Windows Media Server & Network Troubleshooting

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Terms

- Streaming Media: Generic Term - Streaming media technology enables the real time or on demand distribution of audio, video and multimedia on the internet. Streaming media is the simultaneous transfer of digital media (video, voice and data) so that it is received as a continuous real-time stream. Streamed data is transmitted by a server application and received and displayed in real-time by client applications. These applications can start displaying video or playing back audio as soon as enough data has been received and stored in the receiving station's buffer. A streamed file is simultaneously downloaded and viewed, but leaves behind no physical.

- Webcast: Generic Term - The delivery of live or delayed sound or video broadcasts using web technologies. The sound or video is captured by conventional video or audio systems. It is then digitized and streamed on a web server.

Terms: IP Unicast

- **Unicast:** Unicast is a one-to one connection between the client and the server. Unicast uses IP delivery methods such as Transmission Control Protocol (TCP) and User Datagram Protocol (UDP), which are session-based protocols. When a Windows Media Player client connects using unicast to a Windows Media server, that client has a direct relationship to the server. Each unicast client that connects to the server takes up additional bandwidth. For example, if you have 10 clients all playing 100-kilobits per second (Kbps) streams, those clients as a group are taking up 1,000 Kbps. If you have only one client playing the 100 Kbps stream, only 100 Kbps is being used.

  – Point-to-Point
  – Very bandwidth intensive based on user connections
  – On-demand broadcast
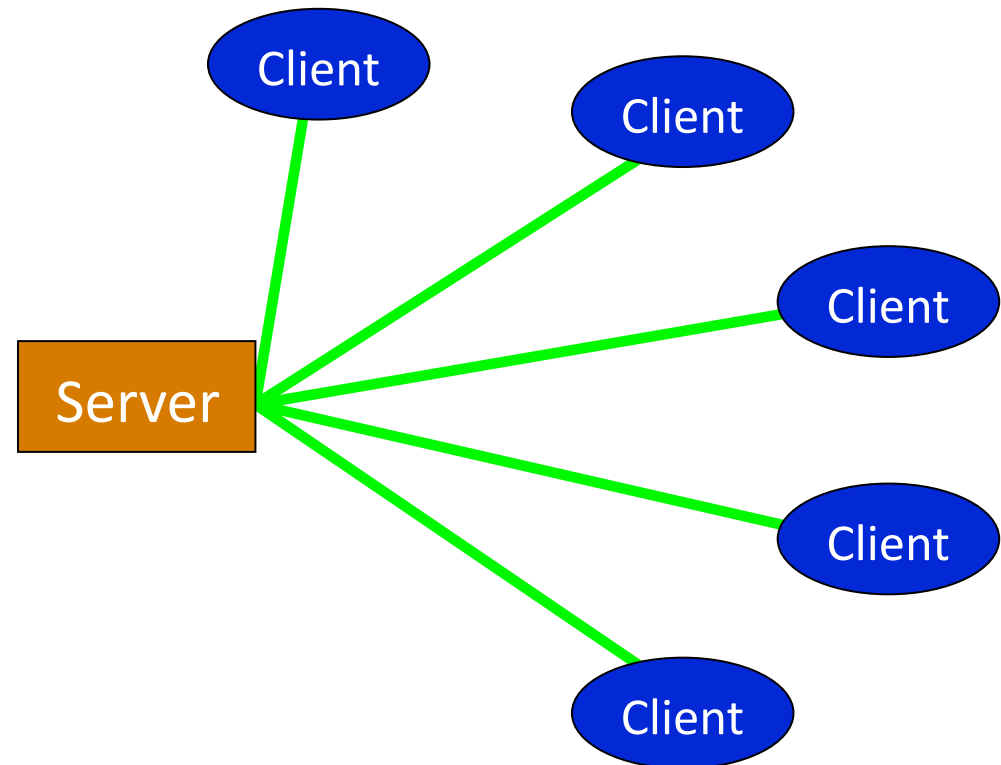
Terms: IP Multicast

