Video Monitoring System

Web Management Software

TSM Web

Mividi Media Systems, Inc.

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MIVIDI™ Video Monitoring Web Management System

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Chapter 1 Introduction

Mividi provides several professional digital video monitoring systems for TV broadcasters and Internet TV (IPTV) providers to monitor their DTV signal quality and standard compliance. Mividi monitoring systems include IP Video Monitoring System TSM100, Integrated Multi-viewer Monitoring System IMS120, and HLS Analyzer (LSA100). In this User Guide, they will be called “TSM Systems” or “TSM Unit” in general.

The TSM Web Management software (named TSM Web) is a web server for users to remotely control their TSM units and view test results. It can be installed on the same TSM unit or a different computer. Specifically, the TSM units may not be directly accessible from the Internet, the TSM Web can be used as a gateway for users to view test results on TSM units.

1.1 Note on Product Variation

The TSM Web is used as a web interface to several Mividi monitoring products. Depending on the products that the TSM Web has connected to, certain features described in this document may or may not be available.

Chapter 2 Account Management

The TSM Web creates a default administrator account when the software is initially installed. The username and password of the default administrator account are “admin/admin”.

2.1 User Management

The account administrator can use the User Management page to add, edit and delete additional user accounts. The User Management page can be accessed by clicking on the “Setting” button, as shown in the following figure:

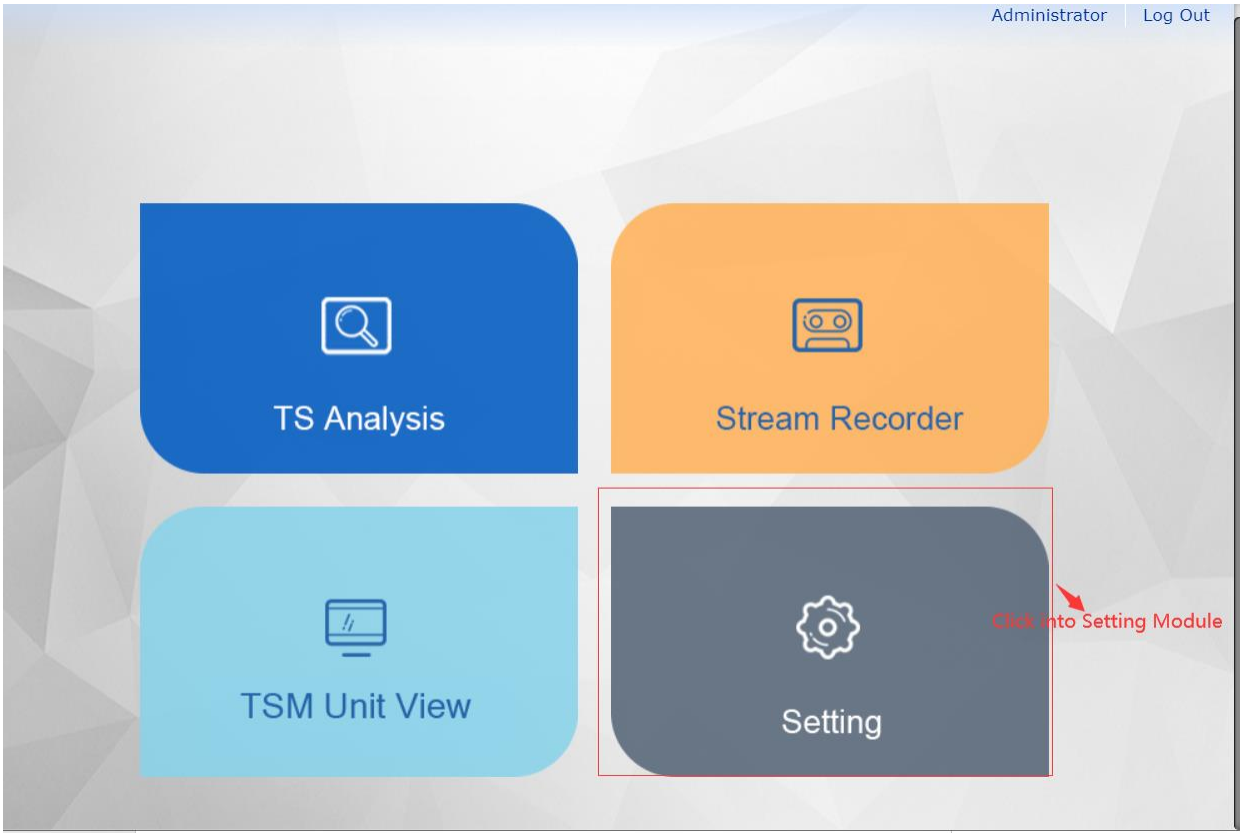


Figure 2-1 Open the Setting Module

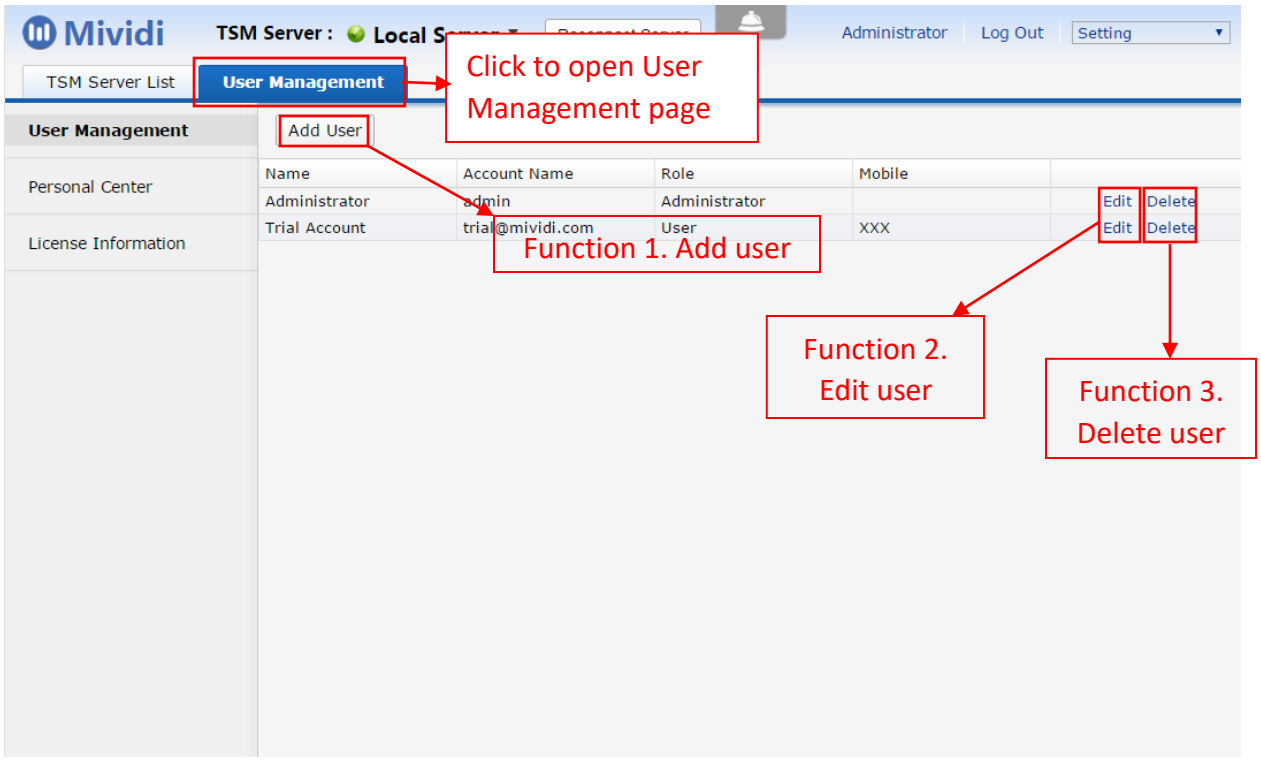


Figure 2-2 User Management Page

2.1.1 Add a User

Click **“**Add User” button in the User Management page to open “Add User” page. Fill in user information, then click “OK” button to save. A new user is added.

The TSM Web supports two user roles: Administrator and User. An Administrator can use all functions available on the product. A User can only view test results provided by the software, but is not allowed to change any settings to the system.

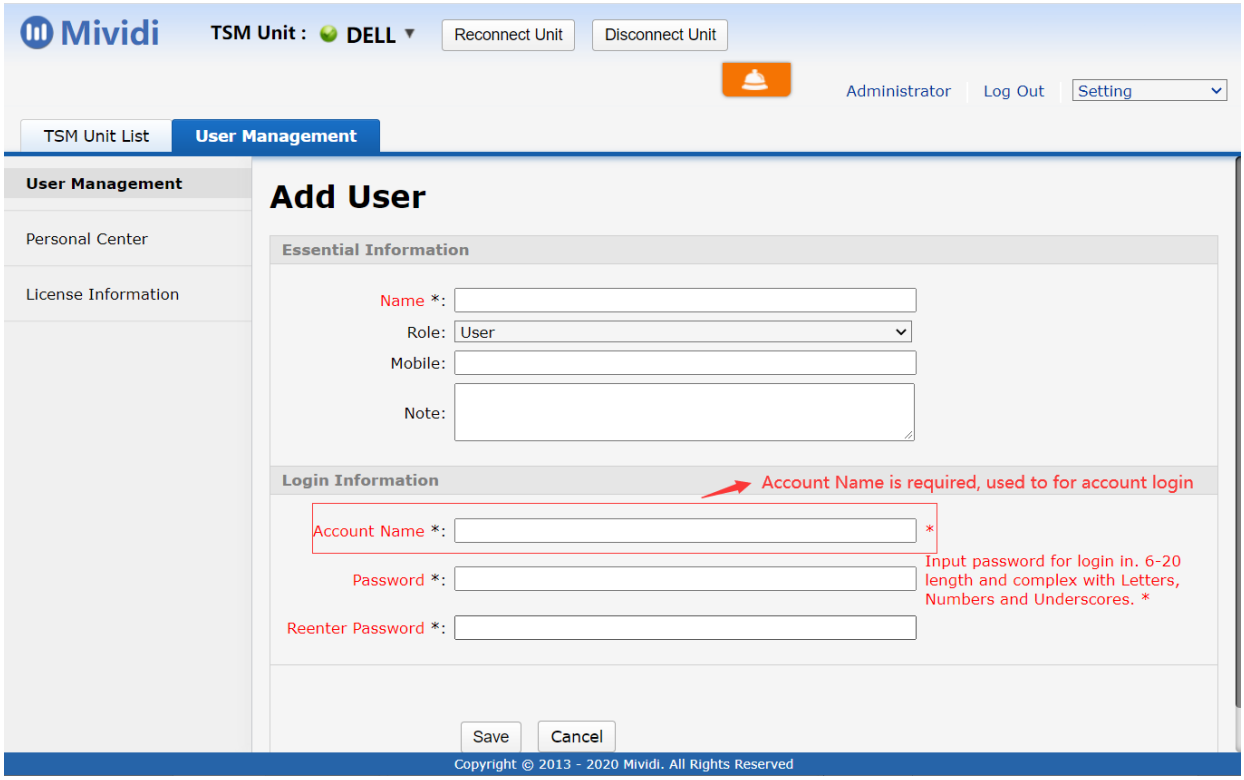


Figure 2-3 Add User Page

2.1.2 Edit User

Click “Edit” button in a user row to open the “Edit User” page. The content on this page is the same as “Add User” page. An administrator can modify general information and login password of other users.

2.1.3 Delete User

Click “Delete” button in a user row to delete this user.

2.2 Personal Center

After logging into the TSM Web, users can view and edit their personal information. Click “Setting” menu on the top menu bar to open system Setting page, then click “Personal Center” menu on the left menu list to open “Personal Center” page. You can also click the “User Name” link button on the top-right corner of the web site to open “Personal Center” page.

Users can view and modify their information and password in “Personal Center”, as shown in the following figure:

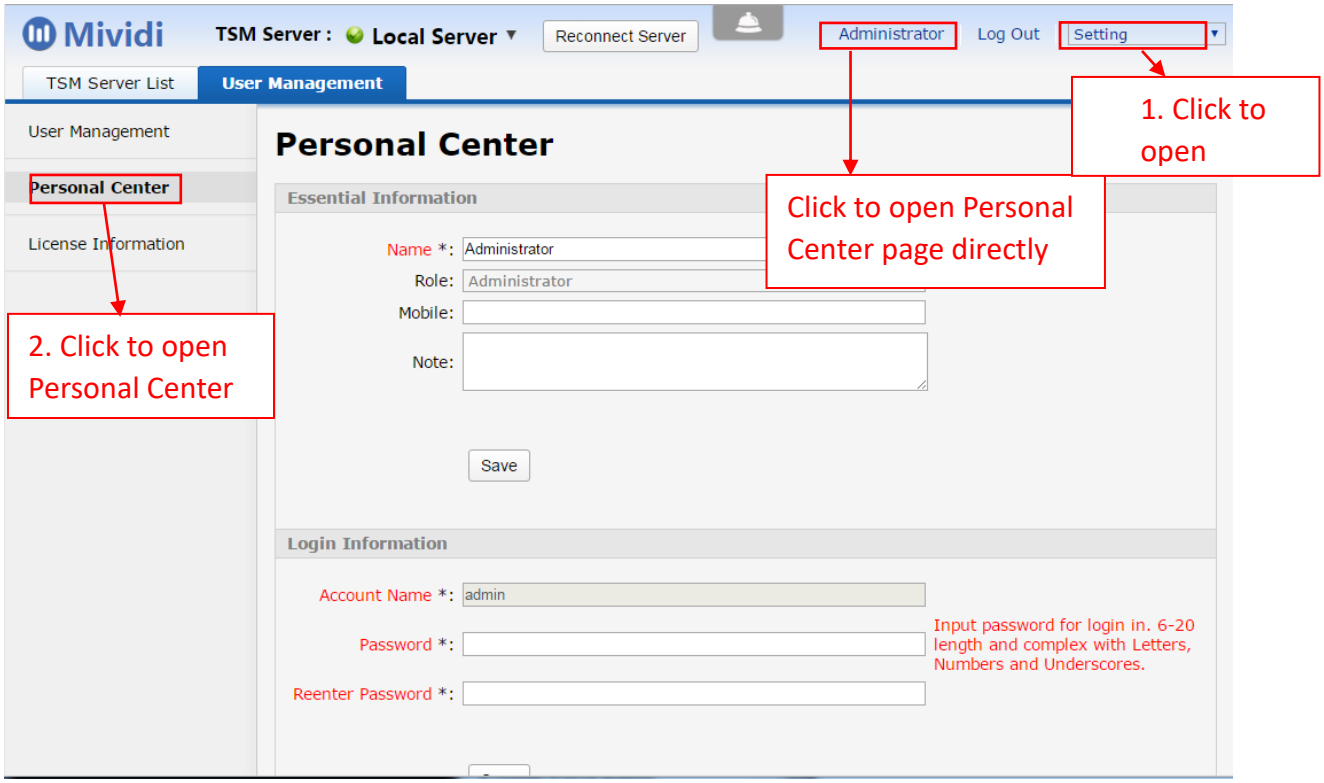


Figure 2-4 Personal Info Management Page

Chapter 3 TSM Monitoring Unit Setup

The TSM Web is a website program that manages one or more TSM monitoring units. Users can obtain TSM test results using the TSM Web and a standard Internet browser.

The TSM Web can manage multiple TSM units running in the same LAN. When the TSM Web is initially installed, the TSM Web contains a default configuration to a local TSM monitoring unit. In case that the TSM Server (such as TSM100) is not installed on the same computer with the TSM Web, you may delete the local server as described below.

3.1 TSM Monitoring Unit Display

As shown in the following Figure 3-1, the TSM Web displays all available TSM monitoring units on the top of the main page. The one that is currently selected for data analysis is highlighted. To see the test results on another server, first select the server here.

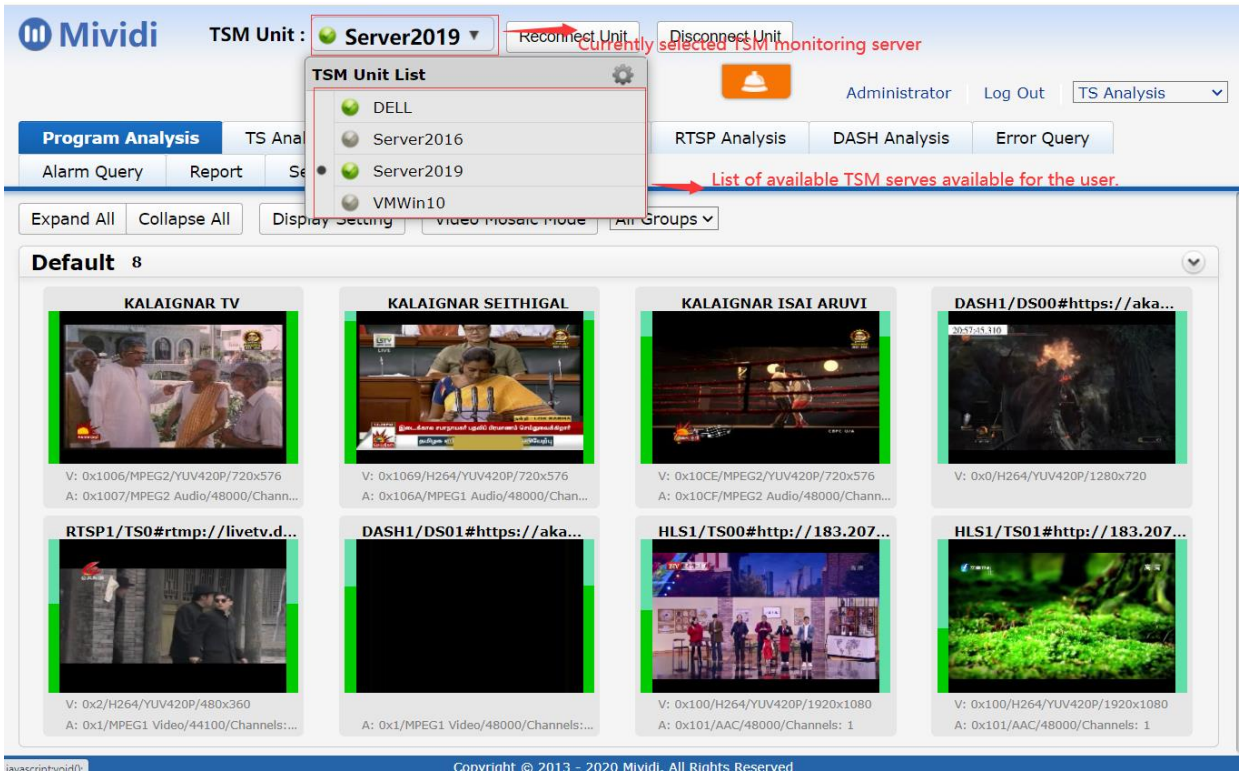


Figure 3-1 TSM Monitoring Unit List

3.2 TSM Monitoring Unit Management

In addition to the default local server pre-configured with the software, users can add more units to connect, or delete unwanted units.

As displayed in the following figure, select the “Setting” module on the top right corner, and then click “TSM Unit List” link button on the left side of the page.

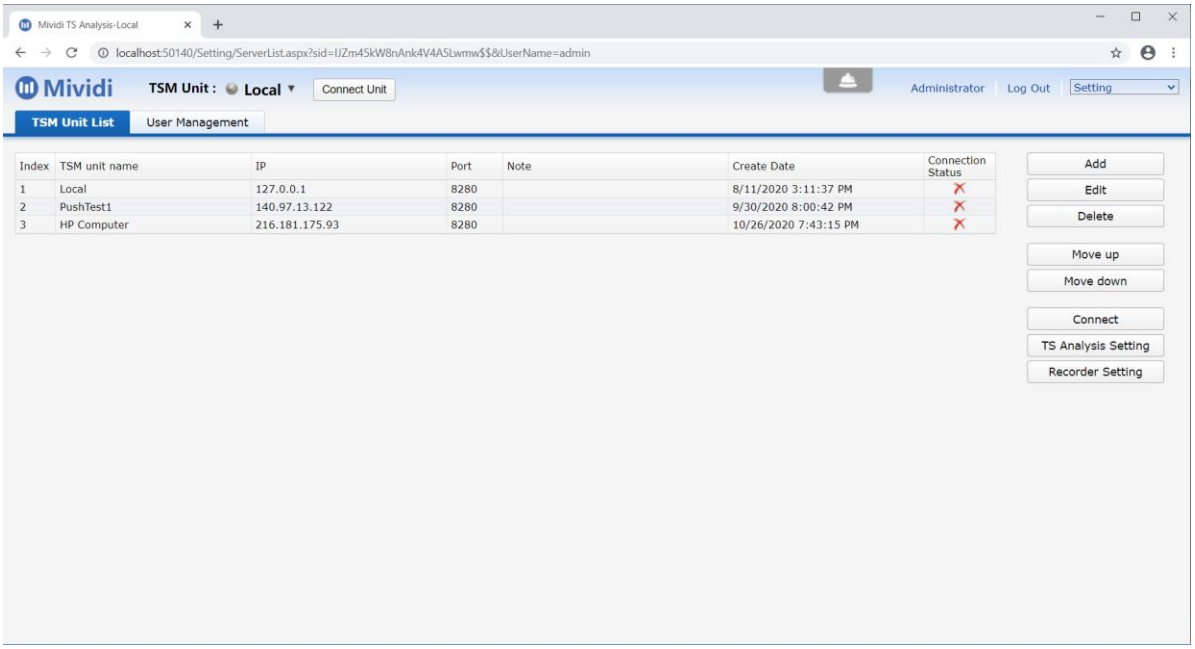
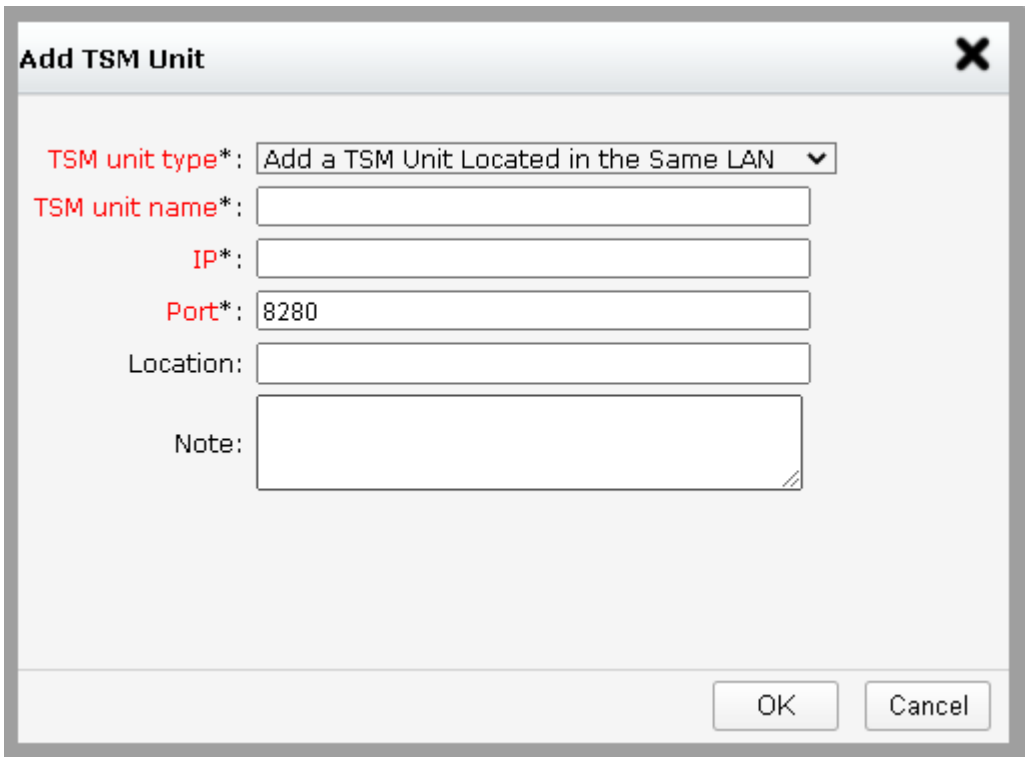


Figure 3-2 TSM Monitoring Unit Management

To add a TSM monitoring unit, click “Add” button to open the “Add TSM Unit” dialog. On the dialog, enter the unit’s name and IP. The name can be given arbitrarily, as long as it is unique among the server list. The port should be a predefined value of 8280, on which the monitoring unit is listening. In addition, you can optionally add location and note to identify the server easily. Click “Save” when it’s done.



3-3 Add a TSM Unit

You can use the same web interface to edit unit information later on.

3.3 Add TSM Probes Located in Different Networks

The TSM Web can manager TSM monitoring devices on the same or different LAN. The communication mechanisms between the TSM Web and monitoring devices differ depending on whether the monitoring devices are in the same LAN or in different LAN. Normally, we call the TSM monitoring devices located in the same LAN as the TSM Web Server as TSM Servers and the devices located in different LAN as TSM Probes.

To enable the TSM Web management for TSM Probes, find the configuration file web.config in the TSM Web software installation folder C:\inetpub\wwwroot\TSMWeb. Open the file using a text editor such as the Notepad and set the “pushServerEnabled” parameter to True.

Figure 3-4 Enable TSM Probe in Web Config

Click the “Add” button on the TSM Unit List page to enter the “Add TSM Unit” dialog, as shown in the figure below. Select the probe type "Add a TSM Unit Located outside of the LAN", and enter the probe name and the location. Click the “OK” button to save data.

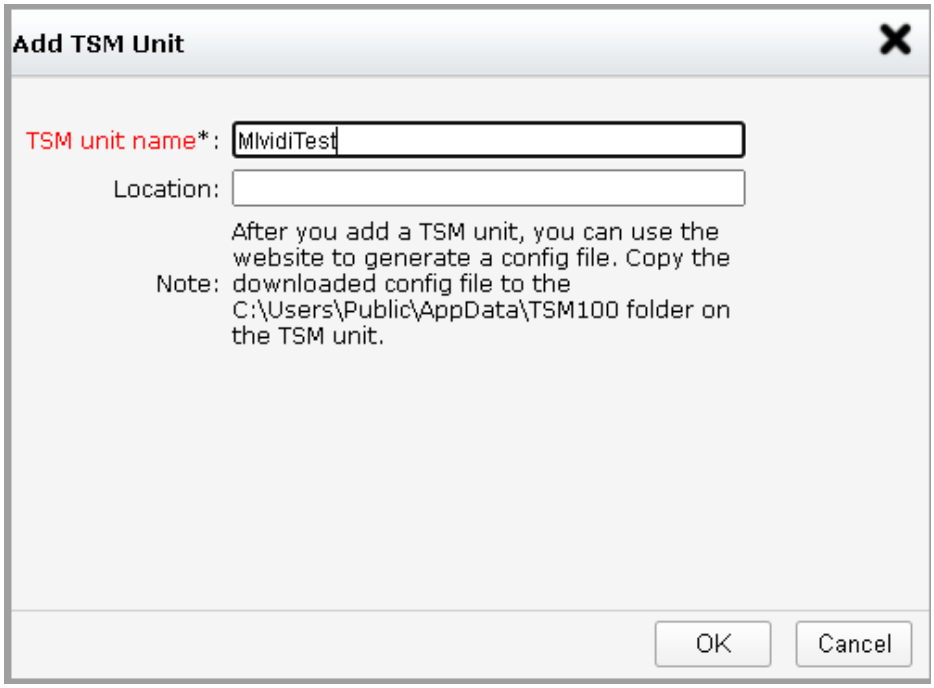


Figure 3.5 Add a TSM Probe Located on a Different Network

After completing the TSM probe addition, select the probe just added on the TSM Unit List, and then click the “Download Configuration File” button on the right side. At this time, a "CentralManagerConfig.xml" file will be downloaded on your local computer. Move this file to the folder C:\Users\Public\AppData\TSM100 on the TSM probe. After restarting the “Mividi TSM Server” service on the probe, the TSM Web program will start to receive data pushed up by the TSM probe.

Chapter 4 Transport Streaming Monitoring

The Mividi TSM units provide comprehensive MPEG TS analysis functions. The TS analysis results can be viewed using the TSM Web program.

4.1 Transport Streams Overview

Click “TS Analysis” menu on the top menu bar to open TS overview page, which provides a summary of monitoring status of all streams as shown in the following figure:

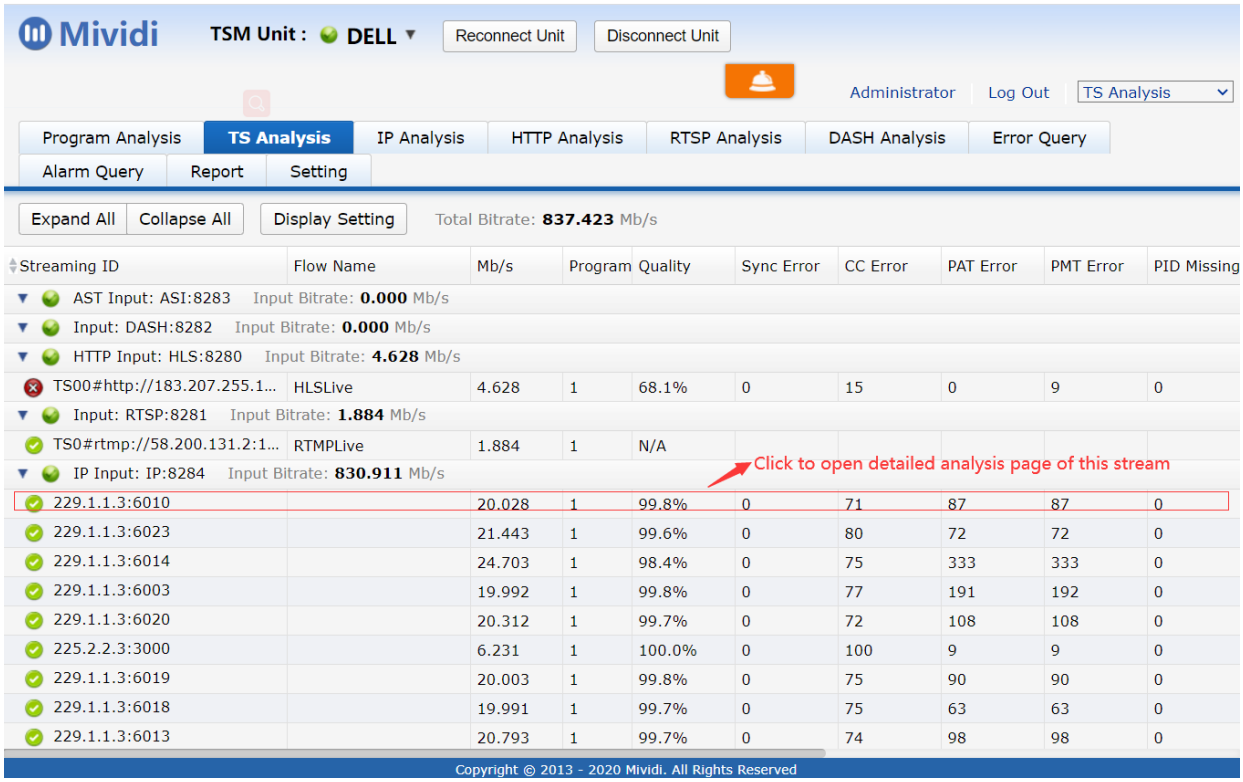


Figure 4-1 TSM Web Overview Page

The TSM Web overview page displays the following stream parameters:

- **Streaming ID:** Namely the playlist URL;
- **Stream Name**: A user-friendly name given by users, such as the brand of the channel service;
- **Programs:** Program number in this Transport Stream;
- **Quality:** The TS quality score of the transport stream calculated by summarizing all error codes using a proprietary algorithm. Normally, a value above 90% indicates a good service.

The columns after **Quality** are optionally displayed. Each column shows the error count of a specific

error type. To select parameters to be displayed on the overview page, click “Display Setting” button to open “Display Options” panel, as shown below:

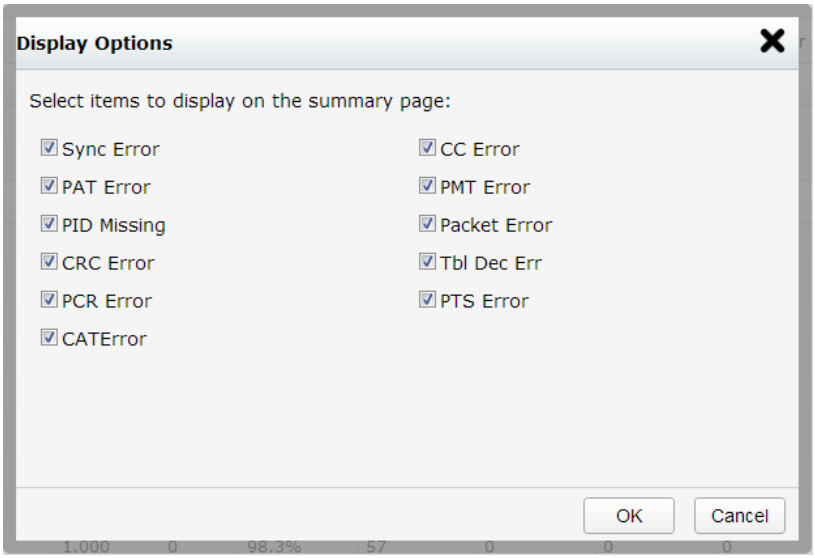


Figure 4-2 TS Overview Display Options Panel

Check the error types you wish to display and click “OK” to save the setting. The overview page will be updated and selected parameters are displayed.

4.2 Transport Stream Analysis Details

Click a transport stream in the TS Analysis overview page, and a new web page is opened to show the detailed information of this stream:

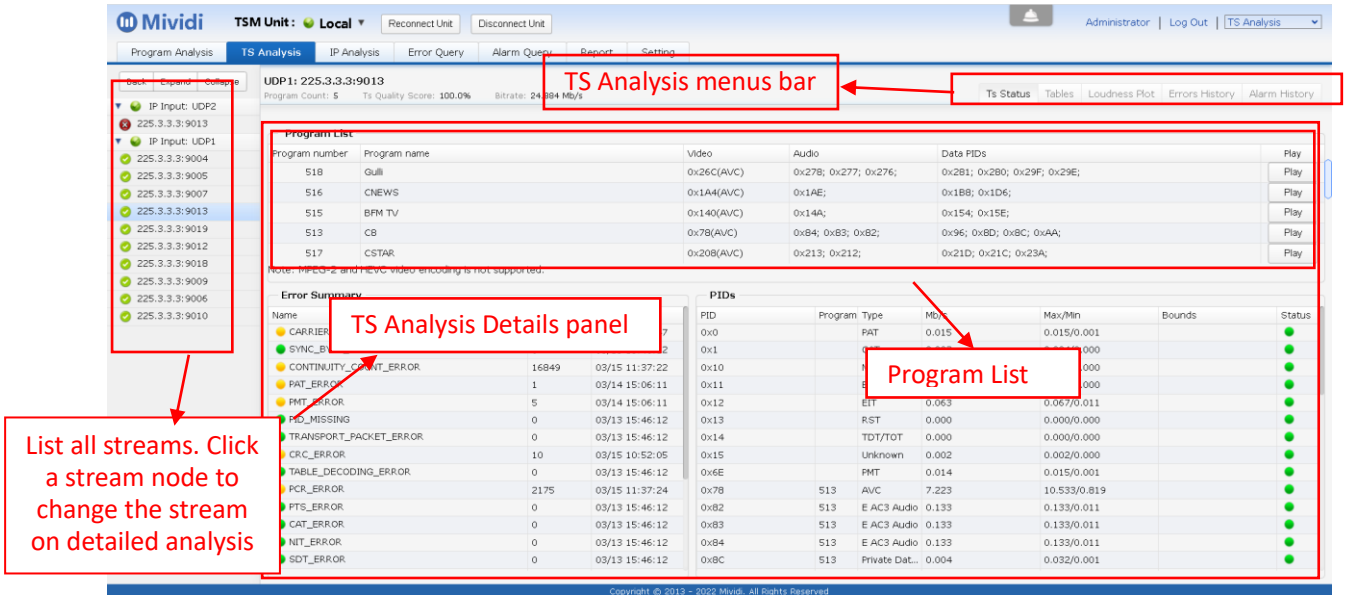


Figure 4-3 TS Analysis Details Page

4.2.1 Play a Video Program

Click the “Status” tab under “TS Analysis” main tab and a list of programs of the selected transport stream are displayed on the top. A “Play” button is shown for each program. Click the “Play” button will play this program. The remote TSM server will generate an HLS stream and the stream is played by an HLS player on a web browser.

Note: The HLS player for web browsers has a number of limitations. It can only play certain H.264 streams and other type of video streams are not supported. If the HLS play can play a stream, you may copy the URL it displays to a VLC player and play the stream on VLC. The VLC player supports more audio and video codecs.

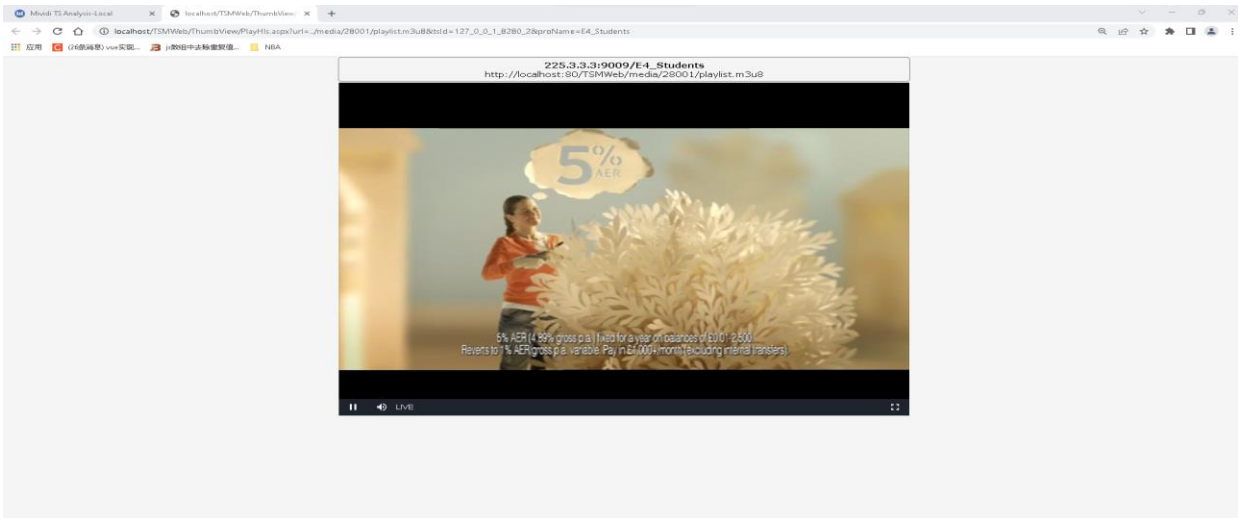


Figure 4-4 Remote Play of a Video Program

4.2.2 TR 101 290 Error Summary and PID Analysis

Click “TS Status” menu on the top-right menu bar to show the Transport Stream status view. The status view displays TR 101 290 error summary and PIDS analysis results.

The Error Summary panel shows a summary of errors detected according to the DVB Test Guideline ETSI TR 101 290. It displays the number of errors encountered in each error category as well as the time the last error occurred in this category.

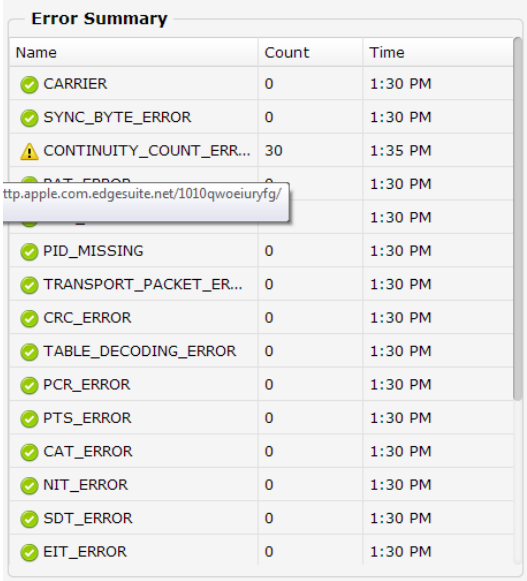


Figure 4-5 Error Summary Panel

An MPEG TS is composed of a sequence of TS packets. A TS packet is the basic unit of data and is always started with a sync byte, whose value is 0x47, followed by three one-bit flags and a 13-bit Packet Identifier (PID). This is followed by a 4-bit continuity counter. Additional optional transport fields, as signaled in the adaptation field, may follow. The rest of the packet consists of payload. Packets are 188 bytes in length, but the communication medium may add some error correction bytes to the packet.

Metadata tables, audio, video and other types of data can be present in a transport stream. Each metadata table and elementary stream in TS is identified by a 13-bit packet ID (PID).

The TSM monitoring system monitors every unique PID in the TS, and decodes metadata tables to identify the content types carried with each PID. The system performs statistical analysis to measure the bitrate of each elementary stream, and the percentage of bandwidth used by each elementary stream. A user can setup expected high and low bounds for each elementary stream bitrate (See Profile Section below) and the monitoring systems will compare the actual bitrate to the expected bitrate. If the bounds are violated, an error will be logged in the database, and an alarm may be sent to technicians if it is configured. This feature can be used to detect missing elementary streams.

