



**SightLine**  
APPLICATIONS

## **EAN-Network Configuration**

PN: EAN-Network-Configuration

9/17/2018

**Contact:**

Web: [sightlineapplications.com](http://sightlineapplications.com)

Sales: [sales@sightlineapplications.com](mailto:sales@sightlineapplications.com)

Support: [support@sightlineapplications.com](mailto:support@sightlineapplications.com)

Phone: +1 (541) 716-5137

**Export Controls**

Exports of SightLine products are governed by the US Department of Commerce, Export Administration Regulations (EAR); classification is ECCN 4A994. The [export summary sheet](#) located on the support/documentation page of our website outlines customers responsibilities and applicable rules. SightLine Applications takes export controls seriously and works to stay compliant with all export rules.

**Copyright and Use Agreement**


© Copyright 2018, SightLine Applications, Inc. All Rights reserved. The SightLine Applications name and logo and all related product and service names, design marks and slogans are the trademarks, and service marks of SightLine Applications, Inc.


Before loading, downloading, installing, upgrading or using any Licensed Product of SightLine Applications, Inc., users must read and agree to the license terms and conditions outlined in the [End User License Agreement](#).


All data, specifications, and information contained in this publication are based on information that we believe is reliable at the time of printing. SightLine Applications, Inc. reserves the right to make changes without prior notice.

**Alerts**

The following notifications are used throughout the document to help identify important safety and setup information to the user:

 **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.*



## Contents

1	Overview .....	1
1.1	Associated Documents .....	1
1.2	SightLine Software Requirements.....	1
2	Default IP Addressing.....	1
3	Discovering SLA Boards on the Network .....	2
4	Defining Static IP Address .....	2
5	Telemetry Destination IP Addresses.....	3
6	Changing Network Interface Metric for Panel Plus .....	4
7	Connection Issues .....	4
7.1	Windows Firewall .....	4
7.2	Serial Connection .....	5
8	Advanced Networking Tip and Techniques .....	5
8.1	Terminology .....	5
8.2	Tool Summary .....	5
8.3	Third Party Utilities.....	6
8.4	User Names and Passwords .....	6
8.5	Changing the Default Password on the Target .....	6
8.6	Default Inbound SSH Port .....	7
8.6.1	1500-OEM - Changing the Inbound SSH port .....	7
8.6.2	3000-OEM – Changing the Inbound SSH port.....	7
8.7	Assigning Multiple IP Addresses to Single NIC.....	8
8.8	Configuring a VLAN.....	9
8.9	Traffic Control (tc) .....	9
8.10	FTP .....	10
8.11	Changing the MTU.....	11
8.12	Iperf (3000-OEM only).....	13
8.13	Changing Interface Speed / Duplex / Auto-Negotiation Configuration.....	14
8.13.1	1500-OEM Ethernet Interface Configuration Startup .....	15
8.13.2	3000-OEM Ethernet Interface Configuration Startup .....	16
8.14	Change Time-To-Live (TTL).....	17



8.15 Improving UDP Performance ..... 18

8.16 Analyze RTP with Wireshark ..... 18

8.17 Disable Network Services ..... 19

9 Questions and Additional Support..... 20

**List of Figures**

Figure 1: SLDiscover Command Sequence..... 2

Figure 2: Routing Specific Traffic to Different Networks ..... 8

Figure 3: Default MTU in Tera Term ..... 11

Figure 4: Packet Sizes in Wireshark ..... 12

Figure 5: MTU Reduced in Tera Term ..... 12

Figure 6: Smaller Packet Sizes in Wireshark ..... 12

Figure 7: Inbound Connection and Average Bandwidth During Test Period..... 13

Figure 8: Outbound Connection and Bandwidth in 1s Intervals ..... 14

Figure 9: Check Ethernet Interface Configuration ..... 14

Figure 10: Interface Speed / Duplex / Auto-Negotiation Configuration Changed ..... 15

**List of Tables**

Table 1: Tool Summary ..... 5

Table 2: Username and Passwords ..... 6

Table 3: Disable Network Services ..... 19



## 1 Overview

Document describes configuring a static IP address for the 1500-OEM and 3000-OEM video processing board. It additionally covers setting telemetry destination and port. This documentation also pertains to SLE versions. General knowledge of IP addressing is recommended.

### 1.1 Associated Documents

[EAN-Startup Guide 1500-OEM](#): Describes steps for connecting, configuring, and testing the 1500-OEM video processing board on the 1500-AB accessory board.

[EAN-Startup Guide 3000-OEM](#): Describes steps for connecting, configuring, and testing the 3000-OEM video processing board on the 3000-IO interface board.

[Interface Command and Control \(IDD\)](#): Describes the native communications protocol used by the SightLine Applications product line. The IDD is also available as a local download on the [Software Download](#) page.

Panel Plus User Guide: Provides descriptions of all the settings in the Panel Plus application. (Located in the Panel Plus application in the *Help* menu.)

### 1.2 SightLine Software Requirements

Windows 7, 8, or 10 required for use with the Panel Plus application.

The 3000-OEM (REV C) requires firmware 2.24.xx and higher.

**ⓘ IMPORTANT:** The Panel Plus software version should match the firmware version running on the board.

## 2 Default IP Addressing

Dynamic Host Configuration Protocol (DHCP) is supported by all SightLine boards. This support allows SLA boards to automatically obtain an Internet Protocol (IP) address. This assignment includes the subnet mask and default gateway. If a DHCP server is not available on the connected network, each SLA board will then default to a predefined IP address.

1500-OEM predefined IP address: 169.254.1.180, 255.255.0.0 subnet mask, and no gateway is defined.

3000-OEM predefined IP address: 169.254.1.181, 255.255.0.0 subnet mask, and no gateway is defined.

This predefined assignment supports the implemented address block of 169.254.0.0/16. If a Windows PC starts without a static or DHCP assigned IP address, it will then default within this same address block (and subnet).

*These addresses are only valid on the link, i.e., as a local network segment or point-to-point connection that a host PC is connected to. These addresses are not routable and cannot be the source or destination of packets crossing the internet.*



### 3 Discovering SLA Boards on the Network

When opening the Panel Plus software, it will send out an *SLDiscover* packet on the connected network to look for any SLA boards. An example is shown in [Figure 1](#). If there are other boards on the same physical network, they will also be displayed and added to the *SightLine Boards* dropdown menu on the *Connect* tab in Panel Plus.

It is important to know the address of the system that you want to connect with, and to ensure the host PC is on the same network/subnet.

If a response is not shown with a board name and IP address, see [Connection Issues](#) for more information.

```
sent: SLDiscover
received: SLA3000_ea4870, 192.168.0.27
received: SLA3000_3a2b7a, 192.168.0.24
```

Figure 1: SLDiscover Command Sequence

### 4 Defining Static IP Address

The following steps reference the Panel Plus software.

