

TESTING MPEG STREAMS IN DEVELOPMENT, INSTALATION AND TRANSMISSION ENVIRONMENTS

EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT TESTING MPEG STREAMS, BUT WERE AFRAID TO ASK.

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The user requirements for testing MPEG streams vary, dependant on the user's function and physical location within the broadcast production chain. Developers of encoders and multiplexes in a lab need both different functions and different levels of portability in comparison with a field installation engineer commissioning an encode / multiplex suite in a regional broadcast studio.

These differing requirements have lead to the development of Adherent's comprehensive range of stream test tools tailored to the end user's application and requirement.

MPEG stream test equipment can therefore be split into groupings by its expected functional usage, primarily

- In-depth analysis tools for product development
- Signal Sources
- Operational real time monitoring tools
- Field installation and debug tools

Adherent manufactures MPEG test product for all these application areas, and for all three international broadcast standards:

- DVB Digital Video Broadcast – The European standard for terrestrial, cable and satellite transmission.
- ATSC Advanced Television Standards Committee - The US standard for terrestrial, cable and satellite transmission.
- ISDB Integrated Services Digital Broadcast – The Japanese standard for terrestrial, cable and satellite transmission.

Looking at the individual requirements for the development chain, several key features of Adherent's equipment are common across all platforms; these include :

- Intuitive and clear user interfaces, allowing largely pictorial display of test results for easy interpretation by non expert users.
- The ability to drill down through the layers of a system to identify and isolate faults.
- Conformance to industry standard published open interfaces, HTML, XML, DCOM, SNMP.
- A wide choice of industry standard electrical interfaces including ASI, SSI, L Band, QAM, G703, DHEI.
- Scalability and expandability of solutions, particularly in the real time/operational monitoring arena.

- ❑ A continual programme of feature enhancements to ensure products remain current and have a upgrade path as technical standards evolve and consolidate.

Development

Within a video product development environment the primary requirements for test equipment can be split into stimulus and analysis, the generation and decoding/interpretation of digital video signals.

In the generation domain we can consider the three primary elements that constitute a digital video signal or stream, the MPEG encoded video, the System Information (SI) and program Specific Information (PSI) tables, which allow the decode of MPEG video by a target decoder, and any data broadcast content included in the material. Test tools capable of generating this data generally operate by storing pre encoded video material and allow the manipulation and alteration of the SI/PSI by a multiplexer before or during playout. Addition of data broadcast material would be by insertion of data broadcast carousel information into the multiplexer.

Adherent provides a range of signal sources, including the AD991 Stream Source and the AD951 AD952 and AD953 Stream Station II MPEG analysers. All the machines provide the capability to record and replay MPEG streams via a range of industry standard interfaces at variable bit rates. Offline multiplexer options allow for the manipulation of test streams and the introduction of known, repeatable error conditions to stress test transmission and decoder systems.

Additionally all the products are fully compatible with the Snell & Willcox Test Card M (TCM) and TSM lite reference test stream patterns. In a production test environment the AD991 Stream Source can be controlled by a client server scheduling application, providing a GUI for the automation and looping of pre-selected test sequences.

From the stream analysis prospective, Adherent's Stream Station product family provide the ability to rove from the top layer of an MPEG stream, the SI/PSI, through the Packetised Elementary Stream (PES) layer and down to the Elementary Layer, with the ability to decode video pictures, analyse group of Picture (GOP) structure and look at quantising matrices and motion vector displays. All this is in addition to the ability to provide real time analysis of incoming MPEG stream, with triggered recording and pre-trigger buffers for rapid fault finding and fault capture, even with highly aperiodic events.

In addition to the standard DVB, ATSC and ISDB protocols, a number of proprietary extensions to the public standards have been developed by companies to provide enhanced functionality and features. This includes OpenTV™ and NDS XSI™ protocols designed to enhance standard broadcast material. Adherent provides a series of optional plug-in analysis packages for these private protocols for use by authorised developers of these systems.

Adherent has also developed a powerful proprietary scripting language which allows developers to author their own add-on analysis capability to extend the standard machine. These scripts can be encrypted securely by the author to protect their intellectual property within the source script.

