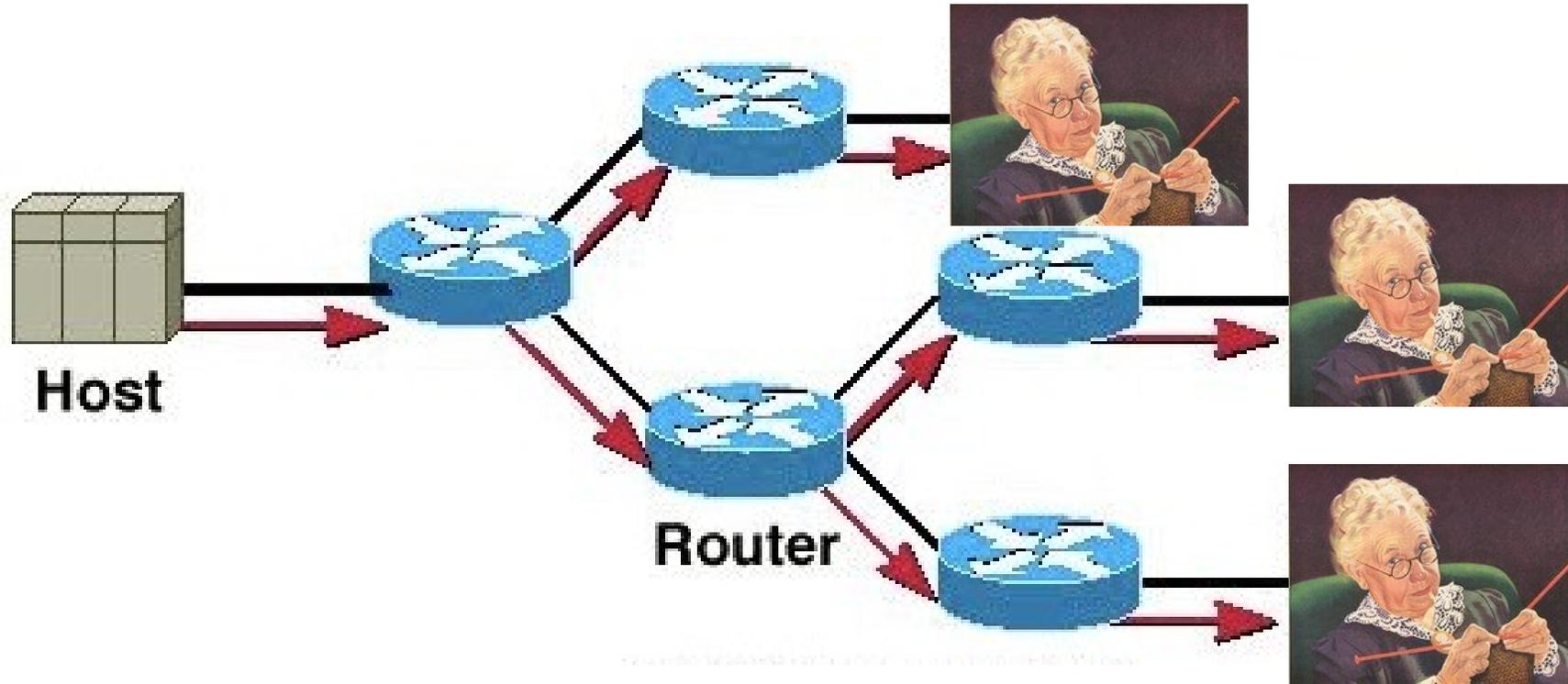# Multicast to the Grandma (MTTG): It's finally here!

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What is MTTG?

- Multicast made so easy and ubiquitous that your Grandma uses it!

Why Multicast?

