

IP Multicast

Next steps to make it real

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Intro

- IETF/W3C work we're building:
 - [RFC 8777](#) (+ [RFC 7450](#))
 - [draft-ietf-mboned-dorms](#)
 - [draft-ietf-mboned-cbacc](#)
 - [draft-ietf-mboned-ambi](#)
 - +[multicast-receiver-api](#) in Chromium/Chrome (& W3C)
- Bringing to NANOG (my first!) for:
 - review, feedback, exposure
 - looking for **trial partners**

Outline

- **Why Multicast**
- What we are proposing
- How it can be managed safely
- Who is invited

How 'bout those floods?

Spike in traffic to Google&Akamai caches?

(Tue Apr 21 12:56:11 UTC 2020)

Did anyone notice a huge jump in traffic today ... ?

nanog.org/pipermail/nanog/2020-April/107310.html

akamai yesterday - what in the world was that

(Mon Mar 9 18:40:31 UTC 2020)

Just as a heads-up that if those previous two patches caused you some strain...

nanog.org/pipermail/nanog/2020-March/106298.html

Unicast Arithmetic (Delivery)

Game download = **65GB**, Popular game = **100m** users

$65 \times 10^9 \text{ bytes} * 8 \text{ bits/byte} * 100 \times 10^6 \text{ users} / 167 \times 10^{12} \text{ bps} \Rightarrow 311,377\text{s}$
 \Rightarrow 3.6 days to deliver to all users (@**167** tbps)

$65 \times 10^9 \text{ bytes} * 8 \text{ bits/byte} / 50 \times 10^6 \text{ bps} \Rightarrow 10,400\text{s}$
 \Rightarrow 3 hours user expectation from **50**mbps network

(similar troubles with OS updates)

Unicast Arithmetic (Live Video)

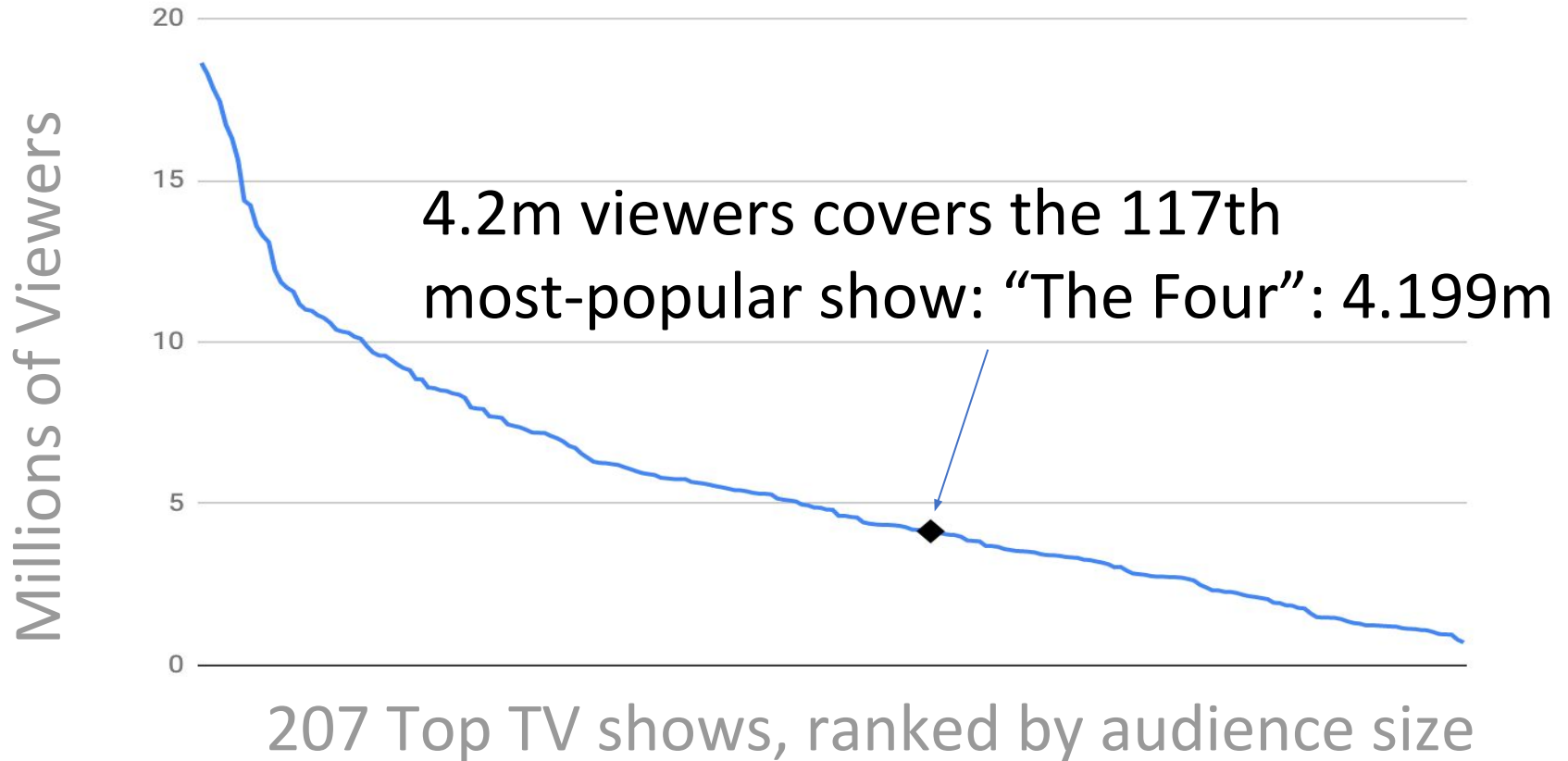
- 167 tbps = Akamai Traffic Record, April 2020*
- 40 mbps = 4k typical bitrate (35-45 mbps, 24-30fps)

