MBONE WEBCAST: NETWORK SETUP AND DATA COLLECTION

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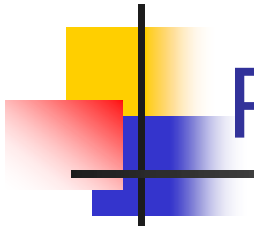
Simon Fraser University

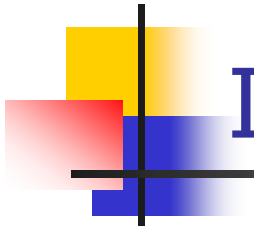


Road map

- Introduction
- MBone application tools
- MBone test session and network setup
- IFSA/NAFIPS 2001 MBone live webcast
- Data collection and processing
- Conclusions

Introduction

- Multicasting is used to send data packets across the Internet:
  - videoconferencing
  - corporate communications
  - distance learning applications.
- Multicast session of the Open Forum workshop at the IFSA/NAFIPS 2001 held in Vancouver was webcast on July 25, 2001.

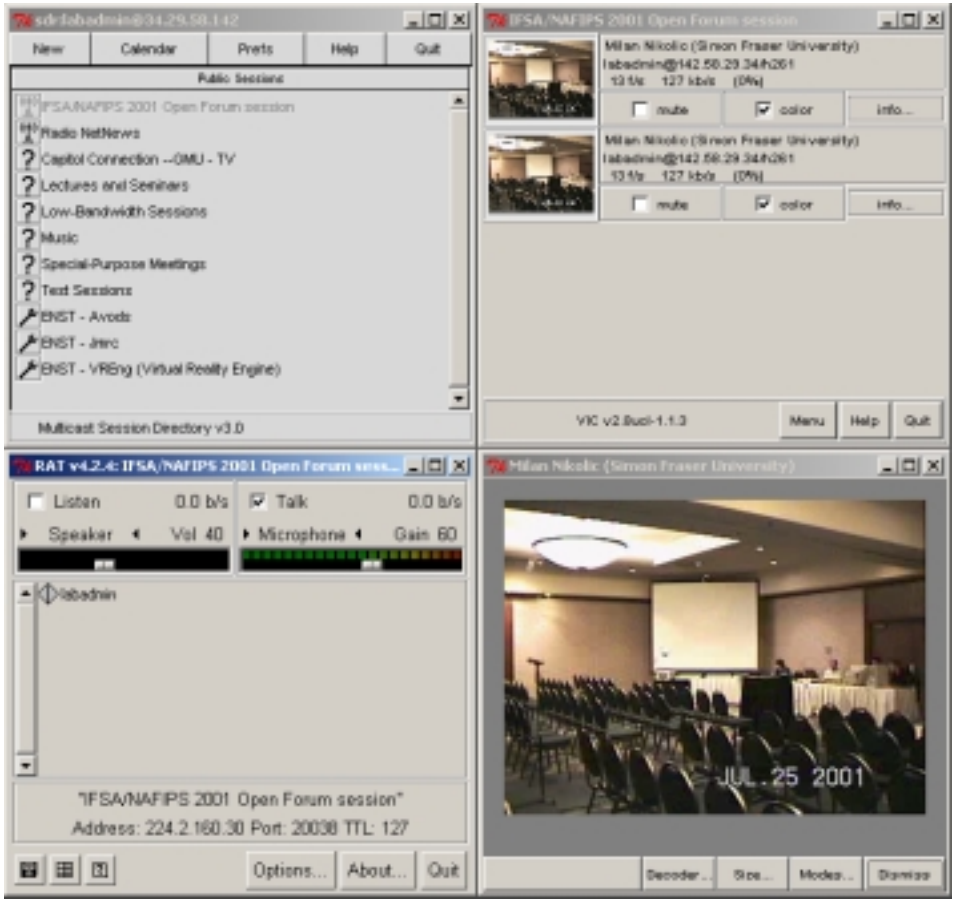


Introduction (cont.)

- We provide an overview of the Internet Multicast Backbone (MBone) multimedia application tools.
- We describe details of the MBone multicast sessions and the webcast setup at the IFSA/NAFIPS 2001 conference.
- Data collection was performed during the multicast and traffic traces were later used for network simulation.

MBone application tools

- **`sdr`**: multicast session directory tool;
  enables users to join the multicast sessions
- **`rat`**: robust audio tool
- **`vic`**: videoconferencing tool



MBone application tools setup for the live webcast.

MBone application tools

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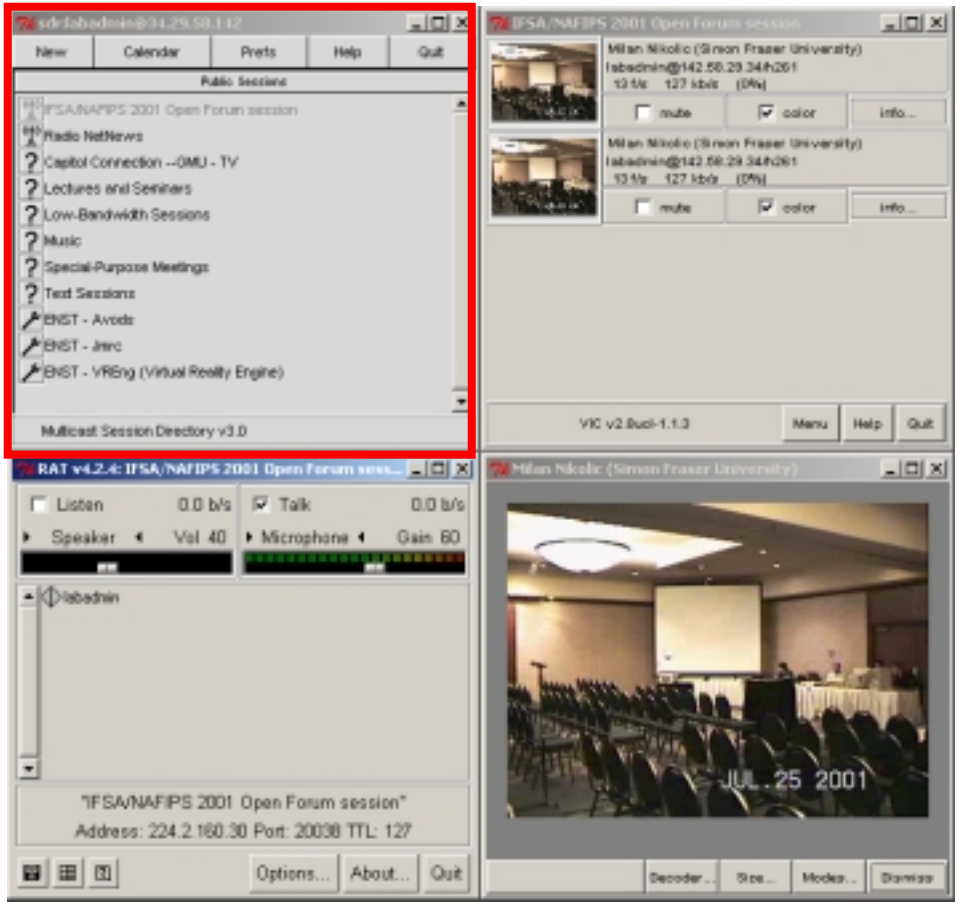

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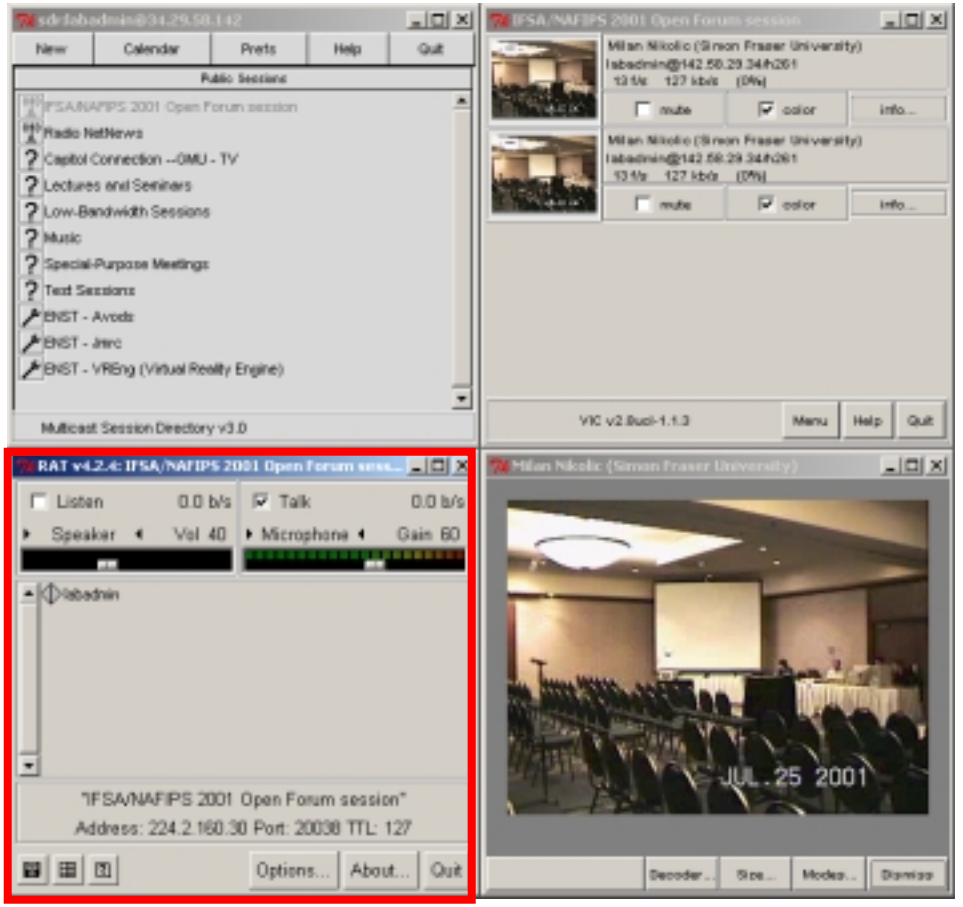

