ZeeVee IP Streaming Function Usage Application Note

1. ZeeVee IP Stream Function

1.1. Description

ZeeVee now provides IP streaming output from certain models of encoder/modulator products in addition to the traditional RF QAM output.

The initial offerings are versions of the ZvPro products specifically labeled as IP-capable.

1.2. IP Stream Characteristics

ZeeVee units output MPEG2 IP streams at whatever video resolution arrives on the input port.

For example, if an HDMI source is connected at 720p60, the resulting stream will be output at 720p60.

The same stream is output over the IP interface as the Coax QAM interface.

As such, the bandwidth is very high for Ethernet, as the emphasis is on quality, not bandwidth efficiency. Typically a 1080 stream without any modifications to the stream parameters will be around 20Mbps.

2. IP Stream Usage from ZeeVee Products

The IP stream generated by the ZeeVee encoder modulator products is an exact copy of the broadcast-grade transport stream output over the RF port(s).

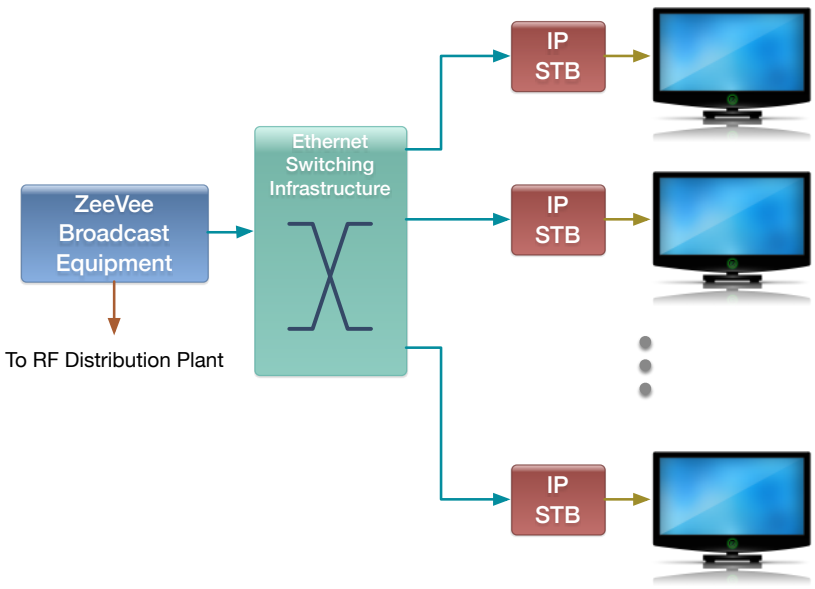
As such, it is formatted as MPEG-2 and the bandwidth is quite high (for Ethernet). Consideration and care must be paid to the deployment so as to not overwhelm the Ethernet switching infrastructure to which the IP stream is sent.

The IP stream offered by the current generation ZeeVee products is appropriate for bulk distribution of high quality video over switching infrastructures specifically tailored to handle the bandwidth.

It is NOT intended for general Internet distribution and will quickly overwhelm Internet infrastructures. Additionally, unless the scope of WiFi distribution is managed correctly and sparingly, the distribution of the ZeeVee IP stream will also overwhelm most Ethernet WiFi distribution schemes.

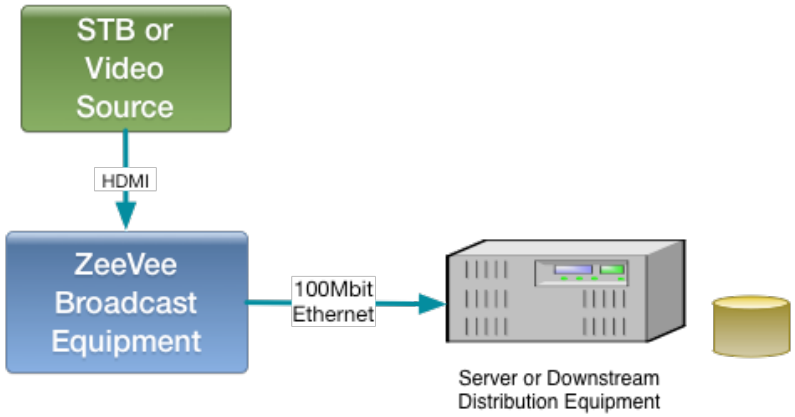
2.1. Expected Usage – Local Distribution

Ideally the ZeeVee IP stream will be used in a captive, wired, Ethernet switching infrastructure that is fully IGMP-enabled (explained later).



