



## Goal:

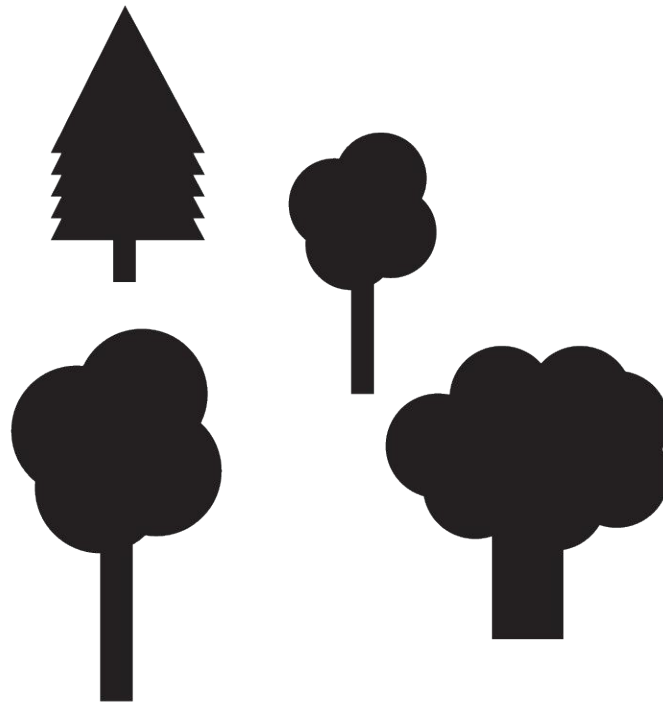
Learn how to address wireless networking challenges so we can troubleshoot and improve networks together.

Why?

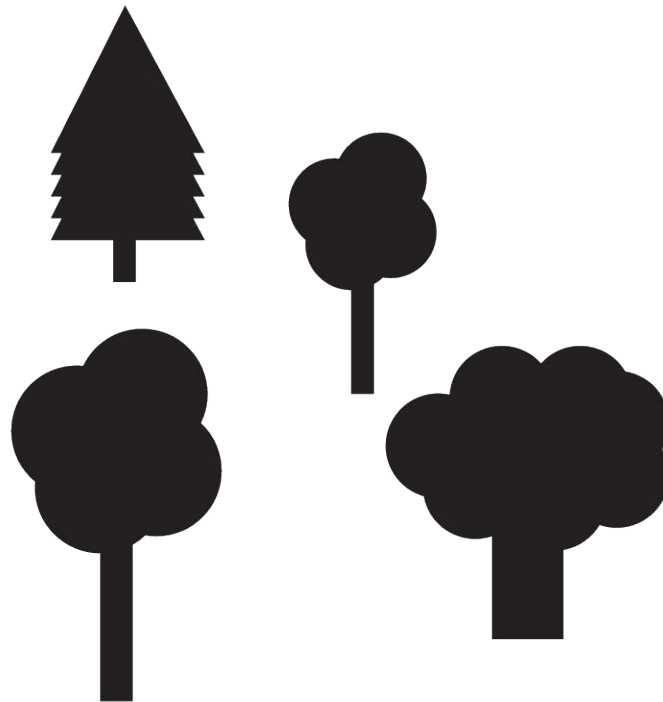
We need to plan according to real-world conditions and work around the obstacles in our environments.

First, an example of a wireless challenge.

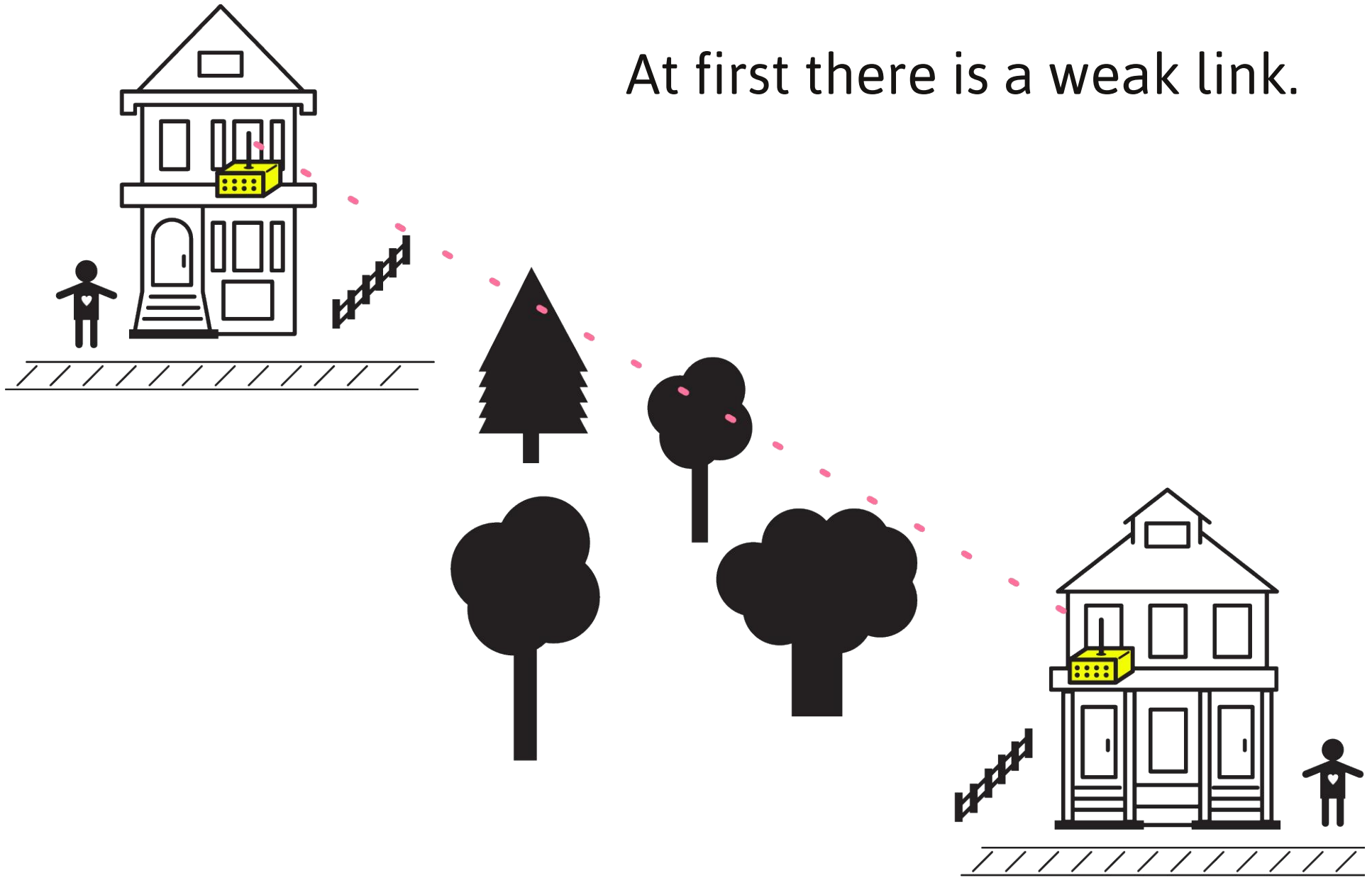
Two neighbors want to connect.



