

Green Communications

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Meet The Team



Rebekah Han

Rising EE & CS junior



Shashwati Jha

MSCS grad



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SBHS Junior

Topics

- Project Objective
- Methodology
- Results
- Next Steps

Project Objective

The Problem

- Current WAN is expensive and gatekept by gov't & large corporations
- Cellular networks tend to not cover rural areas
- Censorship (in war zones, oppressive gov'ts, etc.)

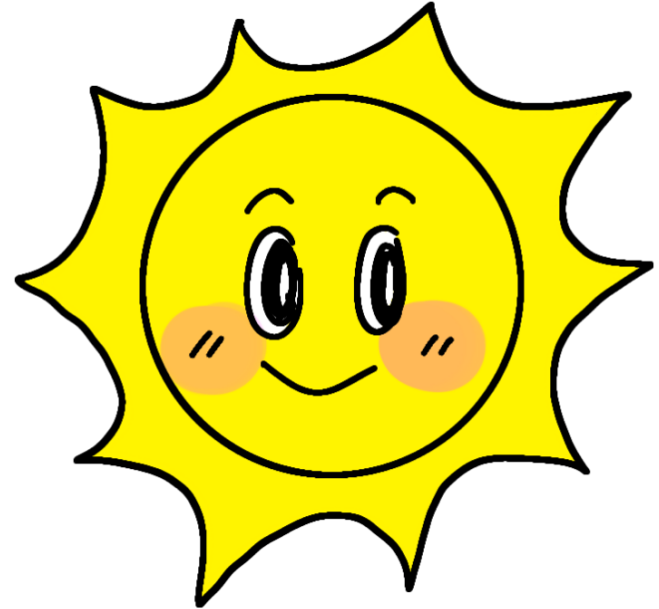
→ Need for a **decentralized, accessible** network



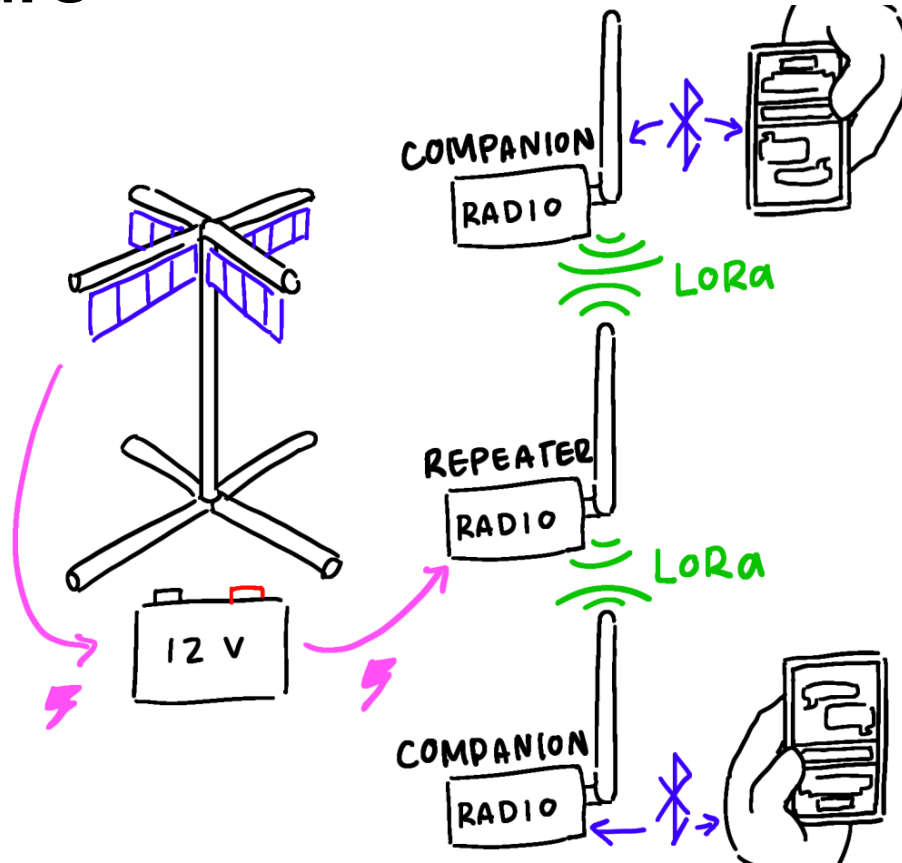
PROJECT OBJECTIVE

The Goals

- **Accessibility**
 - Should scale down to underserved areas
 - Cheap
- **Self-Sufficiency: solar**
 - Does not rely on the grid
 - Can be deployed independently



The Big Picture



Use LoRa radios to transmit texts and form a mesh network.

