Designing Media Networks for ST2110 based Live Production

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Architecture for Scale
Scale

• Absolutely vital to have clear objectives here 😊

• Think - initial deployment >>>>>>> anticipate future needs
• Plan for 25/50/100Gbe capability – 2.5x more dense than 40Gbe

• 400Gbe provides 4x capacity for massive scale

• Beware feature / scale creep
Scale – Rules of Thumb

- Sometimes easier to start with “SDI” scale
- Overlay this with physical constraints
- Average “full duplex” use?
- Average planned BW usage %?
- Average flow size – Audio/SD/HD/UHD?
- Are you thinking ST2110, or ST2022-6?

- BUT…. your SDI matrix size is about 5x what you think….

- 576^2
- Centralized model
- 60% full duplex
- Max 75% BW usage
- 80% 1080p50, 20% UHD
- ST2110

- 576 * (0.8 * 2 + 0.2 * 10) / (0.6 * 0.75)
- 4.6 Tbps total throughput
- 46x 100Gbe host facing ports.
Facility Geography

- Consider your workflows, how much BW is needed?
- Centralized, or more Campus like?
- Physical cabling lengths?
- Shared “virtual” facilities model?
- Resiliency – how much do you need?
- Think “failure domains”
  - Physical
  - Logical
  - Functional
Layer 2 vs Layer 3

- Widely used in small Data Centers, Campus, etc
- L2 networks typically deployed for audio installations
  - Simple
  - Low bit rate flows, undersubscribed networks
  - Some control systems use L2 scoped discovery techniques
  - MLAG provides scale, and spine resilience
  - Limited to 2 spines
  - Large failure domains
  - Routing in the spine
Layer 2 vs Layer 3

- **L2 does not suit Live Production, high bit rate multicast**
  - Flows originated in remote switches are flooded towards the querier
  - This potentially requires very large pipes!
  - Large failure domains
  - Limited scalability

- **L3 is the way to go**
  - “Switches” do routing these days & PIM allows multicast to be routed
  - Failure domains are now able to be much smaller
  - Flooding towards the querier is no longer required
  - Multiple Spines
Scale – tpc / METECHNO

- 500 Anc senders -> 1000 Anc receivers
- 750 Video Senders -> 2,300 Video receivers
- 13,000 Audio senders -> 24,000 Audio receivers

- 500Mbps Anc
- 104Gbps Audio
- 5.1Tbps Video (1080i50)

- Rising to 40Tbps Video (2160p50) in the future
Our Solution

- 4th floor West
- 3rd floor West
- 3rd floor East
- 2nd floor West
- 1st floor Central
- Ground floor Central
- Outside TC-Building
- Basement MDC

Network Diagram:

- DCS-7020TR-48-F Audio Leaf
- DCS-7050SX3-48YC12-F Video Leaf
- DCS-7508R-BND - Spine Switch with 5 line cards: DSC-7500R2-36CQ-LC

Legend:
- Green lines: 100GigE
- Blue lines: 10GigE
ST2110 Flow Orchestration

- **Media Control Service**
- **AMWA IS-06 API Endpoint**
- **ARISTA Media Control Service**
- **Logical Network – Topology / Capacity / Endpoints**

**SOURCES**:
- Media Endpoint 1
- Media Endpoint 2
- Media Endpoint 3
- Media Endpoint 4
- Media Endpoint 5
- Media Endpoint 6

**RECEIVERS**:
- S,G,B,input,output

**SPINE**
- Streaming Telemetry
- Visualisation
- Provisioning
- Change Control
- Snapshots

**LEAF**
- Streaming Telemetry
- Real-time Provisioning

**PARTNER APPLICATION**
- MCS API
- AMWA NetCtrl Compliant

**AMWA API ENDPOINT**
- S,G,B,input,output
PTP – Complex, but not Rocket Science
PTP Architecture

- Resilience, Resilience, Resilience
- Follow vendor recommended templates
- Design and test for all failure modes
- Build in constant monitoring
- BC’s add simplicity, scalability, security, visibility
- Boundary Clocks aid security and debug
- Beware Management Messages
- If you can’t avoid PTPv1, try to keep it in its own PTPv1 network.
Monitoring – A First Class Citizen
Day one – standup tools

Make your life as easy as possible:

• Zero Touch Config
• DHCP
• Script your configs
• Name your switches
• Enable LLDP
• Provide port / vlan descriptions
• Turn on SNMP and SysLog
On Switch Tools

- Bash, tcpdump, scp
- MAC / ARP Tables
- Snooping Tables
- Routing / mRoute tables
- Mirror (to CPU)
- sFlow
- ACL counters
- PTP counters
Day 2 – ongoing monitoring

Transparency and Visibility

- Plan it in!
- SNMP, sFlow, Syslog, Telemetry
- Port Mirroring, Optical tapping
- Broadcast specific monitoring tools
- Network Management tools
Lessons Learned

• Use the power of COTS, and Cloud Architectures
• Make sure your team is cross-functional
  - If you don’t have the in-house skills:
    ➪ Use POC’s and Labs as learning opportunities (tpc Truck)
    ➪ Bring in an experienced SI or
    ➪ Engage AS/PS from the network vendor
    ➪ Use the process to build your skills
• Treat Telemetry, Monitoring and Visibility as a 1\textsuperscript{st} class citizen
  - Build it in from the beginning
  - You’ll benefit straight away
Thankyou
Q&A
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