- First, some simple facts:
  - HD Bitrate: 4-8Mbps (Netflix recommends 5Mbps)
  - 4K Bitrate: 15-35Mbps (Netflix recommends 25Mbps)
  - 8K Bitrate: 80-100Mbps
  - VR Bitrate: 500Mbps-5.2Gbps!!!
  - TV Audience of typical NFL game: ~15M
    - 15M viewers @ 25Mbps = 375Tbps!! Can Brute Force Unicast (BFU) keep up?
  - "Cord Cutting" Evolution- live, linear TV is the last frontier
    - SlingTV, HuluTV, Vue, YouTubeTV, etc
  - Live, linear TV is not dead yet!

What's old is new: Live streaming is Trending

- **Brand Transparency and Authenticity:** due to spontaneous and un-editable nature, live streams are perceived as more authentic and drive greater emotional engagement than on-demand

- Viewers spend **8X longer with live video** than on-demand (**5.1 minutes** for on-demand vs. **42.8 minutes** for live video content)

- **67% of live video viewers are more likely to make a purchase**

- **>50%** of marketing professionals said they have seen the **best ROI from live video** than any other social media platform

- Live video is outpacing the growth of other types of online video, with a **113% increase** in ad growth yearly

Conclusion: Live linear video is here to stay

- … but, IP (unicast) is not well suited to multi-destination traffic
  - IP Multicast was created 2+ decades ago to solve this problem
    - So, what went wrong?

Steps For world domination

- Step 1: AMT Relays

- Step 2: AMT GW implementations

- Step 3: Portal for mContent

- Step 4: Off-Net Sourcing

  - Simple way for end users to add live multicast content to the MBone

- Step 5: **Profit!!**

Step 1: AMT Relay Deployment

- AMT Relay deployed at Thomas Jefferson HS
  - Already had 10G multicast-enabled connection to I2 (MBone)
  - Student (William Zhang) deployed the first AMT relay on the MBone as sr. project
  - Also, curated existing multicast content on I2
    - Python script that ran "show multicast route detail" on all routers at I2 Looking Glass
    - Found 119 sources and 40 mcast groups > 5pps
  - Presented his experiences at IETF 101 (London)
- Added a second relay at George Washington Univ (Andrew Gallo)

Step 2: AMT Gateway Implementation

- Goal- build a modern AMT GW implementation that's easiest enough for Grandma to use
  - Preferably in browser
    - Doesn't appear possible today
  - Settled for VLC- widely used video apps
    - Available for Mac/Windows/iOS/Android
    - Initial implementation by Natalie Landsberg (presented in IETF102)
    - Enhancements added by Wayne Brassem (relay resilience, etc)
    - Open source- patch submitted
- Download and watch it now!
  - https://github.com/Juniper/amt-vlc

Step 3: Multicast Content Portal

- Webpage/Portal with a list of active multicast streams
  - Take output of William's curation script and populate "(mc)TV Guide" that can launch AMT-enabled VLC to view
  - Simple API for sources to add own content

Step 4: Off-Net Sourcing

- Sourcing from MBone is available today (On-Net)
  - … but most sources will be on unicast-only networks (Off-Net)
- Off-Net sourcing- users on unicast-only nets can stream to some "server" on MBone, which converts stream to multicast
  - Then accessible natively to on-net receivers and via AMT to off-net receivers

How to get involved

- CONTENT, CONTENT, CONTENT
- Further dev of VLC (maybe)
- In browser implementation
- Portal- curation script to populate "TV Guide" of active streams
- Add more relays
  - Ideas for relay discovery- lessons from CDNs?
- Off-Net Sourcing

MUST...
HAVE...
Multicast

Summary

- Need for Internet Multicast is now greater than ever
  - Live linear is cool again, democratization/decentralization of content providing
- Internet Multicast is the destination, AMT is the indispensable transition step
- AMT has been around a while, but until now had missing pieces
  - All pieces now in place to have working solutions
  - You can see it working now! The proof is in the pudding
- If you are interested in any of this, find me at the bar

References

- Natalie/Wayne's VLC with AMT GW build
  - https://github.com/Juniper/amt-vlc
- William's Senior Project Docs
  - https://github.com/willzhang05/senior-research
- Curation Results
  - https://github.com/willzhang05/senior-research/blob/master/logs/results.txt