- **Multicast:** Multicast is a true broadcast. The multicast source relies on multicast-enabled routers to forward the packets to all client subnets that have clients listening. There is no direct relationship between the clients and Windows Media server. The Windows Media server generates an .nsc (NetShow channel) file when the multicast station is first created. Typically, the .nsc file is delivered to the client from a Web server. This file contains information that the Windows Media Player needs to listen for the multicast. This is similar to tuning into a station on a radio. Each client that listens to the multicast adds no additional overhead on the server. In fact, the server sends out only one stream per multicast station. The same load is experienced on the server whether only one client or 1,000 clients are listening

- **Important:** Multicast on the Internet is generally not practical because only small sections of the Internet are multicast-enabled. Multicast in corporate environments where all routers are multicast-enabled can save quite a bit of bandwidth.

- Point-to-Many
- Consistent bandwidth
- Scheduled broadcast
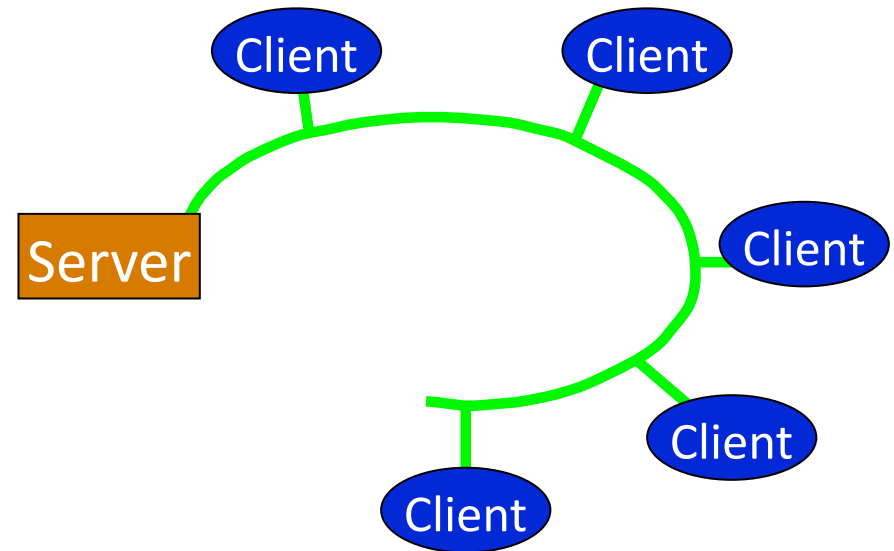
Starting Tips

- Get the contact information from your Principal Network Engineer
  - These are usually the folks who design the network
  - Get contact information, meet with them and ask if you can work with them directly or a delegate for network issues
- Get the contact information of your System Architect
  - These are usually the folks who design the server architecture
  - Get contact information, meet with them and ask if you can work with them directly or a delegate for network issues
- Send them your vendor contacts
  - Oh, don't have vendor contacts?
  - Get contact information of the vendor system engineer as well as any folks who come on site or you talk to on the phone during install
    - Cell phones, direct emails and direct phone numbers
    - The company may not like the contact this way, but most of these folks will help you directly
- Keep all this information in your contacts and on your Cell Phone.

May Seem Obvious, but…

- All of the above typically are "blamed" for things
  - Never accuse, always ask for help and always use Please and Thank you
  - Offer suggestions to areas that you may have answers to
- Find, friends, colleagues, support personnel who can test through out your network
  - Need folks that represent you viewers
  - Geographically different (building, state, country)
  - VPN users
- Thank them for everything they do and praise them for their knowledge

Divide & Conquer

Finding the Source

- This is all about good investigation techniques
- First outline the exact problem
  - No stream
  - Buffered stream
  - No Audio or Video
  - Lost packets or increasing lost packets
  - Encoder can't connect to server
  - Server not sending stream
  - Etc.
- This can sometime help with your starting point, however..
  - You may not yet know what part of the system is a problem
 - Start at the lowest/easiest end

