Introduction to Show Networking

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Who Am I?

- **Platform Integration Manager for Q-SYS**
  - Network-based audio, video and control systems
  - Large networks with sub-microsecond synchronized timing and complex multicast management

- **Lucy Depp Park Light Show**
  - 7.5 acres, 6 houses, 150k+ channels
  - Show network spanning entire neighborhood
  - www.ldplights.com

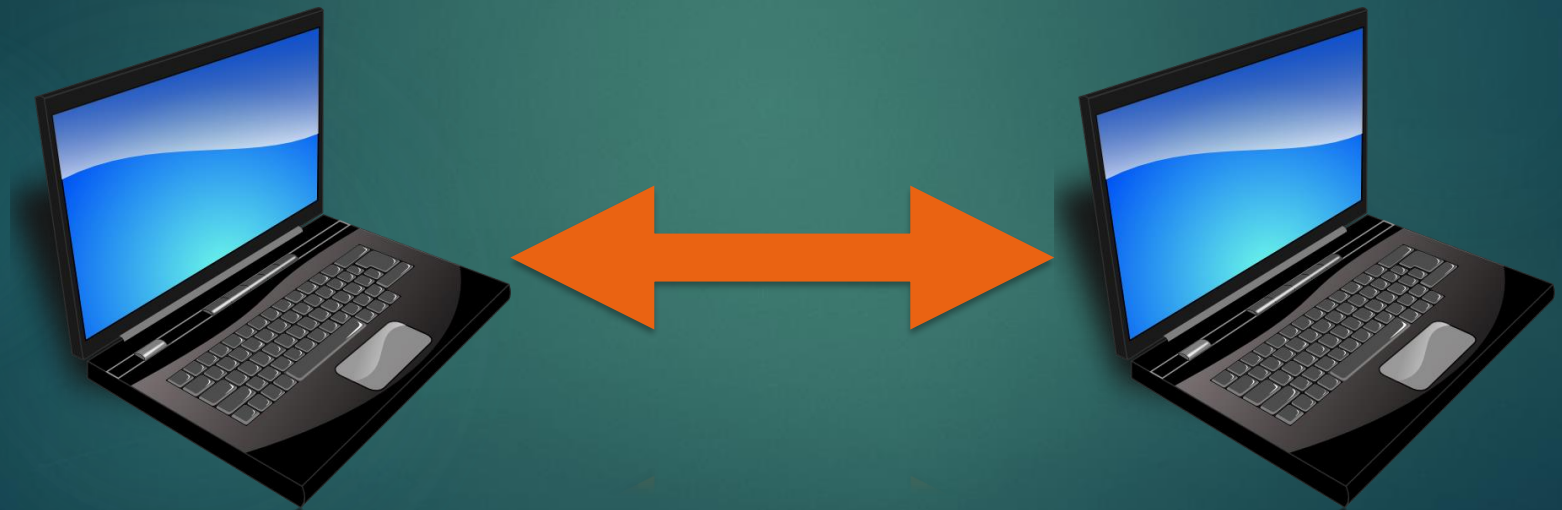
Agenda

- What Makes a Network
- How Devices Communicate within a Network
- Building a Light Show Network
- Q&A

What Makes a Network

What is a Network?

