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Registered office: 1 Hills Road
Cambridge
CB1 2EU

OCR is an exempt charity.
This activity offers an opportunity for English skills development.
Networks

Introduction

Networks are collections of connected devices such as traditional desktop and laptop computers, mobile devices, and shared peripherals such as printers and storage devices. Networks operate on a global scale and it is vital those devices connected to the network are all able to communicate with each other. For this reason agreed protocols, or rules, operate. One important protocol is the transfer control protocol Internet protocol or TCP/IP. This is layered protocol establishing the rules for how each layer will communicate with the next.

When a message is sent across the network, it will pass through the layers from the application level to the physical level where the data is transferred to the receiver and processed through the same layers in reverse order.
Each device on a network is given an IP address assigned permanently by the administrator or more likely temporarily by the Dynamic Host Configuration Protocol server (DHCP). Since there are so many devices worldwide this enables systems to allocate private local addresses on a private subnet.

When communicating beyond the private subnet, we need to locate remote resources by name rather than IP and the Domain Name System (DNS) does this by resolving the name to an IP address. Networks can be described by their range and Local Area Networks (LAN) correspond to the private subnets with local IP addresses connected to a larger system via some type of telecommunication device to other networks on a Wide Area Network (WAN). Data travelling across a network is generally sent as packets of data. Data is broken up into individual packets and given all the information needed to reach the destination and be reassembled into the original data. Data can then travel via any route among other data packets to make best use of the available connections and ensuring routes are not tied up dealing with individual data streams.

Data is being presented to networks constantly and it is the role of router firewalls to determine if the data is intended for and acceptable to a network. There is an excellent animation called ‘warriors of the net’ that explains this process effectively and in some detail. The website is http://www.warriorsofthe.net.

**Suggested activities**

Using a suitable web-based trace route site, for example http://traceroute.monitis.com, it is possible to see a visual trace of the route taken to a specific site. By looking at various times and from various locations, it is possible to see the trace take various routes to the destination. The information provided can be used to locate the routers used in reaching the destination. By locating using the same website or similar website such as http://www.ip-adress.com/ip_tracer/, it is possible to locate each of the routers accurately geographically and plot the route on a map.

Students should be aware of the hardware and software required to set up a network and will benefit from being able to set up a small network using any available devices and hardware. Failing this they could be allowed to add devices to an existing network under supervision.

There is a simple simulator for a network to show utilisation under different circumstances on teach-ict.com; http://www.teach-ict.com/gcse_new/networks/hardware/resources/NWB_SIM.swf There are other simulators available, for example from GNS3 http://www.gns3.net/
Support material

Worksheet: Tracing the route taken to a destination.

Use [http://traceroute.monitis.com](http://traceroute.monitis.com) to trace the route from your computer to a website for a well-known domain.

The map will show the outline route.

Use the detailed IP addresses for the routers passed through on the journey and the website [http://www.ip-adress.com/ip_tracer/](http://www.ip-adress.com/ip_tracer/) to identify the exact location of the routers used and plot these on a map.

Repeat the process at another time or from another location to see if the route changes.

Equipment list for building a network activity.

Equipment required

Switch, selection of network cables, selection of devices, including a computer to act as a server, access point and mobile devices.

Worksheet for building a network activity.

Design and build a simple network installing (if necessary) software on a server to manage the network (DHCP). Connect the devices allocating some IP addresses and allowing the DHCP server to allocate others.

Plan the design to include all the devices available and use a program such as WireShark ([http://wireshark.com](http://wireshark.com)) to monitor the traffic on the network.

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