Examine The Stream

- Windows Media Player Statistics
  - transmission quality
  - Content information
  - Client information
- Transmission quality statistics are:
  - How many packets were dropped
  - How many packets were resent
  - How many bytes were transmitted
- Content information include:
  - Which audio and/or video CODECs were used
  - What the URL of the .asf file is
  - What the embedded URL is
- Examples of client information include:
  - How long a client received a particular stream
  - The IP address of the client receiving the stream
  - The Internet service provider (ISP) the client used
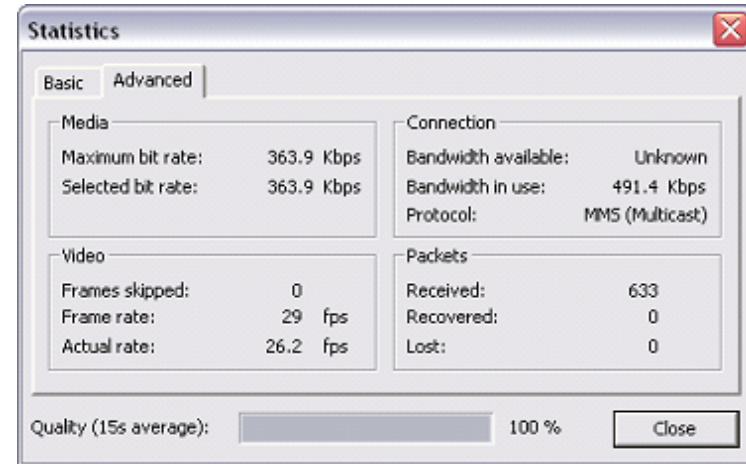
Windows Media Statistics

- Looks for the optimal transport in the following order:
  - UDP (User Datagram Protocol)
  - TCP (Transmission Control Protocol)
  - HTTP (Hypertext Transfer Protocol)
- However, a UDP stream must establishing a TCP session to negotiate the UDP
- Check **Packets Recovered** and **Packets Lost**
  - If the Packets Recovered counter is incrementing, the Windows Media Player is reconstructing packets that were dropped
  - Packets Lost means actual data has not been received by the client
- Quality (Frame Rate) will also adjust to maintain video quality when lost of data occurs
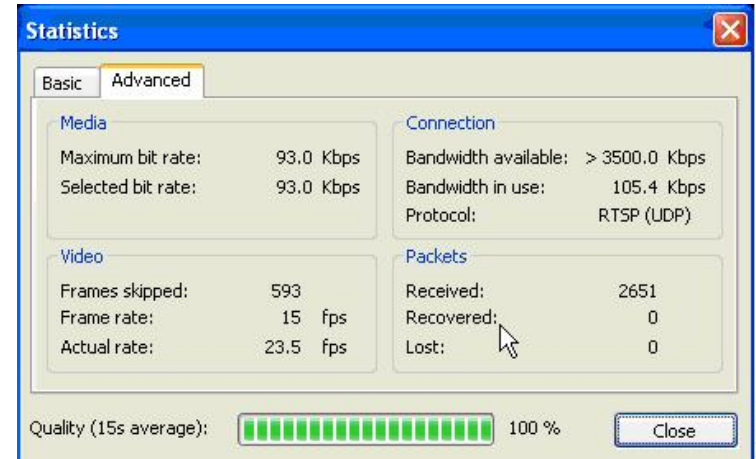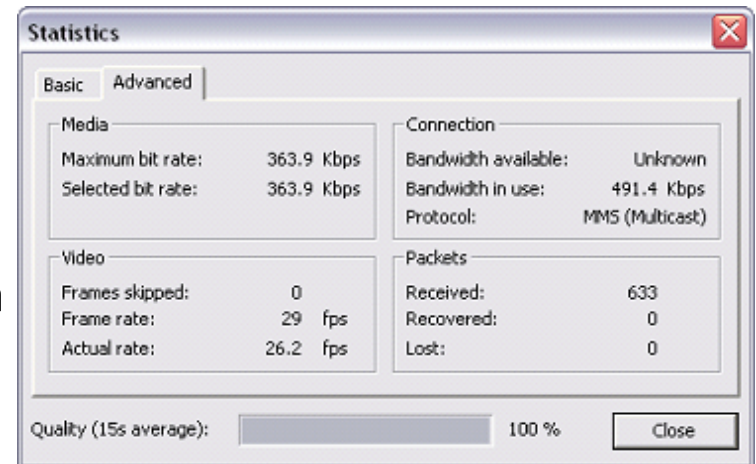
Verify Encoder is Functioning

