



## EAN-RTSP

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Exports: [Export Summary Sheet](#)

EULA: [End User License Agreement](#)

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 **CAUTION:** Alerts to a potential hazard that may result in personal injury, or an unsafe practice that causes damage to the equipment if not avoided

 **IMPORTANT:** Identifies crucial information that is important to setup and configuration procedures.

 *Used to emphasize points or reminds the user of something. Supplementary information that aids in the use or understanding of the equipment or subject that is not critical to system use*



## 1 Overview

This document describes how to use various commercial off-the-shelf media players to stream video from the RTSP server running on SightLine OEM hardware. Most video client examples use VLC. For more complex tasks FFmpeg/FFplay or GStreamer can be used.

### 1.1 Additional Support Documentation

Additional Engineering Application Notes (EANs) can be found on the [Documentation](#) page of the SightLine Applications website.

The [Panel Plus User Guide](#) provides a complete overview of settings and dialog windows located in the Help menu of the Panel Plus application.

The Interface Command and Control ([IDD](#)) describes the native communications protocol used by the SightLine Applications product line. The IDD is also available as a PDF download on the [Documentation](#) page under Software Support Documentation.

### 1.2 SightLine Software Requirements

**ⓘ IMPORTANT:** The Panel Plus software version should match the firmware version running on the board. Firmware and Panel Plus software versions are available on the [Software Download](#) page.

### 1.3 Application Bit Requirements

The functions described in this EAN require Application Bits (app bits) purchased from SightLine. App bits are enabled with a license file provided by SightLine at initial unit purchase or during a license upgrade process. License files use a hardware ID that is applicable to a specific hardware serial number. For questions and upgrade support contact [Sales](#).

**Table 1: Application Bits Requirement**

RTSP Support	Initial Software Release	Required Application Bit(s) v7 License
1500-OEM	2.22.xx	IP Encoding (H.264) 0x0000 0004 Optional: IP Encoding (H.265) 0x0001 0004
3000-OEM	2.24.xx	
4000-OEM	3.00.xx	

### 1.4 Third Party Software

**VLC media player:** Used to display video. See [EAN-Using-VLC](#) for more information on using this application.

**FFplay Media Client:** Included in the Panel Plus application folder.

The RTSP server from SightLine Applications is compatible with other RTSP clients including VMS (Video Management Systems) compliant with [RFC 2326](#).



## 1.5 Feature Overview

**Table 2: RTSP Feature Overview**

RTSP	IP Network Protocols
<ul style="list-style-type: none"> <li>RTP MJPEG</li> </ul>	<ul style="list-style-type: none"> <li>UDP and TCP Packets</li> </ul>
<ul style="list-style-type: none"> <li>RTP H.264</li> <li>RTP H.265</li> </ul>	<ul style="list-style-type: none"> <li>Unicast Streaming</li> </ul>
<ul style="list-style-type: none"> <li>RTP MPEG2-TS H.264 + Metadata</li> <li>RTP MPEG2-TS H.265 + Metadata</li> </ul>	<ul style="list-style-type: none"> <li>Multicast Streaming</li> </ul>
<ul style="list-style-type: none"> <li>RTP MPEG2-TS MPEG-4 + Metadata</li> </ul>	<ul style="list-style-type: none"> <li>Multiple Unicast Streaming</li> </ul>
	<ul style="list-style-type: none"> <li>TCP Tunneling</li> <li>RTCP</li> </ul>
Streaming	Clients
<ul style="list-style-type: none"> <li>1 camera stream (1500-OEM)</li> <li>2 camera streams (3000-OEM / 4000-OEM)</li> </ul>	<ul style="list-style-type: none"> <li>8 simultaneous connections (1500-OEM)</li> <li>16 simultaneous connections (3000-OEM / 40000-OEM) (8 sessions for Net0, 8 sessions for Net1)</li> </ul>
Multiple Display Options	On Screen Display (OSD)
<ul style="list-style-type: none"> <li>Picture-In-Picture</li> <li>Side-By-Side</li> <li>Zoom to Track</li> <li>False Color</li> <li>Digital Pan, Tilt, Zoom, and Rotation</li> </ul>	<ul style="list-style-type: none"> <li>Text</li> <li>Shapes</li> <li>Customer Logo / Watermark</li> </ul>
Authentication	Keep Alive
<ul style="list-style-type: none"> <li>Digest Authentication</li> </ul>	<ul style="list-style-type: none"> <li>RTSP Keep alive timeout is set to 120 seconds</li> </ul>

## 1.6 Definitions

SightLine hardware:	OEM hardware products available from SightLine Applications - 1500-OEM, 3000-OEM, 4000-OEM.
RTSP server:	SightLine hardware will host an RTSP server that will manage client connections and translate RTSP requests into actionable video streaming by VideoTrack.
RTSP client:	Remote software which communicates with the RTSP Server to negotiate the streaming video session.
VideoTrack:	The video processing software from SightLine Applications that runs on SightLine hardware.
Panel Plus:	The PC user interface from SightLine used for configuring and testing SightLine hardware. It also provides help with developing the interface to the OEM for an end user system. Panel Plus is a stand-in for any other client such as an autopilot or ground control station that can be used to control the SightLine hardware.
VMS:	Video Management System

## 1.7 RTSP Overview

RTSP (Real Time Streaming Protocol) allows a media client, e.g., VLC to request streaming video in a variety of formats from a server such as the 1500-OEM. The RTSP client and RTSP server negotiate the destination port and video format, but actual streaming of video is done by another service (VideoTrack on the 1500-OEM, 3000-OEM, and 4000-OEM), typically using the RTP streaming protocol over UDP. An introduction to the RTSP protocol can be found on [Wikipedia](#). Detailed and authoritative information is available from [RFC 2326](#).



### 1.7.1 How it Works



The SightLine RTSP server will startup automatically on power up of the hardware and will listen for inbound connections on port 554. Before clients can connect, system administrators will use Panel Plus to configure the video encoding parameters, such as codec (MJPEG, H.264) and other parameters such as quality, frame rates, and image size.

To view the video, operators will use a simple standard URL: `rtsp://<<ip address>>`, where the IP address is the unique address for the SightLine hardware. The video client will then manage all the connection details behind the scenes communicating with the SightLine RTSP server.

**ⓘ IMPORTANT:** RTSP sessions are not recommended for applications where there is active gimbal control because of the additional latency introduced by the RTSP session.

### 1.7.2 RTSP Requests and Features

The RTSP server running on SightLine OEM hardware supports sending the video stream in different formats. Consult the client software documentation for specific formatting requirements for the video payload. SightLine hardware can be configured to stream RTSP video in the following formats shown in [Table 3](#).