2.2. Expected Usage – Translator

A number of “captive” applications are simply using the ZeeVee IP encoder/modulators as appliances to translate video to IP for use in intelligent equipment that does further processing, but expects an MPEG data stream instead of raw video.

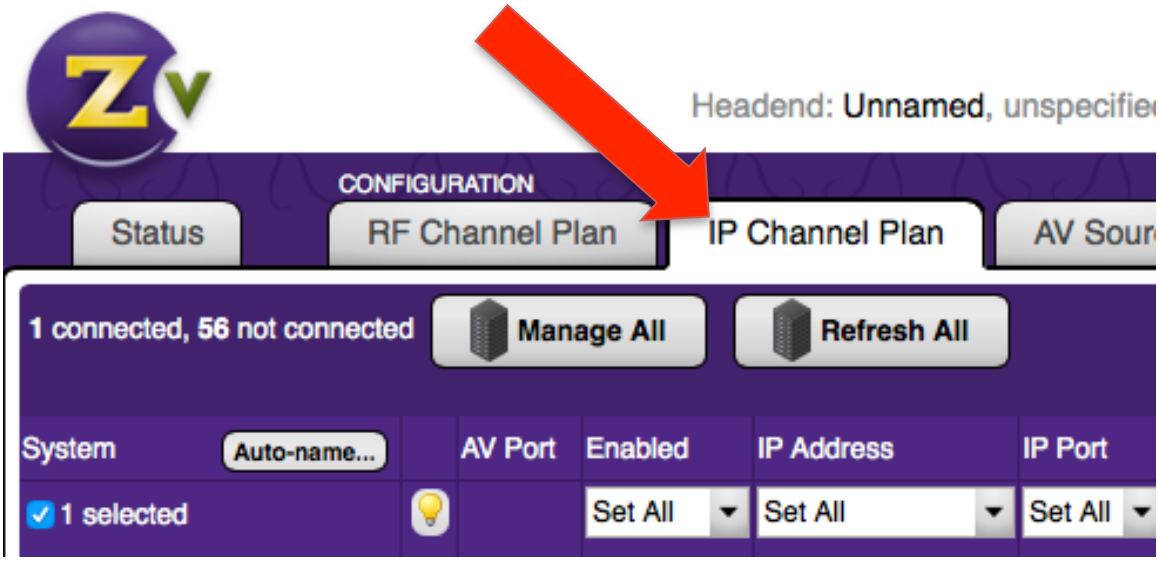


2.3. IP Stream Characteristics

- RJ-45 10/100Mb Ethernet connection
- UDP Unicast or Multicast, IPV4
- User Programmable Destination Address/Port
- Source IP address via DHCP or set by user
- MPEG2 HD: ISO13818-2 MainProfile@HighLevel
- Traffic Shaping: Variable Bit Rate
- Video Encoding Data Rates Variable, 10 Mbs - 24 Mbs per channel
- Average Encoding Data Rate 18 Mbs per channel
- Encoding Latency Programmable 200 msec to 400 msec
- Color Profile 4:2:0
- GOP Size 15
- Encoder Audio Profile ATSC A/52, Dolby® Digital (AC-3)