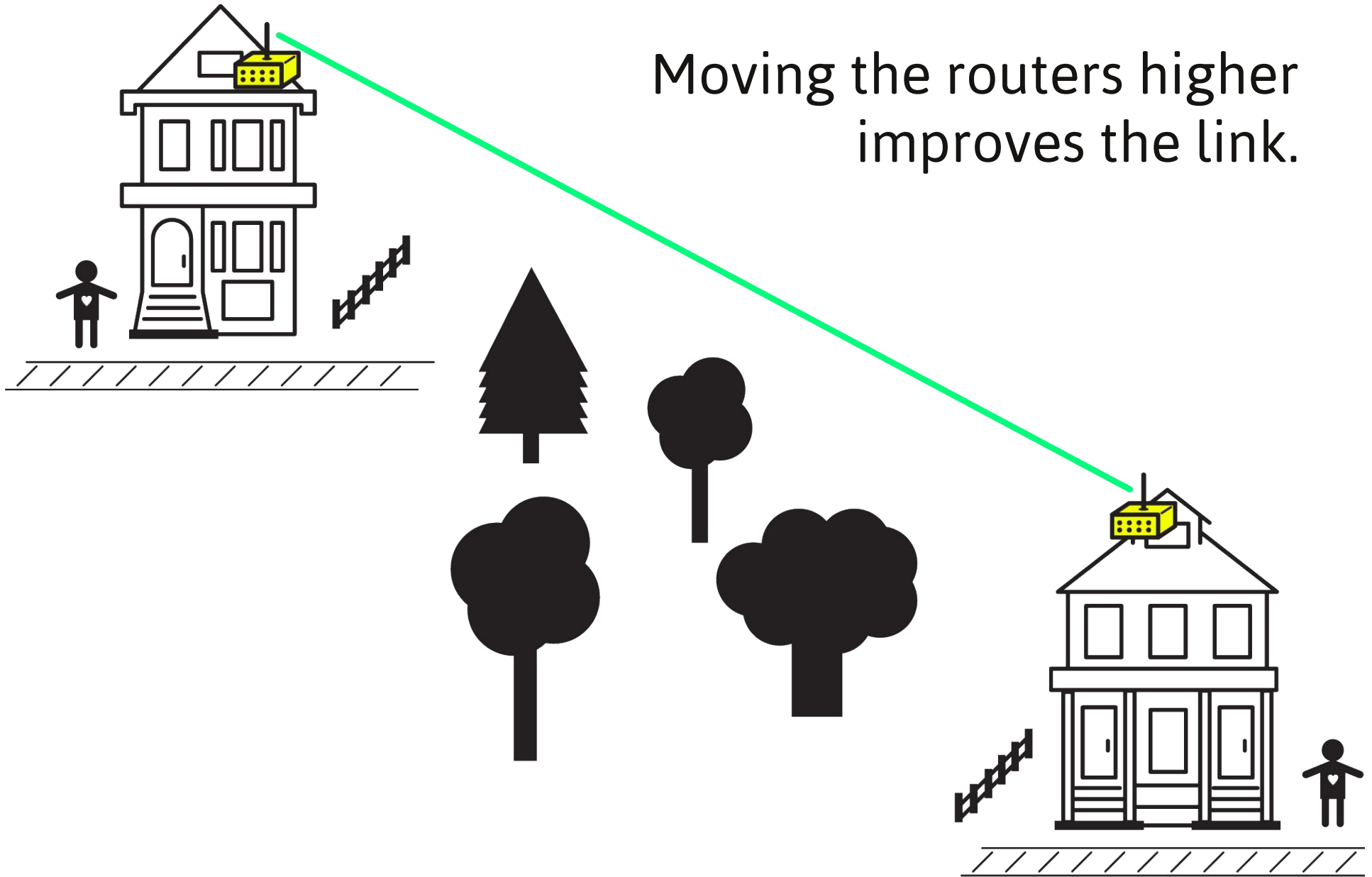
They place routers in windows.



At first there is a weak link.



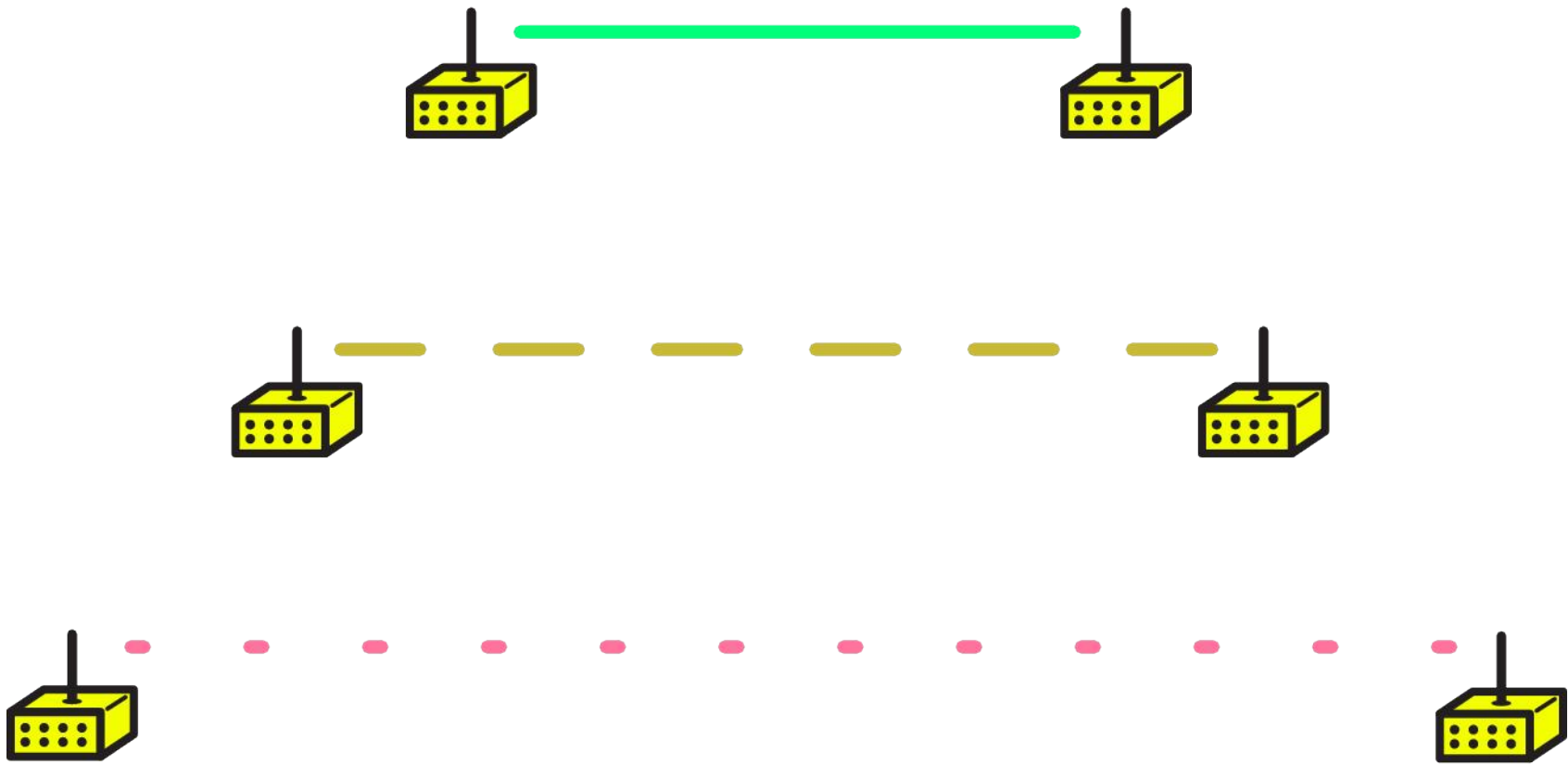
Moving the routers higher improves the link.





We want to represent links in a consistent way in the flashcard problems and our solutions.

# Wireless Link Quality



We use solid or dashed lines to show the strength of the link between two nodes.