1. Connect to the board using the Panel Plus application. See the [1500-OEM Startup Guide](#) or the [EAN-Startup Guide 3000-OEM](#) for connection instructions.
2. Once connected to the board, from the main menu go to *Configure » Network Settings*.
3. Select the checkbox for *Use Static IP*. Enter the IP Address, Subnet, and Gateway address.
4. Click the *Send* to update the parameter file.

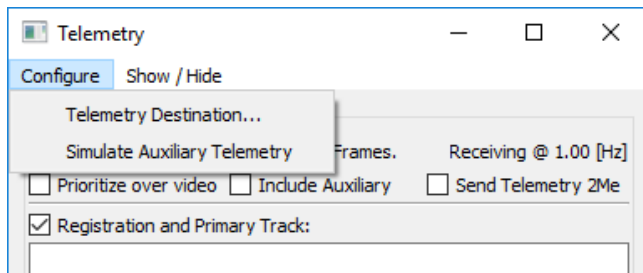
5. From the main menu, go to *Parameters » Save to board*.
6. From the main menu, go to *Reset » Board* or power cycle the board.
7. Wait for the system to boot, and then reconnect to the board.
8. After rebooting the board will now have the newly assigned IP address. Make sure to change the IP address on the host PC to an address on the same logical subnet.



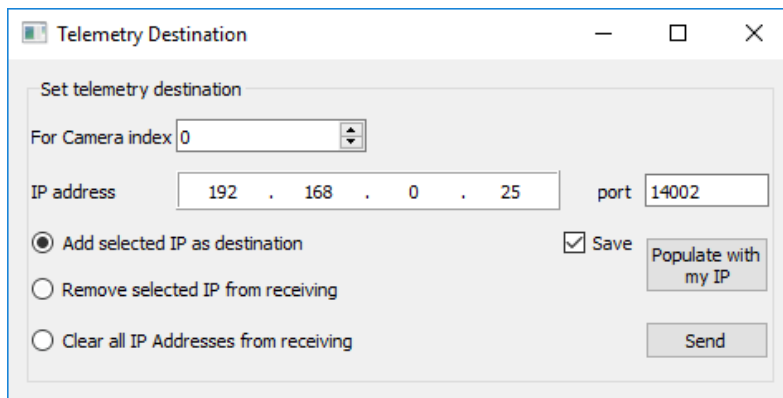
## 5 Telemetry Destination IP Addresses

The destination IP address for telemetry will typically be the IP address (as input) of the gimbal control system or the autopilot program.

1. From the main menu in Panel Plus go to *Configure » Telemetry*.
2. From the Telemetry dialog window menu go to *Configure » Telemetry Destination*.



3. In the Telemetry Destination dialog window, select the camera index number. This will be the source camera for the pixel telemetry.
4. Set the destination IP address and port. This will be UDP packet and the port will be a listening UDP port on the remote system.
5. Select the *Add selected IP as destination*, and then click *Send*. This sends this configuration data to the SLA board. Up to five telemetry destinations may be added.



To enter additional telemetry destination after the maximum (5) has been reached, a destination IP address will need to be removed. Use the *Remove selected IP from receiving* and then click *Send*.


To clear all the telemetry destination IP addresses, select *Clear all IP Addresses from receiving* and then click *Send*.

6. From the main menu, go to *Parameters » Save to board*.
7. From the main menu, go to *Reset » Board* or power cycle the board.
8. Wait for the system to boot, and then reconnect to the board.



## 6 Changing Network Interface Metric for Panel Plus

To use a wireless adapter for general internet and network access and to use a local LAN (hard wired interface) connection to the SLA board, the network interface metric should be changed. This allows Panel Plus application to communicate on a local LAN adapter.

 *The Network Sharing user interface will vary based on the Windows version.*

To change the network interface metric:

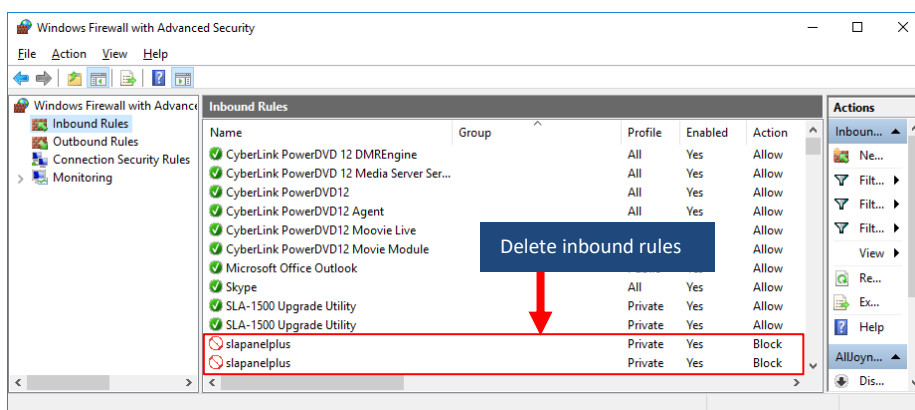
1. Go to the *Network Sharing Center* in Windows. In all versions of Windows, it is located in the Control Panel.
2. Click on *Change Adapter Settings*.
3. Right click on the local area network adapter and select properties.
4. Click on *Internet Protocol Version 4 (TCP/IPv4)*, and then click on *Properties*.
5. Click on *Advanced*.
6. Uncheck the *Automatic metric* check box. Set the interface metric to 1. A low number designates this adapter. Click *OK* in the dialog windows and close.
7. Select a new wireless adapter and repeat the process above. Set the interface metric higher than 999.
8. Disable and re-enable the adapters (or reboot PC) for the settings to take effect.

## 7 Connection Issues

### 7.1 Windows Firewall

Failure to allow access in the Windows Security Alert prompt upon initial startup of the Panel Plus application can cause connection issues.

1. Close the Panel Plus software application and open the Windows Firewall Security Manager on the host PC.
2. Go to *Inbound Rules* and delete the two *slapanelplus* rules (TCP and UDP).
3. Re-start the Panel Plus application and allow access in the Windows Security Alert prompt window.







## 7.2 Serial Connection

A PC-to-board serial connection can be used for troubleshooting or if a network connection cannot be established.

Most network connection issues are related to either cabling or assigned IP addresses not matching properly. The Panel Plus software will automatically recognize serial ports and list them in the dropdown menu for available connections.

See the Serial Communications section in the [EAN-Startup Guide 1500-OEM](#) or the [EAN-Startup Guide 3000-OEM](#) for setting up a serial connection in Panel Plus.

