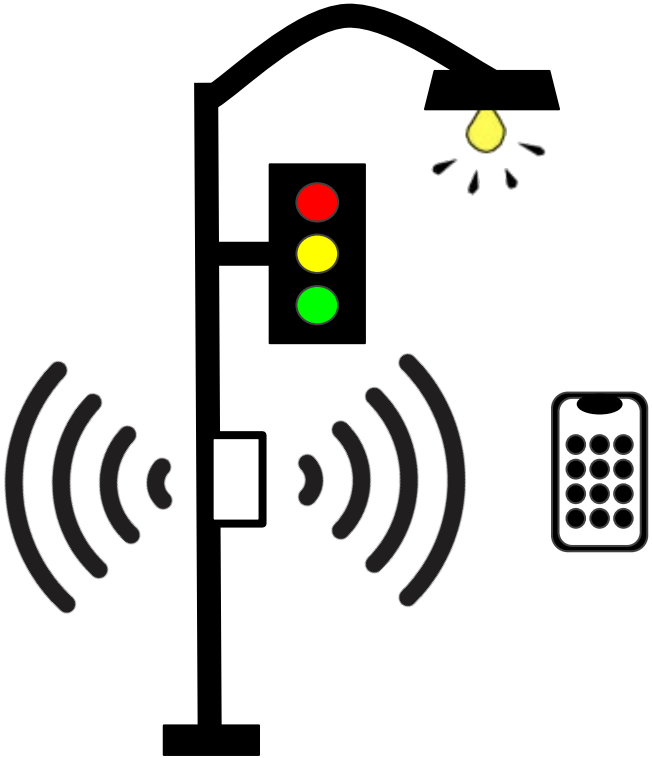
IoT Street Lights of the Future

How can we improve the existing system?

- Improve Safety
- Improve monitoring of the network
- Prioritize movement of special users
- Improve street use

Light

Connected Network



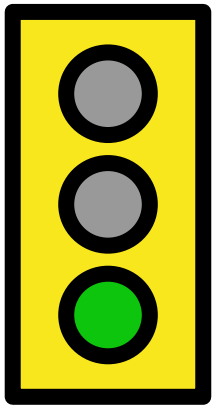
Smart Street Light:

Actions of smart street lights are influenced by the devices within its network.

Actions of the light are determined by the type of user, the number of users, and the user’s proximity to the light/network node.

Smart Light Usage:

