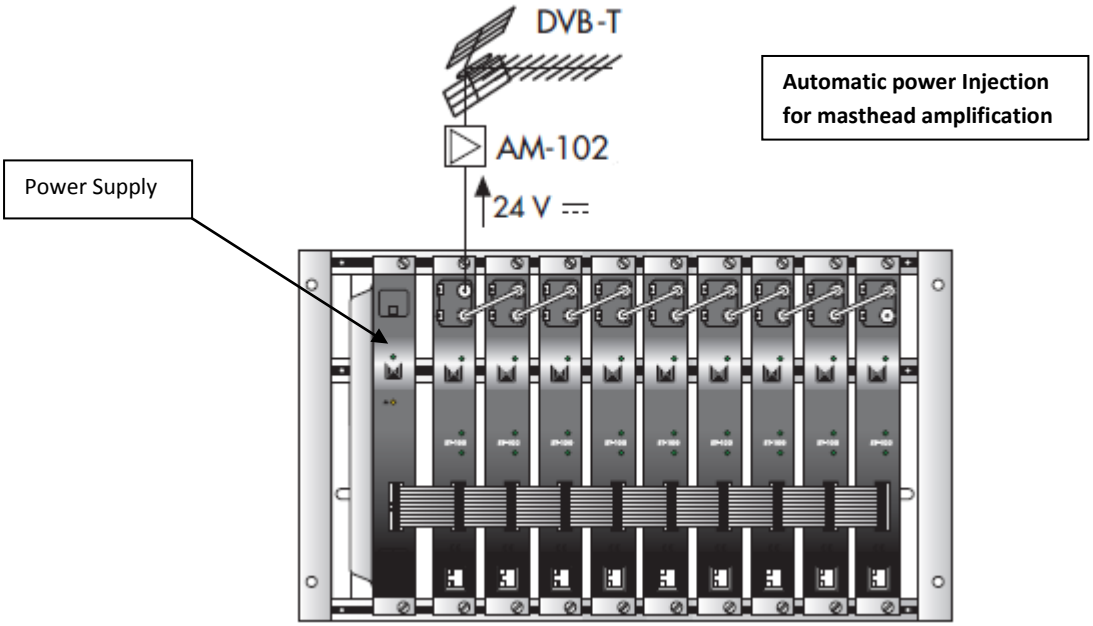
Technote 6: Setting up ST-100 Terrestrial IP Streamers

DVB-T to IP streaming equipment (ST-series) broadcasts multicast streams and TV/radio channels, selected from a DVB-T multiplex (maximum 8), from digital terrestrial reception, over a TCP-IP network. TV services broadcast as IPTV streams can be viewed on an individual IPTV receiver or by using video reproduction software. The ST modules are configured via TCP/IP, using either the HTTP protocol (web browser) or TELNET (virtual terminal).

IMPORTANT: ***It is possible to connect up to 9 ST- 100 modules and 7 ST-110 modules per power supply unit. Each ST module can handle up to 8 MPEG streams; the IP broadcast, therefore, consists of 8 TV/radio services per module.***



IMPORTANT: Layout of the modules must be as shown above. Power Supply (FA-310/312) must be located on the far left hand side and Terrestrial IP streamer must be the next module in the chain. Please look at the above picture.

Ensure the following prior to programming:

- It is necessary to connect all the modules to the support frame SP-226 (code 9120130) for the system to function.
- It is also recommended that you make the earth connection to the building using a cable with a section of at least 4 mm.
- Power supply/Control cable must be plugged into each module. **DO NOT ADD OR REMOVE** modules without disconnecting mains supply power from wall outlet. Always disconnect the equipment, and then reconnect it to the mains supply. Failure to do so can cause equipment to fail.