**ⓘ IMPORTANT:** If connecting to the serial port on the 1500-OEM or 3000-OEM boards from a host PC, the connection may require a null modem serial cable or adapter for proper communications. The pinout for this cable can be found in the [ICD-1500-OEM](#) or [ICD-3000-OEM](#).

If you are still having issues and require additional support, please contact [Support](#).

## 8 Advanced Networking Tip and Techniques

SightLine OEM products run a version of embedded Linux on the ARM processor. Many network related services and network capabilities can be accessed. Additional functionality (such as Ethernet to serial passthrough) can be accomplished with the Panel Plus software interface.

### 8.1 Terminology

SLA-hardware	General purpose term to describe any hardware product sold by SightLine
Target	Refers to the Linux Kernel running on SLA-hardware
Host	Refers to the host PC used to interface with SLA-hardware
DM-37x#	Linux command prompt on target
\$	Linux command prompt on host

### 8.2 Tool Summary

Table 1: Tool Summary

Utility	Description
SSH (Secure Shell)	Allows users to logon to target and execute commands
FTP	Allows users to move files from host to target
SCP (Secure Copy)	Used to transfer files from host to target
TC (Traffic Control)	Used to modify the flow of Ethernet packets
VCONFIG	Create and remove virtual Ethernet devices (VLAN)
NETSTAT	Used to display networking information such as open ports
ROUTE	Used to create route tables
IFCONFIG	Used to configure network interfaces
ETHTOOL	Used to modify Ethernet interface parameters
IPERF	Industry standard network performance measurement tool



### 8.3 Third Party Utilities

Use of third party support tools and utilities are integral to the integration and support of SLA-products. SightLine Applications offers the links shown below as a convenience. Users that download third party tools do so at their own risk and are bound to the usage agreements contained for each product.

There are many tools and utilities that are available on the web that provide identical functionality. Developers should use the tools that works best for their application.

<a href="#">FTP - FileZilla</a>	FTP client utility
<a href="#">Tera Term</a> or <a href="#">PuTTY</a>	Terminal emulator (command console)
<a href="#">Wireshark</a>	Network protocol analyzer

### 8.4 User Names and Passwords

SightLine uses the following conventions for usernames and passwords shown in Table 2.

Table 2: Username and Passwords

System	User name	Password
Target Hardware	<i>root</i>	<i>root</i>
Host (PC)	<i>slroot</i>	<i>slroot</i>

### 8.5 Changing the Default Password on the Target

**ⓘ IMPORTANT:** Use discretion when performing this operation. Some SightLine documentation and software such as Panel Plus assumes *root* is used as the default username and password. Changing this default behavior may render some operations unavailable.

1. Use PuTTY (or similar) to establish an SSH session to the target.

2. Login using the default username and password: *root*
3. At the command prompt, type `passwd`. Enter a new password and follow the prompts. Use characters and numbers to create a strong password.

```

192.168.1.183 - PuTTY
Using username "root".
root@192.168.1.183's password:
DM-37x# passwd
Changing password for root
New password:
Retype password:
Password for root changed by root
DM-37x# █

```



## 8.6 Default Inbound SSH Port

SightLine processors listen for incoming SSH connections on port 22 by default. The inbound SSH port may be changed by editing the *dropbear* SSH server configuration file.

### 8.6.1 1500-OEM - Changing the Inbound SSH port

1. Open a terminal emulator and establish an SSH session to the target.
2. From the *DM-37x#* prompt, enter: `vi /etc/rc.d/init.d/dropbear`
3. Press the (I) key to enter insert mode.
4. Insert `-p port` between `/usr/sbin/dropbear` and `$DROPBEAR_ARGS` in the second to last line. Port 3333 is used in the example below:

```

if [ ! -x /usr/sbin/dropbear ]
then
    exit 0
fi

if [ "$1" = "stop" -o "$1" = "restart" ]
then
    echo "Stopping the dropbear ssh server: "
    exec /etc/rc.d/rc.restart dropbear $1
fi

if [ "$1" = "start" -o "$1" = "restart" ]
then
    if [ ! -f /etc/dropbear/dropbear_rsa_host_key ]
    then
        echo "Generating keys for the dropbear ssh server: "
        mkdir -p /etc/dropbear
        dropbearkey -t rsa -f /etc/dropbear/dropbear_rsa_host_key
    fi
    echo "Starting the dropbear ssh server: "
    /usr/sbin/dropbear -p 3333 $DROPBEAR_ARGS
fi
I /etc/rc.d/init.d/dropbear [Modified] 23/24 95%
  
```

5. Press the Escape key, then type `wq` and press Enter to save the file and exit the vi editor.
6. From the *DM-37x#* prompt, enter: `reboot`
7. Once the board has rebooted, establish an SSH session via the specified port to verify the change.
8. Optional: from the *DM-37x#* prompt, enter `netstat -l` to view active connections.  
(null):port should appear in the under the Local Address column with the State LISTEN.

### 8.6.2 3000-OEM – Changing the Inbound SSH port

1. Open a terminal emulator and establish an SSH session to the target.
2. Remount the filesystem with write access – from the *root@sla3000:~#* prompt, enter:  
`mount -w -o remount /`
3. From the *root@sla3000~#* prompt, enter: `vi /etc/default/dropbear`
4. Press the (I) key to enter insert mode.



5. Add a new line containing `DROPBEAR_PORT=port` to the end of the file. Port 3333 is used in the example below:

```

192.168.1.96 - Tera Term VT
File Edit Setup Control Window Help
# DROPBEAR_BANNER=""
# DROPBEAR_RSAKEY="/etc/dropbear/dropbear_rsa_host_key"
# DROPBEAR_DSSKEY="/etc/dropbear/dropbear_dss_host_key"
# DROPBEAR_KEYTYPES="rsa"
DROPBEAR_PORT=3333
~
~
~

```

5. Press the Escape key, then type `wq` and press Enter to save the file and exit the vi editor.
6. From the `root@sla3000~#` prompt, enter: `reboot`
7. Once the board has rebooted, establish an SSH session via the specified port to verify the change.
8. Optional: from the `root@sla3000~#` prompt, enter `netstat -l` to view active connections. `(null):port` should appear in the under the Local Address column with the State `LISTEN`.

## 8.7 Assigning Multiple IP Addresses to Single NIC

It is possible to route specific traffic to different networks. This process is referred to as multihome. In this example, the target has the existing IP address of `192.168.1.183`. The other network segment has an IP address of `192.168.0.42`.

1. Use PuTTY to establish an SSH session to the target.
2. To view the current settings, type: `ifconfig`
3. To add another IP, type: `ifconfig eth0:1 192.168.0.42 netmask 255.255.255.0 multicast up`

Both IP addresses (`192.168.1.183` and `192.168.0.42`) are now accessible on the LAN.