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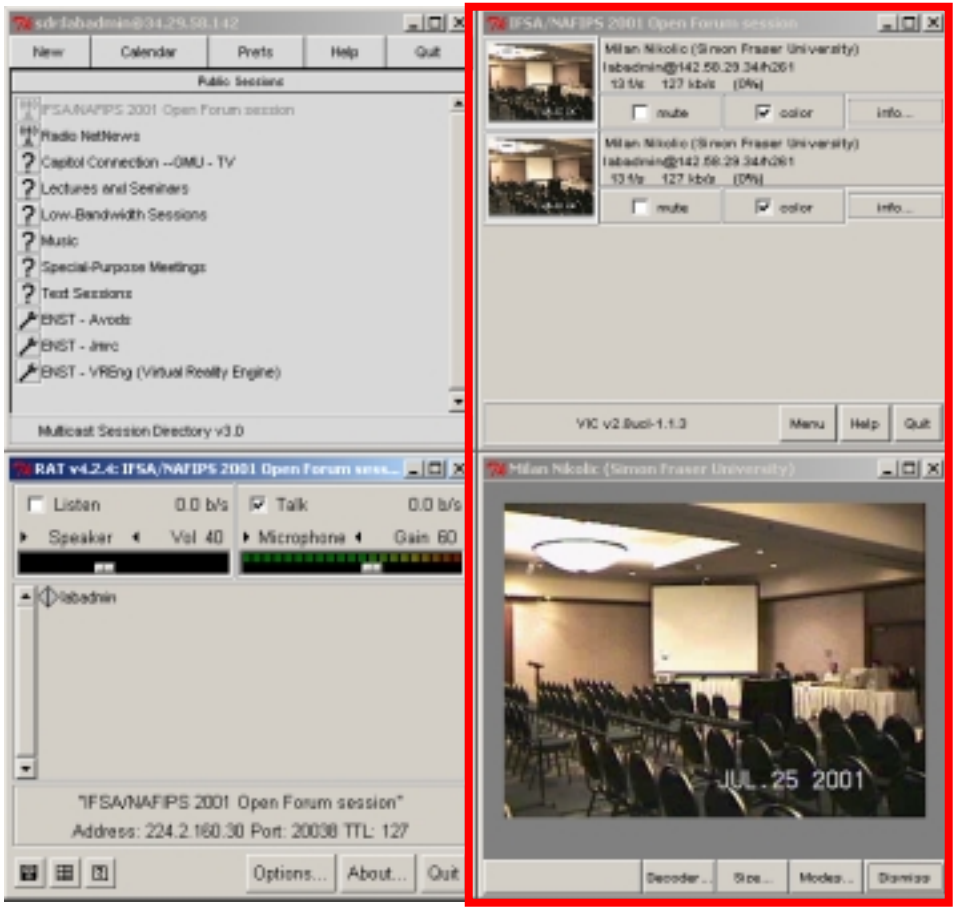

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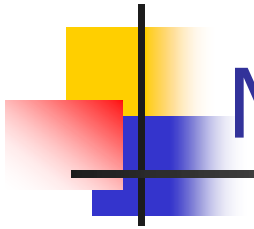


MBone protocol architecture

- MBone uses ITU H.323 standard for IP/Ethernet LAN multimedia conferencing:
  - **`rat`** supports audio quality in the range from LPC at 5.6 kHz to PCM at 64 kHz (ITU G.721).
  - **`vic`** uses ITU H.261 video encoder.
  - **`wbd`** and **`nte`** use ITU T.120 Data Conferencing standard.
- MBone tools are based on IETF standards.
- They use RTP (Real-time Transport Protocol) over UDP/IP connections.

Internet Multicast Backbone (MBone)

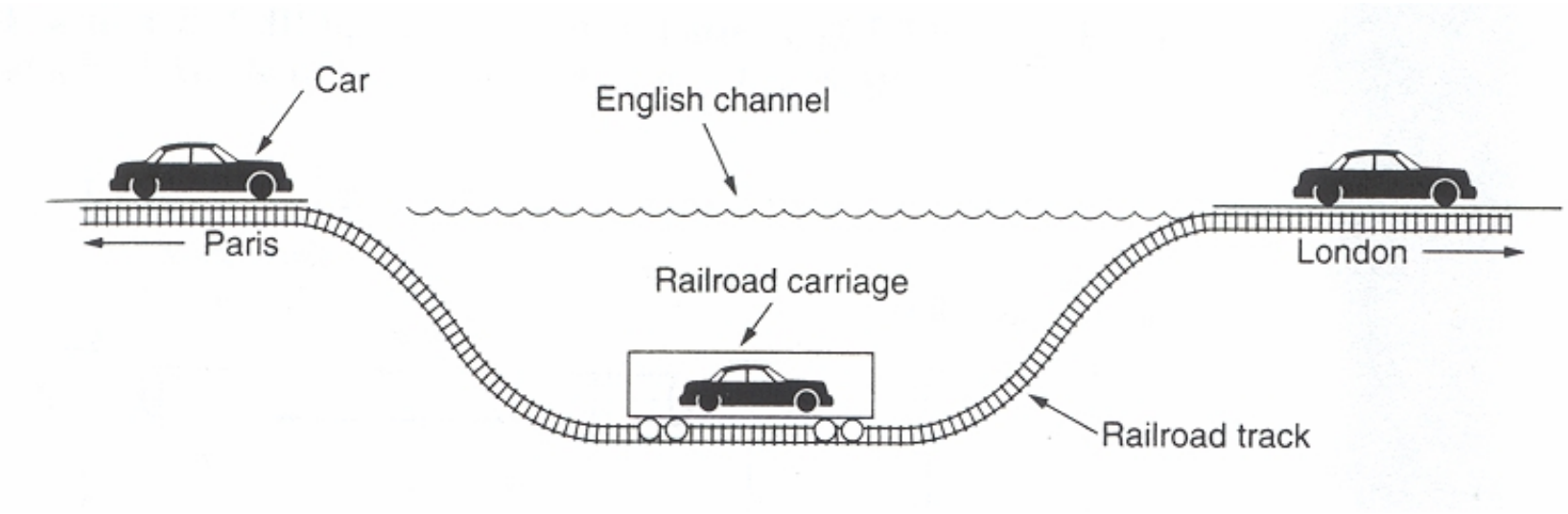
- MBone is the multicast capable backbone of the Internet.
- Multicasting is a way of sending data packets from a host computer to a set of hosts called multicast group.
- Multicast routing protocols:
  - Distance Vector Multicast Routing Protocol (DVMRP)
  - Protocol Independent Multicast (PIM)
  - Internet Group Management Protocol (IGMP).

Multicasting and tunneling

- DVMRP protocol provides connectionless datagram delivery to the multicast group members.
- Multicast enabled routers are connected via high-bandwidth tunnels.
- Tunneling is a technology that enables one network to send its data via another network's connections.
- **`mrouted`** encapsulates multicast packets into unicast IP packets and enables a UNIX workstation to serve as a multicast-capable router.

