Internet Multicast: It’s still a thing!

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State Of Multicast Today

• Multicast has been a modest success overall
  – Vital in some places (Financials, MVPN, video distribution)
    • Walled-garden deployments
• Internet Multicast has been more ... disappointing
  – Interest is as low as ever...
  – Need is as high as ever...
  – Components for success exist
  – You may already be using it!
Internet Multicast: What went wrong?

- Internet Multicast (MBONE) status
  - ~25k BGP routes, ~450 ASNs are multicast enabled
  - Necessity for Internet applications: ubiquity
  - Anything less than ~100% deployment might as well not exist
  - Chicken and egg
In the beginning, there was unicast...
...then came Multicast
But, there was a problem with multicast...

- The “All or Nothing” problem
What to do? CDNs!

- Content Delivery Networks become popular
  - Almost as good as multicast, and it just works!
Comparison: Unicast, CDN and Multicast

- Middle is where you find convenience - old content in new places
- Tails are where you find disruption - new content from new contributors
Early uses of Disruptive technologies

• First Websites (1991):
  – Gopher Search Engine
  – CERN, WWW Digital Library (TBL’s web catalog at CERN)
  – Digital Picture Archive on the 17th Floor of Delft Univ
  – Stanford Linear Accelerator Center
  – ...later would lead to Amazon, eBay, Google, Wikipedia

• First Webcam (1993):
  – Trojan Room coffee pot of Cambridge Univ
  – ...later would lead to Skype, YouTube

• Lesson: don’t judge a technology by the content available now, but rather by what becomes possible
  – Thought experiment: imagine what would become possible with a multicast-enabled Internet
“Think Ecology, not Economics*”

• Diversity: different species take advantages of different niches, providing opportunities for specialized growth and success
• What does this mean?
  – NEW Content from NEW contributors
  – Next Generation of TV (NGTV)
  – Sporting events (big and small), foreign TV content, drones, ?????

[*] John Naughton, From Gutenberg to Zuckerberg
So What’s New?

• Internet Multicast has been around since the 90’s and hasn’t gained much traction
Internet Mcast Game Changer: AMT

• Automatic Multicast Tunnels
• Addresses fundamental “all or nothing” problem
  – Treats issue as a transition problem
    • Rather than trying to get mcast enabled everywhere, make mcast available everywhere
    • Dynamically tunnel from mcast-enabled islands to end users in unicast-only abyss
  – End users no longer dependant on their local provider to receive mcast
Solution Requirements

- Must be simple (grandmother-proof)
- Must work with any application (Flash, Real, QT, etc)
- Must work with any access technology (DSL, Cable, mobile, VPN, etc)
- Content providers must enjoy the benefits of multicast
  - Otherwise they won’t be providing content for long
AMT - How it works

• Gateway (client) uses Anycast to discover nearest relay.
• UDP-encapped IGMP report is sent to relay at the edge of the mcast network.

- Gateway (client)
- Anycast
- Mcast Traffic
- Mcast Join
- UDP-IGMP Request
AMT – Unicast Edge Network

Mcast join is sent by relay on behalf of the unicast receiver.

- **Unicast-Only Network**
- **Mcast Enabled ISP**
- **Content Owner**
- **Mcast Enabled Local Provider**

- **GW**

- **Mcast Traffic**
- **Mcast Join**
- **UDP-IGMP Request**
AMT – Unicast Edge Network

Mcast stream is replicated and encapped in UDP to the unicast receiver.
AMT – Unicast Edge Network

Buy a bigger pipe, or enable multicast, or both?

GW
GW
GW

Mcast Enabled ISP

Content Owner

Mcast Enabled Local Provider

Relay

Unicast-Only Network

Mcast Traffic

Mcast Join

UDP-IGMP Request

UDP Ucast Stream

GW
GW
GW
AMT Overview

• Provides a transition strategy for unicast-> multicast networks
  – Builds dynamic tunnels to hosts
• Any application (Flash, Real, QT) can sit on top of AMT
• Uses UDP so no kernel level changes
  – Unlike IGMPv3, can be a simple plug-in
  – UDP allows NAT/firewall transversal
AMT Details

• 3-way handshake to join groups from unicast receivers to prevent spoofing and DOS attacks
• Replication server (relay) joins multicast group and translates into multiple unicast streams
• Anycast discovery allows for closest topological relay
• Client (gateway) can be a host or join on behalf of local receivers
• Only ~1 line of config enables a native deployment to reach any host on the Internet
AMT Spec Status

• Multivendor proposal- Microsoft, Cisco, Alcatel, Juniper
  – draft-ietf-mboned-auto-multicast
  – Status: IESG Evaluation
  – All DISCUSS issues appear to be resolved now
    • Congestion control, security model
  – Very close to advancement to RFC
• A number of implementations exist
  – Deployed on the Internet for years
Internet Mcast and IPv6: Technological Cousins

• Any argument for/against IPv6 applies just as well to Internet Mcast
  – It’s not needed: NAT, CDN
  – It is needed: v4 address exhaustion, missing long tail of TV
• Both suffer the “all or nothing” problem
• Both require new protocols/extensions of old ones
• Both born in the 90s, struggled through adolescence
• Both require faith in the unseen
  – Both do accomplish little on their own, but enable big things
Will it really happen?

• Internet is the dominant transport for nearly all forms of media, information, entertainment and commerce
  – Newspapers, magazines, books, music, etc
    • Everything except TV!

• Television remains a notable holdout
  – Seems inevitable that they will eventually (truly) merge

• Brute-force unicast is really co$$$$tly
  – Bandwidth is cheap and plentiful... but not free or infinite

• AMT is the first step towards NGTV

• It’s happening today!
  – AT&T/Octoshape Internet Mcast collaboration using AMT
  – CNN.com, Eurovision Song Contest, French Open
Still Not Convinced?

AMT is a...

Cloud-based
Virtualizable
Service-Chainable
SDN solution!
What’s Next

• Reviving PAIX MIX
  – Public AMT Relays
  – Send email to lenny@juniper.net if interested
• World Multicast Day?
• Other ideas??
Further Reading on AMT

• AMT Spec
• AT&T-Octoshape Internet Mcast Collaboration:
  – http://www.attinnovationspace.com/innovation/story/a7658924
  – http://www.nanog.org/meetings/nanog52/abstracts.php?pt=MTc5OSZuYW5vZzUy&nm=nanog52
• Next generation TV over the Internet: This revolution will be televised
When the World Deploys Multicast

Access providers

Mcast Enabled ISP

Content Owners