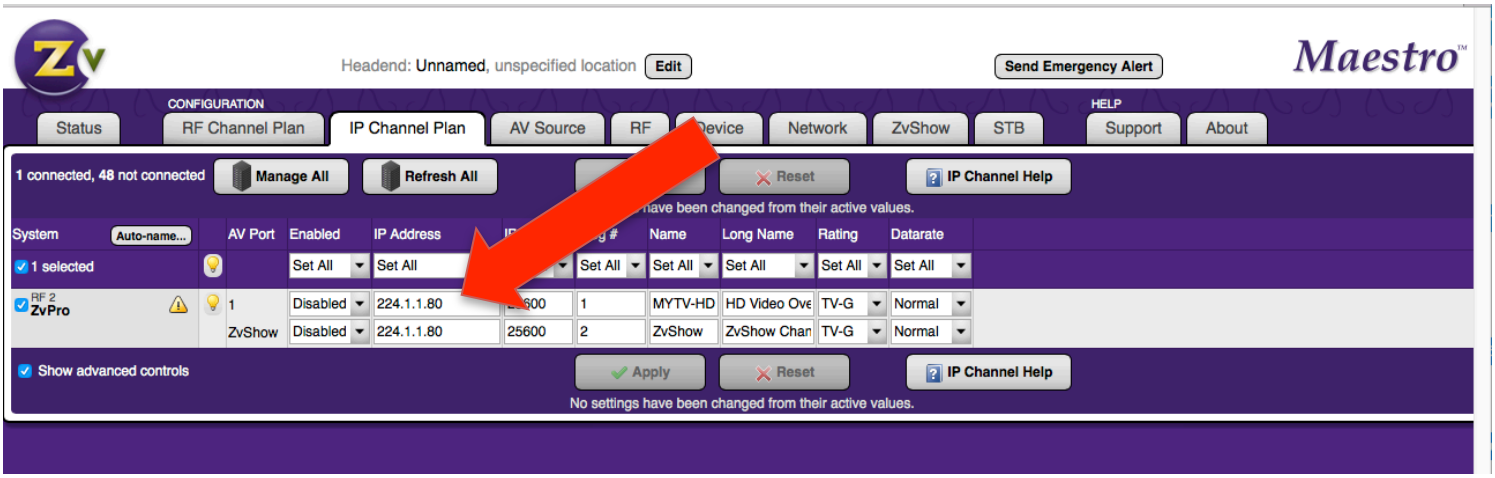
3. Configuration and Control

The ZeeVee product can be configured to output either UDP unicast or UDP multicast IP streams.



Navigate to the IP Channel Plan page in Maestro for the ZeeVee product being controlled. In this case it is a ZvPro810i-NA

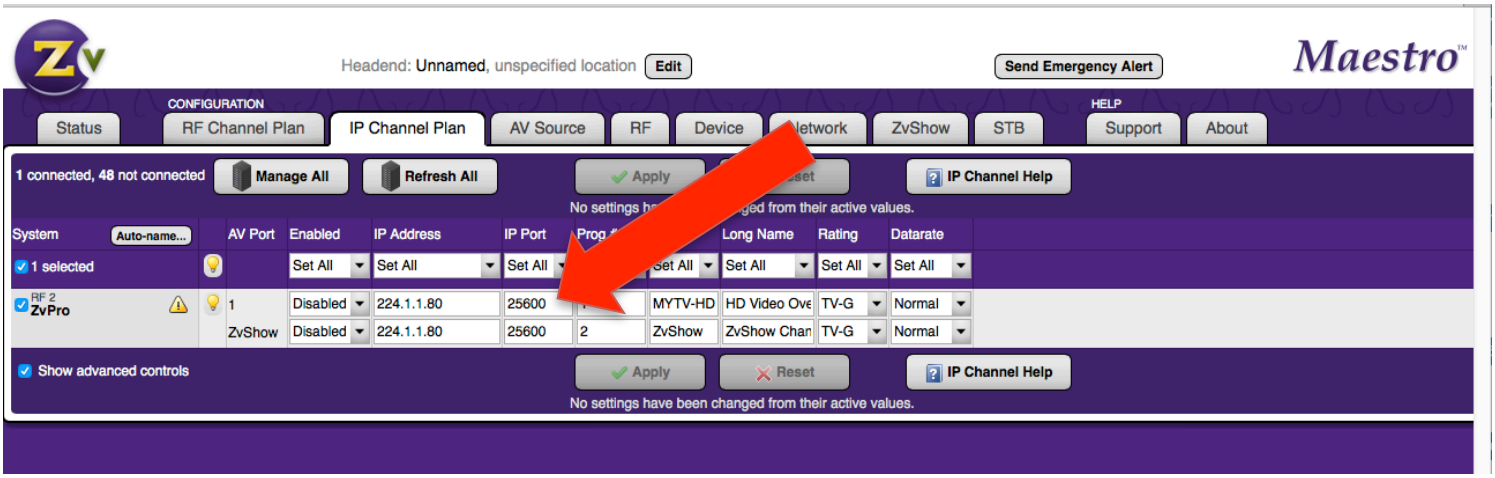
STEP1: Set the Destination Address for where to direct the stream. It can be a valid IP multicast address, in which case any endpoint registered with that multicast can receive the stream. If a valid unicast address is entered, only that specifically addressed endpoint will see the stream.