Flashing Light

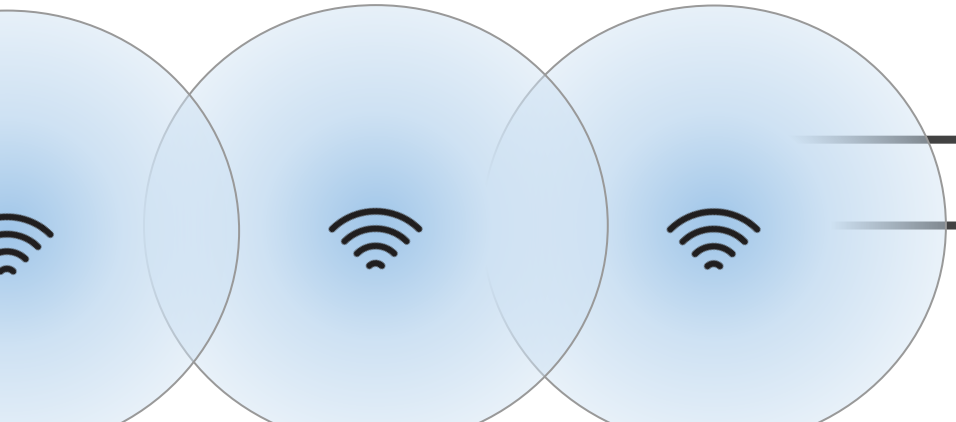


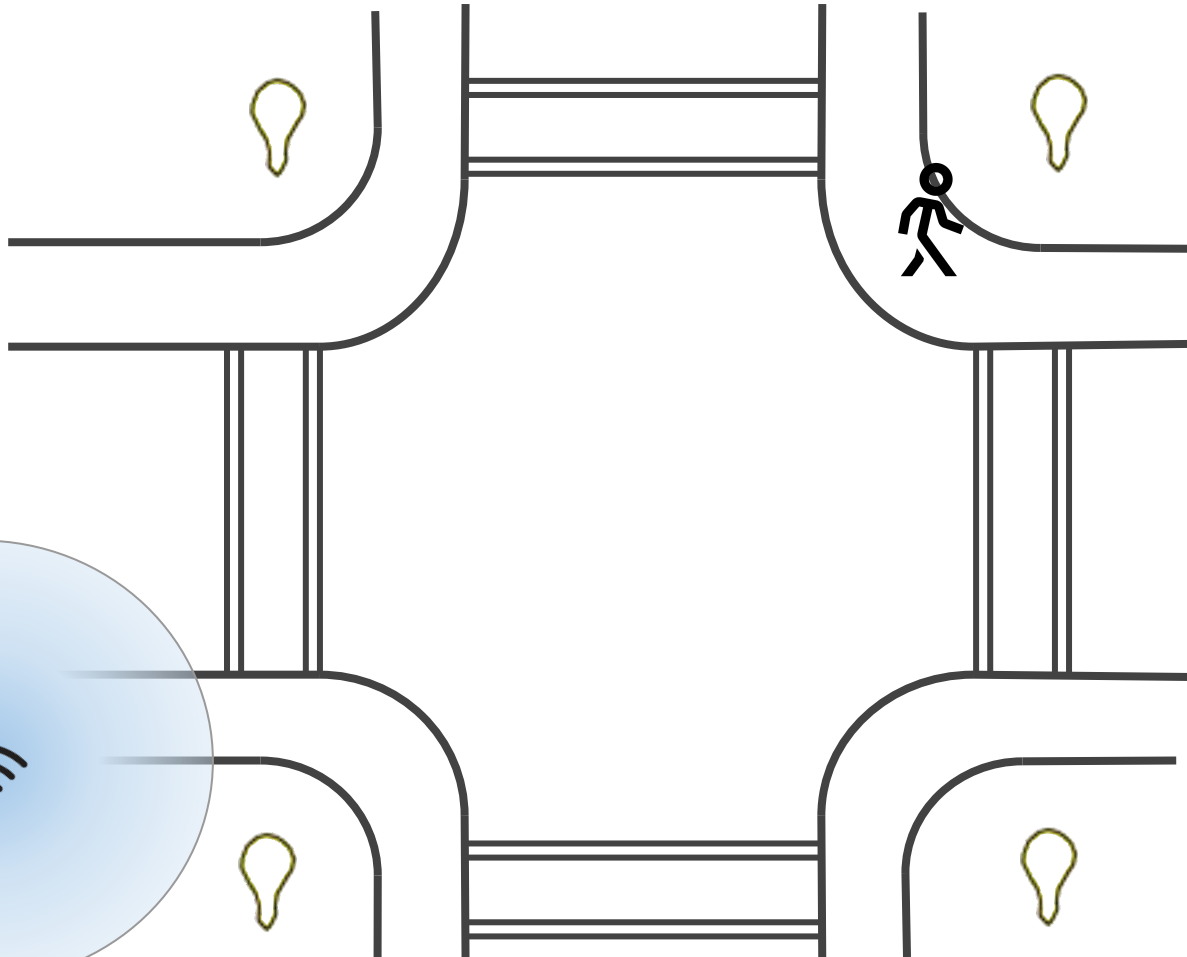
Light Duration

Light Intensity

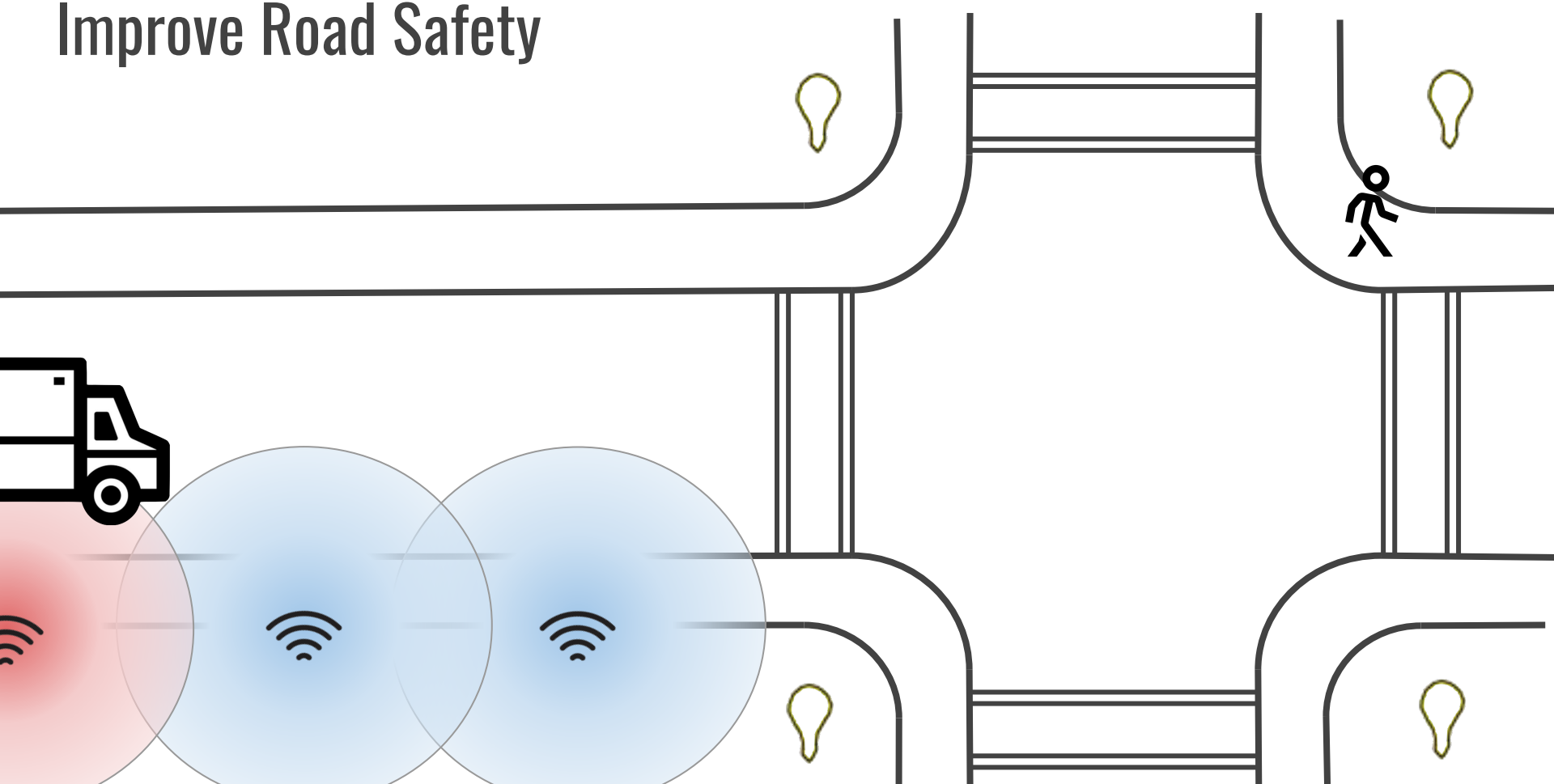
Improve Road Safety

Flashing street lights can be used to bring attention to more vulnerable road users and emergency vehicles.