The PIDs table displays PID, program number that this PID belongs to, the current bitrate, and the minimum and maximum bitrate over the monitoring period.

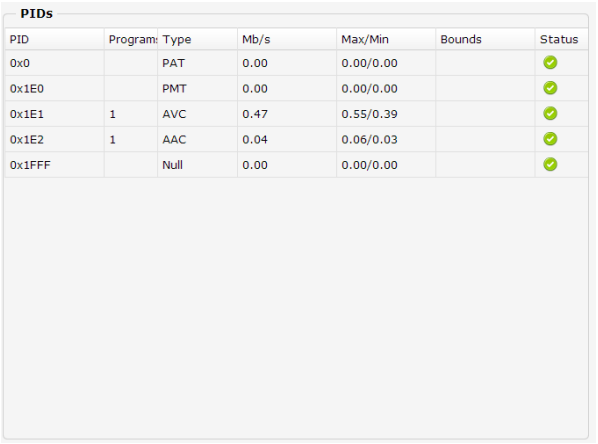


Figure 4-6 Stream PID List

4.2.3 Table Analysis

The MPEG metadata, called the Program Specific Information (PSI), is used to describe the content of the transport stream. There are four PSI tables: Program Association Table (PAT), Program Map Table (PMT), Conditional Access Table (CAT), and Network Information Table (NIT). The MPEG-2 specification does not specify the format of the CAT and NIT.

The Transport Stream s normally just contains two tables: PAT and PMT. The PAT is the first table to decode. It lists all programs available in the transport stream. Each of the listed programs is identified by a 16-bit value called program_number, and each program has an associated value of PID for its Program Map Table (PMT). The HLS stream should only contain one program, as required in its specification.

The value 0x0000 of program_number is reserved to specify the PID where to look for Network Information Table (NIT). If such a program is not present in the PAT, the default PID value (0x0010) shall be used for NIT.

TS Packets containing PAT information always have PID 0x0000.

Program Map Tables (PMTs) contain information about programs. There is one PMT for each program. The PMT provides information on each program present in the transport stream, including the program_number, and lists the elementary streams that comprise the described MPEG-2 program. There are also locations for optional descriptors that describe the entire MPEG-2 program, as well as optional descriptors for each elementary stream. Each elementary stream is labeled with a stream_type value.

In addition to the MPEG PSI, data is needed to provide identification of services and events for users. DVB and ATSC standard each define a set of metadata tables, namely DVB Service Information (SI) and ATSC “Program and System Information Protocol” (PSIP) tables.

The TSM systems will monitor and decode all PSI, DVB SI and ATSC PSIP tables. The table intervals

between two consecutive tables are measured. A number of tests are performed on these tables. MPEG-2 standard ISO/IEC 13818-1 requires that PSI tables should repeat in an interval less than certain threshold. For example, the threshold for PAT is defined as 100 ms and that for PMT is 400 ms. The DVB test guide line TR 101 290 has additional requirements on table intervals.

All tables found in the TS are shown in the Table page. It displays information including table name, table ID, PID, interval time and its min and max value, as well as the interval thresholds according to the test standards or user settings. Click on one of the tables, the table is decoded and its content is displayed on the right side of the window, along with the original binary data.

The default table interval threshold is determined based on MPEG, DVB and ATSC standards. However, users can modify these standard values in the TS Setting page according to the users' test needs. Any violation of the threshold will result in error conditions, which will be recorded in the database and alarm messages will be sent to the user if it is configured as such.

Click "Table" menu on the TS Analysis menu bar to display Table view of transport stream, as shown in the following figure:

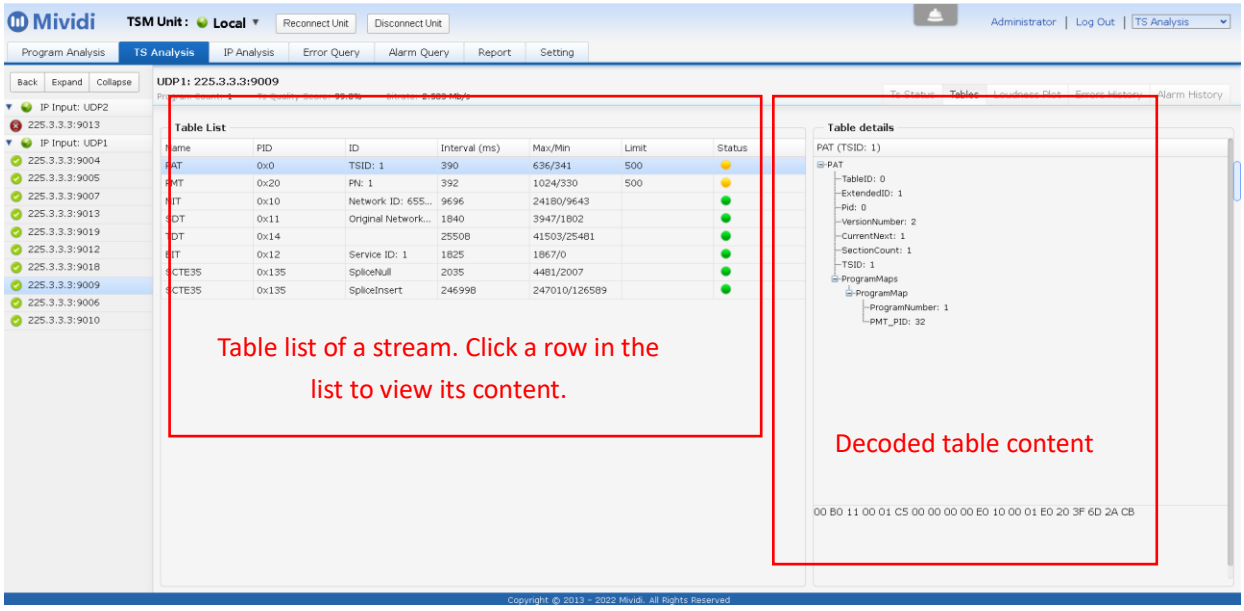


Figure 4-7 Transport Stream Tables Page

4.2.4 Audio Loudness Display

If you have the "Loudness Monitoring and Logging" license on the TSM server, a tab named "Loudness Plot" will be displayed under the "TS Analysis" main tab. Click the "Loudness Plot" tab, it will show a loudness and multiple true peak charts. If a stream is an MPTS, the loudness charts are displayed per program. You may select a program using the Program dropdown list.

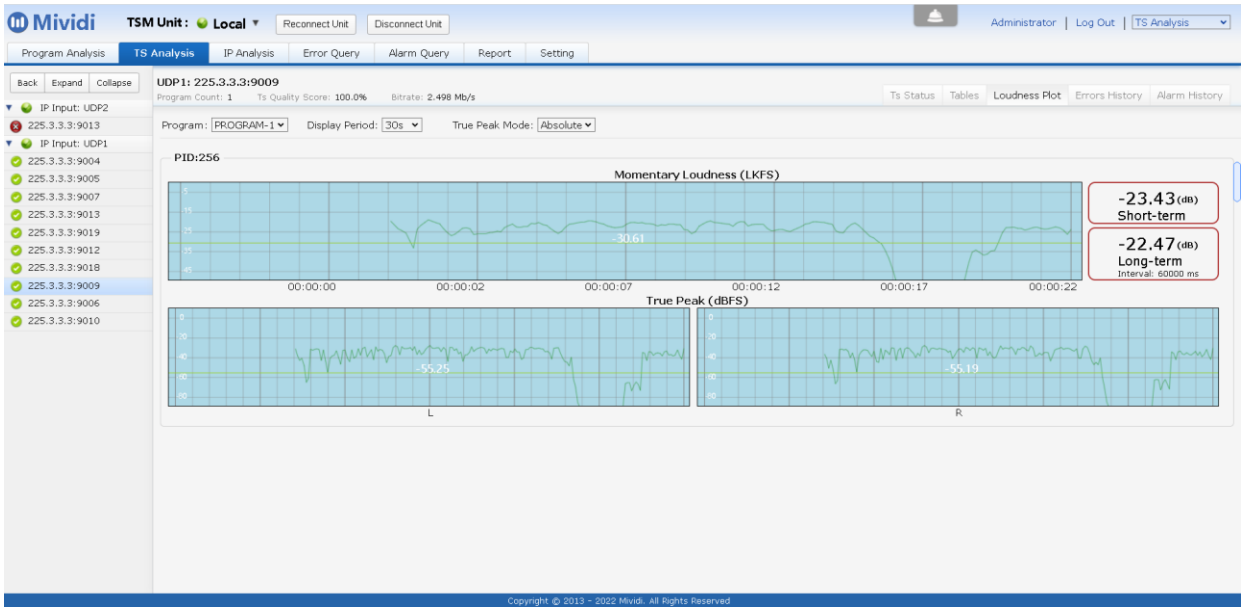


Figure 4.8 Loudness Plot

4.2.5 Error History Analysis

Click “Errors History” menu on the TS Analysis menu bar to open the “TS Error History” panel, as shown in the following figure.

The TSM Web provides a user-friendly interface to view recorded errors. The errors in the past 24 hours are grouped into 12 groups. Each group contains the errors in a period of 2 hours. Click on one of the groups, the service will expand the node and display the errors of this group by dividing the group into 12 sub-groups, each of which contains errors of a period of 10 minutes. A rectangle block represents an error group, and it shows the number of errors in this group. The color of the rectangular block is dependent on the highest error priority in the group. After clicking on the 10 minutes error sub-group, the table below will list all errors in the sub-group with detailed information.

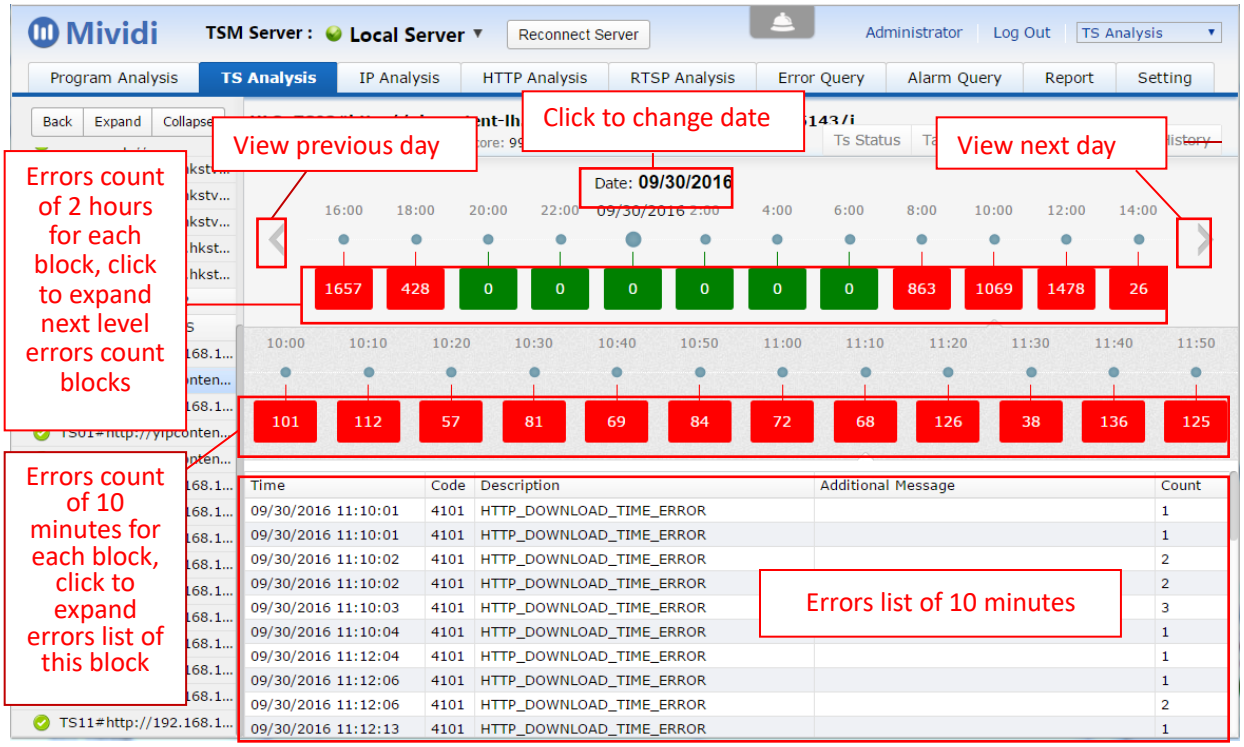


Figure 4-9 Transport Stream Error History Page

4.2.6 TS Alarms History

The “TS Alarm History” page displays all alarms sent to the users. Click “Alarm History” menu on the TS Analysis menu bar to open the page, as shown below.

Similar to the Error History page, the alarms in the past 24 hours are grouped into 12 groups. Each group contains the alarms in a period of 2 hours. Click on one of the groups, the service will expand the node and display the alarms of this group by dividing the group into 12 sub-groups. A rectangle block shows the number of errors in this group. The color of the rectangular block is dependent on the highest error priority in the group. After clicking on one of the sub-groups, the table below shows detailed information of all alarms in this sub-group.

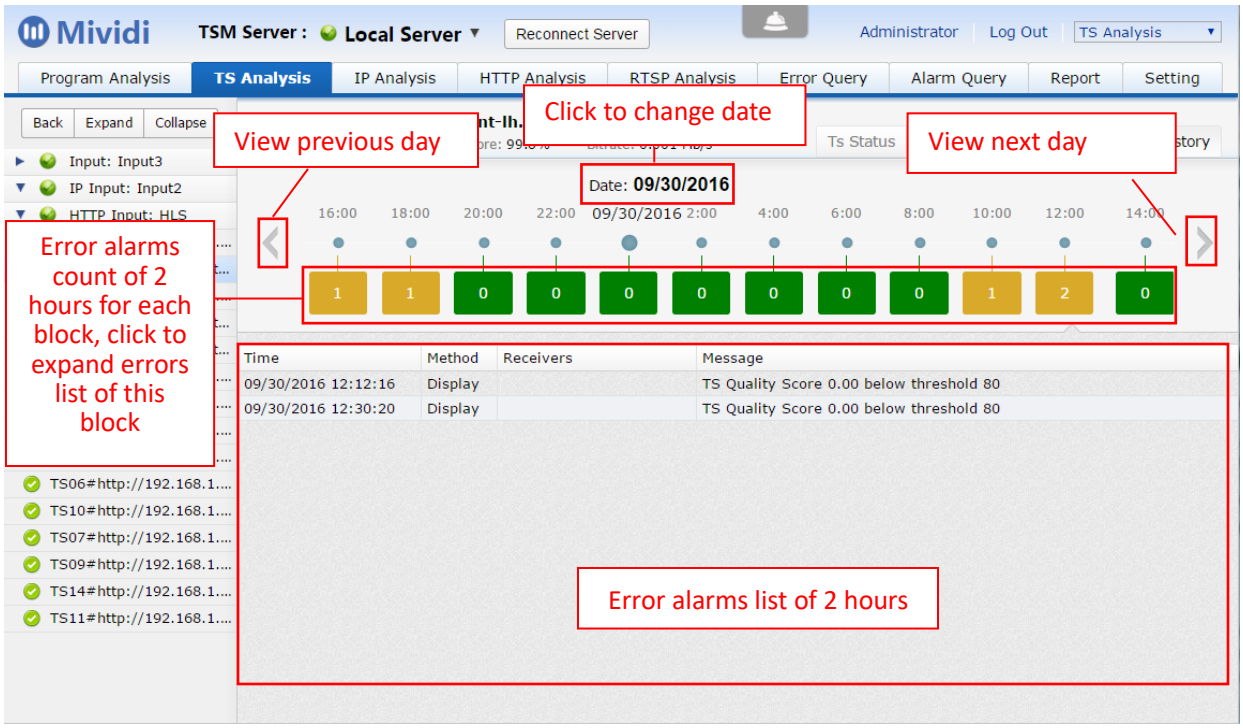


Figure 4-10 TS Alarm History Page

4.3 Error Query

While the Error History page provides a convenient way to review past errors of a single stream, the Error Query page can be used to search errors in all transport streams. Click “Error Query” menu on the top menu bar to open the Error Query page, as shown in the following figure:

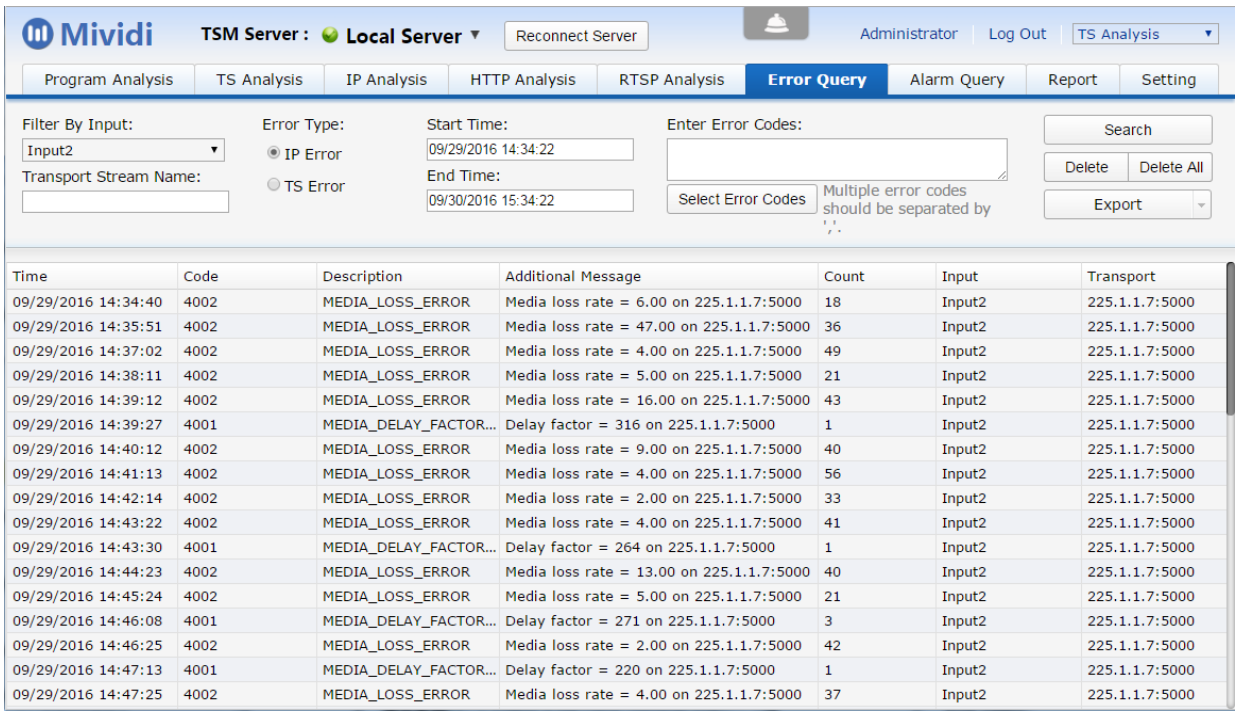


Figure 4-11 Error Query Page

Fill in query conditions and click “Search” button, the TSM Web will find the errors that match the search criteria. The displayed errors can be exported to a PDF or Excel file. The parameters for setting the query criteria are described below:

- **Filter by Input:**
  When you have multiple input, using this parameter to limit the errors belong to certain inputs.

- **Transport Stream Name:**
  The Streaming ID of Transport Streams as described in TS Overview section (See 3.3). The field can be empty. In this case, errors are search in all Transport Streams.

- **Start Time and End Time:**
  Define the time period when the errors occurred.

- **Error Codes:**
  Filter errors by error code, multiple error codes can be entered and separated by “,”. This field can be empty.

Description of operation buttons:

- **Delete:**
  Delete the errors displayed from database.

- **Delete All:**
  Delete all errors of selected Input from database.

- **Export:**
  Export the searched errors to PDF or Excel file.

4.4 Alarm Query

While the Alarm History page provides a convenient way to review past alarms of a single Transport Stream, the Alarm Query page can be used to query alarms in all transport streams. Click “Alarm Query” menu on the top menu bar to open the “Alarm Query” page, as shown in the following figure:

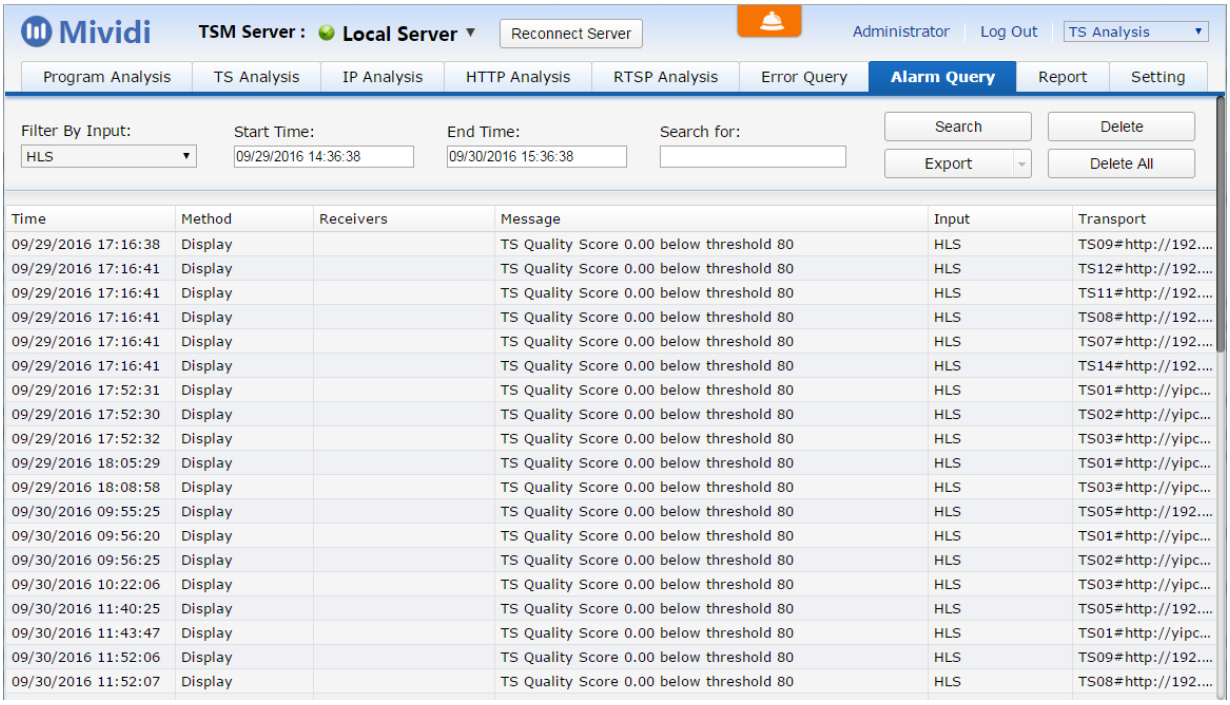


Figure 4-12 Alarm Query Page

Fill in query conditions and click “Search” button, find the errors that match the search criteria. The displayed errors can be exported to a PDF or Excel file. The parameters for setting the query criteria are described below:

- **Filter by Input:**
  When you have multiple inputs, using this parameter to limit the errors belong to certain inputs.
- **Start Time and End Time:**
  Define the time period when the errors occurred.
- **Search for:**
  Enter a value for fuzzy query; The TSM Web will filter alarms that contain the query value and display all items that meet other search criteria.

Description of operation buttons:

- **Delete:**
  Delete the alarms displayed from database.
- **Delete All:**

Delete all alarms of selected Input from database.

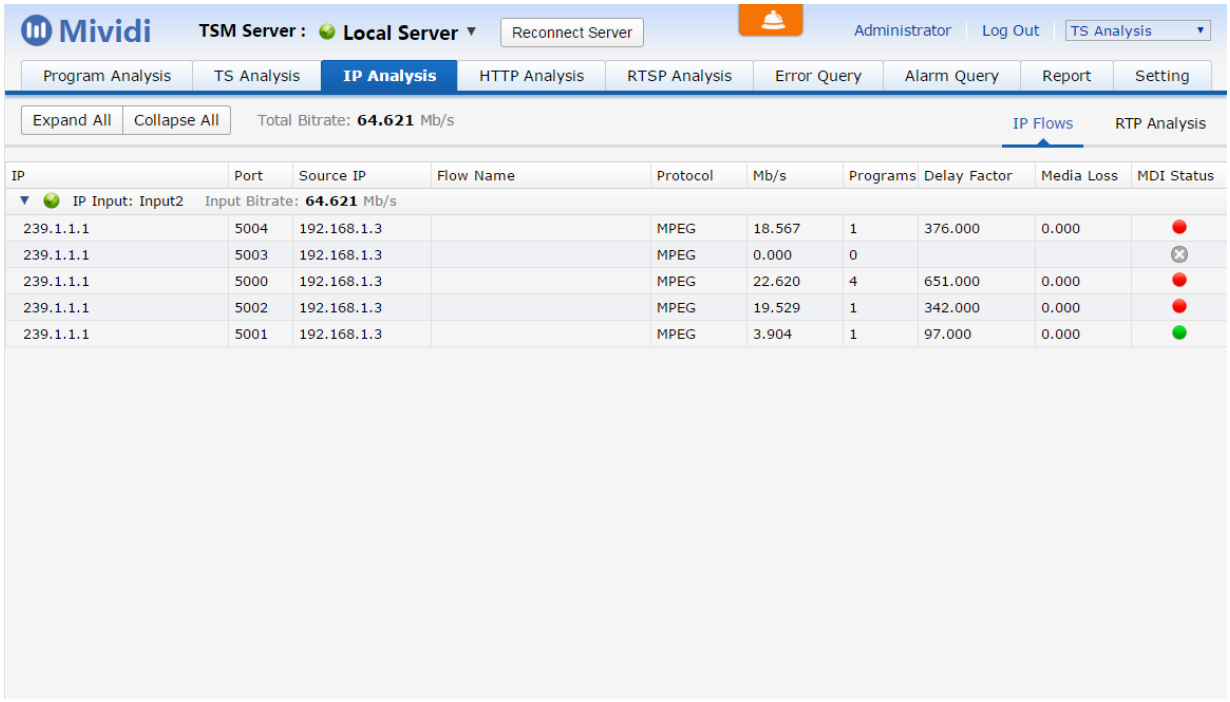
- **Export:**
  Export the searched alarms to PDF or Excel file.

Chapter 5 IP Analysis

In addition to the TS layer analysis, TSM100 and IMS120 also perform various tests and analyses on the IP transport layer. The TSM systems will monitor all MPEG data over UDP or over RTP/UDP on an Ethernet input. All media flow properties, including IP, port, source IP, bitrate and protocol are displayed. In addition, TSM systems will monitor and calculate MDI values (Delay Factor and Medial Loss Rate), and analyze various RTP parameters if the TS is carried in an RTP flow. The test data is displayed in two pages: IP Analysis and RTP Analysis.

5.1 IP Analysis

The IP Analysis page will show all the IP flows being monitored by the TSM servers. Once a TSM server is connected to a network, it will start to sniff the network IP packets and analyze video streams. The “IP Analysis” page displays the basic information of the IP flow including IP, port, source IP, bitrate and the Media Delivery Index (MDI) measurement values. For more detailed information on the measurement, please refer to “Mividi TSM User Guides”.



IP	Port	Source IP	Flow Name	Protocol	Mb/s	Programs	Delay Factor	Media Loss	MDI Status
239.1.1.1	5004	192.168.1.3		MPEG	18.567	1	376.000	0.000	
239.1.1.1	5003	192.168.1.3		MPEG	0.000	0			
239.1.1.1	5000	192.168.1.3		MPEG	22.620	4	651.000	0.000	
239.1.1.1	5002	192.168.1.3		MPEG	19.529	1	342.000	0.000	
239.1.1.1	5001	192.168.1.3		MPEG	3.904	1	97.000	0.000	

Figure 5-1 IP Analysis

5.2 RTP Analysis

RTP, which stands for Real-time Transport Protocol (RTP), defines a standardized packet format for delivering audio and video over IP networks. RTP is used extensively in communication and entertainment systems that involve streaming media, such as telephone, video teleconference applications, television services and web-based push-to-talk features.

A number of measures are important to determine the quality of the video transport stream, as described in detail by ANSI/SCTE 168-6 2010: Recommended Practice for Monitoring Multimedia Distribution Quality. The TSM servers will perform the following test on the RTP streams, including finding the number of sequence errors, the packet loss rate, the maximum loss duration, and the minimum loss distance. An example of RTP test results are shown in the figure below. To see the RTP Analysis results, click on “RTP Analysis” menu to display the following page.

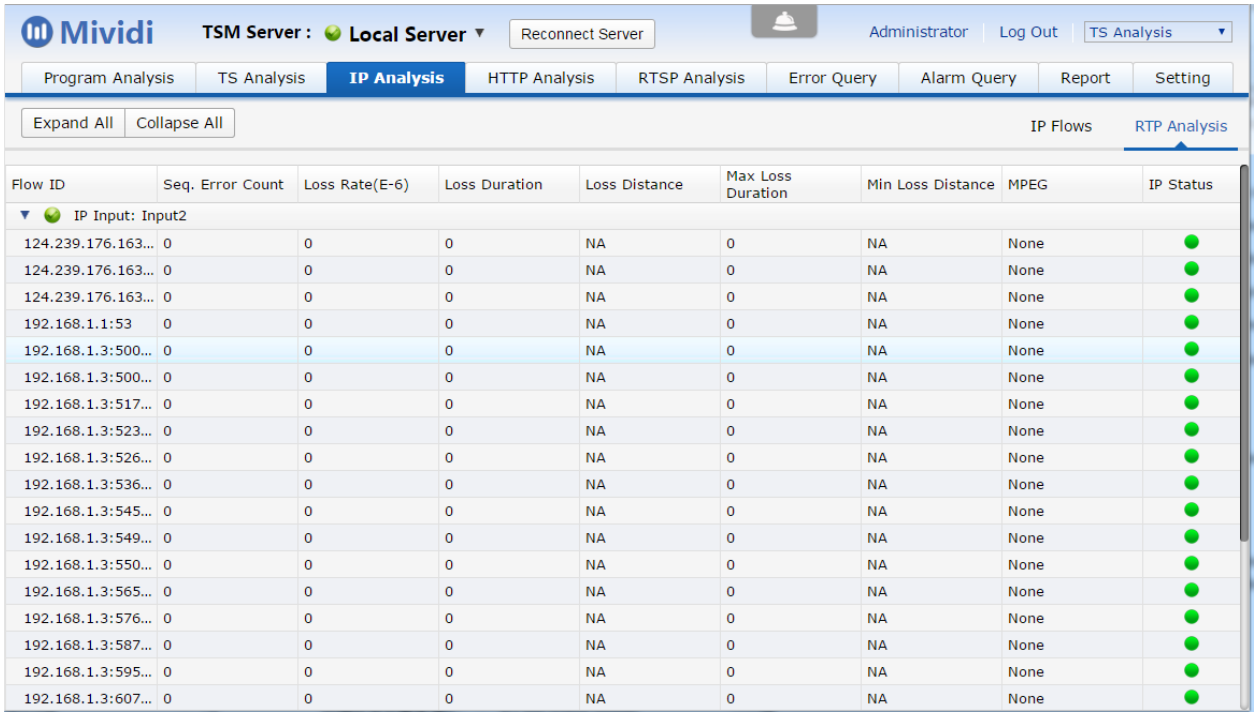


Figure 5-2 RTP Analysis

Chapter 6 HTTP Analysis

In addition to the TS layer analysis, the TSM monitoring systems also perform various tests and analyses on the HTTP sessions. The TSM systems can simultaneously start multiple HTTP sessions to download TS data from one or more video servers. (Please refer to Section 11.1.1 concerning how to start an HLS streaming session). The system will monitor all HLS sessions initiated by the service and perform extensive analysis on HTTP transfer status, HLS playlist file format, MPEG TS standard compliance, and audio and video qualities in all video services.

6.1 HTTP Stream Overview

Click “HTTP Analysis” menu on the top menu bar to open HTTP stream overview page. Similar to the TS Overview page, the available HLS Inputs and HLS streams in each input are all displayed in this page, along with several real-time properties of the streams, including:

- **Playlist:** The Playlist URL of an HLS stream;
- **Media File:** The latest TS segment file of an HLS stream;
- **Stream Name:** A user-friendly name for the stream (Please refer to Section 3.1.2);
- **Download Time:** The time that the HACS downloads this TS segment file;
- **Media Time:** Duration of the TS segment in playing time;
- **Sequence:** The sequence number of the TS segment file.
- **Bitrate:** Bitrate of an HLS stream, as calculated based on the encoded PCR value in an HLS stream.

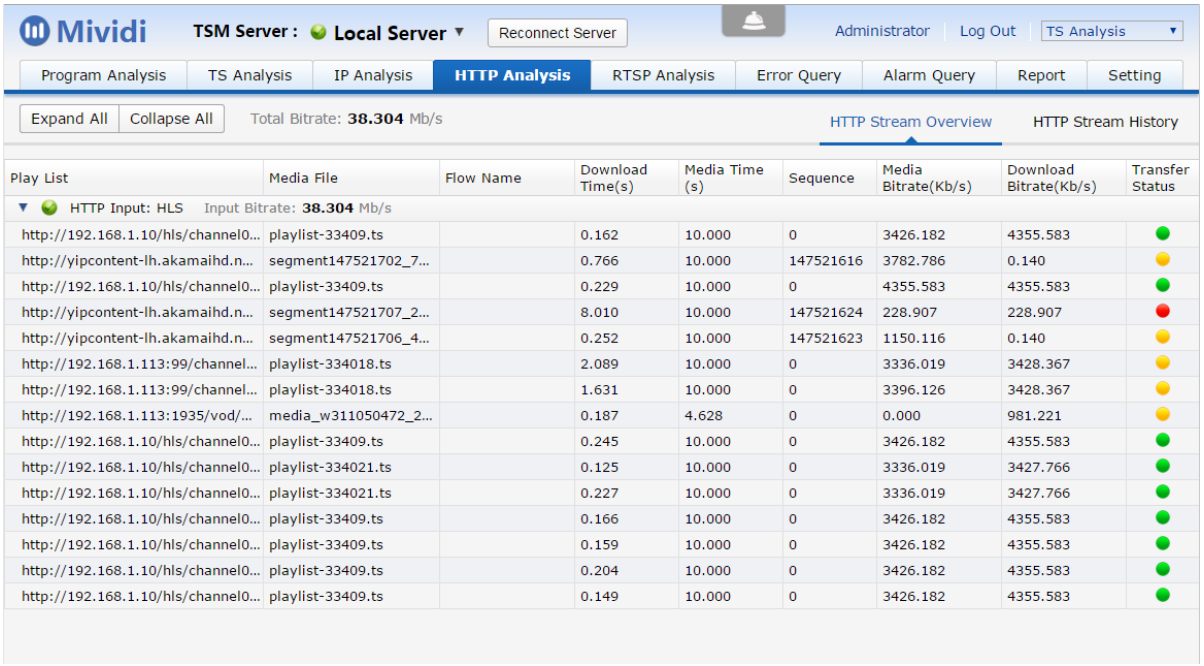


Figure 6-1 HTTP stream overview

6.2 HTTP Stream History

Click “HTTP Stream History” menu on the top-right menu bar in the HTTP Stream overview page to open the “HTTP Stream History” page. Users can view downloading statistics of TS segment files of each HLS stream in the Input.

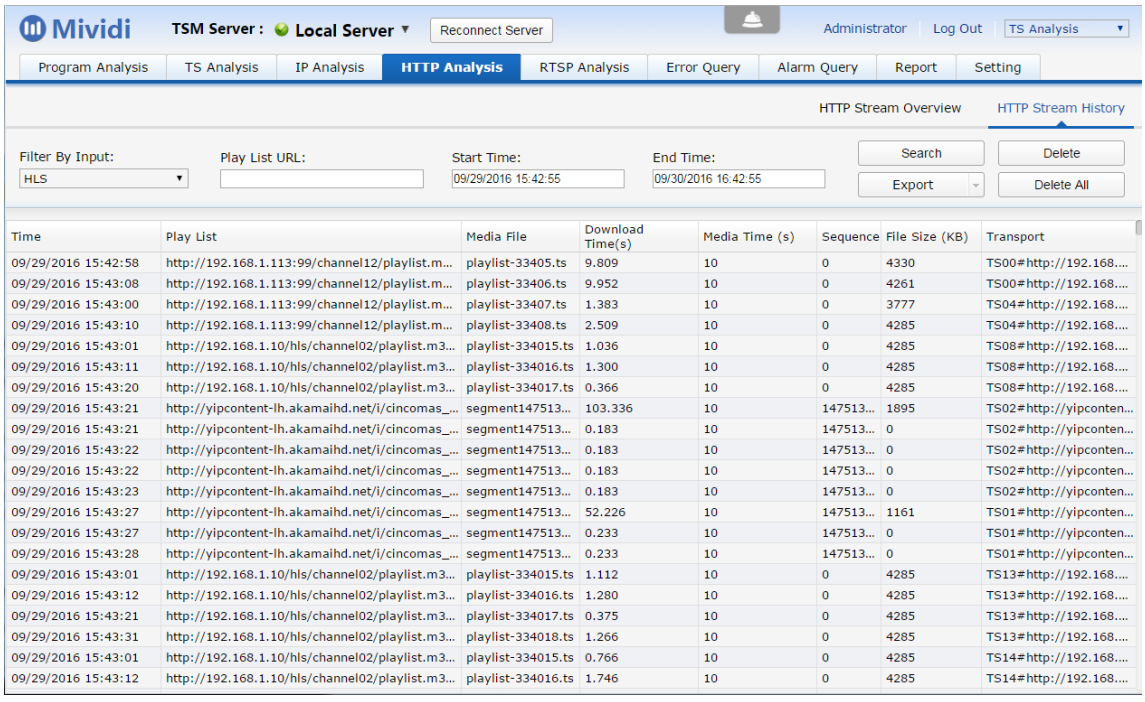


Figure 6-2 HLS Stream Downloading History Page

By filling in search query, it can limit the display to the files that meet the search criteria. The search results can be exported to a PDF or Excel file. The query parameters are described below:

- **Filter by Input:**
  When you have multiple inputs, using this parameter to limit the streams belong to certain inputs.

- **Start Time and End Time:**
  Define the time period when the segment files are downloaded.

- **Playlist URL:**
  When this field is empty, the playlist URL is not tested and all the records that meet other conditions are displayed.

Description of operational buttons:

- **Delete:**
  Delete the TS segment files displayed in the page from database.

- **Delete All:**
  Delete all TS segment files of a selected HLS Input from database.

- **Export:**

Export the searched TS segment files to a PDF or Excel file.

Chapter 7 RTSP/RTMP Analysis

In addition to the TS layer analysis, TSM Web system also supports streaming media analysis using RTSP, RTMP, MMS protocols. It monitors streaming errors and checks the streams based on user-defined stream profiles.

7.1 RTSP/RTMP Analysis

Click “RTSP/RTMP Analysis” menu on the top menu bar to open RTSP/RTMP stream overview page. Similar to the TS overview page, the available RTSP, RTMP streams are all displayed in this page, along with real-time bitrate of the streams, and stream name, as shown in figure7-1:

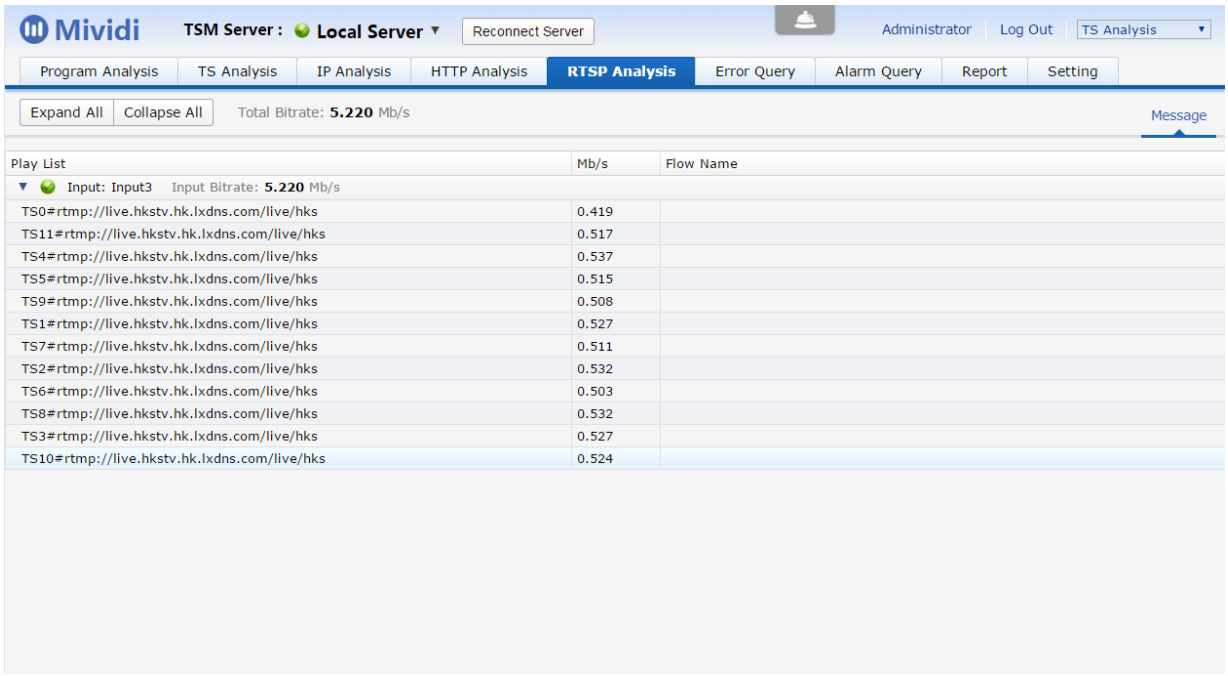


Figure 7-1 RTSP/RTMP Analysis

RTSP uses text messages to exchange information between the RTSP streaming server and client. The server sends the client stream properties, and the client send a number of control commands to the server. The TSM Web monitors the real-time message exchange between the server and the client, therefore helps users to trouble-shoot potential problem in streaming service. Click on a stream to enter the RTSP message page, all messages are displayed in the Message page. As shown in Figure 7-2.