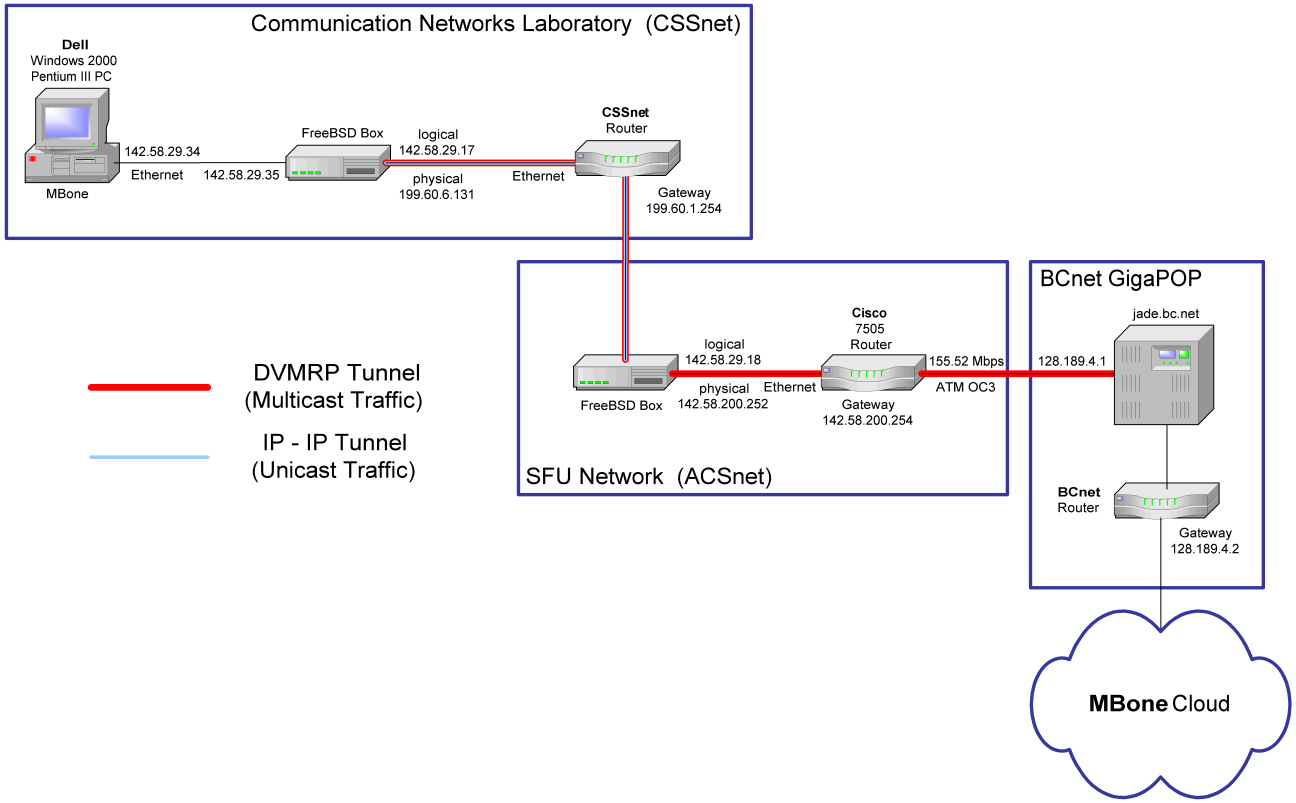
Tunneling

- Tunneling works by encapsulating a network packet within a packet carried by the second network.



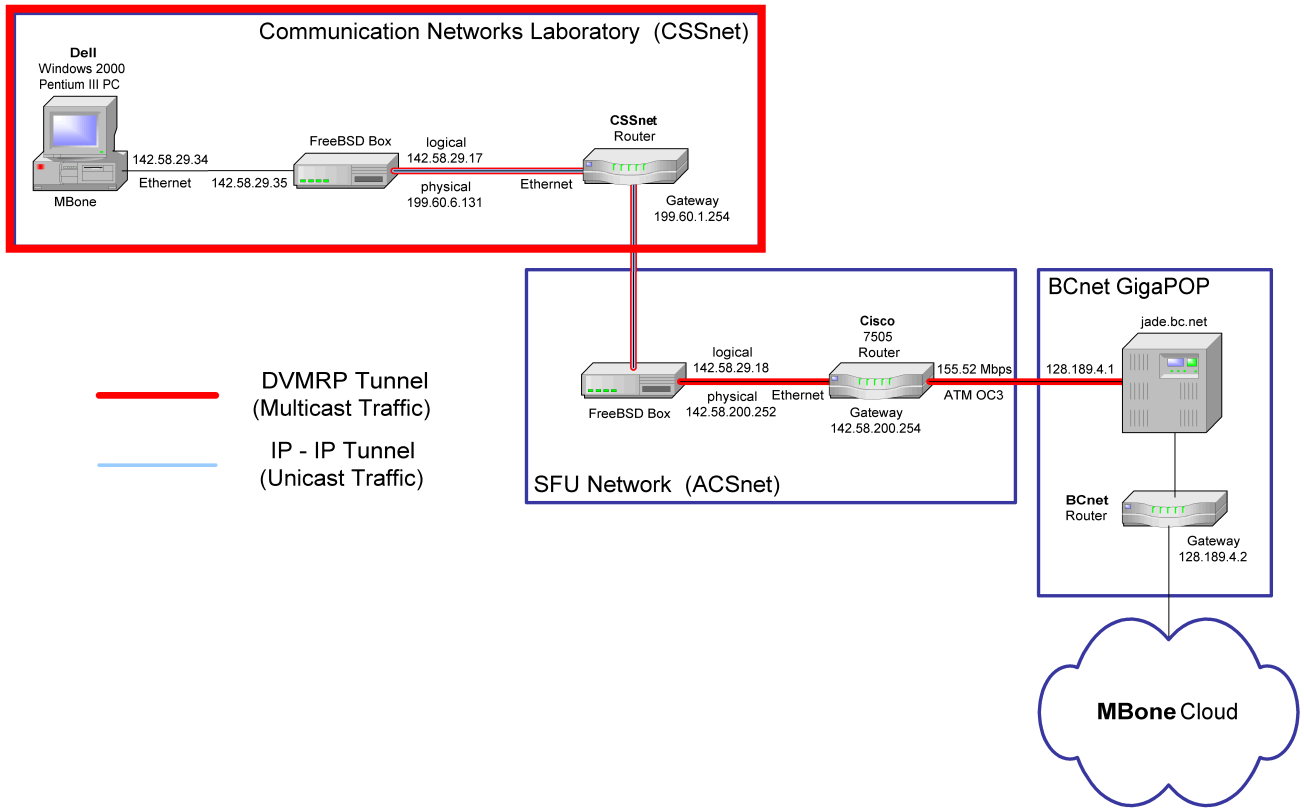
Tunneling a car from France to England.

Test session in the CNL at SFU



Network setup for the MBone test session in the CNL laboratory at SFU.

Test session in the CNL at SFU



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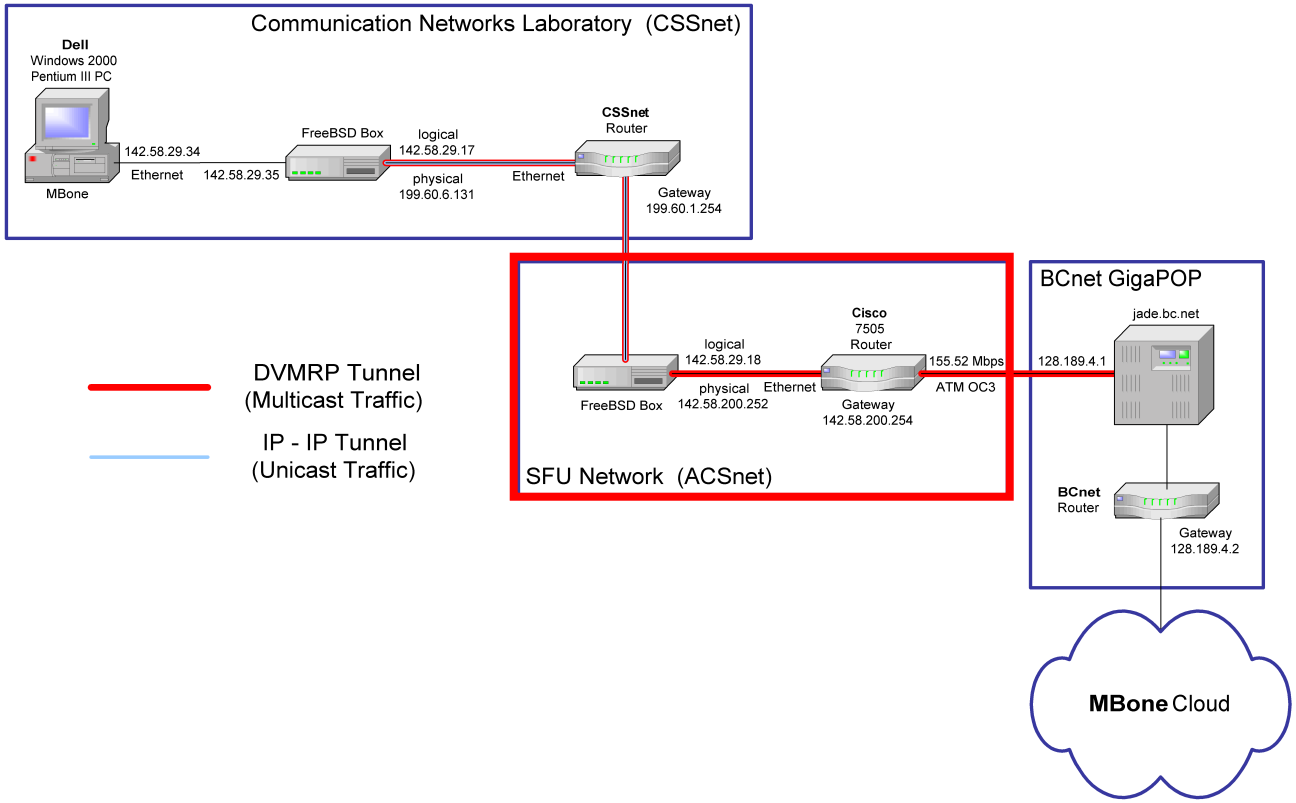