$$167 \times 10^{12} / 40 \times 10^6$$

=> 4.2m 4k viewers to set new traffic record

* <http://news.mit.edu/2020/3-questions-tom-leighton-managing-covid-19-internet-traffic-surge-0427>

Nielsen Audience Sizes 2017-2018

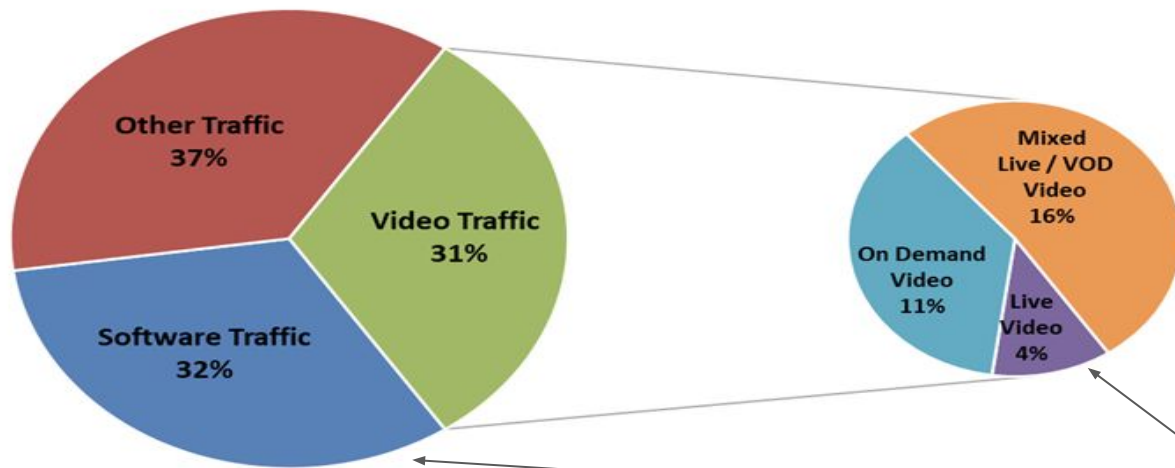


Future looks even worse

- More 4k (~40mbps/stream)
- More 8k (~100mbps/stream)
- Maybe VR? (~400mbps/stream?)
- 20% CAGR for per-household traffic

