Application Note – AN113

Bandwidth Monitoring with DVStation

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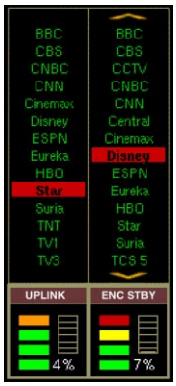
Advances in broadcast technologies have allowed the multiplexing of data transport streams, making it possible for broadcasters and network operators to distribute and consolidate differing data types into one unified network simultaneously.

While this evolution allows broadcasters to offer a wider variety of programs and services, it has created a highly competitive environment. Hence, it has become imperative for broadcasters to monitor bandwidth utilization for maximum efficiency for better service in order to maintain a competitive advantage.

Background



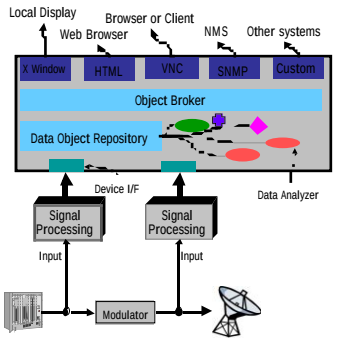
Packet switching and multi-stream technology in television, and the emergence of MPEG-2 that allows video compression, are now widely used by TV broadcasters to distribute a multitude of channels with complicated content including multiple languages of audio, subtitles/closed captions, and embedded multimedia data. With this advancement, operators of transport networks have the opportunity to consolidate differing types of traffic into a single unified network. While the progression of broadcast networks from television to multi-service data networks presents many opportunities for broadcasters, it also poses many challenges.

Remaining competitive in this increasingly volatile market is a key to remaining profitable. As such, it is important to know if bandwidth is optimally utilized, and if wastage is minimized.

DVStation is a monitoring solution that boasts highly accurate bit rate measuring logic and flexible automation features. The system enables the monitoring of bandwidth of a particular service or PID within an easy-to-use and integrated environment.

Hardware Timing Architecture

Within the system, bandwidth is measured by a Transport Stream Processor (TSP) card which connects to one of the twenty-one slots on the DVStation backplane. Cards in each of the twenty-one slots on the DVStation backplane share a common high-accuracy reference clock which can be derived from one of the user-selectable clock sources including GPS, DVStation internal high-accuracy clock source, and SMPTE-259 clock source. The TSP card itself also generates a high-accuracy 108 MHz clock synchronized to the backplane clock source.



The result of this conscientious effort to ensure the highly accurate synchronization of clocks enables DVStation to achieve a bandwidth measurement accuracy of ±1 b/s over an impressive range of 0 Mb/s to 180 Mb/s.

Software Architecture

Bandwidth reports are sent from each card to the host software once a second. For the purpose of measuring the minimum, maximum and mean bandwidth within a bandwidth report, ten samples are taken per second. The average bandwidth for a PID over one bandwidth report will be the average bandwidth over that second. The minimum bandwidth for the PID over one bandwidth report will be the lowest bandwidth of the ten samples. Likewise, the maximum bandwidth for the PID over one bandwidth report will be the highest recorded bandwidth of the ten samples. The refresh rate on the GUI is once a second in accordance to the bandwidth report received every second.

There are three categories of bandwidth measurement provided by DVStation:

1. Total Bandwidth - the sum of all the packets in the transport stream. All the packets in the transport stream are counted over a two second interval referenced against DVStation's highly accurate clock.

2. Bandwidth by PID - the sum of the TS packets based on particular PIDs.

3. Bandwidth by Service - the sum of TS packets grouped into Services.

For each of the categories mentioned above, the minimum, maximum and mean measurements are provided.

It should also be noted that there would be occasions where Bandwidth by Services may be greater than Bandwidth by PIDs because of shared components. For example, an audio PID might be shared between several services. Discrepancies in sums may also be due to unreferenced PIDs and/or other PIDs.

Unreferenced PIDs refer to PIDs that are found in the transport stream but not referred to in the SI. This means that nothing is known about the PIDs. This may be due to a configuration error or it may be data PIDs that are not referred to in the SI, or Conditional Access (CA) PIDs that are used as encryption keys. These CA PIDs changes very quickly for security reasons and are not referred to in the SI. Other PIDs refer to PIDs that are referenced but are not a SI, PES, or PCR PID. One example will be the MIP PID (0x0015).
Accurate bandwidth measurement by DVStation helps to ensure that the services delivered match the services on the Service Description Table. This reduces the risks of accusations when a disputable situation arises.

Graphical User Interface

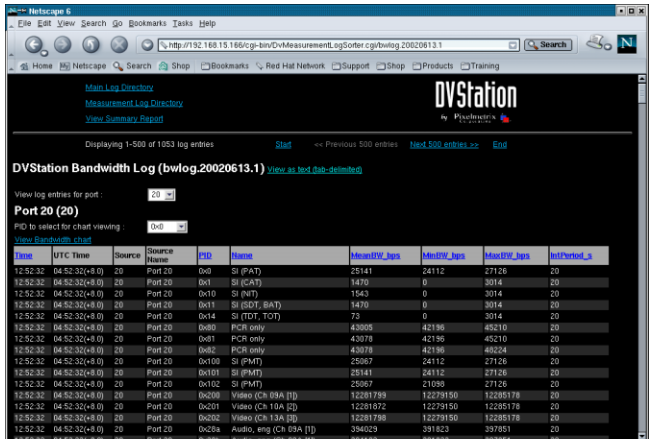
The DVStation has a flexible GUI and offers several User Interface options. The graphical display of bandwidth information can be shown in pie chart, bar chart or graph format.

Auto Logging of Measurement Data

Automatic monitoring of bandwidth measurement is another feature of the DVStation. The DVStation can be configured to measure the bandwidth of a particular PID/Service at a programmed time interval. This measurement is logged in DVStation and can be easily retrieved in XML or text delimited format for further analysis. The measurement log can be downloaded through the HTML interface of the DVStation in a text table format from the web browser for greater convenience.

Also built-in is the ability to create a bandwidth graph directly in the web browser. This graph can easily be saved via a simple mouse click for inclusion in management reports, etc.

An alarm threshold for a particular PID/Service selected can be set so that if the bandwidth is out of the range of the threshold, an alarm will be triggered.



Abbreviations

PID - Packet ID
GUI - Graphical User Interface
SI - Service Information
PES - Packetized Elemetary Stream
PCR - Program Clock Reference

For More Information

To learn more about the DVStation, request a demo, or learn how Pixelmetrix might help you optimize video network integrity, contact us today!

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About the Author

Jenn Chuan Ling is a Product Engineer with Pixelmetrix Corporation, manufacturer of the DVStation, a preventative monitoring solution for digital broadcast networks.