- Two or more devices connected together to share data



Parts of a Typical Home Network

-Cable Modem

-Router

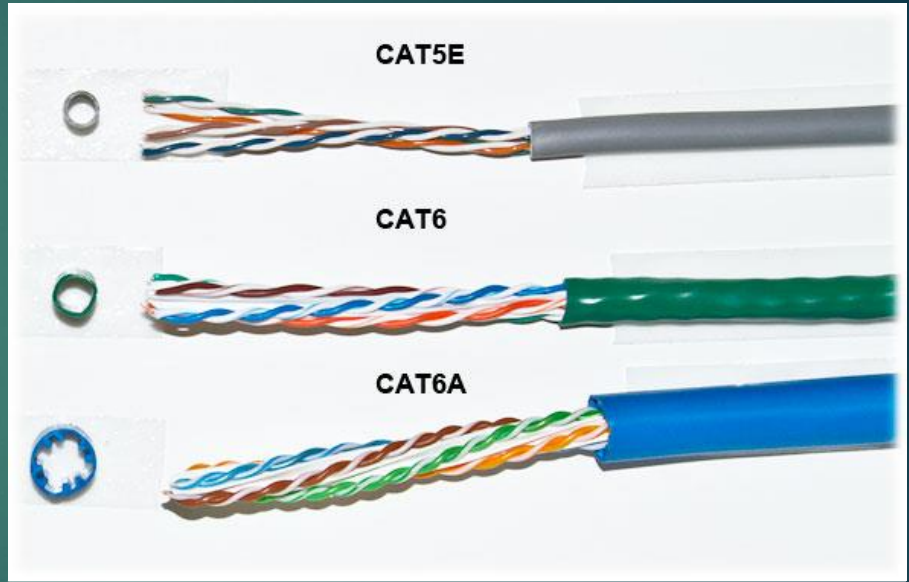
-Cabling

-Wifi Access Point

-Ethernet Switch

Cabling

- Category Twisted Pair
  - Unshielded (UTP)
  - Shielded (STP)
  - Plenum, Riser
  - Direct Burial / UV Resistant
- CAT 5e/CAT6/CAT6A
- RJ45 Connector
- Avoid Copper Clad Aluminum



Router

- Connects multiple networks together
  - Local network to internet
  - Local network to another local networks
- Main brain of the network
  - One per network
  - Contains DHCP server