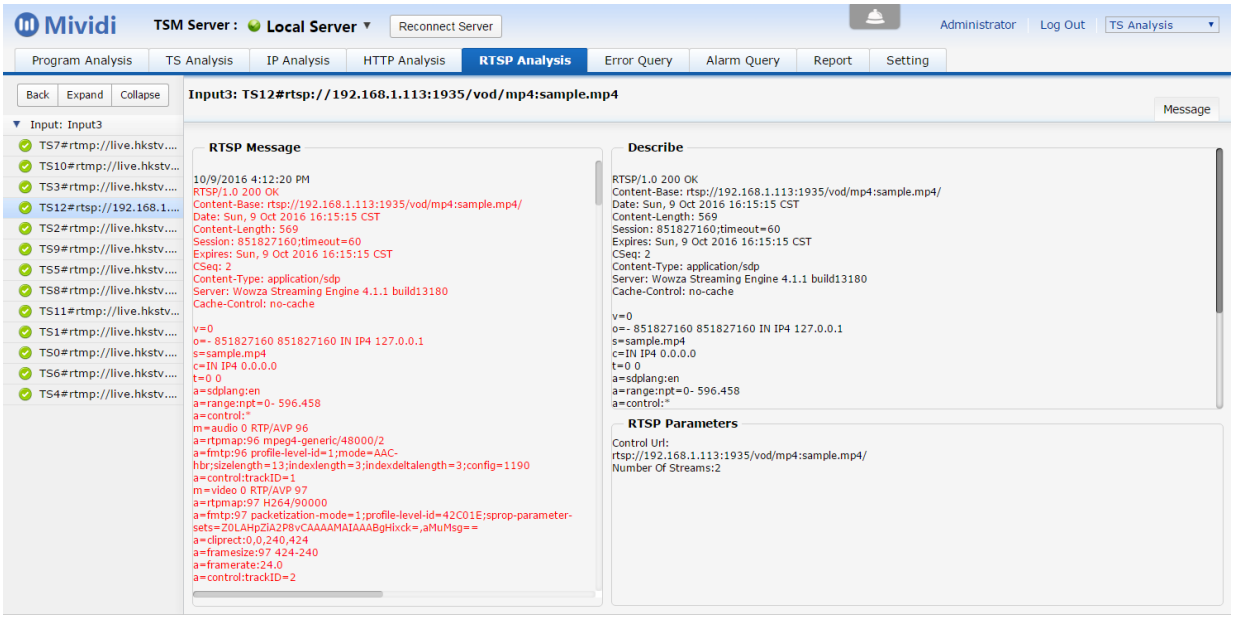


Figure 7-2 RTSP Message

Similar to RTSP protocol, RTMP also uses various messages for server and client communication. Click on a stream to enter the RTMP message page, as shown in Figure 7-3. Both binary data and decoded text messages are displayed in this page.

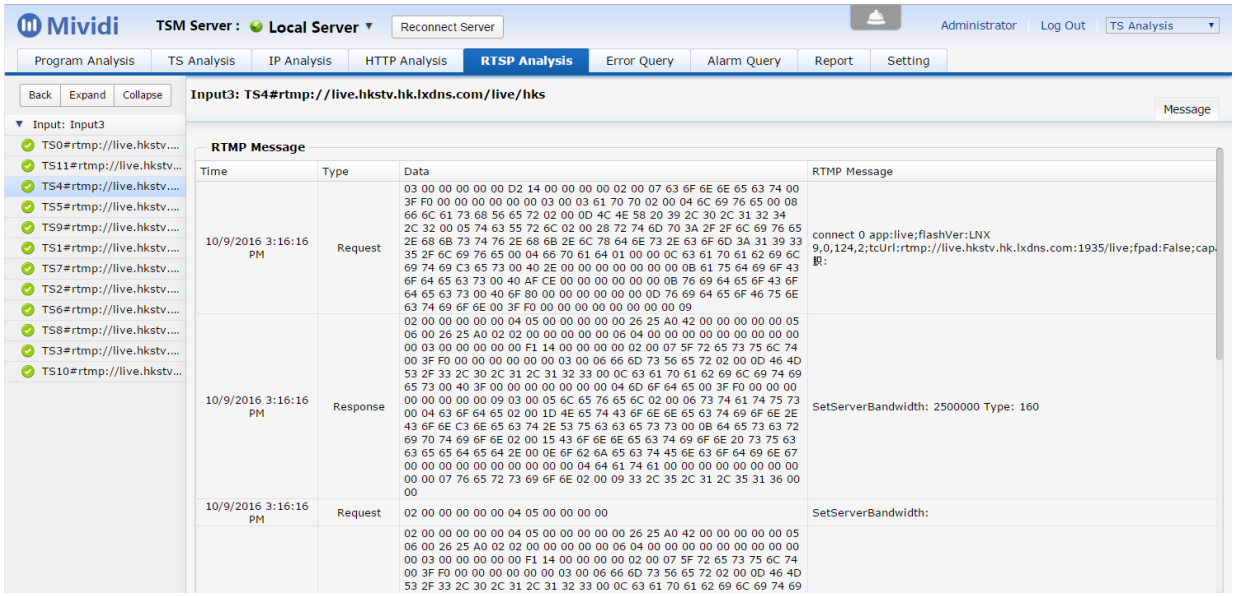


Figure 7-3 RTMP Message

Chapter 8 MPEG-DASH Analysis

The TSM Web supports IP streaming based on the MPEG-DASH protocol and checks the syntax of DASH MDP file and analyzes downloaded media data.

8.1 MPEG-DASH Analysis

Click the “DASH Analysis” tab on the main menu bar to go to the “DASH Analysis” page, as shown in Figure 8.1.

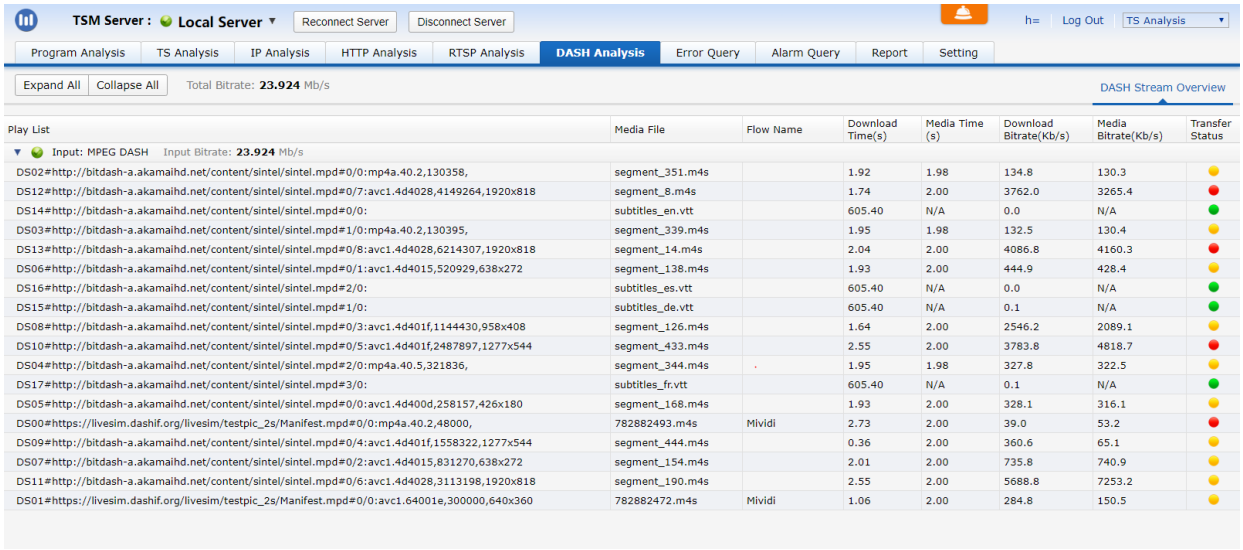


Figure 8-1 DASH Analysis Page

This page shows the results of the HTTP download activity and the download status in real time. The average download time is calculated and compared with the playback time of the streaming media segment. If the download time is greater than the media time, the stream status will be displayed in red color, indicating the delay of download media segment.

The “DASH Analysis” page displays the following columns:

- **Playlist URL**: shows the playlist URL of the DASH stream;
- **Media File**: the media clip file currently being analyzed by the server;
- **Stream Name**: user-defined stream name;
- **Download time**: the time taken by the monitoring server to download the current media clip file;
- **Download Bit Rate**: the bit rate of downloading the current media clip file by the monitoring server downloads;
- **Media Bit Rate**: the bit rate of the DASH stream based on the playback time;
- **Status**: the real-time status of the downloading of the current DASH stream.

Chapter 9 Key Frame Thumbnail Display

Note: This feature described in this chapter is not available when the TSM Web is connected to a "TSM for Broadband" product.

The TSM units decode video key frames, and periodically decode audio frames as well. The decoded video frames are re-encoded into small thumbnails to be displayed on the Video Mosaic page for visual verification that the streaming services are running.

The Video Mosaic page displays thumbnails from all streams being monitored in a single page. The thumbnails from different streams can be grouped according to users' preference.

9.1 Key Frame Display

Click "Program Analysis" menu on the top menu bar to open the Video Mosaic page, as shown in the following figure.

This page will display thumbnails in groups. One thumbnail panel corresponds to a program, and it shows the video thumbnail, audio VU bars, stream ID, audio and video encoding information.

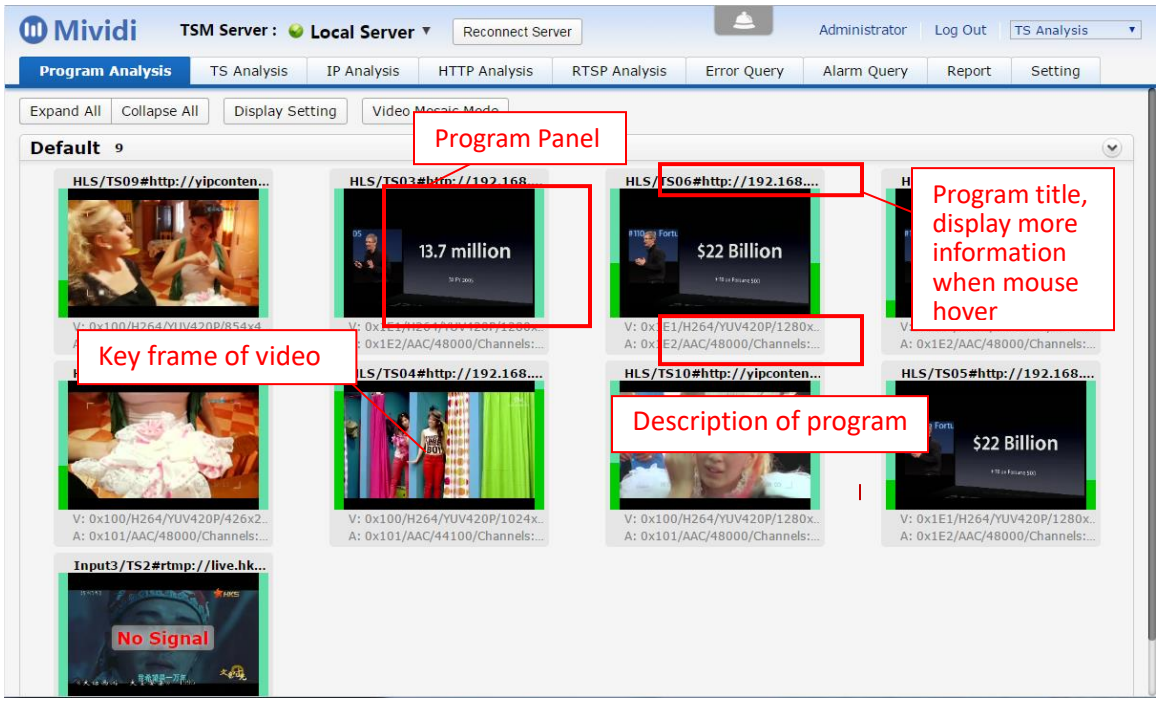


Figure 9-1 Video Mosaic page

9.2 Display Setting

The users can change the display settings according to their preference. Three parameters which can be changed on the display include: 1. Selection of programs to be displayed; 2. Group a program belongs to; 3. Display order of programs and groups.

Click “Display Setting” button on the Video Mosaic page to open display setting dialog.

9.2.1 Program Group Setting

Click “Program Groups” button on the “Display Setting” dialog to open the Program Groups setting dialog as shown below:

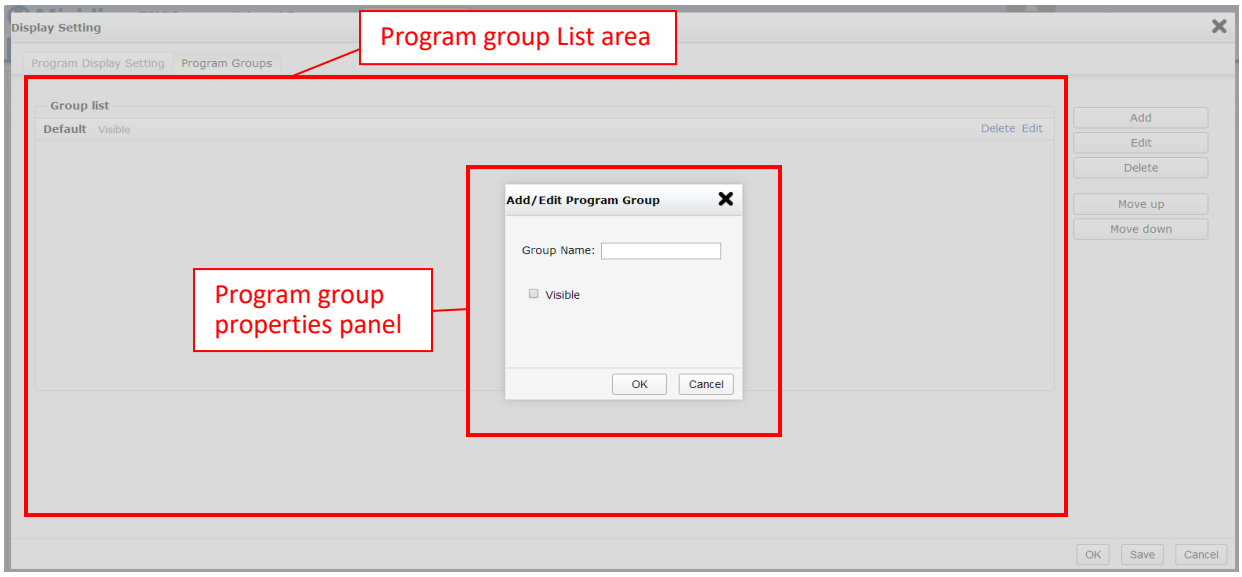


Figure 9-2 Display Setting dialog – Program Groups Setting Tab

The Group List box displays all groups configured. Click a row in the group list to select this group, and then click “Move Up” and “Move Down” buttons on the right side to change the order of program groups. Use “Delete” button to delete this program group. Click “Edit” button to open the Group Edit Panel to modify the properties of this program group. Click “Add” button to open Add Group panel. Fill in each item in the Add Panel to add a new program group.

The properties of a program group include:

- **Group Name:** The name must be unique can cannot be reused;
- **Visible:** If checked, this program group will be displayed in the Video Mosaic page. Otherwise, this group will not be displayed.

Note: After modifying Program Groups setting, click “OK” or “Save” button in the bottom of the page to save the changes. Otherwise, the modification is not saved and the new parameters are not applied to the service.

9.2.2 Program Display Setting

Click “Program Display Setting” tab in the Display Setting dialog to open the “Program Display Setting” page:

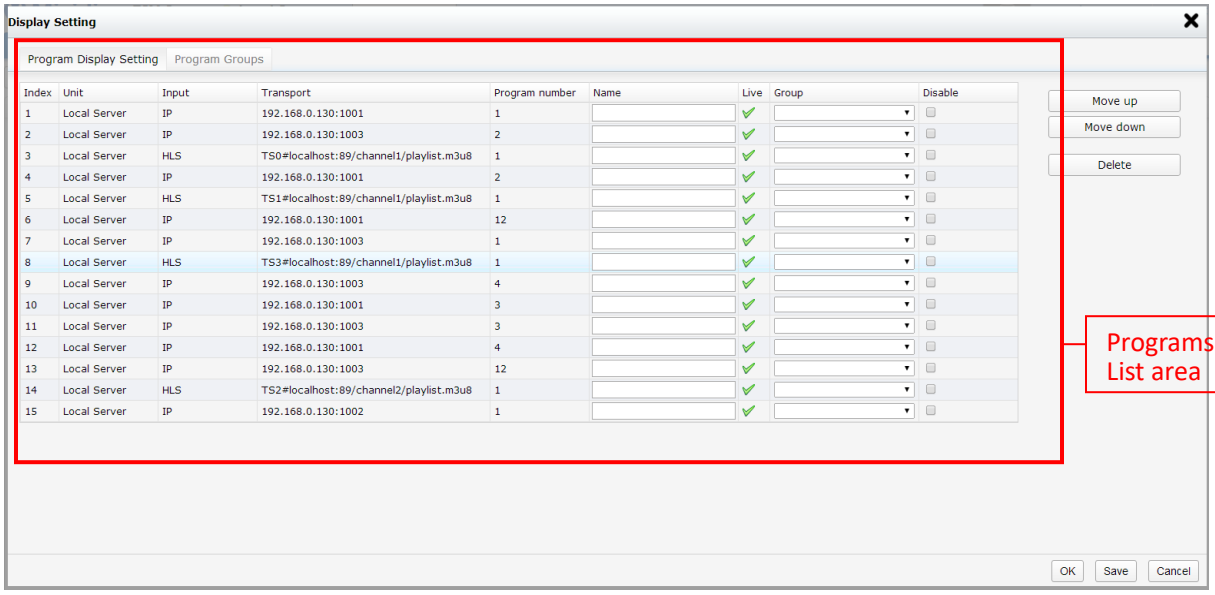


Figure 9-3 Display Setting Dialog - Programs Display Setting Tab

The table on the left side shows the current configuration, including the program identification, whether the program thumbnail to be displayed, which group it belongs to, and the display order. Click a row in the program list table to select a program, and then click “Move Up” and “Move Down” buttons on the right side to sort programs. Click “Delete” button to delete this program. In addition, users can set a user-friendly name for this program. When a program has a given name, the panel title in the Video Mosaic page will show this name, instead of the HLS playlist URL.

Note: After modifying Program Display Setting, click “OK” or “Save” button in the bottom of the page to save the changes. Otherwise, the modification is not saved and the new parameters are not applied to the service.

Description of each column in the program list table:

- **Input:** The Input which contains the Transport Stream;
- **Transport:** The name of the stream containing this program;
- **Program Number:** Program number of this program;
- **Name:** A user-friendly name of this program;
- **Live:** Show if this program is currently alive;
- **Group:** Selected display group for this program;
- **Enable:** If checked, this program will be displayed in the Video Mosaic page. Otherwise, it will not be displayed.

9.2.3 Penalty Box Setting on Thumbnail Display

The TSM Web contains a Penalty Box feature which will display the thumbnails of video programs with error alarms. When an error alarm is received for a program, the TSM Web will move the program thumbnail from a user-defined group to the Penalty Box group. If you need to enable this function, you need to do that in the “Program Group Settings” dialog. Open the “Program Group Settings” page, check the “Display Penalty Group” checkbox, as shown in the following figure:

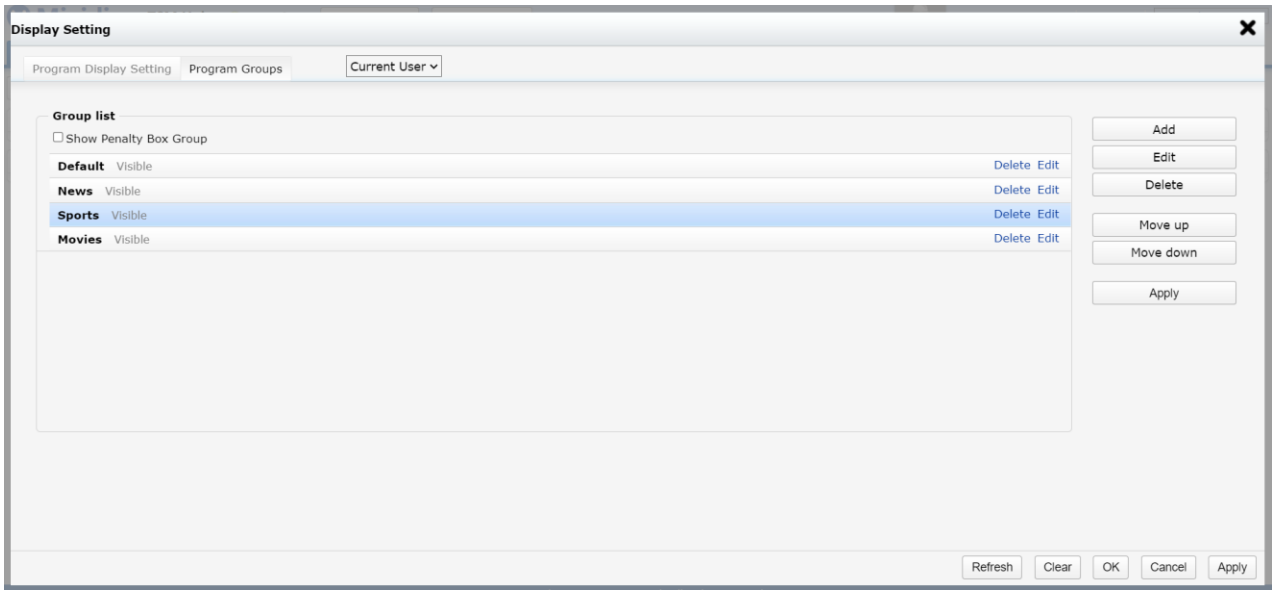


Figure 9-4 Penalty Box Group

Click the “Apply” button or click the “OK” button to save and close the Program Display Group setting. At this time, a Penalty Box Group will be added to the thumbnail display page. If your program has an error alarm, the program thumbnail will be moved from other groups to Penalty Box Group. If the alarm error disappears and you want to return the program in the Penalty Box Group to the previous group, click the “Resolved” button under the thumbnail, and the program thumbnail will be removed from the Penalty Box Group to a normal group.

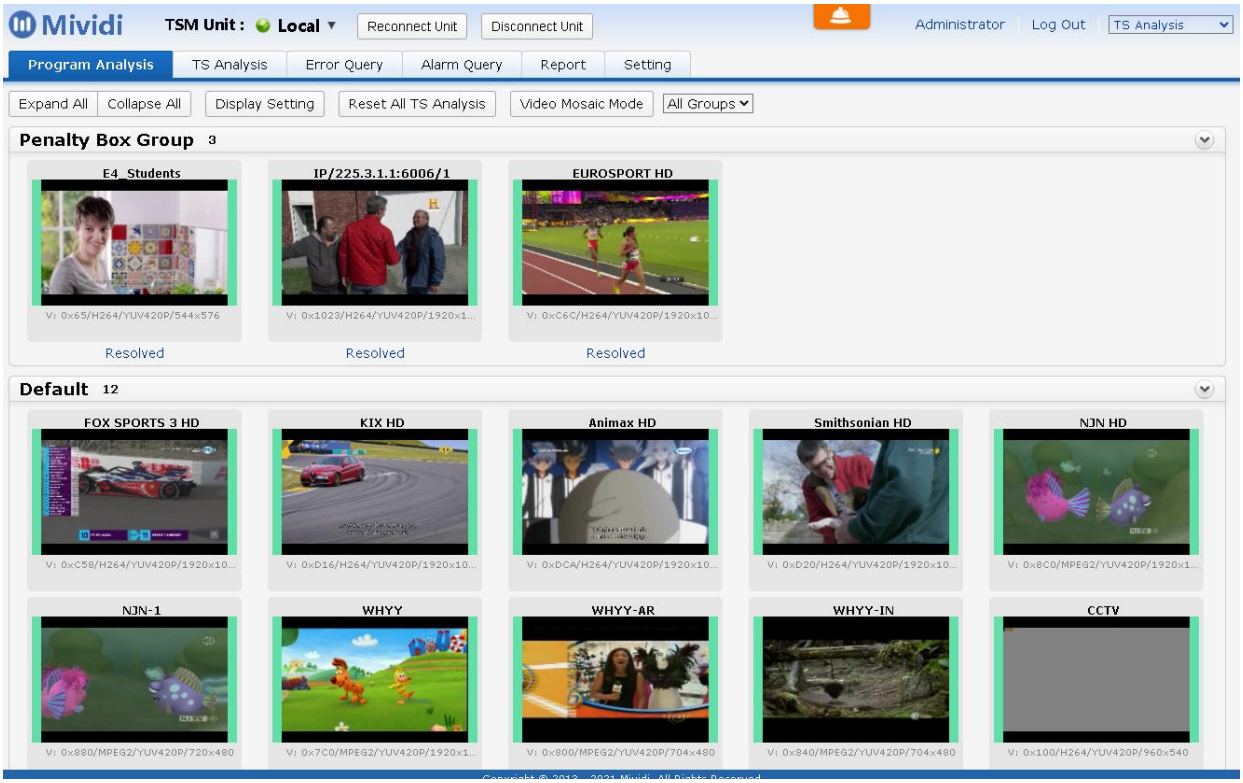


Figure 9-5 Thumbnails of Programs with Error Alarms in the Penalty Box Group

9.2.4 Create Display Setting for Different Users

The TSM Web defines two user roles: Administrator and Users. All settings have to be done by an Administrator. The Administrator needs to set the thumbnail display panels for other users, and users can only see programs that selected for them to see.

To configure for a different user, select a user from the user drop down list on the top of Display Setting page. Set the program display using the method described in the previous section 9.2.2, as shown in the following figure:

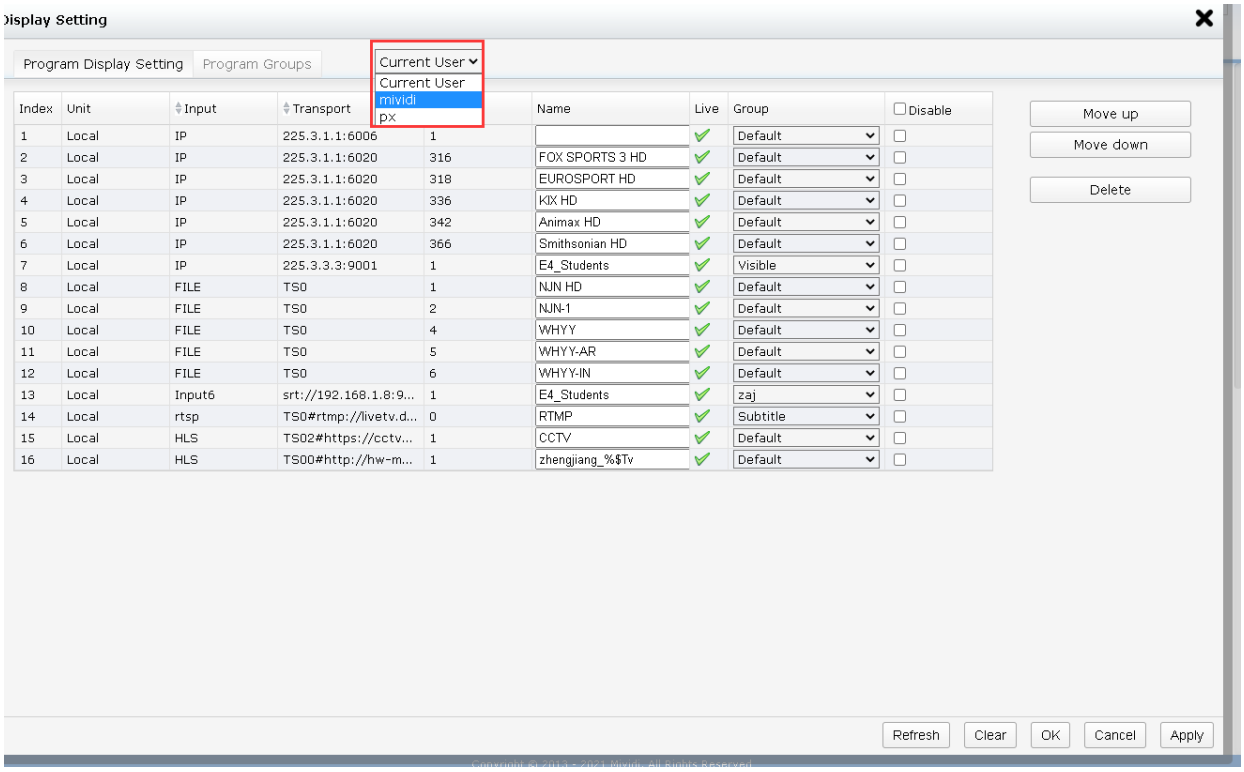


Figure 9-6 Perform Display Setting by an Administrator for Different users

You can also copy the settings of the current Administrator user to other users if you want other users to have similar settings. To do that, simply click the “Copy Current User Settings” button to copy the settings to the user you want to set, as shown in the following figure:

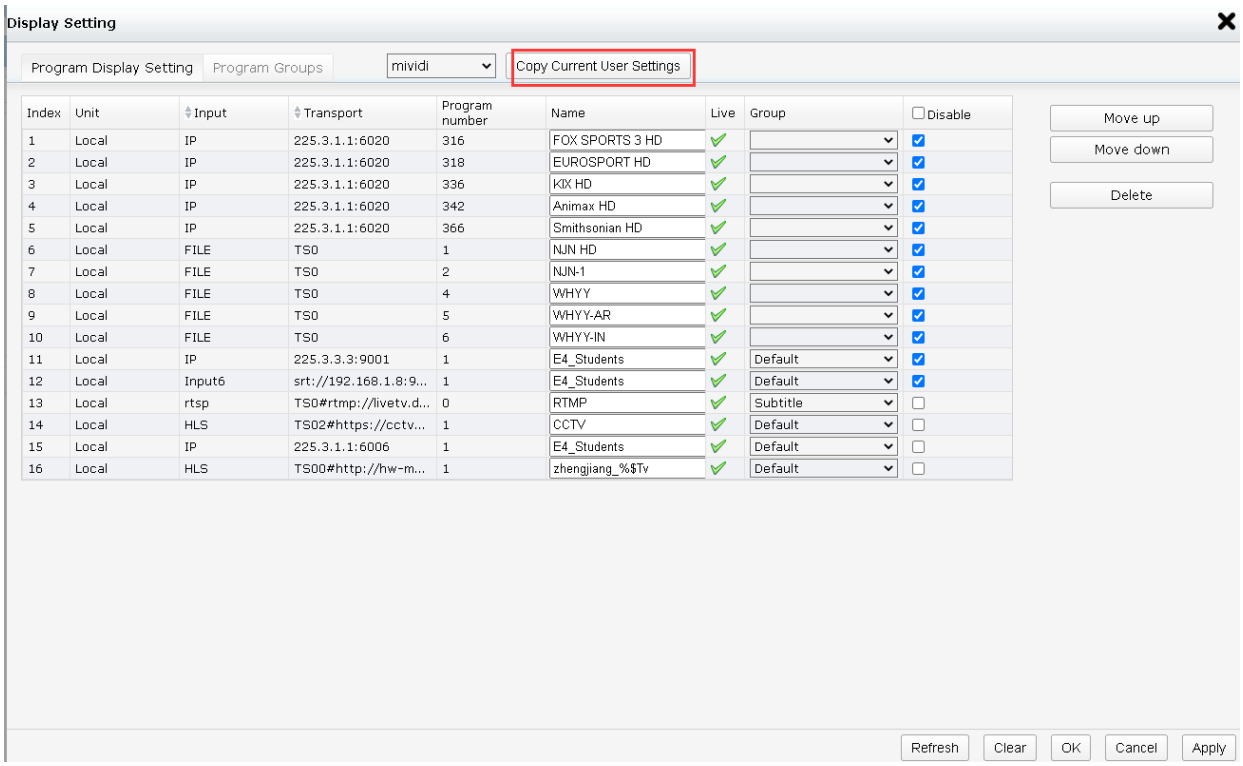


Figure 9-7 Copy Display Setting from the Current Administrator User to Another User

Chapter 10 Statistics and Report

The TSM Web can create several types of reports. The reports are divided into three groups: TS Analysis Reports, HTTP Analysis Reports and IP Analysis Reports. TS Analysis Reports are generated per transport stream and they include: Error Summary report, Error Selection Report, Transport Stream Quality Report, Transport Snapshot Report and Statics Report. HTTP Analysis Reports are generated per HLS Input and they include: HTTP Errors, Streaming Summary Report and Streaming Status Report. IP Analysis Reports are generated per IP Input and they include: IP Errors Report, IP Flow Status Reports, MDI Reports.

10.1 TS Analysis Reports

10.1.1 Error Summary Report

Click “Report” menu on the top menu bar to open the “Report” page. Click “Error Summary” menu on the left menu list to open the “Error Summary Report” page. Select an input, set the start and end time for the reporting period. You can also optionally select the error priority types you want to include in the report, and finally click the “Create” button. The software will split the time period into 10 equal time periods and assign all errors in these 10 periods. If there are no errors in some periods, there will be no data for that period on the plot. You may need to adjust the start and end time to get a plot you need. An example of the Error Summary report is shown in the following figure. Once the report is created, you can print it or save it in PDF or Excel format.

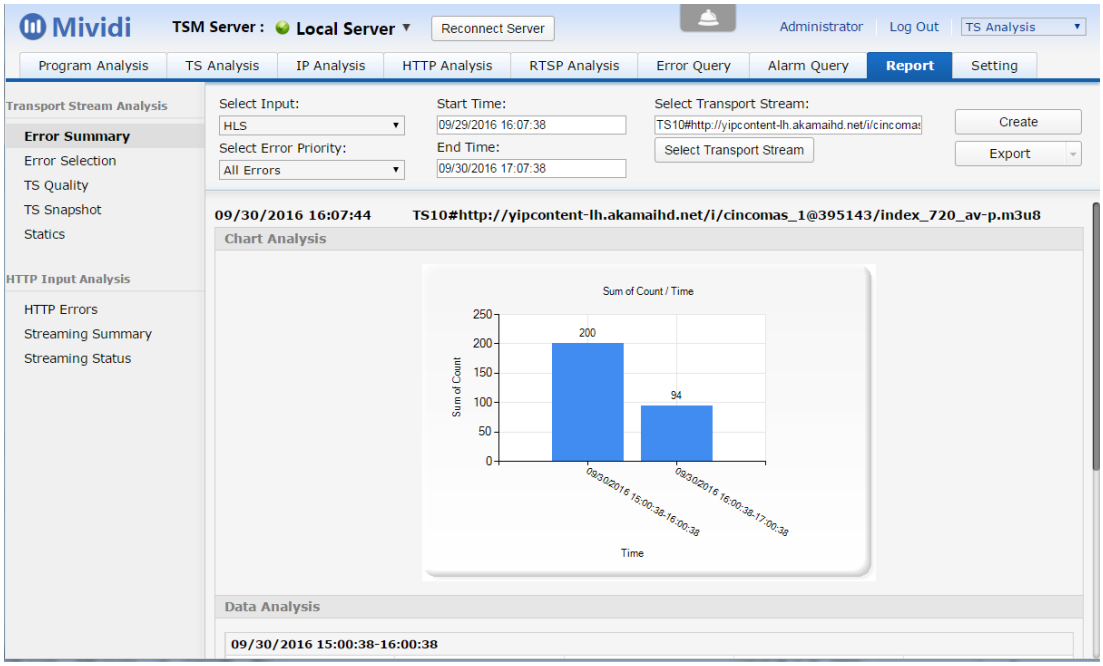


Figure 10-1 Error Summary Report Page

10.1.2 Error Selection Report

Click “Report” menu on the top menu bar to open the “Report” page, and then click “Error Selection” menu on the left menu list to open the “Error Selection Report” page. Similar to the Error Summary report, you can select input, transport stream, start and end time for the report. The difference is in this page, you can plot only errors of specific error codes, instead of all errors in the previous page.

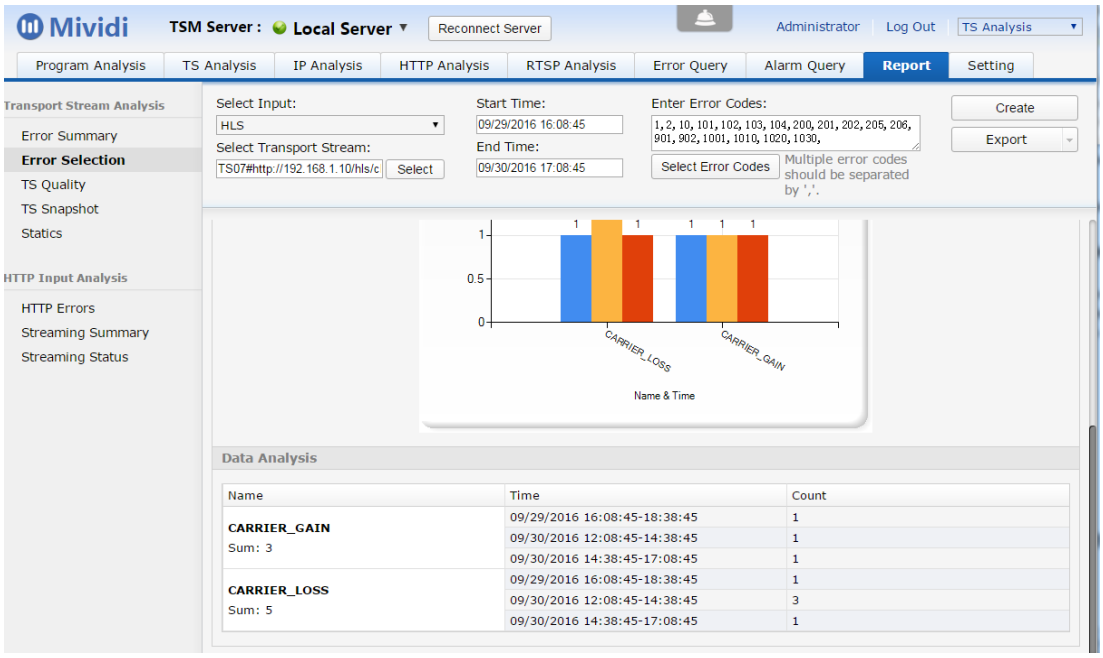


Figure 10-2 Error Selection Report Page

10.1.3 Transport Stream Quality Report

Click “Report” menu on the top menu bar to open “Report” page, then click “TS Quality” menu on the left menu list to open the “TS Quality” report page. The report is generated similar to the other reports described in previous two sections.