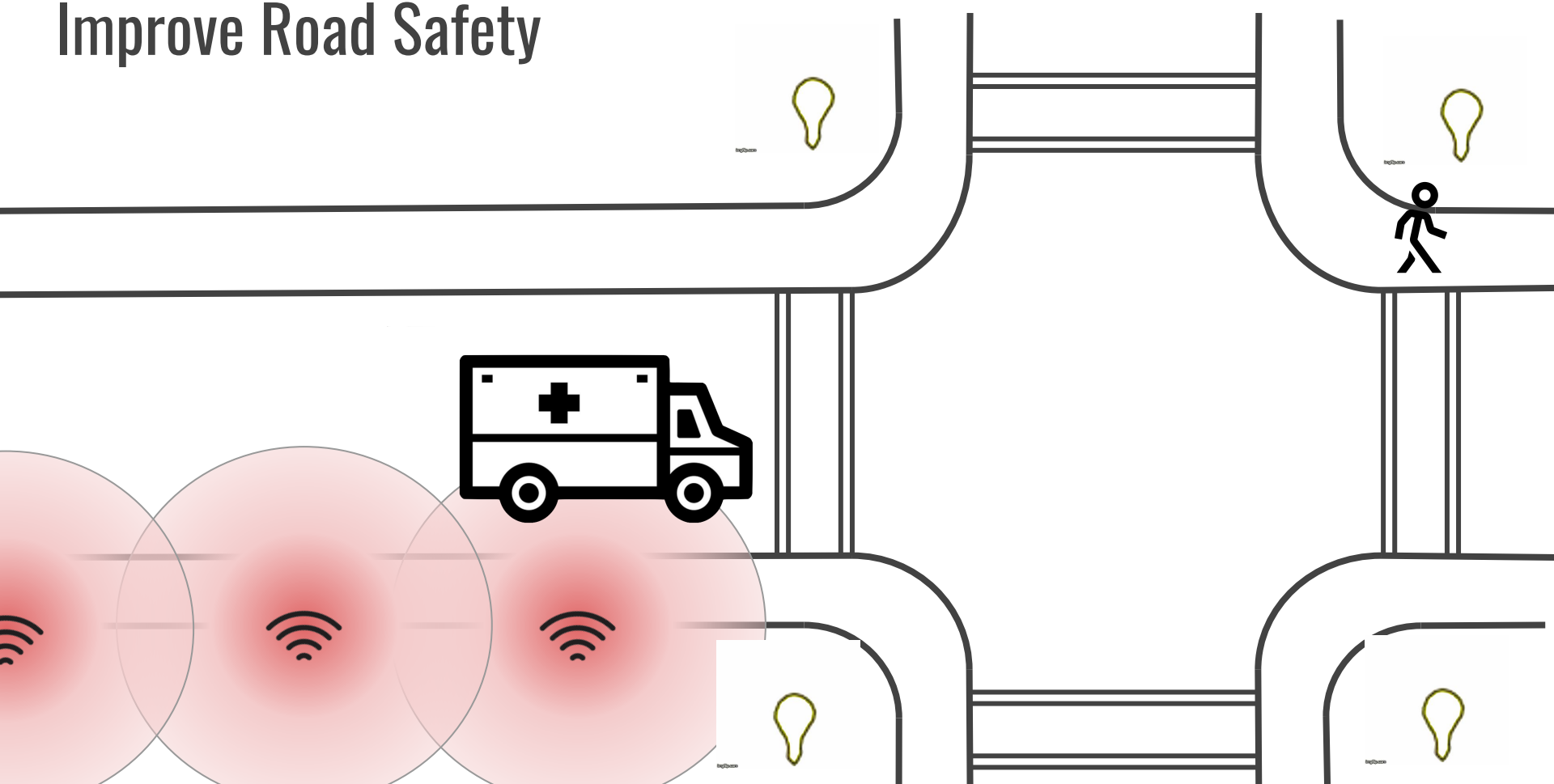




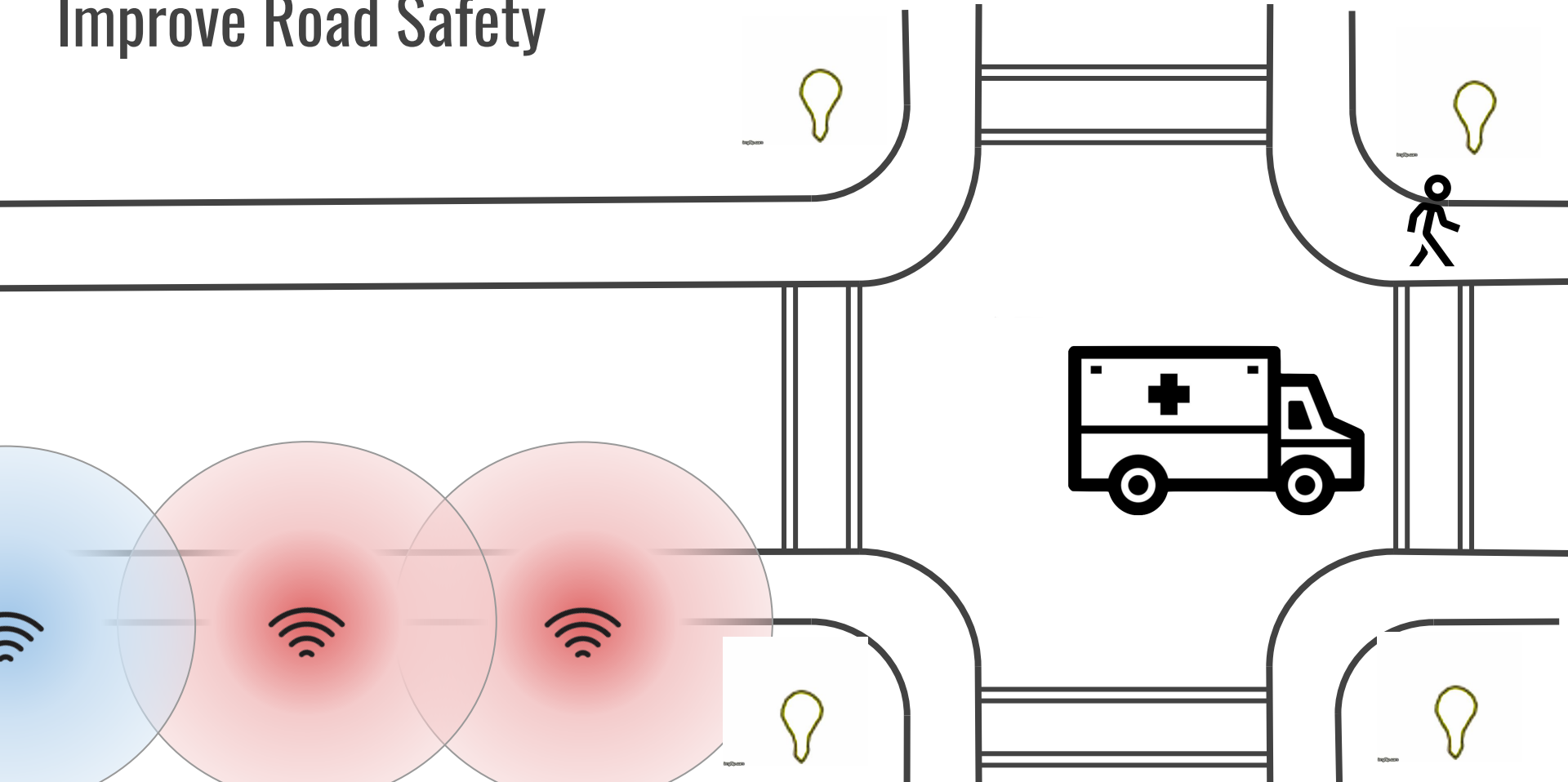
Improve Road Safety



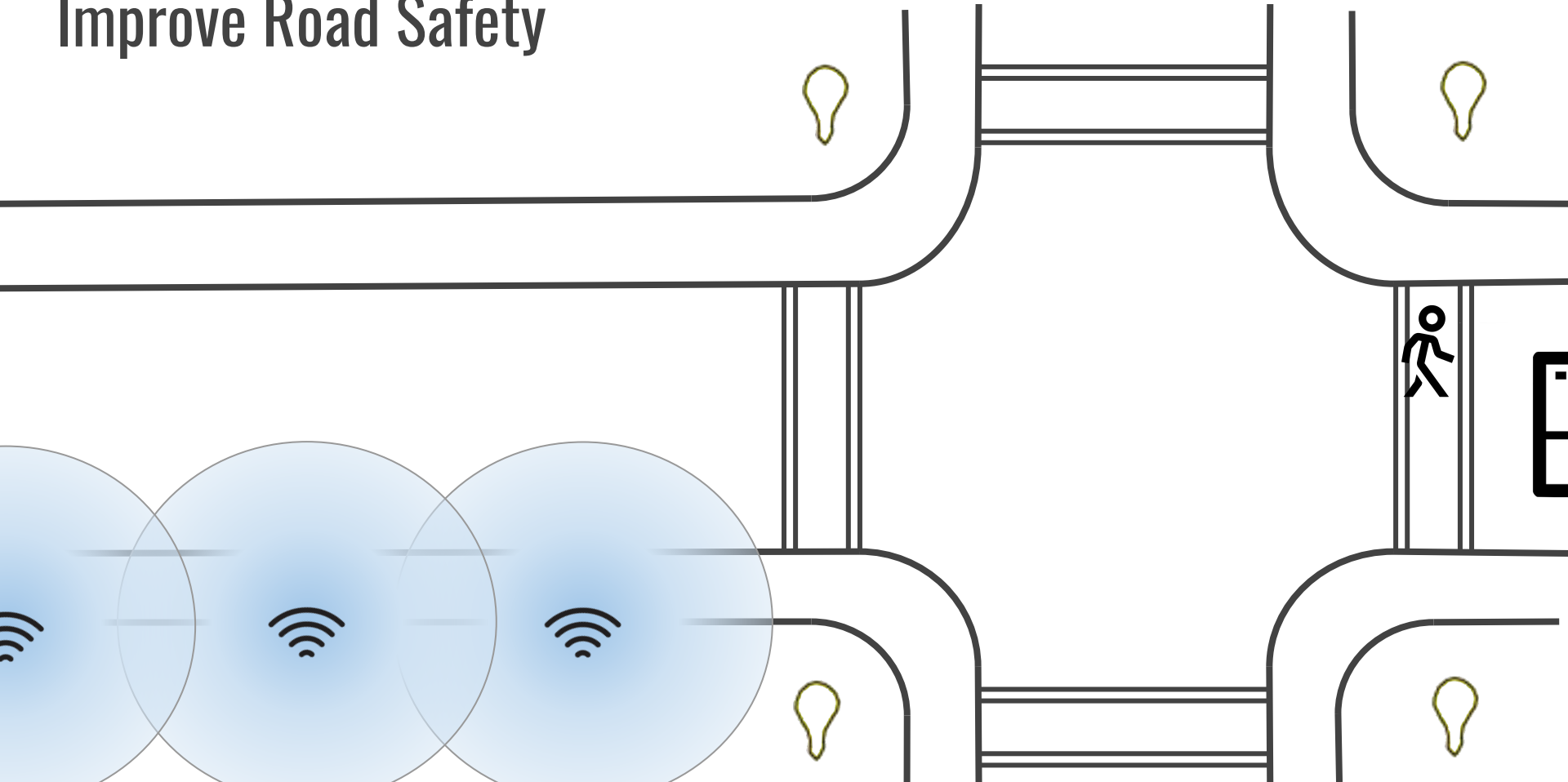
Improve Road Safety



Improve Road Safety

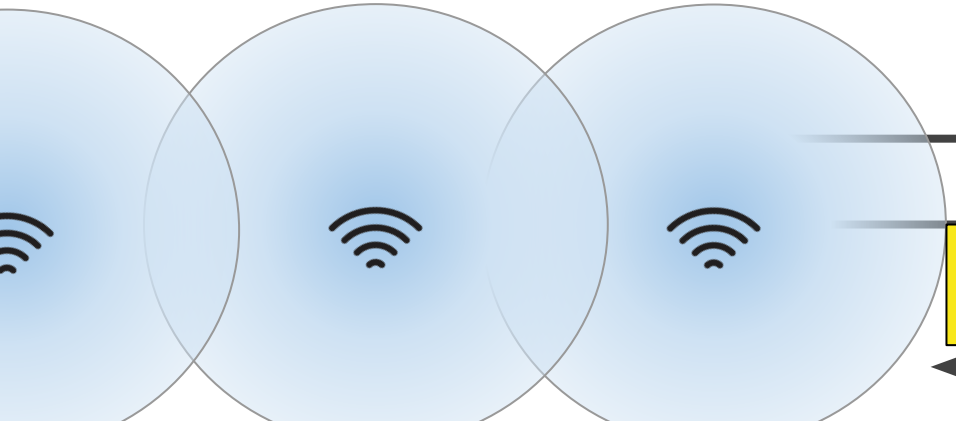