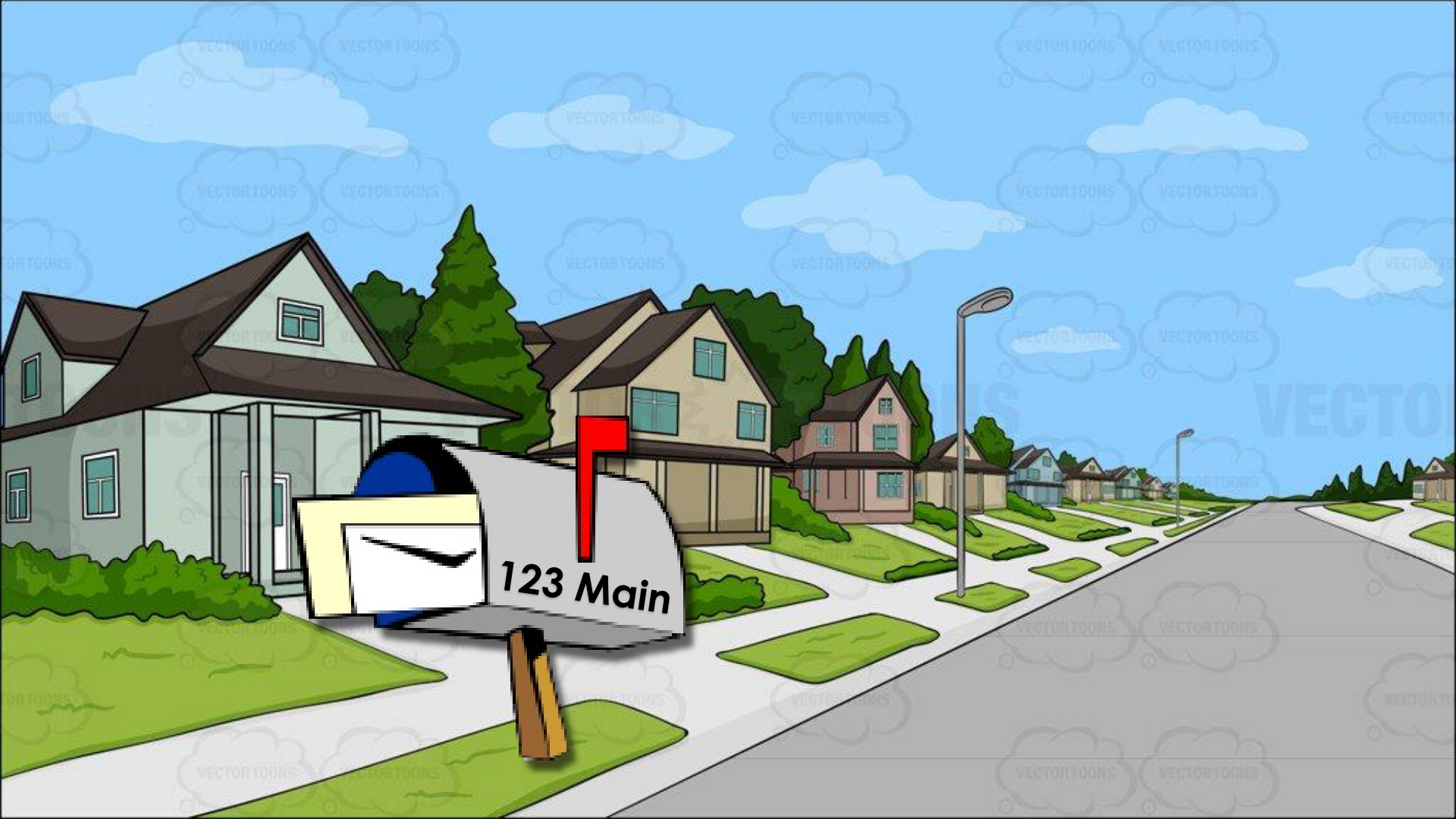
Ethernet Switch

- Connects multiple wired devices together
- Sends data between devices on the network
- Data is only sent to the port that needs the data
- Ability to provide power to devices (POE)

Wi-Fi Access Point

- Converts hardwired network to wireless
- Many consumer versions built-in to router
- Rated by spec – 802.11a/b/g/n/ac/ax
- Max speed shared by all connected devices