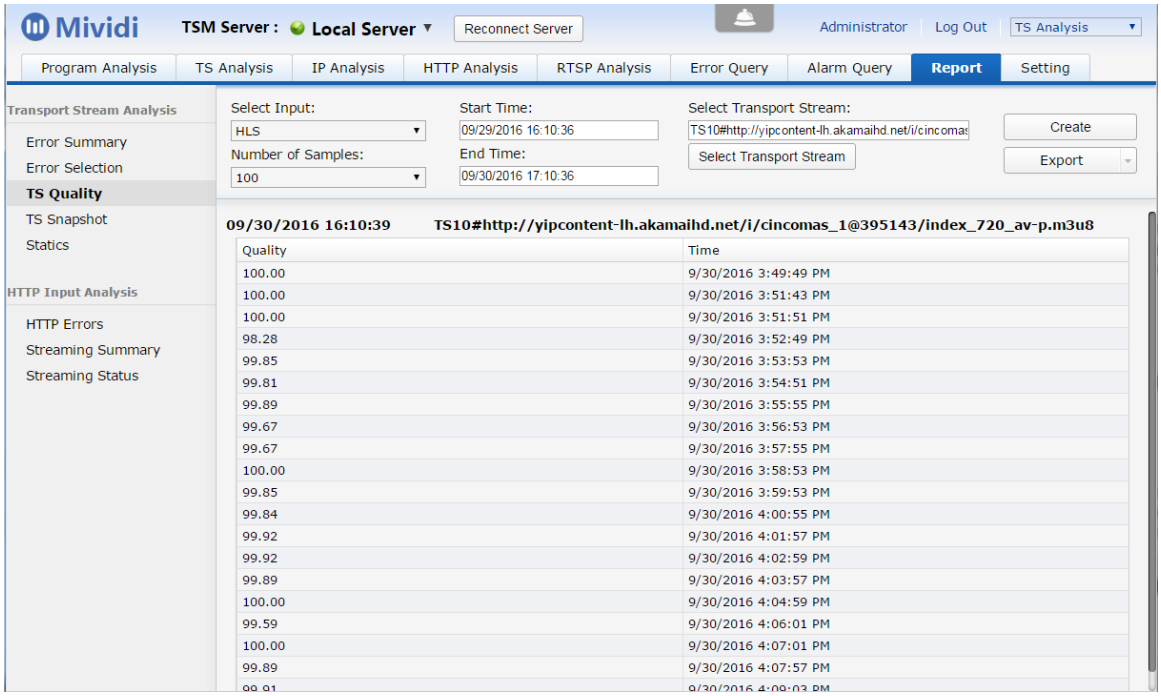


Figure 10-3 Transport Stream Quality Report Page

10.1.4 Transport Stream Snapshot Report

Click “Report” menu on the top menu bar to open report page, then click “TS Snapshot” menu on the left menu list to open the “TS Snapshot” report page. Select an HLS Input and set the start and end time for the reporting period. Then select how many snap shots you want to create during the time period, and finally click the “Create” button. The system will create the reports at a uniform time interval. Information including PIDs, stream types, programs, bitrates, and max/min bitrates will be shown on the report. An example of the report is shown in the following figure:

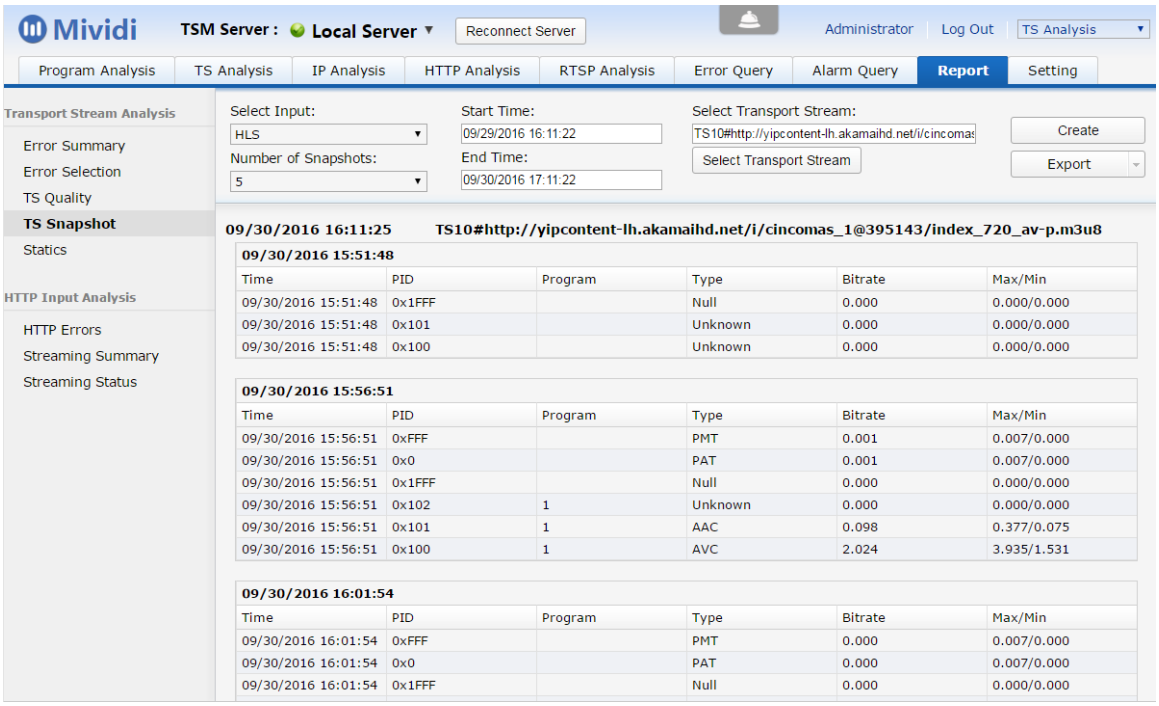


Figure 10-4 Transport Stream Snapshot Report Page

10.1.5 Statics

Click “Report” menu on the top menu bar to open “Report” page, and then click “Statics” menu on the left menu list to open the “Statics” report page. The report is generated similar to other reports described in previous pages.

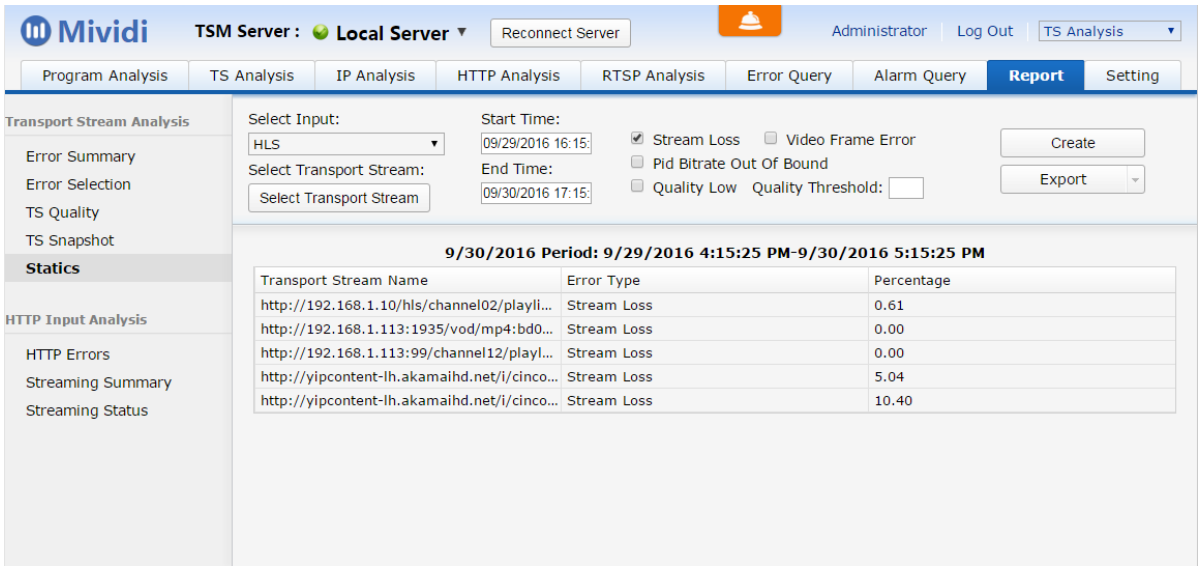


Figure 10-5 Statics Report Page

10.2 HTTP Analysis Report

10.2.1 HTTP Errors Report

Click “Report” menu on the top menu bar to open “Report” page, then click “HTTP Errors” menu on the left menu list to open the “HTTP Errors” report page. Select an HLS service and click the “Create” button to generate a report.

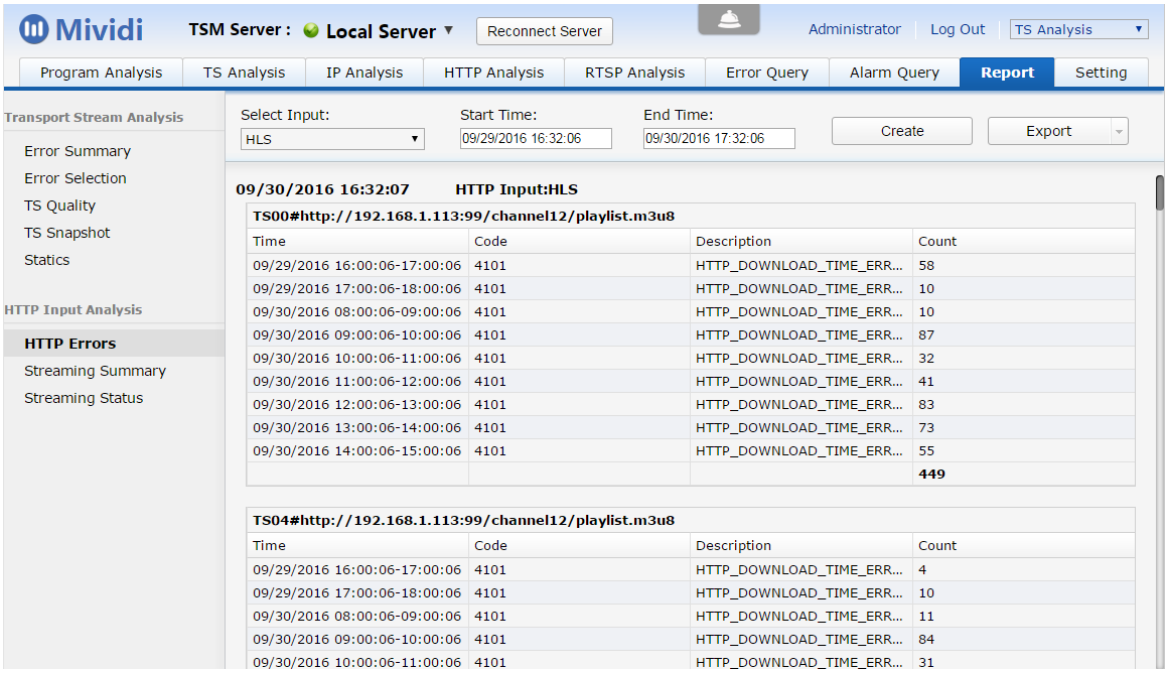


Figure 10-6 HTTP Errors Report Page

10.2.2 Streaming Summary Report

Click “Report” menu on the top menu bar to open report page, then click “Streaming Summary” menu on the left menu list to open the “Streaming Summary” report page. Select an HLS Input, set the start and end time for the reporting period, and click the “Create” button. The report contains information including the Play List URL, media file count, total media size downloaded, start and end time. In addition, the system can create detailed status report for a single transport stream. An example of the report is shown in the following figure:

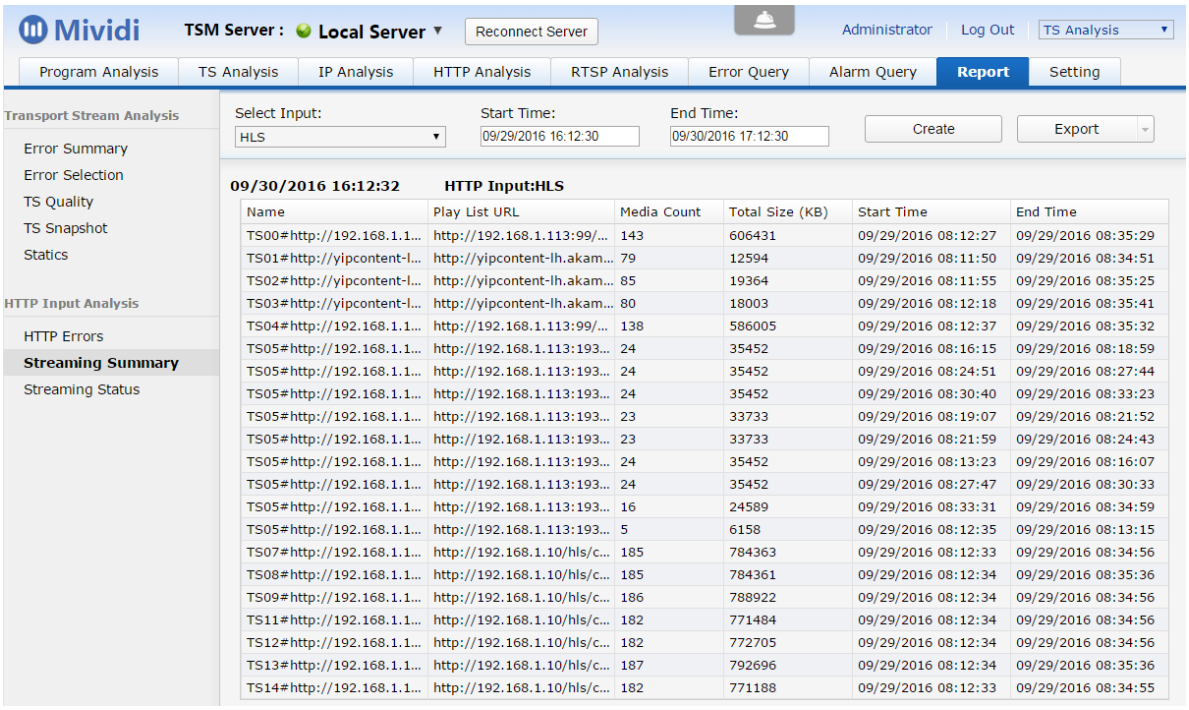


Figure 10-7 Streaming Summary Report Page

10.2.3 Streaming Status Report

Click “Report” menu on the top menu bar to open “Report” page, then click “Streaming Status” menu on the left menu list to open the “Streaming Status” report page. Select an HLS Input and set the start and end time for the reporting period. Select an HLS service and click the “Create” button to generate a report.

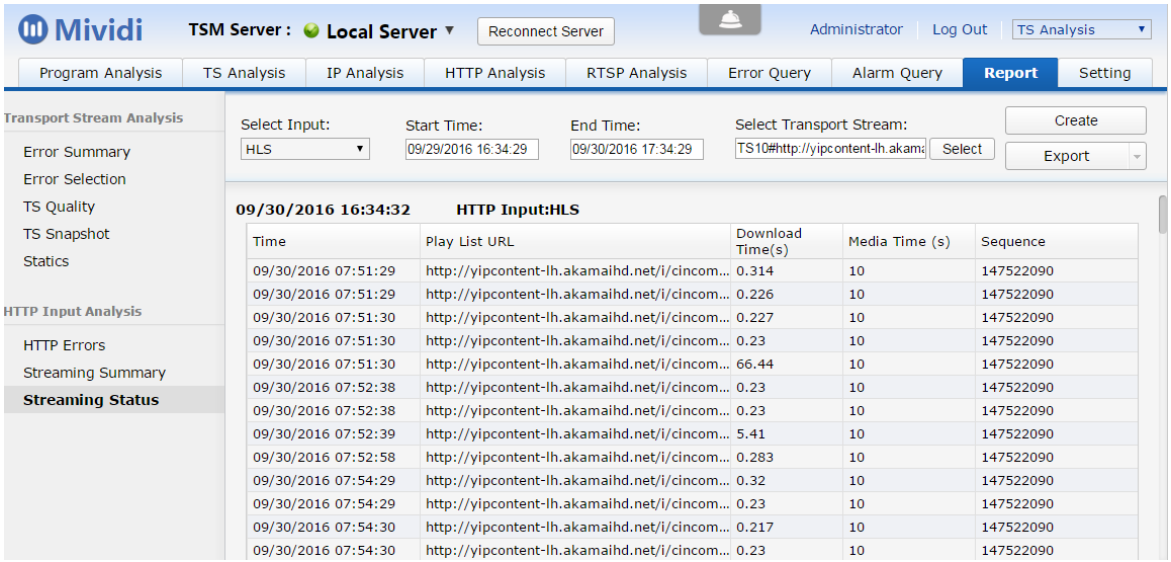


Figure 10-8 Streaming Status Report Page

10.3 IP Analysis Report

10.3.1 IP Errors

Click the **“Report”** in the main menu to enter the “Report” page and click the “IP Errors” link on the left side to enter the “IP Report” page. Enter the “Start Time” and “End Time” and select a stream. Click “Create” to create an error report, as shown in the Figure below:

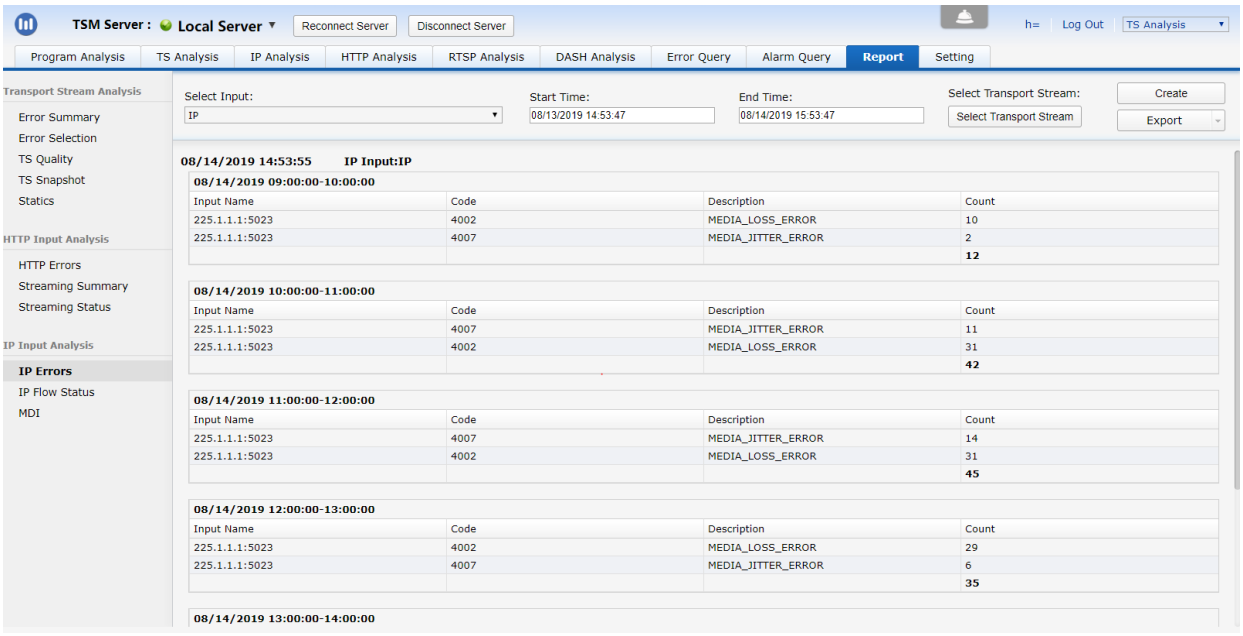


Figure 10-9 IP Error Report

10.3.2 IP Stream Status

Click the “Report” menu in the main menu to enter the “Report” page and click the “IP Flow Status” link on the left side the enter the “IP Flow Status” page. Enter the “Start Time” and “End Time” and click “Create” to create an “IP Flow Status” report, as shown in the Figure below:

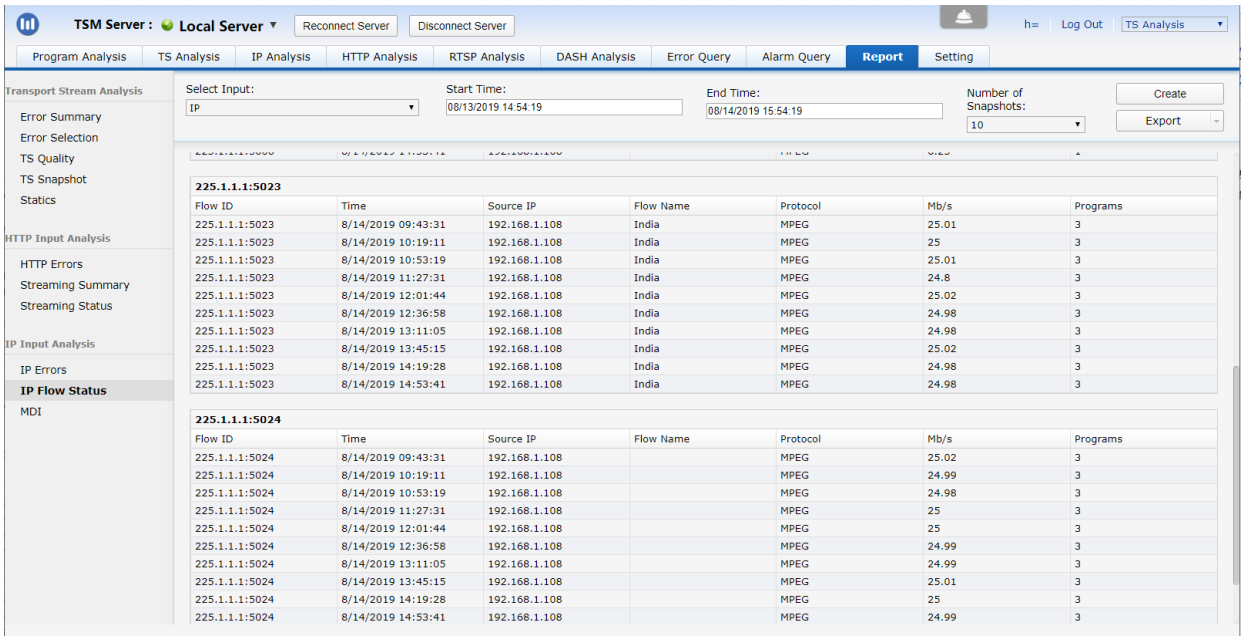


Figure 10-10 IP Flow Status Report

10.3.3 MDI Report

Click the “Report” menu in the main menu to enter the “Report” page and click the “MDI” link on the left side to enter the “MDI” page. Enter the “Start Time” and “End Time” and click “Create” button to create an “MDI” report, as shown in the Figure below:

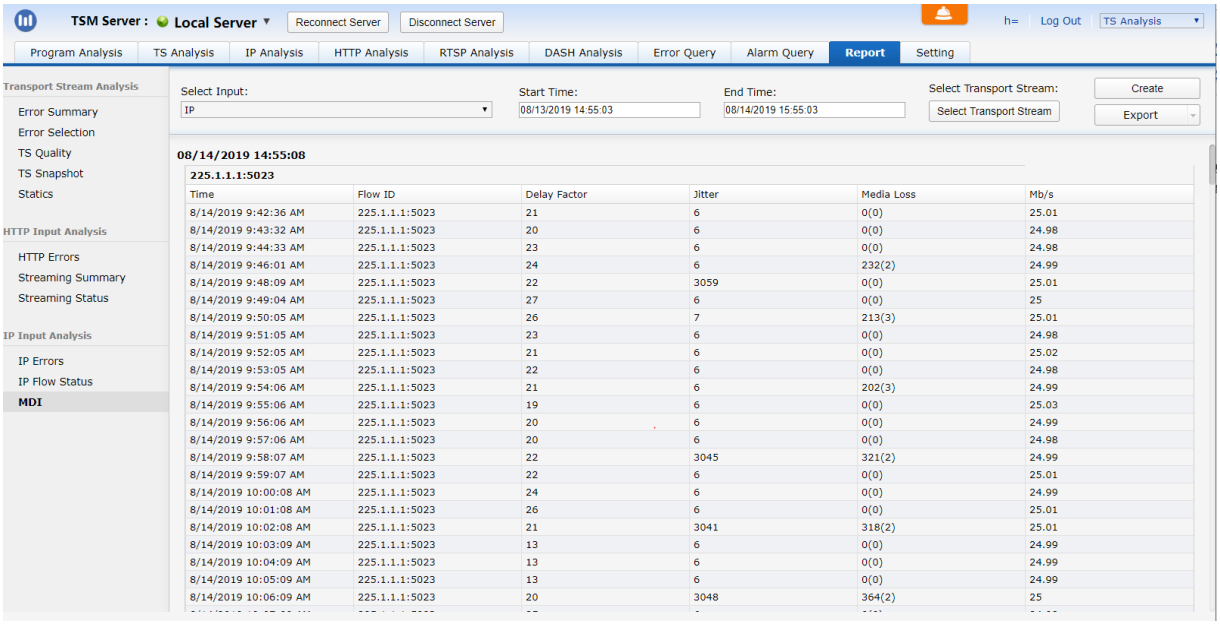


Figure 10-11 MDI Report Page

Chapter 11 Input Stream Setting

You can use the TSM Web service to configure the input streams. The procedure to add HLS URLs are as follows:

11.1 HLS Input

An “HLS Input” is a virtual input that bundles multiple HLS streams being monitored. A single TSM unit can contain multiple HLS Inputs. One input can contain a maximum of 100 streams, therefore if more than 100 streams will be monitored, more than one inputs can be created.

The TS Analysis page will list all inputs and all HLS streams being monitored under each input, as shown in the following figure:

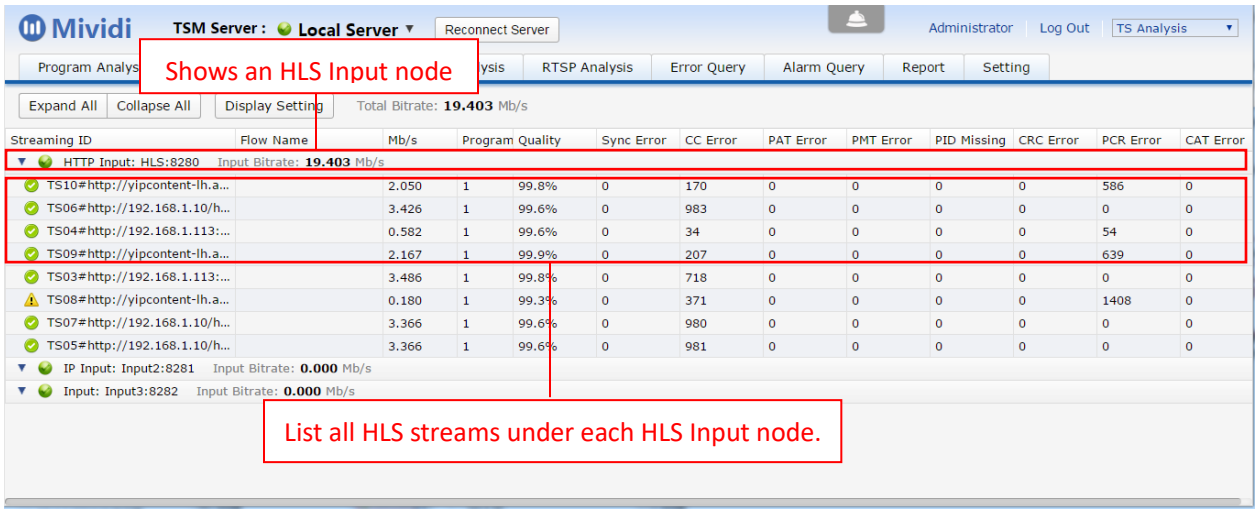


Figure 11-1 Overview of HLS Input Nodes and All HLS streams

11.1.1 HTTP Session Setting

“HTTP Session setting” page is used to add playlist URLs to an HLS Input. Click “Setting” menu on the top menu bar to open the “Setting” page, then click “HTTP Session” menu on the menu list to open “HTTP Session Setting” page, as shown in the figure below:

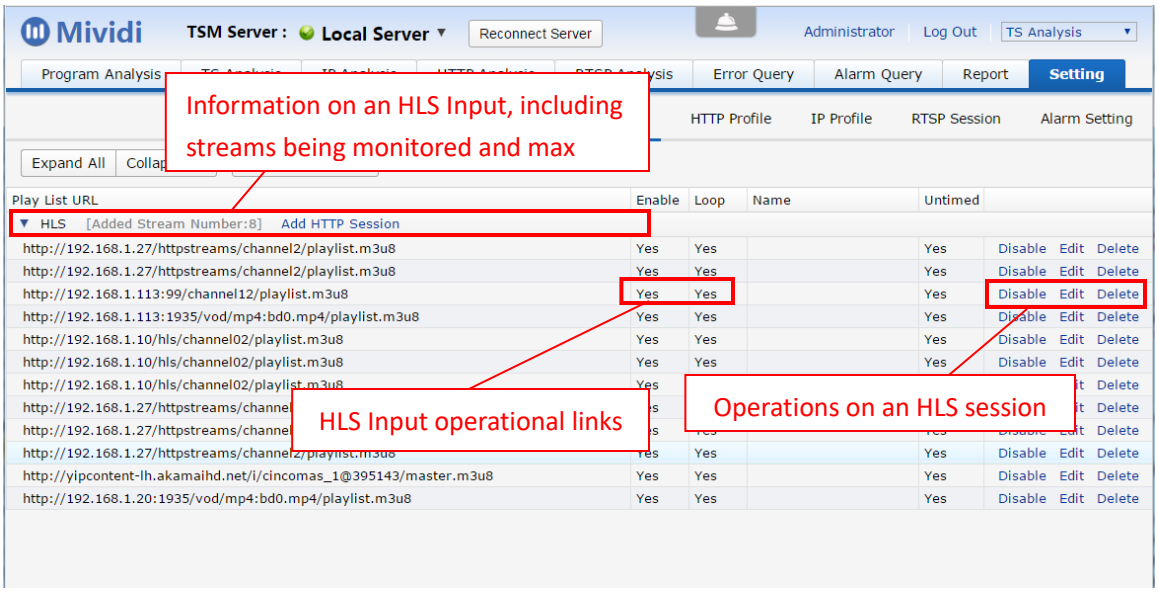


Figure 11-2 HTTP Session Setting Page

11.1.1.1 Edit Max Stream Number of an HLS Input

As mentioned before, an HTTP Input can contain up to 100 HLS streams. If there are more than one input, you can distribute these streams to different inputs and set a max number for each input as long as this value is less than 100. In that case, a user cannot add more streams to this input once your self-set maximum number is reached.

Click “Edit Max Stream Number” button next to the HTTP Input label to open the edit panel, as shown in the following figure:

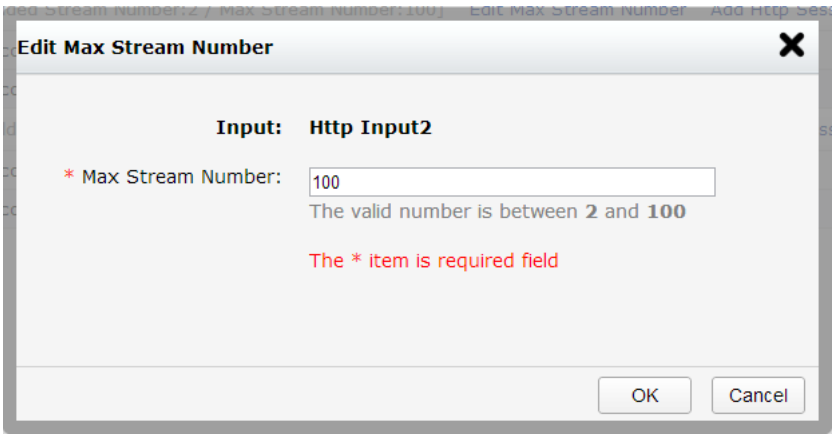


Figure 11-3 Edit HLS Input Max Stream Number

11.1.1.2 Add an HTTP Session

Click “Add HTTP Session” button next to the HTTP Input label to open the “Add/Edit HTTP Session” panel, as shown in the following figure:

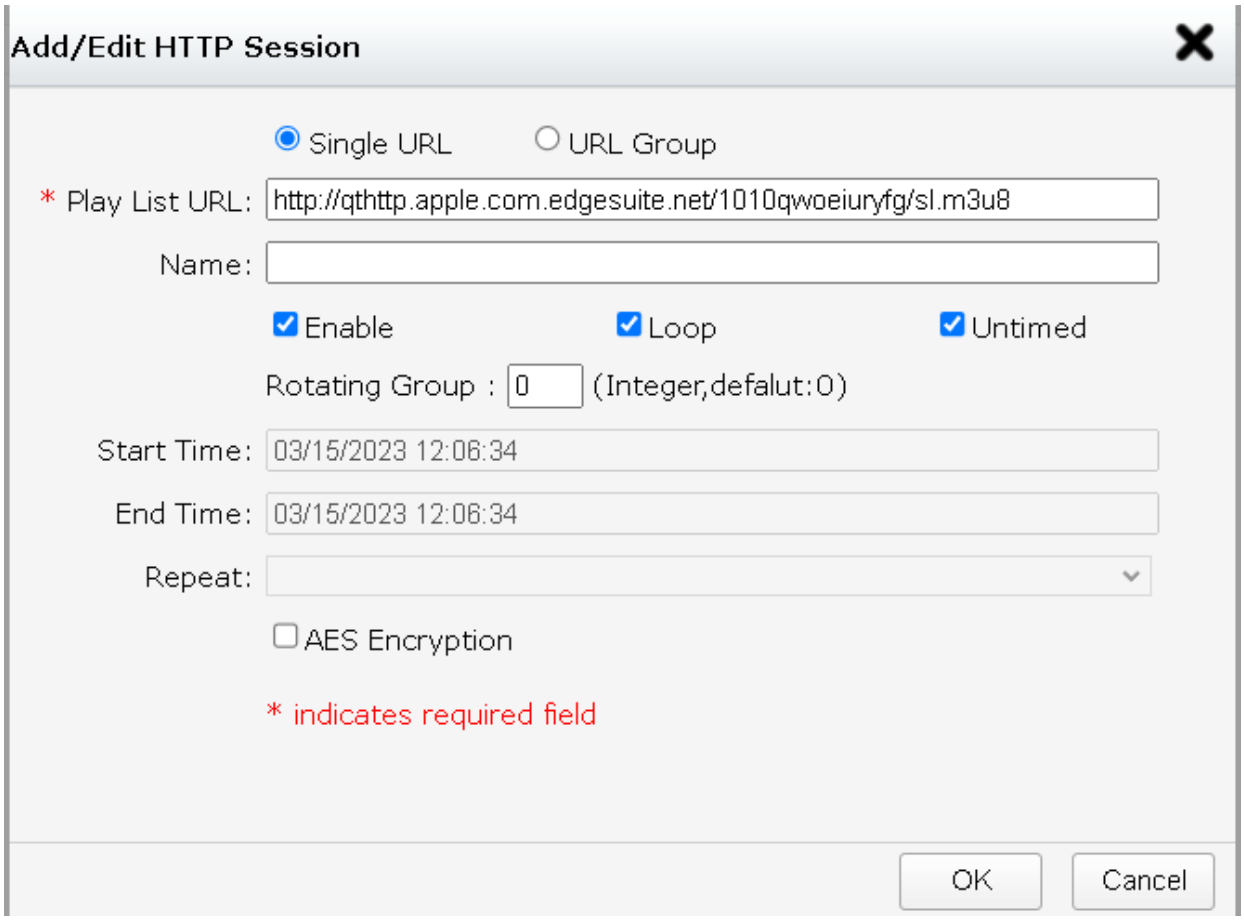


Figure 11-4 Add HTTP Session Panel

The following parameters related to an HTTP session can be edited:

- **Playlist URL:** The playlist URL of HLS services;
- **Name:** A user-friendly name given to this HLS;
- **Enable:** If checked, this HLS will be analyzed in the TSM systems; and if unchecked, this HLS URL will be recorded in a configuration file but not analyzed;

The TSM systems also support HLS session timing. Uncheck **Untimed** item and set **Start Time** and **End Time**, the TSM system will analyze this HLS between the start time and end time. If a value for **Repeat** item is set, the TSM systems will repetitively analyze this stream according to the setting, such as daily, weekly, monthly.

11.1.1.3 Enable or Disable an HTTP Session

Clicking “Enable” checkbox will start HLS analysis if it is unchecked. Clicking it again will disable or stop the analysis.

When a playlist URL contains a master playlist file that includes a list of alternative bitrate streams, the TSM systems will automatically start analyzing all alternative bitrate streams listed in the master file. If the master URL is disabled in the HTTP Session panel, the analysis on all streams will be stopped.

11.1.1.4 Edit an HTTP Session

Click “Edit” button in an HLS row to open “Add/Edit HTTP Session” panel. On the “Add/Edit HTTP Session” panel the value of Playlist URL cannot be modified. If you want change the URL, please delete the old playlist URL and add a new one.

11.1.1.5 Delete an HTTP Session

Click “Delete” button in an HLS row to delete this HTTP Session.

Note: Deleting an HTTP Session is different from disabling an HTTP Session. The TSM systems will not analyze the HLS after it is disabled in HTTP Session, but this HTTP Session is still record in profile file and users can enable it again later. Deleting an HTTP Session will stop the analysis and remove the HLS from the HLS analysis configuration file.

11.1.2 HTTP Profile

The “HTTP Profile” page let users to set the low and up bound of an HLS bitrate. When the actual bitrate is out of the bound, an error will be triggered and recorded. This feature can be used to detect that an expected HLS service is lost.

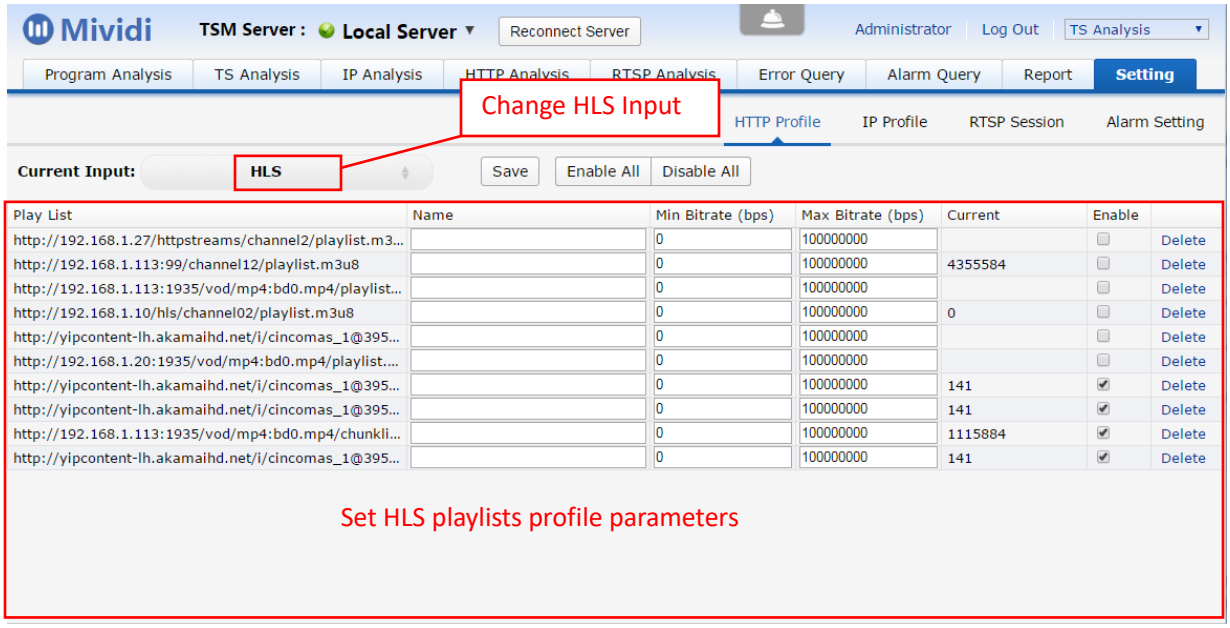


Figure 11-5 HTTP Profile Page

The following parameters can be entered in this page:

- **Name:** The same as the Name in the HTTP Session page;
- **Min bitrate** and **Max bitrate:** The minimum and maximum bitrate of an HLS service. When the actual bitrate exceeds this limit, the HACS will report an error;
- **Enable**: The bound check is enabled or disabled.

11.2 IP Profile

Similar to the "HTTP Profile", the "IP Profile" page can be used to set the test threshold and the code rate range of the media stream. IP test is based on the US standard ANSI / SCTE 168-6 2010: *Recommended method for monitoring the quality of multimedia streaming to determine the type of test and the default thresholds.*

You can change the test threshold according to testing needs. The fields in the IP Test Setting list are editable, and you only need to enter values in the appropriate locations. Check the box for each test to enable or disable some items. As shown in the table, the default threshold depends on the encoding standard and the streaming rate.

