Guide to reliable H.323 campus networks

This guide is aimed at network engineers and technicians, primarily in educational organisations, who need to provide a network capable of handling videoconferencing traffic.

It aims to inform the reader about the ‘special’ requirements relating to real-time voice and video traffic, as opposed to http, ftp or other traffic types. It then discusses techniques that can be applied to provide a network that can be made to carry such traffic reliably without the need for continual network changes or upgrades.

It will also, therefore, provide information that can help in determining the likely causes of problems experienced with real-time traffic.

This guide will consider the types of equipment and topologies that are frequently encountered in educational environments. It will primarily look at switched campus topologies, but with reference to the necessary routing that will take place, and will assume in the main 100Mbit/ s or higher core and 10/100Mbit/s edge links. Issues related to running non-switched, i.e. repeated, networks will be briefly addressed, but as real-time traffic and non-switched networks rarely go well together, it will be only a plea to sites to implement completely switched systems – at least where videoconferencing traffic will flow.

The List of References and Further Reading sections provide links to more detailed information about many of the areas discussed in this document. By its nature, a document like this has to be highly selective in what is included – as an example of how selective, the Cisco® guide to implementing Campus QoS (Flannagan et al, 2003) alone runs to 400 pages. Those looking for further information about WAN (Wide Area Network) QoS provision on Janet should take a look at the QoS Project at:

http://www.ja.net/development/network-engineering/qos/ [1]

This document is not an introduction to H.323 and the reader is assumed to have a working knowledge of H.323 infrastructure components such as endpoints, gatekeepers and MCUs (multipoint control units). An excellent introduction to H.323 can be found in the VTAS Guide An Introduction to H.323 Videoconferencing which can be found at:

http://www.ja.net/documents/services/video/vtas/323intro.pdf [2]

A Word of Caution

Applying QoS in a network can allow certain applications that require real-time data throughput, such as videoconferencing and VoIP (Voice over IP), to work apparently effortlessly even in networks under significant load. It should be noted that if switches and routers have overloaded CPUs and no memory, then applying QoS will just add additional load to an overloaded system and that will not help, irrespective of link capacity.

Chapter Outlines

It is not necessary to read through this document in any particular order, and it is recommended that you pick and choose as best fits your needs.

- Videoconferencing Traffic: Network Requirements is a closer study of the network profile and requirements of videoconferencing traffic. It discusses the relative importance of metrics such as packet loss, latency and jitter as well as typical bandwidths required for IP videoconferencing.
- Campus Traffic and Common Network Issues looks at some of the issues and types of traffic that can commonly be found on LANs (Local Area Networks). This section covers issues such as speed and duplex settings, network broadcasts and spanning tree protocol updates, and takes a look at common campus-edge issues with H.323 videoconferencing, such as the use of NAT (Network Address Translation) and firewalls.
- Network Engineering - Physical Separation of H.323 Traffic looks at network engineering – providing physically separate links for real-time traffic.
- Traffic Engineering 1: Logical Separation at Layer 2 - the VLAN looks at traffic engineering – providing logical traffic separation in the form of VLANs (Virtual LANs).
- Traffic Engineering 2: Layer 2 Prioritisation - CoS (Class of Service) looks at providing QoS by means of policing, classification and priority queuing on Layer 2 networks – some configurations for Cisco® and 3Com® are included.
- Case Study: The QoS H.323 Network at University of Wales, Aberystwyth is a case study at the University of Wales, Aberystwyth, where some of the above methods have been used to provide reliable videoconferencing across campus.

Links
[1] http://www.ja.net/development/network-engineering/qos/
[2] http://www.ja.net/documents/services/video/vtas/323intro.pdf