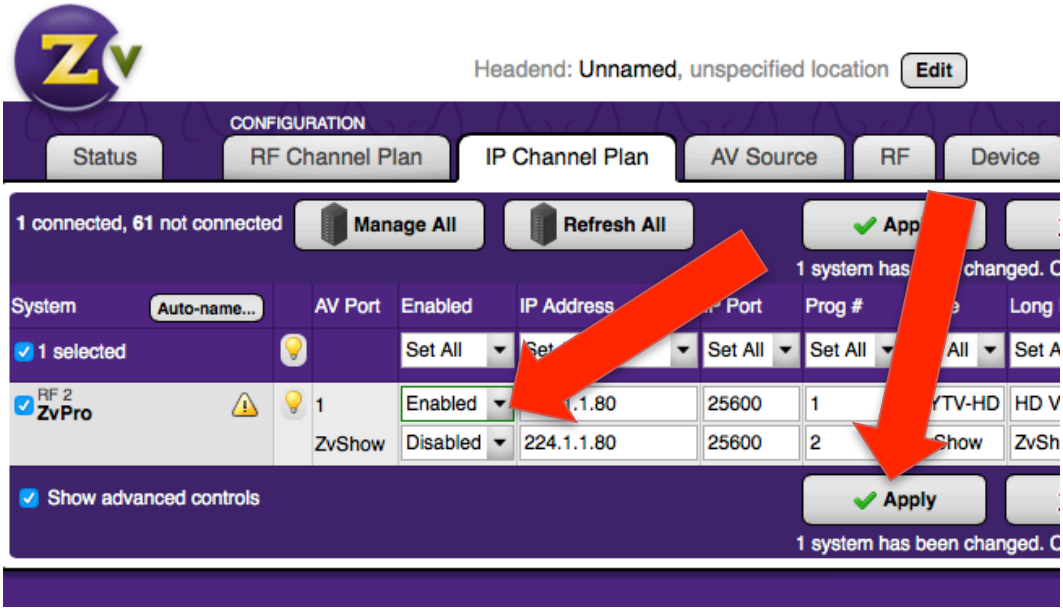
Each unique ZeeVee encoder/modulator IP stream on the Ethernet network should have a unique multicast address.

STEP2: Set the IP port number for the stream to be sent. This must be a valid IP port number and must NOT CONFLICT with well-known IP protocols that exist on the wire. Selection of an appropriate IP port is the task of the IT administrator on the destination network.

All ZeeVee units sending traffic into a particular network should have a common port number to ease the “re-tuning” of a receiving device.



STEP3: Enable the IP stream function and APPLY the changes. Note that Maestro does not effect the changes indicated on a form until the APPLY button is hit.



At his point the ZeeVee encoder/modulator will be sending the specified IP stream to its Ethernet interface.

4. Deployment Considerations

To receive and display an IP stream, a suitable device must be present on the Ethernet network. Common devices are:

- **IP Set Top Box** – like a Cable Set Top Box, this device registers and receives an IP transport stream, and renders it to a video port which is attached to a display.

- **Computer or Server** - If secondary processing of the stream is desired, the stream can be sent to a server or servers. In this case UDP unicast addressing is typically used to avoid congestion issues on the Ethernet network

- **PC or Laptop** – With suitable display software, the IP stream can be received and rendered on a computer. The open-source program VLC is commonly used.