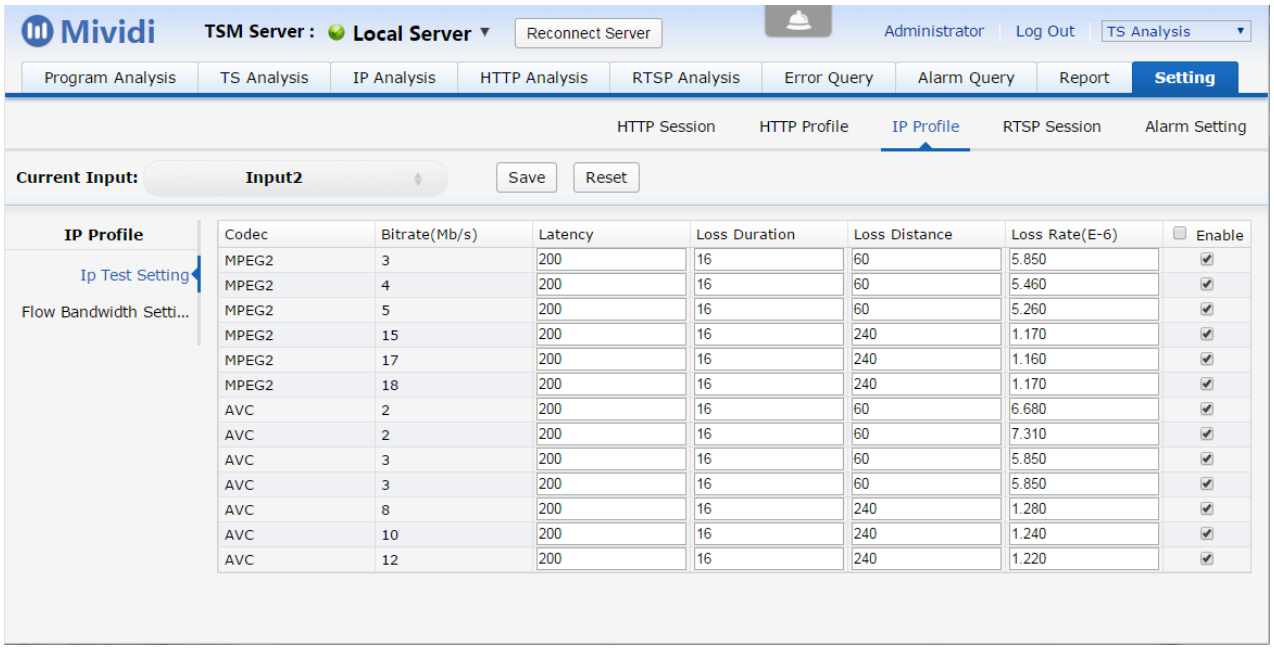


Figure 11-6 IP Test Setting

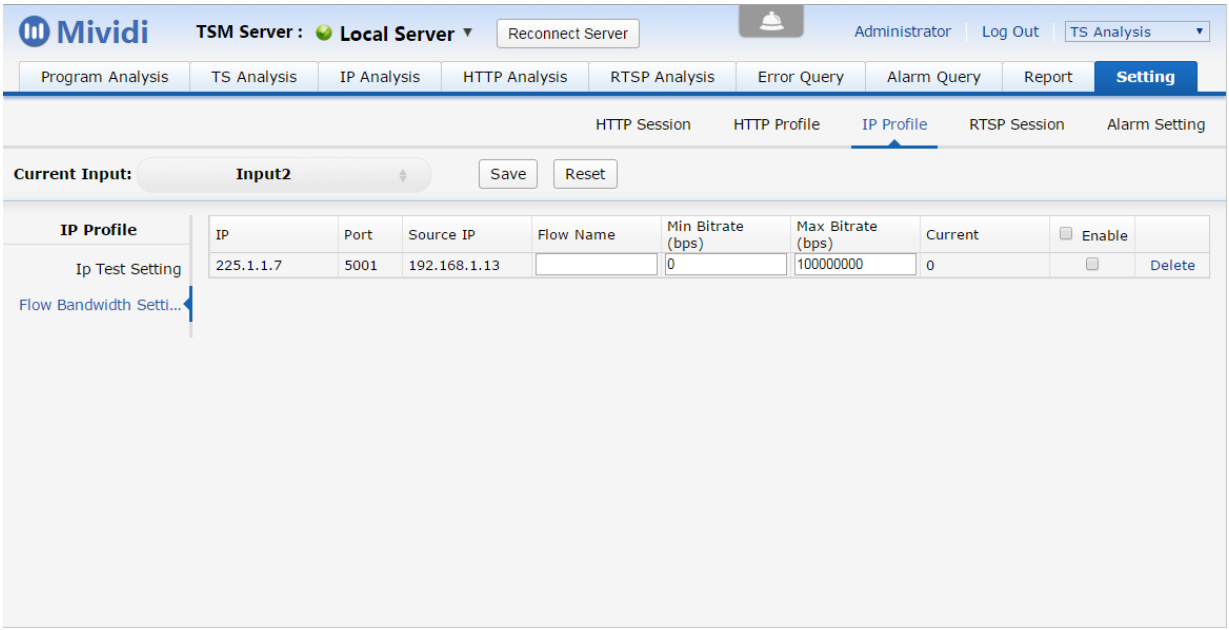


Figure 11-7 Flow Bandwidth Setting

Users can also define the bit rate for all streaming media in the network. As shown in the above figure, the Stream Bandwidth Settings table displays all the media streams in the network and the IP, Port, Source IP, Flow Name, and current bit rate. The system will not monitor the bit range of the IP stream by default. Users can enable this monitoring and even set the alarm.

On this page, you can set the expected minimum and maximum values for each stream. Click the “Save” button to save the configuration changes. System will then detect the bit rate that is likely to exceed the condition range.

11.3 RTSP Input

An “RTSP Input” is a virtual input that bundles multiple RTSP/RTMP streams being monitored. A TSM unit can contain multiple RTSP Inputs. The TS Analysis page will list all inputs and all RTSP/RTMP streams being monitored under each input, as shown in the following figure:

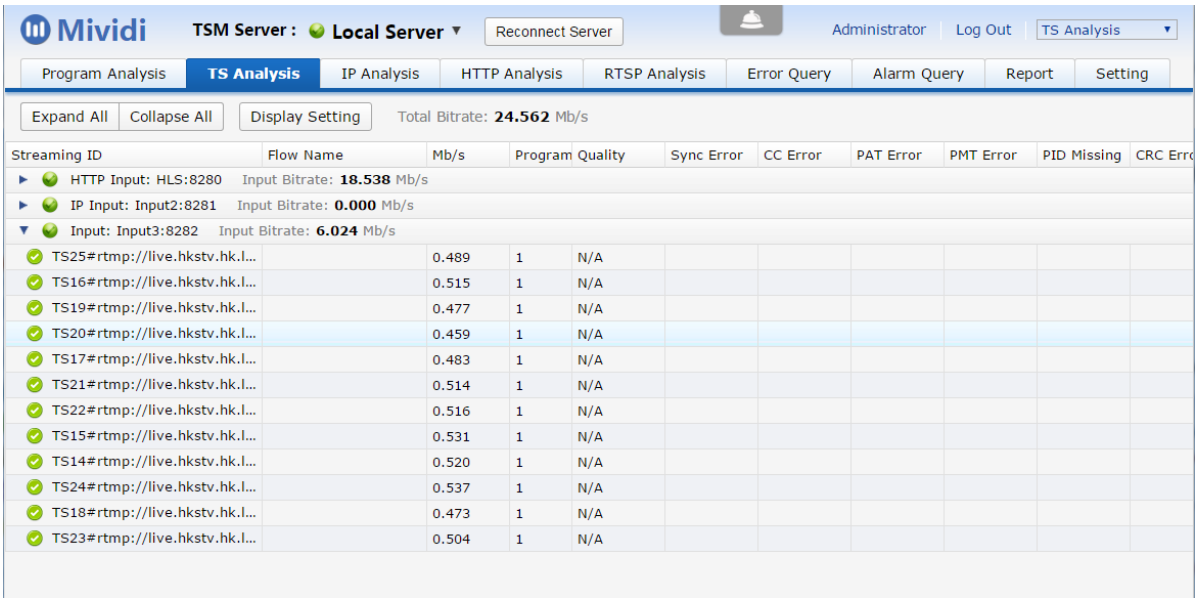


Figure 11-8 Overview of RTSP/RTMP Input Nodes and All RTSP/RTMP streams

11.3.1 RTSP Session Setting

The “RTSP Session” setting page is used to add playlist URLs to an RTSP/RTMP Input. Click “Setting” menu on the top menu bar to open the “Setting” page, then click “RTSP Session” menu on the menu list to open RTSP Session setting page, as shown in the figure below:

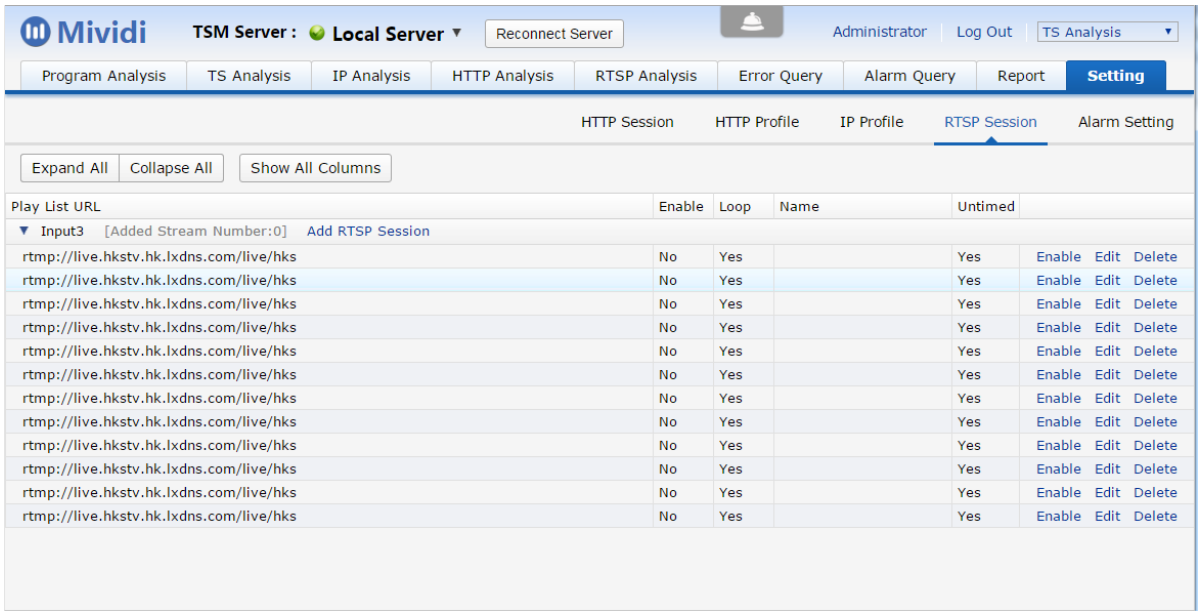


Figure 11-9 RTSP Session Setting Page

11.3.1.1 Add an RTSP/RTMP Session

Click “Add RTSP Session” button next to the HTTP Input label to open “Add RTSP Session” panel, as shown in the following figure:

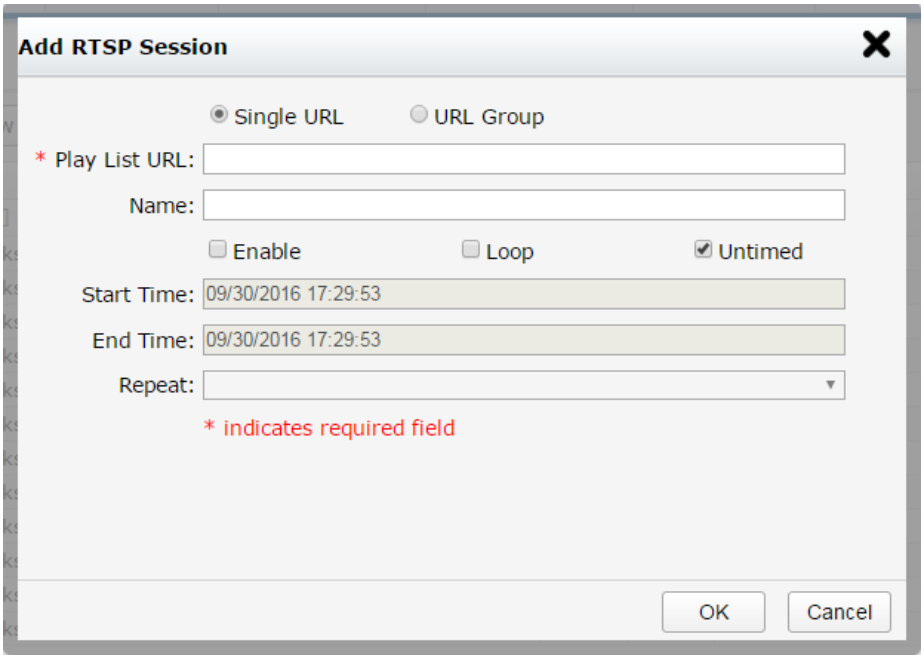


Figure 11-10 Add RTSP Session Panel

The following parameters related to an RTSP/RTMP session can be edited:

- **Playlist URL:** The playlist URL of RTSP/RTMP services;

- **Name:** A user-friendly name given to this RTSP/RTMP stream;
- **Enable:** If checked, this RTSP/RTMP stream will be analyzed in the TSM systems; and if unchecked, this RTSP/RTMP URL will be recorded in a configuration file but not analyzed;

TSM units also support scheduling of RTSP/RTMP stream analysis. Uncheck **Untimed** item and set **Start Time** and **End Time**, the TSM units will analyze this RTSP/RTMP stream between the start time and end time. If a value for **Repeat** item is set, the TSM units will repetitively analyze this stream according to the setting, such as daily, weekly, monthly.

11.3.1.2 Enable or Disable an RTSP/RTMP Session

Clicking “Enable” checkbox will start RTSP/RTMP analysis if it is unchecked. Clicking it again will disable or stop the analysis.

11.3.1.3 Edit an RTSP/RTMP Session

Click “Edit” button in an RTSP/RTMP stream row to open “Edit RTSP Session” panel. On the “Edit RTSP Session” panel, the value of playlist URL cannot be modified. If you want change the URL, please delete the old playlist URL and add a new one.

11.3.1.4 Delete an RTSP/RTMP Session

Click “Delete” button in an RTSP/RTMP stream row to delete this RTSP/RTMP Session.

Note: Delete an RTSP/RTMP Session is different from disable an RTSP/RTMP Session. The TSM systems will not analyze the stream after it is disabled in RTSP/RTMP Session, but this RTSP/RTMP Session is still record in the configuration file and users can enable it again later. Delete an RTSP/RTMP Session will stop the analysis and remove the stream from the RTSP/RTMP analysis configuration file.

11.4 MPEG DASH Input

11.4.1 MPEG DASH Session Setting

The “DASH Session” setting page is used to add playlist URLs to the MPEG DASH input. Click the “Settings” menu at the top of the menu bar to open the “Setting” page, and then click the “DASH Session” menu to open the “DASH Session” settings page, as shown below:

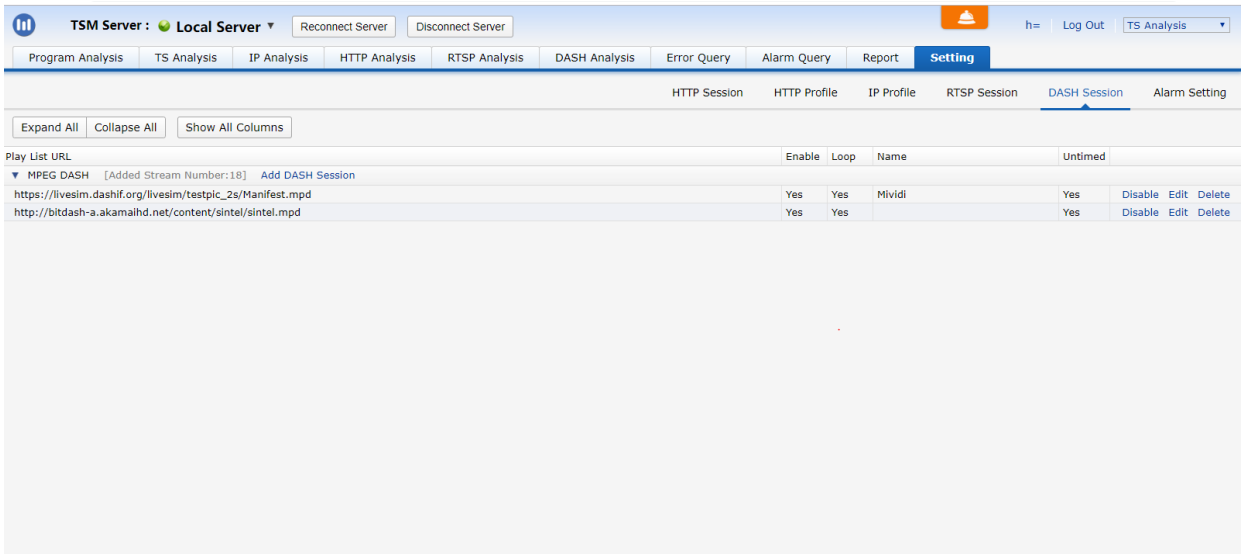


Figure 11-11 DASH Session Setting Page

11.4.1.1 Add MPEG-DASH Session

Click “Add DASH Session” button to open the “DASH Session” editing dialog box as shown below:

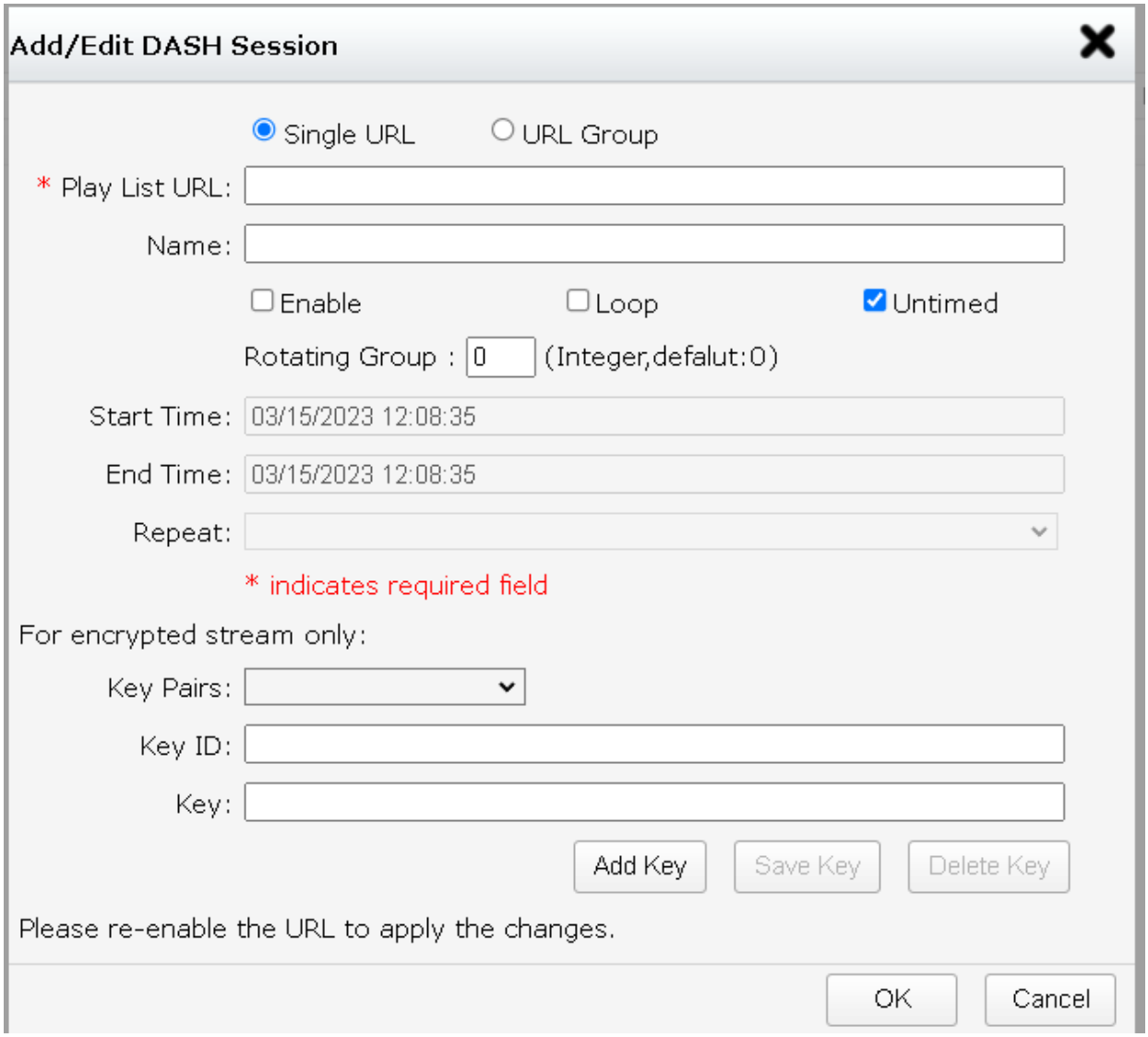


Figure 11-12 Add DASH Session Page

The following fields are on the DASH Session page：

- **Playlist URL：** This contains the MPEG DASH Stream URL；
- **Name：** The user-defined name of MPEG DASH Stream;
- **Enable：** When this checkbox is checked, the monitoring server will start to play and monitor the MPEG DASH service；

The MPEG DASH monitoring server also allows the user to define specific monitoring period and repeat option. First, check the **Untimed** checkbox, and then enter the **Start Time** and **End Time** to define time period the stream will be monitored. If you select an option for the **Repeat**, the monitoring session will be repeated daily, weekly or monthly according to your configuration.

11.4.1.2 Enable and Disable DASH Session

If a monitoring session is already started, you can click “Disable” checkbox to disable the session. Once a session is disabled, you can restart the session by click the “Enable” button.

11.4.1.3 Edit DASH Session

Click the “Edit” button next to the DASH URL and it will open the “Add/Edit DASH Session” dialog. Please note the URL field cannot be edited. If you want to edit the URL, please delete the session and enter a new session.

11.4.1.4 Delete DASH Session

Click the “Delete” button next to the DASH URL and you can delete the DASH session. Note: “Delete” is different from “Disable”. “Disable” will stop the monitoring of the stream, and “Delete” will remove the session from the configuration document so it will not be displayed again.

11.5 SRT Input

11.5.1 SRT Session Configuration

Use the “SRT Session” setting to add the addresses of the SRT streams to be monitored. Click the top-level menu “Settings” to enter the system settings page, and then click the “SRT Session” sub menu to enter the SRT session management page.

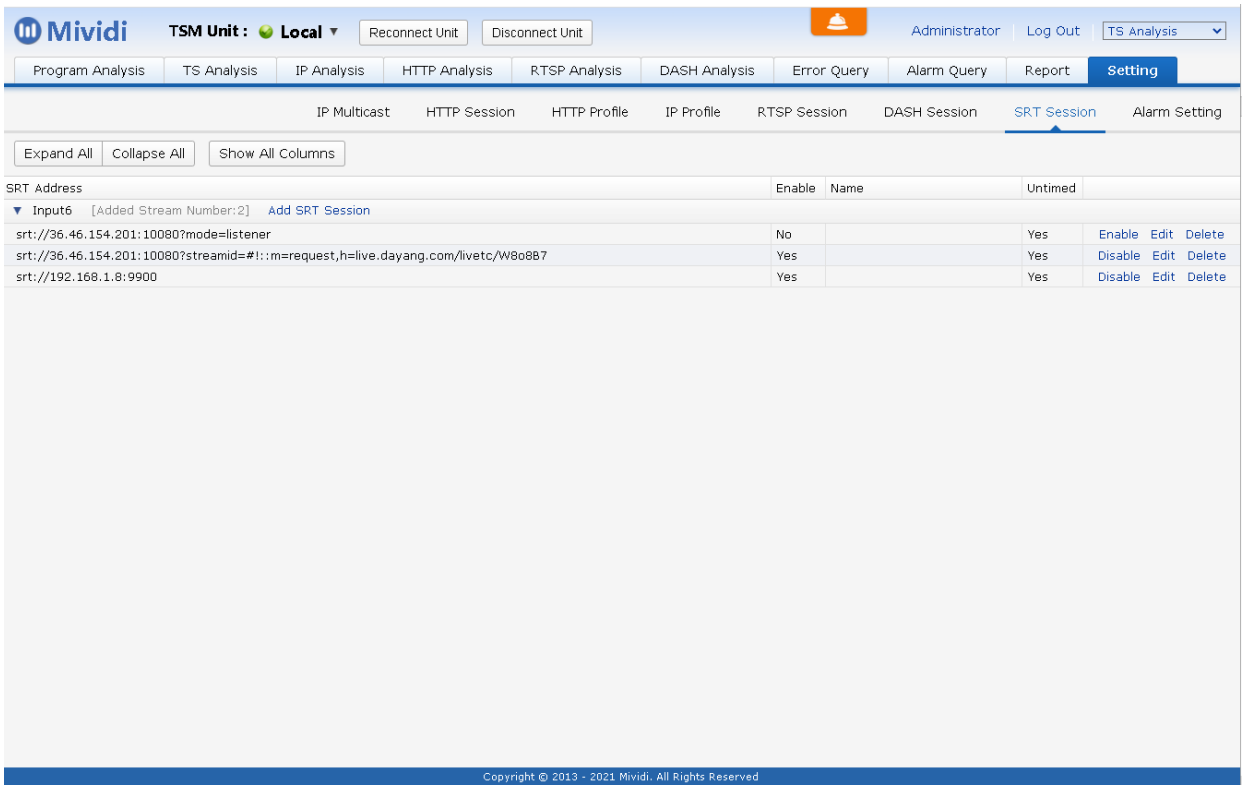


Figure 11-13 SRT Input Session Management Page

11.5.1.1 Add SRT Session

In the “SRT Session” page, click “Add SRT Session” to open the “Add/Edit Session” dialog as shown in the following figure:

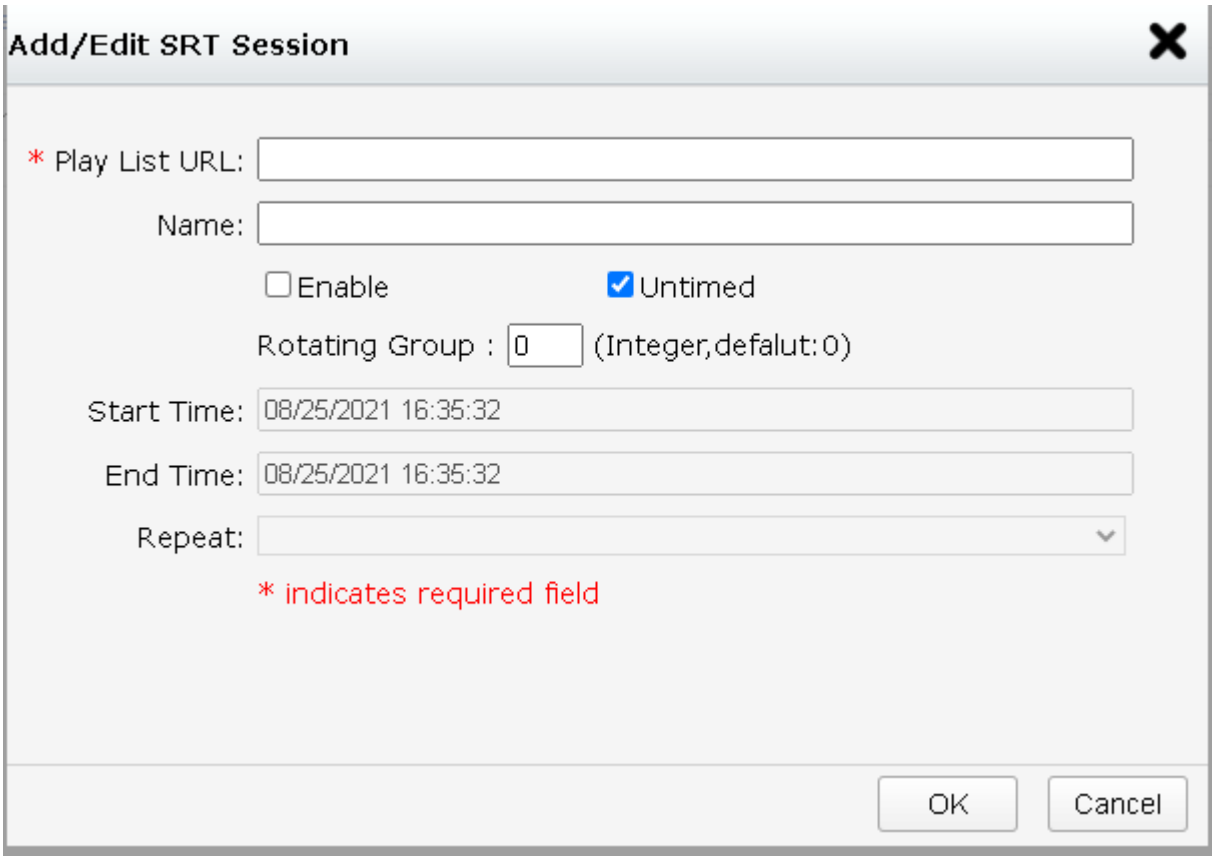


Figure 11-14 Add SRT Session Dialog

Enter the following parameter of an SRT session:

• Playlist URL: the URL address of the corresponding SRT stream;

• Name: a user-defined name of the SRT stream. This value will be used as the SRT stream name in the subsequent display;

• Enable: If checked, the SRT stream will be analyzed, otherwise, only the session will be recorded but not analyzed;

The SRT analysis service also supports time-based analysis which can start and stop at specific times. Uncheck the "untimed" option, and set the "start time" and "end time", and the system can analyze the SRT stream within the specified time period.

11.5.1.2 Disable and Enable SRT Sessions

Users can disable and enable SRT sessions by checking or unchecking the “Enable” and “Disable” link button in the "SRT Session" page.

11.5.1.3 Modify SRT Session

Click the “Modify” button on the “SRT Session” page to pop up the “Add/Edit SRT Session” dialog.

When you click the “Edit SRT Session” link to open the dialog, the "Playlist URL" item is populated and cannot be changed. If you want to change the "Playlist URL", delete the original URL first, and then add a new one.

11.5.1.4 Delete SRT Session

Click the “Delete” button on the “SRT Session” page to delete the SRT session. Note: Deleting is different from disabling. Disabling means that the system will not analyze the corresponding SRT stream, but the SRT session is still recorded in the relevant configuration file and can be re-enabled next time; deleting will stop the SRT session analysis and also remove the SRT address from the configuration.

11.6 Alarm Setting

TS Setting provides user-configurable monitoring parameters. It includes three parts:

- Transport Stream Profile
- Transport Stream Error Setting
- Transport Stream Alarm Setting

Click “Alarm Setting” tab on the menu bar on the “Setting” page to show the “Alarm Setting” page.

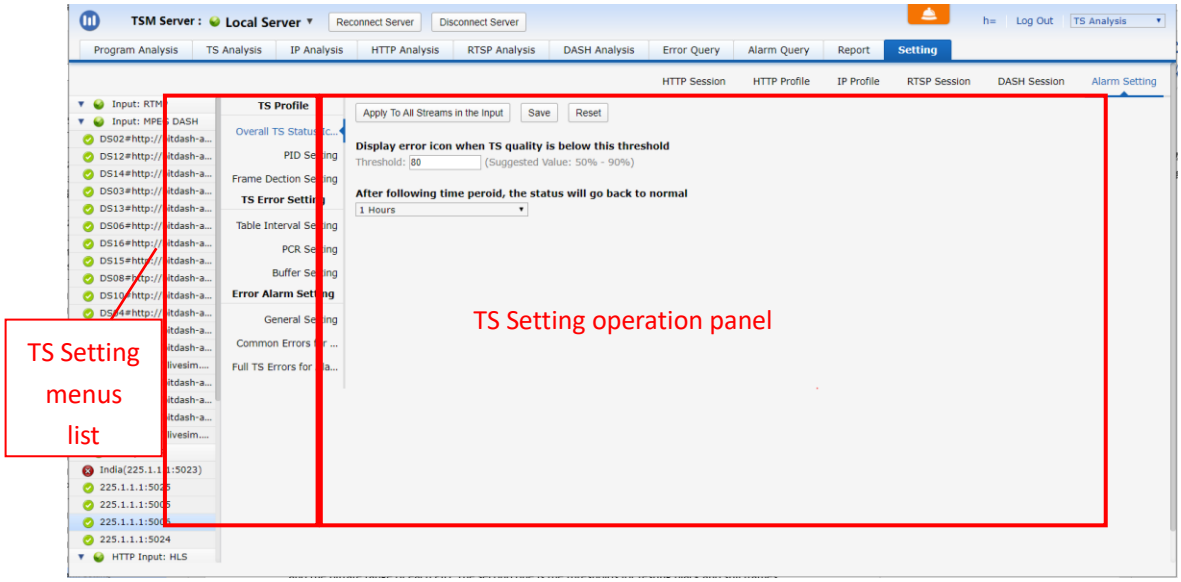


Figure 11-15 Transport Stream Setting Panel

11.6.1 Transport Stream Profile

Transport stream profile includes three components: The first one is the overall TS status icon setting. The second one defines the PIDs present in the stream and the bitrate range of each PID. The third one is the thresholds for testing black and still frames.

1. Overall TS Status Icon Setting

Click “Overall TS Status Icon Setting” menu on the left side under the “TS Profile label” to open “Overall TS Status Icon Setting” panel, as shown in the following figure:

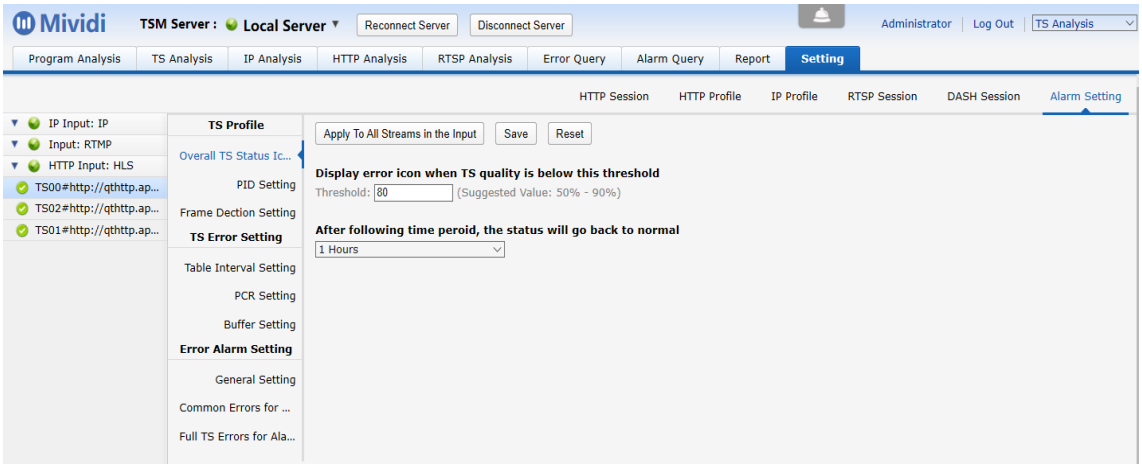


Figure 11-16 TS Setting – Overall Status Icon Setting Panel

The TSM Web uses an icon to display the overall status of the transport stream. The icon has three statuses: error (red), warning (yellow), and normal (green). When the icon displays an error status, it indicates that there is currently an error in the transport stream. The following conditions can trigger an error in the transport stream:

- The overall TS quality is below the configured threshold
- Video or audio stream loss
- Black or still Frames

The warning icon indicates that an error occurred in the past, but the stream has returned to normal. To avoid an error that occurred long in the past is still being displayed as a warning, you can select a time period by using the "After following time period, the status will go back to normal" option. After this time period, if the error does not occur again, the overall status of the transport stream becomes normal.

The button “Apply to All Streams in the Input” will apply the current status icon configuration to all the streams in the Input.

2. PID Setting

Click “PID Setting” menu on the left side under the “TS Profile” label to open “PID Setting” panel, as shown in the following figure:

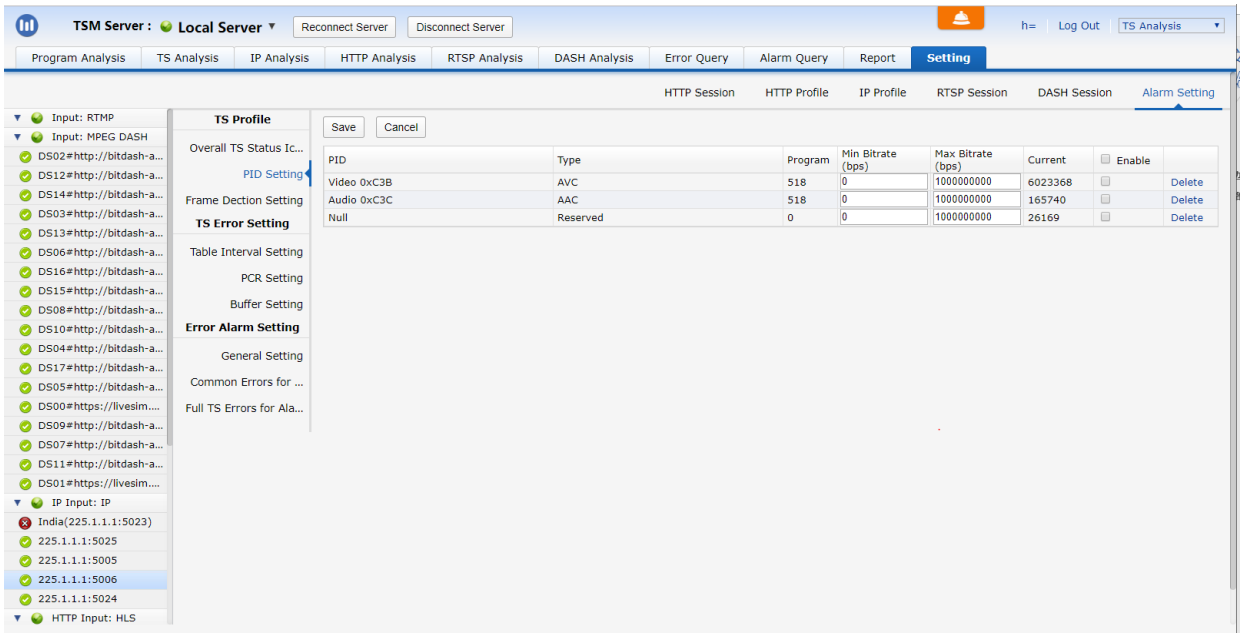


Figure 11-17 TS Setting – PID Setting Panel

This panel displays the audio and video PIDs of selected Transport Stream. Users can setup expected high and low bitrate bounds for each PID and the TSM systems will test the actual bitrate against the bounds. If the bounds are violated, an error will be logged in the database, and an alarm may be sent to the user if it is configured. The logged errors can be seen in the TS Errors panel (See 3.4.4).

The “Enable” checkbox let users to enable or disable the bitrate check.

3. Frame Detection Setting

Click “Frame Detection Setting” menu under the “TS Profile” label to open “Frame Detection Setting” panel.

The “Frame Detection Setting” is used to set the thresholds for **Black Frame** and **Still Frame** detection. The threshold for the black frame detection is the pixel gray scale value (range 0-255). A gray scale below the threshold is considered as a black pixel. The still frame threshold set the bound for the difference in gray scale in two consecutive frames. The value in the “Error after Consecutive Frames” field defines that an error is triggered if the number of consecutive frames meets the test conditions. The “Enable” checkbox will enable or disable the tests. Similar to the PID Setting, if the frame detection profiles are violated, an error will be logged in the database, and an alarm may be sent to the user if it is configured as such.

If the software is not able to decode the video at all, it will report “Failed to decode video error”. A user

can specify the time period in which the software fails to decode to trigger an error alarm.

Please note: The frame test is currently only applied to the key frames. Therefore, the consecutive frames mean consecutive key frames.

Click “Apply to All Streams in the Input” will apply the same setting to all streams being monitored in this input.

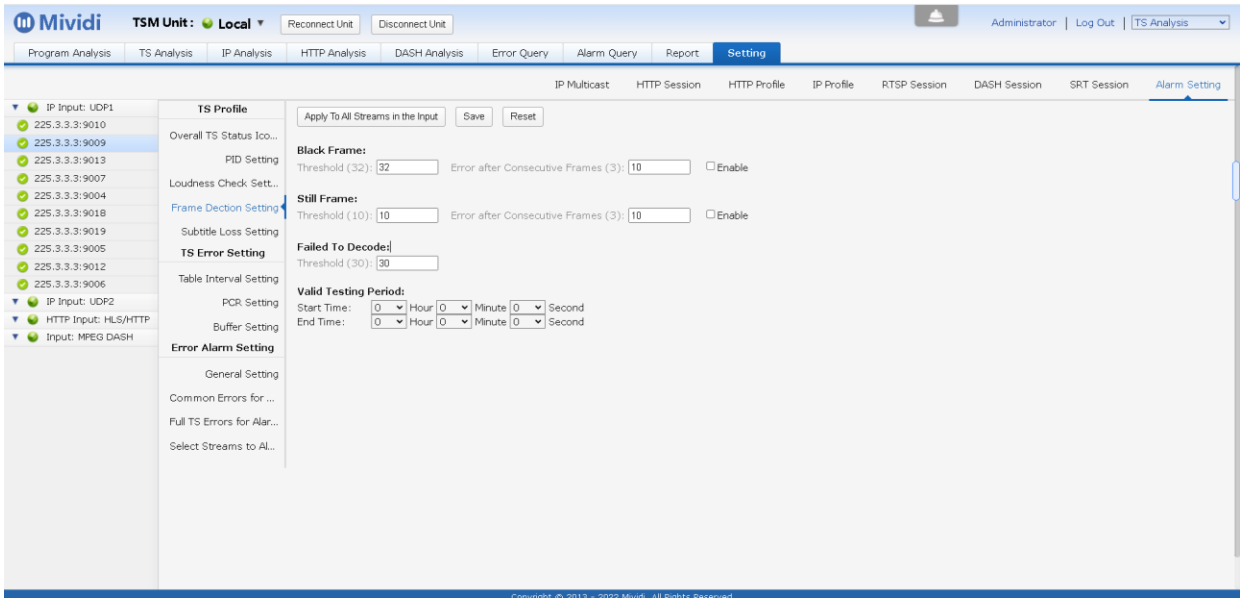


Figure 11-18 TS Setting – Frame Detection Setting Panel

4. Subtitle/CC Loss Configuration

Click the “Subtitle Loss Setting” menu in the “TS Profile” setting menu list, and the subtitle loss setting panel will appear, as shown in the figure below:

You can add the program number of the subtitle data you want to monitor and edit the interval time. If no subtitle or closed captioning data is found after this interval, the TSM monitoring system will report an error. Check the "Enable" checkbox to enable monitoring. After completing the configuration, click the "Save" button to save the changes.