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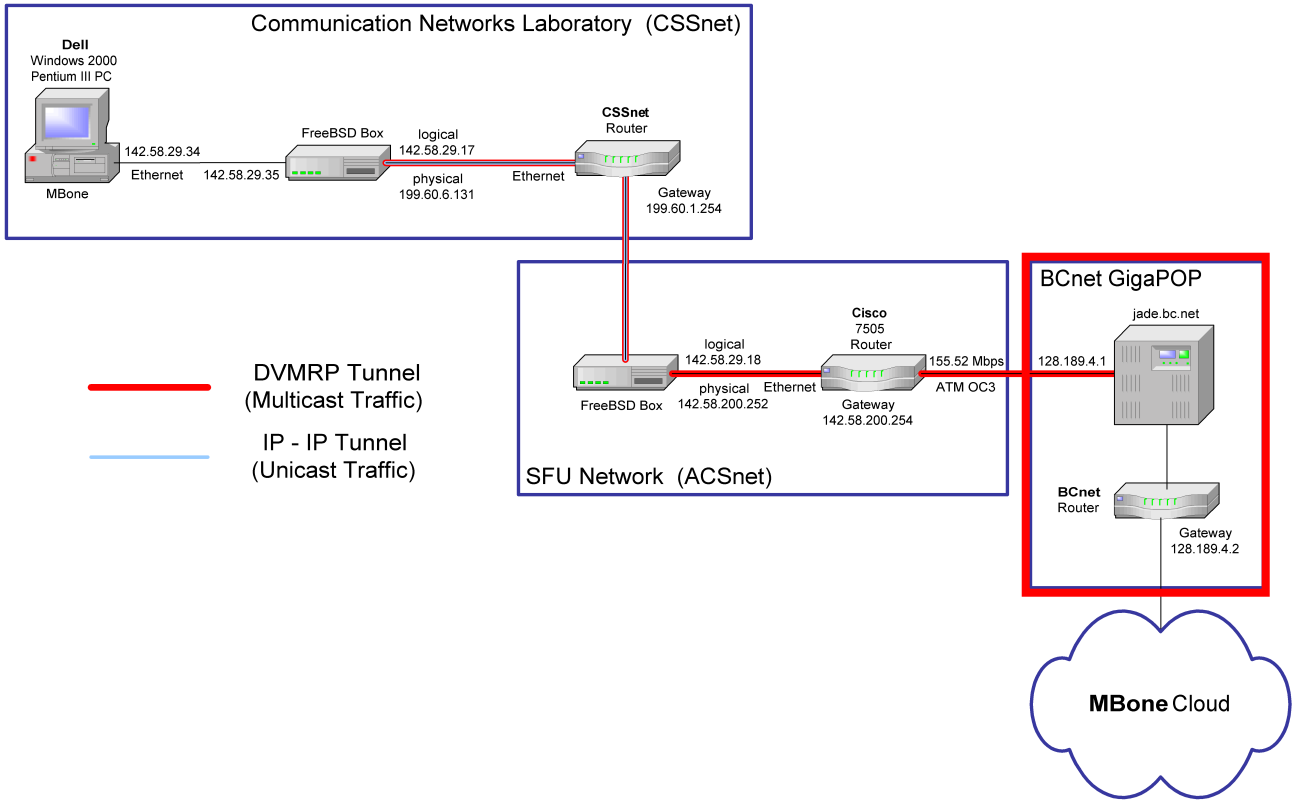

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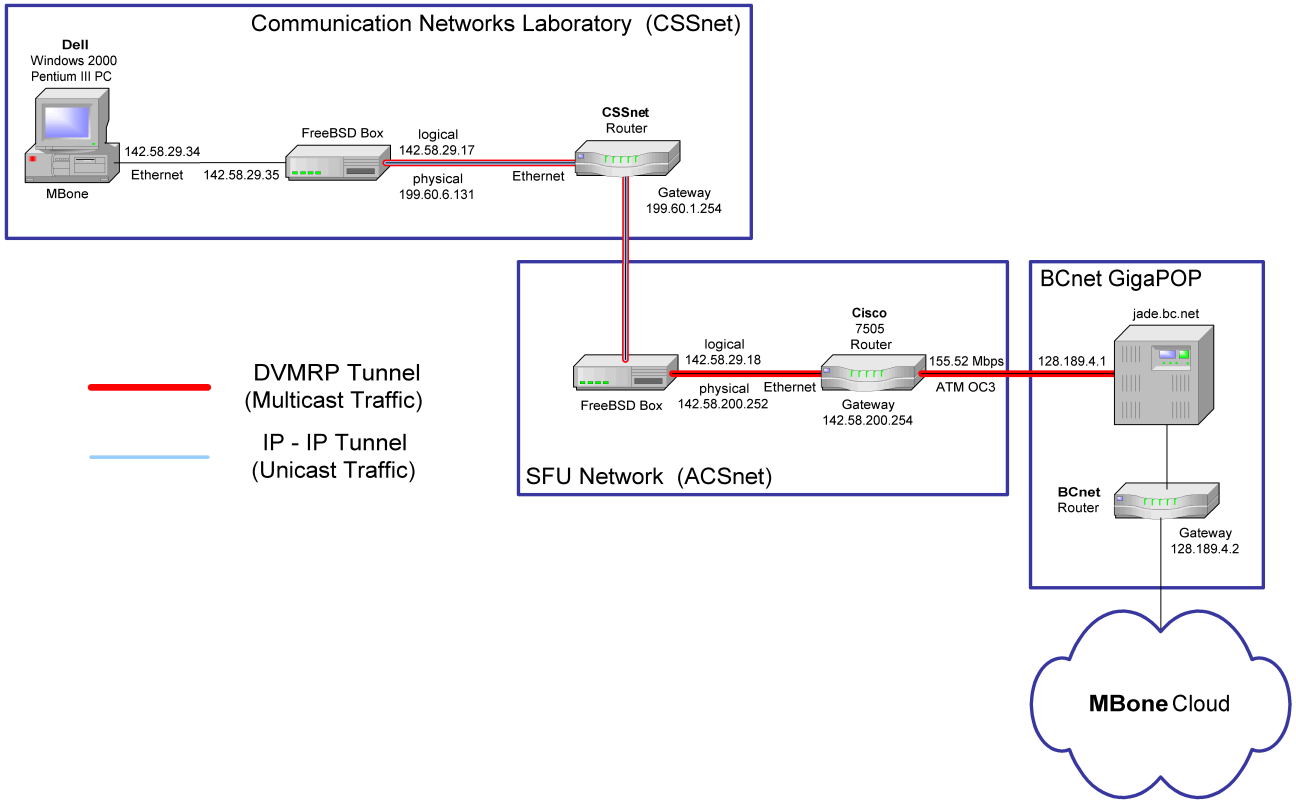
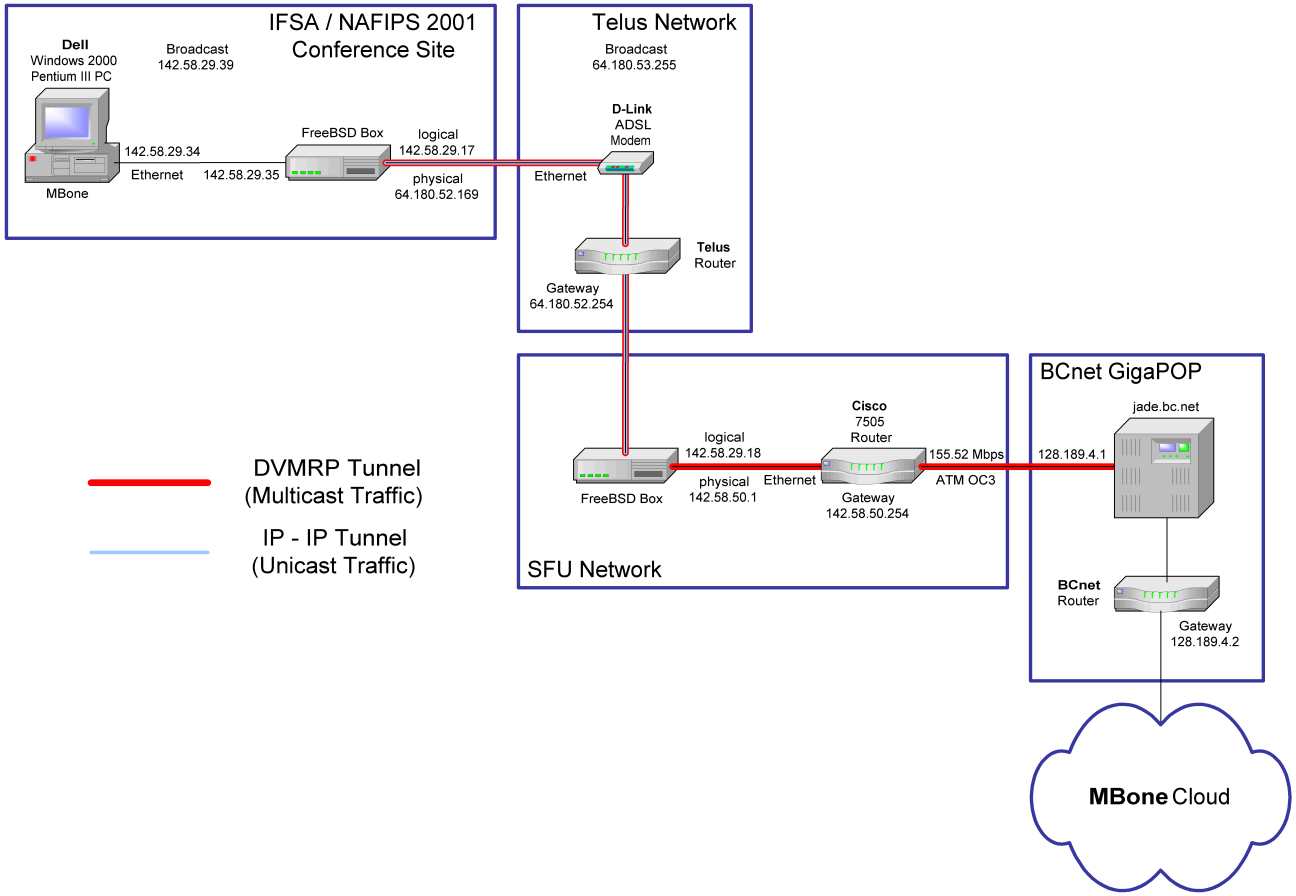


Network setup for the MBone test session in the CNL laboratory at SFU.