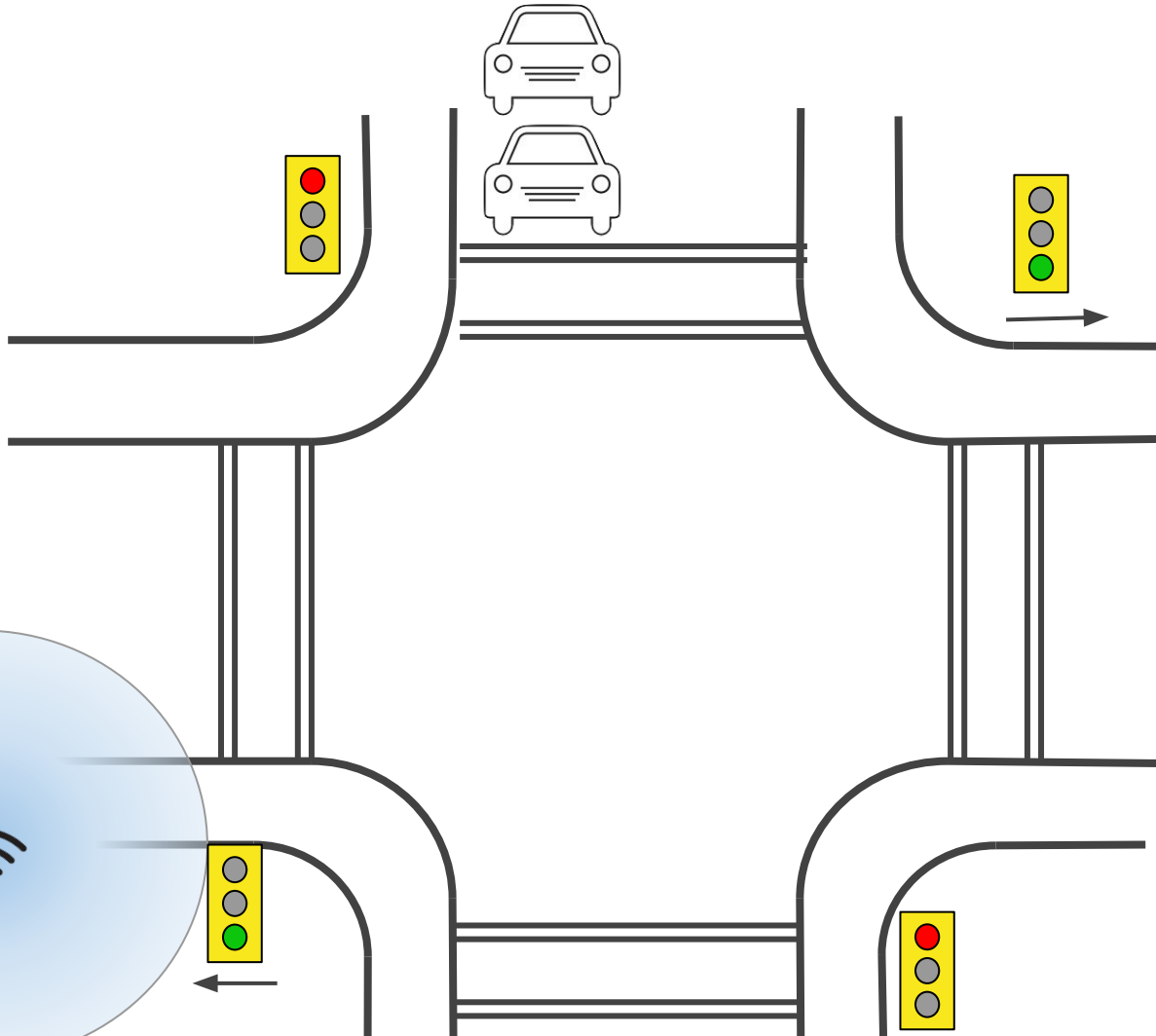
Improve Road Safety



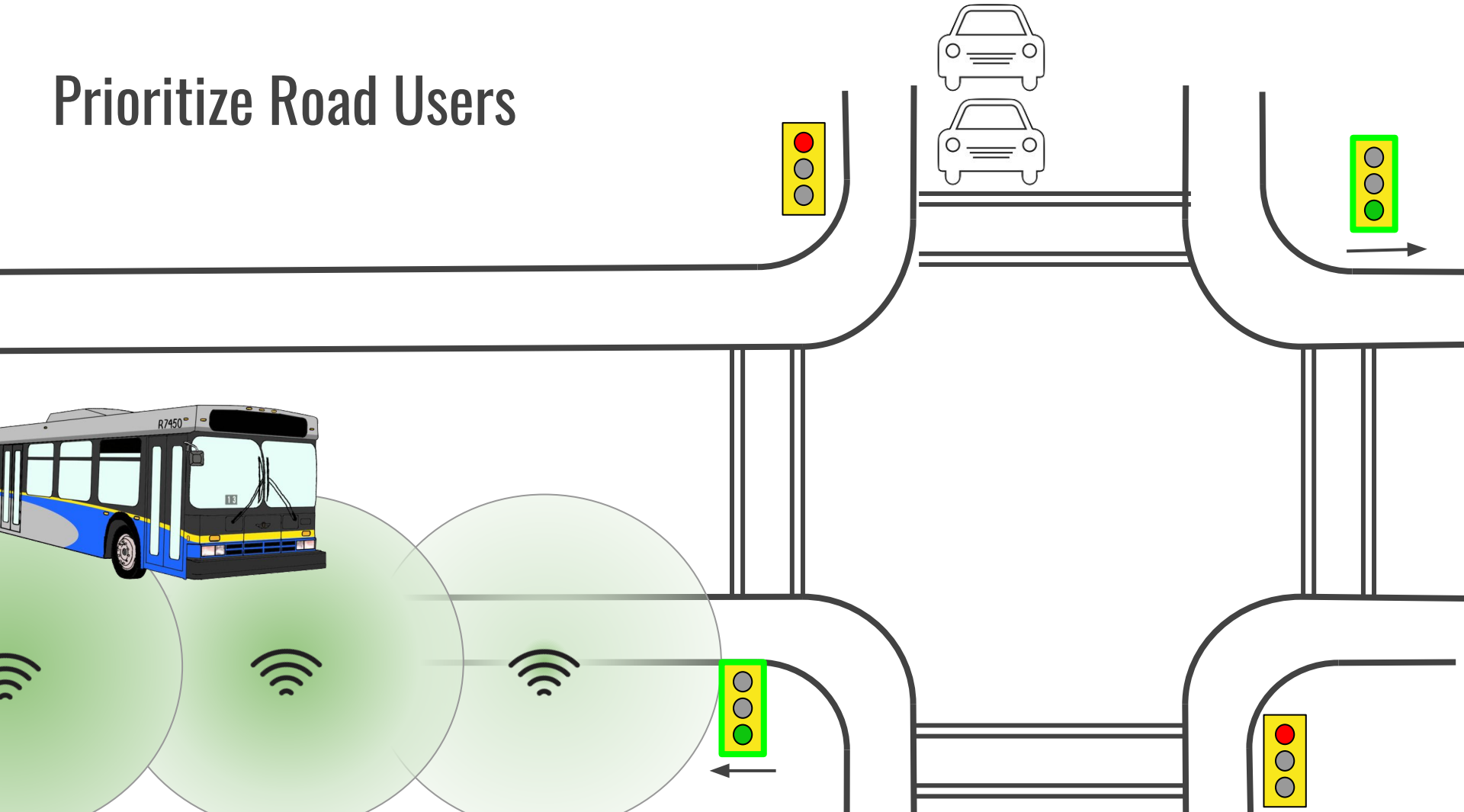
Prioritize Road Users

Transit and emergency vehicles get longer green lights to clear the intersection

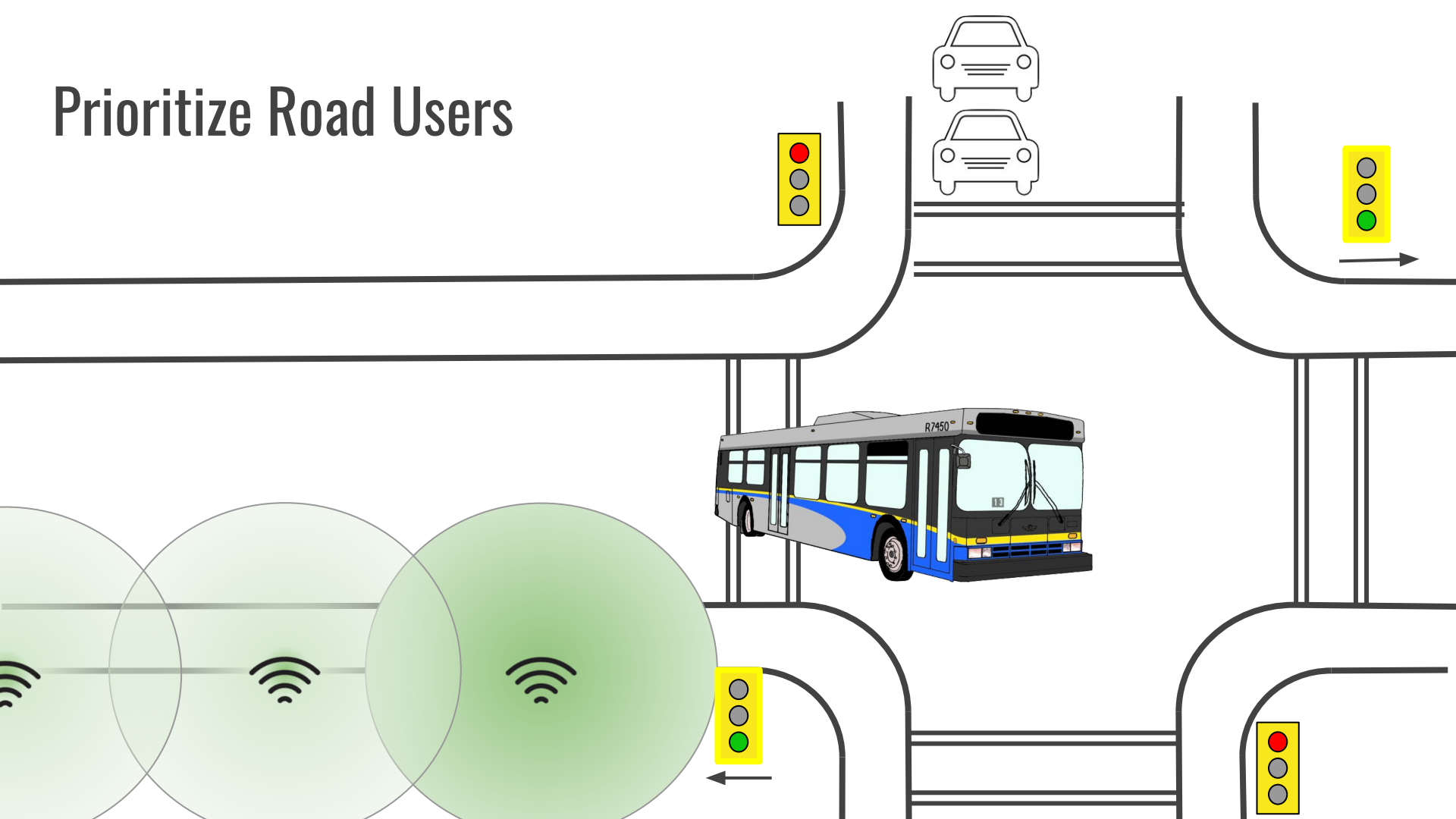




