

Smart Home

Jake Palandri - z5313097

Outline

- Breakdown of functionality
- Tech Stack
- Demonstration
- Addressing the problem
- Plans for Thesis C

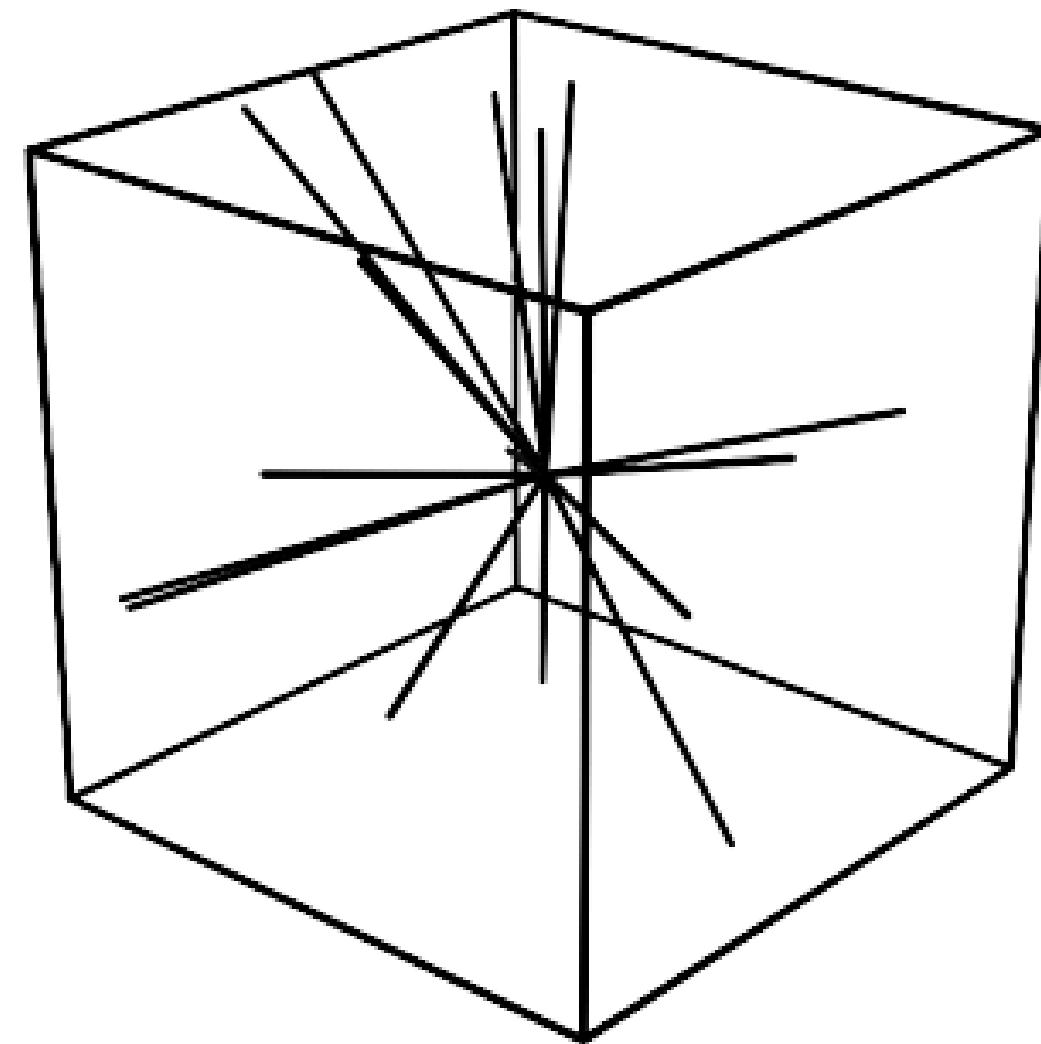
YOLOv8 Pose Estimation



Intrinsic Camera Matrix Multiplication

$$\begin{bmatrix} x' \\ y' \\ w \end{bmatrix} = \begin{bmatrix} \alpha & -\alpha \cot\theta & x_0 & 0 \\ 0 & \frac{\beta}{\sin\theta} & y_0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$