**Table 3: RTSP Video Formats**

Hardware*	Format	Description
All	RTP-H.264	H.264/AVC encoded video stream
All	RTP-MPEG2-TS H.264	H.264 encoded video stream within an MPEG2 transport stream
1500-OEM	RTP-MJPEG	MJPEG (Motion JPEG) video stream
1500-OEM	RTP-MPEG2-TS MPEG-4	MPEG4 encoded video stream within an MPEG2 transport stream
4000-OEM	RTP-H.264 / RTP-H.265	H.264 / H.265 encoded video stream
4000-OEM	RTP-MPEG2-TS H.264 / RTP-MPEG2-TS H.265	H.264 / H.265 encoded video stream within an MPEG2 transport stream

\*SightLine hardware is designed as a live streaming encoder. The RTSP server does not currently support a pause option.

These types of encoded payloads should be selected prior to establishing RTSP sessions with the OEM board. Use Panel Plus to select the desired encoded video payload format.

By default, OEM boards will send out video encoded as H.264 in an elementary stream inside an MPEG2 Transport Stream. The client software may already support this format. This is a MISB (Motion Industry Standards Board) requirement for UAV video streams. For more information refer to [EAN-Encoding](#) or go to the [MISB](#) website.

### 1.8 Before Starting

Use the [EAN-Startup Guide 1500-OEM](#), [EAN-Startup Guide 3000-OEM](#) or the [EAN-Startup Guide 4000-OEM](#) to setup the SightLine hardware and confirm that video and Ethernet communications are functioning. For the purposes of examples shown in this EAN, the following IP addresses are used:

**PC:** 192.168.0.23    **1500-OEM:** 192.168.0.115    **3000-OEM:** 192.168.0.24    **4000-OEM:** 192.168.1.230



## 2 Configuring 1500-OEM for RTSP Sessions

This section describes how to set up the 1500-OEM to send the selected RTP payload for a RTSP session through the VLC media player client. The following steps will reference the Panel Plus software.

To configure Panel Plus to stream RTSP, see the [Streaming RTSP to Panel Plus](#) section.

1. Connect to the board using the Panel Plus application.
2. Go to the *Compress* tab.
3. In the RTP section select one of the four encoded payload options. In this example, *RTP H264* is selected.

CODEC / TRANSPORT			
<b>RTP:</b>	<input type="radio"/> MJPEG	<input type="radio"/> RTP MPEG2-TS MPEG4	
	<input checked="" type="radio"/> RTP H.264	<input type="radio"/> RTP MPEG2-TS H.264	
<b>MPEG2-TS:</b>	<input type="radio"/> H.264	<input type="radio"/> MPEG4	

It is not required to set an IP address or Port for a remote client. They are set when the RTSP client connects.

4. Click *Send*. If streaming to Panel Plus, encoding, transport and overall performance can be verified using the onscreen statistics.

Statistics					
Frames	30.38	[1/sec]	Video	1287.43	[Kb/sec]
Profile:	Baseline		KLV	0.00	[Kb/sec]
Encapsulation: rtp			Codec:	h264	

To save the settings to the parameter file, from the main menu » Parameters » Save to Board.

5. Close the Panel Plus application. Click *No* in the *You are about to Quit Panel Plus* dialog window.
6. Start the RTSP client and enter the IP address of the SightLine hardware.

### 2.1 Using VLC as RTSP Client

In this example the VLC media player is the RTSP client requesting a session. See [EAN-Using-VLC](#) for more information on using this application.

1. Open the VLC media player. From the main menu, go to *Media » Open Network Stream (CTRL+N)*.
2. In the URL field use the following syntax:

*rtsp://<ip-address-of-SLA-Hardware>*

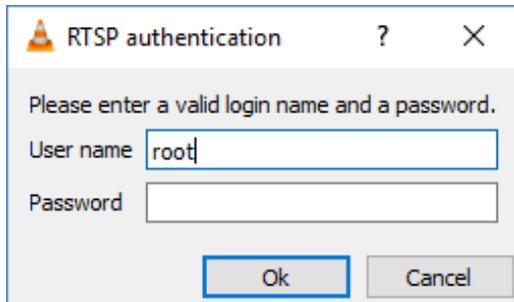
Network Protocol
Please enter a network URL:
rtsp://192.168.0.115

3. Click *Play* to begin the connection. The VLC media client will negotiate with the SightLine hardware RTSP server to establish a session.



## 2.2 Connecting with Authentication

1. If authentication is enabled, VLC will display the authentication dialog box (see [RTSP Authentication - Advanced Use](#)). Enter the login and password in the prompt as configured in the RTSP server.



2. To avoid the login prompt, bypass the username and password directly in the URL by using the following syntax:

`rtsp://<login>:<password>@<ip-address>`

Example: The username is *admin*. The password is *bls\_345*. The following URL can be used with the username and password to avoid the login prompt:

`rtsp://admin:bls_345@192.168.1.15`

3. If authentication is successful or authentication is disabled, the video will start streaming from the RTSP server. If video is not streaming, see to the [Troubleshooting](#) section.

## 3 Configuring 3000-OEM /4000-OEM for RTSP Sessions

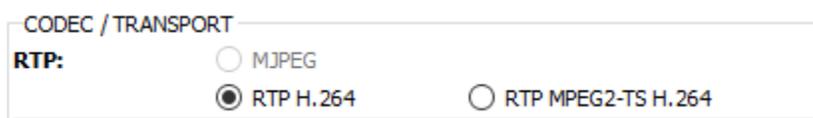
This section describes how to set up the 3000-OEM to send the selected RTP payload for a RTSP session through VLC media player client.

The 3000-OEM and 4000-OEM can output two network streams. These streams are assigned to logical networks: *Network 0* and *Network 1*. RTSP clients can establish sessions on either of these network channels.

 To configure Panel Plus to stream RTSP, see the [Streaming RTSP to Panel Plus](#) section.

1. Open the Panel Plus application and connect to the 3000-OEM / 4000-OEM.
2. Go to the *Compress* tab.
3. In the top *Output* section, select the *Output Frame Size* for the session.
4. In the *RTP* section select one of the two available encoded payload options, and then click *Apply*. The alternate options will be grayed out. In this example, *RTP H264* is selected.

### 3000-OEM RTP options:





#### 4000-OEM RTP options:

CODEC / TRANSPORT	
<b>RTP:</b>	<input type="radio"/> MJPEG <input checked="" type="radio"/> RTP H.264 <input type="radio"/> RTP H.265
	<input type="radio"/> RTP MPEG2-TS H.264 <input type="radio"/> RTP MPEG2-TS H.265

Do not set an IP address or Port for a remote client. Only set these to the host PC if the video stream is viewed in Panel Plus

- Go to the *Display* tab. Using the radio buttons to assign the preferred camera to either *Network 0* or *Network 1*. In this example, *Camera 2* is assigned to *Network 0*. Click *Send* to send changes to the board.