Achievable Offloads

NORTH AMERICA-Jan 2019 Volumetric Data Delivery - Application Traffic Mix



■ Software Traffic (Gbps) ■ Other Traffic ■ Video Traffic
■ Live Video ■ On Demand Video ■ Mixed Video

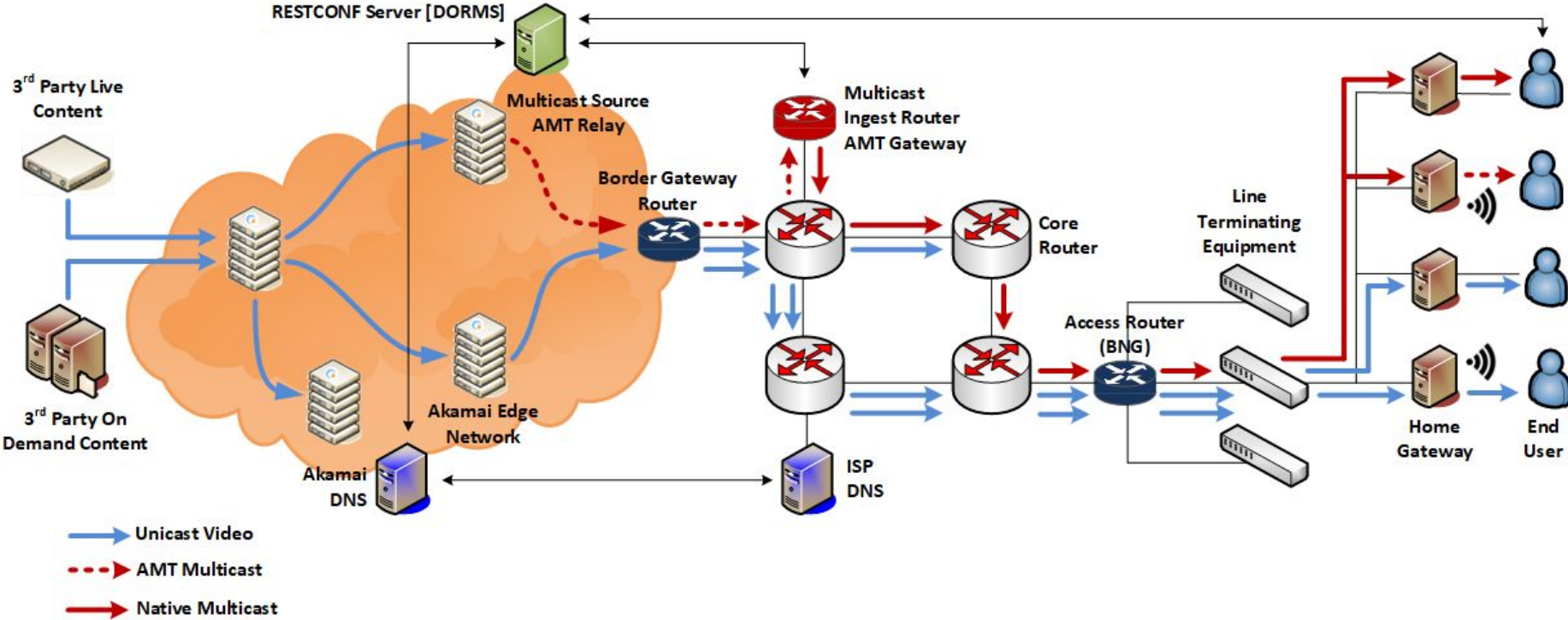
Overall:
50% peak
20% typical

Most of this

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Overview



Network Changes

Where	Specs	Solving what
Ingest Points	AMT Gateway (RFC7450), DRIAD(RFC8777)	(via Unicast Tunnel) Connectivity
Choke Points/Ingest	CBACC, DORMS (drafts)	BW Provisioning
Core thru Access	SSM (RFC 4607) +PIM/BIER or equivalent	Connectivity
CPE	IGMP/MLD Proxying (RFC4605)	Connectivity
CPE	M2UC (OpenWRT default ~2011)	Wifi Support

