 Reliable Transport of Audio and Data Over IP

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Featuring
GatesAir’s
Keyur Parikh
Director, Intraplex
Reliable Transport of Audio and Data Over IP

Keyur Parikh
Agenda

- Transport reliability
  - Review causes of packet losses
  - Review of media transport protocols
  - IP Link’s methods for reliable IP transport for audio, FM MPX and control (GPIO, PAD)
- Network security
- Introducing Intraplex® IPConnect
Causes of Packet Losses

- **Jitter**: Variation in inter arrival time of a packet. Caused by queueing in network nodes.

  - **Solution**: Use Static or Dynamically sized De-Jitter buffer

- Various causes: link fades, route changes, congestion etc..
  - **Patterns varies based on network quality - private Vs public**
  - **Solution**: Several - depending on the pattern of losses
Media Transport Protocols

- **TCP**
  - Consumer streaming applications
  - Point to Point only, much higher playout delay, requires full duplex connection. Relies on retransmission of lost segments
  - Not suitable for broadcast application – no support for Multicast.
  - SHOUTcast/Icecast, RTMP, HLS, MPEG-DASH

- **RTP over UDP**
  - Broadcast application: 24/7 streams Vs on-demand
  - Most commonly used protocols for transport of VoIP, Audio and Video over IP. Standardized by both SMPTE and EBU for Audio and Video
  - Playout delay is controllable
  - Works with uni-directional network and Multicast
  - No retransmission of lost packets. Recovered outside of standard RTP/UDP protocol

- **IP Link uses RTP/UDP as the main streaming protocol for Audio, MPX and PAD data transport**
Packet Loss Recovery Techniques

• RTP level Forward Error Correction (FEC). Parity packets are used to recover lost packets. Very effective for Random/isolated pattern of losses

• Stream Splicing – uses duplicate packets sent with time or network diversity. Very effective for burst packet losses. IP Link can use up to 3 network connections.

• Combination of FEC + Stream Splicing provides a scalable method for different network conditions

Random/isolated losses

Burst losses

Use Intraplex LiveLook to analyze the patterns of losses
Packet Loss Protection – 1 WAN Network

- Multiple streams (up to 12) in a group with programmable time delay. Very effective for burst packet losses
- Time delay value can be recommended by LiveLook
- FEC can be added to any stream for added protection
- Falls back to local audio source (USB, local feed)
Grouped streams sent across diverse network paths.
Scalable protection: group of streams consisting of time diversity, network diversity and FEC
“Hitless” operation as long as one network is available
USB or local source as backup source
Main and Backup Networks

- Send high fidelity stream over main path (e.g. high speed microwave) as primary
- Send compressed stream from the same or different encoder, or an Internet server as a backup source
- Backup stream can be always ON or turned ON when required – useful for using LTE/Cellular as backup
- Failover criteria: Network loss at receiver, AES signal or silence at the encoder
Network Reliability Use Case - NPR

Capabilities used:
- 3 network ports to securely isolate networks
- Streaming splicing with 2 different ISPs
- Decoder at the hub site failover to backup site
- Reliable transport of GPIO and PAD, aligned to audio frame
Network Security

- Common threats: hacking and misconfiguring system, DoS, wrong content on the air
- Leaving the default password has been the most common mistake
- IP Link forces the user to change the password out of the box
- IP Link’s 3 network ports will physically isolate trusted from untrusted networks
- IP Link’s layer 3 and layer 4 firewall capability restricts traffic based on source IP and type of traffic
- Support of secure Web (SSL) and SNMP (v3)
- 2-factor web authentication – password and answer to secret question to protect against user account hacking
- Smart web cookies to track if a user session has been hijacked by another computer
- RTP stream authentication to ensure that the stream is coming from the approved encoder
IP Link: Internal Data Flow

IP Link

- Encoding, Signal Processing
- Payload Format
- Reliable IP Transport
- Firewall

External IP Data

LAN

Network 1
Network 2
Network 3

Analog, AES Audio, FM MPX, GPIO, RS-232

Transport
Transmit Television
Transmit Radio
• Integrated IP Gateway software to reliably transport external IP datagrams
• Leverages IP Links network reliability and security capabilities
• Included on all models of IP Links (100, 100p, 200, MPX)
IPConnect

- Encapsulates local IP traffic
- Bridges Local IP traffic across WANs
- Application agnostic. Transports E2X, Web, SNMP traffic across STL. Future platform will increase capacity to transport video
- Provides specialized gateway functions typically not found on commodity routers
IPConnect: Replicate & Translate

- Point-to Multipoint for Unicast packets. Deliver a unicast packet to multiple destinations.
- E.g.: SNMP command can be sent to multiple devices at the same time
IPConnect: Network Relay

- Network relay overcomes IP connectivity between Studio and Site B
- Site A can output audio and IP data and relays the stream to site B
- IP Data at site B can be output with IP address translation
**IPConnect: Multicast ↔ Unicast**

- Encapsulate local Multicast or Broadcast traffic (e.g. E2X) in to outgoing Unicast RTP streams - overcome lack of Multicast support in WAN
Thank You!

Keyur Parikh
Director, Intraplex Business Unit