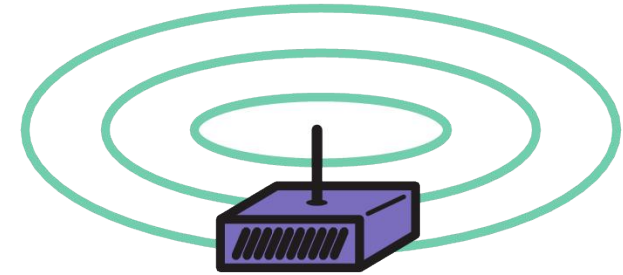
# Wireless Power



SPEAK POWER



LISTEN POWER



SPEAK POWER



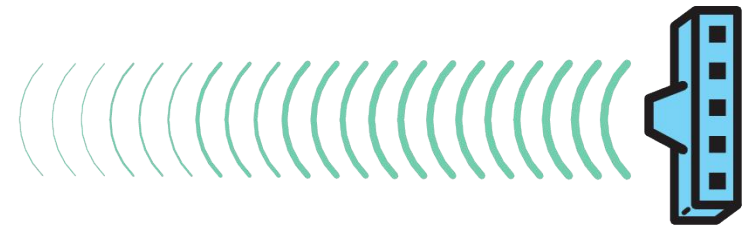
LISTEN POWER



SPEAK POWER



LISTEN POWER



SPEAK POWER

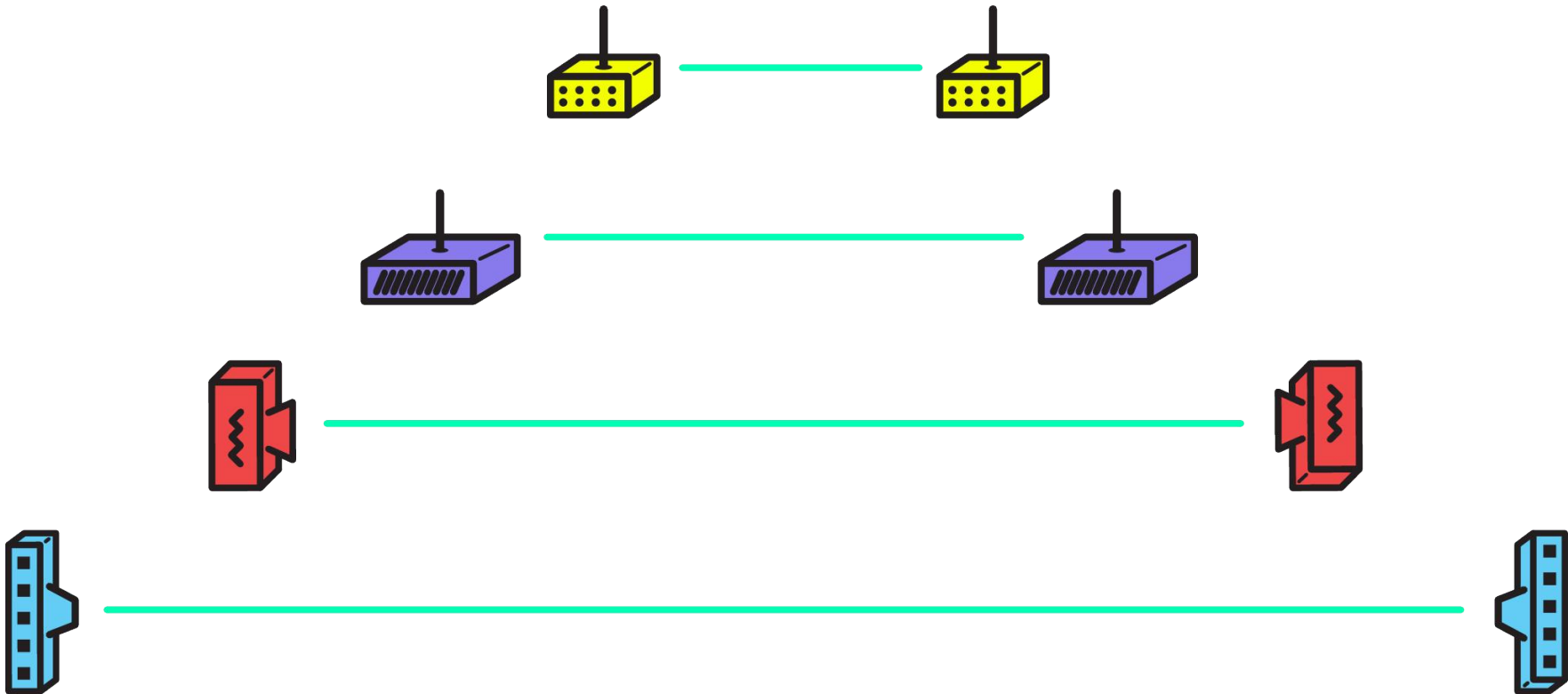


LISTEN POWER



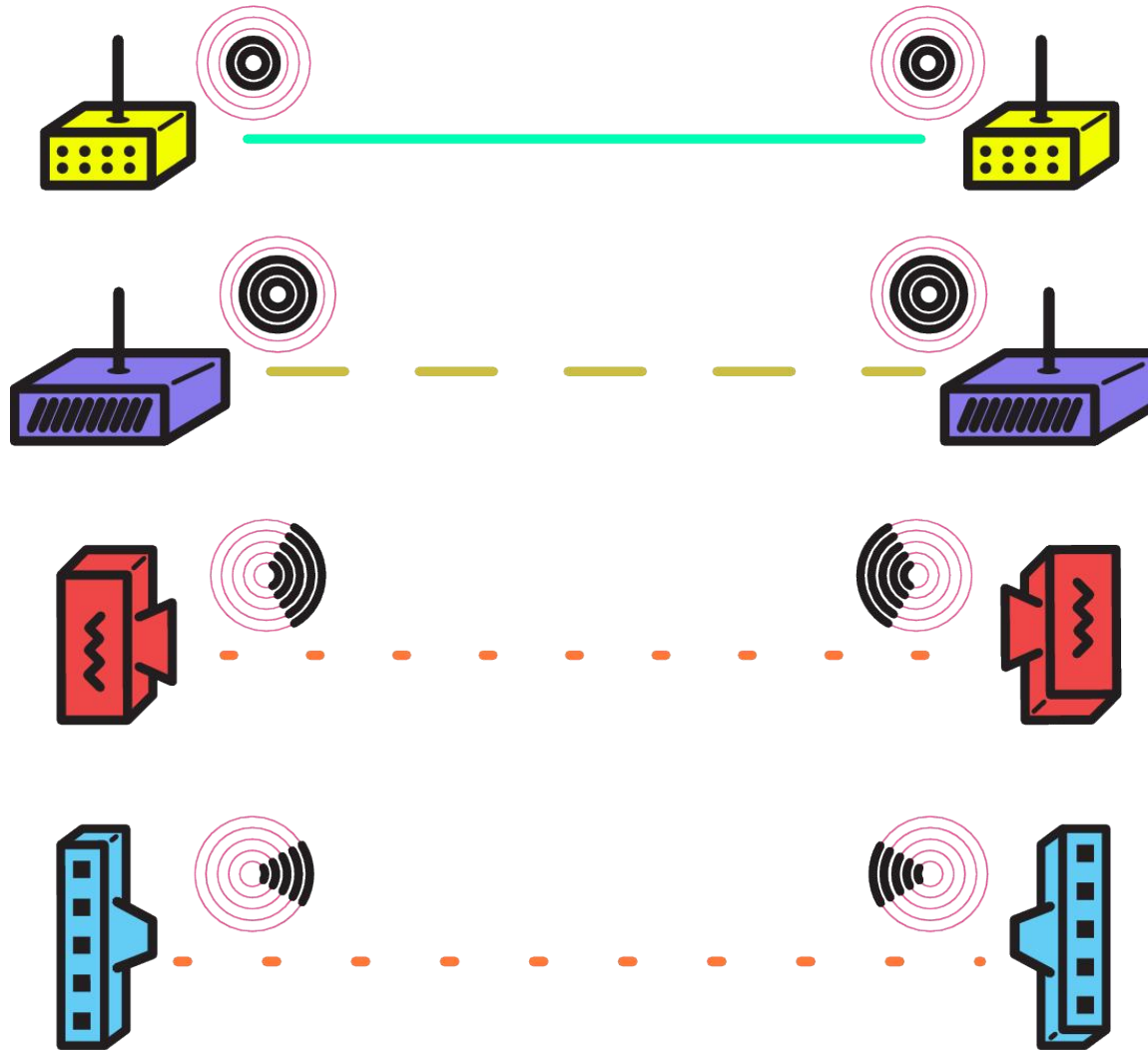
Routers speak and listen with different power.

