ATDECC Scaling to Large Networks (and helping with Engineered Networks)

Ashley Butterworth
Apple Inc.

AVDECC Today

- Works really well for small to medium sized plug and play networks
- Large and very large networks have issues with the amount of multicast traffic for device discovery.

Very Large Applications

- There are applications today where the network has
  - 10’s of thousands of streams
  - thousands to 10’s of thousands of devices providing those streams
- Theses applications are struggling with managing those vast amounts of stream sources and devices

Current approach

- Currently these types of applications are splitting their networks into multiple AVB domains by splitting into sub-nets and then using other means to route audio between the domains (i.e. having a listener on one domain send audio to a talker on another domain via an alternative [digital] interface)
  - This approach does not make connecting arbitrary streams from any device to any device possible

What are the problems?

- ADP is flood multicast (i.e. every device receives the notification)
  - With thousands of devices, a lot of time is spent processing and discarding these messages
- ACMP is flood multicast and doesn't cross boundaries
  - ACMP is limited to be within the multicast scope and will not cross a gateway/router to propagate in another domain.
- SRP has a limit on the number of streams that can be advertised

SRP Talker Available Packability

- SRP can advertise the most streams when attributes are packable
- Talker Available packability requires
  - Sequential stream IDs and Destination MAC Addresses
  - The same VLAN ID
  - The same Accumulated Latency

Proposed Solutions

- Add an option for unicast ADP
- Add an option for unicast ACMP
- Make native 1722 (non UDP) routable
  - Cross sub-nets
  - See next presentation
- Create a Controller to Controller protocol that allows a local controller in one domain to talk to the devices within that domain and share

How ADP works today

- After entity is booted and ready it starts sending out ADP Announce messages at 1/4 of it's valid_time (2 to 62 seconds) period.
- A controller that wants to know all of the entities currently available sends out an ADP Discover message which triggers every entity to send out their ADP Announce message
- All messages are multicast

Unicast ADP

- Add an option to unicast ADP.
- Default out of the box/factory reset behaviour is that an entity will use multicast
  - Allows device to be immediately discoverable for configuration by the controller
  - By defaulting to multicast the entity remains backwards compatible with older controllers

Unicast ADP (cont.)

- A control allows controller to configure the entity to use unicast addresses for ADP at which point it stops sending periodic announces on the multicast address and starts sending to a registered list of unicast addresses
- Entities no longer need to deal with as much multicast traffic however the Controller still needs to deal with same amount of traffic (but its a big box)

Unicast Directed ACMP

- Already on our list of work
- Allows the Controllers to be more in control of the communication path
- Will allow Controllers in separate domains to co-operate to establish connections to devices across domain boundaries.

Controller to Controller Protocol

- Need a way to have a Controller in each domain gather information about the state of it's domain and the forward that to a central Controller overseeing the entire network
- Existing proxy protocol may be enough but this just forwards every packet over the network to the central Controller

Controller to Controller Protocol

- Perhaps we need a protocol which will allow the local Controller to determine the state of the network exactly like a Controller would today but then share that state with the central Controller.

Engineered Networks

- Engineered networks typically know in advanced every device and stream that will be on the network. Dynamically adding and removing devices (other than for failures) is typically not done without explicit direction and setup by the user
- Typically the Controllers are one or two well known devices.

How does this help with Engineered Networks

- Unicast ADP will significantly reduce the amount of traffic that devices on the network see while still maintaining the “canary in the coal mine” indication that the entity is alive and capable of transmitting packets
- Controller to Controller protocol will allow distributed local Controllers to manage their own little domain while still providing the central Controller with the state of the network while also reducing the amount of traffic trunked back to the central Controller