When making changes save the parameter file to the board as needed. Main menu » Parameters » Save to Board.

Index	Video Source	Network Display		Physical Display			Decode @ P+	
		Enable	Resolution	Ana	HDMI	HDSDI		Resolution
0	Cam 2	<input checked="" type="radio"/>	Out=In	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	720p60	<input checked="" type="radio"/>
1	None	<input type="radio"/>	N/A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	720p60	<input type="radio"/>

**Send**

### 3.1 Using VLC as RTSP Client - 3000-OEM

Load the RTSP client and enter the IP address of the 3000-OEM board. In this example, the board has been assigned IP the address of 192.168.0.24. The VLC media player is the RTSP client requesting a session.

- Open the VLC media player. From the main menu, go to *Media » Open Network Stream (CTRL+N)*.
- In the dialog box provided use the following syntax: `rtsp://<ip-address-of-SLA-board>/<Network>`

The network designation is either *net0* or *net1*. For example:

Network Protocol

Please enter a network URL:

Network designations allow choosing either of the logical outbound networks supported by the OEM.

- Another client can stream simultaneously from *Network 1* by using the *net1* designation. For example:

Network Protocol

Please enter a network URL:

- Click *Play* to begin the connection.
- The VLC media client will negotiate with the 3000-OEM RTSP server to establish a RTSP session.
- If authentication is enabled see [Connecting with Authentication](#).



### 3.2 Using VLC as RTSP Client for 4000-OEM

Load the RTSP client and enter the IP address of the 4000-OEM board. In this example, the board has been assigned IP the address of 192.168.1.230. The VLC media player is the RTSP client requesting a session.

1. Open the VLC media player. From the main menu, go to *Media » Open Network Stream (CTRL+N)*.
2. In the dialog box provided use the following syntax: `rtsp://<ip-address-of-SLA-board>/<Network>`
3. The network designation is `net0` for the 4000-OEM. For example:

Network Protocol

Please enter a network URL:

rtsp://192.168.1.230/net0

4. Click *Play* to begin the connection.
5. The VLC media client will negotiate with the 4000-OEM RTSP server to establish a RTSP session.

## 4 Joining Multicast Sessions Through RTSP

RTSP can join to an existing multicast session if the multicast session is configured through Panel Plus for a network.

To join a multicast session through RTSP:

1. Open the Panel Plus application and connect to the SightLine hardware.
2. Follow the steps in the previous sections to configure the network and camera.
3. Go to the *Compress* tab and click *Use Multicast*.

In the *IP Address* window enter the multicast address and port if it is different than the default multicast address and port shown.

4. Click *Send* to begin streaming. The video should start rendering in the Panel Plus display window.

Streaming

To IP Address 224.10.10.10 Port 15004

Use My IP - Unicast Use Multicast Broadcast

Send Stop Streaming

Export SDP File... Stream RTSP URL

5. Open the VLC media player. From the main menu, go to *Media » Open Network Stream (CTRL+N)*. In the URL field use the following syntax:  
`rtsp://<ip-address-of-SLA-board>/<Network>`
6. The network designation is either `net0` or `net1`, for example:

Network Protocol

Please enter a network URL:

rtsp://192.168.0.24/net0

7. Verify the video is streaming in the VLC media player.



 Starting a unicast session (RTSP URL) or joining a multicast session are the same. RTSP URL should always use the IP Address of the board and not the multicast address given in Panel Plus. Terminating RTSP multicast session will only terminate the RTSP session. The SightLine hardware will continue to stream to the multicast address. Panel Plus should be used to terminate the multicast streaming by either clicking the Stop Streaming button or switching to Unicast session in the Compress tab.

#### 4.1 Issues with Multiple Network Adapters

Windows default routing behavior assigns equal priority for multicast traffic to network interfaces of the same type. On systems with multiple network adapters, this can result in applications listening for multicast traffic on interfaces that are not connected to the SightLine hardware. Try disconnecting or disabling other network adapters if VLC fails to decode the multicast stream.

## 5 RTSP Commands

The RTSP server in the SightLine hardware supports the following RTSP methods (commands): OPTIONS, DESCRIBE, SETUP, PLAY, GET\_PARAMETER, SET\_PARAMETER, and TEARDOWN.

## 6 RTSP Authentication

The RTSP server supports the [digest authentication](#) mechanism based on [RFC 2069](#). Currently, the RTSP server does not support basic authentication. Digest authentication applies an MD5 hash function to the username and password before sending them over the network.

RTSP authentication is disabled by default. It can be enabled through a command line argument while starting RTSP Server.

### 6.1 Procedure Overview

- Create and modify the authentication file.
- Create a password file on the hardware or alternately create a password file on the PC.
- Test the authentication.
- Deploy the authentication.

#### 6.1.1 Create and Modify Authentication File

The authentication file should be named `.htpasswd`. It can have multiple entries corresponding to different users. Each entry in the authentication file should use the following syntax:

```
<username>:<realm>:<MD5>
```

**Username:** A unique identifier for everyone that uses the system.

**Realm:** This string should contain the name of the host performing the authentication and indicate the collection of users that have access.

Example: `registered_users@gotham.news.com` or `sla_rtspserver`.

Realm should be specific to the customer or product. Digest authentication uses *Realm* to group usernames and passwords.



**MD5:** A checksum calculated over the string comprised of the (username:realm:password)

*The authentication file can reside anywhere on the target filesystem, but we recommended that it is placed at the same location as the RTSP server executable.*

### 6.1.2 Create Password File on Hardware

An authentication file can be created directly on the target SightLine hardware.

1. Open SSH connected to target OEM:

4000-OEM: Since the server application is in `./sl/bin`, change to that directory:

```
SD> cd ./sl/bin
```

3000-OEM: Make the file system writable:

```
root@sla:~# mount -w -o remount /
```

2. Create an empty password file:

```
root@sla:~# touch .htpasswd
```

3. Use `md5sum` to generate a MD5 checksum for a given username, realm, and password:

```
root@sla:~# echo -n "root:sla_rtspserver:root" | md5sum | cut -d ' ' -f 1
54a6205c85e92a26699dc2c1184e887d
```

4. Add the username, realm and MD5 to the password file. Check the contents using `cat`:

```
root@sla:~# echo
"root:sla_rtspserver:54a6205c85e92a26699dc2c1184e887d" >> .htpasswd
```

5. Add other users as needed:

```
root@sla3000:~# echo -n "admin:sla_rtspserver:bls_345" | md5sum | cut -d ' ' -f 1
66b7f77eb8d65ece28a3a36ad2ba8736
```

```
root@sla3000:~# echo
```

```
"admin:sla_rtspserver:66b7f77eb8d65ece28a3a36ad2ba8736" >> .htpasswd
```