Live MBone webcast session at the IFSA/NAFIPS conference



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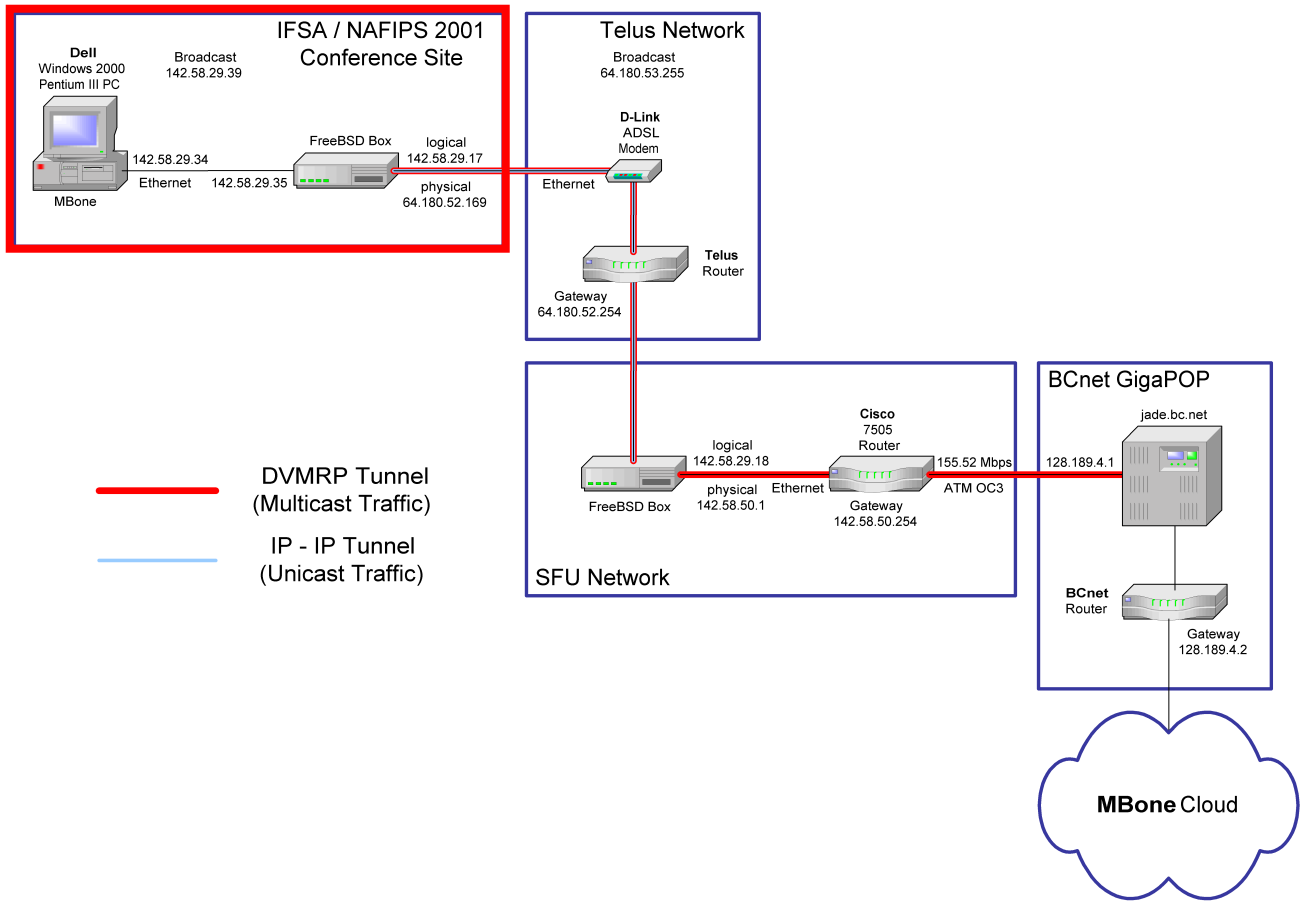

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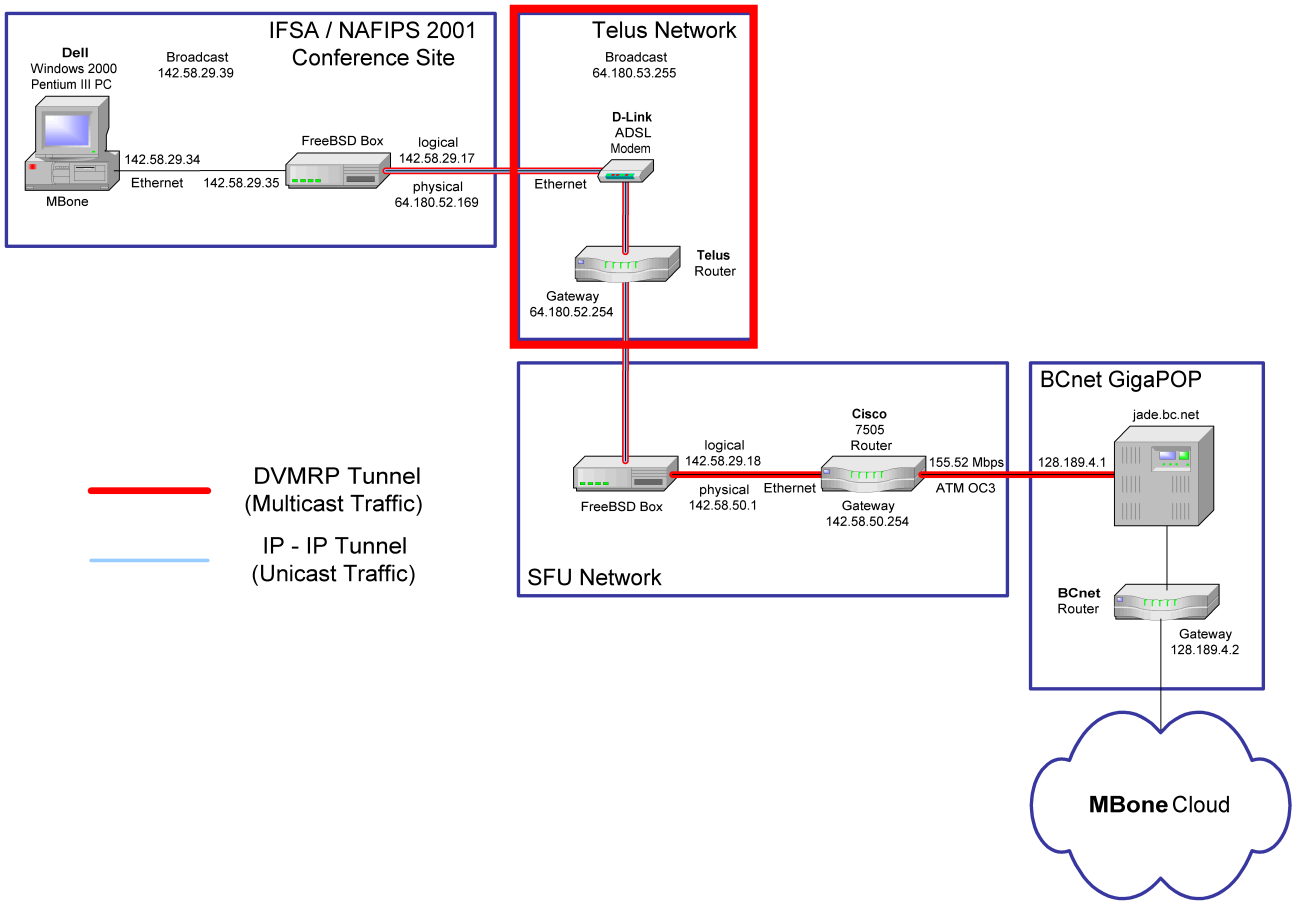