4.1. Client Consideration

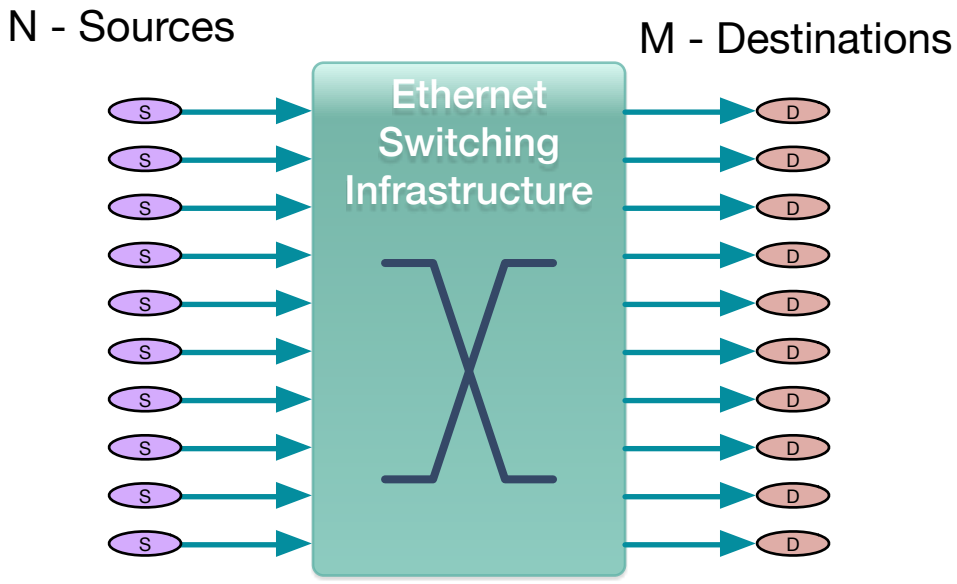
Whatever client is being utilized should be capable of IGMP participation if distributing IP video using UDP multicast addressing.

IGMP (Internet Group Management Protocol) is a means by which client devices communicate to intelligent Ethernet switches to indicate their interest in specific multicast traffic. IGMP-aware switches will only forward the multicast traffic for which an attached device has expressed an interest, and not ALL the multicast traffic.

That way bandwidth can be controlled.

4.2. Ethernet Switch Consideration

A single ZeeVee IP stream can be 24Mbits/second. 3 streams on a single 100Mbit segment can saturate that link. Less than or equal to 2-streams per link is recommended. This pertains to both the sending side and the receiving side.

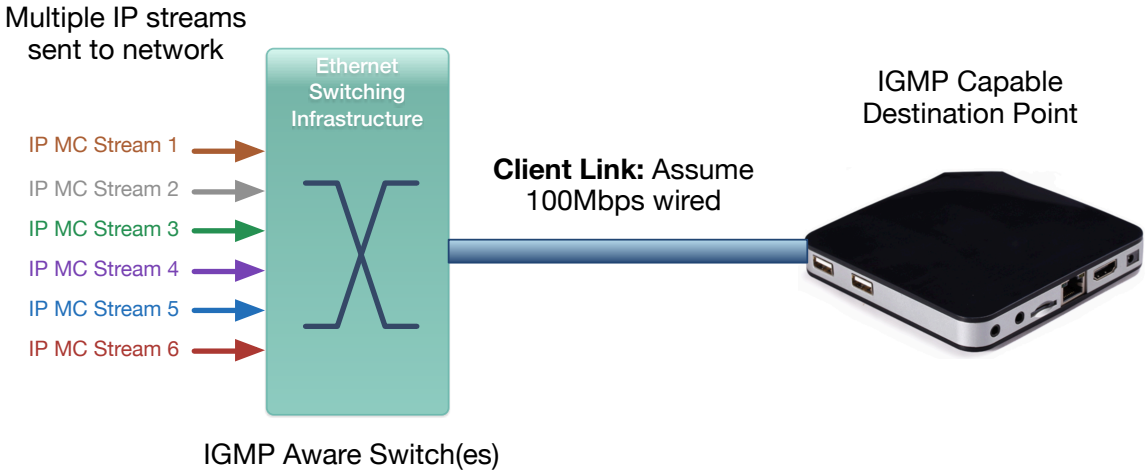


There is effectively no limit to the number of sources and destinations that can be added to a switched Ethernet network providing:

1. The switches, or mesh or switches, is fully non-blocking
2. The switches are IGMP aware and responsive
3. The Destination devices participate in the IGMP protocol