Vector-Bounding Box Intersection



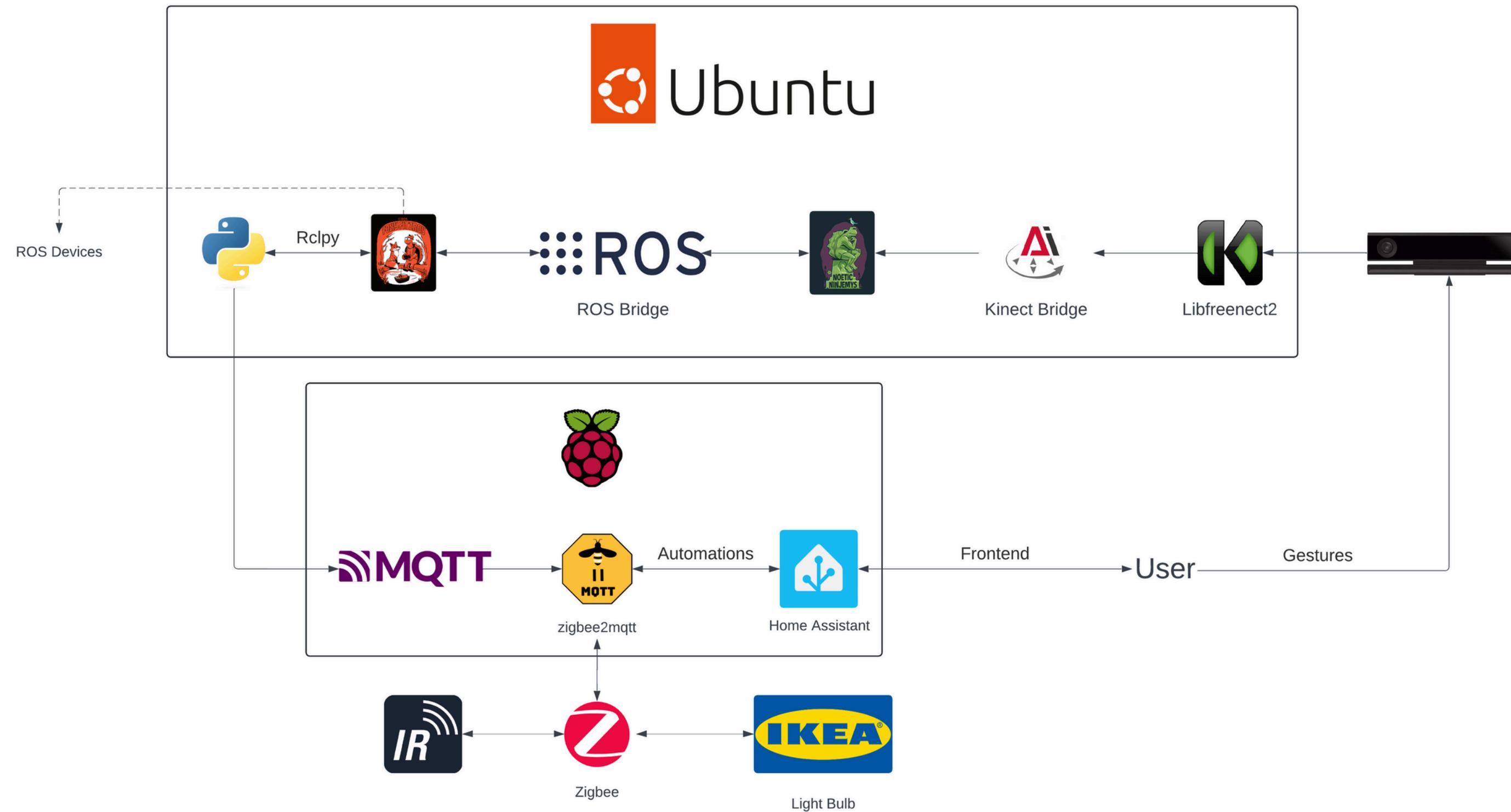
 MQTT

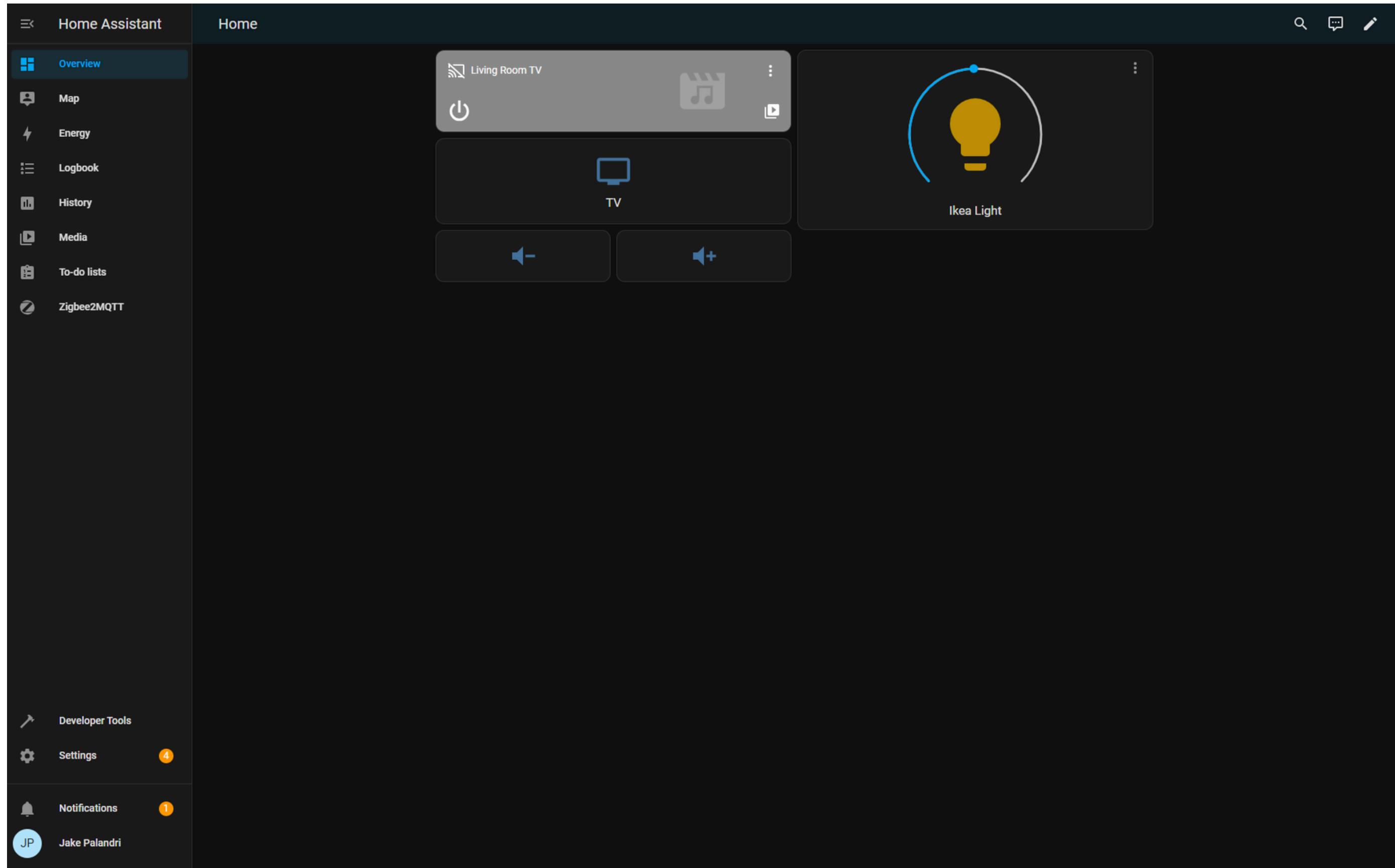
Home Assistant

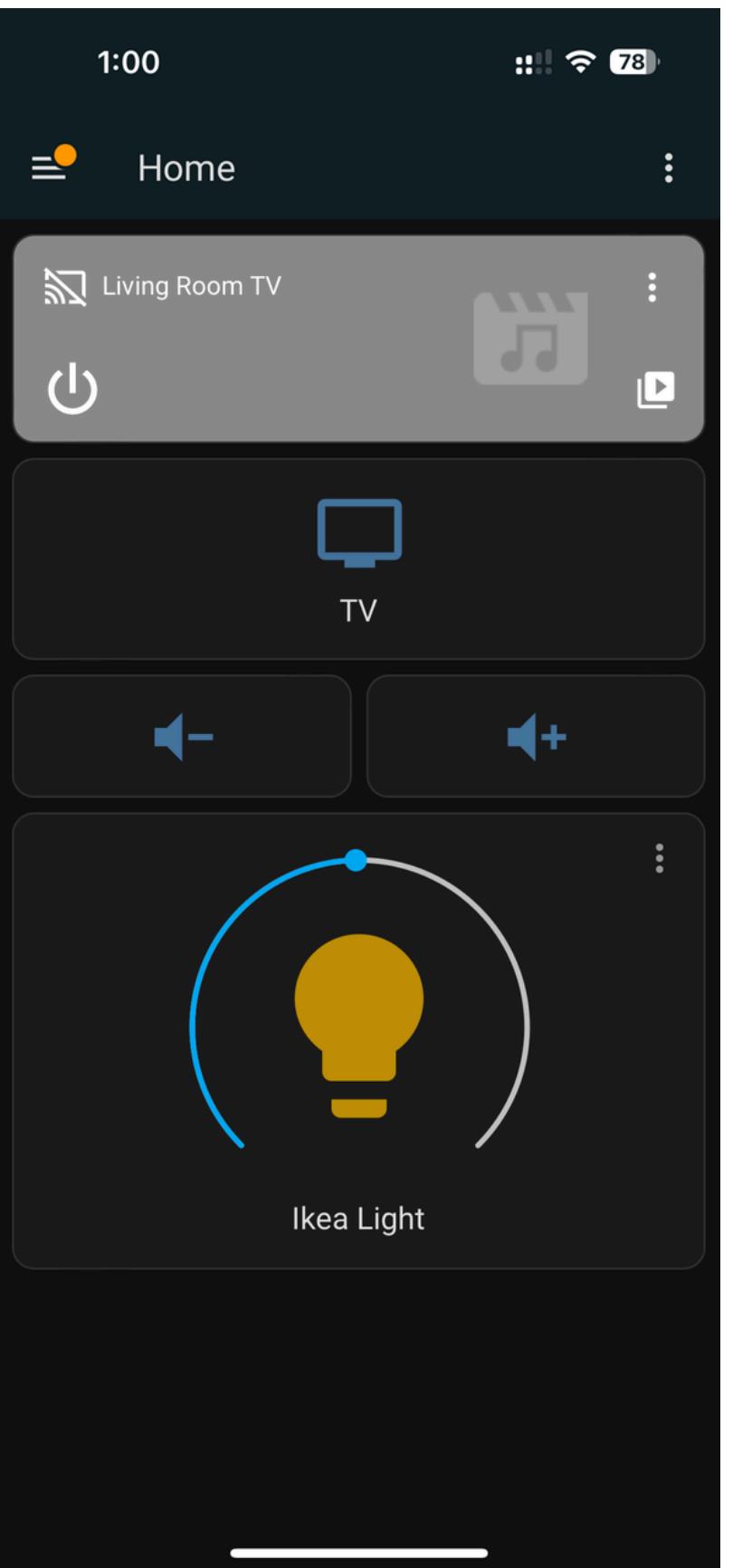
Proposed Tech Stack



Implemented Tech Stack







Home Assistant

Automations

Scenes

Scripts

Blueprints

Overview

Map

Energy

Logbook

History

Media

To-do lists

Zigbee2MQTT

Developer Tools

Settings

Notifications

Jake Palandri

CREATE AUTOMATION

Name	Last triggered	Enabled	More
Light Brightness Down	9 Aug, 00:26	<input checked="" type="checkbox"/>	⋮
Light Brightness Up	9 Aug, 00:26	<input checked="" type="checkbox"/>	⋮
Light Toggle	9 Aug, 00:26	<input checked="" type="checkbox"/>	⋮
TV Fast Forward	9 Aug, 00:24	<input checked="" type="checkbox"/>	⋮
TV Play/Pause	9 Aug, 00:24	<input checked="" type="checkbox"/>	⋮
TV Power On/Off	9 Aug, 00:52	<input checked="" type="checkbox"/>	⋮
TV Rewind	9 Aug, 00:25	<input checked="" type="checkbox"/>	⋮
TV Volume Down	9 Aug, 00:52	<input checked="" type="checkbox"/>	⋮
TV Volume Up	9 Aug, 00:52	<input checked="" type="checkbox"/>	⋮