# Links over distance



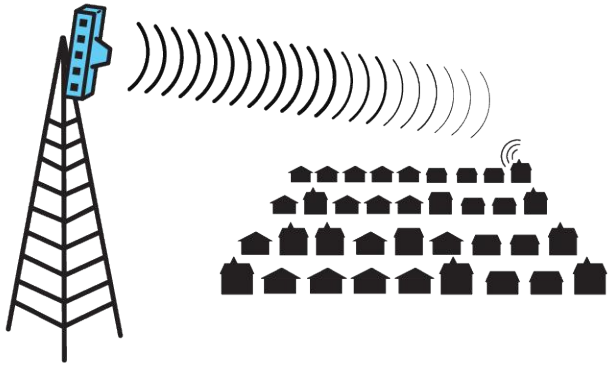
For some links, you will need routers with more power or focused antennas that can reach further.

# Wireless Power

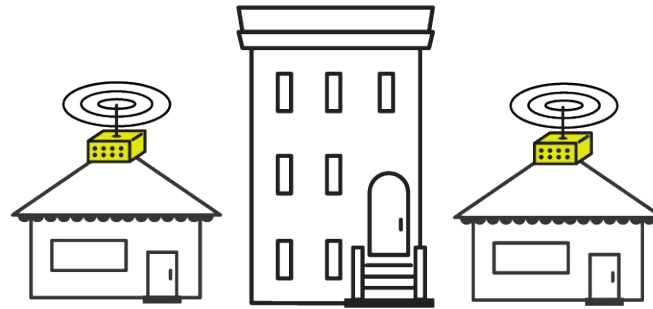


Use the lowest power level that creates a good link, too much power can cause interference.

Wireless signals are affected by obstacles, such as physical objects and environmental conditions.