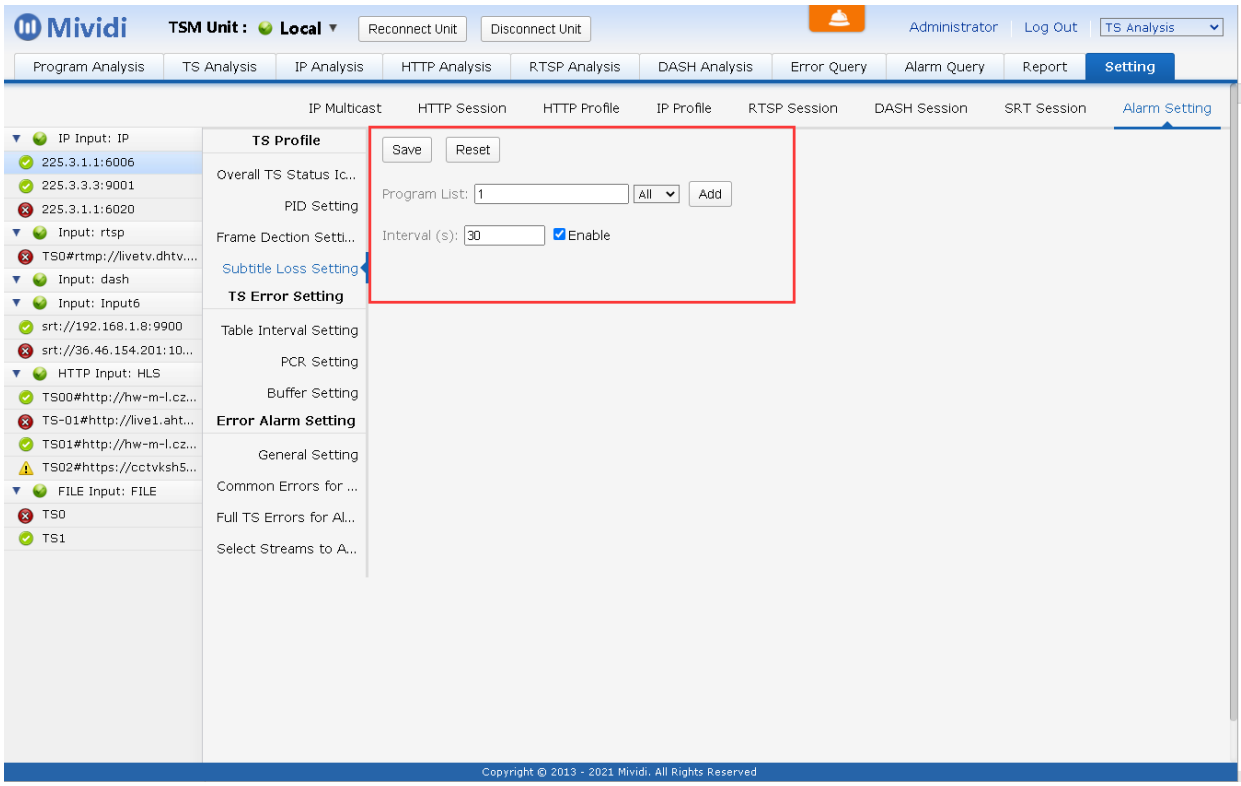


Figure 11-19 TS Profile – Subtitle/CC Loss Setting

11.6.2 TS Error Setting

Although MPEG, DVB and ATSC standards provide default thresholds for table interval, PCR timing, and buffer usage, users may change these thresholds based on their own test needs. The following three sections describe methods for setting up these thresholds.

Note: The “TS Error Setting” is applied input-wide, which means that if the setting is changed for one stream, the new setting is applied to all streams under the same input.

1. Table Interval Setting

Click “Table Interval Setting” menu under the “TS Error Setting” label on the left side of the page to open the interval setting page:

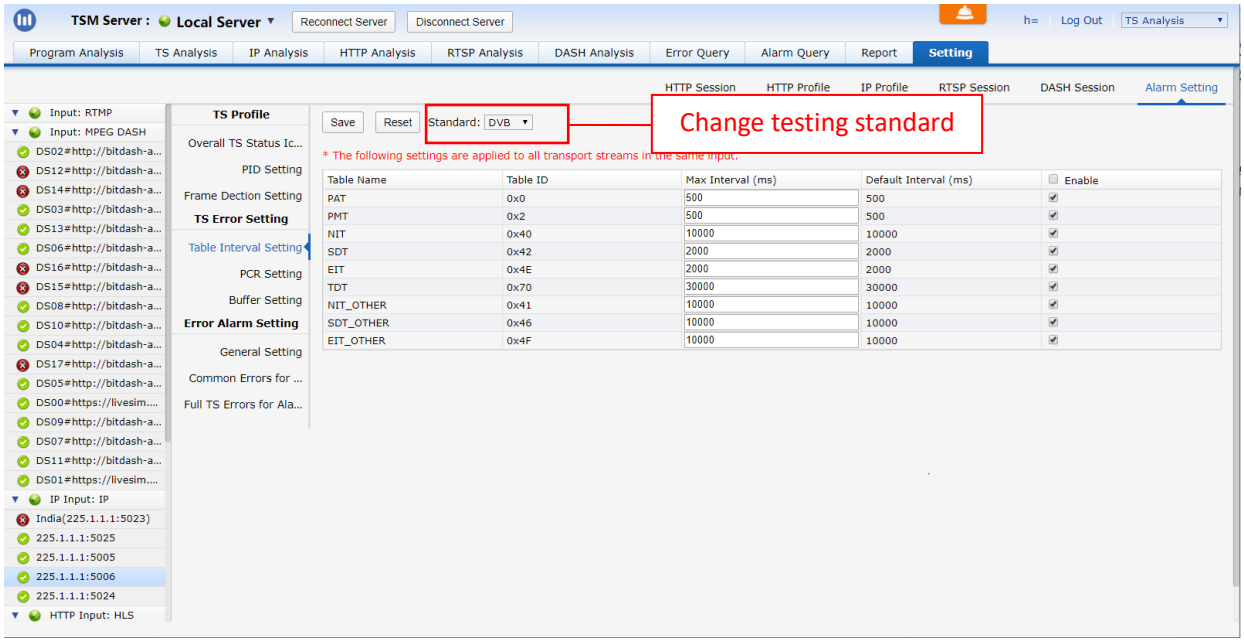


Figure 11-20 TS Error Setting – Table Interval Setting Panel

The interval threshold can be different under different testing standards. Three test standards are currently supported: MPEG, DVB and ATSC. The “Standard” dropdown list is used to change the testing standard. When a different test standard is selected, only the tables applicable to this standard are displayed. Enter the max table interval value to change the table threshold setting. The “Enable” check box is used to enable or disable table interval check for a selected table type. Click “Save” button to save the setting.

2. PCR Setting

Click “PCR Setting” menu under the “TS Error Setting” label on the left side of the page to open the “PCR Setting” panel:

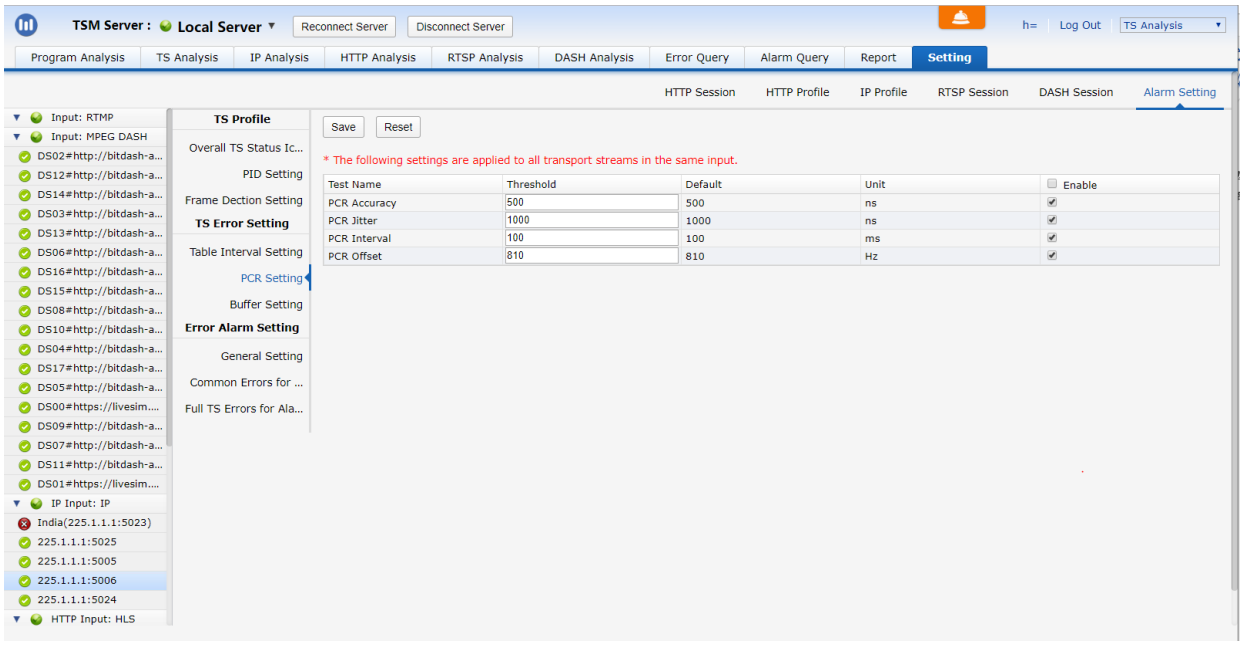


Figure 11-21 TS Error Setting – PCR Setting Panel

The PCR testing parameters are displayed in “PCR Setting” panel. Users can set the threshold for each PCR parameter. If the threshold is exceeded, an error will be logged in the database. The “Enable” check box is used to enable or disable PCR testing. Click “Save” button to save the setting.

Note: Because most HLS streams are variable bitrate (VBR) streams, the PCR accuracy and Jitter testing are automatically disabled.

3. Buffer Setting

Click “Buffer Setting” menu under the “TS Error Setting” label on the left side of the page to open “Buffer Setting” panel:

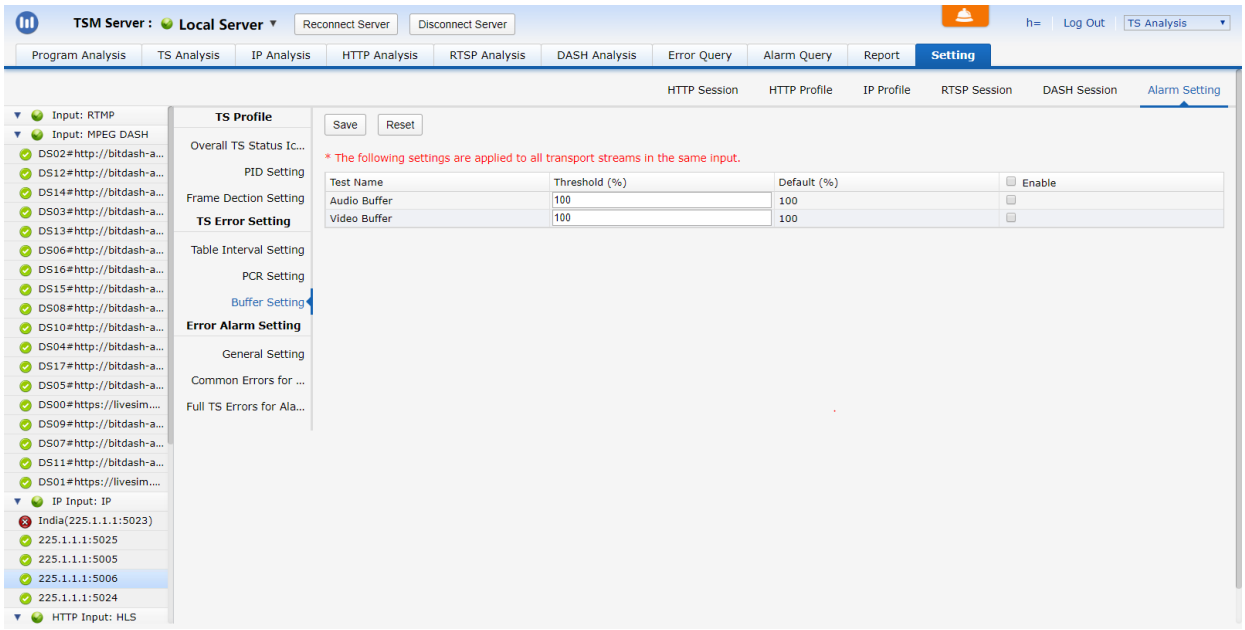


Figure 11-22 TS Error Setting – Buffer Setting Panel

Because the buffer usage limit for audio and video streams depends on encoding parameters and the value is either encoded in the stream or derived from encoding parameters, users are not allowed to set an arbitrary number, which is difficult to decide. Instead, users can set a relative percentage value, such as 150% or 200% of the standard value as the new limit.

11.6.3 Transport Stream Alarm Setting

To notify users when TS errors occur, the TSM systems provide several ways of sending alarm messages to users: Email, SMS, multi-viewer display and sound alarm on TSM Web. In order to email alarm messages, you need to add the receiver email addresses in this page. The SMS messages are sent by your local wireless providers via their Internet gateway.

Please note that the error alarms are not generated by default. They must be configured before any error alarms will be sent. The configuration procedure for alarms is described in the following sections.

All error alarms generated by the service are also recorded in the TSM monitoring system database for review and search. This information is displayed in “TS Alarm History” page (See 4.2.4).

The procedures for setting up alarms are as follows:

1. General Setting

Click “General Setting” menu under the “Error Alarm Setting” label to open “General Setting” panel:

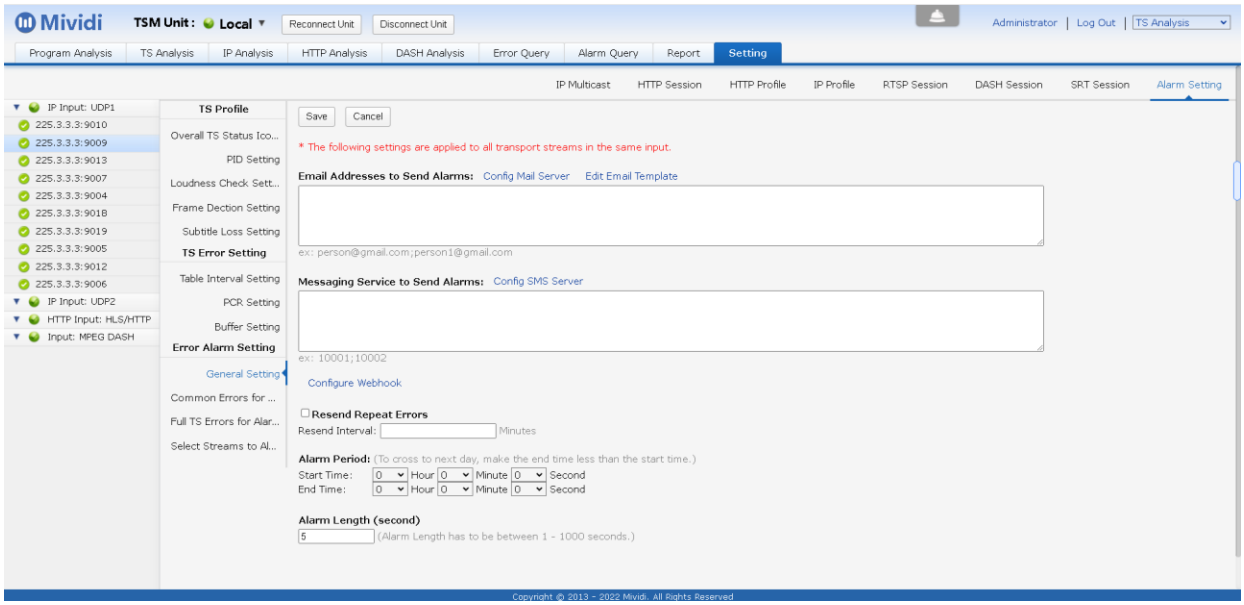


Figure 11-23 Error Alarm Setting – General Setting Page

On this page, users can set email addresses and phone numbers to receive alarms. Because TS errors often happen repetitively, users can choose whether they want the system to re-send alarms when the same errors happen again. If so, the repeat interval can also be set here.

Users can send alarms to a Slack channel using Slack Webhook API. To do that, first follow the direction from Slack website to setup Slack Webhook. Once you finish, the Slack service should generate a URL for application to send messages to a Slack channel, such as the one below:
https://hooks.slack.com/services/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

2. Common Errors for Alarm

Click “Common Errors for Alarm” menu under the “Error Alarm Setting” label to open the alarm setting panel for common errors, as shown in the following figure:

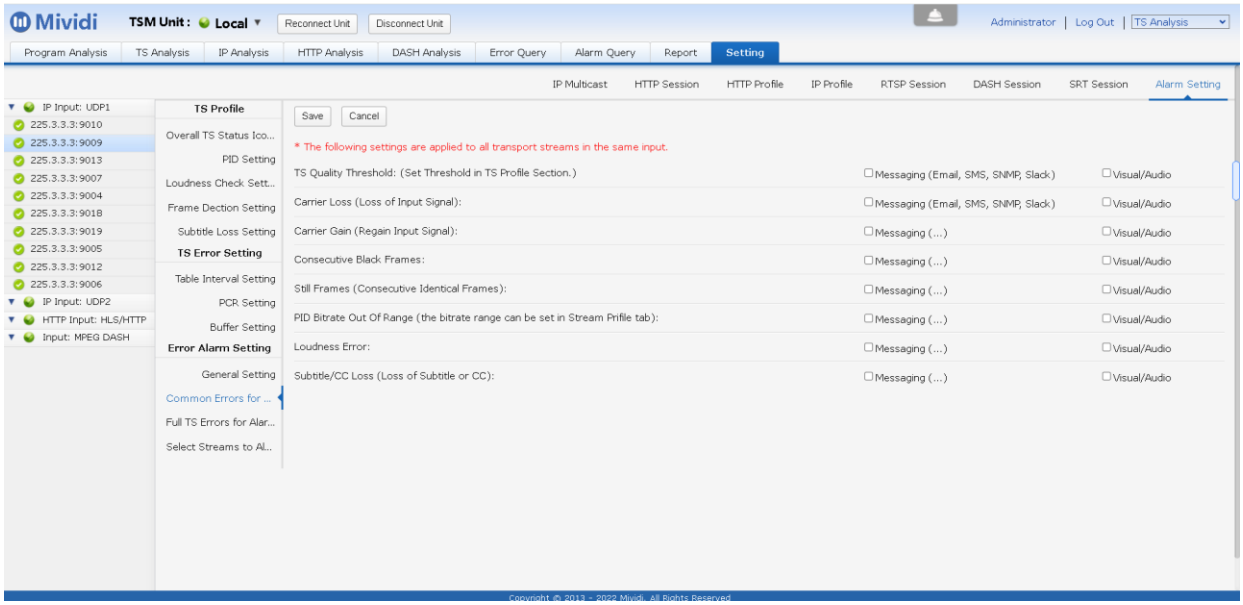


Figure 11-24 Error Alarm Setting – Common Errors for Alarm Setting Page

The common errors are the important errors that users normally would like to receive alarms when they occur. They include six common errors:

- TS Quality Threshold:

The TS Quality summarizes the overall TS error status. Users can set a TS quality threshold, and the TSM servers will send error alarms when the actual quality scores of a Transport Stream are below the threshold.

- Carrier Loss and Carrier Gain:

Alarms are sent when the Transport Stream service is not available, or an off-line Transport Stream service shows up again.

- Black Frames and Still Frames:

The alarms are triggered when black frames or frozen frames are detected as described in the Transport Stream Profile (See11.6.1.3) section.

- PID Bitrate Out of Range

The alarms are triggered when audio or video bitrate is out-of-defined range, as described in in the Transport Stream Profile (See11.6.1.2) section. This feature can often be used to detect loss of audio or video elementary stream.

3. Full TS Errors for Alarm

Click “Full TS Errors for Alarm” menu under the “Error Alarm Setting” label to open the alarm setting panel for a full list of error code, as shown in the following figure:

All error codes are displayed in this page which can be selected to trigger alarms. The meaning of each code is described in more detailed in the **Appendix: Monitoring System Error Codes.**

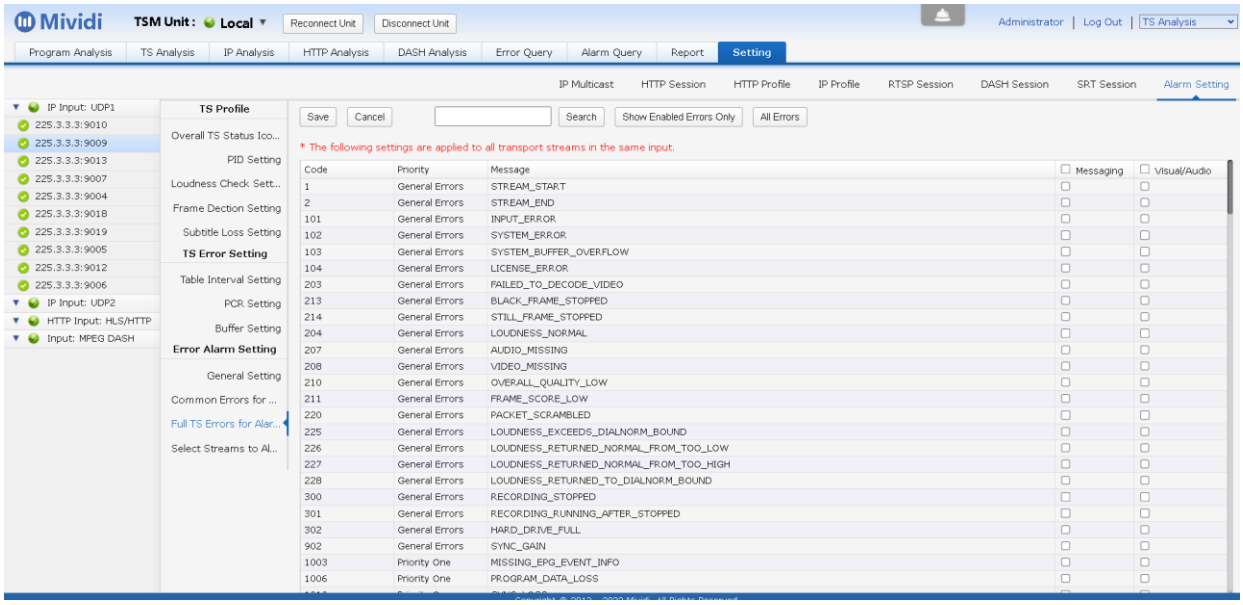


Figure 11-25 Error Alarm Setting – Full TS Errors for Alarm Setting Page

4. Select Streams to Alarm

In the “Alarm Settings” page, click the “Select Streams to Alarm” menu and it will show a list of streams being monitored. By default, if you enable alarms for an input, all streams under the input will generate alarms if errors are detected. However, you can unselect some streams. For example, if some test streams contain known errors, you may not want these streams to generate alarms over and over again. To do that, unselect some streams and click the “Save” button, and alarms will not be sent for these streams even errors are detected.

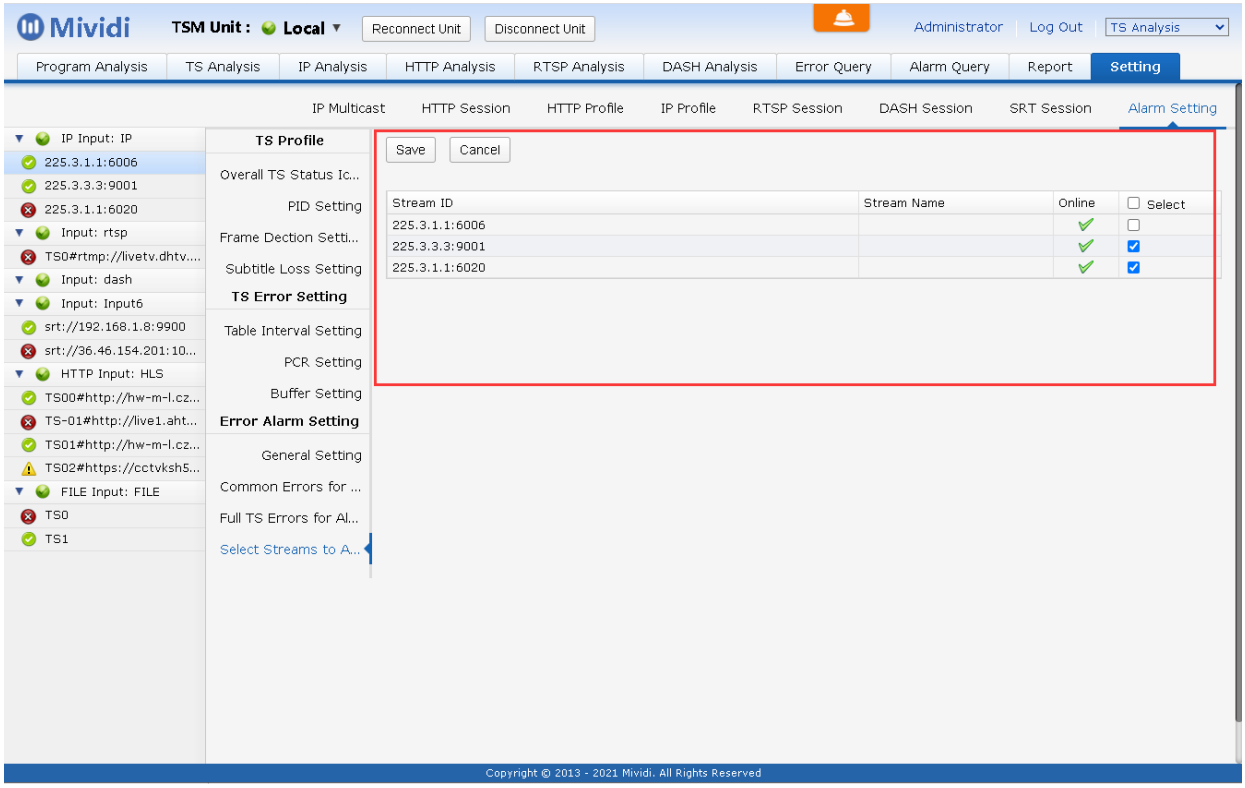


Figure 11-26 Alarm Setting – Select Streams to Alarm

11.7 Sound Alarm

The TSM Web provides sound alarm when any of the monitoring systems trigger an error alarm, in addition to the Email, SMS and Multi-viewer display alarms provided by the TSM monitoring systems.

To enable alarms and set up alarm triggers, click “Setting” on the top menu bar. Select a transport stream and click the “Alarm Setting” sub-menu item. On the list of TS Setting categories, select either “Common Errors for Alarm” or “Full TS Errors for Alarm” to configure the alarm triggers.

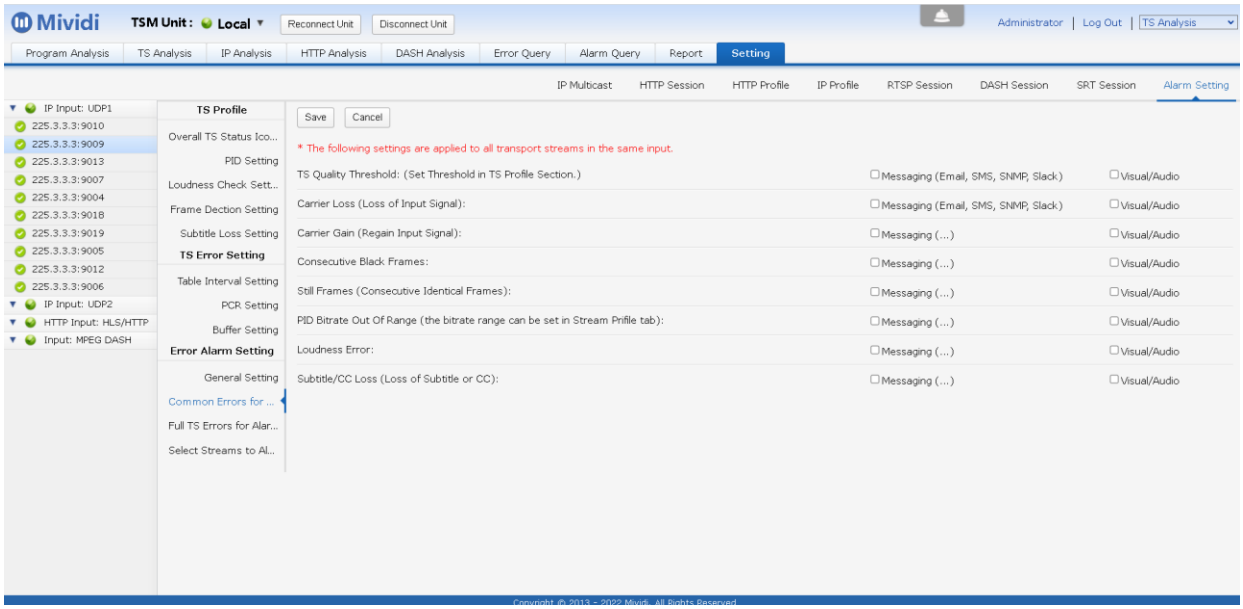


Figure 11-27 Setting Alarm Trigger Condition

If the trigger conditions are reached, the TSM Web will immediately play the sound alarm and the doorbell color is changed, as shown in Figure 11-24. In addition, the monitoring servers may also send alarms using emails, SMS, or show the errors on the multi-viewer if they are configured.

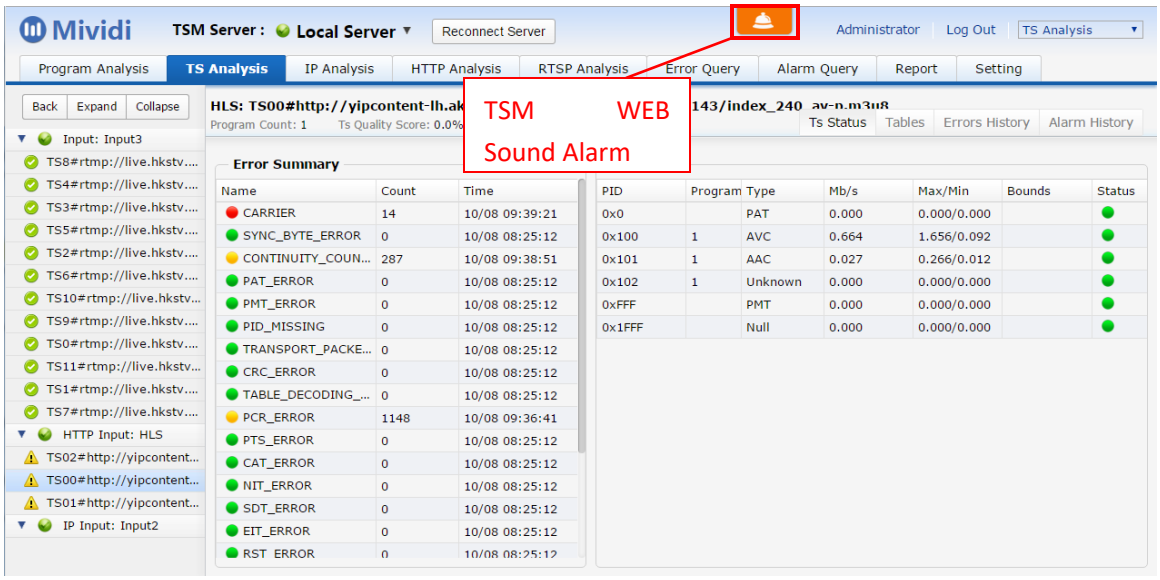


Figure 11-28 Sound Alarm of TSM Web

To get more information about the reason of alarm, click the alarm bell icon on the page and the alarm record will be displayed.

To disable the alarm sound, a user can click the "mute" button, and the TSM Web will stop make the alarm ringtone. Once the alarm is disabled, you can change the configuration to enable automatically after a certain period of time. To change the configuration, go to the TSM Web installation folder:

"C:\inetpub\wwwroot\TSM Web\" find the "web.config" file and open it with a text editor, as shown below:

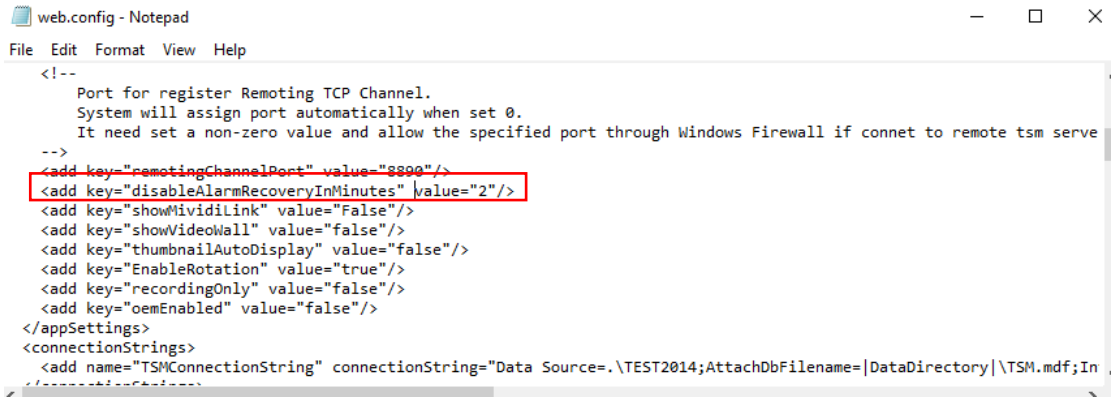


Figure 11-29 Setup Alarm Bell Auto Recovery Time Period

Find the parameter “disableAlarmRecoveryInMinutes” and change the value. If the value is 2, it means the alarm will recover in 2 minutes.

To delete alarm records under the bell, click the “Clear” link button.

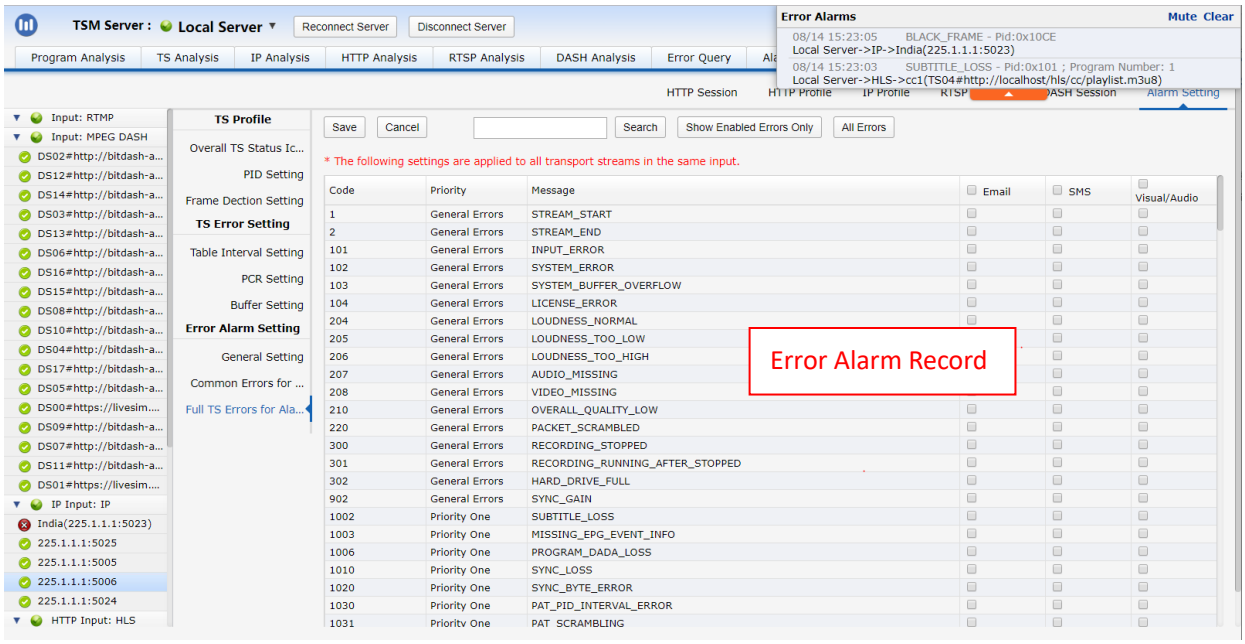


Figure 11-30 Error Alarm Records

Chapter 12 Stream Recorder

Stream Recorder module can be used to record entire transport streams or selected programs. It supports auto-recording as well as manual recording. Additionally, users can use the Client application to remotely manage recorded files and play audio and video from recorded files. During recording, it will keep tracking disk storage space. When the free disk space is less than 10% of the hard drive size, the software will automatically delete old files to save disk space for continuous recording. Furthermore, the system supports external recording media for high bandwidth transport stream recording.

Click the "Stream Recorder" module to enter the recording pages, as shown below:

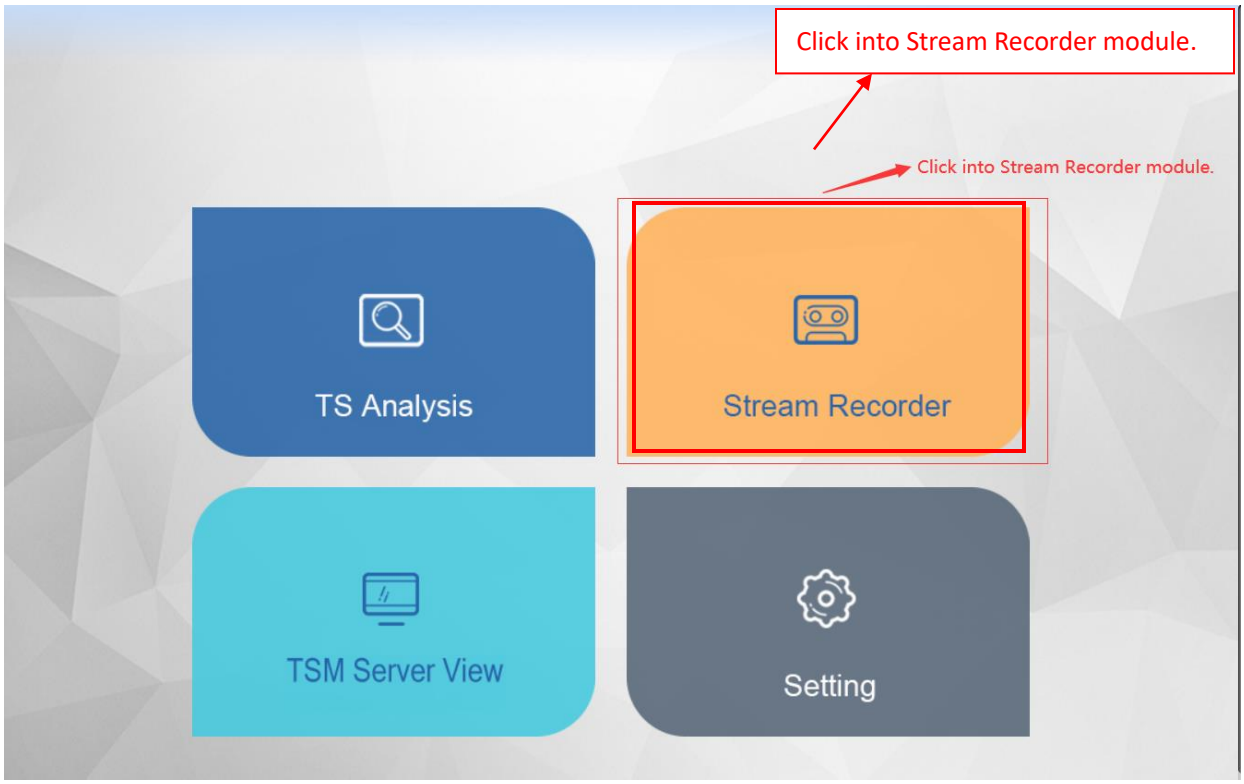


Figure 12-1 Click the Stream Recorder Module

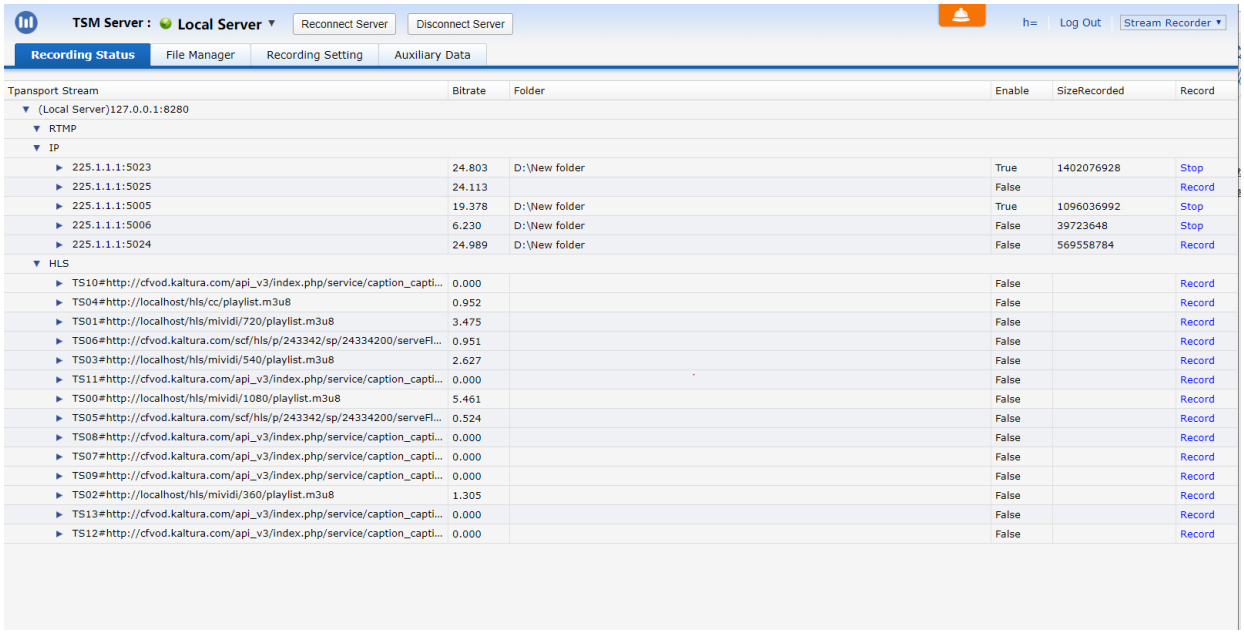


Figure 12-2 Open the Stream Recorder Module

The Recording Status page display the transport stream name, programs of each stream (PN: 1), the bit rate of the stream, the location where the recorded file is stored, whether the recording enabled (True or False), the bytes recorded, and the status of the control (Record or Stop).