Home Assistant

Light Brightness Up

TRACES :

Overview

Map

Energy

Logbook

History

Media

To-do lists

Zigbee2MQTT

Developer Tools

Settings 4

Notifications 1

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When

When an MQTT message has been received

+ ADD TRIGGER

And if (optional)

Confirm the time is after entity Time At Next Gesture

+ ADD CONDITION + ADD BUILDING BLOCK

Then do

Increase Ikea Light brightness

+ ADD ACTION + ADD BUILDING BLOCK

This screenshot shows the Home Assistant configuration interface for creating automation rules. The main panel displays a rule titled "Light Brightness Up". The "When" section contains a trigger for "When an MQTT message has been received". An optional "And if" condition is present, triggered by "Confirm the time is after entity Time At Next Gesture". The "Then do" section contains an action to "Increase Ikea Light brightness". The sidebar on the left provides navigation links for Overview, Map, Energy, Logbook, History, Media, To-do lists, and Zigbee2MQTT. The bottom navigation bar includes Developer Tools, Settings (with 4 notifications), Notifications (with 1 notification), and a user profile for Jake Palandri.

Home Assistant Light Toggle TRACES ⋮

Overview Map Energy Logbook History Media To-do lists Zigbee2MQTT

Developer Tools Settings 4 Notifications 1 Jake Palandri

When

When an MQTT message has been received

Topic* `kinect_pose`

Payload (optional)
`{"gesture": "right_arm_ceiling"}`

When an MQTT message has been received

Topic* `kinect_pose`

Payload (optional)
`{"gesture": "left_arm_ceiling"}`

+ ADD TRIGGER

And if (optional)

Confirm the time is after entity Time At Next Gesture

+ ADD CONDITION + ADD BUILDING BLOCK

Then do

Toggle Ikea Light

Input Datetime 'Set' on Time At Next Gesture

+ ADD ACTION + ADD BUILDING BLOCK

Home Assistant ← TV Rewind TRACES :

Overview Map Energy Logbook History Media To-do lists Zigbee2MQTT

When ?

When an MQTT message has been received ⋮ ⋮

+ ADD TRIGGER

And if (optional) ?

Confirm the time is after entity Time At Next Gesture ⋮ ⋮

+ ADD CONDITION + ADD BUILDING BLOCK

Then do ?

Set value for IR Emitter Ir code to send ⋮ ⋮

Device: IR Emitter X ▾

Action: Set value for IR Emitter Ir code to send

Value*: BYQJMQJ+AoADA80EMQJAC0AHQAPAC0AH4AEDAZtk4FozAgJ+Ag==

+ ADD ACTION + ADD BUILDING BLOCK

Developer Tools

Settings 4

Notifications 1

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The screenshot shows the Home Assistant configuration interface with a dark theme. On the left is a sidebar with various icons and links: Overview, Map, Energy, Logbook, History, Media, To-do lists, and Zigbee2MQTT. Below these are Developer Tools, Settings (with a notification count of 4), Notifications (with a notification count of 1), and a user profile icon for Jake Palandri.

The main area is titled "TV Rewind". It shows an automation rule with three sections: "When", "And if (optional)", and "Then do".

- When:** "When an MQTT message has been received" (with a dropdown arrow and a question mark icon).
- And if (optional):** "Confirm the time is after entity Time At Next Gesture" (with a clock icon, a dropdown arrow, and a question mark icon).
- Then do:** "Set value for IR Emitter Ir code to send" (with a question mark icon). This section includes fields for "Device" (set to "IR Emitter"), "Action" (set to "Set value for IR Emitter Ir code to send"), and "Value*" (containing the base64 string "BYQJMQJ+AoADA80EMQJAC0AHQAPAC0AH4AEDAZtk4FozAgJ+Ag==").

At the bottom of the main area are buttons for "+ ADD ACTION" and "+ ADD BUILDING BLOCK".