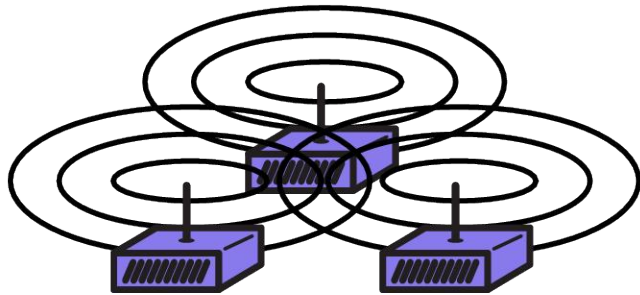
Distance



Line of sight



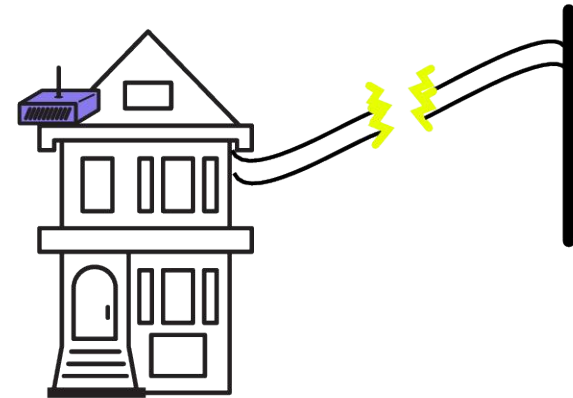
Barriers



Interference

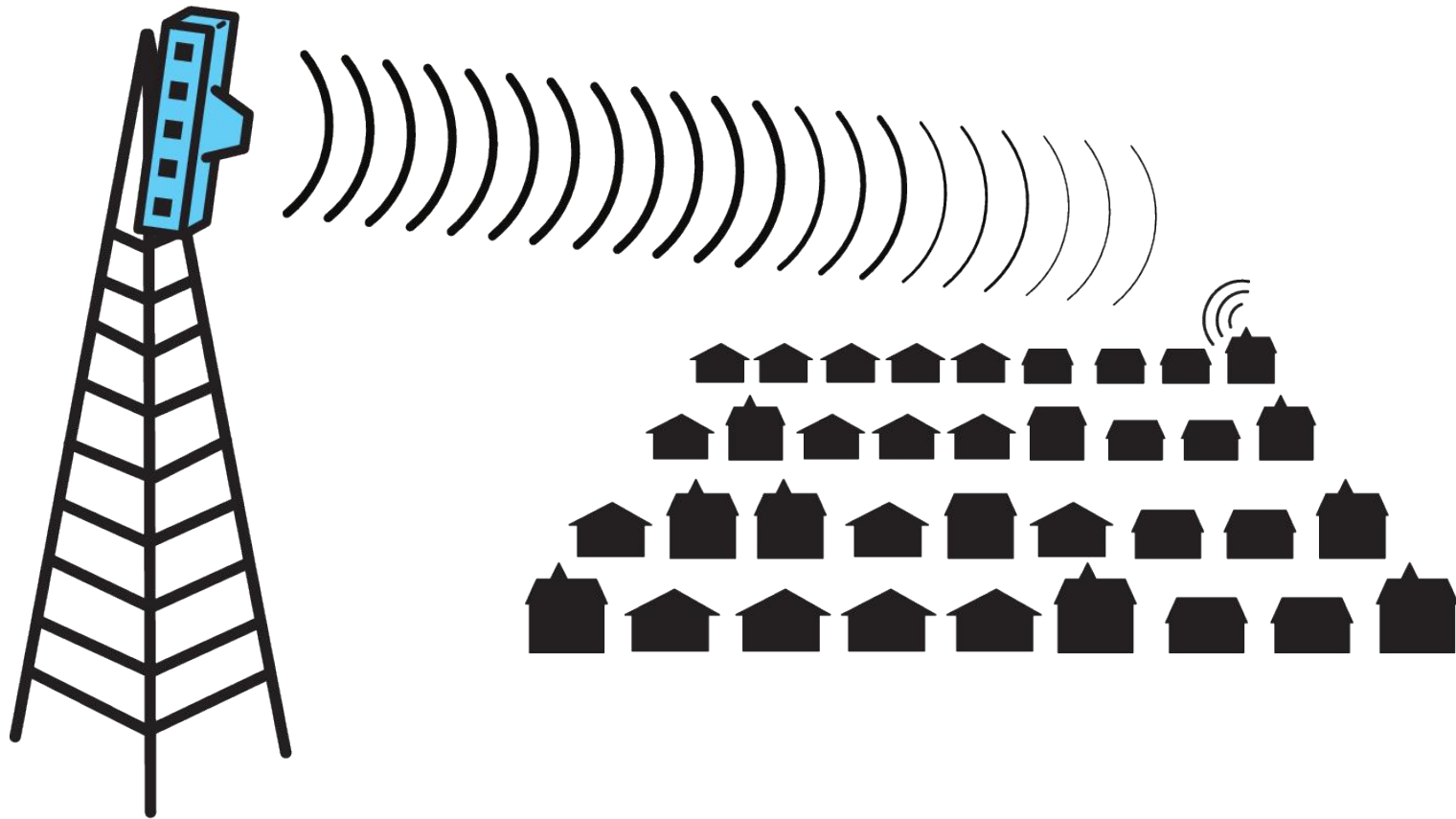


Weather



Electricity

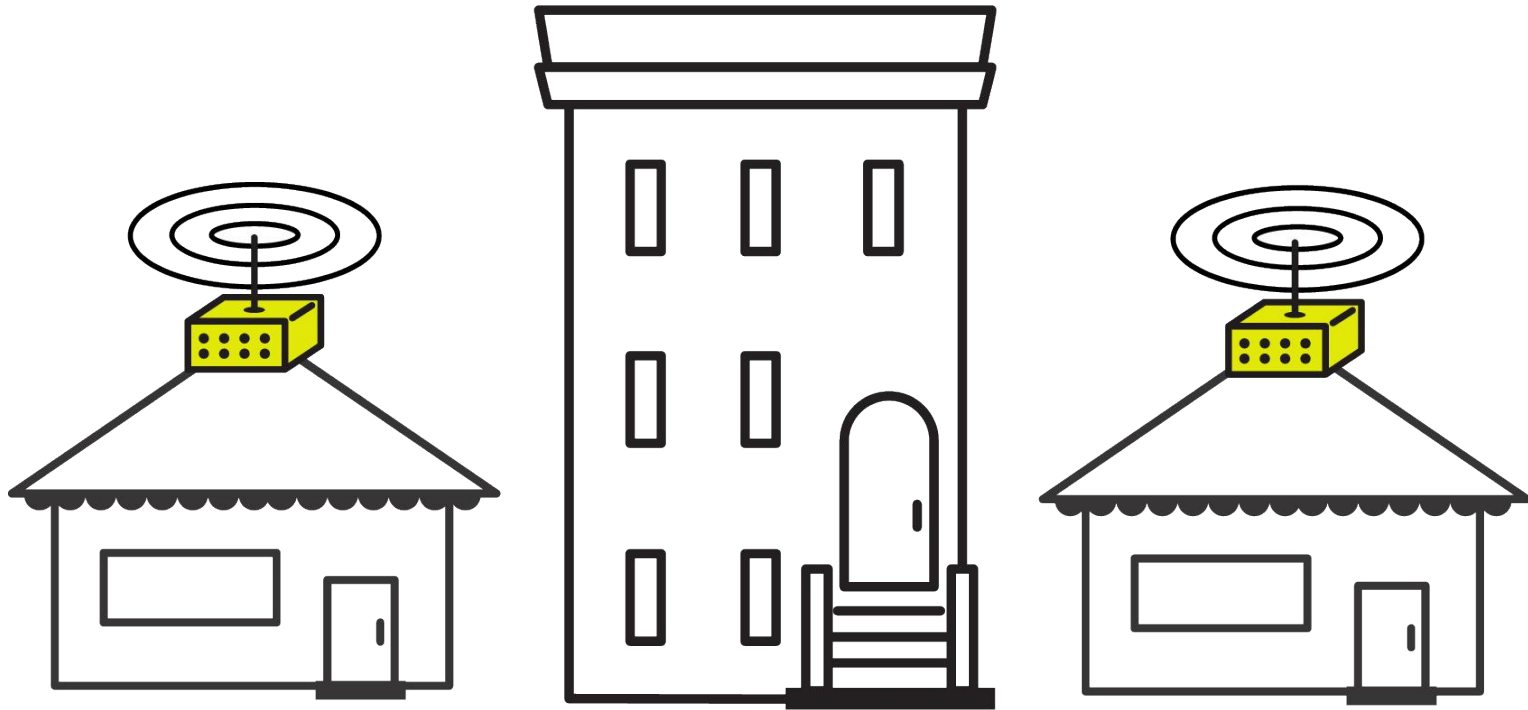
# Distance



Wireless signals lose power the further they travel.



# Line of Sight



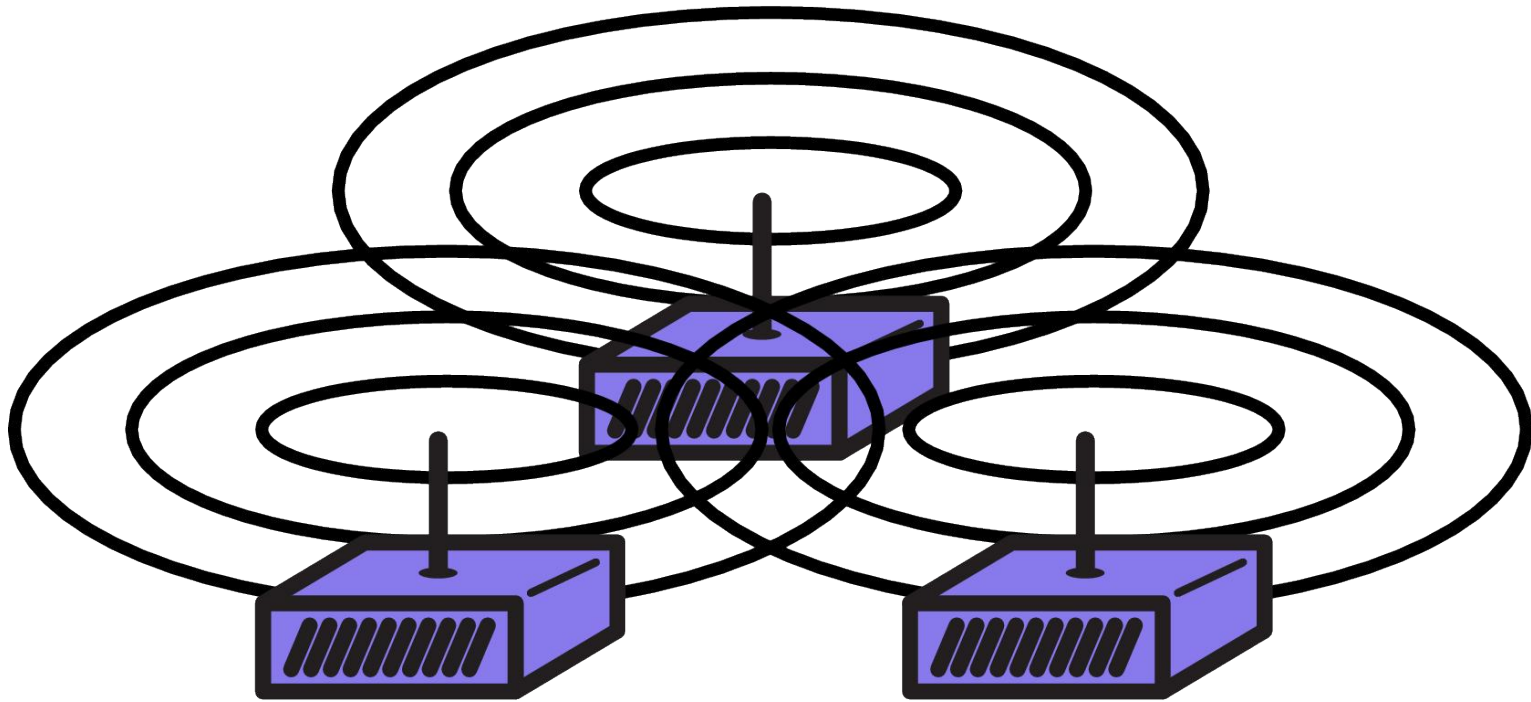
Wireless signals can encounter total barriers, preventing connections.

# Barriers



Wireless signals lose strength through objects.

