INTRAPLEX PRODUCTS

AUDIO CONTRIBUTION AND DISTRIBUTION
Intraplex® Products

Audio encoding and IP transport solution for Studio to Transmitter Link (STL) and Studio to Studio Link (SSL) applications

**Intraplex® IPConnect**

Reliable IP Gateway

**IP Link 100 /100P*/200*/200A**

Audio, Digital FM MPX Over IP

**IP Link MPXp**

Analog & Digital FM MPX Over IP
- **1.64 Mbps** for AES 192

**Ascent**

8-16 channels AoIP platform. Supports AES3, Analog and AES67 channels. Support SRT protocol with encryption

**LiveLook**

Real-time network performance monitoring

**T1/E1 and IP Multiplexer**

- Voice, Data, Program Audio Mux
- CM30 card replaces CM5 (T1) or CM7 (E1)
- CM30 provides an easy transition from TDM to IP

**HD Link – 950 MHz STL**

- 5 Watts of power
- Redundant IP Path
- LDPC channel coding
IP LINK CODEC FAMILY
IP Link Codec Family

- 1 full duplex stereo channel
- 16 – 48 Khz Audio, AES 192 (Digital MPX)
- 100p add display and GPS timing

- 2 full duplex stereo channels
- 16 – 48 Khz Audio, AES 192 (Digital MPX)
- 200A replaces 2nd channel with AES67 (AoIP)

- Point to Multipoint with 12 unicast and multicast stream
- DSP based Coding Algorithms: AAC (LC, HE, HEv2, ELD), MPEG (II, III), Opus, G722, Linear, E-aptX
- All models support AES67 input source. IPL 200A supports AES67 output with native PTP
- Internal and external GPS timing for SFN and MFN (expect IP Link 100)
IP Link Connectors

- **Channel 1 Input/Output, Analog/Digital**

- **Channel 2 Input/Output, Analog/Digital**

- Studio Hub connectors

- 200A has Ethernet

- Symmetric 100 Mbps network ports, USB

- 8 GPI, 8 GPO

- 3 Ports for RDS

- Input/Output of 10 Mhz, 1PPS

- GPS Antenna for internal receiver

- Ext 12V or -48V supply
IP Link MPXp

- Single Channel, Full-Duplex FM MPX or Linear audio codec
- Dual domain – supports Analog and Digital MPX simultaneously
- Same platform features as IP Link audio codec, including GPS timing for SynchroCast

GatesAir In/Out: AES 192 or 32 & 48 Khz L&R
Redundant Analog MPX inputs
2 active Analog MPX outputs
3 symmetric 100 Mbps network ports, USB
RDS/SCA input for mixing on output
8 GPI, 8 GPO
80-480V supply
Ext 12V or -48V supply
Input/Output of 10 Mhz, 1PPS
GPS Antenna for internal receiver

• Single Channel, Full-Duplex FM MPX or Linear audio codec
• Dual domain – supports Analog and Digital MPX simultaneously
• Same platform features as IP Link audio codec, including GPS timing for SynchroCast
Minimum MPX bandwidth requirement is **1.64 Mbs** – lowest among any vendor
IP Link FM MPX Summary

**IP Link 100/100p/200/200A**
- Only supports **Digital** MPX (AES 192)
- Minimum FM MPX Bandwidth: **3.2 Mbps**
- Fall back and return audio options: uncompressed and **compressed** audio
- IPL 200 provides capability to transport 2 different MPX streams

**IP Link MPXp**
- Supports **Analog** and **Digital** MPX interface
- Minimum FM MPX bandwidth: **1.64 Mbps**
- Allows mixing in local RDS at the decoder
- Provides **redundancy** for input and output
- Fall back and return audio options: uncompressed audio
IP Link Key Capabilities

- **Network Reliability/Security**
  - 3 network ports
  - Hitless packet recovery using Stream Splicing technology (Combination of FEC and duplicate Time/Network diversity streams)
  - Source switching at decoder (automatic or manual switching between 3 sources)
  - Built-in firewall with packet authentication
  - Reliability and alignment for GPIO and PAD data

- **IPConnect - IP Gateway**
  - Provides reliable tunneling of external IP data packets
  - Use cases: HD Radio (E2X), EDI

- **Single Frequency Network / Content Sync**
  - SynchroCast® - Patented technology to provide precision delay (1 usec) of audio at all times
  - Content Sync (New!!) – New feature key to enable content sync within 1 msec across Multi-Frequency Network.
- Two networks ports are used for Stream Splicing across WANs, the 3rd port is connected to LAN
- Stream Splicing provides “hitless” protection for Audio and FM-MPX signals
- IPConnect uses Stream Splicing to provide “hitless” protection for E2X, EDI or any IP traffic
Source Switching at Decoder

- Automatic or commanded switching between Primary, Secondary and backup at the decoder
- Secondary or Backup network can be on-demand LTE connection, typically public internet or 950 MHz RF STL.
- Works with Audio, FM-MPX and IPConnect streams
Other Integrated Features

- **Multi-encoding** – channel content can be encoded simultaneously with different formats. Primary use case: Main / Backup network switchover
- **Icecast / ShoutCast** transmit and receive
  - Automation interface support (Audio vault, Enco)
- **EBU R128** for Audio Leveling and Loudness
- **Dynamic Initiator** - Automatic connection setup for NAT traversal
- Internal and external alarm logging via SysLog and SNMPv3 traps
- 1+1 and N+1 redundancy
Upcoming IP Link Products – IP Link 100e