*eth0:1 can be changed as appropriate to match your system. For example, eth0:1 is already in use on the 3000-OEM, therefore eth0:2 or similar can be used.*

```

COM1 - PuTTY
DM-37x# ifconfig
eth0    Link encap:Ethernet  HWaddr 12:01:90:17:01:5A
        inet addr:192.168.1.170 Bcast:192.168.1.255 Mask:255.255.255.0
        UP BROADCAST RUNNING MULTICAST  MTU:1500 Metric:1
        RX packets:4914 errors:0 dropped:851 overruns:0 frame:0
        TX packets:86 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:376241 (367.4 KiB)  TX bytes:11584 (11.3 KiB)
        Interrupt:33

lo      Link encap:Local Loopback
        inet addr:127.0.0.1  Mask:255.0.0.0
        UP LOOPBACK RUNNING  MTU:16436 Metric:1
        RX packets:16 errors:0 dropped:0 overruns:0 frame:0
        TX packets:16 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:0
        RX bytes:960 (960.0 B)  TX bytes:960 (960.0 B)

DM-37x#
Before

COM1 - PuTTY
DM-37x# ifconfig
eth0    Link encap:Ethernet  HWaddr 12:01:90:17:01:5A
        inet addr:192.168.1.170 Bcast:192.168.1.255 Mask:255.255.255.0
        UP BROADCAST RUNNING MULTICAST  MTU:1500 Metric:1
        RX packets:5865 errors:0 dropped:1026 overruns:0 frame:0
        TX packets:86 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:447379 (436.8 KiB)  TX bytes:11584 (11.3 KiB)
        Interrupt:33

eth0:1  Link encap:Ethernet  HWaddr 12:01:90:17:01:5A
        inet addr:192.168.0.42 Bcast:192.168.0.255 Mask:255.255.255.0
        UP BROADCAST RUNNING MULTICAST  MTU:1500 Metric:1
        Interrupt:33

lo      Link encap:Local Loopback
        inet addr:127.0.0.1  Mask:255.0.0.0
        UP LOOPBACK RUNNING  MTU:16436 Metric:1
        RX packets:16 errors:0 dropped:0 overruns:0 frame:0
        TX packets:16 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:0
        RX bytes:960 (960.0 B)  TX bytes:960 (960.0 B)

DM-37x#
After

```

Figure 2: Routing Specific Traffic to Different Networks



## 8.8 Configuring a VLAN

Use PuTTY to establish an SSH session to the target.

### Adding a VLAN:

Type in:	Reason:
1. <code>vconfig add eth0 5</code>	Add VLAN ID 5
2. <code>ifconfig eth0.5</code>	To see the VLAN
3. <code>ifconfig eth0.5 192.168.42.100 netmask 255.255.255.0 broadcast 192.168.42.255 up</code>	To add an IP address for the VLAN
4. <code>cat /proc/net/vlan/eth0.5</code>	To check the status

 This can be added to the `/etc/rc.d/rc.local` or `/etc/network/interfaces`.

### Removing a VLAN:

Type in:
1. <code>ifconfig eth0.5 down</code>
2. <code>vconfig rem eth0.5</code>

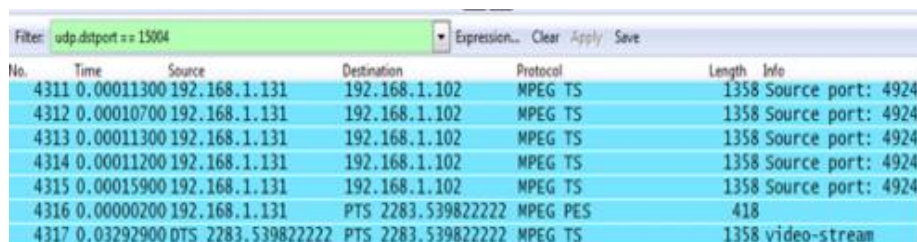
## 8.9 Traffic Control (tc)

Traffic control (tc) can be used to normalize the rate at which packets are transmitted preventing massive peaks when using IP radios or similar.

In this example, the target will be configured to transmit video, and then the packet formation will be adjusted.

The following steps reference the Panel Plus software.

1. Connect to target using Panel Plus.
2. Set up for Network Output.
3. Configure MPEG2-TS + H.264 video streaming.
4. Click *Send*. The target should now be streaming video.
5. Start Wireshark.
6. From the main menu go to *Capture » Interfaces*.
7. Filter the H.264 packets that are going to port 15004.



No.	Time	Source	Destination	Protocol	Length	Info
4311	0.00011300	192.168.1.131	192.168.1.102	MPEG TS	1358	Source port: 4924
4312	0.00010700	192.168.1.131	192.168.1.102	MPEG TS	1358	Source port: 4924
4313	0.00011300	192.168.1.131	192.168.1.102	MPEG TS	1358	Source port: 4924
4314	0.00011200	192.168.1.131	192.168.1.102	MPEG TS	1358	Source port: 4924
4315	0.00015900	192.168.1.131	192.168.1.102	MPEG TS	1358	Source port: 4924
4316	0.00000200	192.168.1.131	PTS 2283.539822222	MPEG PES	418	
4317	0.03292900	DTS 2283.539822222	PTS 2283.539822222	MPEG TS	1358	video-stream



8. Configure the scale to view the base line data and periodic large data peaks.
  - a) *Menu » Statistics » IO Graph*
  - b) *X Axis » Tick Interval = 0.1 sec*
  - c) *Y Axis » Unit: Bytes/Tick*
9. Use PuTTY to establish an SSH session to the target.

```
597 ?      00:03:44 VideoTrack1500
599 ?      00:00:00 DSPLINK_DPC_0
601 ?      00:00:02 DSPLINK_DPC_1
615 ?      00:00:01 DSPLINK_DPC_2
633 ?      00:00:00 dhclient
651 ?      00:00:00 kworker/0:0
653 ?      00:00:00 dropbear
654 pts/0  00:00:00 sh
666 pts/0  00:00:00 ps
DM-37x# kill 597
```

10. To list running processes, type: `ps -A`
11. To stop the VideoTrack1500 process, type: `kill 597`
12. To configure and run the traffic control (tc) binary, type:
 

```
tc qdisc replace dev eth0 handle 1:0 root tbf burst 3000 limit 300k rate
2000000 peakrate 2500000 mtu 3000
```
13. Edit parameters as necessary.
14. To restart the application, type: `./VideoTrack1500`

 In WireShark there should be less peaks and more consistent output packet rate.

## 8.10 FTP

There are many FTP client applications available for this process. In this example the Windows command line is used. The default user name and password are *root*.