# Interference



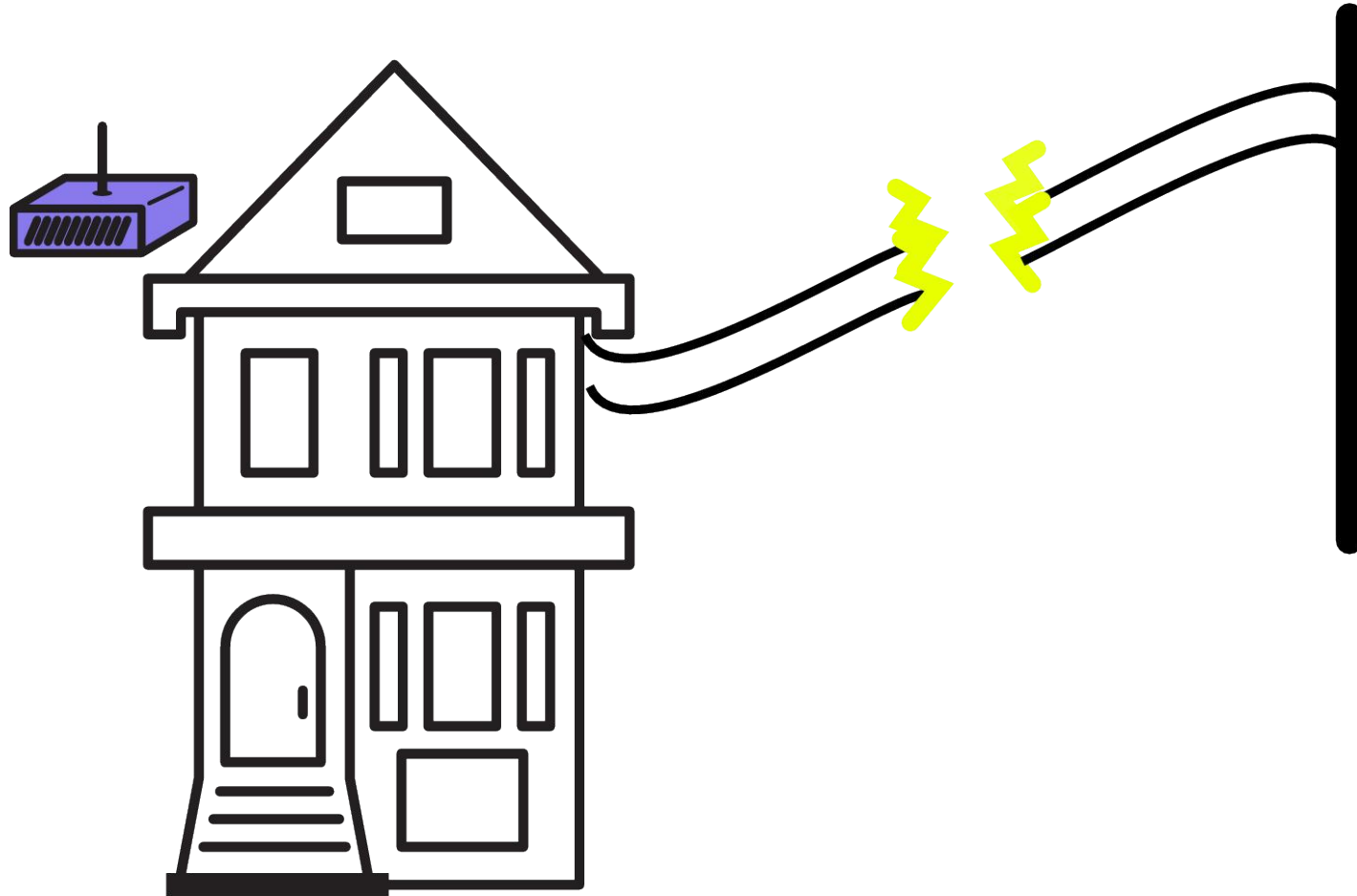
Routers can be too loud, making it much harder for them to hear each other.

# Weather



Weather conditions can make wireless signals weaker.

