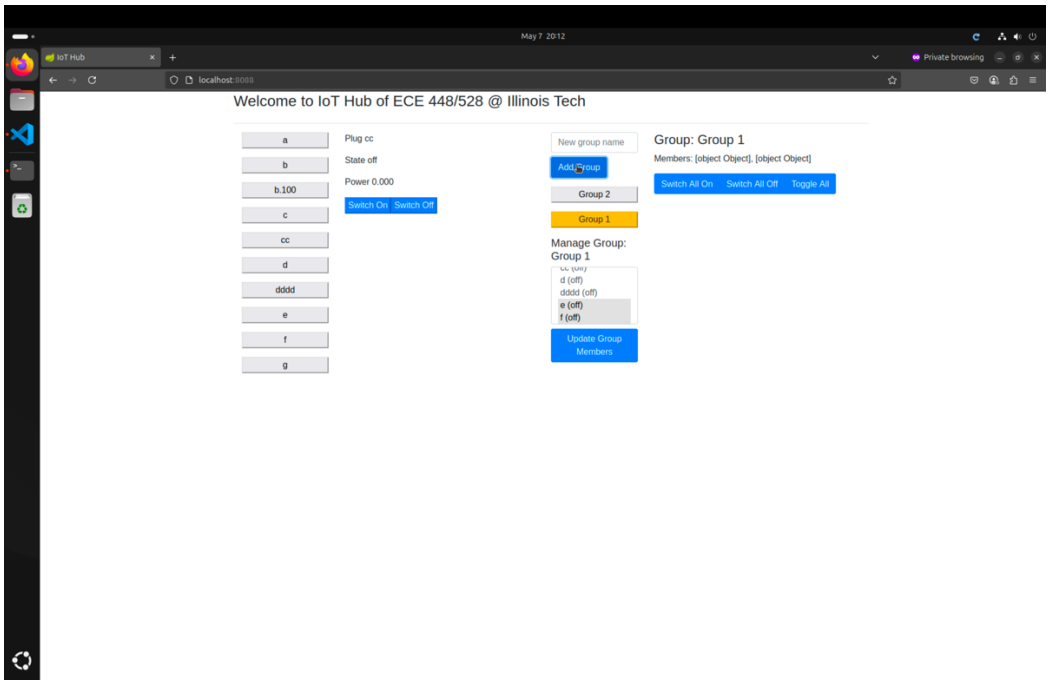

Figure 7: Secondary Group Creation.

4.4 Group Management

4.4.1 Steps

1. Use the user interface to add a new group by entering an assigned group name and selecting corresponding member plugs.
2. The newly established group is part of the list of groups.
3. Edit an existing group's members.
4. The group has since been revamped to mirror the changed membership.
5. Remove a designated group and check its removal from the list.