The Big Picture (cont.)



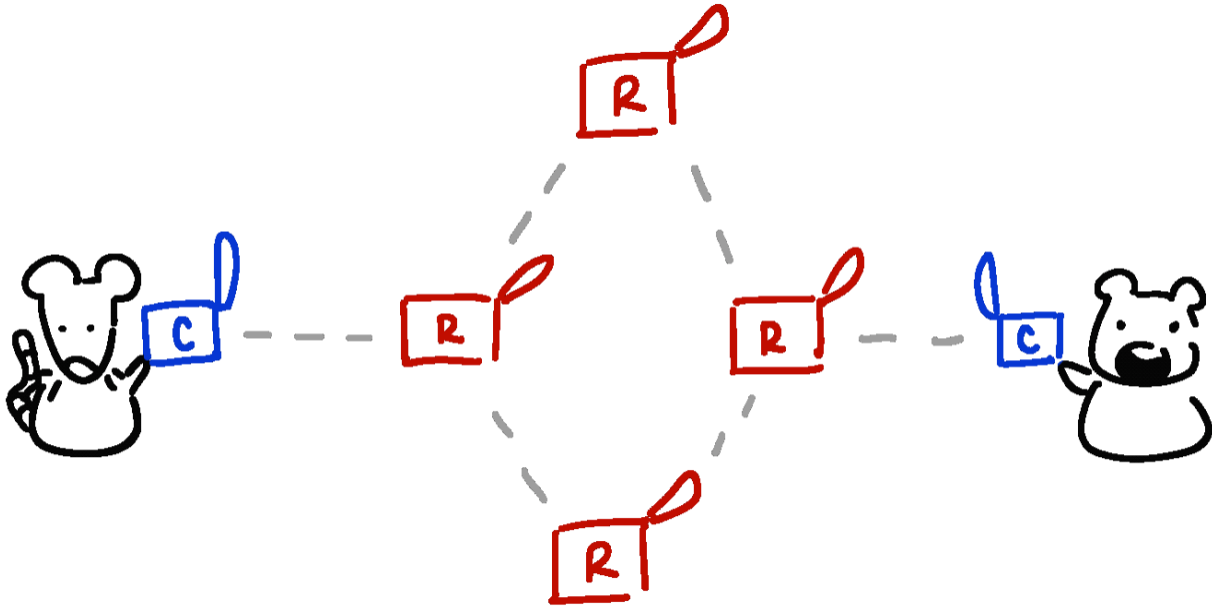
- **MeshCore**

- Free, open-source firmware for decentralized, encrypted messaging
- Flashed onto LoRa radios, forming a self-healing mesh network

- **Vision Language Model (VLM)**

- Lightweight AI model that describes or answers questions about a photo
- Runs locally on the Pi, no cloud or internet required
- Ask it real questions about the scene, like "is it snowing outside?"

The Big Picture (cont.)