At the elementary level, Adherent provide ES Analyser, a comprehensive picture analysis tool that provides near real time picture decode, with the ability to overlay MPEG motion vectors and quantiser scales. Using the tool encoding anomalies can be captured and studied in depth. Additionally the tool has the ability to display teletext decodes and subtitle displays to the DVB standard.

In the emerging and rapidly growing area of data broadcast, Adherent launched its data analysis product at IBC 2000. This software tool, running on Stream Station, provides developers and broadcasters with the ability to parse and visualise Digital Storage Media Command and Control (DSM_CC) data and object carousels used to add interactivity to digital TV transmissions.

DSM_CC is the transport mechanism for the new and highly important Multimedia Home Platform (MHP) DVB standard for a uniform Application Programming Interface (API) for terrestrial, cable and satellite integrated decoder receivers (IRDs) or set top boxes. Additionally, Adherent provides the capability to decode the MHP Application Information Table (AIT).

Operational Real Time Monitoring

Real time monitoring of MPEG streams in a high reliability 24x7 environment requires specialised equipment like the Adherent SV970 and SV971 Stream View MPEG broadcast monitors.

The requirements for real time monitoring of MPEG streams in the DVB domain are specified in ETSI technical Requirement (ETR) 290. This standard, recently revised to version 1.1, specifies 22 real time tests, prioritised to levels 1, 2 and 3.

- ❑ Priority 1 covers parameters required for decodability of the video picture, and includes loss of synchronisation, sync byte error, Program Association Table (PAT) error, Continuity Count Error, Program Map table error and Packet Identifier (PID) errors.
- ❑ Priority 2 covers parameters recommended for continuous or periodic monitoring and includes Transport Errors, Cyclic Redundancy Errors (CRC), Program Clock Register (PCR) errors, Presentation Time Stamp (PTS) and Conditional Access Table (CAT) errors.
- ❑ Priority 3 covers parameters required for application dependant monitoring and includes detailed SI tests primarily of table repetition rates and of video buffer model fullness.

Key to the operation and use of real time monitoring systems is the simple but powerful hierarchical display of the monitored information. Adherent provides the AD976 web based remote monitoring system implemented in Java which provides both geographic and logical views of the monitored system.

By providing simple graphical views of the monitored system, together with the ability for the user to define the priority of his own alarms, the system can monitor installation anywhere in the world via a Wide Area Network (WAN), yet still drill down with a couple of mouse clicks to detailed information on a particular monitored stream. Additionally snapshots of the SI/PSI table structure can be taken, together with operational status on the actual measurement unit, operating temperature, power supply status etc.

Additionally SI/PSI templates can be pre set which will raise alarms should the table data in a monitored stream deviate from the expected content. This provides an extremely powerful tool which will indicate that programs may have dropped from a multiplex, or Packet Identifiers (PIDs) may be misassigned, not uncommon operational problems, that are not readily recognised by ETR 290 monitoring alone.

In Field Testing.

In the field environment, Adherent offers both portable and ruggedised versions of its Stream Station and the new prize winning AD954 Stream Grabber. Stream Grabber provides a highly portable real time monitoring, offline analysis and recording capability in conjunction with a laptop PC to which it connects via a IEEE1284 ECP parallel printer port.

Designed for engineers on the move, the Grabber provides a cost effective and light weight analysis package for real time "in the field" problem solving. Grabber provides ETR 290 Priority 1 real time analysis, with the ability to perform a triggered recording of up to 192 Mbytes of stream, approximately 30 seconds at normal terrestrial transmission rates.

These recorded files can be analysed using the proven Stream Station based offline SI/PSI analysis tools, including structure view decode, and conformance checking.

Stored stream can be stored to the host PC disk for later analysis or transfer to colleagues by e-mail or recordable media.

Conclusion

Testing of MPEG streams, whether to the DVB, ATSC or ISDB standards is now straightforward even for non expert users. Conformance testing tools are extremely powerful and allow the rapid debug and isolation of stream faults, using hierarchical tools with graphical user interfaces.

Comprehensive test solutions from Adherent address the development, production, real time monitoring and installation/commissioning markets, with products ranging from powerful lab tools to small battery powered handheld instruments.

Watch our website at www.adherent.com for several new instrumentation product launches between now and NAB 2001.

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