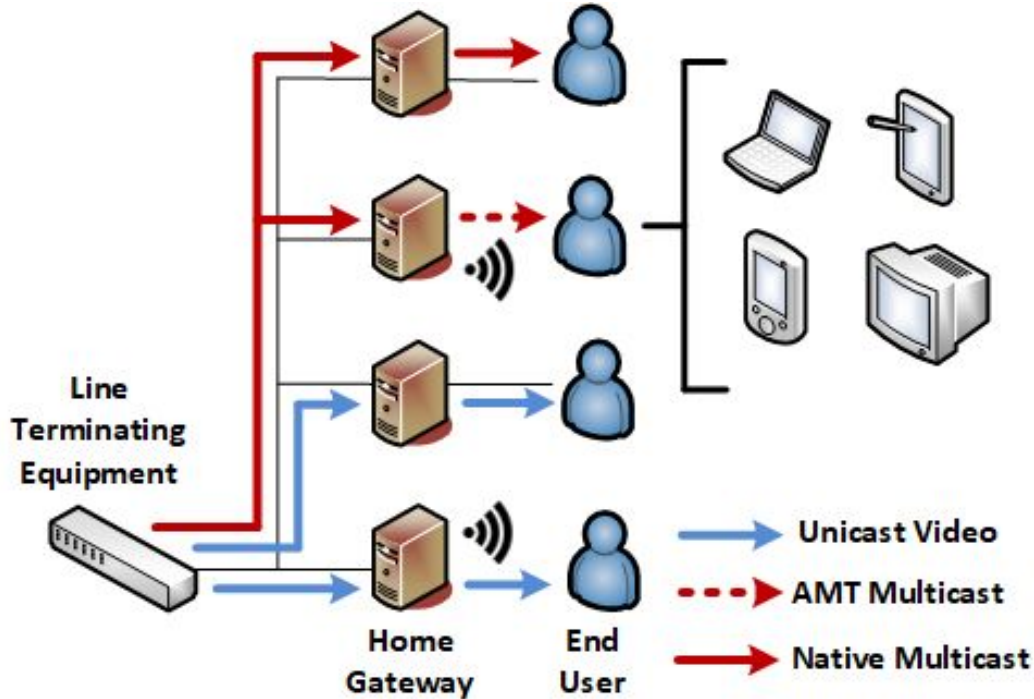
CDN/Content Owner Changes

Where	Specs	Solving what
Receiver	SDK (Custom) / Browser	App Transport
Tunnel & DNS records	DRIAD(RFC8777), AMT Relay(RFC7450)	Connectivity
Sender	App (Custom)	App Transport
Metadata Publishing	DORMS/CBACC	BW Provisioning
Receiver	DORMS/AMBI	Authentication

What Doesn't Need Changing

- No peering required
 - auto-established tunnels
 - provider-neutral
- No encoding
 - New use cases transparent to network
 - Live/download/carousel/VR all the same
 - UDP multicast in & out