- Direct Client connect to encoder? (http://192.168.1.10:8080 using Pull)
  - If using Push the encoder will stop if it can't connect to server
  - This will verify that the encoder is truly sending a stream
  - If you are concerned about the network connect local first then move to a player that is on same subnet then different subnet
  - If Encoder streams with direct connect but not in same Subnet or Different Subnet talk to the network folks (more on this later)
- Few other items to check (common sense, but…)
  - Camera is working (connect to another device)
  - Audio is working (headphones?)
- If you are able to direct connect and receiving audio and video
  - Encoder is accepting connections
  - Encoder is encoding and streaming correctly

- Next…

Verify Server is Functioning

- Create test publishing points and connect to server
  - Single unicast publishing point with single video
  - Single unicast publishing point with looping playlist
  - Single multicast publishing point with single video
  - Single mulitcast publishing point with looping playlist
  - Single multicast with unicast rollover publishing point
- Verify each can be viewed
  - Client can reach the .NSC file by opening the browser and typing in the direct http URL
  - Unicast Publishing Point– verify there are no port conflicts
    - IIS running and using port 80 for stream
    - Verify WMS is configured for HTTP port 80 and RTSP on 554
  - Multicast Publishing point—verify multicast point was created correctly
    - Remote into server and test multicast locally
    - Verify Multicast Publishing Point is using the correct Multicast Address Group for broadcast
      - » By default publishing point uses an auto generated Class D number and Port
      - » This may not be the IP Address used by your network or allowed by the routers
- Repeat test process from encoder
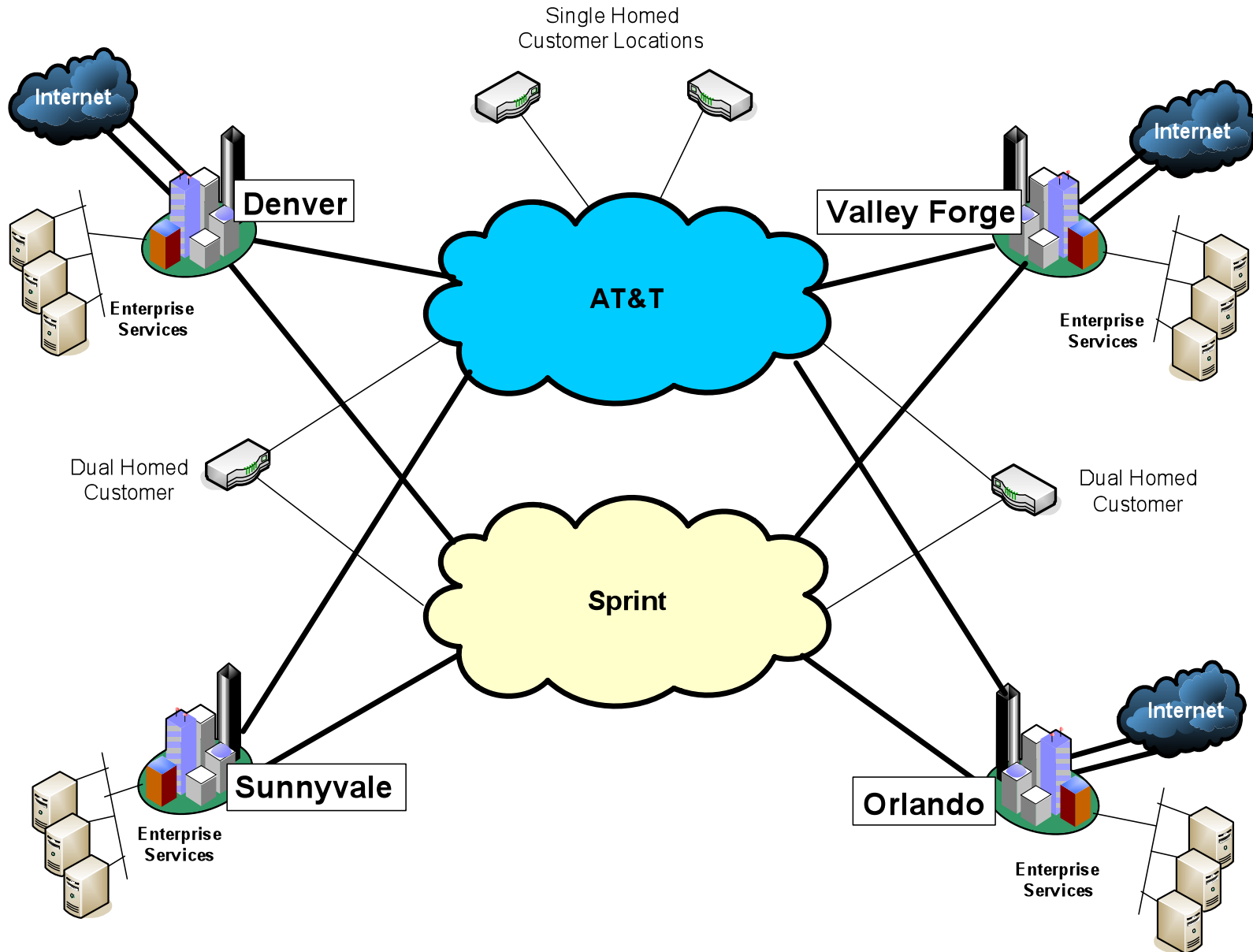 - Remote to machine in same subnet and test, etc.

