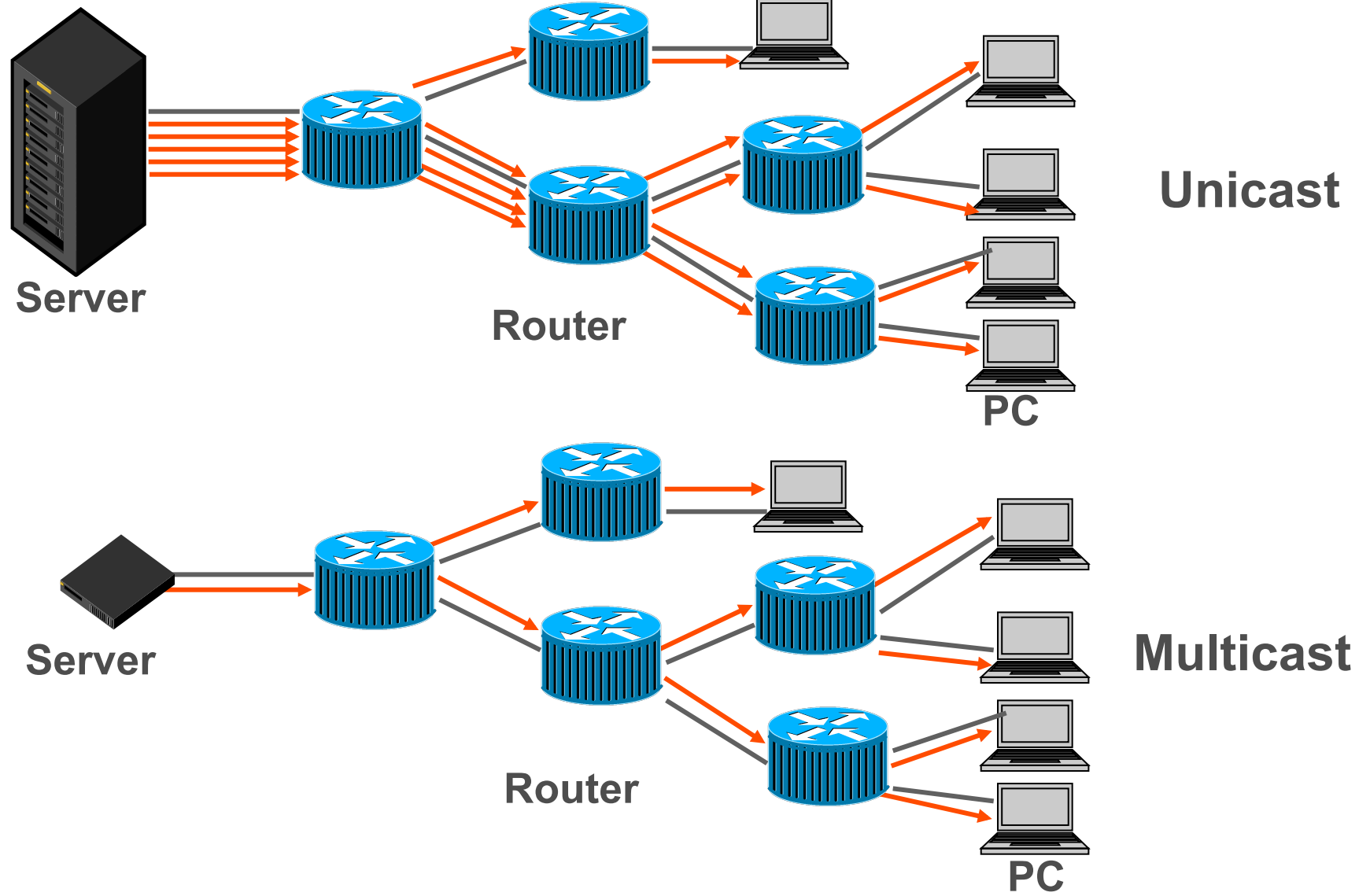# AMT Multicast

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Presentation Outline

- Multicast Refresher
- AMT Multicast
- AMT Multicast Pilot
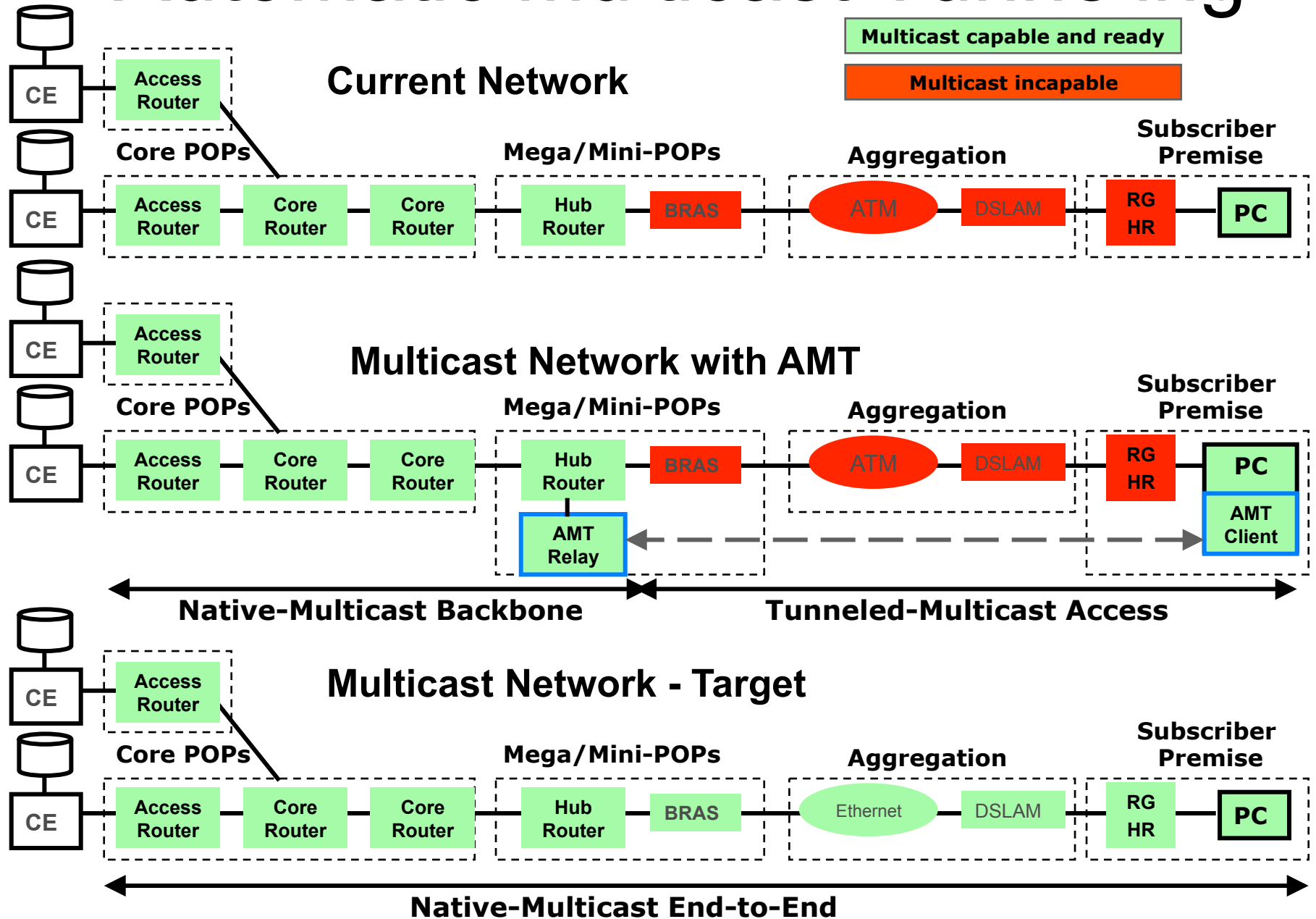- AT&T Multicast Deployment

What is Multicast?

Server

Router

PC

Unicast

Server

Router

PC

Multicast

Applications "Friendly" to Multicast Delivery

Content Delivery Modes	Content Delivery Examples	Delivery Technologies & Uses	
		Multicast	Unicast
Live Content	Internet Radio, March Madness, News, Events, Conferences, etc.	Simple linear multicasting of content	Fast-start and error/loss recovery
"Delayed-Play" Download	Software, movie download (pre-placement), magazine, etc.	Repeated multicasting of content	Error/lost recovery
"Instant-Play" Download	On-demand streaming,VOD, etc.	Simultaneous repeated multicasting of content segments	Fast-start and error/loss recovery

