

Local Area Network Design for H.323

Your IT staff needs to plan for H.323 connections if you wish to participate in regular videoconferences with the University of Illinois at Chicago. Part of the preparation process should include an extensive series of tests performed during peak periods of network usage; IPVC initiatives often fail due to a lack of testing or insufficient testing during pre-certification. To avoid this common pitfall be sure to test your conferences during periods of network usage that will most closely resemble the usage that will occur during the planned videoconferences. Do not perform your tests in a vacuum (ie. During Christmas or Spring break when only 10% of your LAN users are actually on the network.)

As part of the pre-certification process we would like to share with you this list of LAN guidelines. These recommendations are based on research done at the University of Wisconsin Madison and the Wisconsin Technical College System, as well as discussions with other H.323 networks in Indiana, Missouri, Oklahoma and the Internet2 community in general. If you follow these recommendations you should be able to do a "best-effort" videoconference call between your location and UIC. Best-effort is defined as achieving a high quality IPVC call without the need for incorporating formal quality control mechanisms. **Best effort also means there are no guarantees of a quality experience every time.** If you are interested in more formal quality control mechanisms you will need to implement and configure QoS at your location.

VCS Recommendations for H.323 Videoconferencing:

1. **LAN Cables:** use high quality manufactured Category 5e or better LAN cabling, patch panels and patch cords.
 - a. Do **not** use home made cables, no matter how good you are at making cables.
 - b. Keep cables away from electrical fields and outlets.
 - c. Cable runs should be as short as possible. Don't exceed 100 meters (300 feet) on any Ethernet segment. If the segment is over 100 meters (300 feet), we recommend that you use a fiber connection between the switch and the codec.

2. **Switched Hubs:** use Switched Ethernet routers from the codec to the edge device (router). A switch reduces the chance that packets carrying the transmission will collide with each other as they are sent and received.
 - a. Hubs should be eliminated from the path.
 - b. If you are considering the purchase of new switches, have switches that support (and are properly configured for) h.323 and the 802.1P protocol. This protocol marks video traffic as priority. However, choosing the 802.1P option places the responsibility for video quality on the local LAN manager. In this scenario, it is important that the LAN manager is available when videoconferences are

taking place in order to address quality concerns when and if, they occur.

3. **Number of Switches:** minimize the number of switches between the communicating endpoints. Each switch adds more delay (latency), which is undesirable.
4. **LAN Bandwidth:** Minimum 10 Mbps, 100 Mbps is preferred on the transport path. Because some routers do not auto negotiate reliably, we recommend not using the AUTO setting, instead select 10 or 100 fixed. Codecs should also be fixed 10 or 100.
5. **Duplex Settings:** set duplexing to FULL on your Ethernet switch ports from the edge to the endpoint or to any other paths the video signal will follow to other endpoints on your LAN. Full Duplex is preferred to reduce jitter and latency. Continue Full Duplex from the endpoint to the edge and to other endpoints resident on your LAN.
 - a. **Do not select "Auto Negotiate"** as this can cause jitter problems if one device keeps re-negotiating all the time. Some Cisco routers are known to do this, so make sure you have them set to FULL, not AUTO.
 - b. Half Duplex should be used **only** when the endpoint will not support Full Duplex (Polycom 128 Viewstation models do not support Full Duplex and should be set to 10/half.) Full Duplex is preferred when your endpoint can handle it. Here's why:
 - On a half duplex circuit, the bandwidth required for a call is double your transmission speed. A calling speed of 384K requires 384K to send and 384K to receive; that is, 768k.
 - On a half duplex network, only one device may transmit at a time. If multiple devices attempt to transmit at the same time there is a collision. When this happens, both devices must back off momentarily and then attempt to retransmit. As the network becomes more congested collisions occur more frequently. This causes delay and jitter which in turn cause poor quality video.
6. **Firewalls and Network Address Translation:** videoconferencing and firewalls are like oil and water. At this time, they don't mix well. We recommend that you use a static IP address for your endpoint and connect the endpoint outside your firewall when possible. If you must put your endpoint behind a firewall please contact your firewall manufacturer for their configuration settings and h.323 recommendations. If you are participating in a conference and are unable to configure the firewall please contact the UIC representative associated with this conference to find out about alternate solutions.
7. **Endpoint Settings:**
 - a. Make sure that the NIC card or network parameters of the endpoint is fixed to 100 Mbps/Full Duplex if possible.

- b. If the endpoint is an appliance (on a roll about monitor cart), make sure that the LAN jacks that it is plugged into are also set to 100 Mbps/Full Duplex if the endpoint can support it.

8. Bandwidth supplied to endpoints:

- a. Make sure you have ample bandwidth to handle most situations. Allow for the 384 Kbps bandwidth plus 10% overhead.
 - Your H.323 video data should be less than 30% of the available bandwidth on your LAN. Example: single T1 to is 1.5Mbps. One H.323 connection at 384K + 20% overhead for call setup and signaling is 460K. One third of the T1 is 495K. So one T1 should never have more than one H.323 call across it.
 - The total bandwidth, data and video, should be less than 75% of the available bandwidth. The remaining 25% is overhead used by routers and network devices that are the network.