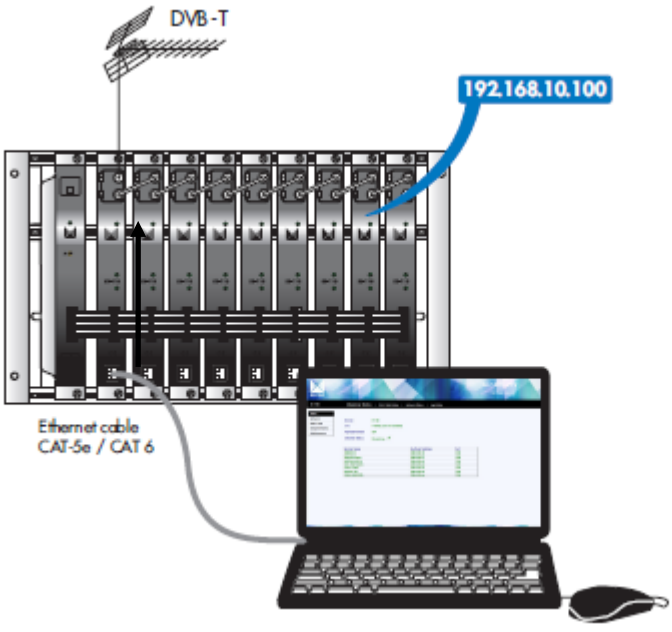
SPECIFICATIONS

Frequency range output of modulators	**46MHz --- 862MHz**
Operating temperature of Modulators	**- 10ºC --- +65ºC**
Output Level Adjustment	**15dB**
Input Level	**45 - 100dBµV**
Streaming Format	**Multicast UDP, RTP**
Supported Protocols	**IPv4 UDP, RTP, ARP, ICMP, HTTP, TELNET**

1.0 PROGRAMMING THE ST MODULE

Once the DVB-T to IP streaming equipment (ST-100/101) has been assembled, each ST module can be configured. All ST modules use a factory default *IP address:* ***192.168.10.100***.

In order to avoid conflicts with other IP addresses, it is necessary to perform an initial configuration in local mode. Subsequently, it will be possible to access the DVB-T to IP streaming equipment ST-100 via the local area network (LAN), either to re-programme it or to check is operating status.



The picture above shows local mode configuration accessing each streamer individually and assigning new IP addresses. This is strongly advised prior to LAN network connection.

The ST modules have a factory default TCP/IP configuration of:

IP address of the module: ***192.168.10.100***
Subnet mask: ***255.255.255.0***
Default Gateway: ***192.168.10.1***

To access each ST module, use a PC or MAC personal computer equipped with an Ethernet card and an RJ- 45 cable (CAT-5E or CAT-6).

The IP address of the PC/MAC must be configured within the following range: *192.168.10.2 – 192.168.10.254* (**do not use 192.168.10.100**, as this is the IP address of the module to be configured).