6. Check the contents of the newly created file:

```
root@sla3000:~# cat .htpasswd
root:sla_rtspserver:54a6205c85e92a26699dc2c1184e887d
admin:sla_rtspserver:66b7f77eb8d65ece28a3a36ad2ba8736
```

### 6.1.3 Alternate - Create Password File on PC

1. Create a new password file (`.htpasswd`) in the *Upgrade Utility* folder using Notepad++ or similar application. Starting in `C:\Program Files (x86)\SightLine Applications\...`

	<table border="0"> <tr> <td style="vertical-align: top;">1500-OEM</td> <td>... \SLA-1500 Upgrade Utility 3.02.01 \firmware \release \root \root.</td> </tr> <tr> <td style="vertical-align: top;">3000-OEM</td> <td>... \SLA-3000 Upgrade Utility 3.02.01 \firmware \release \root \home \root.</td> </tr> <tr> <td style="vertical-align: top;">4000-OEM</td> <td>... \SLA-4000 Upgrade Utility 3.02.01 \firmware \release \root \home \slroot \sl bin</td> </tr> </table>	1500-OEM	... \SLA-1500 Upgrade Utility 3.02.01 \firmware \release \root \root.	3000-OEM	... \SLA-3000 Upgrade Utility 3.02.01 \firmware \release \root \home \root.	4000-OEM	... \SLA-4000 Upgrade Utility 3.02.01 \firmware \release \root \home \slroot \sl bin
1500-OEM	... \SLA-1500 Upgrade Utility 3.02.01 \firmware \release \root \root.						
3000-OEM	... \SLA-3000 Upgrade Utility 3.02.01 \firmware \release \root \home \root.						
4000-OEM	... \SLA-4000 Upgrade Utility 3.02.01 \firmware \release \root \home \slroot \sl bin						



2. Create MD5 hashes for each username, realm, and password.
3. Add username, realm, and MD5 hash to the `.htpasswd` file.

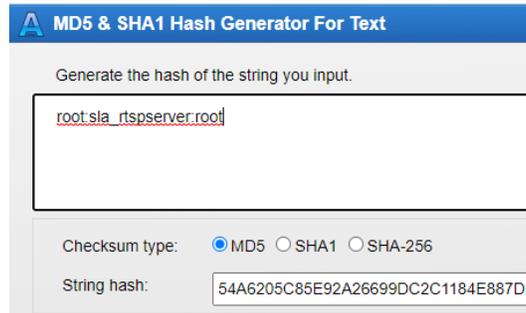
 *The md5 hash can be generated online using [OnlineMD5](#). However, OnlineMD5 generates the hash in upper case. Convert into lower case before writing into the `.htpasswd` file.*

**Example 1:** Adding a single user to the authentication file. Assume the following information for username, realm, and password:

Username: `root`

Realm: `sla_rtspserver`

Password: `root`



The screenshot shows a web application titled "MD5 & SHA1 Hash Generator For Text". It has a text input field containing "root:sla\_rtspserver:root". Below the input field, there are radio buttons for "Checksum type": MD5 (selected), SHA1, and SHA-256. The "String hash" field displays "54A6205C85E92A26699DC2C1184E887D".

**Figure 1: MD5 Online Hash Generator**

In this example (Figure 1) the `.htpasswd` entry is:

```
root:sla_rtspserver:54a6205c85e92a26699dc2c1184e887d
```

**Example 2:** Adding more users.

Username: `admin`

Realm: `sla_rtspserver`

Password: `bls_345`

The modified `.htpasswd` file is now:

```
root:sla_rtspserver:54a6205c85e92a26699dc2c1184e887d
admin:sla_rtspserver:66b7f77eb8d65ece28a3a36ad2ba8736
```

4. Upgrade the target SightLine hardware to move the password file to the destination.

#### 6.1.4 Testing Authentication

1. Open an SSH connection to the target OEM:

```
4000-OEM: SD> cd ./sl/bin
```

2. Stop the RTSP server:

```
1500-OEM and 3000-OEM: root@sla3000:~# killall rtspMain
```

```
4000-OEM: SD> sudo pkill 1_rtsp
```



- Restart the service with command line parameters:

1500-OEM and 3000-OEM:

```
❏ rtspMain -a <path to password file> <realm>
```

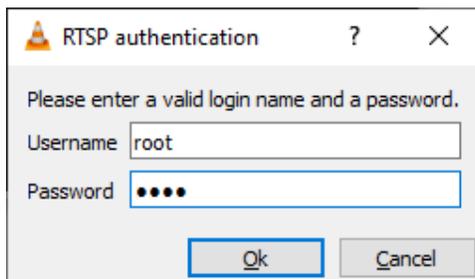
```
root@sla3000:~# ./rtspMain -a . sla_rtspserver
Enabling authentication in rtsp with password file path .
Passed realm to rtspserver is sla_rtspserver
```

4000-OEM:

```
❏ sudo ./1_rtspMain_ARM64_Release.out -a <path to password file> <realm>
```

```
SD> sudo ./1_rtspMain_ARM64_Release.out -a . sla_rtspserver
Enabling authentication in rtsp with password file path .
Passed realm to rtspserver is sla_rtspserver ./rtspMain -a . sla_rtspserver
```

- Connect with an RTSP client such as VLC. The client should prompt for a username and password.



- Verify a successful connection on the client.

The video should be seamlessly displayed. When authenticating, the server will output the following verbose diagnostics from RTSP server as shown in [Figure 2](#).

```
110116325: Got Authorization header Digest username="", realm="sla_rtspserver",
nonce="11660150213401011283", uri="rtsp://169.254.1.181:554/net0", response="ad
6b6ba3d6a71730fa312b86451e6c8f"
110116326: RTSP Server: RTSP_METHOD_DESCRIBE : 0x6f280
110116326: Did not find authentication header
110116326: Calling handle request without auth header
110116326: Returning null in get_header
110116326: returning 0 in parse_auth_header
```

Figure 2: Verify Successful Connection

### 6.1.5 Deploy Authentication

Modify the initialization scripts that launch the RTSP server. The following startup scripts can be modified to add the authentication path and realm arguments shown in the previous section:

1500-OEM: `/etc/rc.d/rc.local`

3000-OEM: `/home/root/sla3000_init.sh`

4000-OEM: `/home/slroot/sl/scripts/sla_init.sh`



### Example:

The 1500-OEM and 3000-OEM default startup script that launches the RTSP server without authentication is shown in [Figure 3](#).

```
if [ -f rtspMain ]; then
    sleep 5
    ./rtspMain &
else
    echo -e "\e[31mrtspMain not found - RTSP support disabled\e[0m"
fi
```

**Figure 3: Default Startup Script - 1500-OEM and 3000-OEM**

The 1500-OEM and 3000-OEM modified startup script to launch the RTSP server with authentication is shown in [Figure 4](#).

```
if [ -f rtspMain ]; then
    sleep 5
    ./rtspMain -a . sla_rtspserver &
else
    echo -e "\e[31mrtspMain not found - RTSP support disabled\e[0m"
fi
```