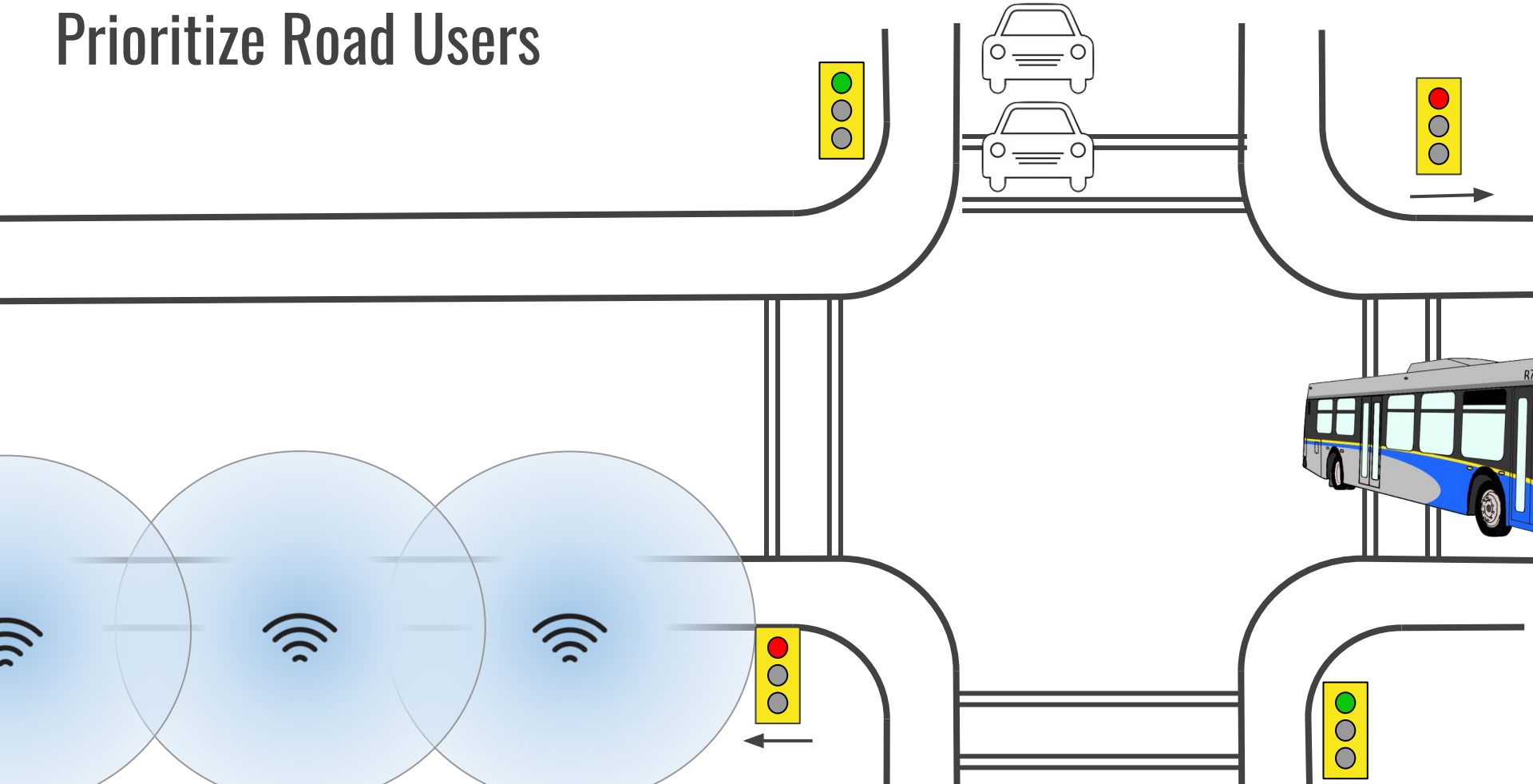
Prioritize Road Users



Prioritize Road Users

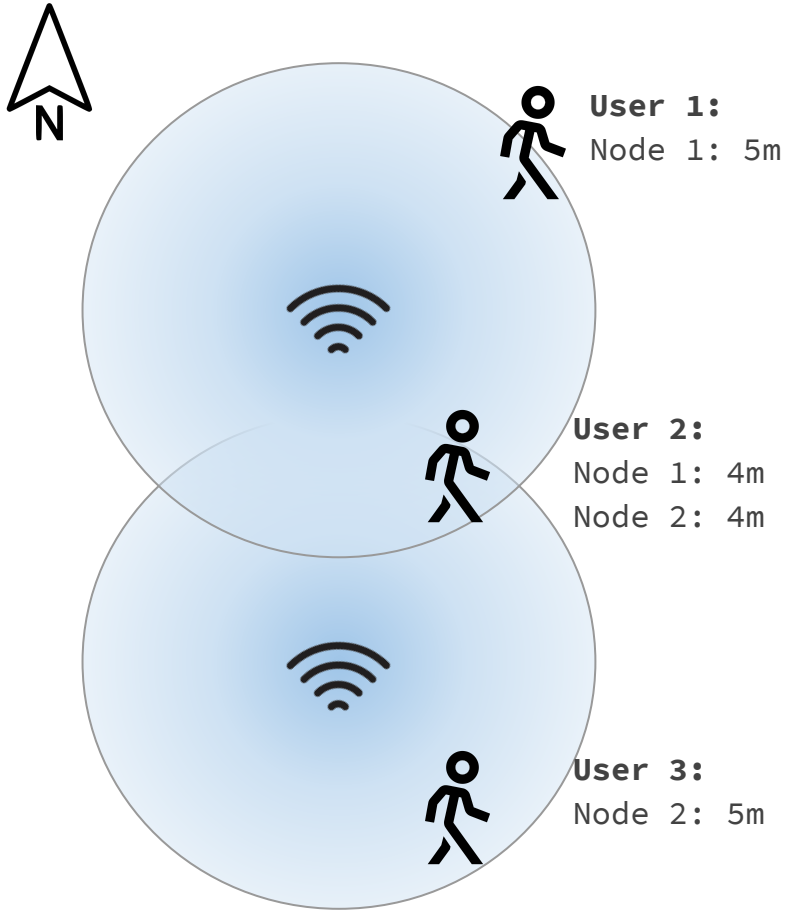


Prioritize Road Users



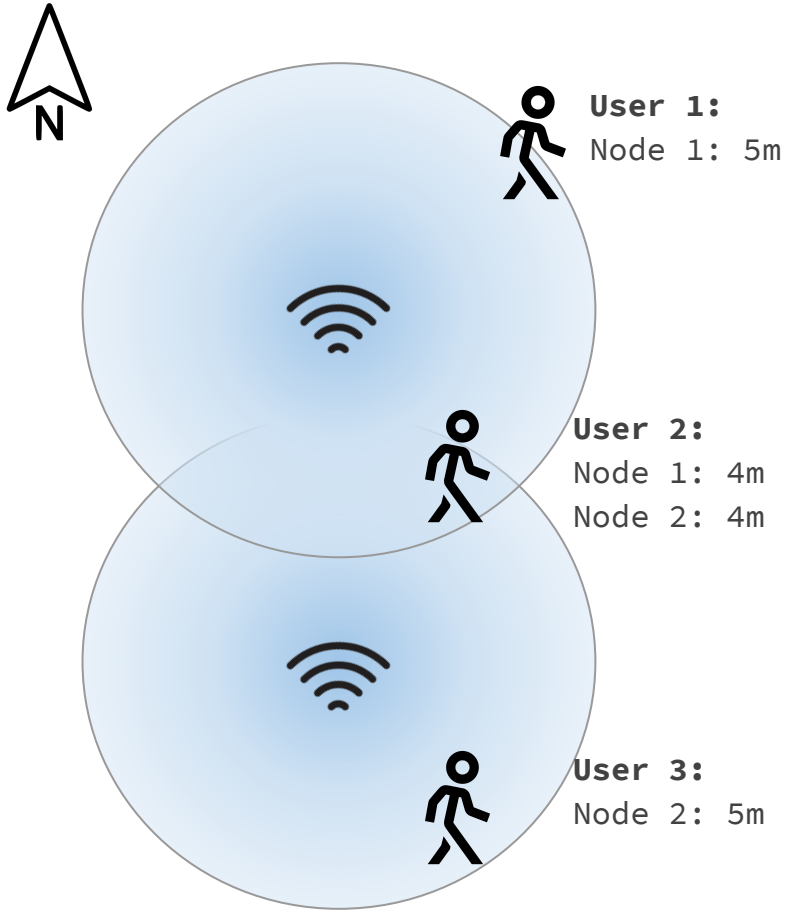
Improve Traffic Monitoring

- Number of users passing through a network
