Agenda

➢ Reliable Internet Transport Protocols
➢ Q&A
➢ Lucky Draw
Reliable Internet Transport Protocols

AVW Broadcast
Contents

➢ Why should we use Internet Distribution?

➢ Reliable Internet Transport Protocol Overview

➢ SRT/RIST/Zixi Working Principle

➢ Relative Products
Why should we use Internet Distribution?
Typical Broadcast Methods

• **Satellite Distribution**
  – DVB-S/S2/S2X
  – CAM/Smart Card based Encryption

• **Pros**
  – High availability, even remote locations
  – Bandwidth exceeding 80Mbps

• **Cons**
  – Putting stuff in space is expensive!
  – Can be effected by weather, sun spots etc.
Typical Broadcast Methods

• Fiber Distribution
  – Leased Fiber, Dark Fiber

• Pros
  – High reliability
  – Low Latency
  – Bandwidth to 100Gbps+

• Cons
  – High cost to deploy and/or lease
  – Only available if infrastructure is present
Distributing Content Over the Internet

- Broadband is easy to find!
  - Diversity in the market (cable, DSL, cellular)
  - Competition driving down costs, increasing bandwidth
- Consumer cable and wireless networks capable of 100Mbps+
- Higher compression = less bandwidth
Challenges of Delivery

• **Packet loss, Corruption or Out of Order**
  – Packet retransmission
  – Reordering

• **Jitter or Packet Pacing**
  – Input buffers
  – Output buffers

• **Latency**
  – Buffers increase latency
  – Congestion on regional or local networks
Reliable Internet Transport Protocols

Overview
What is reliable internet transport?

• Technologies used to transport live video and audio over the open internet
• Quickly growing method of transport in all tiers of broadcast
• "Household" names such as Zixi, LTN and VideoFlow

• Open source alternatives creating new opportunities
How is Internet Transport being used?

• Alternative to traditional transport methods
  – MPLS Networks
  – Satellite
  – Leased Fiber Links

• Backup to primary transport methods
  – Backup paths should be inexpensive

• Inexpensive transport of non-”must carry” services

• Emerging transport method for distribution
Use Cases

- Point-to-Point Contribution
- Low-cost distribution over Internet
- Backup to primary distribution link
- Collection
- Hub and spoke
- Many edge devices transmitting to central aggregation site over Internet
Major Players

- ZiXi Platform
  - Receive pay-per-use licensing
- Zixi Feeder/Receiver devices tested with Sencore MRD products

- LTN SmartCloud delivery service
  - Pay-per-use licensing
- LTN appliances tested with Sencore MRD products

- DVP (Digital Video Protection)
- VideoFlow Protector/Sentinel gateway products tested with Sencore MRD and Wellav products

- Caton R2TP streaming platform
  - R2TP on MRD4400/5800 is under development

- Secure Reliable Transport
  - Founded by Haivision
  - Sencore is a member of the SRT Alliance

- Reliable Internet Stream Transport
  - In progress by VSF activity group
    - Predicted draft by end of 2018
  - Sencore is a participant in the RIST activity group
SRT/RIST/Zixi

Working Principle
SRT Introduction

- **Secure Reliable Transport**
- Developed by Haivision and Wowza
- Announced as open source at NAB 2017
- SRT Alliance
  - Group of 100 vendors
SRT – How does it work?

• Bidirectional UDP data stream
  – One flow containing control info and data stream
• Control information used as negation and “keep alive”
• Data stream is SRT packaged transport stream
SRT UDP Stream Structure

- **Transport stream as RTP with FEC**
  - Uni-directional stream
  - Single IP Address with multiple ports
  - FEC data on +2 and +4 port

- **Transport Stream as SRT**
  - Bi-directional UDP stream
  - Control data contained in UDP header
  - Single IP address with single port
SRT Packet Recovery Method

• Burst transmission replaces packets
• Bandwidth Overhead enables burst transmission
Calculating Latency and Bandwidth

- Round Trip Time or RTT (ms)
- Packet Loss Rate (%)
  - Sustained Packet Loss
  - Burst Packet Loss

<table>
<thead>
<tr>
<th>Worst Case Loss Rate (%)</th>
<th>RTT Multiplier</th>
<th>Bandwidth Overhead (%)</th>
<th>Minimum SRT Latency (for RTT &lt;= 20 ms)</th>
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<tbody>
<tr>
<td>&lt;= 1</td>
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<td>20</td>
<td>100</td>
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<tr>
<td>&lt;= 10</td>
<td>6</td>
<td>17</td>
<td>120</td>
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</table>
Encryption over open internet

• SRT protocol natively supports AES encryption
  – AES-128 and AES-256 fixed key
• Encryption does not add to Bandwidth Overhead
• Encryption does add to stream processing
SRT and Firewalls

- **Network Address Translation (NAT)**
  - Translate external IP to internal IP

- **Rendezvous Mode for firewall tunneling**
  - Stateful firewalls “connection tracking”
  - UDP control data originating within firewall are passed
RIST Introduction

• **Rliable Internet Stream Transport**
  – Joint effort between industry vendors
  – Submitted to VSF as TR-06

• Built upon current SMPTE standards and IETF RFCs

• Intended to be backwards compatible
RIST – How does it work?