**Figure 4: Modified Startup Script - 1500-OEM and 3000-OEM**

The 4000-OEM default startup script that launches the RTSP server without authentication is shown in [Figure 5](#).

```
# Run rtspMain, etc.
./1 rtspMain ARM64 Release.out &
```

**Figure 5: Default Startup Script - 4000-OEM**

The 4000-OEM modified startup script to launch the RTSP server with authentication is shown in [Figure 6](#).

```
# Run rtspMain, etc.
./1_rtspMain_ARM64_Release.out -a . sla_rtspserver &
```

**Figure 6: Modified Startup Script - 4000-OEM**

1. Copy files to target SightLine hardware or edit them on the OEM.
2. Use the SightLine Upgrade Utility tool or FTP client to move the files to the target hardware.
3. Reboot the SightLine hardware. RTSP authentication is now enabled.



## 7 Generating SDP File Using Panel Plus

1. Open the Panel Plus application and connect to the SightLine hardware.
2. Go to the *Compress* tab.
3. In the *CODEC / TRANSPORT* section, select one of the four encoded payload options. In this example, *RTP H264* is selected.
4. In the *Output Properties* section, select the *Output Frame Size* for the session.

CODEC / TRANSPORT

**RTP:**  MJPEG  RTP H.264  RTP MPEG2-TS H.264

**MPEG2-TS:**  H.264

Pad UDP packets so all packets are the same size (MPEG2-TS only).

Output Properties

Frame Step: 1 Down Sample: None

Output Frame Size: Out=In

When input field changes have been detected in the *Compress* tab the *Send* button will turn red. Click the *Send* button to send the changes to the board.

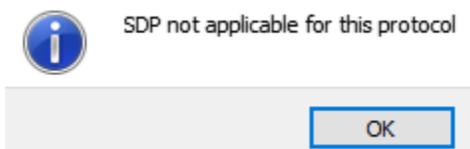
5. Click *Export SDP File*. This will generate an SDP file and will save it to a user designated folder.

Use My IP - Unicast Use Multicast Broadcast

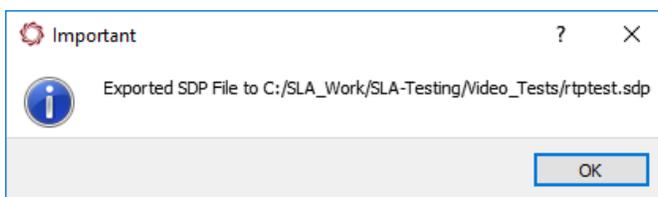
Send Stop Streaming

Export SDP File... Stream RTSP URL

If the configuration is not valid, the following error window opens.



If the configuration is valid, the following message will appear.



6. Use the generated SDP file in VLC or other players to stream the video.



## 8 Additional Configurations for VLC

### 8.1 Bypass RTP Client Port

VLC may use the same control port for all the instances of the application. This will allow only one VLC instance to receive the RTP stream. This behavior can be overridden by bypassing the RTP client port as an optional parameter in network streaming.

To set the RTP client port for network streaming in VLC:

1. From the main menu, *Media » Open Network Stream* and check *Show more options*.
2. In *Edit options*, enter client port using the following syntax:

```
rtp-client-port=<client_port to be used>
```

MRL	rtsp://192.168.0.115
Edit Options	:network-caching=300 :rtp-client-port=16480

Per [RFC 3550](#) SightLine recommends that port numbers be even.

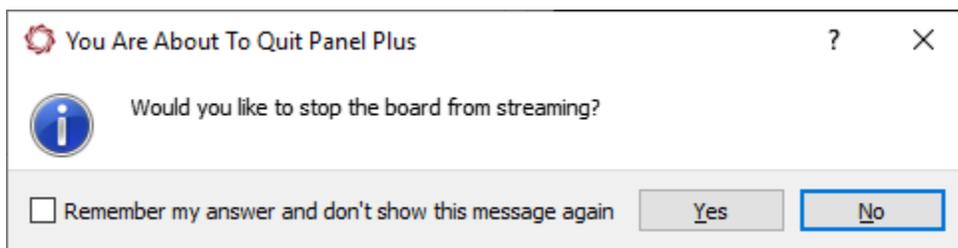
### 8.2 VLC Media Player with SDP File

In this method, VLC is a passive receiver of video being streamed by UDP. The SDP file sends the properties of the stream to the VLC so it can be properly interpreted.

This only works if the video is already streaming, no other process (like Panel Plus) is reading the video, and the SDP file accurately describes the stream.

This section describes how to open the SightLine video stream using an SDP (Session Description Protocol) file with the VLC media player.

1. Using Panel Plus software, create a standard RTP output stream. Set the outbound UDP Port to 5400. Verify that the video can be seen in the Panel Plus display window.
2. Follow the steps in [Generating SDP File Using Panel Plus](#) to generate an SDP file.
3. Close the Panel Plus application, and then click *No* in the prompt about stopping video streaming.



4. Open the VLC media player.
5. From the main menu, go to *Media » Open File* to open the file that was saved at `C:\SLA_Work\SLA-Testing\Video_Tests\rtptest.sdp`.

The VLC will then display the video stream in the display window.



## 9 Enabling TCP Transport Mode

RTSP server supports TCP transport mode for streaming. RTP packets will be sent in the same RTSP connection instead of a separate UDP connection.

**ⓘ IMPORTANT:** Multicast support through RTSP is not available in TCP mode.

### 9.1 Enable TCP mode in VLC

1. From the main menu, go to *Tools » Preferences » Input / Codecs*.
2. Enable *RTP over RTSP (TCP)*.

Follow the configuration steps mentioned in previous sections to begin streaming to VLC.

To switch back to UDP mode:

1. From the main menu, go to *Tools » Preferences » Input / Codecs*.
2. Enable *HTTP (default)* to switch to UDP streaming.



## 10 Configuring RTSP Streaming in Other Media Players

SightLine supports multiple media players that utilize RTSP streaming and RTP protocols. Procedures to configure RTSP/RTP streaming on other media players and VMS software are similar to VLC.

For all SightLine hardware follow the same steps for setting the network configuration for testing the RTP output stream (see [EAN-Video-Management-Software](#)).

## 11 Using FFplay with RTSP

This section describes how to open the SightLine video stream via RTSP and using FFplay media player. The FFplay executable is included in the Panel Plus installation folder.