- User duration within a network
- Direction and speed of users



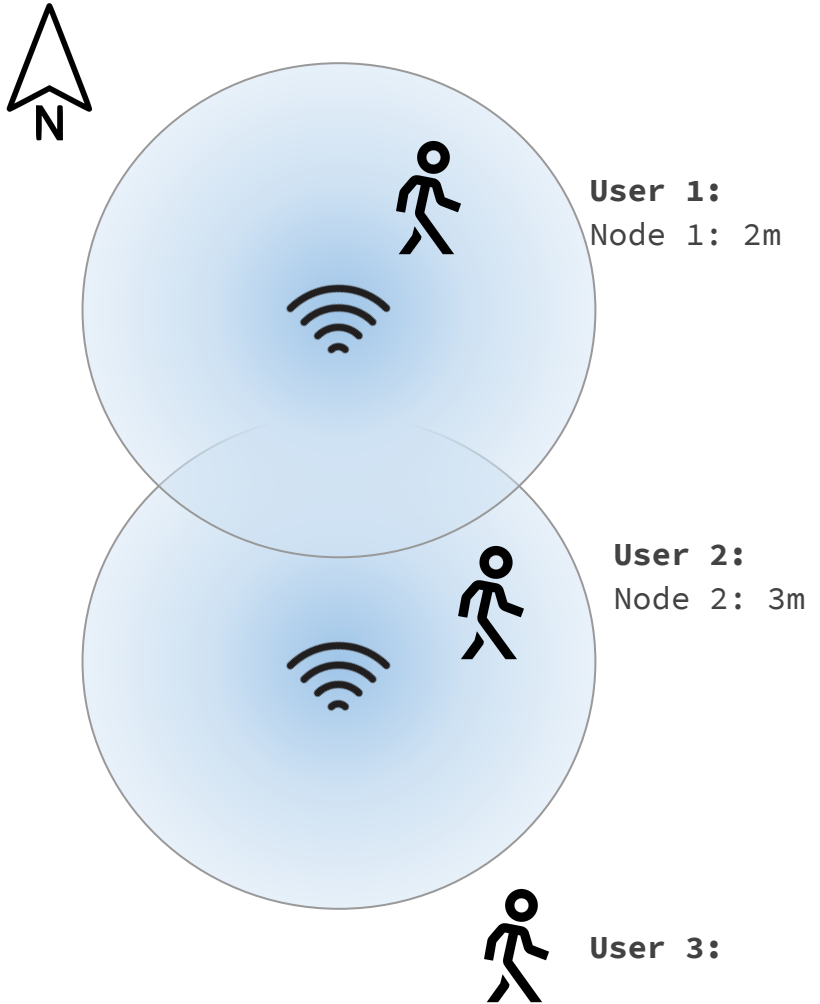
Improve Traffic Monitoring

- Stats:
  - Current Users: 3
  - User 1:
    - Distance from Node 1
  - User 2:
    - Location: X, Y
  - User 3:
    - Distance from Node 2



Improve Traffic Monitoring

- Stats:
  - Current Users: 2
  - User 1:
    - Distance from Node 1
    - Moved 3m closer to Node 1
    - Speed 3m/reading interval
  - User 2:
    - Moving South
    - Moved 1m closer to Node 2