It Sometimes Works

- Example 1
- Stream works fine with multicast with unicast rollover until 300 or more connections are made
  - Server shows no processor, memory or network issues
  - Bandwidth from server to viewers show no issue
- Tools: Windows Media Player Statistics, Opnet nCompass
- Process
  - Watch stream remotely with multiple testers
  - Watch stream local on server while testing
  - Packets leaving server not received at player
  - TraceRT to determine if there are any differences in Network structure and understand what devices may be a problem
  - nCompass used to track where the packets are lost
- Root Cause
  - One of two network cards in server was failing and loosing random packets. Once a large amount of continuous data hit this card packets were lost continuously
- Tips
  - Network team did "cursory" check of servers and network and found no issue – "must be the application" – have network team watch stream during test so they see the buffering and packet loss
  - Make someone available to network team to run stream tests or setup test publishing points for them. Makes testing easier
  - Ask lost of questions; "Why are packets only lost after we get 300 or more connections", "Why does stream look ok on server?"
  - Ask for the results. Don't accept "we fixed it"

It Sometimes Works

– Example 2
– Stream works fine with multicast with unicast rollover to multiple sites within Lockheed Martin, but Multicast looses packets within two sites only
  • Server shows no processor, memory or network issues
  • Bandwidth from server to viewers show no issue
– Tools: Windows Media Player Statistics, CACE Technologies Wireshark
– Process
  • Create looping multicast publishing point
  • Ask users from around the corporation to connect and watch
  • Gather feedback from WMP Statistics on who is loosing packets
  • Packets leaving server not received at player
  • Determine differences in network between those watching without issue and those with issue