1. Navigate to the SightLine Applications folder on the host PC hard drive.
2. Open the Panel Plus folder.
3. In the window address bar type CMD, and then press the Enter key to open a command prompt window.

```
Microsoft Windows [Version 10.0.17134.165]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\Program Files (x86)\SightLine Applications\SLA-PANEL-PLUS 2.25.01>
```

4. In the command window, type the following command:

```
FFPLAY rtsp://<enter-ip-address-here>
```

Example: `FFPLAY rtsp://192.168.0.24`

The video will be displayed in the FFplay media presentation window.



## 11.1 Using FFplay with SDP File

See also [Generating SDP File Using Panel Plus](#) and [VLC Media Player with SDP File](#).

1. Select video format.
2. Create an SDP file.
3. Start streaming.
4. Exit Panel Plus.
5. Assuming the SDP file is named *rtptest.sdp*, launch FFplay by using the command:

```
<ffplay rtptest.sdp>
```

Some versions of ffplay require additional arguments:

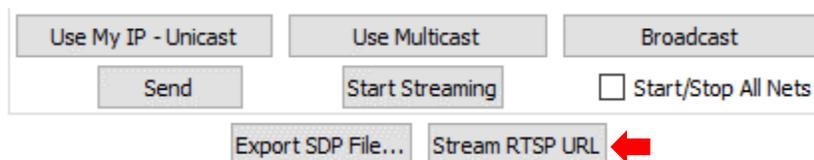
```
<ffplay -protocol whitelist file,udp,rtp rtp.sdp>
```

FFplay should launch a display window with the RTP video stream.

## 12 Streaming RTSP to Panel Plus

Panel Plus can be configured as an RTSP client to receive RTP video from SightLine hardware using RTSP protocol. The following procedure outlines connecting to SightLine RTSP streams in Panel Plus.

1. Connect Panel Plus to the SightLine hardware.
2. Configure the board for IP video output and select an RTP payload/transport type as described in [section 2](#) (1500-OEM), [section 3](#) (3000-OEM / 4000-OEM).
3. In the *Streaming* section under the *Compress* tab, click *Stream RTSP URL*.



4. Panel Plus will open a window with the available streaming URL(s) based on the configuration in the *Compress* tab.

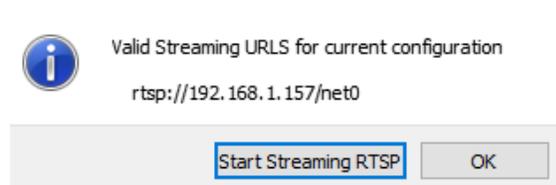
### Example 1:

RTP setting: RTP H.264

Chosen network: Net0

IP of board: 192.168.1.157

Displayed dialog window:



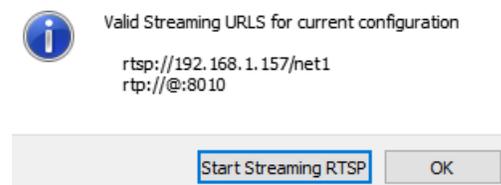
### Example 2:

RTP setting: RTP TS-H.264

Network: Net1

IP of board: 192.168.1.157

Displayed dialog window:





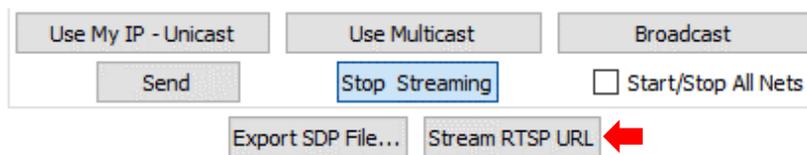
The dialog window also shows a sample RTP URL that can be used with other players like VLC, which support RTP streaming with an SDP file.

5. Click *Start Streaming RTSP*.

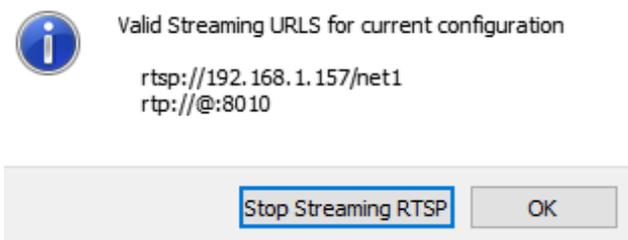
Panel Plus will establish an RTSP session and begin decoding RTP video from the board. When the RTSP session is initiated, the destination IP under the *Compress* tab will be set to the localhost address (127.0.0.1) on port 8008 (network 0) or 8010 (network 1).

6. To end the RTSP session:

- a. Click *Stream RTSP URL* under the *Streaming* section.



- b. Click *Stop Streaming RTSP*.



To switch to standard UDP streaming, enter the destination IP and port under the *Compress* tab, click *Send*, and click *Start Streaming* if necessary. This will bypass the RTSP server on the SightLine hardware.

**IMPORTANT:** When Panel Plus is configured as an RTSP client, the *Decode @ P+* stream selection setting under the *Display* tab is ignored.

*Panel Plus does not support TCP transport mode for RTSP video streams.*

*It is possible to connect multiple RTSP clients running on the PC to the same SightLine RTSP stream.*

## 13 Streaming Video Over the Internet

With 2.23 support of RTSP, video can be streamed over the internet. A simple network topology is shown in [Figure 7](#).

Basic setup steps:

1. Configure the SightLine hardware for RTP streaming.
2. Configure the router to allow port 554 forwarding to the SightLine hardware.
3. Connect to the video client.