When the TSM Server program is running in the background and the system has active stream input, the data in the Transport Streams and Bit Rate columns will be automatically populated. If the Transport Stream Recorder already contains recording configurations for some streams or programs, the data will be displayed in the Folder, Enabled and Status columns. If recording is enabled, the data in the recording status column will show the size of the recorded data. You can manually turn on and off the recording process using the “Record” and “Stop” buttons.

When the file folder path field is empty, clicking on the recording will prompt a message that the file location has not been set (Figure 12-3) and needs to be configured in the recording configuration page.

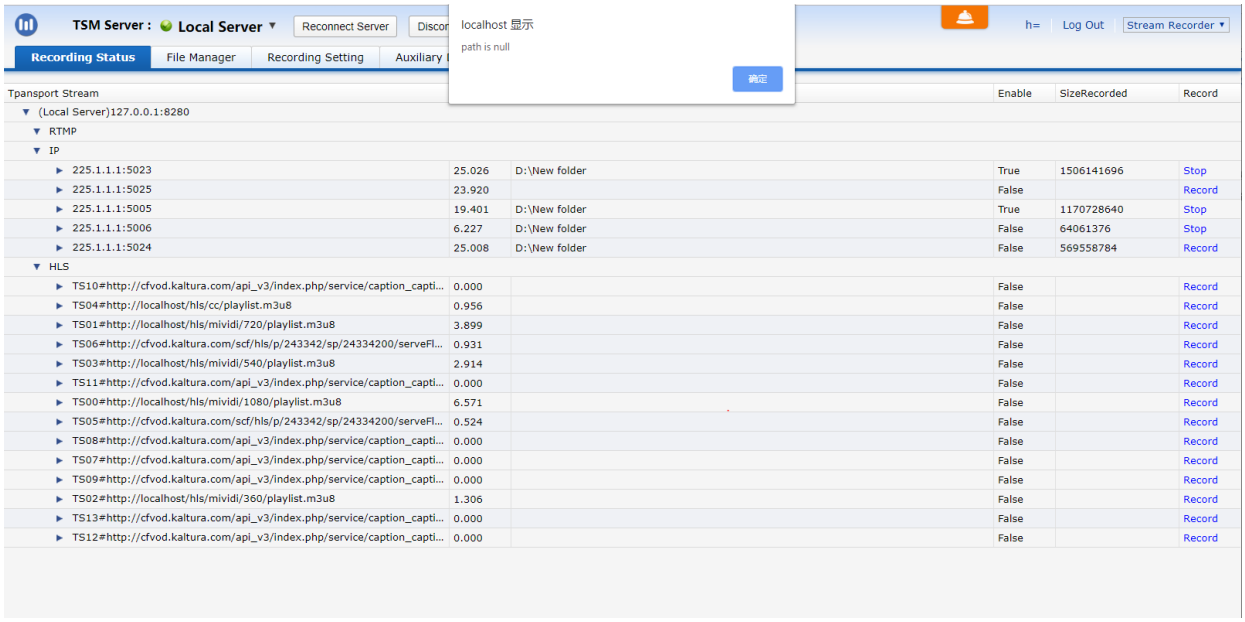


Figure 12-3 Recording Error Message

12.1 Recording Setting

12.1.1 Continuous Recording Setting

Click “Recording Setting” tab and then click the link “Continuous Recording Setting” on the left side, the setting page will be displayed as below:

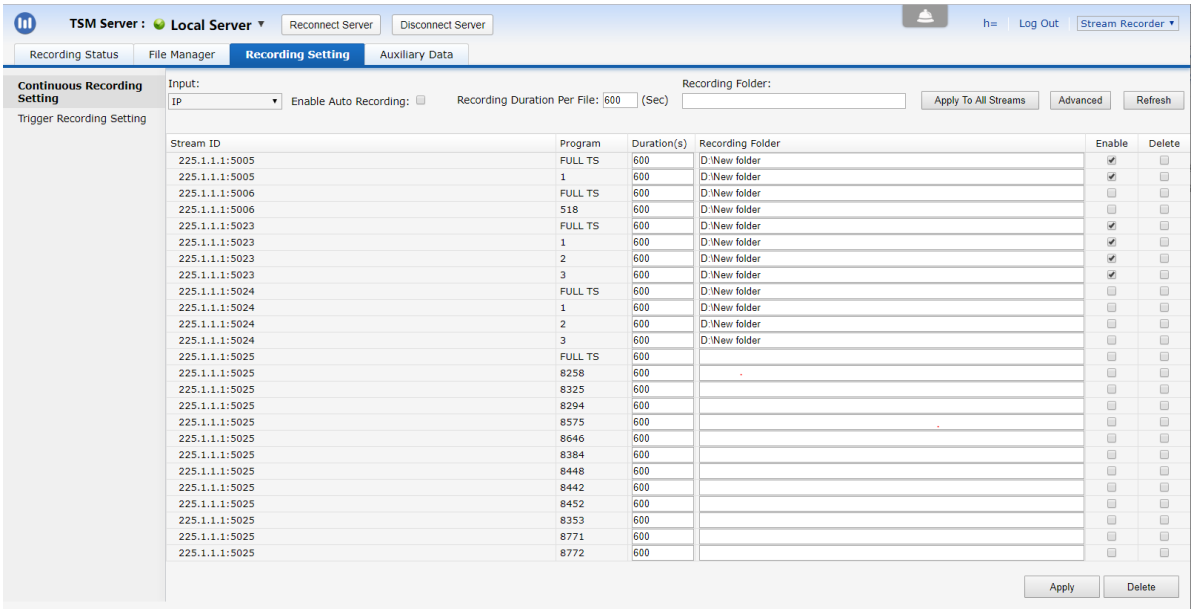


Figure 12-4 Recording Setting Page

You can configure each stream or program individually, or you can configure all streams of an input at

once. To do one-time configuration of the input is as follows:

1. Select Input;

2. Add the path to the recording folder of the transport streams and set the recording duration for each file. When a file recording time is longer than the set time, the recording service will close the current file and open a new file to record automatically;

3. Select the “Enable” check box, click “Apply to all streams”, and click “Apply” in the bottom to start recording.

To change the settings for individual transport streams, select a stream or a program and modify its settings directly in the configuration table, and then click “Apply” button to save the data. In addition, the system also supports the timed recording function. Click the “Advanced” button shown in Figure 12-4 to enter the advanced setting page shown in Figure 12-5 to configure the timing parameters.

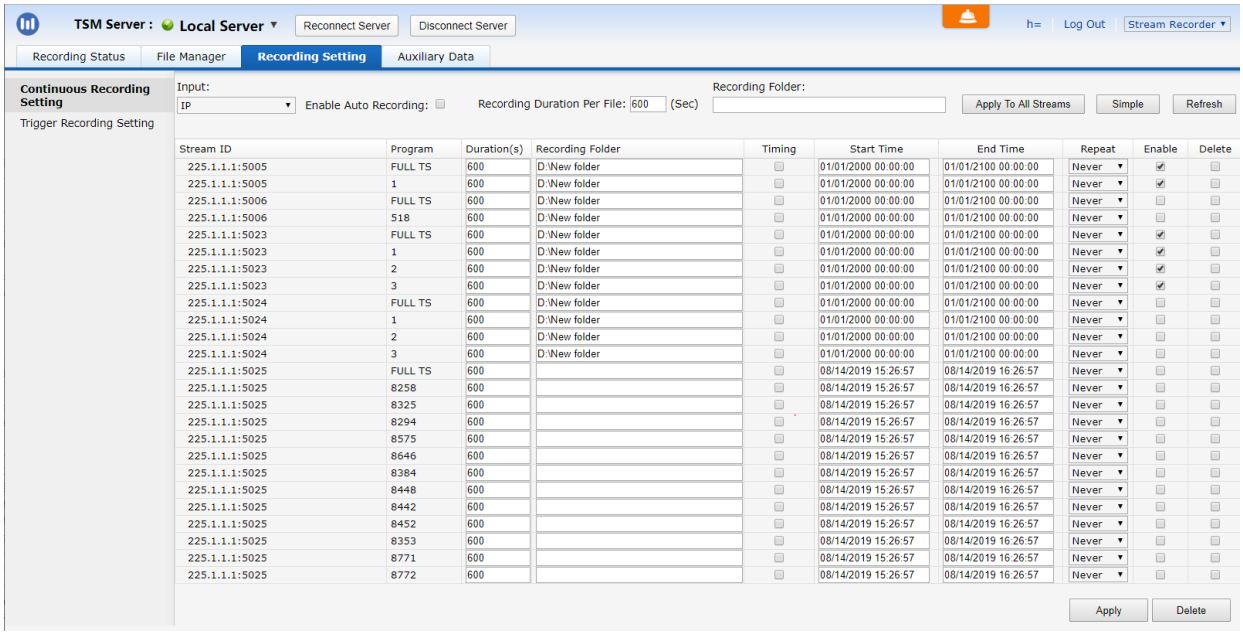


Figure 12-5 Advanced Configuration Page

To set the timed recording function, first select the enable timer and set the start time, end time, and repeat (Daily, Weekly, Monthly, Monthly, Weekly, Monthly) options, and then click the “Apply” button.

12.1.2 Triggered Recording Setting

Click “Recording Setting” tab and then click the link “Triggered Recording Setting” on the left side, the setting page will be displayed as below:

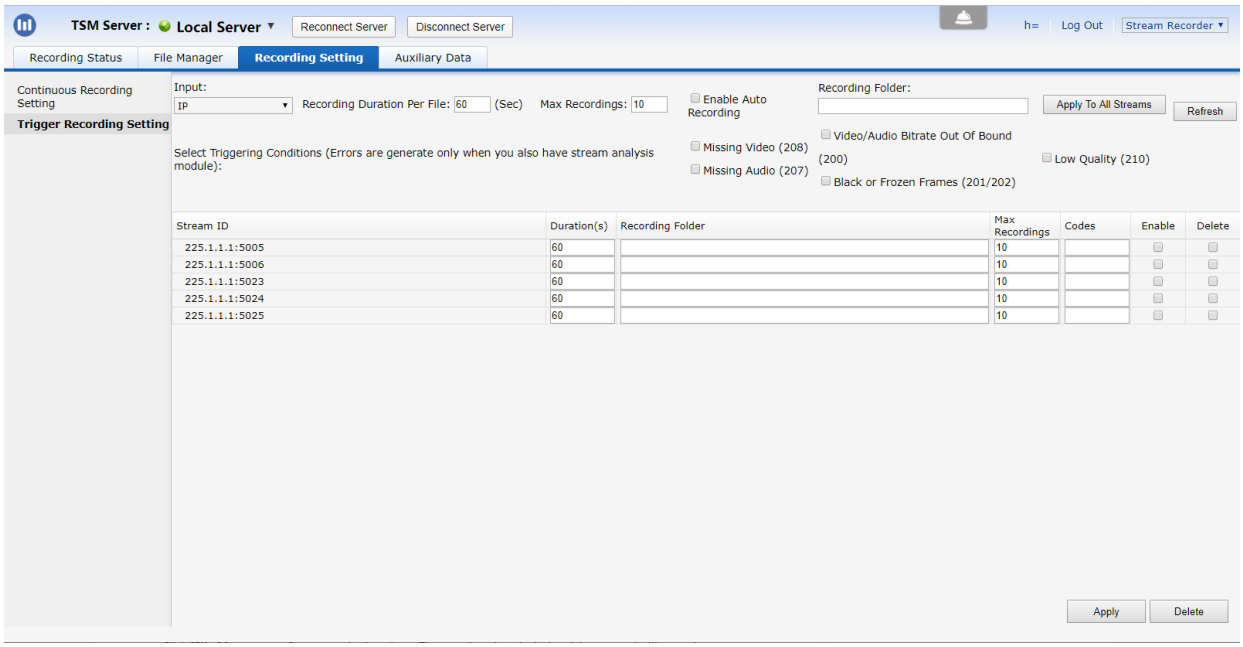


Figure12-6 Triggered Recording Setting Page

The TSM server supports stream error triggered recording. Users can configure which error will trigger the recording.

The “Trigger Recording Setting” page is similar to the "Continuous Recording Settings" page. Users need to specify the error code that will trigger the recording. Multiple error codes are separated by commas. Users can also check the required error codes in the multiple check boxes above for one-time settings.

12.2 File Manager

Click “File Management” to enter the “File Management” page. The user interface includes delete, search, filter and export functions, as shown in figure 12-7. Enter search criteria, such as input, transport stream (supports fuzzy query), start time and end time, then click “Search” button. If the data matches the search criteria, it will be displayed on the list.

Check the box under the "Delete" column and click "Delete files" to delete selected files. Click “Clear Database” will delete all file records from database. When the system deletes a recording file, it will also delete the reference to the file from database.

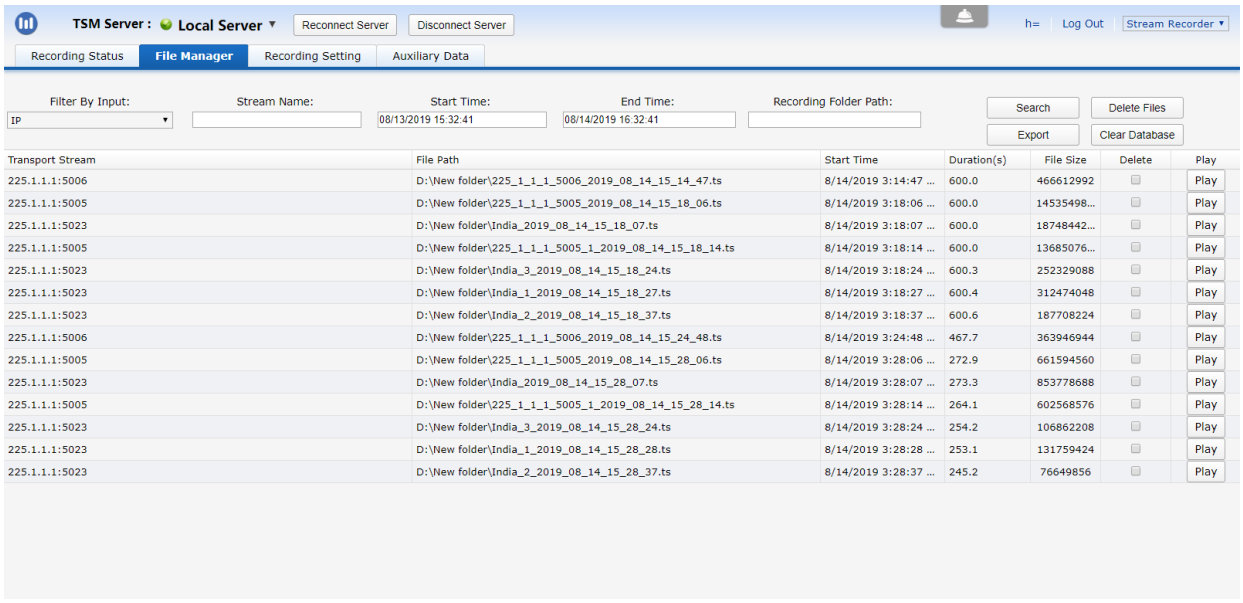


Figure 12-7 File Manager Page

The Export function saves the data in the table to a file, and the export file can be viewed in a text editor. As shown in figure 12-8:

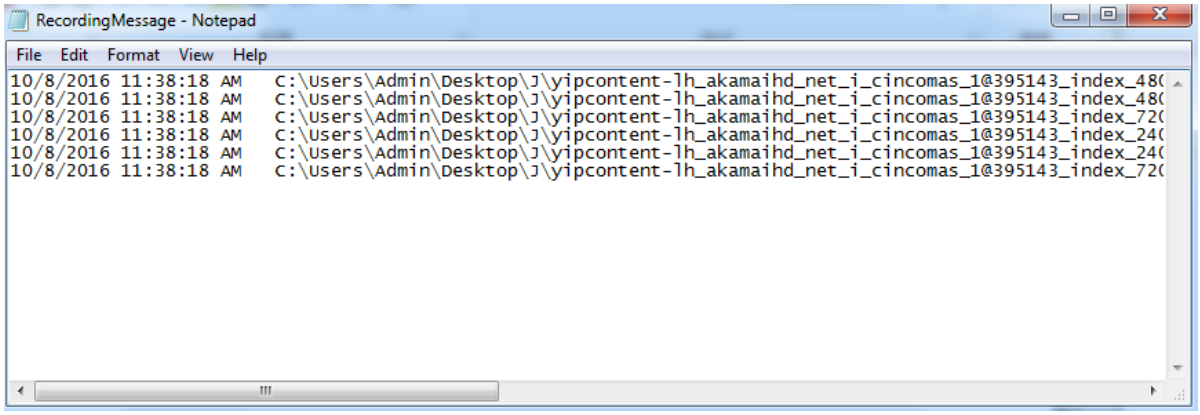


Figure 12-8 Export File

12.3 Playback and Cut Recorded Files

12.3.1 Setup Virtual Path

You can use the TSM Web to playback and cut recorded files. To use these functions, the first step is to configure the virtual path in the IIS. Open Windows Internet Information Manager (IIS) Manager and browse to the Default Web Site as shown in the following figure:

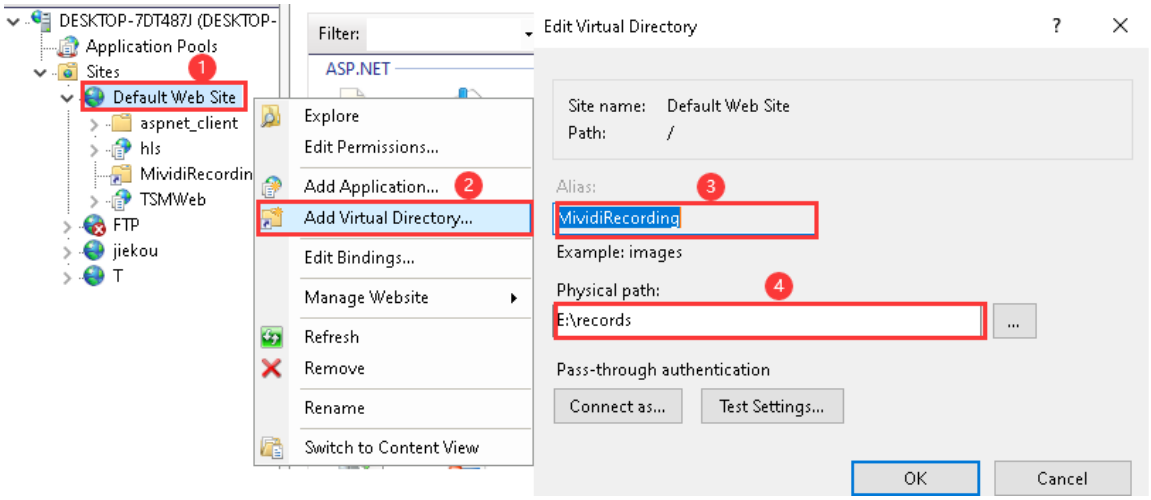


Figure 12-9 Configure IIS Virtual Directory

Click “Add Virtual Directory” and name the virtual director to “MividiRecording”. Enter the physical path where your recorded files are located. Click “OK” to save the configuration and the setting will take effect after you restart the IIS service.

12.3.2 Playback Recorded Files

Refer to the method described in Chapter 12.2 to search for the recorded files. Click a file to play the file. Since most web browsers can only play MP4, the TSM Web will first convert the recorded TS files to MP4 files so it may take some time before the player starts.

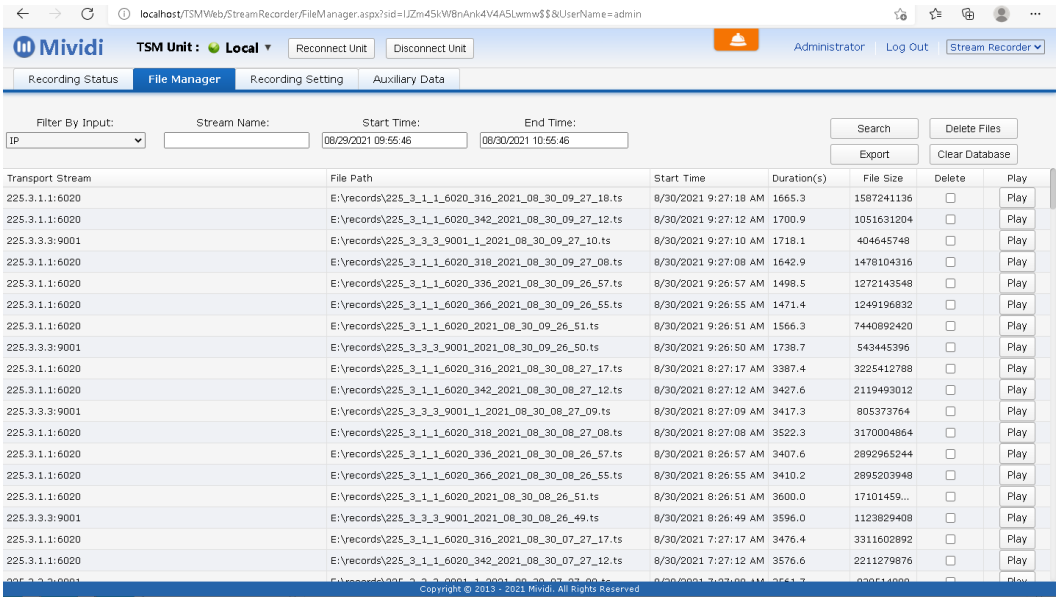


Figure 12-10 Select a Recorded File to Play

If the recorded file is a multi-program TS (MPTS), the TSM Web will list available program numbers as shown in the following figure. Please select one program to play:

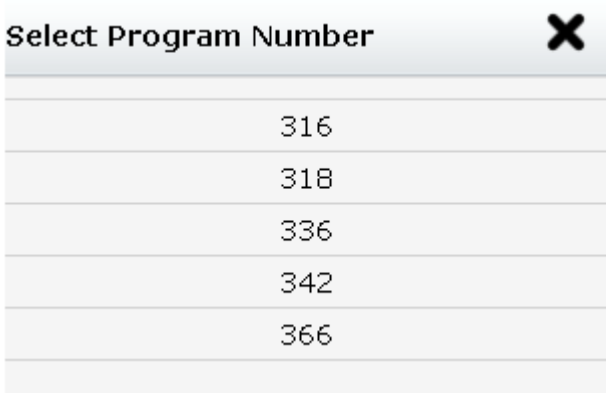


Figure 12-11 Select a Program to Play from MPTS

The converted MP4 file is located in the same folder and the TSM Web will open the player window and start to play the file. The converted MP4 will be automatically deleted one hour later.

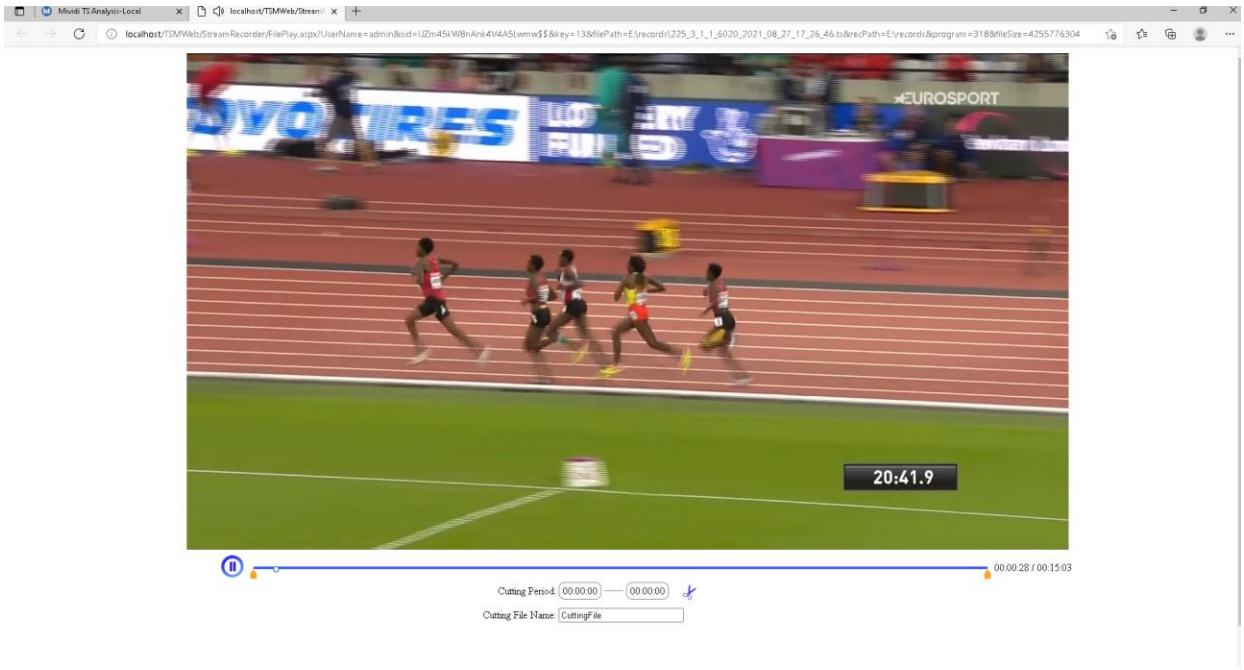


Figure 12-12 Playback a Recorded File on TSM Web

12.3.3 Cut Recorded File

On the video player window, you can cut a piece of video file from the original recorded file. Drag the “Start” end “End” mark on the timeline of video file and then enter the name of new file that will be cut. Click the button with the “ ” sign and the application will cut the file. The cut file will be downloaded

automatically to the “Download” folder in your local computer.

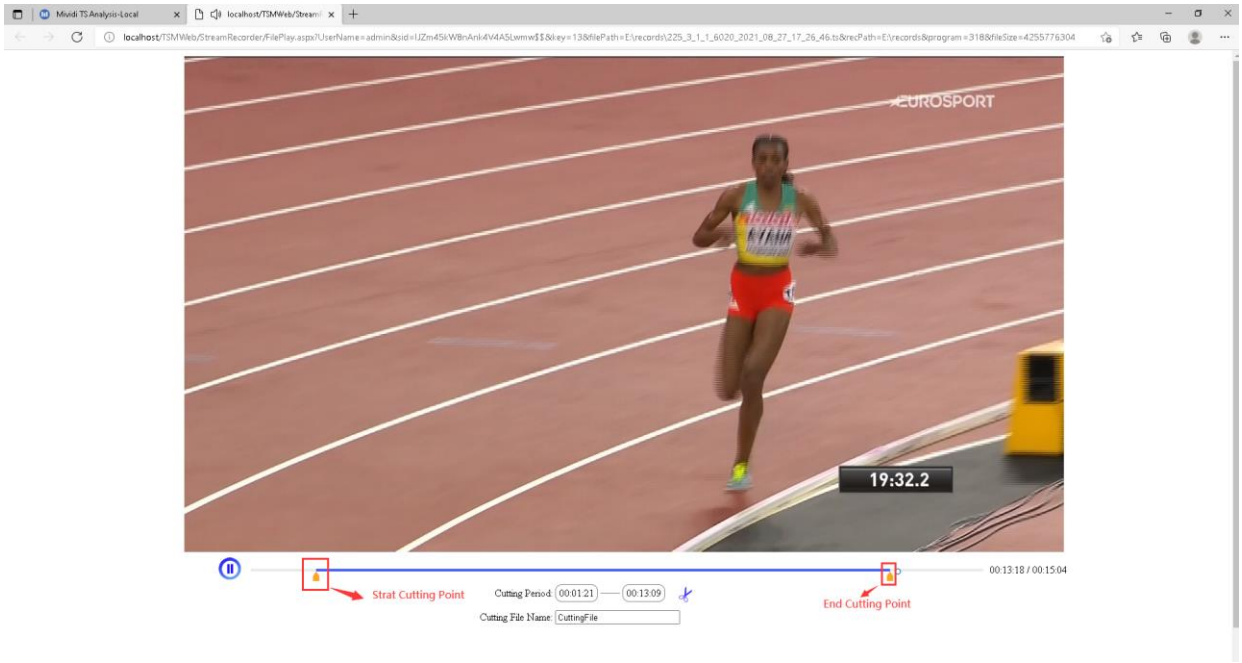


Figure 12-13 Cut a Recorded File

12.4 Auxiliary Data

12.4.1 Subtitle

Click "Auxiliary Data" button, then click the “Subtitle” menu on the left panel to enter the “Subtitle” page, fill in the search conditions, such as Input, Stream Name (support fuzzy query), Program number, Start and End Time, and then click "Search" button. If there is data that meets the search conditions, the data will be displayed on the list. The “Export” button exports the data from the table to a text file that can be viewed in a text editor, as shown in the figure below:

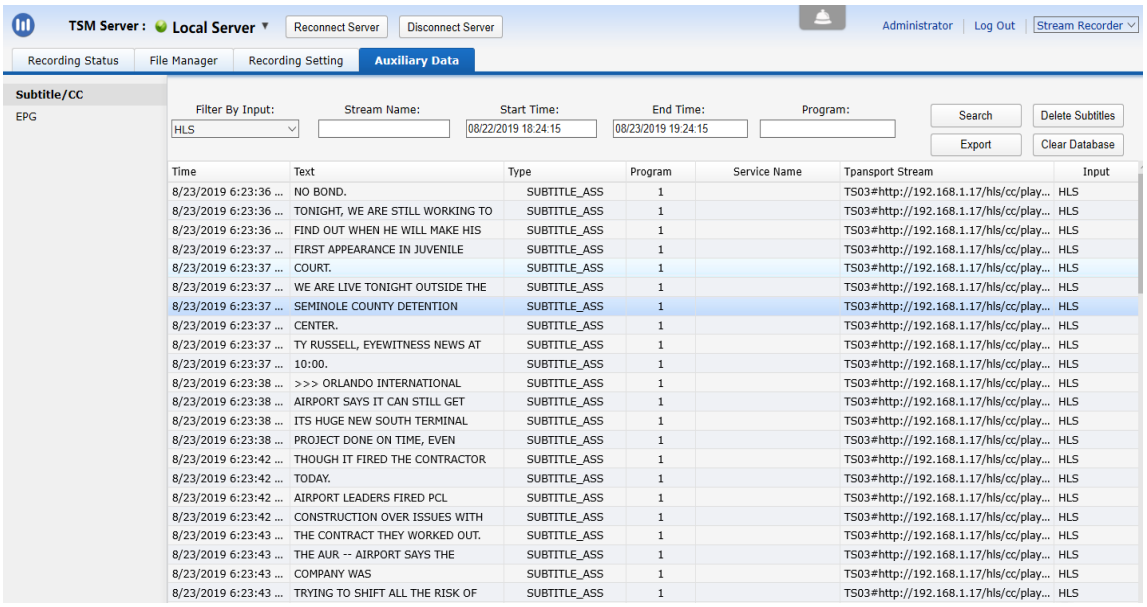


Figure 12-14 Subtitle search

12.4.2 EPG

Click the "Auxiliary Data" button, then click the “EPG” menu on the left panel to enter the “EPG” page. Enter search conditions, such as Input, Stream Name (support fuzzy query), Program number, Start and End Time which can be selected by Event Time and Timestamp and click "Search" button. If there is data that meets the search conditions, the data will be displayed on the list. The “Export” button exports the data from the table to a txt file that can be viewed in a text editor.

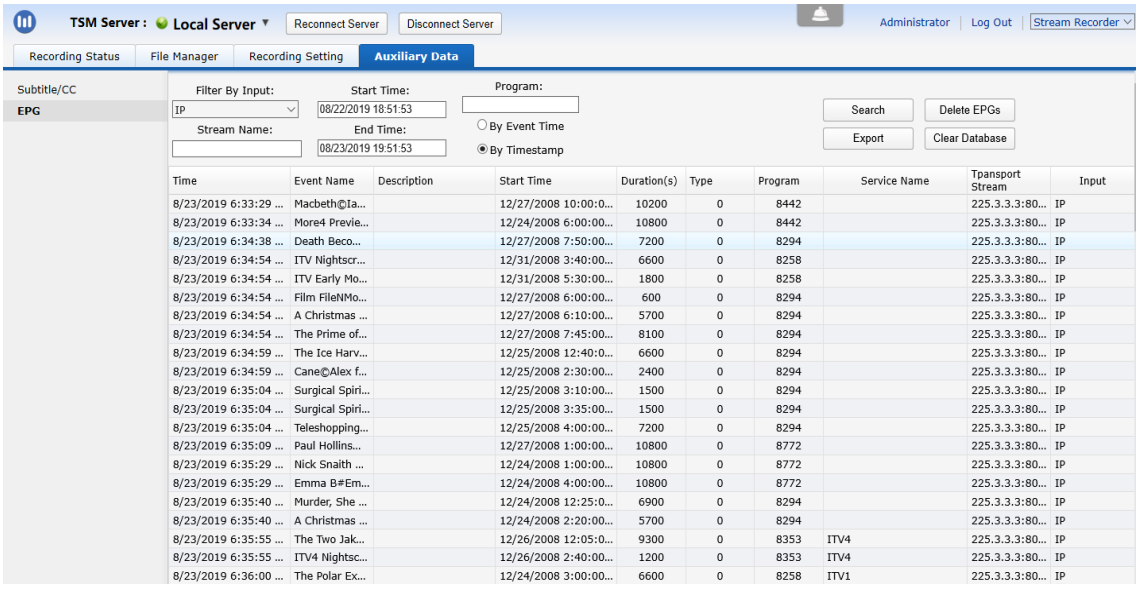
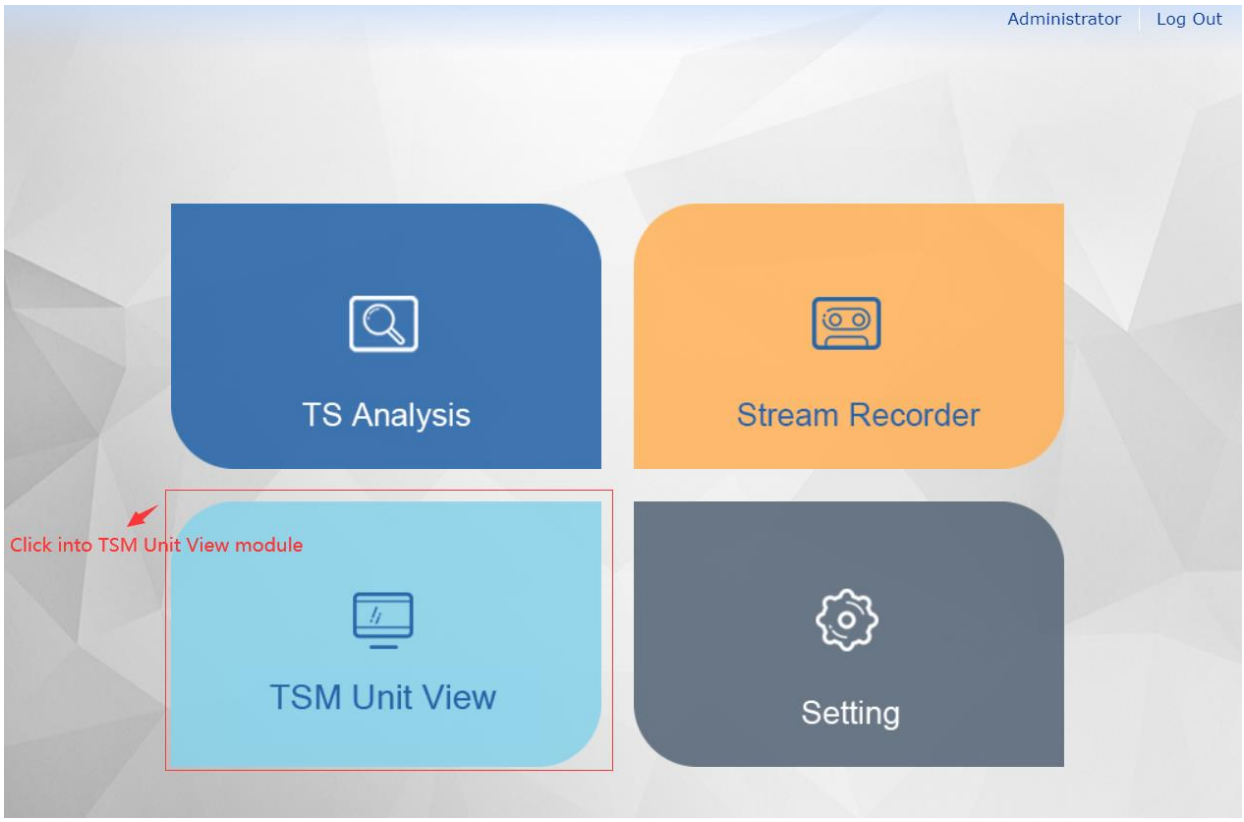


Figure 12-15 EPG search

Chapter 13 TSM Unit View

The TSM Unit View module will display the status of all TSM units (or Probes) connected to the TSM Web server. It provides summary information of the inputs, streams, errors and alarms of each TSM unit. This view can combine data from different TSM units on the same view for the convenience of comparison. You can also create thumbnail view by selecting programs from different TSM units.



13.1 Enter the TSM Unit View Pages

13.1 TSM Status

The TSM Status page will list all TSM units connected to the TSM Web server. For each TSM unit, it displays the number of alarms since last reset, the input count in the TSM unit, total stream bandwidth being monitored, number of streams, as well as the number of streams in error, warning or normal state. Below is an example of TSM Status view.

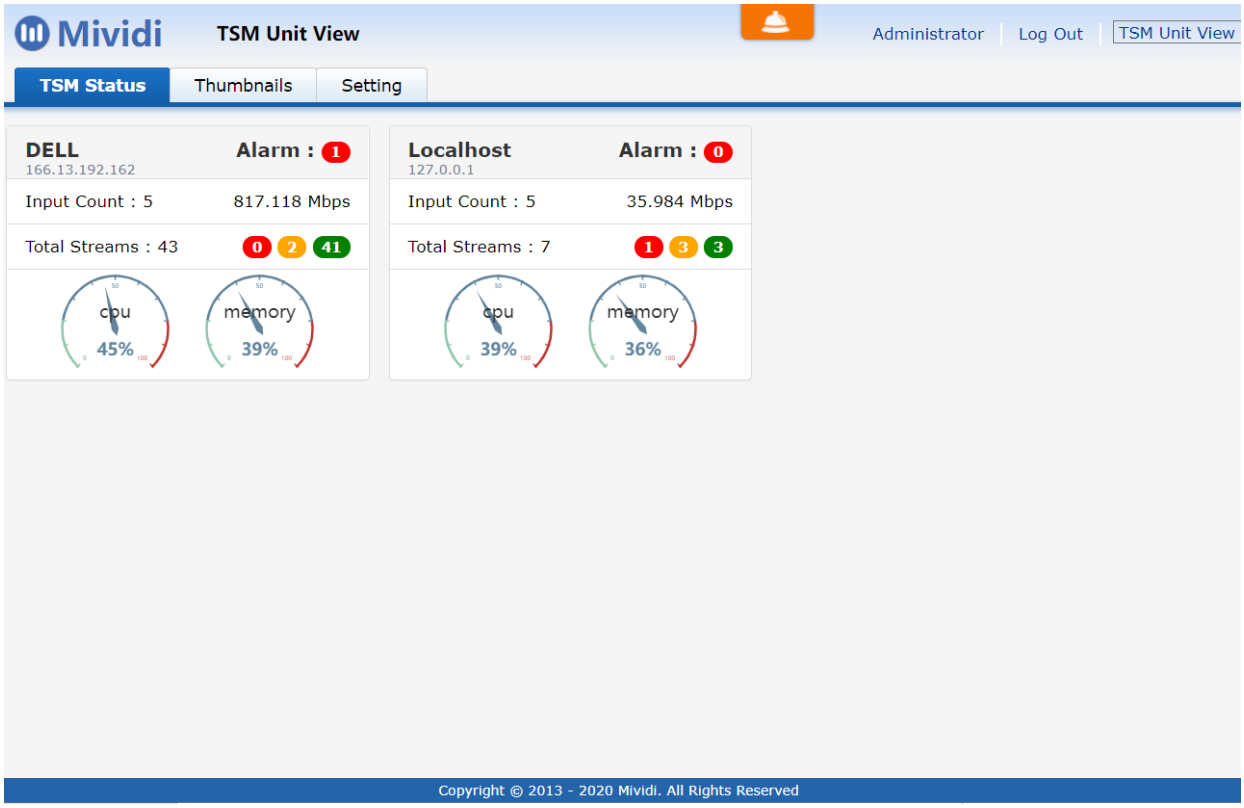


Figure 13.2 TSM Unit Status Info

13.2 Thumbnails

Click “Thumbnails” tab to enter the thumbnail display page. This thumbnail display page is different from that in the TS Analysis module such that thumbnails from different TSM units can be selected and displayed on the same page. The thumbnails are grouped based on the configuration. The configuration method is described in the following section. Each thumbnail panel displays thumbnails decoded from video key frames, and audio volume bars. In addition, it also displays program metadata including program name, audio and video PIDs, codec and pixel information, aspect ratio for video, sample rate and channel number for audio.