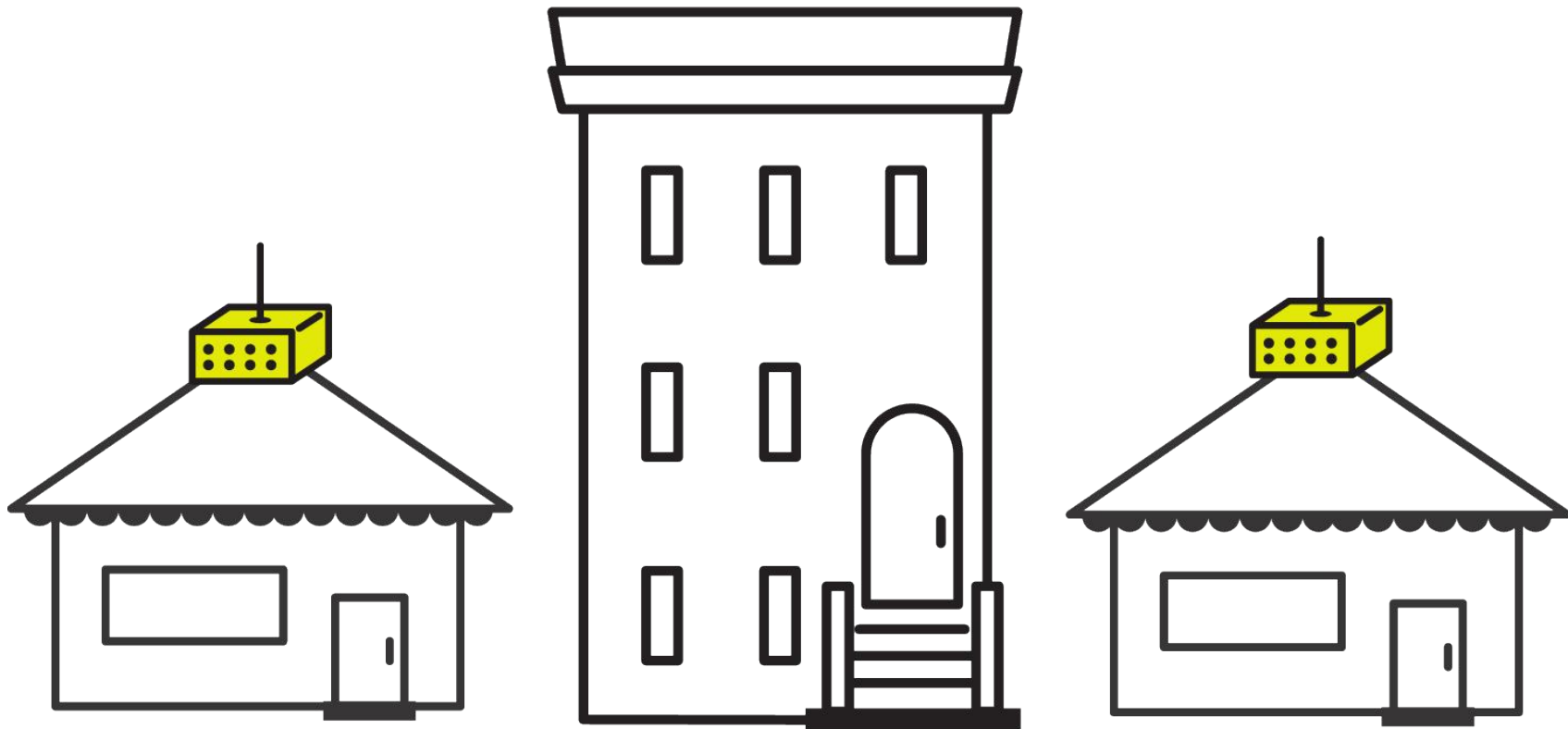
# Electricity issues



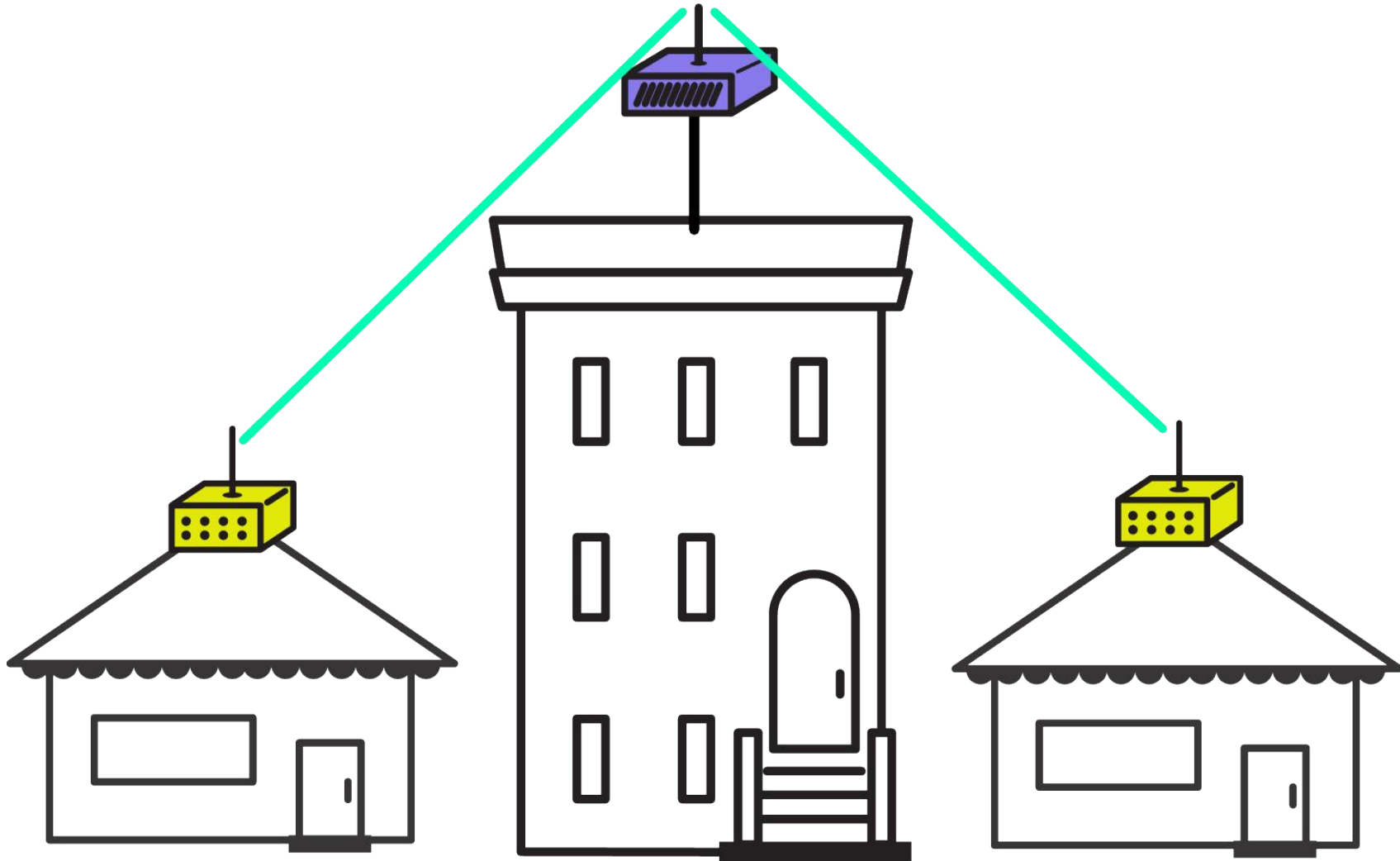
Routers need steady electricity to work well.

So, how do we use the flashcards to solve wireless challenges?

# Example: How do we link the routers?



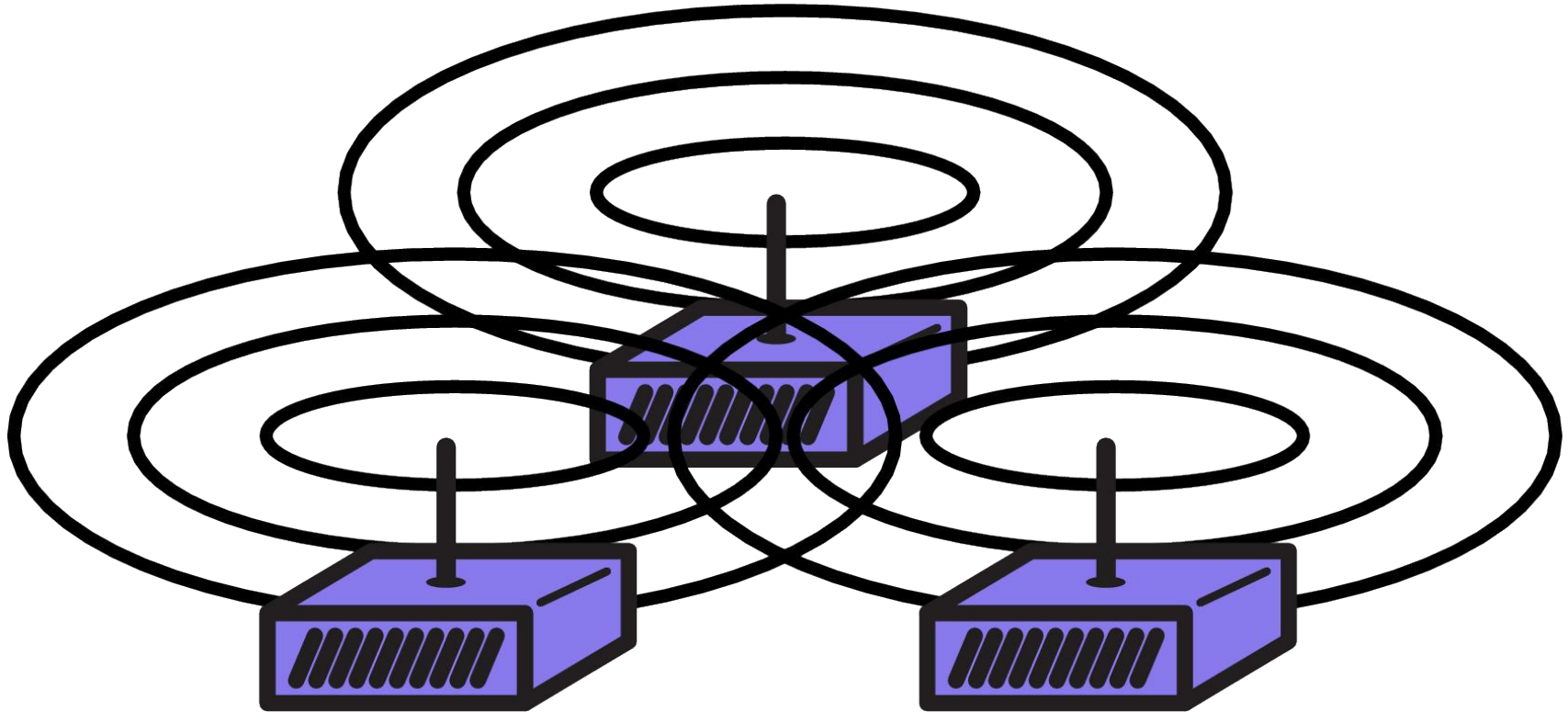
# Creating line of sight.



You can repeat the signal with another node.

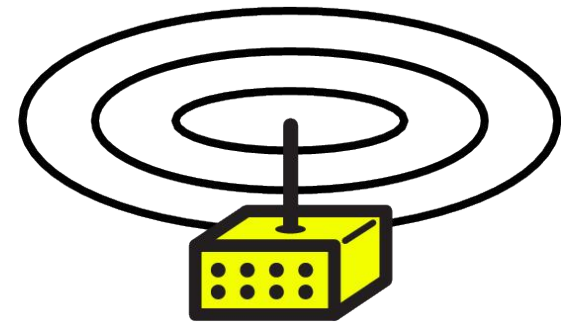
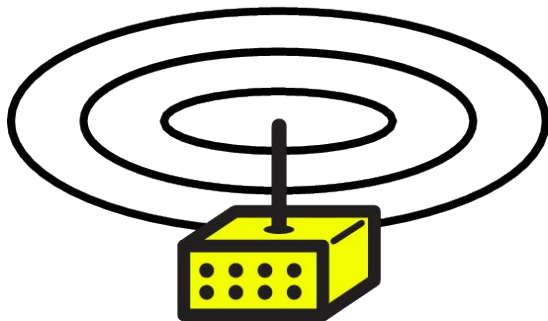
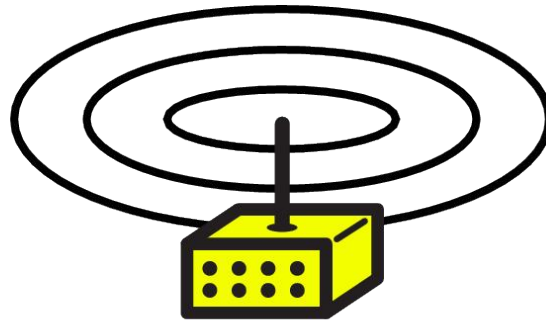