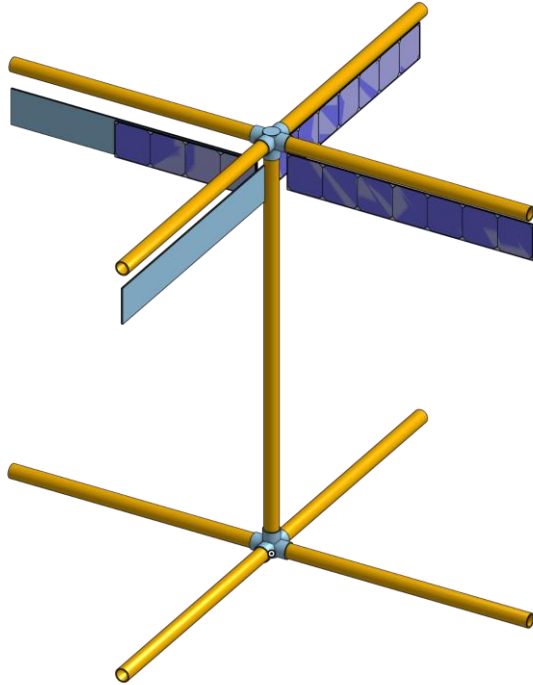
A mesh network

C = companion

R = repeater

Methodology

The Implementation

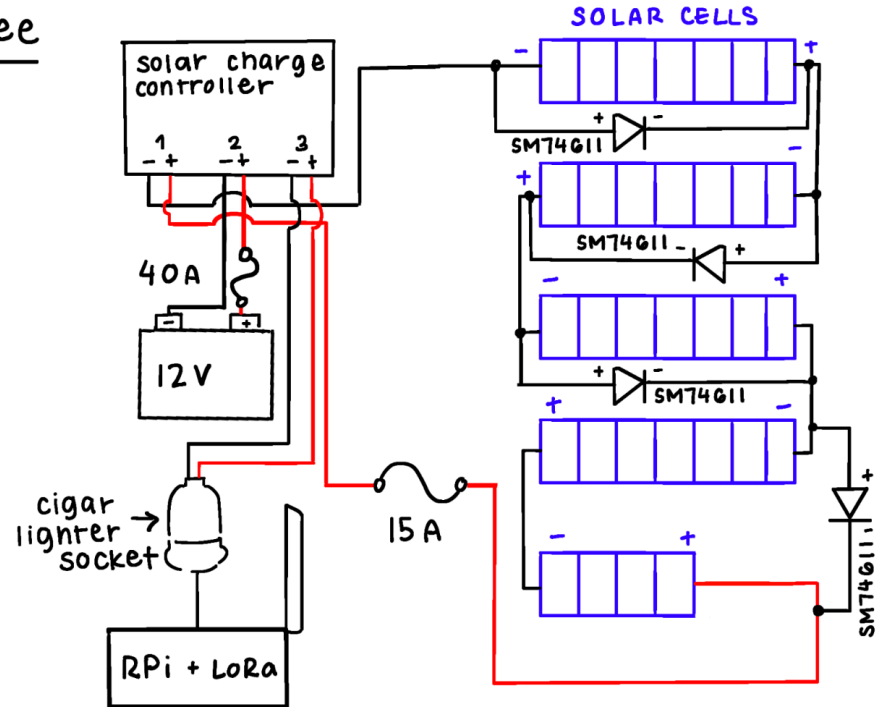


Solar Tree

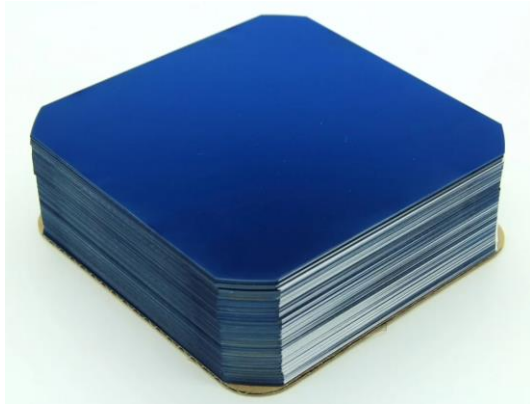
32 cells

~19 V

~115 W



The Parts



3.6 W solar cells



12V 25Ah LiFePO₄
battery



Solar charge
controller

The Parts (cont.)



