Troubleshooting Networking Problems

Understanding your school’s network

by Stu Hasic - Feb 2013
Typical Networks

- All schools use Ethernet Networks
- There’s networks...
Typical School Networks

- and then there’s school networks…
And then there’s Custom Work...
Defining the Network

• Typically, each building at school would have a cabinet, *but not necessarily*
• Cabinets are also called “distributors”
• There’s usually a Campus Distributor (CD) and separate Building/Floor or Room Distributors (BDs)
• The CD is normally the “centre” of your network with each of the BDs connected to the CD via “backbones”
• Backbones can be *copper* or *optic fibre* cables
Deciphering the Cabinet

Optic Fibre Patch Panel contains connectors for fibre backbones to other cabinets.

Copper Patch Panel contains connectors that link to data outlets in various rooms. The numbers represent outlet numbers in rooms.

Optic Fibre Patch Leads connect fibre backbone(s) to Ethernet switches. These are usually orange in colour.

Copper (UTP) Patch Leads connect data outlets in rooms to the Ethernet switch(es). Copper leads can come in various colours.

See the Lights?? These indicate the switch is on, that computers are connected and that there is network activity from certain outlets when the lights flash. The numbers on the switch refer to switch ports, not outlet ports!

Ethernet Switch(es) Your network cannot work without switches. They are the components that link your other switches, servers, computers, printers and other networkable devices together.
Deciphering the Outlets

UTP Outlets
These outlets are in rooms where you need network access. In some newer schools the outlets can be used either for computers or for telephone handsets. If used for telephone, the outlet at the patch panel is patched into a PABX connection instead of into an Ethernet switch.

Outlet Identification
The outlets should all be numbered. The numbers refer to the copper patch panel in the cabinet. If there is a problem at a computer, it can be traced back to the patch panel, then to the switch port.

UTP Patch Leads
These are the leads that connect to your network device. It could be a computer, a network printer or even another ethernet switch to allow for more computers to be connected within the room. If buying new leads, make sure they are CAT5E or CAT6 specification.

Learn About Your Network!
Spend some time finding out how your network fits together. Draw a map! Where are the CD and the separate BDs? How are they linked? Where are the Outlets? And where and how many other Switches are there that are not in cabinets?
Basic Troubleshooting Steps

PROBLEM: The internet is not accessible on a workstation

- You need to make sure the network cable is plugged in and that the appropriate TCP/IP settings have been defined for local IP Address, Gateway (Router) and DNS.

There is usually a light at the port where the network lead joins the PC. Another light should be on the hub where the port connects. Try a different port & patch lead - ones you know work.

Verify the TCP/IP settings. There should be a unique local address for each computer, while all other IP settings - i.e. Gateway/Router and DNS addresses must be the same on all computers.

Every workstation must have the school’s auto-proxy defined in the internet browser’s [i.e. or Netscape] options or preferences screen, e.g., http://pac.schools.nsw.edu.au/schoolid.pac.

If other computers can access the internet, the problem is with that computer or its network connection. Possibly a faulty network card, try a different port or replace the patch lead.

- Has this PC ever accessed the internet before and is the network cable plugged in?

- Is there a light on where the network cable plugs into the PC and on the hub/switch port?

- Are the TCP/IP settings defined correctly on the PC - Local Address / Gateway / DNS?

- Is the PAC file auto-proxy correctly defined in the browser? Check the spelling!

- Ping the router’s IP address = 10.xx.xxx.1 - do you get a reply?

School Internet Access Troubleshooting Flowchart v2.0

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SCHOOL INTERNET ACCESS TROUBLESHOOTING FLOWCHART v2.0

You are sure that the problem is definitely occurring on ALL computers?

Wait ten minutes and then try access the internet again. Does it now work?

The problem lies beyond your school with the Internet Service Provider. You should call the Helpdesk to report it. The Helpdesk number is: 1800-338-483

YES

NO

NO

NO

NO

YES

YES

YES

YES

YES

NO

NO

NO

NO

YES

It was probably a period of downtime that was totally out of your control. But its fixed now, so suit away!