- Unicast delivery can always be available if there is a segment of users that can not receive the multicast content

Automatic Multicast Tunneling

Multicast capable and ready
Multicast incapable

Current Network

CE · Access Router

Core POPs · **Mega/Mini-POPs** · **Aggregation** · **Subscriber Premise**

CE · Access Router — Core Router — Core Router · Hub Router — BRAS · ATM — DSLAM · RG HR — PC

Multicast Network with AMT

CE · Access Router

Core POPs · **Mega/Mini-POPs** · **Aggregation** · **Subscriber Premise**

CE · Access Router — Core Router — Core Router · Hub Router — BRAS · ATM — DSLAM · RG HR — PC

AMT Relay · AMT Client

← **Native-Multicast Backbone** → ← **Tunneled-Multicast Access** →

Multicast Network - Target

CE · Access Router

Core POPs · **Mega/Mini-POPs** · **Aggregation** · **Subscriber Premise**

CE · Access Router — Core Router — Core Router · Hub Router — BRAS · Ethernet — DSLAM · RG HR — PC

← **Native-Multicast End-to-End** →
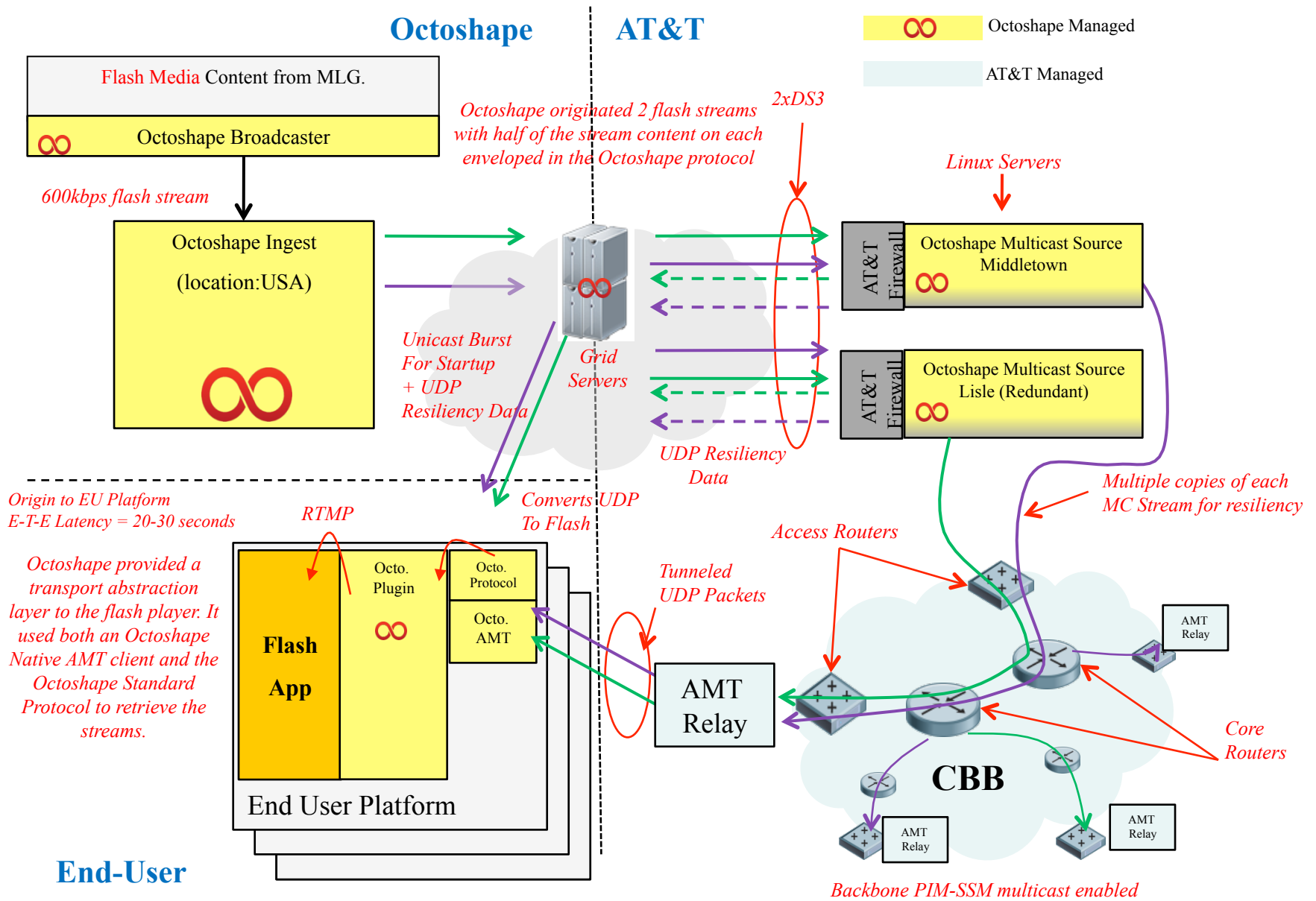
Goal of Multicast Pilot