• Baseline Protocol is RTP
  – Media with existing RTP standards will use same header fields
  – SMPTE 2022-1/2 for transport streams
• Feedback/control messages use RTCP (IETF RFC 3550)
  – Keep alive and mechanism to recover from packet loss
RIST Stream Structure

• RTP packaged transport stream
  – Uni-directional stream
    • Unicast or multicast
  – SMPTE 2022-2

• Forward Error Correction
  – Port N+2 and N+4
  – SMPTE 2022-1

• RTCP
  – Packet retransmission request
  – Keep alive
  – Port N+1
  – RFC 3550
RTCP Function in RIST

• RIST Senders
  – Sender Report (SR) packets
  – Source Description (SDES) Packets with CNAME field

• RIST Receivers
  – Receiver Report (RR) packets
  – Source Description (SDES) packets with CNAME Field
  – NACK Packet
RIST and Firewalls

• Bidirectional RTCP data can tunnel firewalls
  – Stateful firewalls “connection tracking”
  – UDP control data originating within firewall are passed
• Firewall rules for RTP, FEC?
Zixi Introduction

• A proprietary reliable internet transport protocol
  – Developed by Zixi and exists for more than 10 years
  – Focus on perfecting the IP video delivery

• Establish an ecosystem with 100+ partners and OEMs

• High quality, low latency and reliable video delivery over IP
Zixi – How does it work?

• An application protocol over UDP for reliable internet transport
  – Point to point/multi-point transmission
  – Cloud-based deployment
  – ZEN Master control plane and software platform

• Transmission and Error Correction
  – Unicast, Protected Multicast, Zixi ABR, OTT ABR
  – SMPTE 2022-1 FEC, Zixi Congestion Aware FEC, Zixi ARQ

• Encryption and Latency
  – DTLS or AES encryption
  – Low latency HLS, User Defined Latency in Zixi Protocol
Zixi Enabled Network

• Broadcast Quality Video Delivery over IP (Securely, Low Latency, Any Distance)
• Zixi protocol embedded to Encoder, Decoder and Media Gateway
• High interoperable due to 100+ partners and OEMs
The Zixi Platform

- A flexible broadcast-quality IP video delivery platform
- Low predictable latency, superior reliability and no packet loss
- Deployed on cloud, server or hybrid with analytics function
Zixi and Firewalls

- Zixi stream can tunnel firewalls
  - NAT is used to translate external IP to internal IP address
  - Data and FEC stream can pass through the firewall
Relative Products
DMG 7000 – Software Media Gateway

• SRT/Zixi to MPEG/IP Gateway
  – Receive and Transmit SRT/Zixi over open internet
  – MPEG/IP <-> SRT/Zixi encap/de-encap
  – Single source to multiple destinations

• Flexible form factors
  – Small form factor for single channel
  – 1RU servers for up to 32 channels

• RIST support planned for 2019/2020
# DMG7000 Part Numbers

## Software Part Numbers

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
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<tr>
<td>DMG 7000</td>
<td>DMG 7000 Base Software License</td>
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<tr>
<td>DMG 70701</td>
<td>SRT Protocol License, per unit</td>
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<tr>
<td>DMG 70702</td>
<td>ZiXi Protocol License, per unit</td>
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<tr>
<td>DMG 70703</td>
<td>RIST Protocol License, per unit</td>
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<tr>
<td>DMG 70991</td>
<td>Gateway License</td>
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## Hardware Part Numbers

<table>
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<th>Part Number</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>DMG 70010</td>
<td>DMG 70010 Mini Unit (Base Software, MPEG/IP, 1x Gateway License)</td>
</tr>
<tr>
<td>DMG 70020</td>
<td>DMG 70020 Field Unit (Base Software, MPEG/IP, 8x Gateway Licenses)</td>
</tr>
<tr>
<td>DMG 70030</td>
<td>DMG 70030 Headend Unit (Base Software, MPEG/IP, 32x Gateway Licenses)</td>
</tr>
</tbody>
</table>
MRD7000 H.264/HEVC 4K Decoder

- SRT to 4*3G SDI/12G SDI/HDMI2.0/SMPTE2110
  - Receive SRT over open internet
  - H.265/HEVC Decoding and SMPTE2110 Encapsulation
- Flexible and powerful
  - 1RU chassis for 1*UHD or 4*FHD
  - Scalable SW-based decoder
- RIST and ZiXi support planned for 2019/2020
MRD4400/5800 HD/UHD Receiver/Decoder

• R2TP to 3G-SDI/SDI/HDMI/CVBS Decoder
  – Receive SRT over open internet
  – HEVC, H.264, MPEG2 HD or SD video decoding

• Flexible and powerful
  – Support all common signal source (DVB-C/T/T2/S/S2/8VSB/IP)
  – Support 3G-SDI, 4:2:2 and up to 8 audio channel output (MRD5800)
  – Support HD/SD SDI, 4:2:0 and up to 4 audio channel output (MRD4400)
  – Fully complement of ancillary data in ANC and VBI
THANK YOU

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