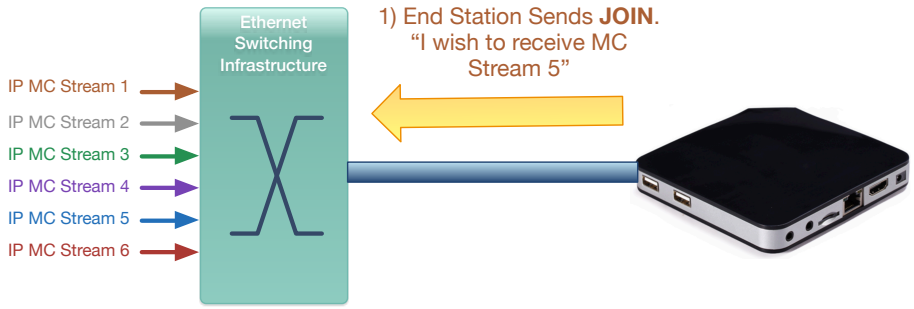
4.3. IGMP Simplified Theory of Operation

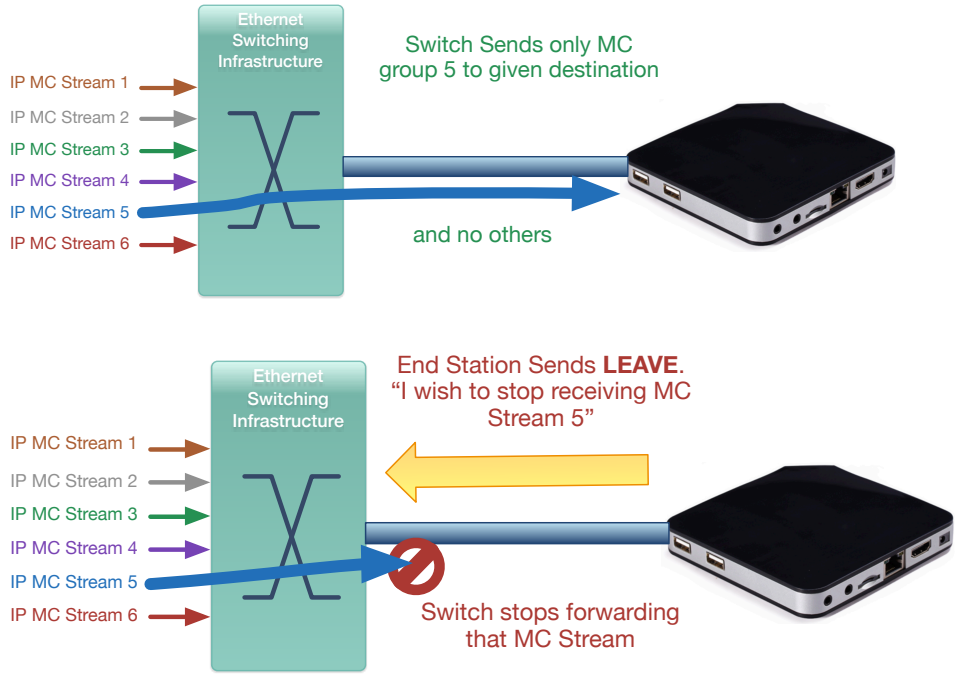
The best way to illustrate the requirement for IGMP is with a simple example. In this case we have 6 streams being sent in to a switched Ethernet network. Together they represent up to 144Mbps of data, which is clearly way above the capacity of a single 100Mbps link.



There are 3 types of messages used in the IGMP protocol:

- **JOIN** – Sent by an end station to indicate that it wishes to join in the receipt of an indicated multicast traffic set.
- **LEAVE** – Sent by an end station to indicate that it wishes to no longer participate in that multicast traffic set.
- **QUERY** – Typically sent by the router on a given switching domain to request that the end stations resend their 'Join' messages so clear out any old information and stale group participation states.





So by virtue of the fact that the switches are intelligent enough to only forward the multicast groups of interest, there is no limit on the number of offered streams (channels) that can be carried. No link should ever be swamped.

In the above example the link to the specific end station never sees more than 24Mbots/second, well below the capacity of the link, even though there is 144Mbps being "offered" to the network.

A word of caution: Many of the very low-end 5-8 port Ethernet switches do not handle multicast traffic well and will drop many, many frames. Be sure to use a good quality switch if testing multicast distribution. Even if "IGMP capable" many switches simply do not have the bandwidth capacity to manage multiple UDP multicast streams. In those cases you will see interruptions at the end clients and potentially long buffering delays.

A few extra dollars goes a long way to ensuring proper operation and low data loss.