Home Assistant

Z2M@homeassistant.local Devices Dashboard Map Groups OTA Touchlink Logs Extensions Permit join (All)

IR Emitter ▾

About Exposes Bind Reporting Settings Settings (specific) State Clusters Scene Dev console

Learn ir code OFF ? ON Turn on to learn new IR code

Learned ir code A2cJSQLAQfWBEkChAJAkAHQANAAcAH4AEBAcNkQDNAJ0ADwB9AB0ADQAHAB+ABAeABMwNJAkkC The IR code learned by device

Ir code to send The IR code to send by device

Linkquality 212 lqi Link quality (signal strength)

Battery Remaining battery in %, can take up to 24 hours before reported 100 %

Voltage 1500 mV Voltage of the battery in millivolts

Developer Tools

Settings 4

Notifications 1

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Home Assistant

TV Power On/Off

TRACES :

When

- When an MQTT message has been received
- When an MQTT message has been received

+ ADD TRIGGER

And if (optional)

- Confirm the time is after entity Time At Next Gesture

After

- Fixed time
- Value of a date/time helper or timestamp-class sensor

Time At Next Gesture

Before

- Fixed time
- Value of a date/time helper or timestamp-class sensor

Before

Weekdays

+ ADD CONDITION + ADD BUILDING BLOCK

Then do

- Set value for IR Emitter Ir code to send
- Input Datetime 'Set' on Time At Next Gesture

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Home Assistant TRACES :

TV Power On/Off

When

- When an MQTT message has been received
- When an MQTT message has been received

+ ADD TRIGGER

And if (optional)

- Confirm the time is after entity Time At Next Gesture

+ ADD CONDITION **+ ADD BUILDING BLOCK**

Then do

- Set value for IR Emitter Ir code to send
- Input Datetime 'Set' on Time At Next Gesture

⚠ Visual editor is not supported for this configuration

- Templates not supported in visual editor

You can still edit your config in YAML.

```
1 service: input_datetime.set_datetime
2 metadata: {}
3 data:
4   timestamp: "{{ as_timestamp(now()) + 2 }}"
5 target:
6   entity_id: input_datetime.time_at_next_gesture
7
```

+ ADD ACTION **+ ADD BUILDING BLOCK**

Developer Tools

Settings (4)

Notifications (1)

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Demo

Aim

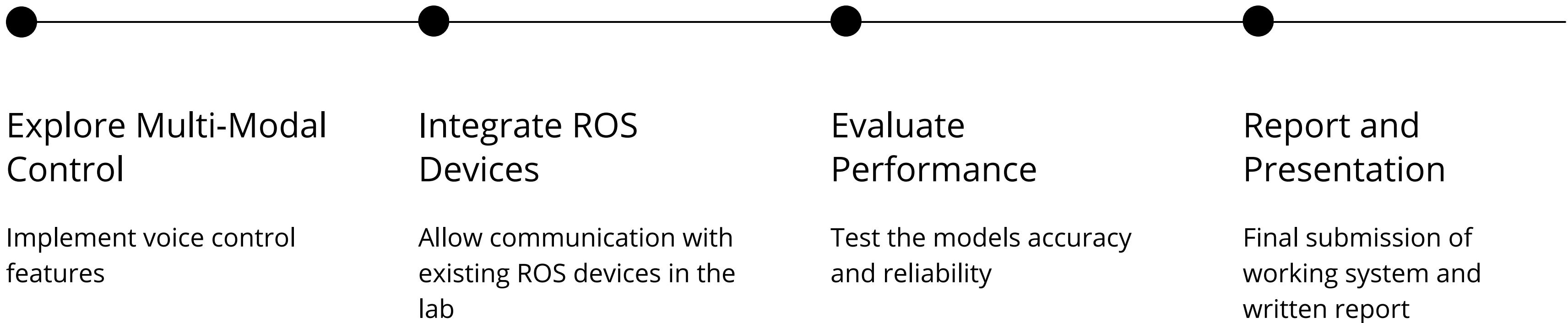
Create an intelligent environment where a user's movements can accurately predict how to control devices within the home locally to increase convenience, safety and security

Problems with Smart Homes

- Interoperability
- Lack of true “intelligence”
- Requirement for internet access

Plan moving
forward

Timeline



Evaluating Success

- Rate of true positives
- Rate of false positives
- Rate of false negatives
- Speed of execution
- Perceived increase in convenience

Thank you!

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