Seed Studio XIAO
ESP32-S3 boards



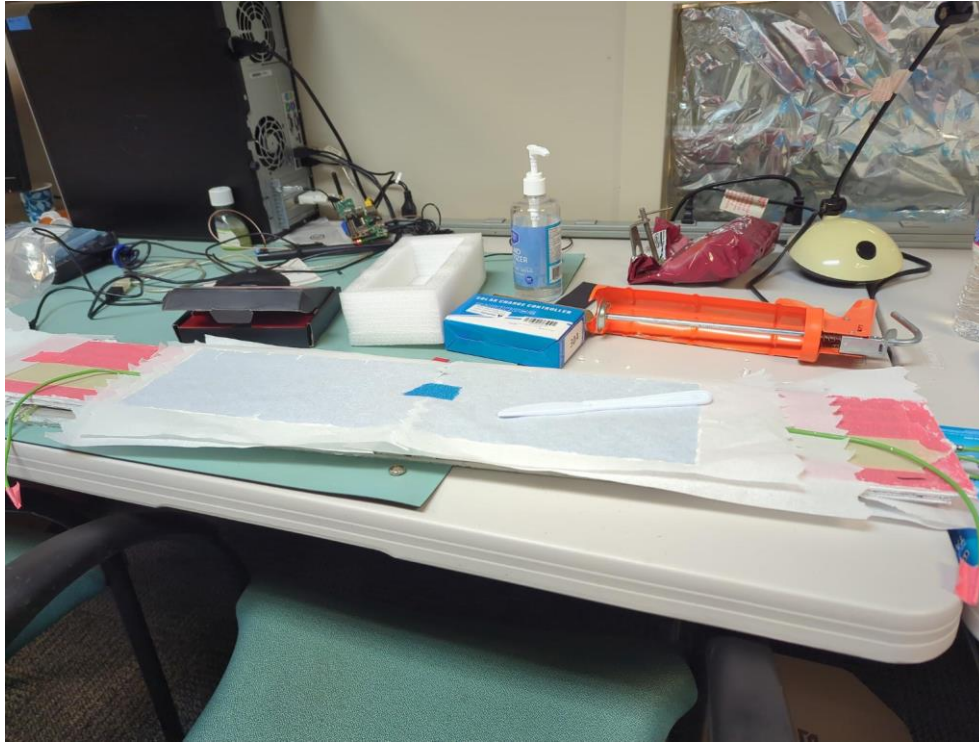
Raspberry Pi 4B

The Product



METHODOLOGY

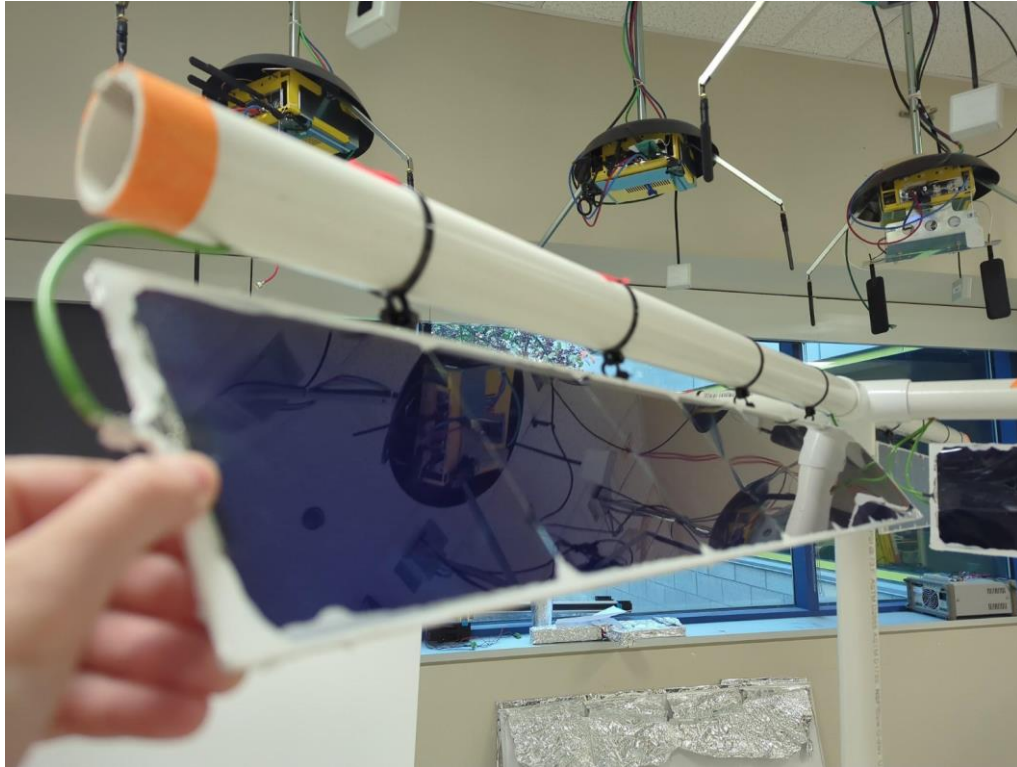
The Product (cont.)