How Devices Communicate within a Network


123 Main

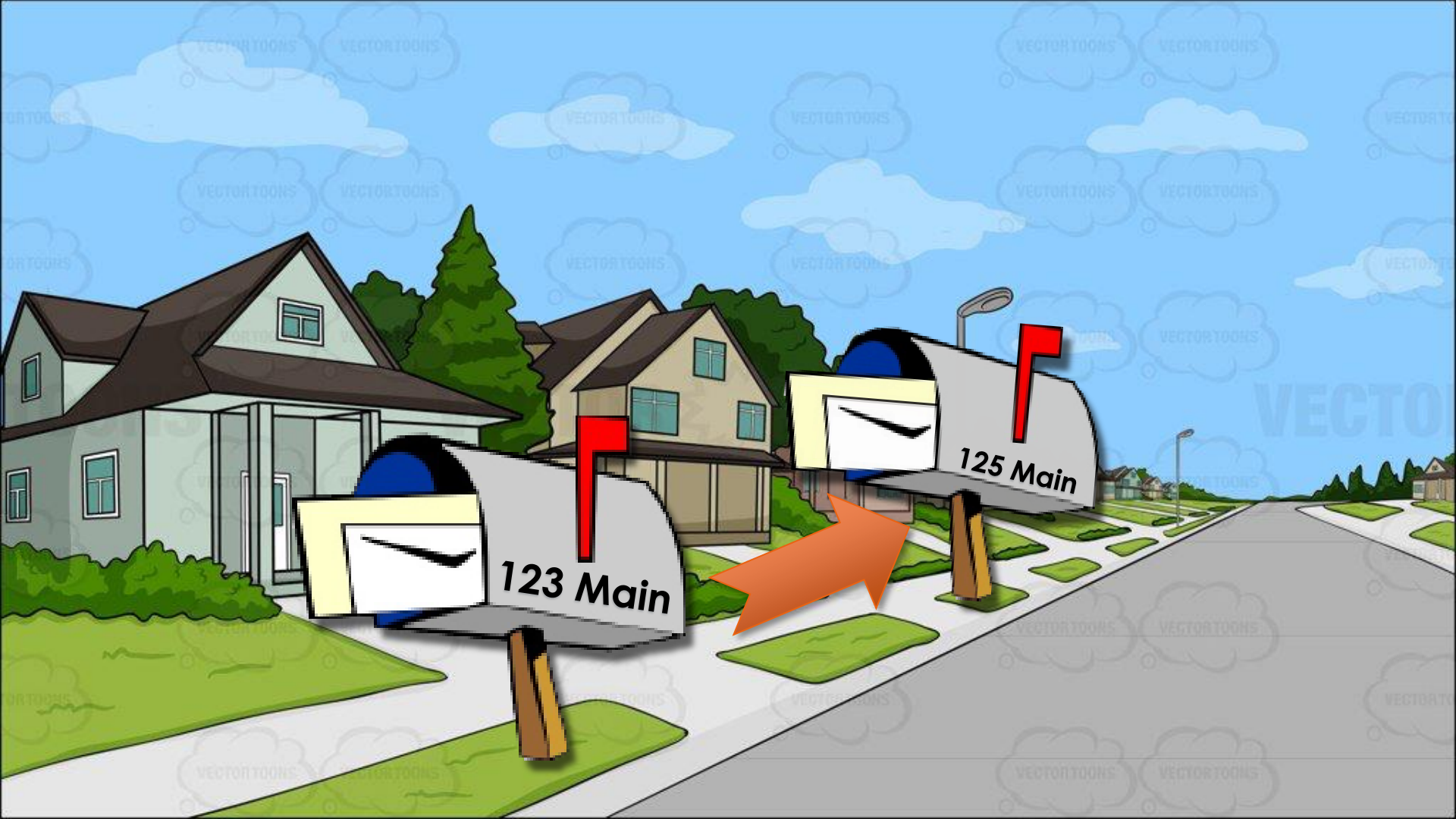
IP Address: 192.168.1.123

IP Address Rules

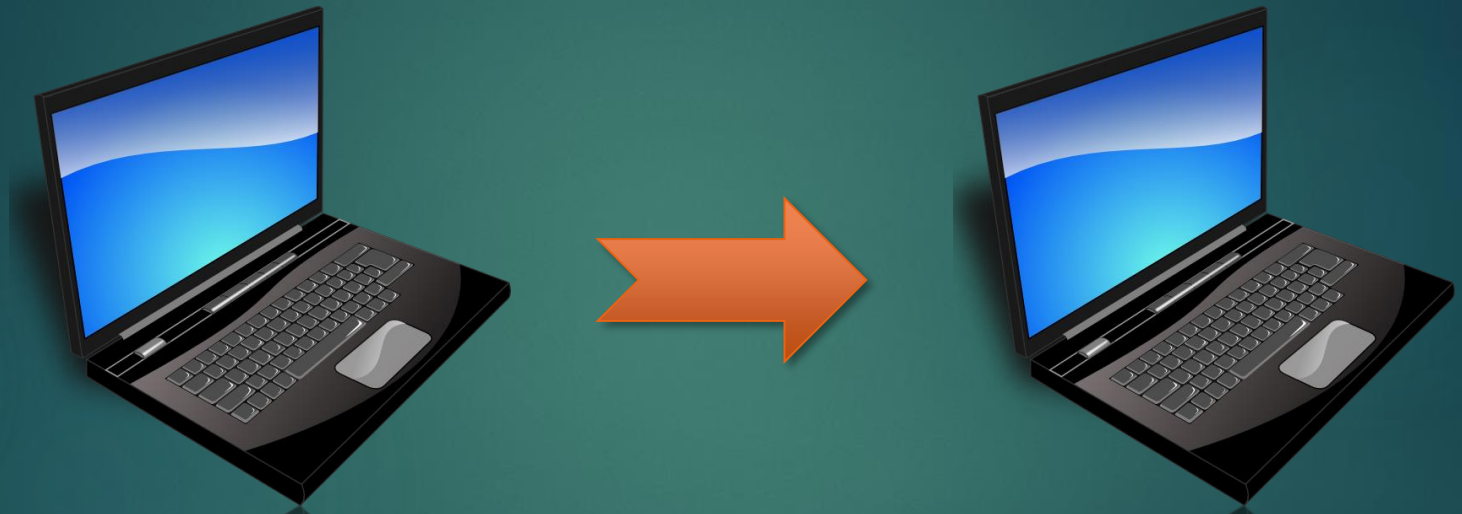
- IP must be within private IP range
  - 10.0.0.0 – 10.255.255.255
  - 172.16.0.0 – 172.31.255.255
  - 192.168.0.0 – 192.168.255.255
- No duplicate IP addresses on the same network
- X.X.X.1 and X.X.X.255 are reserved on a network.