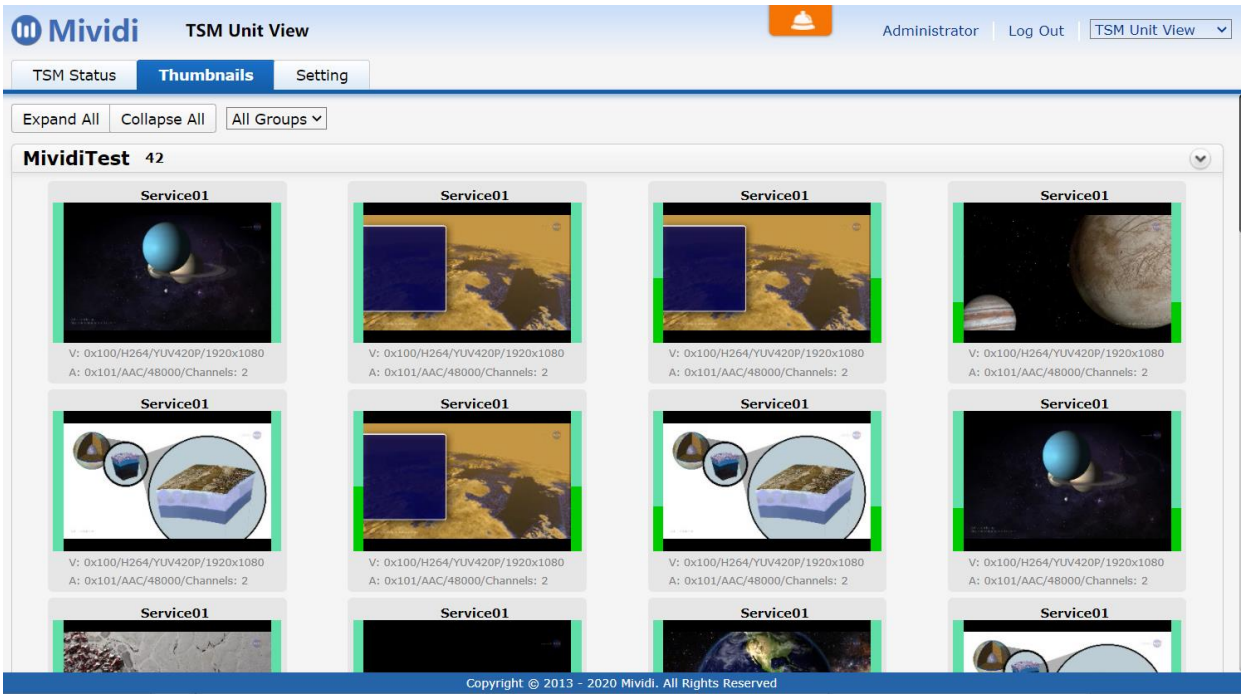


Figure 13.3 Thumbnail Page in TSM Unit View Module

13.3 Setting

TSM Unit View allows users to generate any number of TSM display groups and assign thumbnails from different TSM Units to the same group. To perform thumbnail setting, click the “Setting” tab to enter the setting page as shown in the following diagram:

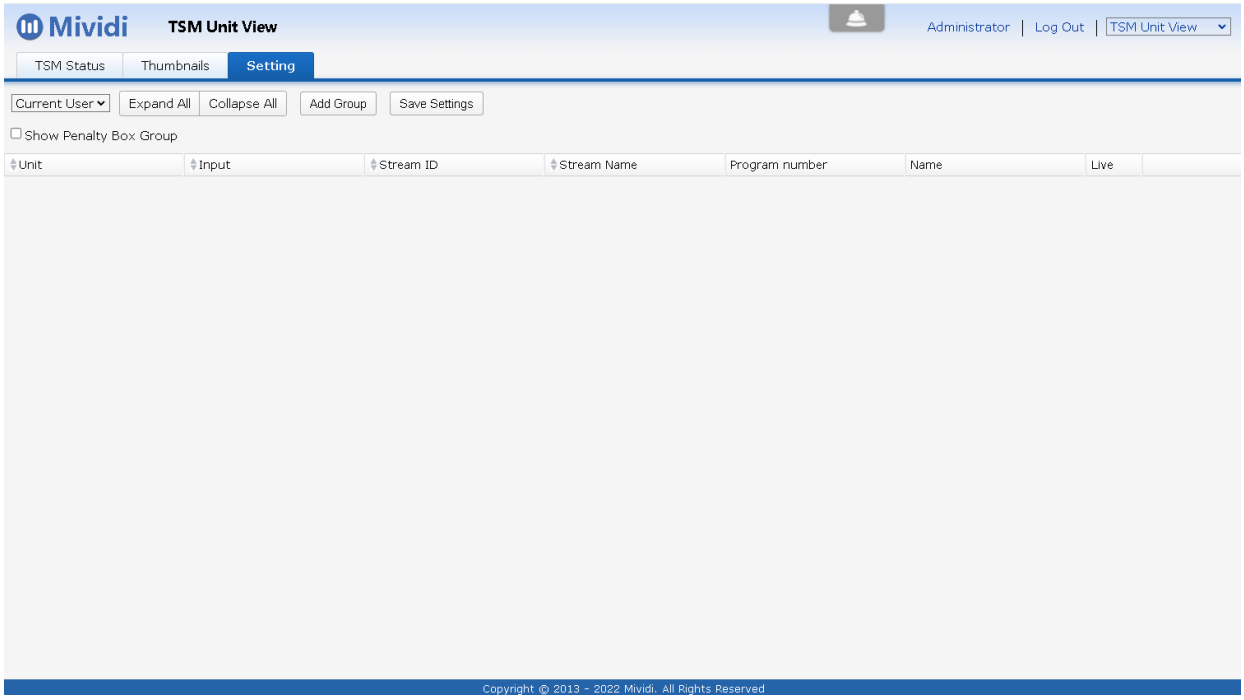


Figure 13.4 TSM Unit View Setting Page

Click “Add Group” button to open the “Add/Edit Program Group” dialog box. Enter a group name such as “Mividi Test” and click “OK” to create and save a group:

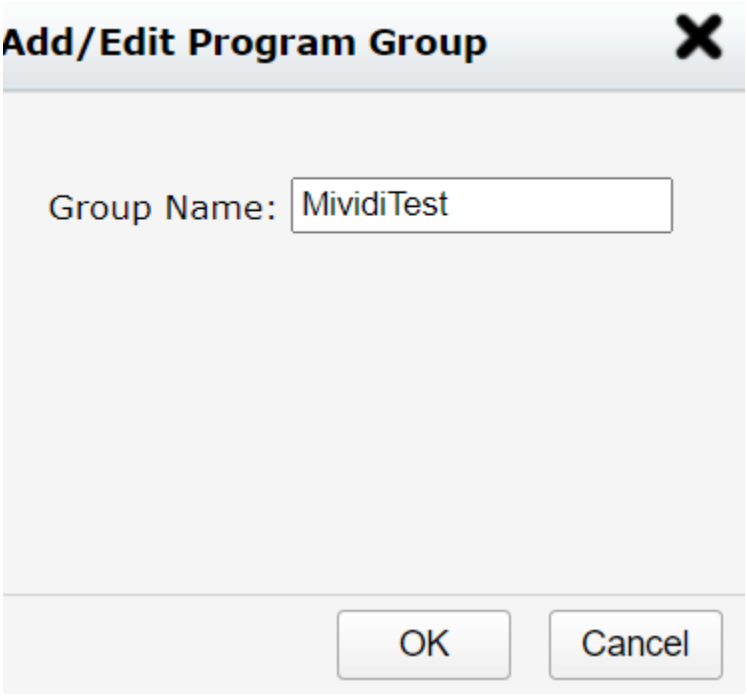


Figure 13.5 Add/Edit Program Groups

After you click a group, the “Setting” page will display three image buttons: “Select Programs”, “Edit Group Name” and “Delete Group”.

13.3.1 Select Programs to Be Displayed

Once you create a group, you can add programs to this group. Click “Select Programs” button to open the “Select Programs” box. First select a TSM unit in the Unit drop down list. Then you can enter a phrase such as a channel name or stream ID to search for programs, and the software will list all matching programs on the table, as shown in the figure below as an example.

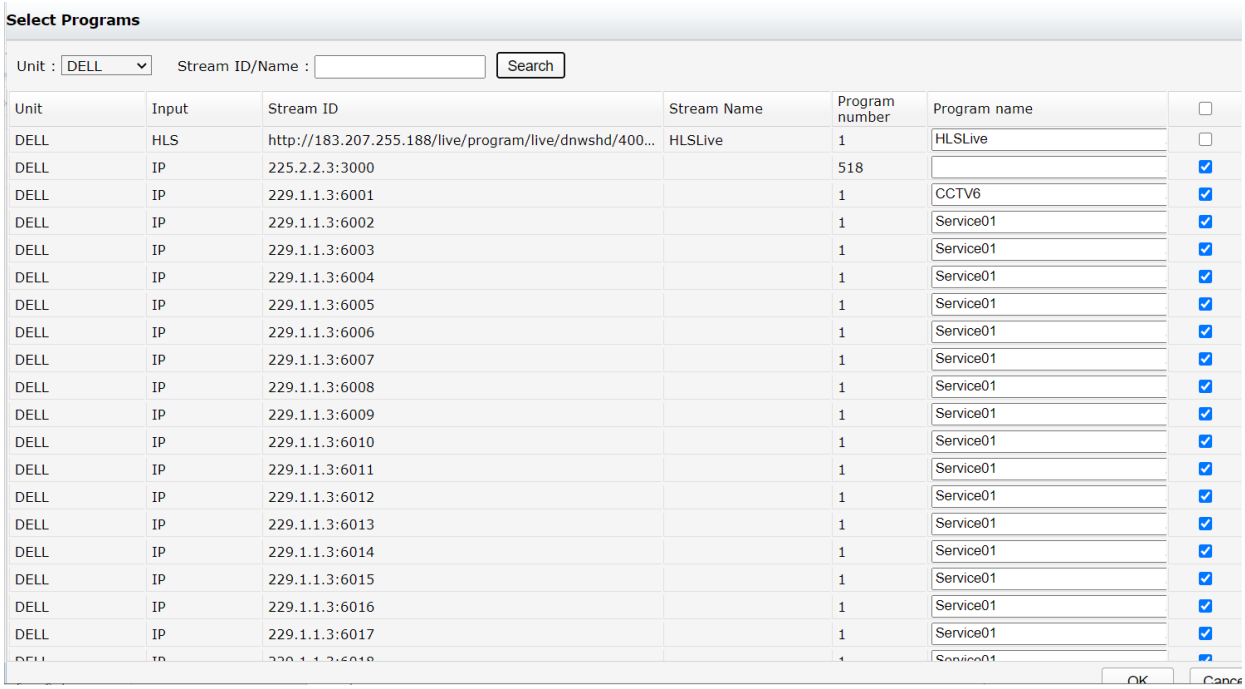


Figure 13.6 Search and Select Programs

Check the programs you want to show, and after completion， click “OK” button to save the selected programs and exit the “Select Programs” dialog. The “Setting” page will update all selected programs as shown below.

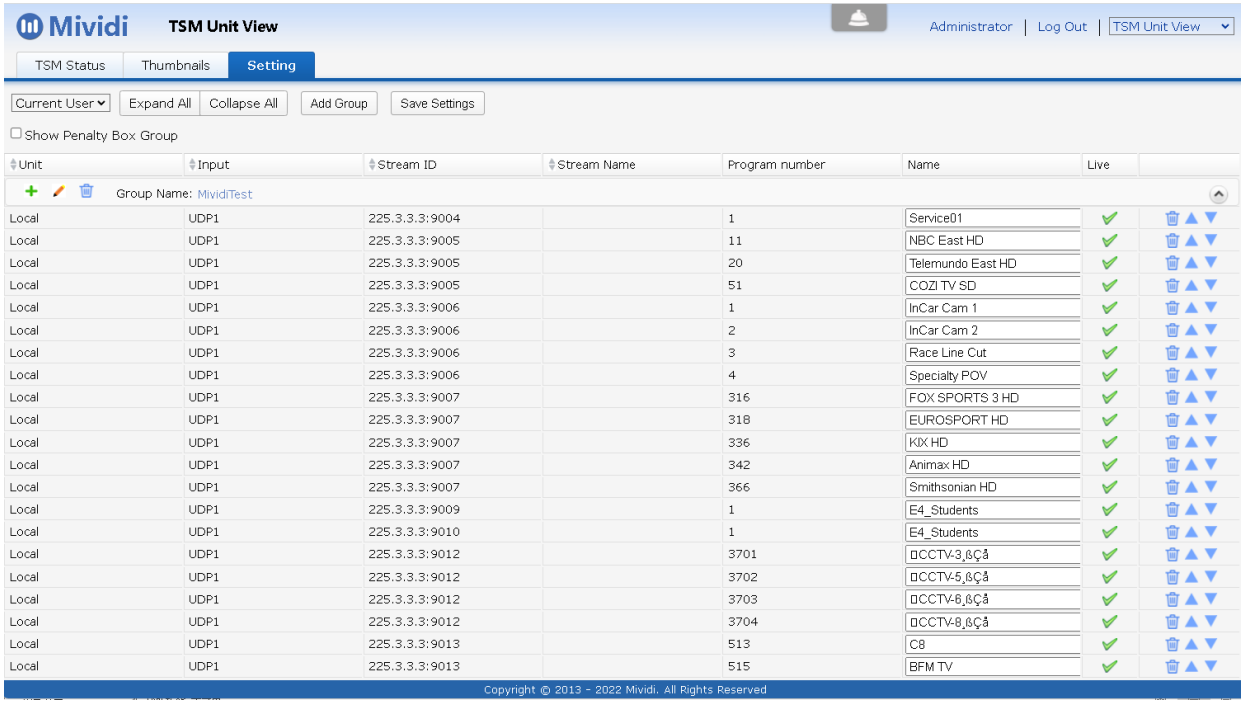


Figure 13.7 Program Group Setting

Click “Save Setting” button on the top of page to save the settings. The Thumbnail page will display thumbnails based on the setting.

13.3.2 Penalty Box Setting on Thumbnail Display

Once the checkbox “Show Penalty Box Group” is checked and saved, thumbnails with active error alarms will be displayed inside the Penalty Box. When an error alarm occurs on a program, the thumbnail of that program will be moved out from the regular display group and moved to the Penalty Box.

13.3.3 Edit Group Name

Click the image button “Edit Group Name” to edit the name of selected group. After finishing change, click “OK” button to save the change.

13.3.4 Delete a Group

If you don’t want a group, click the image button “Delete Group” to delete the group. Then click “Save Setting” to save the change.

13.3.5 Change Setting for Different Users

Only users of Administrator role can change the settings. The Administrators are responsible to create settings for general users. Then general users will be able to see thumbnails based on settings created by the Administrator.

To create settings for a different user, select a user in the user selection drop down list and follow the steps in previous sections to create settings.

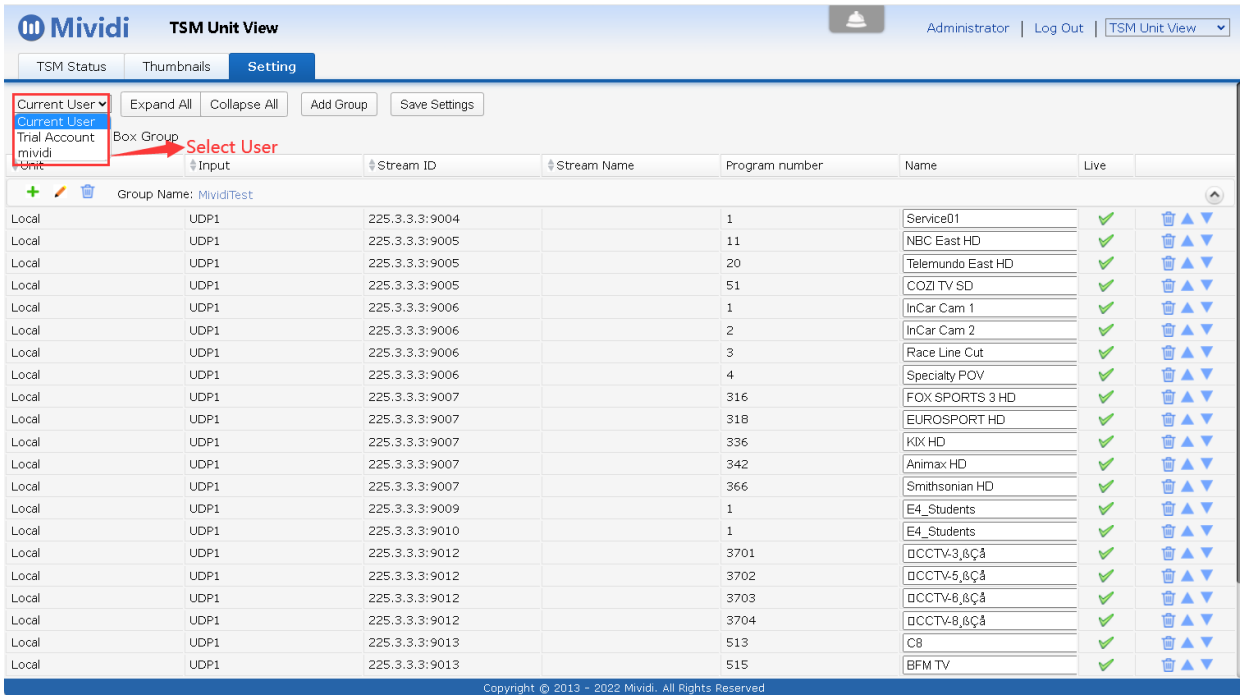


Figure 13.8 Configure Program Display Setting for a User

Appendix: Monitoring System Error Codes

Code	Name	Description
1	STREAM_START	Stream monitoring starts.
2	STREAM_END	Stream monitoring ends.
10	TS_QUALITY_SCORE	Calculated TS quality level.
101	INPUT_ERROR	General input error.
102	SYSTEM_ERROR	General system error.
103	SYSTEM_BUFFER_OVERFLOW	The application input buffer has overflowed.
104	LICENSE_ERROR	The number of streams exceeds the license limit.
200	PID_BITRATE_OUT_OF_BOUND	PID bitrate is out of user defined bounds.
201	BLACK_FRAME	Black frame detected.
202	STILL_FRAME	Still frame detected.
204	LOUDNESS_NORMAL	The audio loudness is normal.
205	LOUDNESS_TOO_LOW	The audio loudness is too low.
206	LOUDNESS_TOO_HIGH	The audio loudness is too high.
207	AUDIO_MISSING	The audio pid is missing.
208	VIDEO_MISSING	The video pid is missing.
210	OVERALL_QUALITY_LOW	The overall quality of the stream is low.
211	FRAME_SCORE_LOW	The frame quality score is lower than the threshold.
220	PACKET_SCRAMBLED	Packet level scrambling including sync byte.
225	LOUDNESS_EXCEEDS_DIALNORM_BOUND	The difference between actual loudness and Dialnorm exceeds the specified range.
226	LOUDNESS_RETURNED_NORMAL_FROM_TOO_LOW	Loudness returned to normal from too low.
227	LOUDNESS_RETURNED_NORMAL_FROM_TOO_HIGH	Loudness returned to normal from too high.
228	LOUDNESS_RETURNED_TO_DIALNORM_BOUND	Loudness returned to Dialnorm bound.
300	RECORDING_STOPPED	Stream recording stopped.
301	RECORDING_RUNNING_AFTER_STOPPED	Stream recording is running again after no status update for a period.
302	HARD_DRIVE_FULL	The hard drive used for recording is full.
901	CARRIER_GAIN	Transport stream carrier gain.
902	SYNC_GAIN	Transport stream re-gains sync.
1001	CARRIER_LOSS	Carrier_loss Loss of signal carrier.
1002	SUBTITLE_LOSS	Subtitle data is missing.
1003	MISSING_EPG_EVENT_INFO	Missing EPG event information.

1006	PROGRAM_DATA_LOSS	All program data are lost and a stream contains only null packets.
1010	SYNC_LOSS	TS_sync_loss Loss of synchronization with consideration of hysteresis parameters.
1020	SYNC_BYTE_ERROR	Sync_byte_error Sync_byte not equal 0x47.
1030	PAT_PID_INTERVAL_ERROR	PAT_error PID 0x0000 does not occur at least every 0,5 s.
1031	PAT_SCRAMBLING	PAT_error Scrambling_control_field is not 00 for PID 0x0000.
1032	PAT_SECTION_INTERVAL_ERROR	PAT_error_2 Sections with table_id 0x00 do not occur at least every 0,5 s on PID 0x0000.
1033	PAT_SECTION_ID_ERROR	PAT_error_2 Section with table_id other than 0x00 found on PID 0x0000.
1040	COUNTINUITY_COUNT_ERROR	Continuity_count_error Incorrect packet order, a packet occurs more than twice or lost packet.
1041	REPEAT_CC	Continuity_count_error Repeated continuity count.
1050	PMT_SECTION_ID_ERROR	PMT_error Sections with table_id 0x02, (i. e. a PMT), do not occur at least every 0,5 s on the PID which is referred to in the PAT.
1051	PMT_SCRAMBLING	PMT_error Scrambling_control_field is not 00 for all PIDs containing sections with table_id 0x02 (i.e. a PMT)
1052	PMT_SECTION_INTERVAL_ERROR	PMT_error_2 Sections with table_id 0x02, (i.e. a PMT), do not occur at least every 0,5 s on each program_map_PID which is referred to in the PAT.
1060	PID_MISSING	PID_error Referred PID does not occur for a user specified period.
2010	TRANSPORT_ERROR_INDICATOR	Transport_error Transport_error_indicator in the TS-Header is set to "1".
2020	CRC_ERROR	CRC_error CRC error occurred in CAT, PAT, PMT, NIT, EIT, BAT, SDT or TOT table.
2021	SECTION_LENGTH_ERROR	Encoded table section length is invalid.
2022	VERSION_NUMBER_INCREMENT_ERROR	Different sections have different version number.
2023	VERSION_NUMBER_INCONSISTENT	Version increment is not one.
2024	TABLE_FORMAT_ERROR	Unable to decode the table due to format error.
2030	PCR_DISCOUNTINUITY	PCR_error PCR discontinuity of more than 100 ms occurring without specific indication.
2031	PCR_REPETITION_ERROR	PCR_repetition_error Time interval between two consecutive PCR values more than 40 ms.
2032	ADAPT_LENGTH_ERROR	PCR_error Adaptation_field_length is invalid.
2033	PCR_DISC_INDICATOR	PCR_error PCR discountinuity indicator is set.
2040	PCR_ACCURACY_ERROR	PCR_accuracy_error PCR accuracy of selected programme

		is not within 500 ns.
2041	PCR_OFFSET_ERROR	PCR_frequency_offset_error PCR frequency offset of selected programme is not within 810 Hz.
2042	PCR_OVERALL_JITTER_ERROR	PCR_jitter_error Overall PCR jitter of selected programme is out of range.
2050	PTS_REPETITION_ERROR	PTS_error PTS repetition period more than 700 ms.
2060	CAT_MISSING	CAT_error Packets with transport_scrambling_control not 00 present, but no section with table_id = 0x01 (i.e. a CAT) present.
2061	CAT_SECTION_ID_ERROR	CAT_error Section with table_id other than 0x01 (i.e. not a CAT) found on PID 0x0001.
3010	NIT_SECTION_ID_ERROR	NIT_error Section with table_id other than 0x40 or 0x41 or 0x72 (i. e. not an NIT or ST) found on PID 0x0010.
3011	NIT_SECTION_MISSING	NIT_error No section with table_id 0x40 or 0x41 (i.e. an NIT) in PID value 0x0010 for more than 10 s.
3012	NIT_ACTUAL_SECTION_ID_ERROR	NIT_actual_error Section with table_id other than 0x40 or 0x41 or 0x72 (i. e. not an NIT or ST) found on PID 0x0010.
3013	NIT_ACTUAL_REPETITION_ERROR	NIT_actual_error Any two sections with table_id = 0x40 (NIT_actual) occur on PID 0x0010 within a specified value (25 ms or lower).
3014	NIT_OTHER_SECTION_INTERVAL_ERROR	NIT_other_error Interval between sections with the same section_number and table_id = 0x41 (NIT_other) on PID 0x0010 longer than a specified value (10s or higher).
3015	NIT_SCRAMBLING	NIT_error Scrambling_control_field is not 00 for NIT PID.
3020	SI_REPETITION_ERROR	SI_repetition_error Repetition rate of SI tables outside of specified limits.
3030	TB_BUFFER_OVERFLOW	Buffer_error TB_buffering_error overflow of transport buffer (TBn).
3031	TBSYS_BUFFER_OVERFLOW	Buffer_error TBsys_buffering_error overflow of transport buffer for system information (Tbsys).
3032	MB_BUFFER_OVERFLOW	Buffer_error MB_buffering_error overflow of multiplexing buffer (MBn) or if the vbv_delay method is used: underflow of multiplexing buffer (Mbn).
3033	EB_BUFFER_OVERFLOW	Buffer_error EB_buffering_error overflow of elementary stream buffer (EBn) or if the leak method is used: underflow of elementary stream buffer (EBn) though low_delay_flag and DSM_trick_mode_flag are set to 0 else (vbv_delay method) underflow of elementary stream buffer (EBn).
3034	B_BUFFER_OVERFLOW	Buffer_error B_buffering_error overflow or underflow of main buffer (Bn).

3035	BSYS_BUFFER_OVERFLOW	Buffer_error Bsys_buffering_error overflow of PSI input buffer (Bsys).
3036	MB_BUFFER_UNDERFLOW	Buffer_error MB_buffering_error underflow of main buffer (Bn).
3037	EB_BUFFER_UNDERFLOW	Buffer_error B_buffering_error underflow of main buffer (Bn).
3040	UNREFERENCED_PID	Unreferenced_PID PID (other than PAT, CAT, CAT_PIDs, PMT_PIDs, NIT_PID, SDT_PID, TDT_PID, EIT_PID, RST_PID, reserved_for_future_use PIDs, or PIDs user defined as private data streams) not referred to by a PMT within 0,5 s (note 1).
3041	UNREFERENCED_PID	Unreferenced_PID PID (other than PMT_PIDs, PIDs with numbers between 0x00 and 0x1F or PIDs user defined as private data streams) not referred to by a PMT or a CAT within 0.5 s.
3050	SDT_SECTION_MISSING	SDT_error Sections with table_id = 0x42 (SDT, actual TS) not present on PID 0x0011 for more than 2 s.
3051	SDT_SECTION_ID_ERROR	SDT_error Sections with table_ids other than 0x42, 0x46, 0x4A or 0x72 found on PID 0x0011.
3052	SDT_ACTUAL_SECTION_ID_ERROR	SDT_actual_error Sections with table_ids other than 0x42, 0x46, 0x4A or 0x72 found on PID 0x0011.
3053	SDT_ACTUAL_REPETITION_ERROR	SDT_actual_error Any two sections with table_id = 0x42 (SDT_actual) occur on PID 0x0011 within a specified value (25 ms or lower).
3054	SDT_OTHER_SECTION_INTERVAL_ERROR	SDT_other_error Interval between sections with the same section_number and table_id = 0x46 (SDT, other TS) on PID 0x0011 longer than a specified value (10s or higher).
3055	SDT_SCRAMBLING	SDT_error Scrambling_control_field is not 00 for SDT PID.
3060	EIT_SECTION_MISSING	EIT_error Sections with table_id = 0x4E (EIT-P/F, actual TS) not present on PID 0x0012 for more than 2 s
3061	EIT_SECTION_ID_ERROR	Sections with table_ids other than in the range 0x4E - 0x6F or 0x72 found on PID 0x0012.
3062	EIT_SECTION_0_MISSING	EIT_actual_error Section '0' with table_id = 0x4E (EIT-P, actual TS) not present on PID 0x0012 for more than 2 s.
3063	EIT_SECTION_1_MISSING	EIT_actual_error Section '1' with table_id = 0x4E (EIT-F, actual TS) not present on PID 0x0012 for more than 2 s.
3064	EIT_ACTUAL_SECTION_ID_ERROR	EIT_actual_error Sections with table_ids other than in the range 0x4E - 0x6F or 0x72 found on PID 0x0012.
3065	EIT_ACTUAL_REPETITION_ERROR	EIT_actual_error Any two sections with table_id = 0x4E (EIT-P/F, actual TS) occur on PID 0x0012 within a specified value (25ms or lower).

3066	EIT_OTHER_SECTION_INTERVAL_ERROR	EIT_other_error Interval between sections with table_id = 0x4F (EIT-P, other TS) on PID 0x0012 longer than a specified value (10s or higher).
3067	EIT_OTHER_SECTION_1_INTERVAL_ERROR	EIT_actual_error Interval between sections '1' with table_id = 0x4F (EIT-F, other TS) on PID 0x0012 longer than a specified value (10s or higher).
3068	EIT_PF_ERROR	EIT_PF_error If either section ('0' or '1') of each EIT P/F subtable is present both must exist. Otherwise EIT_PF_error should be indicated.
3070	RST_SECTION_ID_ERROR	RST_error Sections with table_id other than 0x71 or 0x72 found on PID 0x0013.
3071	RST_REPETITION_ERROR	RST_error Any two sections with table_id = 0x71 (RST) occur on PID 0x0013 within a specified value (25 ms or lower).
3080	TDT_SECTION_MISSING	TDT_error Sections with table_id = 0x70 (TDT) not present on PID 0x0014 for more than 30 s.
3081	TDT_SECTION_ID_ERROR	TDT_error Sections with table_id other than 0x70, 0x72 (ST) or 0x73 (TOT) found on PID 0x0014.
3082	TDT_REPETITION_ERROR	TDT_error Any two sections with table_id = 0x70 (TDT) occur on PID 0x0014 within a specified value (25 ms or lower).
3083	TDT_SCRAMBLING	TDT_error Scrambling_control_field is not 00 for TDT PID.
3090	EMPTY_BUFFER_ERROR	Transport buffer (TBn) not empty at least once per second or transport buffer for system information (TBsys) not empty at least once per second or if the leak method is used multiplexing buffer (MBn) not empty at least once per second.
3100	DATA_DELAY_ERROR	Delay of data (except still picture video data) through the TSTD buffers superior to 1 second, or delay of still picture video data through the TSTD buffers superior to 60 s.
4001	MEDIA_DELAY_FACTOR_ERROR	Media Delivery Delay Factor out of bound.
4002	MEDIA_LOSS_ERROR	Media Loss Rate out of bound.
4003	RTP_PACKET_LOSS_ERROR	RTP packet loss detected.
4004	RTP_MAX_LOSS_PERIOD	RTP stream exceeds max loss period limit.
4005	RTP_MIN_LOSS_DISTANCE	RTP stream exceeds min loss distance limit (below the limit).
4006	RTP_SEQUENCE_ERROR	RTP sequence number is non-consecutive. Packets lost.
4007	MEDIA_JITTER_ERROR	IP packet jitter out of bound.
4008	LONG_TERM_MEDIA_LOSS_ERROR	Long term media loss rate out of bound.
4010	PROFILE_ERROR_FLOW_NOT_EXIST	Expected flow does not exist.
4011	PROFILE_ERROR_BITRATE_OUT_RANGE	The bitrate of the flow exceeds the expected range.

4100	HTTP_FILE_SEQUENCE_ERROR	Media file index for HTTP Live Streaming is reversed.
4101	HTTP_DOWNLOAD_TIME_ERROR	HTTP file downloading time exceeds media time.
4102	ACTUAL_DURATION_LARGER_THAN_TARGET_ERROR	The actual duration is larger than target duration by 10%.
4103	MEDIA_PCR_VALUE_JUMP_ERROR	The difference between two consecutive PCR values are very large.
4104	HTTP_FILE_NOT_FOUND	The requested file is not found on the server.
4105	GENERAL_HTTP_ERROR	An error has returned from HTTP Server.
4106	HLS_MEDIA_TYPE_NOT_TS	The HLS media is not in transport stream format.
4107	HTTP_DOWNLOAD_BANDWIDTH_ERROR	HTTP file downloading bitrate is less than required media bitrate.
4200	INVALID_PLAYLIST_FILE	The first tag line of the file is not #EXTM3U.
4201	ILLEGAL_TAG	Before the type of playlist file determined,the tag that can not determine the type of playlist file appears.
4202	UNKNOWN_TAG	The tag is not defined in HLS protocol.
4203	UNEXPECTED_TAG	The tag can not be placed in current playlist file.
4204	INVALID_TAG_VALUE	The tag value is out of range or its type is wrong.
4205	VERSION_LOW	One tag or attribute needs higher version of HLS protocol supported.
4206	MISSING_ATTRIBUTE	The tag have lost one of its attribute.
4207	INVALID_ATTRIBUTE_VALUE	The attribute value is out of range or its type is wrong.
4208	UNEXPECTED_ATTRIBUTE	One attribute must not appear in the tag.
4209	MEDIA_FILE_SEQUENCE_OUT_OF_SYNC	The media file sequece number for different profile or elementary streams is different.
4210	MEDIA_TIME_OUT_OF_SYNC	The total media play time for different profile or elementary streams is different.
4211	AUDIO_PTS_SYNC_ERR	The segment start audio PTS for different profile streams is different.
4212	VIDEO_PTS_SYNC_ERR	The segment start video PTS for different profile streams is different.
4300	MPD_MISSING_ATTRIBUTE	The MPD element has lost one of its attribute.
4301	MPD_UNEXPECTED_ATTRIBUTE	The MPD element has an unexpected attribute.
4302	MPD_MISSING_ELEMENT	The MPD element is missing.
4303	MPD_INVALID_ATTRIBUTE_VALUE	MPD_INVALID_ATTRIBUTE_VALUE
5001	PAT repetition error	PAT repetition interval error (100ms < cycle time <= 200ms)
5002	PAT repetition error	PAT repetition interval error (200ms < cycle time <= 500ms)
5003	PAT absence error	PAT not found (cycle time > 500ms)
5004	PAT syntax error	Packet with PID 0x0000 does not have table_id 0x00
5005	PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000
5006	PAT syntax error	scrambling_control_field is not 00 for packet within PID 0x0000

5011	PMT repetition error	PMT repetition interval error (400ms < cycle time <= 800ms)
5012	PMT repetition error	PMT repetition interval error (800ms < cycle time <= 2000ms)
5013	PMT absence error	PMT not found (cycle time > 2000ms)
5014	PMT syntax error	Packet with PMT_PID does not have table_id 0x02
5015	PMT syntax error	CRC is incorrect for table_id
5016	PMT syntax error	scrambling_control_field is not '00' for packets containing PMT
5017	PMT syntax error	PMT_PID referenced by PAT not found
5021	MGT repetition error	MGT repetition interval error (150ms < cycle time <= 300ms)
5022	MGT repetition error	MGT repetition interval error (300ms < cycle time <= 750ms)
5023	MGT absence error	MGT not found (cycle time > 750ms)
5024	MGT syntax error	CRC is incorrect for table_id 0xC7
5025	MGT syntax error	scrambling_control_field is not '00' for packets containing MGT 2
5031	TVCT repetition error	TVCT repetition interval error (400ms < cycle time <=800ms)
5032	TVCT repetition error	TVCT repetition interval error (800ms < cycle time <=2000ms)
5033	TVCT absence error	TVCT not found (cycle time > 2000ms)
5034	TVCT syntax error	CRC is incorrect for table_id 0xC8
5035	TVCT syntax error	scrambling_control_field is not '00' for packets containing TVCT
5041	CVCT repetition error	CVCT repetition interval error (400ms < cycle time <= 800ms)
5042	CVCT repetition error	CVCT repetition interval error (800ms < cycle time <= 2000ms)
5043	CVCT absence error	CVCT not found (cycle time > 2000ms)
5044	CVCT syntax error	CRC is incorrect for table_id 0xC9
5045	CVCT syntax error	scrambling_control_field is not '00' for packets containing CVCT
5051	RRT repetition error	RRT repetition interval error (60,000ms < cycle time <=120,000ms)
5052	RRT repetition error	RRT repetition interval error (120,000ms < cycle time <= 300,000ms)
5053	RRT absence error	RRT not found (cycle time > 300,000ms)
5054	RRT syntax error	CRC is incorrect for table_id 0xCA
5055	RRT syntax error	scrambling_control_field is not '00' for packets containing

		RRT
5061	EIT-0 repetition error	EIT-0 repetition interval error (500ms < cycle time <= 1000ms)
5062	EIT-0 repetition error	EIT-0 repetition interval error (1000ms < cycle time <= 2500ms)
5063	EIT-0 absence error	EIT-0 not found (cycle time > 2500ms)
5064	EIT syntax error	CRC is incorrect for table_id 0xCB
5065	EIT syntax error	scrambling_control_field is not '00' for packets containing EIT
5066	EIT-1 repetition error	EIT-1 repetition interval error (3 seconds < cycle time <= 6 seconds)
5067	EIT-1 repetition error	EIT-1 repetition interval error (6 seconds < cycle time <= 15 seconds)
5068	EIT-1 absence error	EIT-1 not found (cycle time > 15 seconds)
5069	EIT-2, EIT-3 repetition error	EIT-2, EIT-3 repetition interval error (1 minute < cycle time <= 2 minutes)
5070	EIT-2, EIT-3 repetition error	EIT-2, EIT-3 repetition interval error (2 minutes < cycletime <= 5 minutes)
5071	EIT-2, EIT-3 absence error	EIT-2, EIT-3 not found (cycle time > 5 minutes)
5072	ETT syntax error	CRC is incorrect for table_id 0xCC
5073	ETT syntax error	scrambling_control_field is not '00' for packets containing ETT
5081	STT repetition error	STT repetition interval error (1000ms < cycle time <= 2000ms)
5082	STT repetition error	STT repetition interval error (2000ms < cycle time <= 5000ms)
5083	STT absence error	STT not found (cycle time > 5000ms)
5084	STT syntax errors	CRC is incorrect for table_id 0xCD
5085	STT time value error	STT time value is more than 30 seconds away from current correct GPS second_count (including GPS_UTC_offsetimpact)
5091	PCR error	Unsignaled PCR discontinuity
5092	PCR repetition error	PCR repetition interval error (100ms < cycle time <= 200ms)
5093	PCR repetition error	PCR repetition interval error (200ms < cycle time <= 500ms)
5094	PCR absence error	PCR not found (cycle time > 500ms)
5095	PCR error	500 ns < PCR inaccuracy <= 2500 ns
5096	PCR error	PCR inaccuracy > 2500 ns
5097	PCR related parameters	810 Hz < PCR frequency offset <= 4050 Hz
5098	PCR related parameters	PCR frequency offset > 4050 Hz)
5099	PCR related parameters	75 milliHerz/second (mHz/s) < PCR frequency drift <= 375 mHz/s

5100	PCR related parameters	PCR frequency drift > 375 mHz/s
5101	PCR related parameters	25 micro seconds < PCR overall jitter <= 125 micro seconds
5102	PCR related parameters	PCR overall jitter > 125 micro seconds
5110	PTS interval error	700 ms < Interval between coded PTS values <= 1400 ms
5111	PTS interval error	1400 ms < Interval between coded PTS values <= 3500 ms
5112	PTS absence error	Interval between coded PTS values > 3500 ms
5113	PTS increment error	PTS time not incrementing at the reciprocal of the frame rate
5121	TSID	TSID values in PAT and VCT (transport_stream_id) do not match
5122	PAT/VCT mismatch	2 Different number of programs found in VCT than signaled in PAT
5123	VCT/PMT mismatch	SLD/PMT mismatch (number of services)
5124	VCT/PMT mismatch	SLD/PMT element mismatch (different parameters for matching program elements)
5125	PMT/EIT-0 descriptor mismatch	Mismatch in duplicated descriptors for current event between PMT and EIT-0
5126	ETT syntax errors	ETT has invalid ETM_ID or ETM_ID does not match existing event_id in EIT (excludes channel ETT)
5127	ETT syntax errors	ETT has ETM_ID of channel ETT, but MGT does not flag channel ETT on this PID
5128	Multiple sources of PSI	Version numbers for particular PSI tables should never decrease (except at wraparound)
5129	Daylight Savings time settings	STT contains invalid values for Daylight Savings time switchover
5130	Service Location Descriptor missing from VCT	No Service Location Descriptor in VCT
5131	Dangling source_id	source_id mismatch (either source_id in VCT does not have a corresponding source_id in EIT or source_id in EIT does not have a corresponding source_id in VCT)
5132	MGT mismatch	Version number and/or size of tables signaled in MGT does not match with actual table
5133	MGT mismatch	PSIP table found in stream, but not signaled in MGT
10001	MISSING_SCTE35_MESSAGE	Missing SCTE35 messages in the input stream
20001	RTSP_MISSING_VIDEO	Missing video stream from the RTSP stream
20002	RTSP_MISSING_AUDIO	Missing audio stream from the RTSP stream