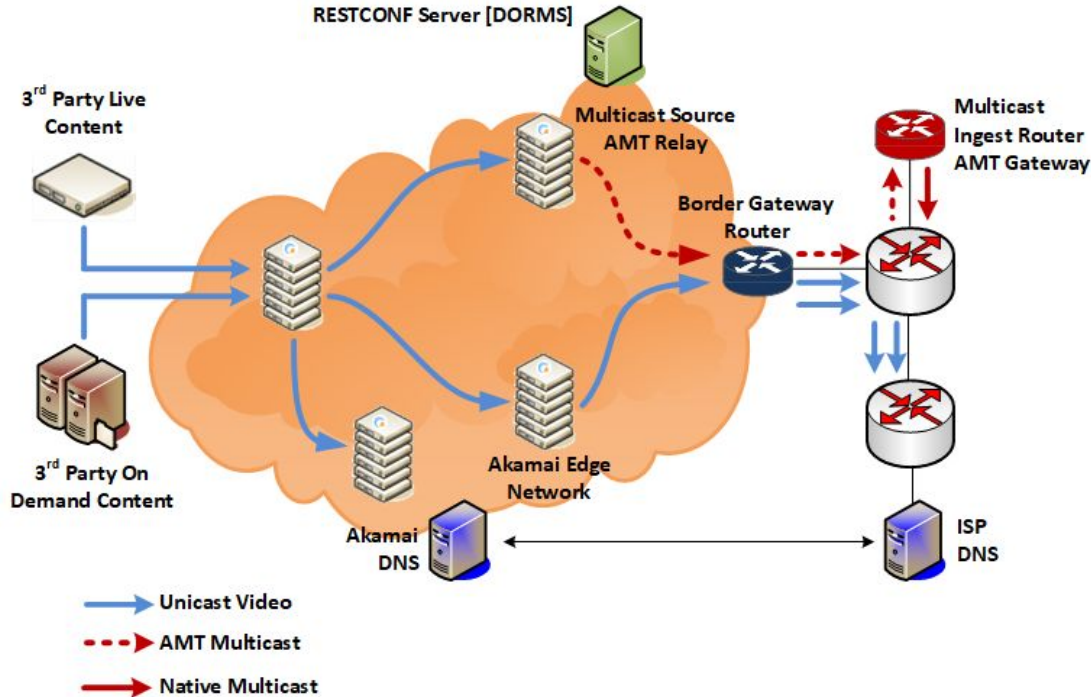
Receiver Join Logic



"Popular Unicast" =>
CDN-triggered-
multicast attempt

- SDK initially
 - Content-owner distributed
- W3C API [in progress](#)
- Standardized Transports: ASAP

Ingesting Traffic

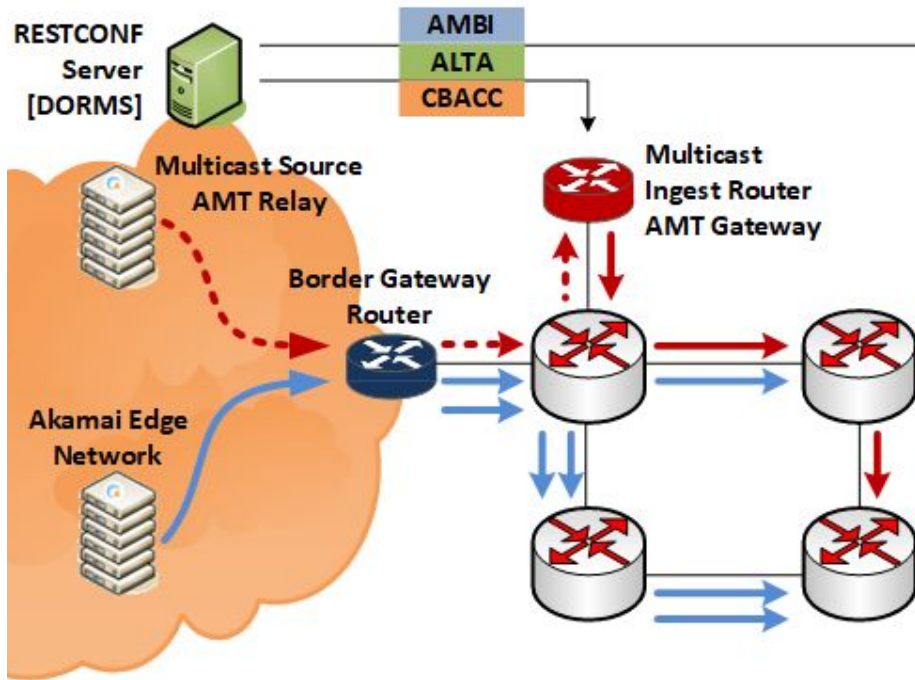


- [RFC 7450](#)
(AMT)
 - [RFC 8777](#)
(DRIAD)
- No Explicit Peering
 - Unicast at Ingest
into Native Multicast
 - Flexible Location

