N Smith 2015

Networking URE Book 1
What is a Network?

Introduction

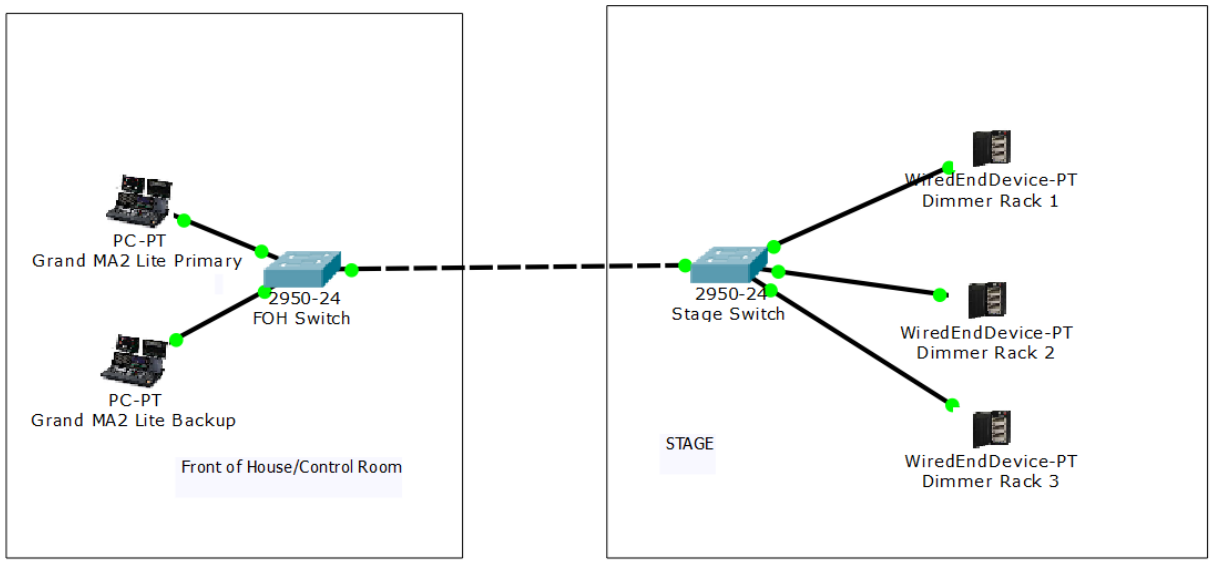
Networking has redefined the way we transfer data in a our theatrical lighting and video systems. Networking is now moving in to take over data distribution in much the same way DMX took over from 0 - 10V analogue control.

What is a Network?

A network is simply a group of devices connected in such a way so they can talk to each other. These devices can be Computers, Lighting Consoles, Media Servers, and now even lights.

The important thing about a network is it allows data to pass freely to and from each device. It is not linear whereby one devices tells the others what to do, but rather an information exchange through which devices can communicate. This is advantageous as it can allows us to have very complex control over our system, without having to run many cables between every device.

A simple Network in a venue could look like this:



The specific kit used to build a network system may vary slightly, but this is a good starting point.

Packets

The best way to envision how data moves around a network is to think of the postal system (well maybe not royal mail, as we'd be waiting a year to get going.)

Each clump of data is called a packet (more mail metaphors to come.) When a device wishes to talk to another device, it takes the data it wants to send, wraps it up, slaps an address on to it and sends it off into the big wide network world.

But how does the packet know where to go? This brings us neatly onto the topic of how packets are moved through a network.

Switches

In the most basic network you could connect two devices, for example a console and a laptop, together and that would be that. They would talk to each other. However a network with only two devices would be very boring and not exciting at all! We have lots of consoles and lots of dimmer racks all begging to be connected to our beautiful network.

Continuing our mail metaphor, pieces of Hardware called "Switches" are the sorting offices of network-mail. Switches can take in data from multiple devices, sort through them, and send them out to the right place.

A common switch is the Cisco SLM2024 24 Port Switch, which looks like this:

As you can see, there are plenty of network ports to connect all our devices to, which allows us to keep expanding our network as much as we like.

But what if we want to connect more than 24 devices together, or we have many devices spread out across the venue in multiple clusters? Luckily, as you can see from the example on the previous page, we can connect two switches together to give us additional connections to the network.

So we have a device that can take all the packets into it and sort them. But now our sorting office needs a way to know where it is sending these packets. And the way we accomplish this is through…

IP Addresses

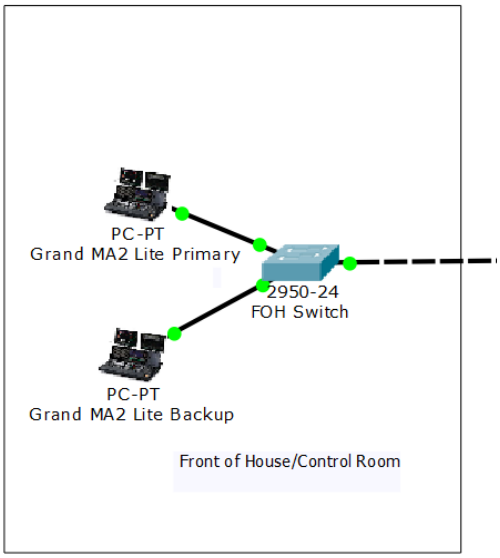
With all this equipment on our network, we need a way of identifying which device is which as we need to make sure all the data we desire to get to a certain place can actually find it's way there.

The way we accomplish this, is by assigning an individual, unique IP Address to each device. In this way every bit of data we send into the network can be routed to the correct destination.

At the moment IP addresses follow a standard called IPV4*, where addresses are 4 sets of 3 digit numbers. For example a common IP address would look like this: 192.168.0.1.

In order for a device to be able to easily communicate with another device and ensure dual way communication, they must be set to the same SubNet**. The SubNet is the first 3 numbers of an IP address, so for our above example the SubNet would be 192.168.0.x . Our value of x can be anywhere from 0 to 255, allowing for up to 256 devices to exist on one SubNet. Even our Switches require an IP address in the same range as our devices.

So if we look at our example from the first page, we can see the two GrandMA2 consoles and our switch currently have no IP address:



This isn't much use at the moment as while our consoles are all plugged into the same switch and are switched on, they can't see each other.

So lets choose some IP addresses for our devices. For ease and to make it easily memorable lets give our switches addresses 1>99 and our consoles addresses 101>199.

Remember, it's only the last digit of the address we are going to change.

So our assigned IP addresses will look something like this:

Device Name	Subnet	Individual Address	Full IP Address
Grand MA2 Lite Primary	192.168.0	101	192.168.0.101
Grand MA2 Lite Backup	192.168.0	102	192.168.0.102
FOH Switch	192.168.0	1	192.168.0.1

This will allow the devices on our network to talk to each other, and our switches can now send our data across the network. We can now start to use the devices special network features to make them work in interesting ways.

**IVP4 is now becoming outdated and will soon be replaced by IVP6, however for now IVP4 is still is massive use.*
***Some protocols can work with devices on a different subnet (mainly sACN/ETC Net) but it is still good practice to keep all similar devices on the same subnet.*