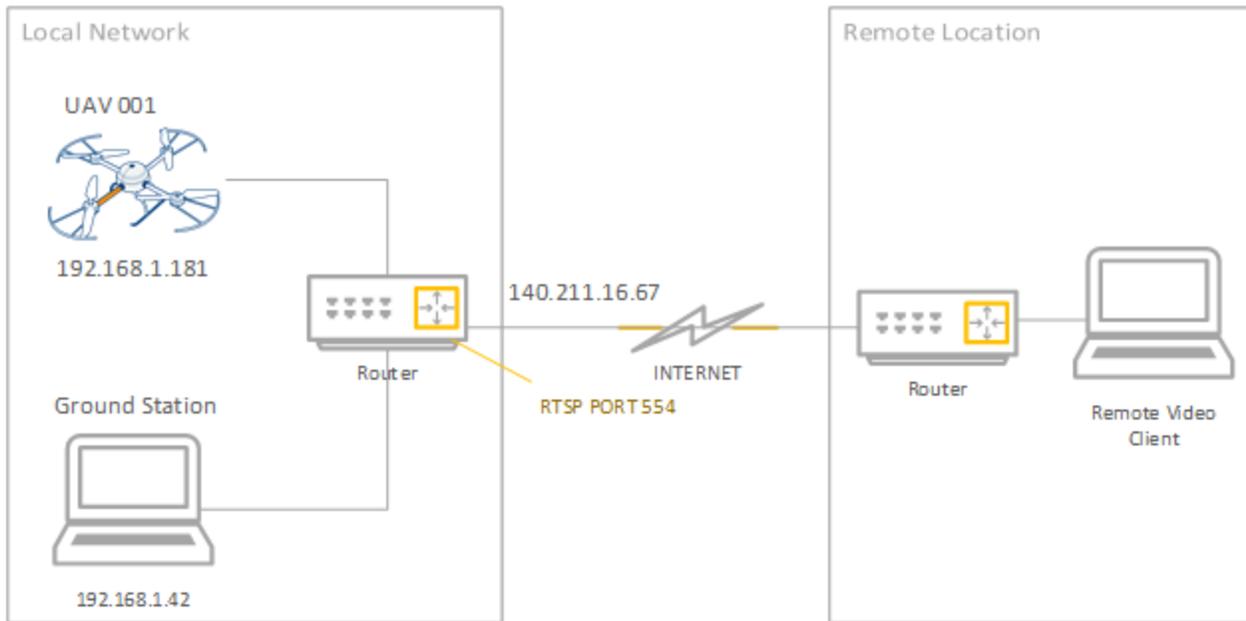


Figure 7: Simple Network Topology

Additional configuration steps may be necessary depending on how the network is setup.

### 13.1 Configure the SightLine Hardware

Detailed configuration information is covered in the previous sections.

1. In the *Compress* tab of Panel Plus, select one of the RTP streaming modes.
2. Save the parameters to the board, *main menu* » *Parameters* » *Save to Board*.
3. In the bottom status bar of Panel Plus, note the IP address of the system. This will be used to configure the router in the next section.

```
board: SLA3000_44bad4, 192.168.1.181 Firmware Ver: 2.24.1.20, temp:123°F
VN Revision: 35035, Build Date: 4/18/2017, Build Time: 10:21:23 This PC: 192.168.1.91
```

### 13.2 Configure the Router

Configure the router to forward port 554 of your external IP address to port 554 of the SightLine hardware. The example shown uses a COTS D-Link DIR-601 router.

Consult the router documentation on how to configure the port forwarding function.

1. Use a web browser to log on to the router, e.g., <http://192.168.1.1>
2. In the top navigation bar, click *Advanced*.





### 3. Configure the port forwarding table.

Name	<< Application Name ▾	Public Port	Protocol
UAV_001		554	Both ▾
IP Address	<< Computer Name ▾	Private Port	
192.168.1.181		554	256

- Save the settings. The router should now be configured to forward any inbound requests to the correct SightLine hardware.

### 13.3 Connect Video Client

To connect the video client, find the public IP address of the router.

In the example shown in [Figure 8](#), the publicly accessible IP address for this router is 140.211.16.67. Another option to find the IP address is to use the Google search engine as shown.

**WAN**

**Connection Type :** fixed IP  
**Cable Status :** Connected  
**Network Status :** Connected  
**Connection Up Time :** 0 Day, 2:36:58  
**MAC Address :** 14:d6:4d:28:37:cb  
**IP Address :** 140.211.16.67  
**Subnet Mask :** 255.255.0.0  
**Default Gateway :** 140.211.16.1

Google search results for "my ip address" showing "140.211.16.67 Your public IP address".

**Figure 8: Router and Google IP Address Examples**

For this example, the address shown in [Figure 8](#) is used for the URL in the video client.

- Open VLC media player from your remote location.
- From the menu, go to *Media » Open Network Stream (CTRL+N)*.
- Enter the network URL for your location: `rtsp://140.211.16.67`

Please enter a network URL:

`rtsp://140.211.16.67` ←

- If the inbound port is changed, the port number can be added in the URL to be more specific.

Please enter a network URL:

`rtsp://140.211.16.67:554` ←

- Once the above steps are complete, video should be streaming in the VLC media player.



## 14 Troubleshooting Streaming Issues

Connect to the target board again using Panel Plus and check network settings and compression protocols are correctly configured.

Check whether RTP port number (e.g., 5004) configured in Panel Plus or VLC media player is being used by any other process or service in the system. If it is being used stop the service and try again.

Example: The Windows media network sharing service on Windows 10 seems to use port 5004 and blocks VLC Media Player from getting the video stream.

- ✓ Use the Windows command line tool [netstat](#) to see all the ports.
- ✓ Check whether RTP port configured for the stream is an even number. RTP streaming will not work with an odd port number on certain media players.
- ✓ Check whether the client is configured to stream RTP over TCP.
- ✓ Verify the IP address, subnet mask, and Gateway are configured correctly for the network. Subnet mismatch and missing or incorrect Gateway IP addresses are a common problem.

### 14.1 Run Command Line Diagnostics

The RTSP server can support command line options for additional flexibility. SSH to the target OEM to select diagnostic options.

```
root@:~# ./rtspMain --help
SightLine Applications - v3.5.0 (147) - Oct 12 2021@02:23:16
Usage:
Assumes VideoTrack has been started with enough delay to allow video and network to
be setup.
CLIENT USAGE: rtsp://:[554]/[dispId]
Examples:
    Example: rtsp://172.10.8.1
    Example: rtsp://172.10.8.1/net1
Options:
    -a -A PATH REALM Enable authentication using PATH
    -D NUM           Enable debugging flags specified by NUM
    -v -V           Enable verbose output
    -t -T FILE      Enable trace to FILE
    -r -R           Disable RTCP
    -c FILE         Path and name of config file (default ./rtsp.conf)
```

#### 14.1.1 Enable Debugging

1. Stop the existing RTSP instance from running:

```
root@sla3000:~# ps | grep rtsp
 356 root      20208 S    ./rtspMain
 402 root      2940 S    grep rtsp
root@sla3000:~# kill 356
```

2. Start the RTSP server:

```
root@sla3000:~# ./rtspMain -v
ERROR: Couldn't open config file rtsp.conf.
580219: ./rtspMain - Oct 12 2021 02:23:16
580221: RTSP Server: Waiting for client connection
```



### 3. Connect with the client.

Examples of diagnostics with and without errors are shown in [Figure 9](#) and [Figure 10](#).

```

647591: EnableKeepAlive TRUE, IdleTime(240), AliveInterval(60), AliveProbes(8)
647591: RTSP Server: New connection accepted from client IP=192.168.3.84, 0x77730
647824: RTSP Server: Waiting for client connection
647826: rtspClientTask start : 0x77730
647831: RTSP Server: RTSP_METHOD_OPTIONS : 0x77730
647836: Unable to stream, Invalid protocol is set : 1
647836: handleClientInputError() errBuf=RTSP/1.0 415 Unsupported Media Type
647836: rtspClientTask: Closing client connection -
D:/sl_trunk/trunk/projects/SLARTSP/rtspServer.cpp 1635.
647836: rtspStopStreaming : 0x77730
647836: rtspClientTask exit : 0x77730
647841: EnableKeepAlive TRUE, IdleTime(240), AliveInterval(60), AliveProbes(8)
647842: RTSP Server: New connection accepted from client IP=192.168.3.84, 0x78468
648074: RTSP Server: Waiting for client connection
648074: rtspClientTask start : 0x78468
648075: RTSP Server: RTSP_METHOD_SETUP : 0x78468
648076: Client connection address is zero
648076: Invalid rtp table index returned
648128: RTSP Server: RTSP_METHOD_PLAY : 0x78468
648128: rtspStartStreaming : disp Count : 0, ctxt 0x78468
650224: RTSP Server: RTSP_METHOD_TEARDOWN : 0x78468
650224: rtspStopStreaming : 0x78468
650224: rtspClientTask: Closing client connection -
D:/sl_trunk/trunk/projects/SLARTSP/rtspServer.cpp 1635.