Static vs Dynamic IP Addresses

- Most networks will assign an IP address automatically (DHCP)
- Typically a range of IPs the network hands out
- Router will (typically) renew after certain amount of time
- Reservation gives a device the same IP each time
- Static requires the user to manually set the IP address of each device


123 Main
125 Main

IP Address



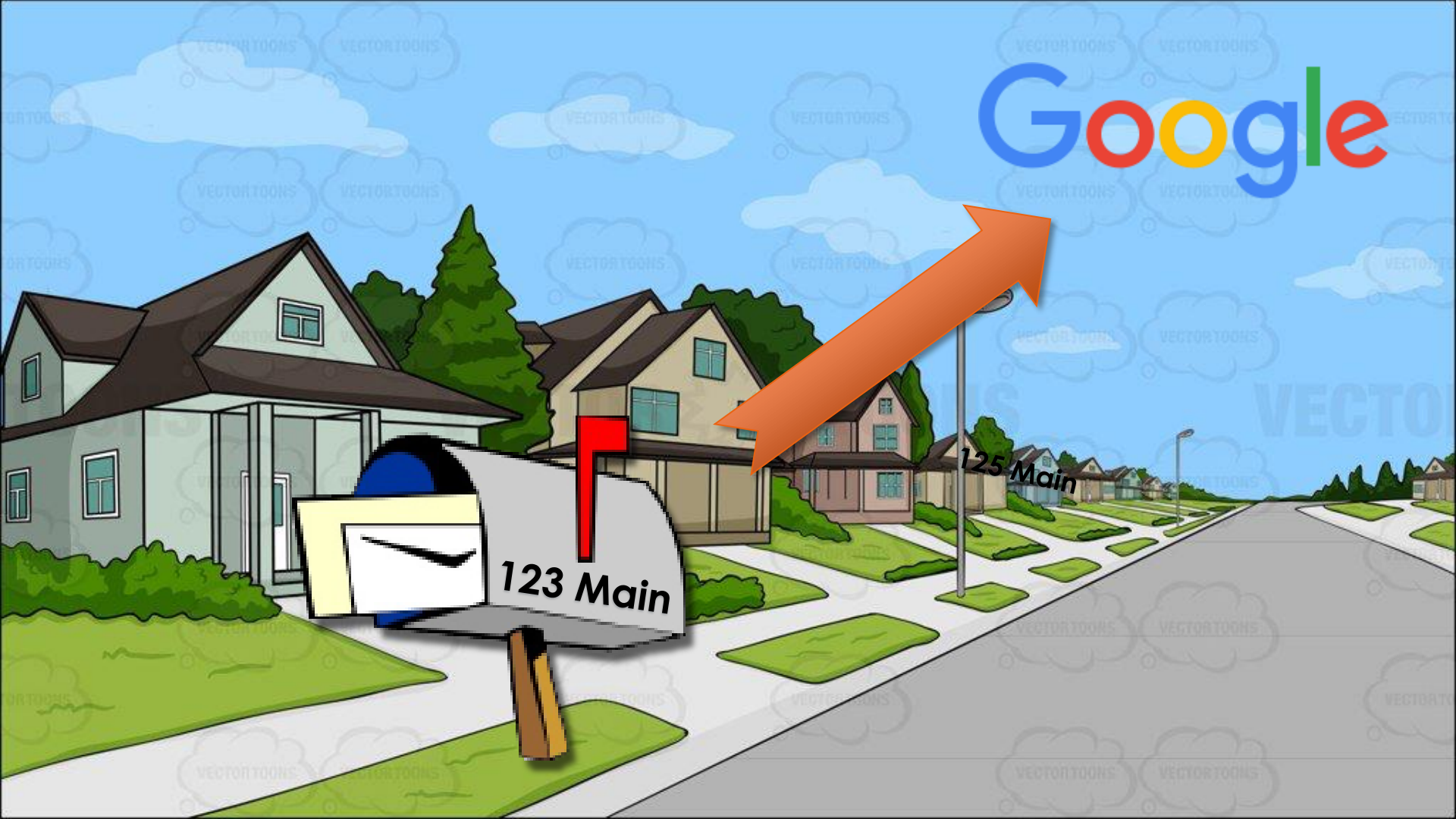
192.168.1.123

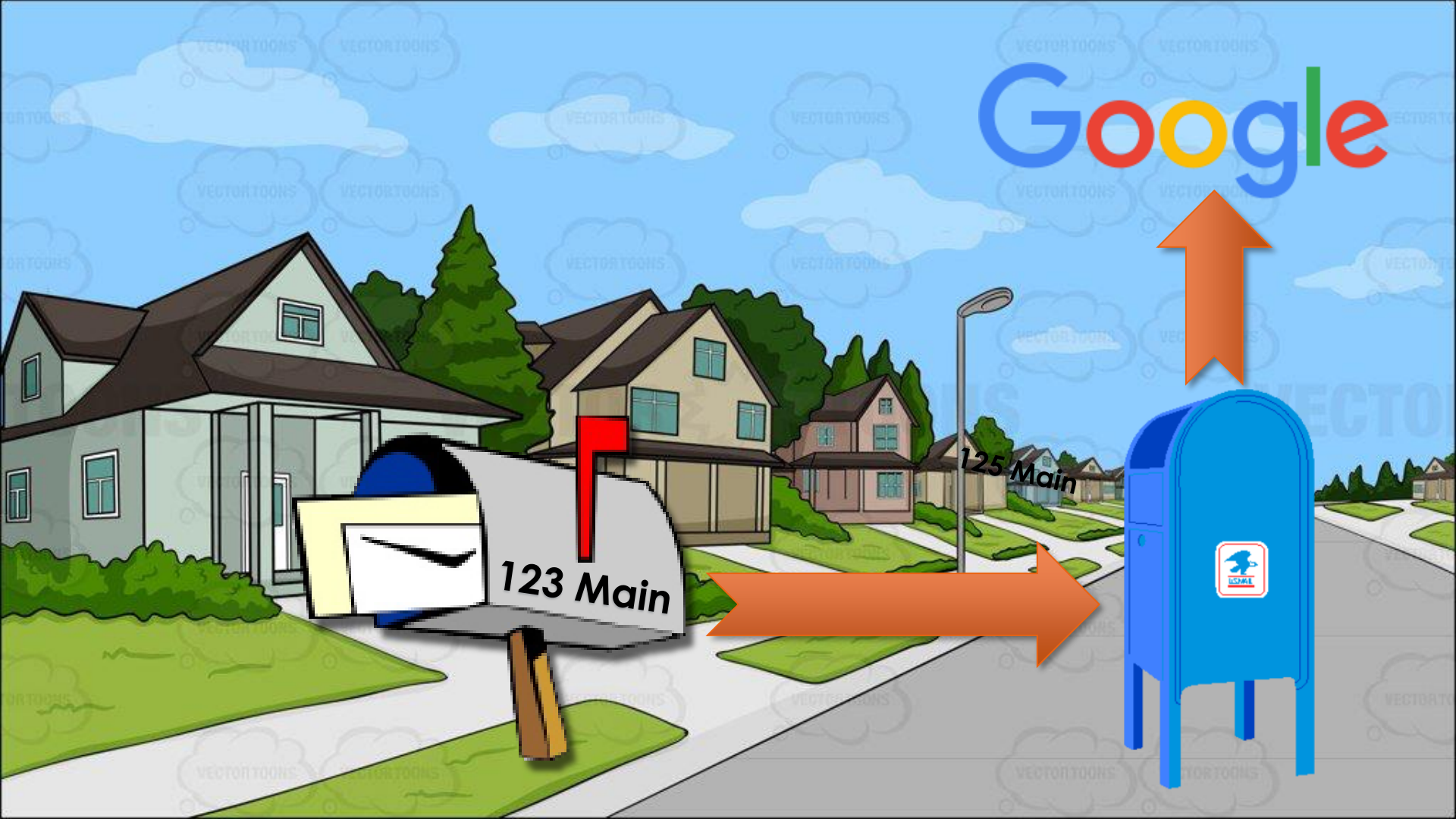
192.168.1.125

IP : 192.168.1.123

Subnet: 255.255.255.0

192.168.1.1 – 192.168.1.255


Google
123 Main
125 Main


Google
123 Main
125 Main

192.168.1.123

172.215.15.110

172.215.15.202

172.215.15.110

Google

192.168.1.123

192.168.1.1

IP : 192.168.1.123