4.4.2 Screenshots

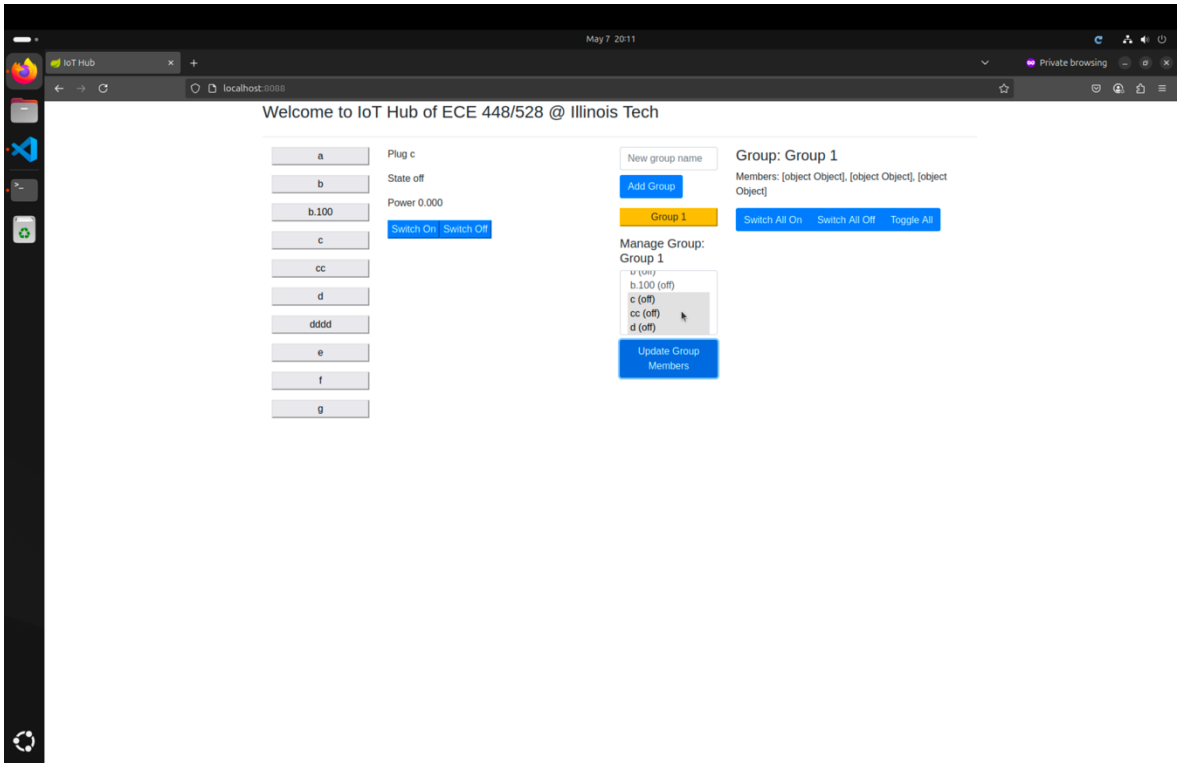

Figure 8: Selecting members of the group.