When connecting to the board, the SLA-hardware will access the */mnt/mmcb1k0p1* directory. This is the directory of the MicroSD card (if installed).

Use the following commands to manage the files:

**List files:** `ls`

```
ftp> ls
200 PORT command successful. Consider using PASV.
150 Here comes the directory listing.
slaimage0.jpg
slaimage_0000.jpg
slaimage_0001.jpg
slavideo_0000.ts
226 Directory send OK.
ftp: 71 bytes received in 0.00Seconds 71000.00Kbytes/sec.
```



**Get a file:** get sla\_image\_0001.jpg

```
ftp> get slaimage_0001.jpg
200 PORT command successful. Consider using PASU.
150 Opening BINARY mode data connection for slaimage_0001.jpg (34788 bytes).
226 File send OK.
ftp: 34788 bytes received in 0.00Seconds 34788000.00Kbytes/sec.
ftp>
```

**Change directory:** cd /root

```
ftp> cd /root
250 Directory successfully changed.
ftp> ls
200 PORT command successful. Consider using PASU.
150 Here comes the directory listing.
1400e013015a86d1.license
VideoTrack1500
captureSample
cmenk.ko
dsplinkk.ko
?
```

**Get param file:** get param51ac9a4a.txt

```
ftp> get param51ac9a4a.txt
200 PORT command successful. Consider using PASU.
150 Opening BINARY mode data connection for param51ac9a4a.txt (11088 bytes).
226 File send OK.
ftp: 11088 bytes received in 0.00Seconds 11088000.00Kbytes/sec.
ftp>
```

**Remove param file:** del param51aca4a.txt

```
ftp> del param51ac9a4a.txt
250 Delete operation successful.
ftp>
```

**Upload a new param file:** put param51ac9a4a.txt

```
ftp> put param51ac9a4a.txt
200 PORT command successful. Consider using PASU.
150 Ok to send data.
226 File receive OK.
ftp: 11088 bytes sent in 0.00Seconds 5544.00Kbytes/sec.
ftp>
```

## 8.11 Changing the MTU

Based on radio capability or other network issues it may be necessary to reduce the Maximum Transmission Unit (MTU) or packet size. The default MTU is 1500 as shown in Tera Term.

```
192.168.1.70 - Tera Term VT
File Edit Setup Control Window Help
root@sla3000:~#
root@sla3000:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 74:DA:EA:43:CC:9E
          inet addr:192.168.1.70  Bcast:192.168.1.255  Mask:255.255.255.0
          UP BROADCAST RUNNING PROMISC ALLMULTI MULTICAST  MTU:1500  Metric:1
          RX packets:179649 errors:0 dropped:49035 overruns:0 frame:0
          TX packets:695422 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:25828640 (24.6 MiB)  TX bytes:740121834 (705.8 MiB)
          Interrupt:40
```

Figure 3: Default MTU in Tera Term





Use Wireshark to view packets. Note that most packets are 1442 bytes.

No.	Time	Source	Destination	Protocol	Length	Info
125	0.611776	192.168.1.70	192.168.1.69	RTP	1442	PT=DynamicRTP-Type-96,
126	0.611777	192.168.1.70	192.168.1.69	RTP	1442	PT=DynamicRTP-Type-96,
127	0.611980	192.168.1.70	192.168.1.69	RTP	1442	PT=DynamicRTP-Type-96,
128	0.612172	192.168.1.70	192.168.1.69	RTP	1442	PT=DynamicRTP-Type-96,
129	0.612172	192.168.1.70	192.168.1.69	RTP	1442	PT=DynamicRTP-Type-96,

Figure 4: Packet Sizes in Wireshark

In the example below, the MTU has been changed to 900 [bytes] by using the command:

```
ifconfig eth0 mtu 900
```

```
192.168.1.70 - Tera Term VT
File Edit Setup Control Window Help
root@sla3000:~# ifconfig eth0 mtu 900
root@sla3000:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 74:DA:EA:43:CC:9E
          inet addr:192.168.1.70  Bcast:192.168.1.255  Mask:255.255.255.0
          UP BROADCAST RUNNING PROMISC ALLMULTI MULTICAST MTU:900  Metric:0
          RX packets:184004 errors:0 dropped:50027 overruns:0 frame:0
          TX packets:911836 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:26460910 (25.2 MiB)  TX bytes:920284490 (877.6 MiB)
          Interrupt:40
```

Figure 5: MTU Reduced in Tera Term

In Wireshark note the smaller packets and fragmentation after the MTU change.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.1.70	192.168.1.69	RTP	65	PT=DynamicRTP-Type-96, SSRC=0x741DB8C5, Seq=4
2	0.000000	192.168.1.70	192.168.1.69	RTP	60	PT=DynamicRTP-Type-96, SSRC=0x741DB8C5, Seq=4
3	0.000243	192.168.1.70	192.168.1.69	IPv4	914	Fragmented IP protocol (proto=UDP 17, off=0,
4	0.000243	192.168.1.70	192.168.1.69	RTP	562	PT=DynamicRTP-Type-96, SSRC=0x741DB8C5, Seq=4
5	0.000243	192.168.1.70	192.168.1.69	IPv4	914	Fragmented IP protocol (proto=UDP 17, off=0,
6	0.000470	192.168.1.70	192.168.1.69	RTP	481	PT=DynamicRTP-Type-96, SSRC=0x741DB8C5, Seq=4
7	0.036316	192.168.1.70	192.168.1.69	RTP	65	PT=DynamicRTP-Type-96, SSRC=0x741DB8C5, Seq=4
8	0.036317	192.168.1.70	192.168.1.69	RTP	60	PT=DynamicRTP-Type-96, SSRC=0x741DB8C5, Seq=4
9	0.036542	192.168.1.70	192.168.1.69	IPv4	914	Fragmented IP protocol (proto=UDP 17, off=0,
10	0.036545	192.168.1.70	192.168.1.69	RTP	562	PT=DynamicRTP-Type-96, SSRC=0x741DB8C5, Seq=4
11	0.036547	192.168.1.70	192.168.1.69	IPv4	914	Fragmented IP protocol (proto=UDP 17, off=0,

Figure 6: Smaller Packet Sizes in Wireshark






## 8.12 Iperf (3000-OEM only)

Iperf is an industry standard cross-platform tool for measuring network performance that is available on the 3000-OEM. Iperf uses a client-server model and creates data streams to measure throughput.

The following example demonstrates configuring an iperf server on a Windows PC using UDP port 11000, connecting an iperf client on a 3000-OEM, and measuring throughput over a switched Ethernet network. The Windows PC uses a [precompiled iperf 2.05 32-bit](#) Windows binary from iperf.fr. This version is compatible with Windows XP-10 x86/x64 and is interoperable with the 3000-OEM version.