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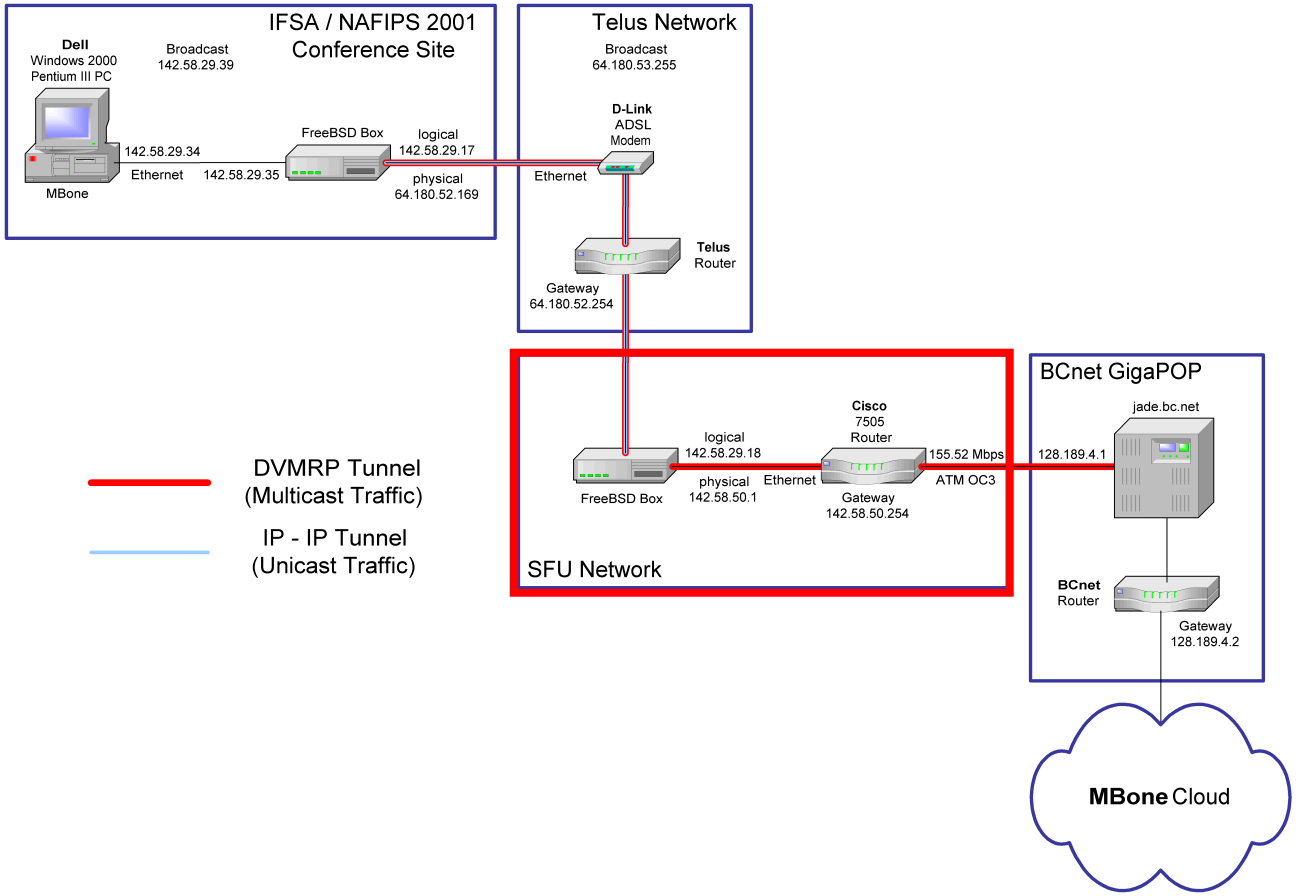

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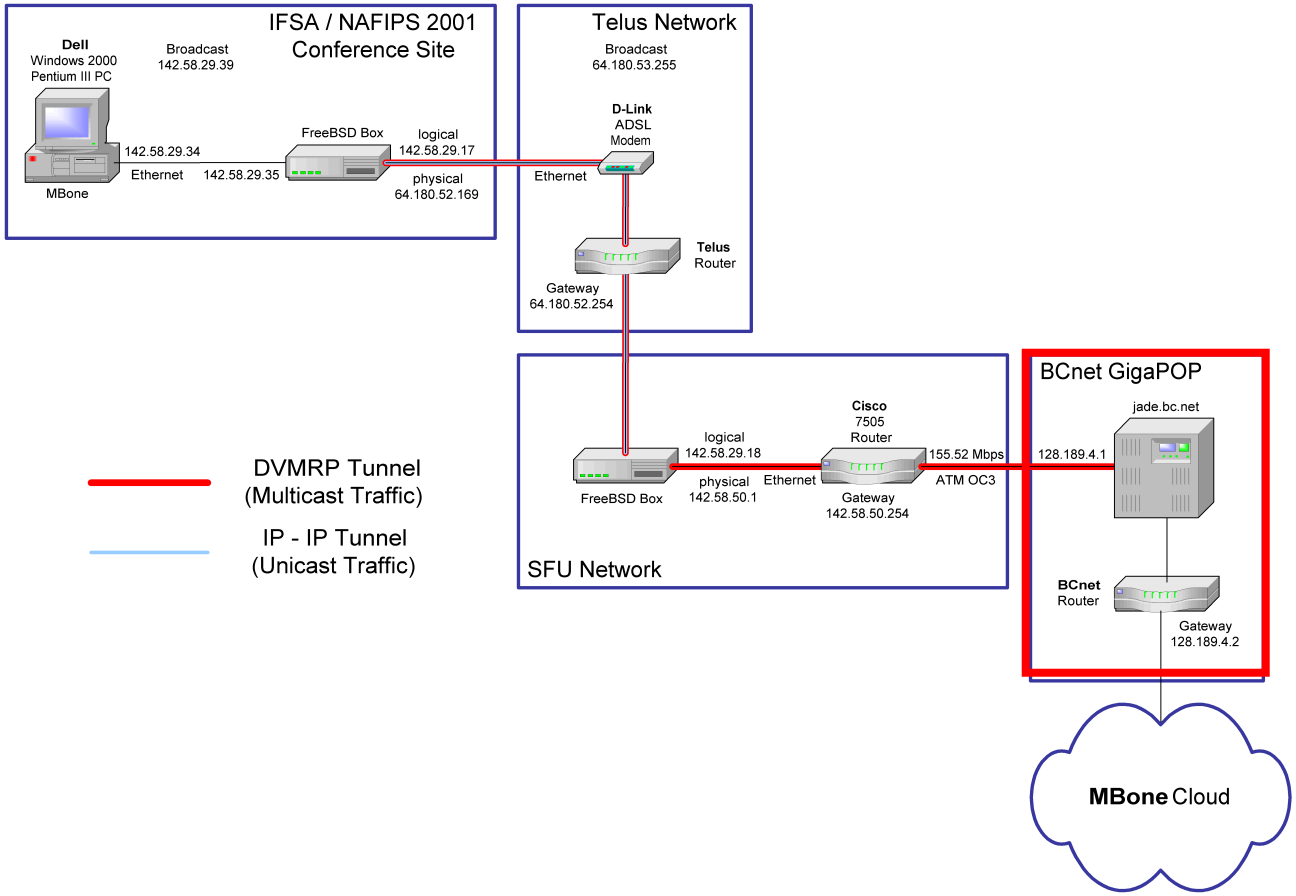