Current LM Network

Single Homed
Customer Locations

Internet

Denver

Enterprise
Services

AT&T

Valley Forge

Internet

Enterprise
Services

Dual Homed
Customer

Sprint

Dual Homed
Customer

Sunnyvale

Enterprise
Services

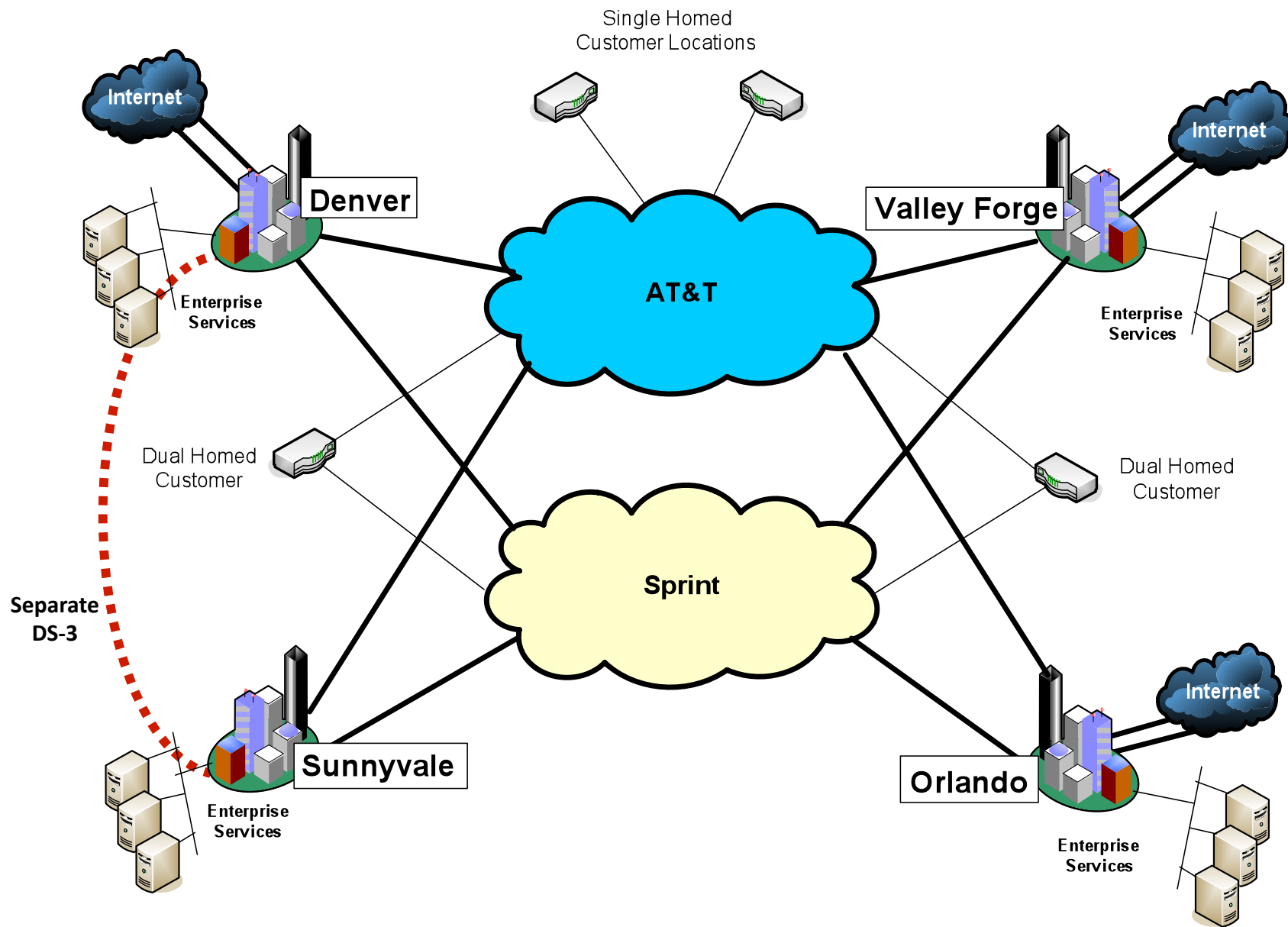Internet

Orlando

Enterprise
Services

TraceRT is Your Friend

TraceRT Orlando to Denver

- 141.240.16.8
- orl-ice1-gig7-3.lmwan.lmco.com [166.27.255.1]
- orl-sce1-gig2-1.lmwan.lmco.com [166.31.242.157]
- **att-orl-sce1.lmwan.lmco.com [192.168.240.17]**
- waterton-space-1.lmwan.lmco.com [192.168.245.114]
- 166.31.252.26
- cat6-ssb-4-a-vl252.ast.lmco.com [160.205.252.77]
- astssfmed1.ast.lmco.com [160.205.124.235]

TraceRT Sunnyvale to Denver

- cis534.lmms.lmco.com [129.197.116.254]
- svl-ssc-border-b-hssi-3-1-1.lmms.lmco.com [129.197.200.13]
- 129.197.216.229
- 129.197.216.246
- **wtn-ssc-wan2-atm1-0-0-20.ast.lmco.com [129.243.1.81]**
- cat6-ssb-4-a-vl252.ast.lmco.com [160.205.252.77]
- astssfmed1.ast.lmco.com [160.205.124.235]