From a computer that CAN normally access the internet, try to PING the router. 10.xx.xxx.1 - does it reply?

Network/WAN or Router Problem

Local Workstation Problem

Check the power on the router. Check if it’s connected to the hub / switch and that both connection lights are active. Switch it off and on and wait 10 minutes. Check the hubs / switches on your LAN. Are things like OASIS working? Consider your location. How does your PC’s connection get back to the router?

You need to take some time and verify whether all PCs are affected or whether it’s only some. Perhaps the problem is with a particular switch or hub on the network that the PC is connected to.
What’s a Bridge Loop?

• A switched network is in a “star” configuration radiating out to nodes (computers, printers, other switches)

• Data is broadcast from the switches out to the nodes

• A Bridge Loop is caused by one or more of the radiating connections being connected back into the switch

• This “loop” in the network causes a “Broadcast storm” which can eventually cripple your network
How is a Bridge Loop Caused?

- All bridge loops are caused by human error!

In a cabinet

You must never plug both ends of a single cable into the same switch!

Where there are two switches there should only be one cable to link them!

With multiple switches, you should link all switches with patch leads from one switch only!

NOTE: Multiple copper or fibre backbone links can also cause bridge loops if plugged in incorrectly
How is a Bridge Loop Caused?

• REMEMBER! All bridge loops are caused by human error!

In most schools, every port in a room has been patched to a switch in the cabinet, so if a student connects two ports in a room, they will produce a bridge loop!

Many schools place a small switch in each room to increase the number of computers they can connect in the room. Adding a single lead to connect two ports on the same switch and connecting that back to the network is a bridge loop!

If two outlet ports are patched in the cabinet to the switch and those outlets are then connected to the same switch in a classroom, you get a bridge loop!

If you find a loose end of a cable, don’t just plug it in anywhere!
Troubleshooting Bridge Loops

1. Go to the CD
   Verify all lights are flashing quickly and simultaneously
   Turn the switches off and on and wait a few minutes to see if the broadcast storm starts again
   If the problem persists, go to Step 2: Backbone Troubleshooting

2. Backbone Troubleshooting: Determine which BD the loop is coming from
   First identify each of the backbone links
   Unplug one backbone lead from the patch panel. If fibre, take note of the orientation
   Do the switch lights revert to normal?
   The loop is on the other side of that backbone
   Go to that BD and start the Switch Troubleshooting process there
   Are there anymore backbone links?
   Reconnect the backbone lead and move onto the next backbone link
   Reconnect one backbone lead. If fibre, take note of the orientation
   If the loop problem is from the backbone, go to Step 2: Backbone Troubleshooting
   If the problem is on the other side of the backbone, go to Step 3: Switch Troubleshooting

3. Switch Troubleshooting: One at a time, remove a patch lead from the switch
   Do the switch lights revert to normal?
   Follow the lead to find where the other end plugs in
   Is it in the patch panel (PP) or switch (S)?
   Is it in the exact same switch?
   Did the lights go normal on the other switch?
   The loop problem is on that second switch
   From the port number on the path panel, find the outlet in the room/office
   Remove the patch lead. The problem should be solved.
   The problem is either the outlet is connected to another outlet or there is a switch in the room with a loop
   Remove the patch lead. The problem should be solved.
   The lead is into the same port and start the Switch Troubleshooting process on that switch
   Reconnect the lead into the same port and remove the next lead from the switch
   Stu Hasic - 2006

NETWORK BRIDGE LOOP TROUBLESHOOTING FLOWCHART
Spanning Tree Protocol

- Spanning Tree Protocol (STP) can be used to “ignore” bridge loops
- But STP only works on managed switches. Most schools have a mix of managed and “cheap” switches
- If a bridge loop is made on a cheap switch, it will still bring down your managed network
- Your best defence against bridge loops is understanding your network
- I hope you do a little more now…