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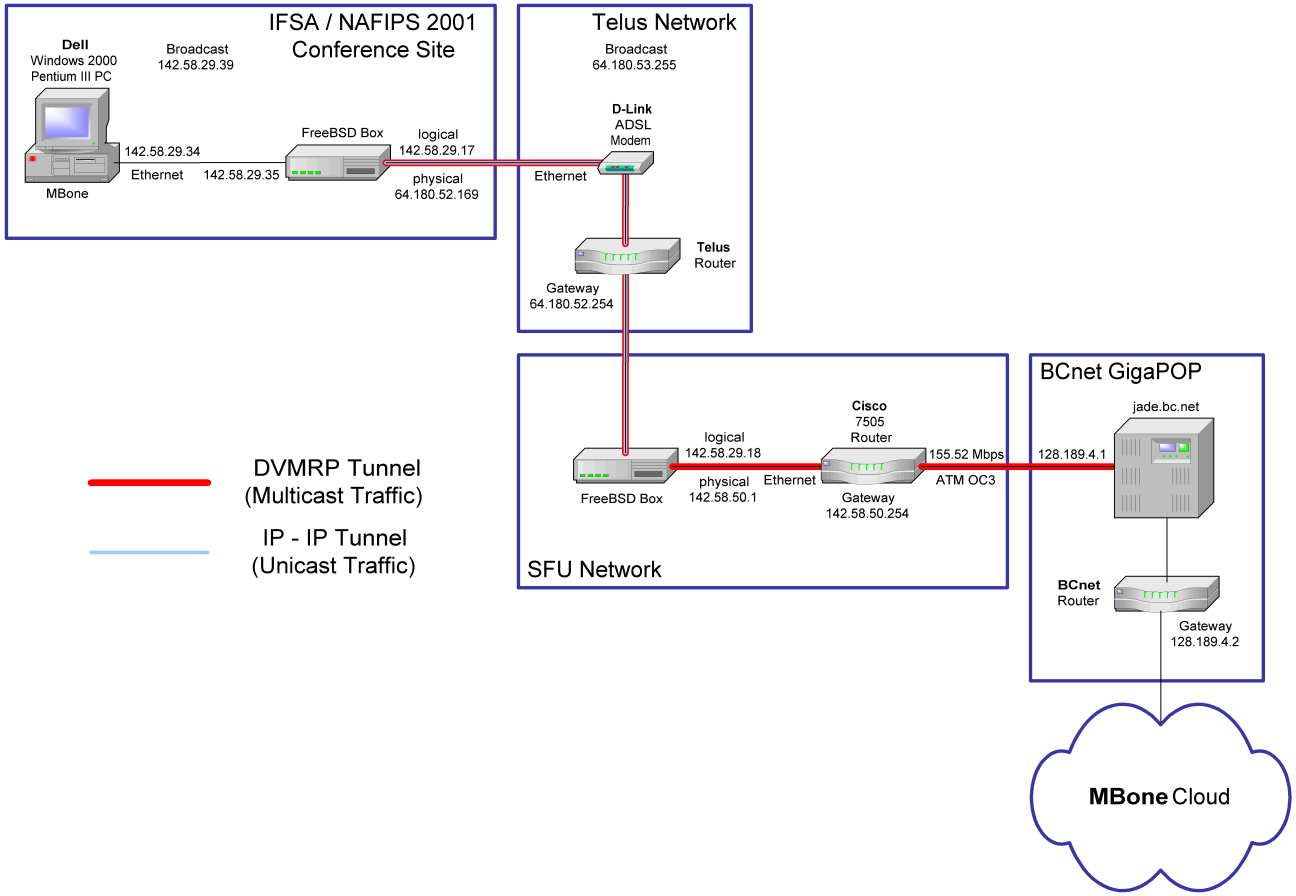

Network setup for the MBone webcast session at the IFSA/NAFIPS conference.

Two MBone networks

- There are two MBone networks:
  - Commodity MBone
  - CA*net 3/Internet2 MBone.
- CANARIE's CA*net 3 is optical network using Dense Wavelength Division Multiplexing (DWDM).
- CA*net II and USA high-speed Internet2 systems are implemented over ATM/SONET/DWDM.

Tunneling setup

- The **`/etc/rc.conf`** file:

```
# -- sysinstall generated deltas -- #
# Enable network daemons for user convenience.
# This file now contains just the overrides from /etc/defaults/rc.conf
# please make all changes to this file.
gateway_enable="YES"
# defaultrouter="142.58.29.17"
hostname="mbone1.ensc.sfu.ca"
ifconfig_gif0="inet 142.58.29.18 netmask 255.255.255.248 142.58.29.17"
ifconfig_xl0="DHCP"
ifconfig_rl0="inet 142.58.29.35  netmask 255.255.255.248"
inetd_enable="NO"
kern_securelevel="2"
kern_securelevel_enable="YES"
nfs_server_enable="NO"
portmap_enable="NO"
sendmail_enable="NO"
sshd_enable="YES"
```

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kern_securelevel_enable="YES"
nfs_server_enable="NO"
portmap_enable="NO"
sendmail_enable="NO"
sshd_enable="YES"
```

Tunneling setup (cont.)

- Assigned IP addresses:

```
IP address: 64.180.52.169
Subnet Mask: 255.255.254.0
Default Gateway: 64.180.52.254
```

- Routing table was obtained using the command **`netstat -rn`**:

```
Routing tables
Internet:
Destination      Gateway         Flags  Refs  Use  Netif
default          64.180.52.254   UGSc   2     21    xl0
64.180.52/23     link #1         UC     0      0   gif0
127.0.0.1        127.0.0.1       UH     0      2     l0
142.58.29.32/29  link #2         UC     0      0    rl0
```

Tunneling setup (cont.)

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127.0.0.1        127.0.0.1       UH     0      2     l0
142.58.29.32/29  link #2         UC     0      0    rl0
```

Tunneling setup (cont.)

- The **`/etc/rc.local`** file:

```
route delete default 64.180.52.254
route add default 142.58.29.17
gifconfig gif0 inet 64.180.52.169 142.58.50.1
route add -net 142.58.50.0 64.180.52.254 255.255.255.0
route add -net 142.58.103.0 64.180.52.254 255.255.255.0
mrouted
```

- The DVMRP tunnel was configured in the **`/etc/mrouted.conf`** file:

```
tunnel 142.58.29.35 128.189.4.1
```

Tunneling setup (cont.)