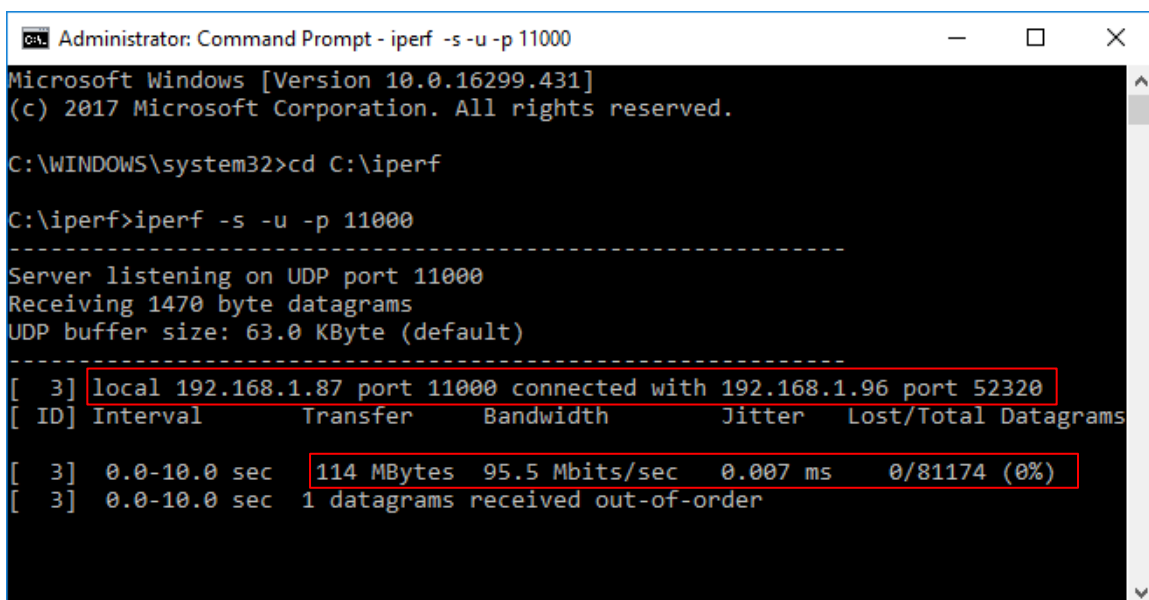
1. Open a command prompt (cmd.exe) on the PC and `cd` to the path of the iperf binary.
2. Start the iperf server – enter: `iperf -s -u -p 11000`
3. Open a terminal emulator and establish an SSH session to the 3000-OEM.
4. Start the iperf client – from the `root@sla3000~#` prompt, enter:

```
iperf -c pc_ip_address -p 11000 -i 1 -b 95m
```

 *The -b parameter specifies target bandwidth in Mb/s and implies UDP transmission. During testing, values above 95 dramatically reduced performance with the 3000-OEM configured as the client. The maximum real-world throughput of the 3000-OEM 10/100 Ethernet adapter is ≈95 Mb/s under ideal conditions. The -b parameter should not exceed 95m when the 3000-OEM is configured as the client*

If successful, the client and server will note the connection established on port 11000. The client reports the data transferred and measured bandwidth in one second intervals.

Once the test is complete, the client and server display the average bandwidth, lost/total packets, jitter, and amount of data transferred during the test period (Figure 7 and Figure 8).



```
Administrator: Command Prompt - iperf -s -u -p 11000
Microsoft Windows [Version 10.0.16299.431]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>cd C:\iperf

C:\iperf>iperf -s -u -p 11000
-----
Server listening on UDP port 11000
Receiving 1470 byte datagrams
UDP buffer size: 63.0 KByte (default)
-----
[ 3] local 192.168.1.87 port 11000 connected with 192.168.1.96 port 52320
[ ID] Interval      Transfer    Bandwidth  Jitter    Lost/Total Datagrams
[ 3] 0.0-10.0 sec  114 MBytes 95.5 Mbits/sec  0.007 ms  0/81174 (0%)
[ 3] 0.0-10.0 sec  1 datagrams received out-of-order
```

Figure 7: Inbound Connection and Average Bandwidth During Test Period




```

192.168.1.96 - Tera Term VT
File Edit Setup Control Window Help
root@sla3000:~# iperf -c 192.168.1.87 -p 11000 -i 1 -b 95m
WARNING: option -b implies udp testing
-----
Client connecting to 192.168.1.87, UDP port 11000
Sending 1470 byte datagrams
UDP buffer size:  106 KByte (default)
-----
[ 31] local 192.168.1.96 port 52320 connected with 192.168.1.87 port 11000
[ ID] Interval           Transfer             Bandwidth
[ 31] 0.0- 1.0 sec      11.4 MBytes        95.6 Mbits/sec
[ 31] 1.0- 2.0 sec      11.4 MBytes        95.4 Mbits/sec
[ 31] 2.0- 3.0 sec      11.4 MBytes        95.4 Mbits/sec
[ 31] 3.0- 4.0 sec      11.4 MBytes        95.4 Mbits/sec
[ 31] 4.0- 5.0 sec      11.4 MBytes        95.4 Mbits/sec
[ 31] 5.0- 6.0 sec      11.4 MBytes        95.4 Mbits/sec
[ 31] 6.0- 7.0 sec      11.4 MBytes        95.4 Mbits/sec
[ 31] 7.0- 8.0 sec      11.4 MBytes        95.5 Mbits/sec
[ 31] 8.0- 9.0 sec      11.4 MBytes        95.5 Mbits/sec
[ 31] 9.0-10.0 sec     11.4 MBytes        95.4 Mbits/sec
[ 31] 0.0-10.0 sec     114 MBytes        95.5 Mbits/sec
[ 31] Sent 81175 datagrams
[ 31] Server Report:
[ 31] 0.0-10.0 sec     114 MBytes  95.5 Mbits/sec  0.006 ms  0/81174 (0%)
[ 31] 0.0-10.0 sec     1 datagrams received out-of-order
root@sla3000:~#

```

Figure 8: Outbound Connection and Bandwidth in 1s Intervals

 To configure the 3000-OEM as the server and the PC as the client, swap the example commands.

### 8.13 Changing Interface Speed / Duplex / Auto-Negotiation Configuration

The speed, duplex, and auto-negotiation configuration of the SLA-hardware Ethernet interface can be adjusted using the *ethtool* binary on the embedded Linux system. This may be useful when integrating older devices or specialized network hardware such as satellite radios.