# Wireless noise and interference



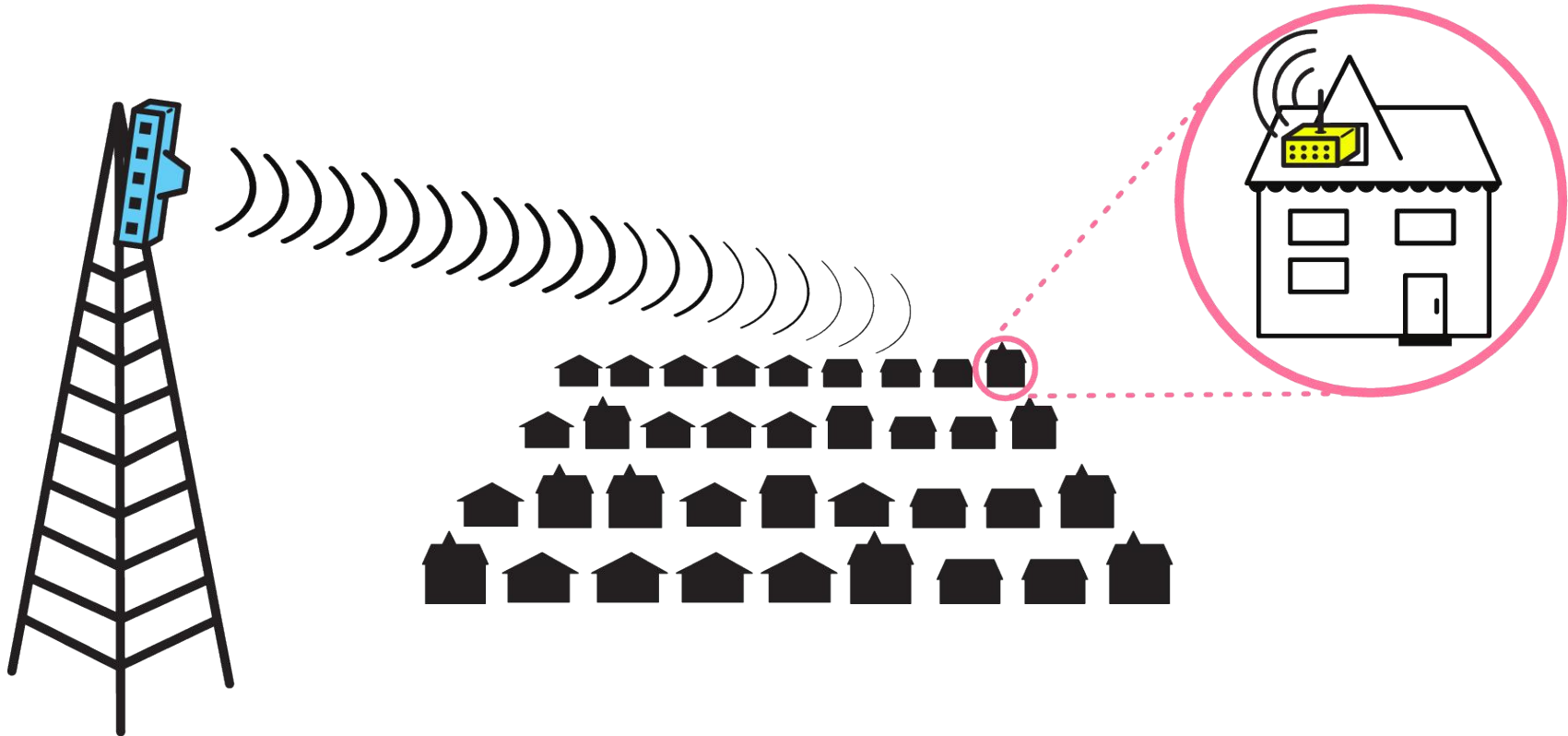
If the power is too high, or the routers are too close, there can be wireless interference.

# Reducing wireless noise



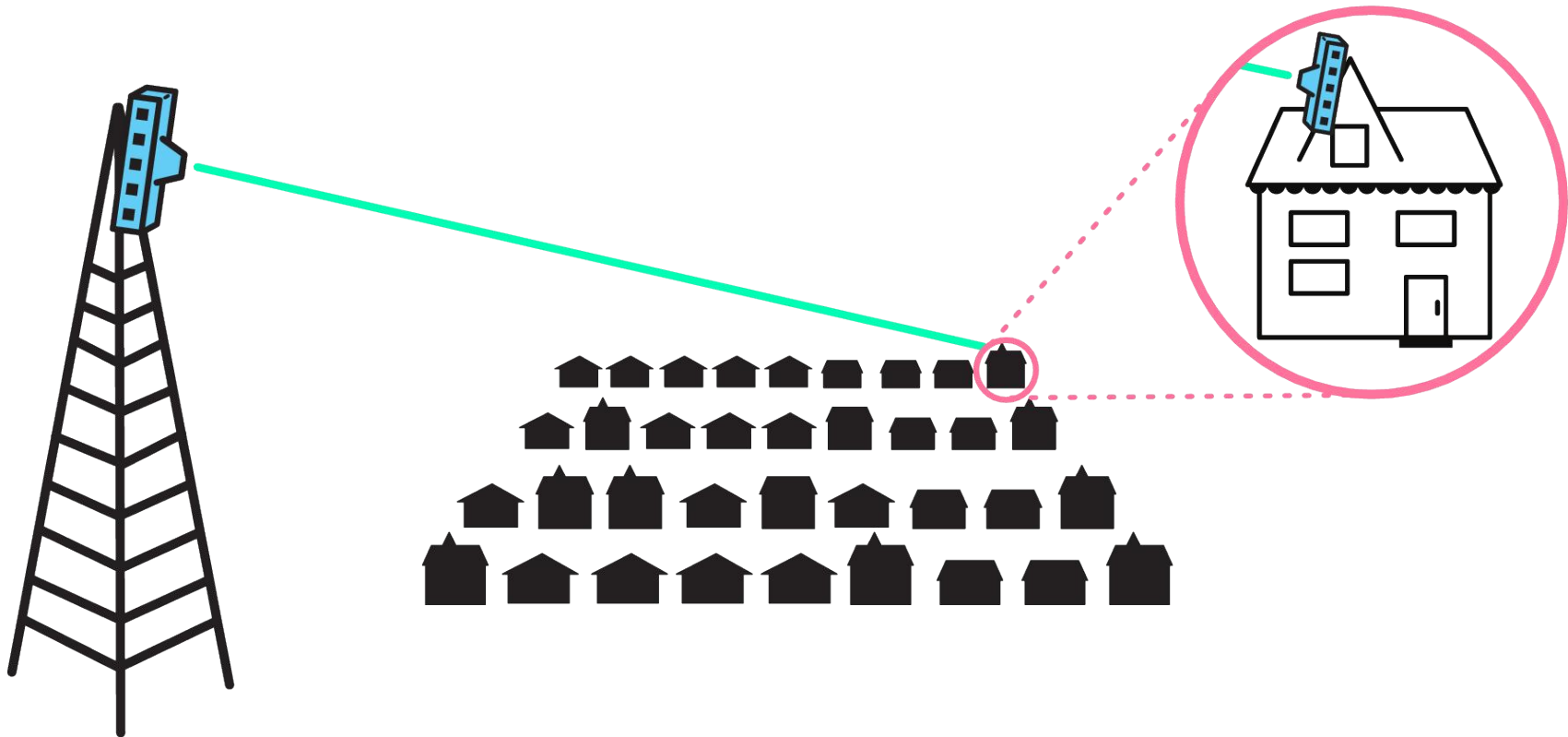
Give routers enough space and reasonable power, so the signals are not too loud.

# Distance Problems



Some routers may be too weak or have the wrong antenna for long distance links.

# Solving Distance Problems



With matched focused routers, we can achieve very long distance links.

Always consider the environment when you plan your network, but keep in mind other obstacles may come up while building the network:

- + Other sources of interference,  
such as microwave ovens
- + Vegetation and weather changing by  
season
- + Things you can't predict!