Demonstrate both internally and to external customers that AMT Multicast is ready to become a scaled, production content distribution service

- AMT Multicast is a more efficient delivery service for both AT&T (network) and the content provider (servers)
- Incremental work by the content provider is more than justified in cost and operations efficiencies
- End user experience is transparent with multicast delivery vs. unicast delivery
  - No additional help desk calls/emails/chats
- End user performance is as good or better with multicast delivery vs. unicast delivery
- Multicast can be an effective delivery mechanism for large file download

Major League Gaming Pilot

- Gamers come together to compete head to head in a championship gaming event
- Live Flash video streams from the event are watched by gaming enthusiasts around the world
- Event on November 5 & 6, 2010, in Dallas, Texas
- MLG provided one 600 Kbps stream for multicast delivery
- Octoshape responsible for resilient delivery of the stream using AT&T's AMT multicast delivery
- 3 AMT relays – capable of ~2.7Gbps of streaming
- 2 redundant multicast sources for reliability

Pilot Architecture

Octoshape

AT&T

Octoshape Managed

AT&T Managed

Flash Media Content from MLG.

Octoshape Broadcaster

Octoshape originated 2 flash streams with half of the stream content on each enveloped in the Octoshape protocol

2xDS3

Linux Servers

600kbps flash stream

Octoshape Ingest (location:USA)

AT&T Firewall

Octoshape Multicast Source Middletown

Unicast Burst For Startup + UDP Resiliency Data

Grid Servers

AT&T Firewall

Octoshape Multicast Source Lisle (Redundant)

UDP Resiliency Data

Multiple copies of each MC Stream for resiliency

Origin to EU Platform E-T-E Latency = 20-30 seconds

RTMP

Converts UDP To Flash

Access Routers

Octoshape provided a transport abstraction layer to the flash player. It used both an Octoshape Native AMT client and the Octoshape Standard Protocol to retrieve the streams.

Octo. Plugin

Octo. Protocol

Octo. AMT

Tunneled UDP Packets

AMT Relay

Flash App

AMT Relay

End User Platform

AMT Relay

Core Routers

CBB

AMT Relay

AMT Relay

End-User

Backbone PIM-SSM multicast enabled

MLG Pilot Summary

Pilot Objective	MLG Result
AMT multicast is a more efficient delivery mechanism for the AT&T Network and for Content Provider/CDN	1970 GB delivered multicast 768 GB delivered unicast, grid server, peer to peer (Note: this ratio of multicast to unicast is dictated by Octoshape's resilient delivery technology and not by the inherent capabilities of multicast.)
No impediments that would prevent scaling of AMT relays	None identified
No impediments that would prevent scaling of streams	None identified
Incremental work by content provider justified by cost and operational efficiencies	Octoshape and MLG enthusiastic about pilot success
End user experience is as good as or better than unicast delivery	No difference in start times No difference in session duration
End user performance is as good as or better than unicast delivery	No differences in packet loss/errors
No additional help desk contact from end users	No reported end user problems
High percentage of end users can receive multicast	95.5% of end points able to receive multicast delivery across 104 countries and 5+ client OSs

Multicast Deployment

- AT&T's backbone is multicast enabled

- AT&T is deploying multicast sources and AMT Relay capacity in its network to support Internet multicast traffic

- AT&T has libraries available for application providers to incorporate AMT GW functionality into their streaming and download applications

- Major router vendors are building AMT Relay functionality into their routers
  - Provides AMT tunneling capability within the router itself
  - Much lower cost and allows ubiquitous AMT across AT&T's network

- As AMT multicast is a stepping stone to support end-to-end native multicast, AT&T is also pursuing pushing multicast all the way to the end user device