Open a terminal emulator and establish an SSH session to the target. Type `ethtool eth0` to check the current Ethernet interface configuration as shown in Figure 9.

```

192.168.1.231 - Tera Term VT
File Edit Setup Control Window Help
root@sla3000:~# ethtool eth0
Settings for eth0:
    Supported ports: [ TP AUJ BNC MII FIBRE ]
    Supported link modes:   10baseT/Half 10baseT/Full
                           100baseT/Half 100baseT/Full
                           1000baseT/Half 1000baseT/Full
    Supports auto-negotiation: Yes
    Advertised link modes:  10baseT/Half 10baseT/Full
                           100baseT/Half 100baseT/Full
    Advertised pause frame use: No
    Advertised auto-negotiation: Yes
    Speed: 100Mb/s
    Duplex: Full
    Port: MII
    PHYAD: 3
    Transceiver: external
    Auto-negotiation: on
    Current message level: 0x00000000 (0)

Link detected: yes

```

Figure 9: Check Ethernet Interface Configuration



In **Figure 10** the interface configuration has been changed to 10 Mbps full duplex with auto-negotiation disabled by using the command: `ethtool -s eth0 speed 10 duplex full autoneg off`

```

192.168.1.231 - Tera Term VT
File Edit Setup Control Window Help
root@sla3000:~# ethtool -s eth0 speed 10 duplex full autoneg off
root@sla3000:~# ethtool eth0
Settings for eth0:
    Supported ports: [ TP AU1 BNC MII FIBRE ]
    Supported link modes:   10baseT/Half 10baseT/Full
                           100baseT/Half 100baseT/Full
                           1000baseT/Half 1000baseT/Full
    Supports auto-negotiation: Yes
    Advertised link modes:  10baseT/Half 10baseT/Full
                           100baseT/Half 100baseT/Full
    Advertised pause frame use: No
    Advertised auto-negotiation: No
    Speed: 10Mb/s
    Duplex: Full
    Port: MII
    PHYAD: 3
    Transceiver: external
    Auto-negotiation: off
    Current message level: 0x00000000 <0>

    Link detected: yes
  
```

Figure 10: Interface Speed / Duplex / Auto-Negotiation Configuration Changed

### 8.13.1 1500-OEM Ethernet Interface Configuration Startup

To set the interface configuration at startup, add an `ethtool` command to the `rc.local` script.

1. Open a terminal emulator and establish an SSH session to the target.
2. Open `rc.local` in the vi editor. From the command line type: `vi /etc/rc.d/rc.local`
3. Navigate to the end of the file using Page Down or the down ↓ arrow key.
4. Press the (I) key to enter insert mode.
5. If an empty line is not present at the end of the file, press the Enter key to insert a new line.
- ❗ **IMPORTANT:** Add the `ethtool` command to the end of the file. The intend interface configuration may be overridden if `ethtool` is called prior to `x_Discover_Release` and/or `VideoTrack1500`.
6. Enter the `ethtool` command.


```

192.168.1.93 - Tera Term VT
File Edit Setup Control Window Help
lighttpd/sbin/lighttpd -f lighttpd/HLS1500.conf -m lighttpd/lib
./VideoTrack1500 -Q &

sleep 5
./rtspMain &
else
echo -e "\e[31mrtspMain not found - RTSP support disabled\e[0m"
fi
ethtool -s eth0 speed 10 duplex full autoneg off
I /etc/rc.d/rc.local [Modified] 204/204 100%
  
```




7. Press the *Escape* key, and then type: `wq`
8. Press the *Enter* key to save the file and exit the vi editor.
9. At the command line, type: `reboot`

 *Auto-negotiation will be enabled during the initial boot process, and the interface will briefly initialize with auto-negotiated parameters once the Linux kernel has loaded. Modifying the interface parameters with `ethtool` may add up to 10 seconds to the startup process.*

### 8.13.2 3000-OEM Ethernet Interface Configuration Startup

To set the interface configuration at startup, add an `ethtool` command to the `sla3000_init.sh` script.

1. Open a terminal emulator and establish an SSH session to the target.
2. Open `sla3000_init.sh` in the vi editor. From the command line, type: `vi sla3000_init.sh`
3. Navigate to the end of the file using *Page Down* or the down arrow `↓` key.
4. Press the `(I)` key to enter insert mode.
5. Position the cursor in the empty line between `esac` and `exit 0`.

 **IMPORTANT:** Add the `ethtool` command to the end of the file. The intend interface configuration may be overridden if `ethtool` is called prior to `x_Discover_Release` and/or `VideoTrack3000`.


6. Enter the `ethtool` command.

```

192.168.1.107 - Tera Term VT
File Edit Setup Control Window Help
rmmod cmenk
rmmod syslink
}
esac
ethtool -s eth0 speed 10 duplex full autoneg off
exit 0
I sla3000_init.sh [Modified] 118/119 99%

```


7. Press the *Escape* key, then type: `wq`. Press the *Enter* key to save the file and exit the vi editor.
8. At the command line, type: `reboot`

 *Auto-negotiation will be enabled during the initial boot process. The interface will briefly initialize with auto-negotiated parameters once the Linux kernel has loaded. Modifying the interface parameters with `ethtool` can add up to 10 seconds to the startup process.*



## 8.14 Change Time-To-Live (TTL)

1. Open a terminal emulator and establish an SSH session to the target.
2. Type: `cat /proc/sys/net/ipv4/ip_default_ttl`
3. Confirm value is 64.

 WireShark can also be used to confirm the value.

```

.... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: No
      Total Length: 1344
      Identification: 0x0000 (0)
  > Flags: 0x02 (Don't Fragment)
      Fragment offset: 0
      Time to live: 64
      Protocol: UDP (17)
      Header checksum: 0xb139 [validation disabled]
      [Header checksum status: Unverified]

```

4. Set TTL to new value. Type: `echo "128" > /proc/sys/net/ipv4/ip_default_ttl`

```

192.168.1.80 - Tera Term VT
File Edit Setup Control Window Help
root@sla1500:~# cat /proc/sys/net/ipv4/ip_default_ttl
64
root@sla1500:~# echo "128" > /proc/sys/net/ipv4/ip_default_ttl
root@sla1500:~# cat /proc/sys/net/ipv4/ip_default_ttl
128
root@sla1500:~# █

```

5. Confirm new TTL with Wire Shark.

```

  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
      Total Length: 1344
      Identification: 0x0000 (0)
  > Flags: 0x02 (Don't Fragment)
      Fragment offset: 0
      Time to live: 128
      Protocol: UDP (17)
      Header checksum: 0x7139 [validation disabled]
      [Header checksum status: Unverified]

```

6. The `rc.local` (1500-OEM) or `sla3000_init.sh` (3000-OEM) can be modified. This allows the TTL to be set every time the system reboots.