- The **`/etc/rc.local`** file:

```
route delete default 64.180.52.254
route add default 142.58.29.17
gifconfig gif0 inet 64.180.52.169 142.58.50.1
route add -net 142.58.50.0 64.180.52.254 255.255.255.0
route add -net 142.58.103.0 64.180.52.254 255.255.255.0
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route add -net 142.58.103.0 64.180.52.254 255.255.255.0
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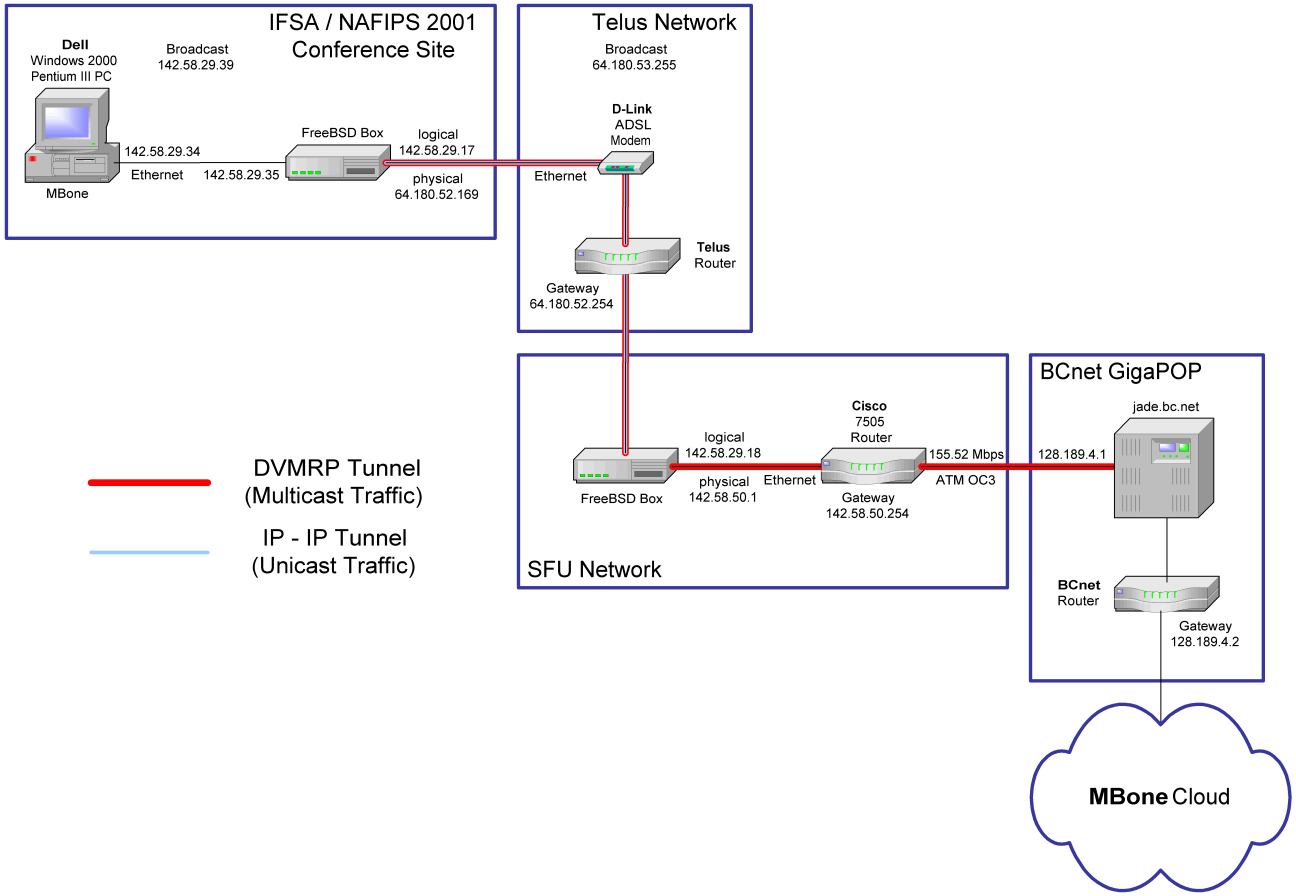
Live MBone webcast session at the IFSA/NAFIPS conference



Network setup for the MBone webcast session at the IFSA/NAFIPS conference.

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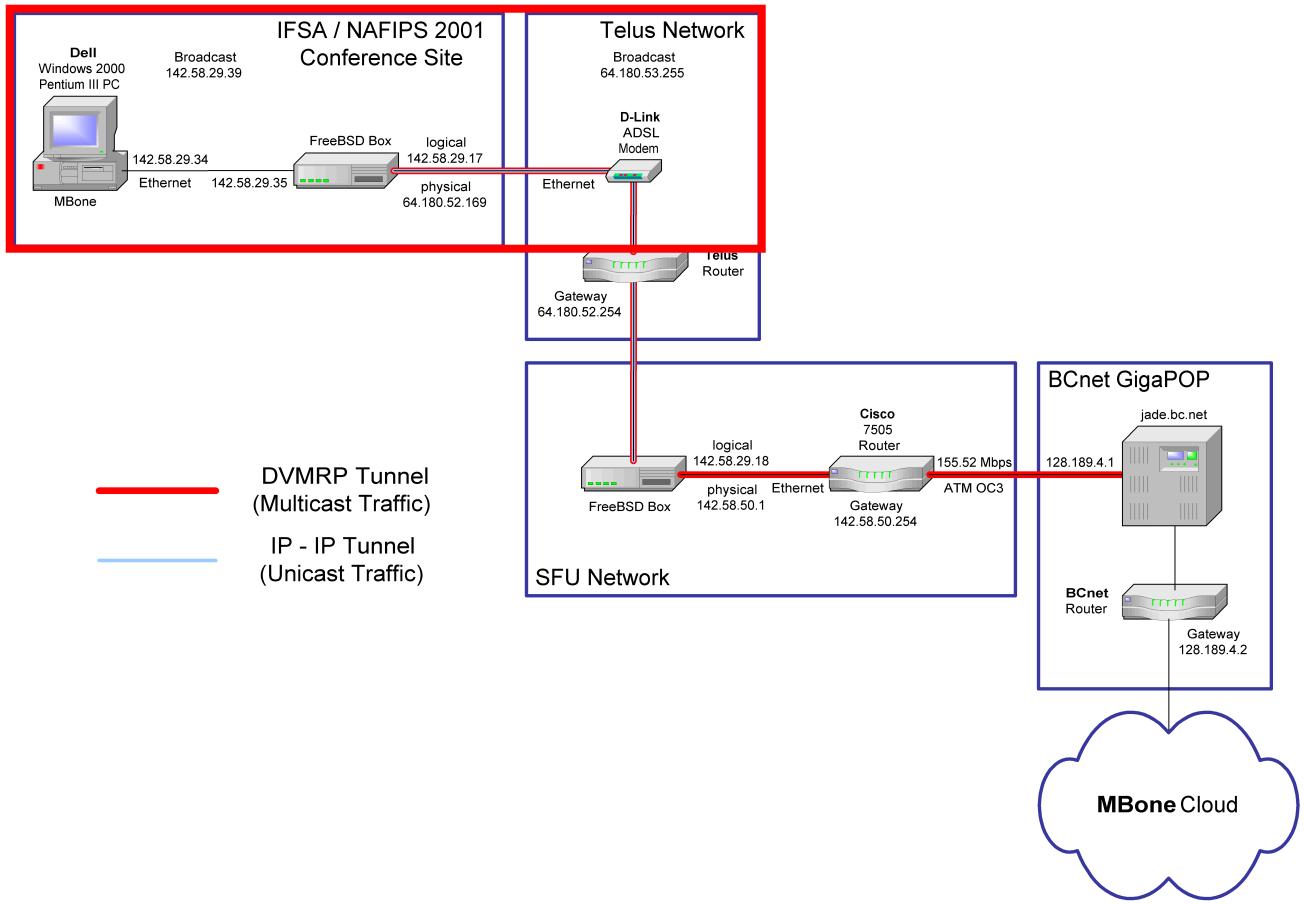
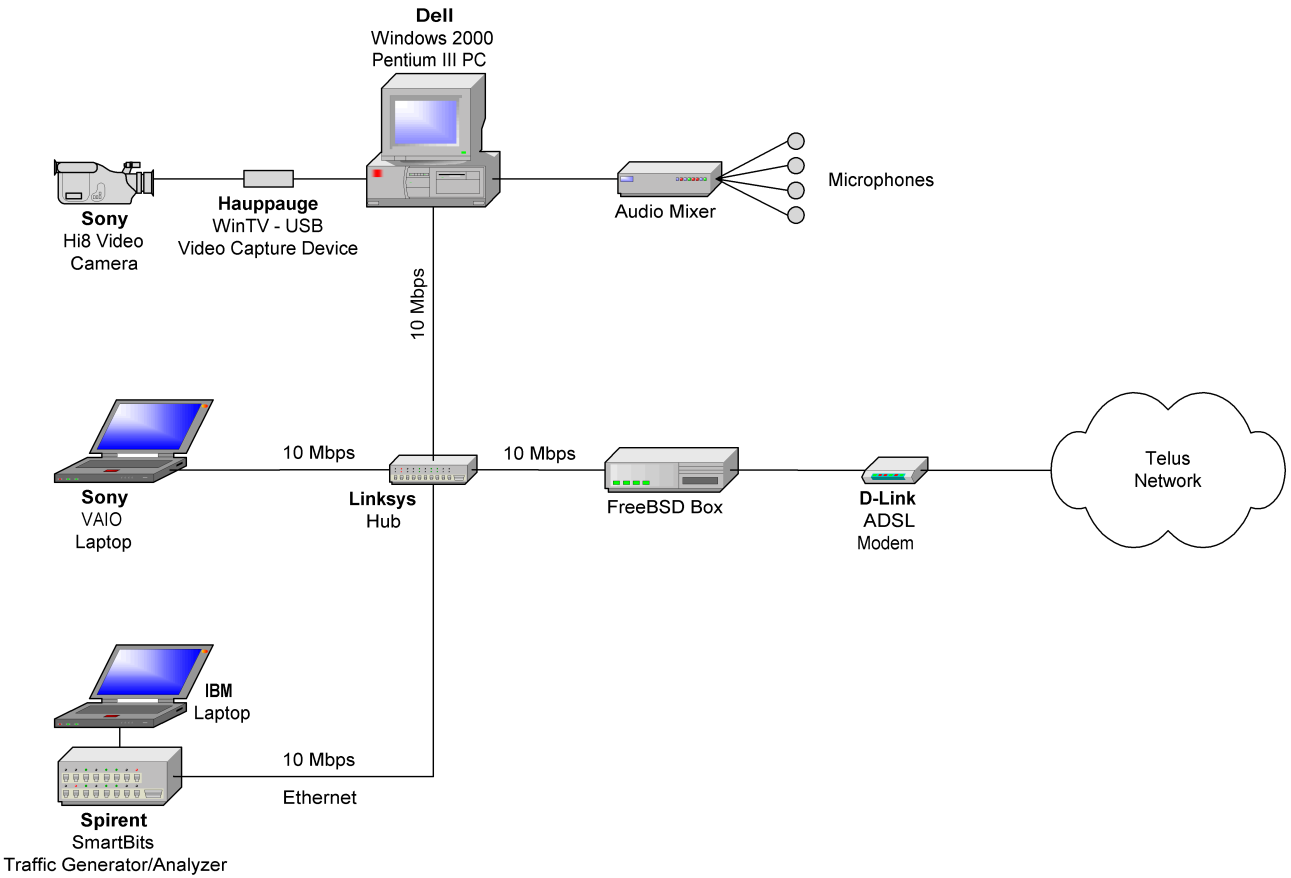


Network setup for the MBone webcast session at the IFSA/NAFIPS conference.

MBone webcast measurements



The audio/video and measurement equipment setup for the live webcast.

Webcast data collection

- Data was captured using **tcpdump**:

```
13:23:52.743908 142.58.29.34.1043 > 224.2.152.112.65504: udp 993
13:23:52.744331 142.58.29.34.1043 > 224.2.152.112.65504: udp 551
13:23:53.212855 142.58.29.34.20038 > 224.2.160.30.20038: udp 96
13:23:53.229241 142.58.29.34.20038 > 224.2.160.30.20038: udp 96
13:23:53.251362 142.58.29.34.20038 > 224.2.160.30.20038: udp 96
```

- We extracted the traffic trace with inter-arrival times [sec] and packet sizes [bytes] (sample):

```
0.001652 993
0.000423 551
0.468524 96
0.016386 96
0.022121 96
```

Webcast data processing

- Genuine traffic traces were used to simulate multimedia conferencing.
- Video-recorded webcast was processed using Adobe Premiere.
- It has been posted on the IFSA/NAFIPS web page http://morden.csee.usf.edu/Nafipsf/openforum IfsaNafips2001.html.
- Available in Real Player and Windows Media Player formats.

Conclusions

- We organized the multicast session of the Open Forum workshop held at the IFSA/NAFIPS 2001 conference in Vancouver.
- We performed several test multicasts on the MBone.
- Genuine traffic traces were collected during the webcast and were used to analyze impact of traffic on the network performance.
- Archived webcast is posted on the IFSA/NAFIPS web page http://morden.csee.usf.edu/Nafipsf/openforumIfsaNafips2001.html.

References

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Acknowledgements

- We thank:
  - Michael Smith and William Gruver for inviting us to webcast the IFSA/NAFIPS 2001 workshop.
  - Peter VanEpp for providing networking expertise.
  - Edward Yan for post-processing of recorded webcast.