Increased light intensity on-demand

650 Watts

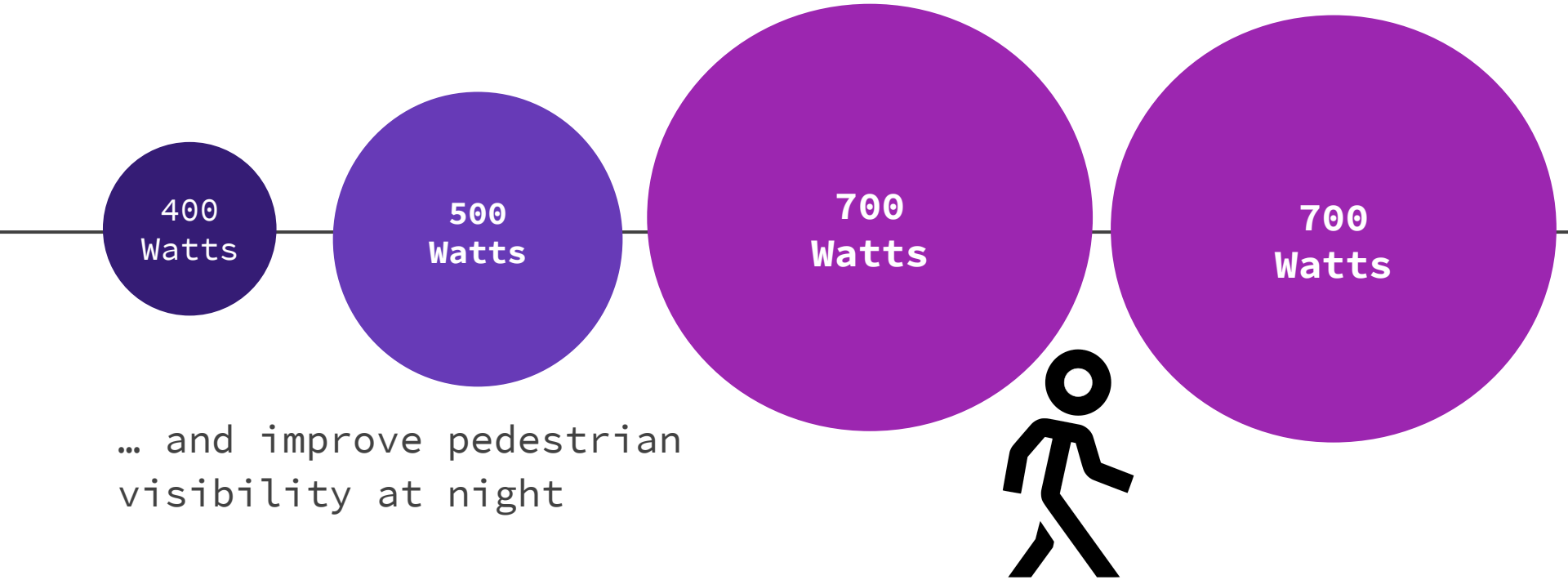
800 Watts

600 Watts

400 Watts

Dynamic street lighting to reduce energy costs

Increased light intensity on-demand



… and improve pedestrian visibility at night

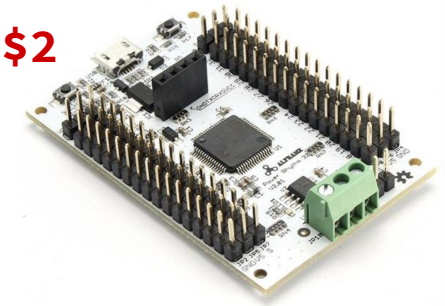
Costs and set-up

Necessary hardware to make a smart light pole:

- Mini computer (e.g. Raspberry Pi Zero) **~$5**

- External Wi-Fi Antenna **~$10**

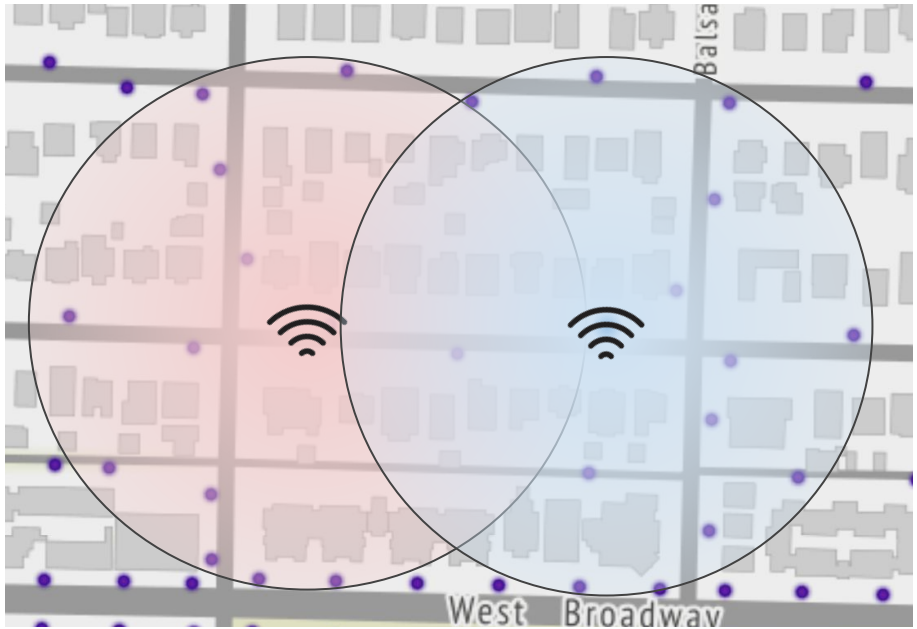
- Microcontroller for brightness adjustment **~$2**



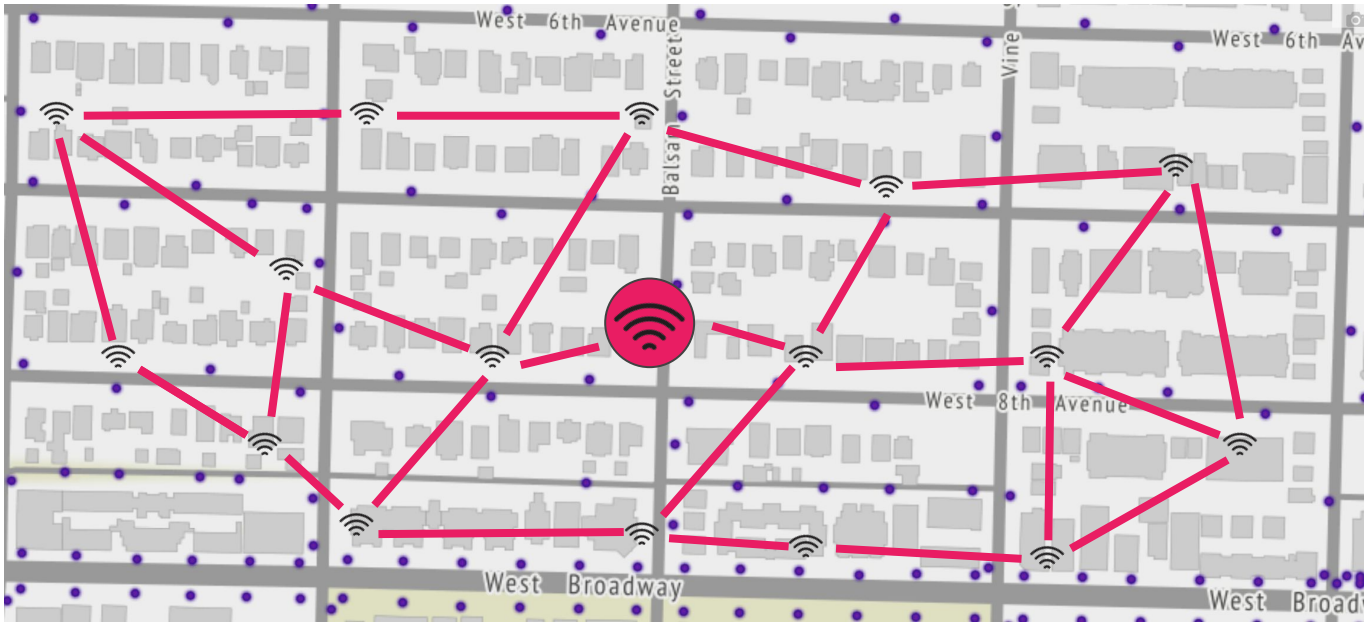
Hardware cost ~$17

Coverage

A **smart light pole** located every 45m would provide full coverage and would allow a position triangulation



Data transmission to centralized data centres



Dummy node - only performs data collection

Master node - sends data to servers via cellular network

Privacy

- Only MAC addresses that are randomly generated by the mobile device are collected - they don’t store any information that can identify the user

- Encrypted communication between dummy nodes to ensure that no data leaves smart light mesh network

- Encrypted communication via cellular network

DEMO

https://www.youtube.com/watch?v=C8kChfpoTfQ&feature=youtu.be

The End