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Discoverable Metadata (standardization in progress)



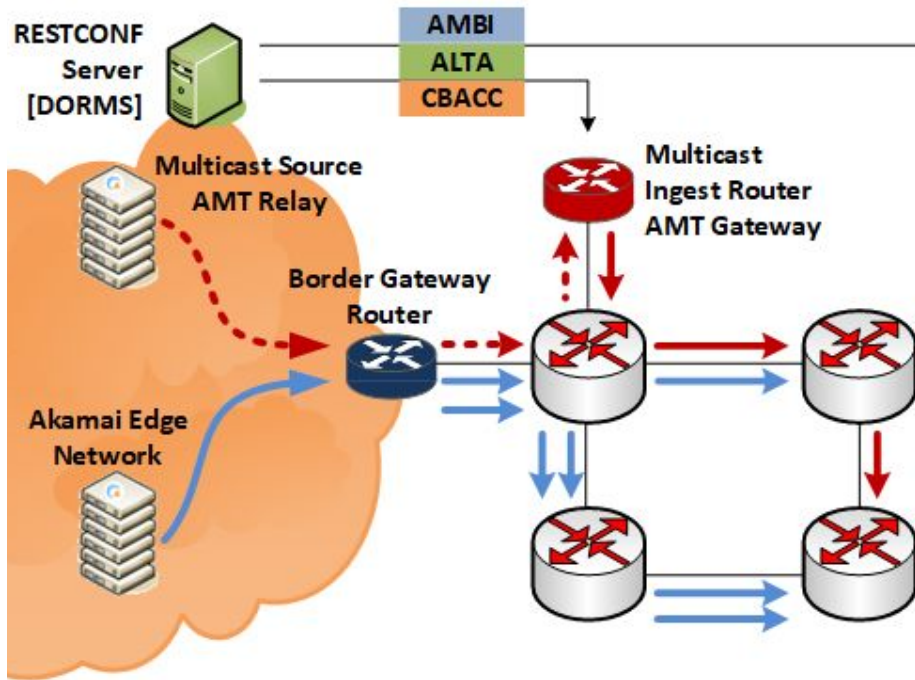
[draft-ietf-mboned-dorms](#):

- Discover metadata (per multicast channel)

[draft-ietf-mboned-cbacc](#):

- bandwidth extension
- circuit-break to avoid oversubscription

Transport Authentication



[draft-ietf-mboned-ambi:](#)

- Packet-level Authentication
- UDP Loss Detection
- (optional in network, mandatory in browser)

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Standards-based & Repeatable

Invited:

- Anyone who can make it work.
 - My competitors
 - Your competitors
 - Content owners directly

What needs work?

Several pieces are still hacky

- Ingest Platform ([github/GrumpyOldTroll/multicast-ingest-platform](https://github.com/GrumpyOldTroll/multicast-ingest-platform))
- DORMS/CBACC Integration with BW controller
 - Specific to your telemetry & controller
- Browser API
 - in progress, will take some time

This Year's Goals (for partners & ourselves)

- find out the actual cost to deploy
- make sure it's viable
- find the holes
 - patch the standards wherever needed
 - nail it down where it's solid

Practical For You?

- Have Multicast IPTV?
 - You might be over 50% done
- Delivered as multicast to in-home wifi devices?
 - You might be over 90% done
- Want to push off a BW upgrade within 5 years?
- Willing to give feedback?

Participation

Trials/POC this year? (Or just standards review & feedback!)

- Interested carriers and content owners, please contact:
 - jholland@akamai.com: Jake Holland (presenter, draft author)
 - jataylor@akamai.com: James Taylor (business director, DISRUPT project)
- 1-hour Architecture walkthrough
 - questions answered
 - AS-specific achievable-offload estimates (peak & typical)
 - ultimate (~3-5yr) target offloads: **50% peak, 20% typical overall** traffic
 - including popular downloads, popular VOD, popular live
 - further discussions as warranted