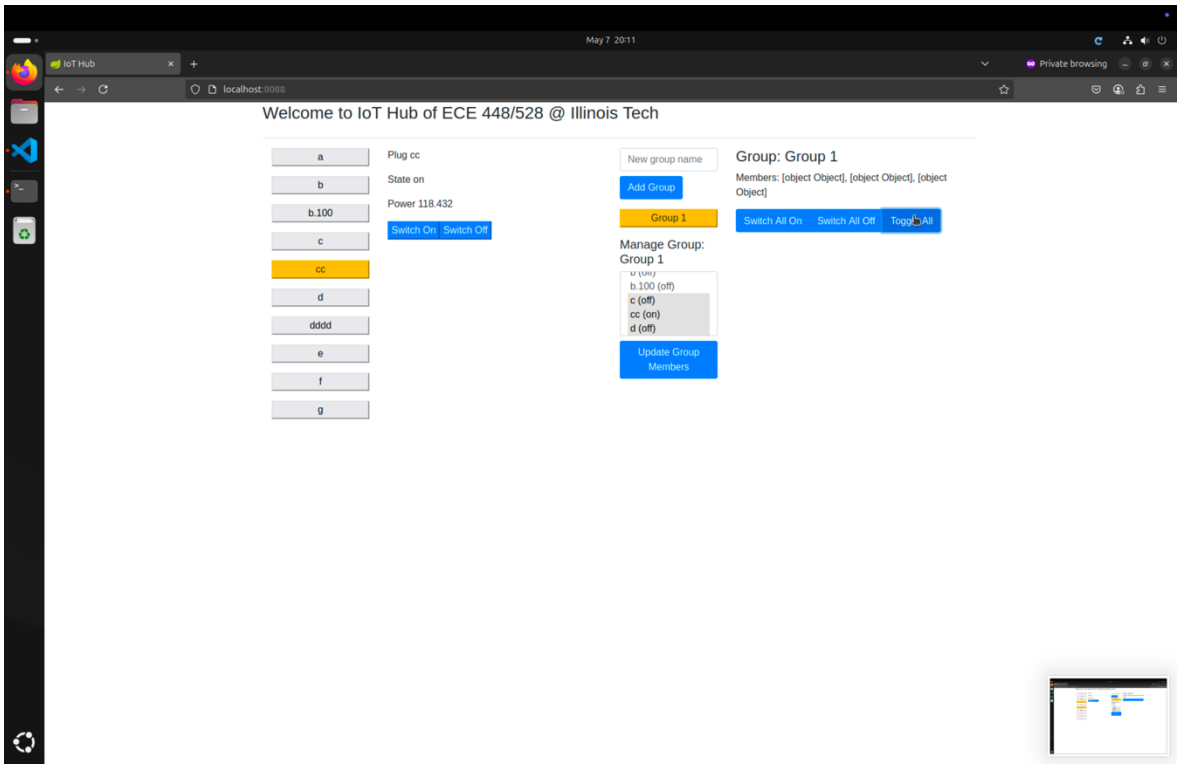

Figure 9: Toggling switch functions for the group members.

4.5 Control Plugs in a Group

1. Select a category from the given list.
2. Use the options labeled as "Activate All," "Deactivate All," or "Alternately Activate All."
3. The user interface correctly reflects the state changes of each plug within the group
4. Ensure the states of individual plugs match the collective operation.

4.6 Multi-user Synchronization

4.6.1 Steps

1. Access the web interface from two different browsers or browser windows.
2. Perform control operations on single plugs or groups in one interface.
3. The next window presents the changes of state that take place either immediately or after a delay, thus demonstrating synchronization.