Subnet: 255.255.255.0
Gateway: 192.168.1.1

Gateway Rules

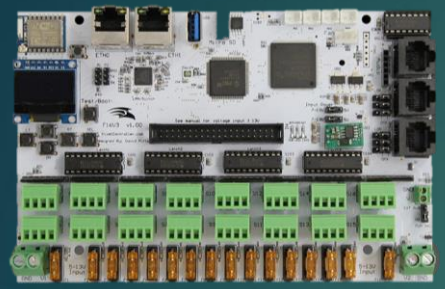
- Gateways are not required
- A device should only ever have one gateway
- If you want a device to communicate past the network it is on, it has to have a gateway
  - Ex. Pi with a static IP has to have a gateway to reach the FPP update server on the internet

Building a Light Show Network

Why Build a Show Network?

- Easier to manage, troubleshoot, and configure
- Keep lighting data separate from Netflix
  - Wifi has to share Breaking Bad with Megatree data
  - Router may support bandwidth, but packets will get delayed or lost
  - Jitter can cause issues in shows
- Survivability

Network A: Switch-Only



192.168.1.10

192.168.1.12

192.168.1.11

Network A Notes

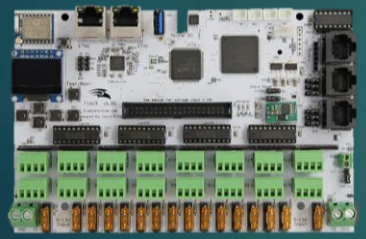
- All devices have to have IP address set static
- No DHCP for new devices plugged into network
- Simplest, most foolproof network design
- No internet access on network

Network B: Router

192.168.1.1

DHCP

192.168.1.10



192.168.1.11

Network B Notes

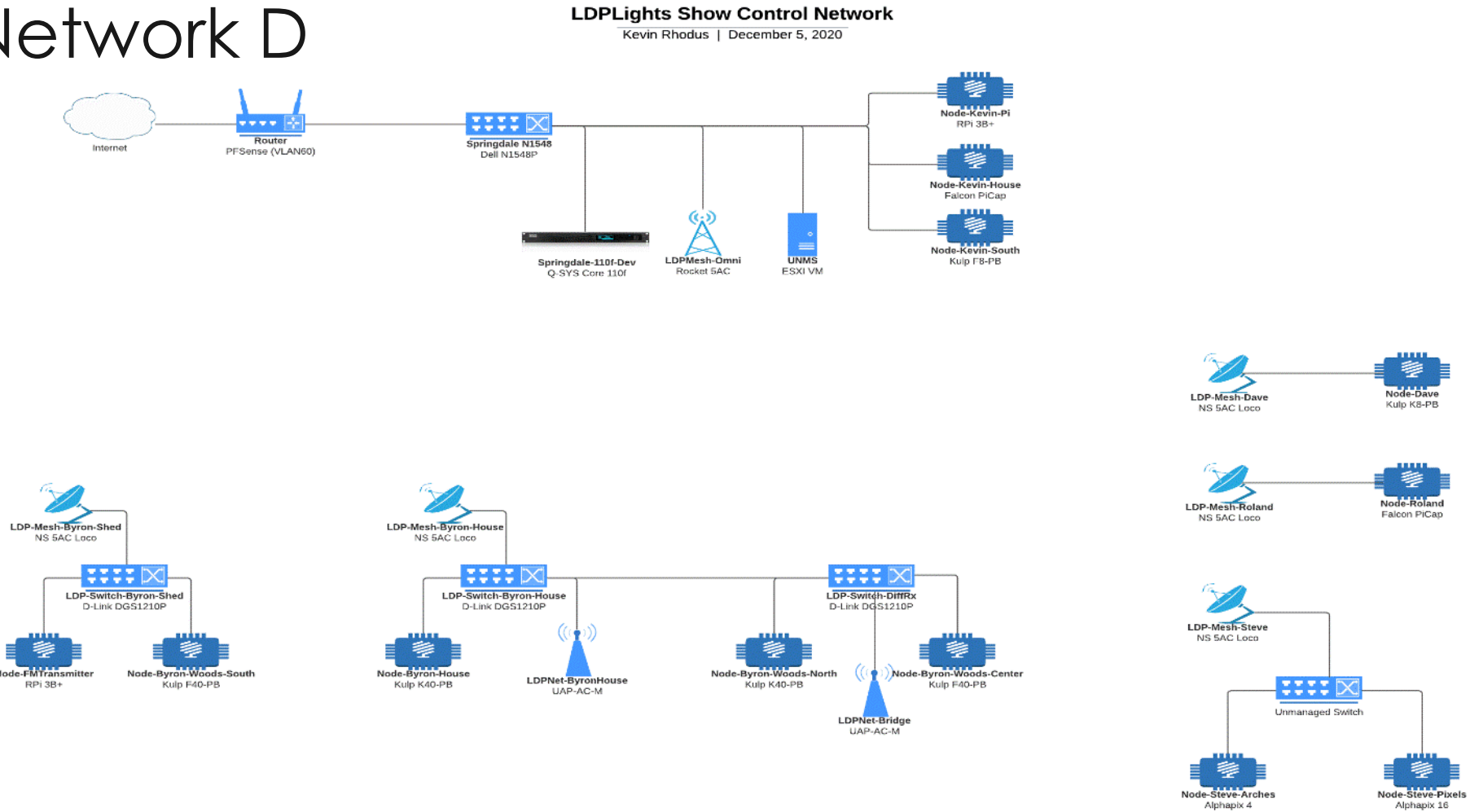
- Show devices should be set to static IP (or a reservation)
  - Make sure they are not in the DHCP server range
- If router has WiFi, make sure it is on a different channel than home WiFi
- Router can be connected to home network to provide internet access for show network
  - Make sure IP range of show network is different than home network