## 8.15 Improving UDP Performance

One of the most common causes of lost UDP datagrams is an undersized receive buffer on the socket. Use these commands to query the current UDP/IP receive buffer default and max value:


```
$ sysctl net.core.rmem_max
net.core.rmem_max = 212992
$ sysctl net.core.rmem_default
net.core.rmem_default = 212992
```

Video hesitation and packet drops are common if the UDP receive buffer size is too small. More so if the video is streamed through RTSP.

 *The RTSP server recommended UDP receive buffer size should be at least 868352 bytes.*

Use the following commands to change the UPP receive buffer size (both commands are required):

```
$ sysctl -w net.core.rmem_max=868352
net.core.rmem_max = 868352
$ sysctl -w net.core.rmem_default=868352
net.core.rmem_default = 868352
```

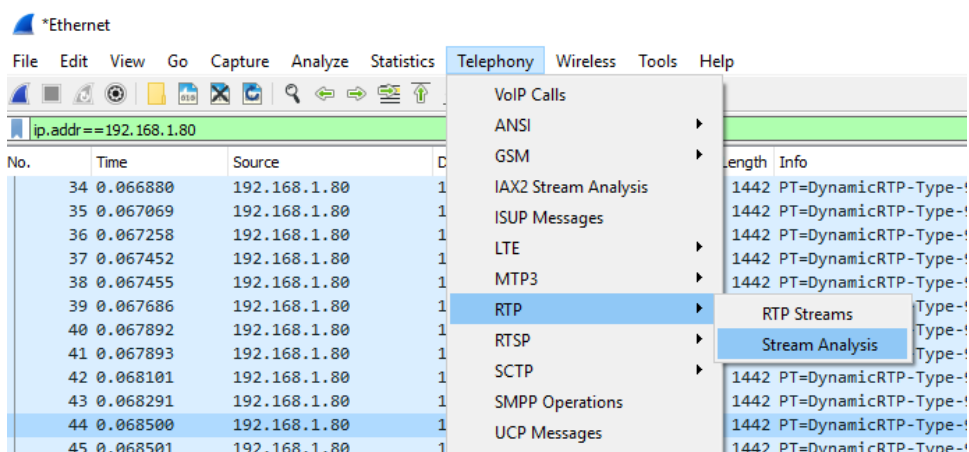
 *Adding the two lines of commands to the beginning of init scripts (/etc/rc.d/rc.local for SLA-1500 and /home/root/sla3000\_init.sh for SLA-3000) will make the changes effective at bootup.*

## 8.16 Analyze RTP with Wireshark

Wireshark can analyze the integrity of an RTP stream by detecting missed RTP packets and packets received out of order. This can be useful when there are any quality issues when streaming with RTP or RTSP.

To analyze a stream:

1. Capture an RTP stream and select an RTP packet.
2. From the main menu » *Telephony* » *RTP* » *Stream Analysis*.





- Review the summary window. It will show details of each RTP packet captured including any lost packets.

Wireshark · RTP Stream Analysis · wireshark\_CF8D8662-7B24-4693-9F5D-333E902A979D\_20180712093317\_a03324

		Forward	Reverse	Graph					
		Packet	Sequence	Delta (ms)	Jitter (ms)	Skew	Bandwidth	Marker	Status
<b>Forward</b>		2274	44562	0.00	0.00	0.00	24153.55		✓
<b>SSRC</b>	0x6b85c5e1	2275	44563	0.00	0.00	0.00	24164.98		✓
<b>Max Delta</b>	0.00 ms @ 0	2276	44564	0.00	0.00	0.00	24176.40		✓
<b>Max Jitter</b>	0.00 ms	2277	44565	0.00	0.00	0.00	24187.82		✓
<b>Mean Jitter</b>	0.00 ms	2278	44566	0.00	0.00	0.00	24199.25		✓
<b>Max Skew</b>	0.00 ms	2279	44567	0.00	0.00	0.00	24210.67		✓
<b>RTP Packets</b>	36442	2280	44568	0.00	0.00	0.00	24222.10		✓
<b>Expected</b>	36442	2281	44569	0.00	0.00	0.00	24233.52		✓
<b>Lost</b>	0 (0.00 %)	2282	44570	0.00	0.00	0.00	24244.94		✓
<b>Seq Errs</b>	0	2283	44571	0.00	0.00	0.00	24256.37		✓
<b>Duration</b>	40.27 s	2284	44572	0.00	0.00	0.00	24267.79		✓
<b>Clock Drift</b>	0 ms	2285	44573	0.00	0.00	0.00	24279.22		✓
<b>Freq Drift</b>	1 Hz (0.00 %)	2286	44574	0.00	0.00	0.00	24290.64		✓

### 8.17 Disable Network Services

Use the table to disable the following network features in the SightLine Hardware. Reboot the target for the settings to take effect.

Starting with 2.23, these files can be edited in the Upgrade Utility subfolder on the host PC. The modified files will be copied to the target during the firmware upgrade process.

**Table 3: Disable Network Services**

Network Feature	Hardware	File to be edited (use vi):	Changes to file:
<b>SSH</b>	1500-OEM	/etc/rc.d/init.d/dropbear	As the second line add: exit 0
	3000-OEM	/etc/init.d/dropbear	Change NO_START=0 to NO_START=1
<b>FTP</b>	1500-OEM	/etc/inetd.conf	Insert # in front of: ftp stream tcp nowait root /usr/sbin/vsftpd vsftpd
	3000-OEM	/etc/rc5.d/S80slaVsFtpd.sh	As the second line add: exit 0
<b>HLS</b> (HTTP Live Streaming)	1500-OEM	/etc/rc.d/rc.local	Comment out (#) the following line: lighttpd/sbin/lighttpd -f lighttpd/HLS1500.conf -m lighttpd/lib
	3000-OEM	/home/root/sla3000_init.sh	Comment out (#) the following lines: mkdir /var/cache/lighttpd lighttpd/sbin/lighttpd -D -f lighttpd/HLS.conf -m lighttpd/lib &



(Disable Network Services cont.)

RTSP	1500-OEM	/etc/rc.d/rc.local	<pre> Comment out (#) the following lines: if [ -f rtspMain ]; then     sleep 5     ./rtspMain &amp; else     echo -e "\e[31mrtspMain not found - RTSP support disabled\e[0m" fi                     </pre>
	3000-OEM	/home/root/sla3000_init.sh	<pre> Comment out (#) the following lines: if [ -f rtspMain ]; then     sleep 5     ./rtspMain &amp; else     echo -e "\e[31mrtspMain not found - RTSP support disabled\e[0m" fi                     </pre>

## 9 Questions and Additional Support

If you are still having issues and require additional support, please contact [Technical Support](#). Additional support, documentation and Engineering Application Notes (EANs) can be found on the Support pages of the SightLine Applications [website](#).