METHODOLOGY



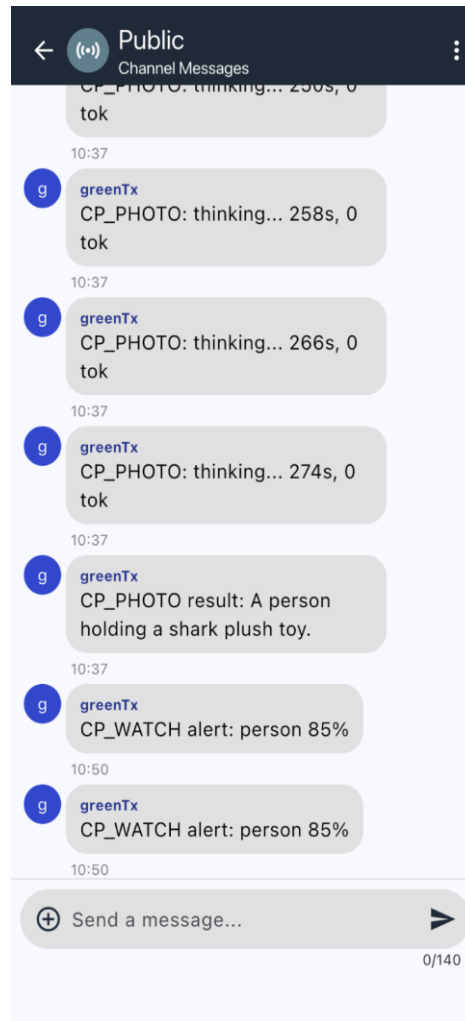
The Product (cont.)