- AoIP Plug-in card for Flexiva
- **Full duplex**: AES3 input and output
- **AoIP Formats**: Linear, Compressed, AES67 and Icecast
- **Three GigE** Network ports for reliability and security
- **Reliability**:
  - Stream Splicing, **Primary, Secondary and Backup** audio source switching
  - Supports Secure Reliable Transport (SRT) with encryption for security
  - USB playlist as backup

- 4 In/out GPIO. RS-232 port
Upcoming – IP Link 100c

- Compact half RU hardware
- **Full duplex**: AES3 input and output
- Optional: Mic level input
- **AoIP formats**: Linear, Compressed, AES67 and Icecast
- **Three GigE** Network ports for reliability and security
- **Reliability**:
  - Stream Splicing, Primary, Secondary and Backup audio source switching
  - Supports Secure Reliable Transport (SRT) with encryption for security
  - USB playlist as backup
  - 4 In/out GPIO, RS-232 port
Ascent Overview

- Multi-channel Audio Over IP codec supporting 8 to 16 stereo channels
- Built on the technology foundation of Intraplex IP Link codec platform. Same Web look and feel
- Interoperable with IP Link codecs
- Software platform: Ubuntu Linux Server (16.04)
- Hardware: Intel i7-4 Core CPU
- Release 1 is now available
Ascent Connections

2 PCIe slots to hold up to 2 8-channel AES3/Analog cards. Each Card has 16 GPI and 4 GPO contact closures.

4 GigE Network Ports.
Typical Deployment Scenarios

- Studio to Studio application
  - Encode and transport of audio channels across studios
  - **Use Case:** Sirius XM will be deploying Ascent across 4 major studio to encode and transport 16 stereo channels

- Distribution
  - Ascent at the head-end feeding to IP Link codecs at transmitter sites or remote studios
  - **Use Case:** Wisconsin Public Radio. 5 Ascent servers at various head-end sites, will feed to 40 IP Link 200 codecs at remote studios and transmitter sites.

- Contribution
  - Ascent at the head-end receiving audio from IP Link codecs
# Ascent - Release 1 Key Specifications

## Audio I/O
- **AES3/Analog** audio with integrated 8-stereo channel audio card (Audio Science). Also works with standard Linux USB audio (ALSA)
- **AES67** input and output
- Sample rates: 32, 44.1, 48 KHz
- **GPIO** (16 In, 4 Out per card). Additional using external Dataprobe
- Combination of **16** stereo encode or decode channels
- Codecs: Uncompressed, AAC-LC, AAC-HE, AAC-HEv2, AAC-xHE, Opus, MPEG II and III
- Multi-coding

## Streaming
- RTP and **SRT (with 128/256 encryption)**
- Up to **150** RTP streams per server
- **64** SRT streams per server
- Dynamic Stream Splicing with RTP and SRT
- FEC (IP Link compatible)
- Primary, Secondary and Backup sources at output channel
- Compatible payload format with IP Link codecs
- LiveLook support for monitoring

## Platform
- **HTTP/HTTPS** – same look and feel as IP Link
- Multiple user accounts and access levels
- SNMPv3
- Front Panel Display
- 4 network ports, with ACL
- Hardened USB ports
- Field upgradable
- Extensible licensing capability
Ascent Media Gateway
- Similar capabilities as IPConnect. Will support point to multi-point high bit-rate media, including ATC3 streams

1+1 Redundancy
Email Notification
Icecast streaming
Hardware: **Ascent PLUS**
- 2 RU
- Redundant power supply – Hot Swappable
- Redundant fans
- 4 PCIe slots to support up to 32 – stereo channels

Release 1.1 – July 2020
HD LINK
HD Link – 950 (932 to 960) MHz Digital STL System

- Configurable modulation from 32 to 256 QAM and 5 watts of power
- 200, 300, 500 KHz bandwidth configuration
- Flexible service configuration between audio and Ethernet bandwidth.
- “IP Only” mode without any built-in audio cards, entire modem capacity is allocated to Ethernet service
- 2 Ethernet ports, one of the ports can be configured for backup IP path, in case RF path fails

HD Link supports up to 2 stereo channels, 2 G722 mono channels and Ethernet traffic.
All-IP mode of HD Link

Advantages:
- Allows “hitless” protection using DSS
- Enables transport of **Audio** and **FM MPX** signals
- Up to **16 stereo signals** (using Ascent) can be transported
- Network 2 can be low speed, IP Link can send low fidelity backup stream
- Backup stream can be on-demand for LTE-Backup

<table>
<thead>
<tr>
<th>Modulation</th>
<th>Bandwidth</th>
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<tbody>
<tr>
<td>500 Khz</td>
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<tr>
<td>256 QAM</td>
<td>2.8</td>
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<tr>
<td>128 QAM</td>
<td>2.4</td>
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<td>64 QAM</td>
<td>2.0</td>
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<tr>
<td>32 QAM</td>
<td>2.0</td>
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Connecting - Analog and HD using AES3–Method 1
Connecting - Analog and HD using AES3–Method 2
Connecting - Analog and HD using MPX