Internet

Denver

Enterprise Services

Separate DS-3

Sunnyvale

Enterprise Services

Single Homed Customer Locations

AT&T

Dual Homed Customer

Sprint

Valley Forge

Internet

Enterprise Services

Dual Homed Customer

Orlando

Internet

Enterprise Services

Example 2 (con't)

– Process
  - TraceRT to determine if there are any differences in Network structure and understand what devices may be a problem
  - Map device differences to determine what to look at
  - Wireshark used to track where the packets are lost
  - Involve vendors to examine Wireshark captures, switch configurations, network topology drawings

– Root Cause
  - Multicast Fragmentation on routers **only** on dedicated network

```
0.022296000   1427 UDP   160.205.6.235   3268   239.192.64.108   3200   Source port: msft-gc  Destination port: tick-port
0.022348000   1417 UDP   160.205.6.235   3268   239.192.64.108   3200   Source port: msft-gc  Destination port: tick-port
0.022396000   1425 UDP   160.205.6.235   3268   239.192.64.108   3200   Source port: msft-gc  Destination port: tick-port
0.022445000   1427 UDP   160.205.6.235   3268   239.192.64.108   3200   Source port: msft-gc  Destination port: tick-port
0.053743000   1514 IP    160.205.6.235          239.192.64.108          Fragmented IP protocol (proto=UDP 0x11, off=0, ID=5742) [Reassembled in #12]
0.053750000   1514 IP    160.205.6.235          239.192.64.108          Fragmented IP protocol (proto=UDP 0x11, off=1480, ID=5742) [Reassembled in #12]
0.053756000   1329 UDP   160.205.6.235   4302   239.192.64.108   23090  Source port: d-data-control   Destination port: 23090
0.053846000   1514 IP    160.205.6.235          239.192.64.108          Fragmented IP protocol (proto=UDP 0x11, off=0, ID=5743) [Reassembled in #15]
0.053850000   1514 IP    160.205.6.235          239.192.64.108          Fragmented IP protocol (proto=UDP 0x11, off=1480, ID=5743) [Reassembled in #15]
0.053854000   1330 UDP   160.205.6.235   4302   239.192.64.108   23090  Source port: d-data-control   Destination port: 23090
0.053907000   1514 IP    160.205.6.235          239.192.64.108          Fragmented IP protocol (proto=UDP 0x11, off=0, ID=5744) [Reassembled in #18]
0.053912000   1514 IP    160.205.6.235          239.192.64.108          Fragmented IP protocol (proto=UDP 0x11, off=1480, ID=5744) [Reassembled in #18]
0.053921000   1330 UDP   160.205.6.235   4302   239.192.64.108   23090  Source port: d-data-control   Destination port: 23090
0.053969000   1514 IP    160.205.6.235          239.192.64.108          Fragmented IP protocol (proto=UDP 0x11, off=0, ID=5745) [Reassembled in #21]
0.053973000   1514 IP    160.205.6.235          239.192.64.108          Fragmented IP protocol (proto=UDP 0x11, off=1480, ID=5745) [Reassembled in #21]
0.053977000   1330 UDP   160.205.6.235   4302   239.192.64.108   23090  Source port: d-data-control   Destination port: 23090
0.054030000   1514 IP    160.205.6.235          239.192.64.108          Fragmented IP protocol (proto=UDP 0x11, off=0, ID=5746) [Reassembled in #24]
0.054034000   1514 IP    160.205.6.235          239.192.64.108          Fragmented IP protocol (proto=UDP 0x11, off=1480, ID=5746) [Reassembled in #24]
```

Example 2 Lessons Learned

- Vendor Application (SonicFoundry Mediasite) was continuously blamed for issue
  - 6 months of churn
  - Interviewing replacement vendors
- Issue was originally discovered through contact with other streaming media groups within LM
  - Network, network, network
- Not all solutions are single threaded
  - After finding this issue, two there issues had to be solved before multicast was fixed
- Never assume anything, but ask lots of questions

Questions?

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