METHODOLOGY

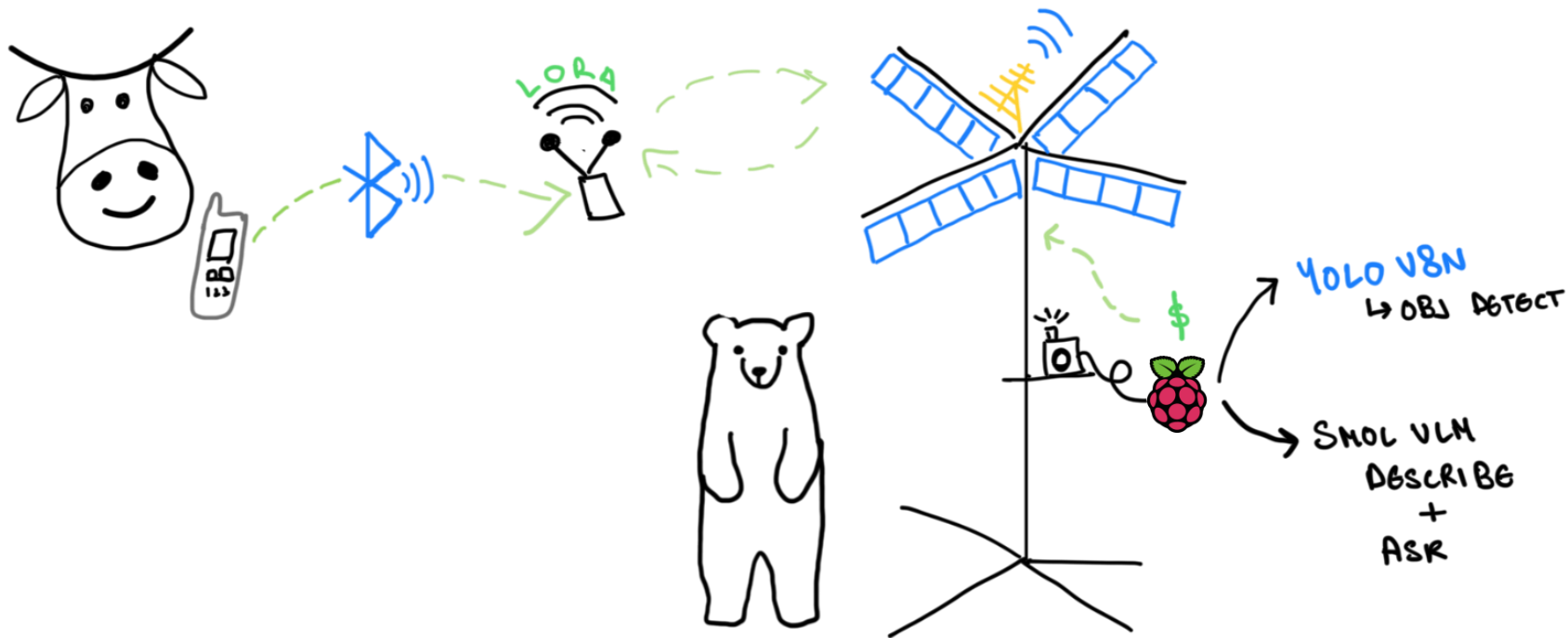
Swinging branches



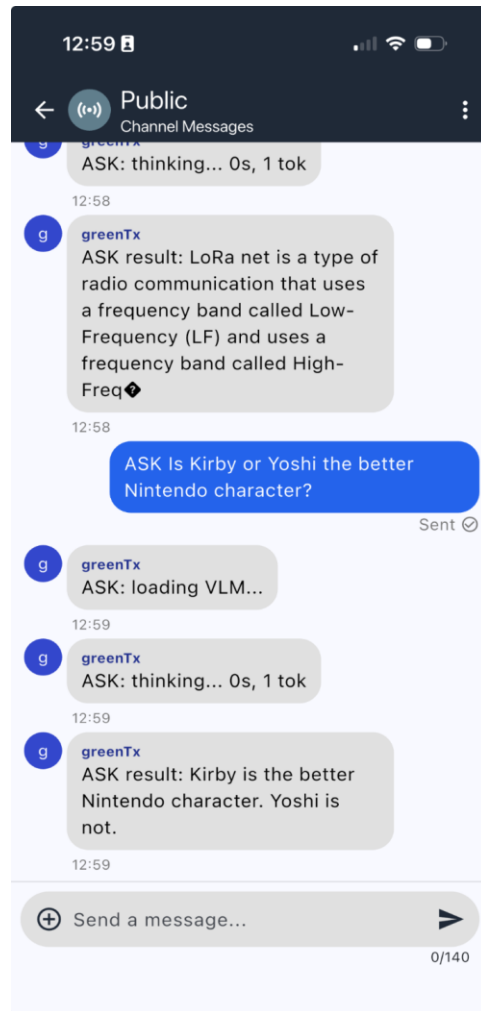
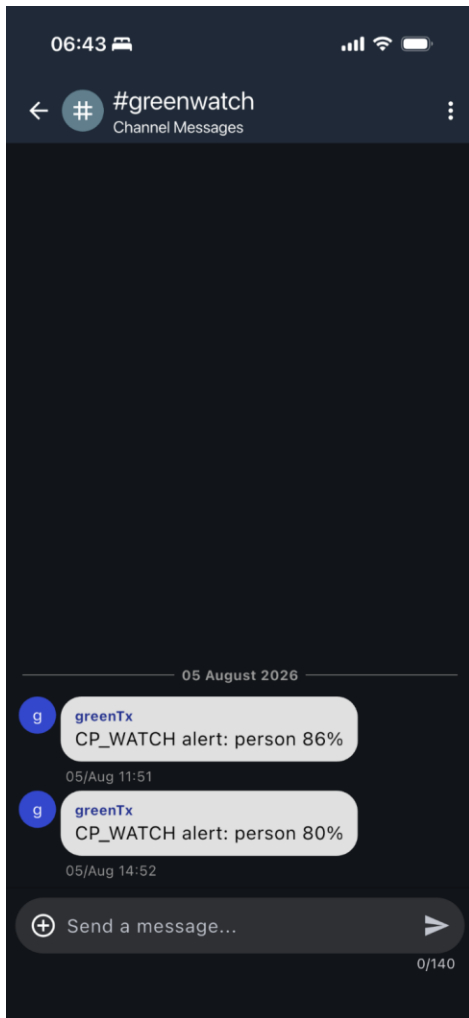


The Software

Software Methodology



Results



MeshCore VLM

#greenwatch: Lightweight object detection.

Detects person, bear, dog, bird, motorcycle, car etc.

Public: Ask your network anything.

Have it capture and describe pictures

#greenpulse: Sends daily heartbeats to monitor status

Charging Battery



RESULTS

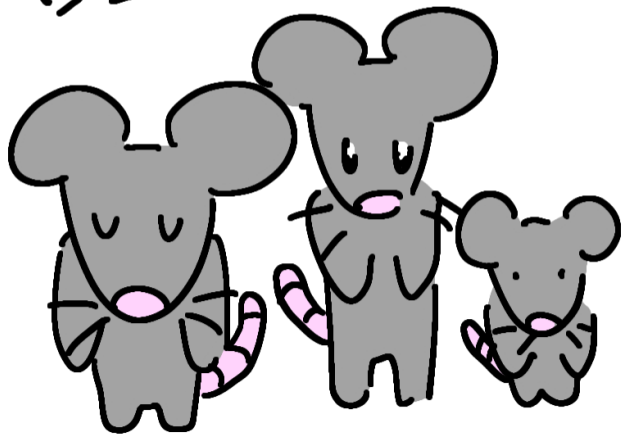
Next Steps

Experimental Deployment

- Leave tree outside for a year, with periodic check-ups
 - To experience all four seasons
 - Save photo's embeddings, follow-up questions take a few seconds instead of a few minutes



THANKS!



Link to our website