4.6.2 Screenshots

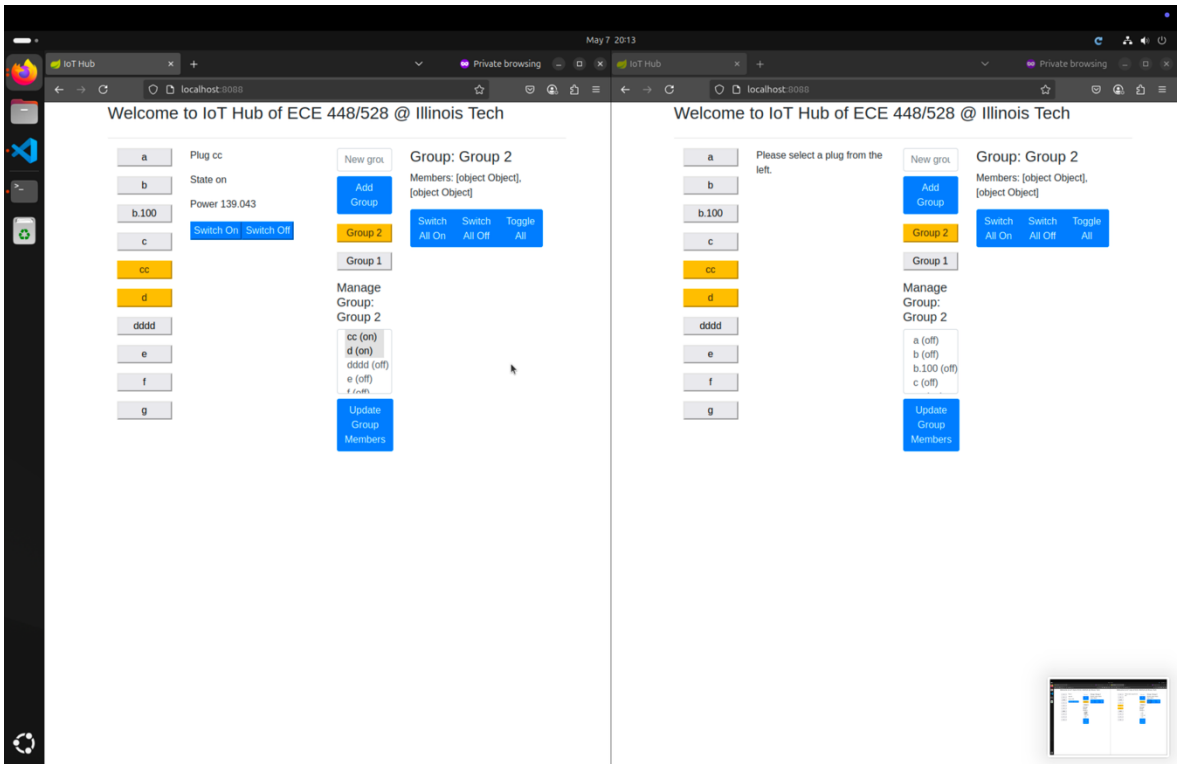

Figure 10: Multi-user Group Plugs ON.

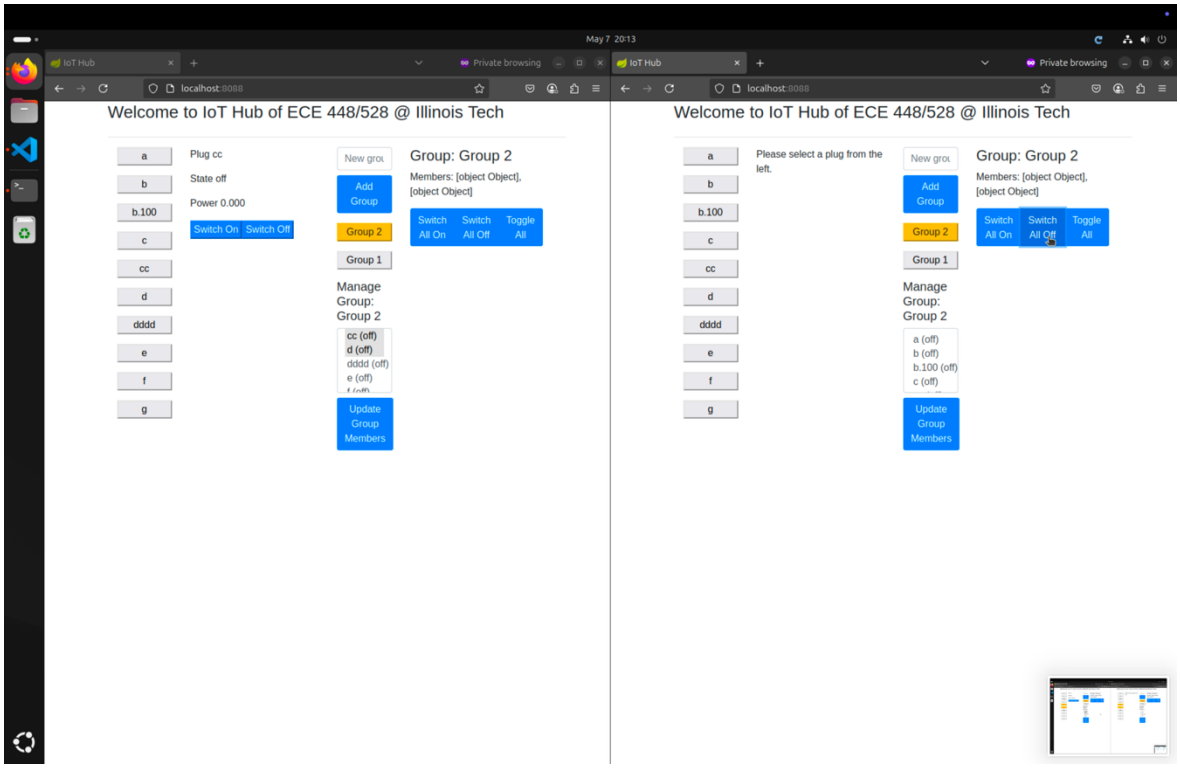

Figure 11: Multi-user Group Plugs OFF.