Network C: Pi Gateway

Network C Notes

- Show Network and Home network MUST have different IP address ranges
- Not able to directly access devices on show network without connecting to it, unless static routes are established on PC
- **Make sure only the Home network has a gateway set on the Pi network config**

Network D


LDPLights Show Control Network
Kevin Rhodus | December 5, 2020
Internet
Router
PFSense (VLAN60)
Springdale N1548
Dell N1548P
Springdale-110f-Dev
Q-SYS Core 110f
LDPMesh-Omni
Rocket 5AC
UNMS
ESXI VM
Node-Kevin-Pi
RPi 3B+
Node-Kevin-House
Falcon PiCap
Node-Kevin-South
Kulp F8-PB
LDP-Mesh-Byron-Shed
NS 5AC Loco
LDP-Switch-Byron-Shed
D-Link DGS1210P
Node-FMTransmitter
RPi 3B+
Node-Byron-Woods-South
Kulp F40-PB
LDP-Mesh-Byron-House
NS 5AC Loco
LDP-Switch-Byron-House
D-Link DGS1210P
Node-Byron-House
Kulp K40-PB
LDPNet-ByronHouse
UAP-AC-M
LDP-Switch-DiffRx
D-Link DGS1210P
Node-Byron-Woods-North
Kulp K40-PB
Node-Byron-Woods-Center
Kulp F40-PB
LDPNet-Bridge
UAP-AC-M
LDP-Mesh-Dave
NS 5AC Loco
Node-Dave
Kulp K8-PB
LDP-Mesh-Roland
NS 5AC Loco
Node-Roland
Falcon PiCap
LDP-Mesh-Steve
NS 5AC Loco
Unmanaged Switch
Node-Steve-Arches
Alphapix 4
Node-Steve-Pixels
Alphapix 16

Currently Playing
Sequence: 2020LDPXmas_v1_1.fseq
00:23
Stop Time:
Next Sequence: Programming
Sunday @ 17:00:00 - (Everyday)
LDPLIGHTS
Frabell Dr
Springdale Dr
Lakeview Dr
Gwendolyn Dr
Harriott Rd
Byron House Mesh
Byron House Switch
Byron House AP
DiffRx Switch
Bridge AP
Roland Mesh
Dave Mesh
Shed Mesh
Shed Switch
Pixel Tree Mesh
Main Mesh
MDF
Router - VLAN60
N1548 Switch
TWC Modem
UNMS (ESXI)
Steve Mesh
Steve Arch Controller
Steve Pixel Controller
Map
Controllers
Network
Sequences

Q&A

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