```

**Figure 9: Diagnostics with Errors**

```

936594: EnableKeepAlive TRUE, IdleTime(240), AliveInterval(60), AliveProbes(8)
936594: RTSP Server: New connection accepted from client IP=192.168.3.84, 0x77730
936827: RTSP Server: Waiting for client connection
936827: rtspClientTask start : 0x77730
936829: RTSP Server: RTSP_METHOD_OPTIONS : 0x77730
936832: RTSP Server: RTSP_METHOD_DESCRIBE : 0x77730
936832: checkValidStreaming(ctxt=0x77730) Before: ctxt->transportTableIdx=-1
936832: checkValidStreaming(ctxt=0x77730) After: ctxt->transportTableIdx=0
936832: Creating rtp Transport Thread for stream : 2
936835: ip address : 8008 192.168.1.233
936873: RTSP Server: RTSP_METHOD_SETUP : 0x77730
936873: Added 0 entry, client port : 65112, server port : 16050, start Time : 1238006586 to
rtp table
936882: RTSP Server: RTSP_METHOD_PLAY : 0x77730
936882: rtspStartStreaming : disp Count : 0, ctxt 0x77730
936882: Rtcp::start
936883: Starting the rtcp sender task
936884: Warning :: Invalid length received in RTCP receive 4, ignoring
936884: Warning :: Invalid length received in RTCP receive 4, ignoring

```

**Figure 10: Diagnostics without Errors**



### 14.1.2 Enable Trace to File

1. On the 3000-OEM only make the system writable. On all systems start the RTSP server.

```
root@sla3000:~# mount -wo remount /
root@sla3000:~# ./rtspMain -v -t gbNVRIssue.txt
```

2. After the trace is complete, use CTRL+C to cancel the trace. The file can now be reviewed or sent to SightLine [Support](#).

```
root@sla3000:~# cat gbNVRIssue.txt
1462457: ERROR: Couldn't open config file rtsp.conf.
1462458: ./rtspMain - Oct 12 2021 02:23:16
1462459: RTSP Server: Waiting for client connection
1471643: EnableKeepAlive TRUE, IdleTime(240), AliveInterval(60), AliveProbes(8)
1471643: RTSP Server: New connection accepted from client IP=192.168.3.84, 0x778a0
1471877: RTSP Server: Waiting for client connection
1471877: rtspClientTask start : 0x778a0
1471878: RTSP Server: RTSP_METHOD_OPTIONS : 0x778a0
1471884: RTSP Server: RTSP_METHOD_DESCRIBE : 0x778a0
1471884: checkValidStreaming(ctxt=0x778a0) Before: ctxt->transportTableIdx=-1
1471884: checkValidStreaming(ctxt=0x778a0) After: ctxt->transportTableIdx=0
1471884: Creating rtp Transport Thread for stream : 2
1471885: ip address : 8008 192.168.1.233
1471910: RTSP Server: RTSP_METHOD_SETUP : 0x778a0
1471911: Added 0 entry, client port : 61978, server port : 16050, start Time : 1238541624 to rtp table
1471914: RTSP Server: RTSP_METHOD_PLAY : 0x778a0
1471914: rtspStartStreaming : disp Count : 0, ctxt 0x778a0
1471914: Rtcp::start
1471915: Starting the rtcp sender task
1471915: Warning :: Invalid length received in RTCP receive 4, ignoring
1471915: Warning :: Invalid length received in RTCP receive 4, ignoring
1480834: RTSP Server: RTSP_METHOD_TEARDOWN : 0x778a0
1480834: rtspStopStreaming : 0x778a0
1480834: remClientFromRtpTable(ctxt=0x778a0) transportIdx=0
1480834: Setting stream invalid
1480834: Sending stop streaming : 2
1480834: rtspClientTask: Closing client connection -
D:/sl_trunk/trunk/projects/SLARTSP/rtspServer.cpp 1635.
1480834: rtspStopStreaming : 0x778a0
1480834: Received BYE packet terminate RTSP Session
1480835: Exiting from rtcpSenderTask
1481813: rtp timed out
1481813: rtpTransportThread for stream : 0 exited
1482835: Exiting rtcpReceiverTask
1482835: Rtcp Stop done
1482835: rtspClientTask exit : 0x778a0
```

Figure 11: Enable Trace to File Output



### 14.1.3 Disable RTCP

To save bandwidth or if the RTSP client does not support RTCP, RTCP can be disabled.

Testing from the command line:

```
root@sla3000:~# ./rtspMain -v -R
```

```
RTCP is disabled
```

```
2000946: ./rtspMain - Oct 12 2021 02:23:16
2000948: RTSP Server: Waiting for client connection
2023118: EnableKeepAlive TRUE, IdleTime(240), AliveInterval(60), AliveProbes(8)
2023119: RTSP Server: New connection accepted from client IP=192.168.3.84, 0x77730
2023351: RTSP Server: Waiting for client connection
2023352: rtspClientTask start : 0x77730
2023354: RTSP Server: RTSP_METHOD_OPTIONS : 0x77730
2023357: RTSP Server: RTSP_METHOD_DESCRIBE : 0x77730
2023357: checkValidStreaming(ctxt=0x77730) Before: ctxt->transportTableIdx=-1
2023357: checkValidStreaming(ctxt=0x77730) After: ctxt->transportTableIdx=0
2023357: Creating rtp Transport Thread for stream : 2
2023359: ip address : 8008 192.168.1.233
2023388: RTSP Server: RTSP_METHOD_SETUP : 0x77730
2023388: Added 0 entry, client port : 52488, server port : 16050, start Time : 1239093101 to rtp table
2023390: RTSP Server: RTSP_METHOD_PLAY : 0x77730
2023390: rtspStartStreaming : disp Count : 0, ctxt 0x7773
```

Figure 12: Disable RTCP

## 14.2 Questions and Additional Support

For questions and additional support, please contact [Support](#). Additional support documentation and Engineering Application Notes (EANs) can be found on the [Documentation](#) page of the SightLine Applications website.