2.0 INTRODUCTION TO THE ALCAD IPTV WEB INTERFACE

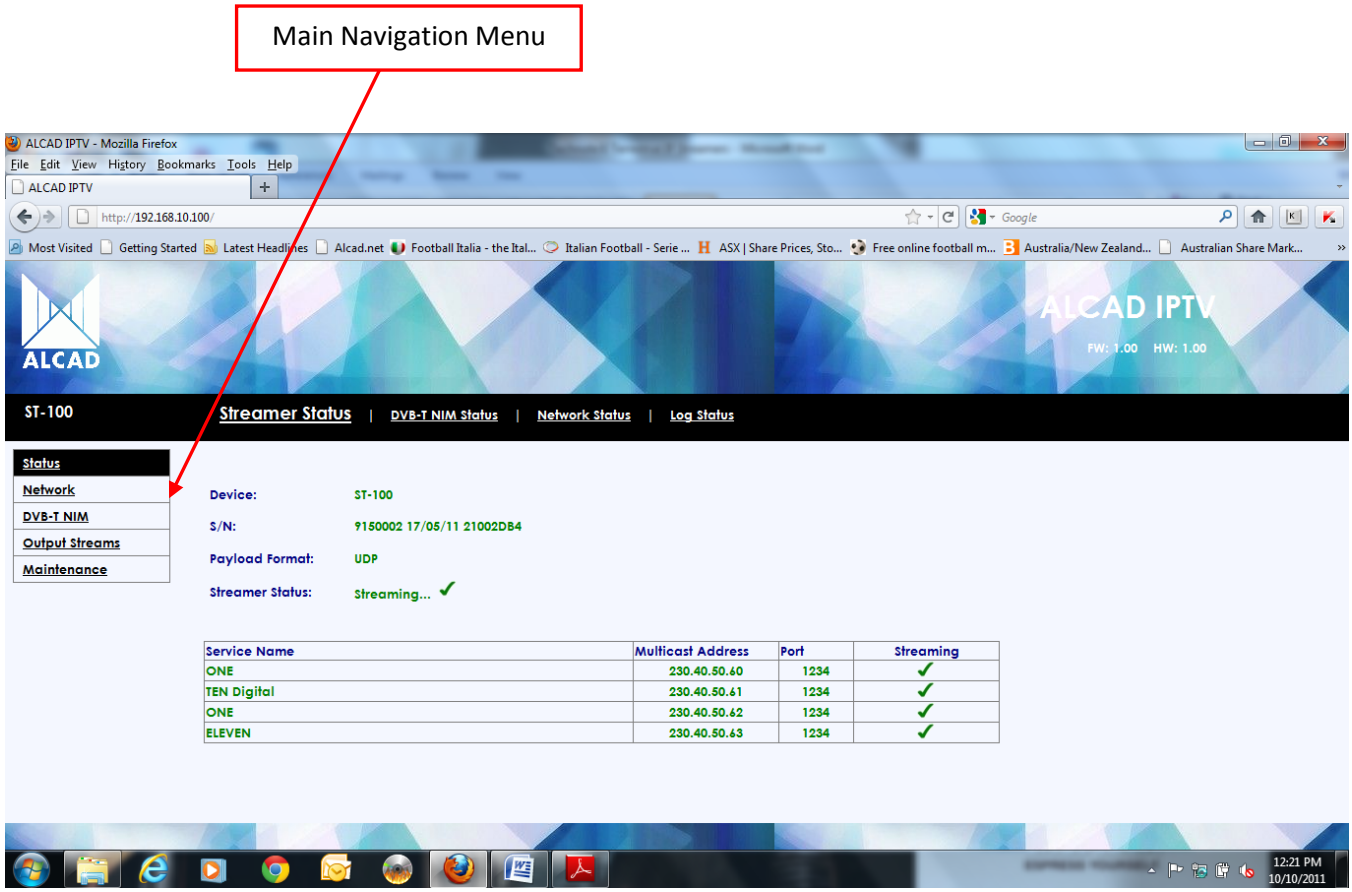
To start configuring the IP streamers, open the Internet Browser of your preference, and then type in the address of the streamer which by factory default is set to: http://192.168.10.100

The first page of the ALCAD IPTV graphical user interface will appear on the screen. Access to the site is protected by username and password. By factory default, the first time the module is accessed, the username and password is:

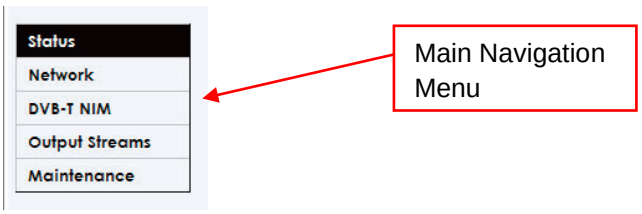
User name: ***alcad***
Password: ***alcad***

PLEASE NOTE: Web browser can be Internet Explorer, Mozilla, and Google Chrome

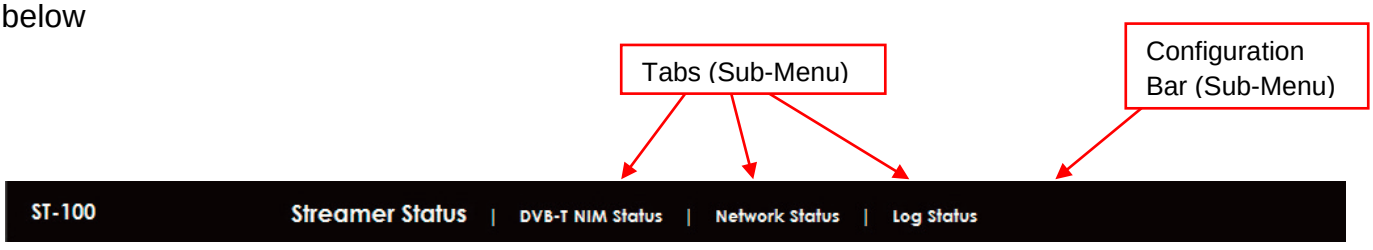
Once you have entered the username and passwords the ALCAD IPTV user interface will be displayed, which can be seen below.



This is the main navigation menu. Using it, you can switch between the 5 different configuration menus. The rectangle highlighted in black shows which main menu is active at a given moment.



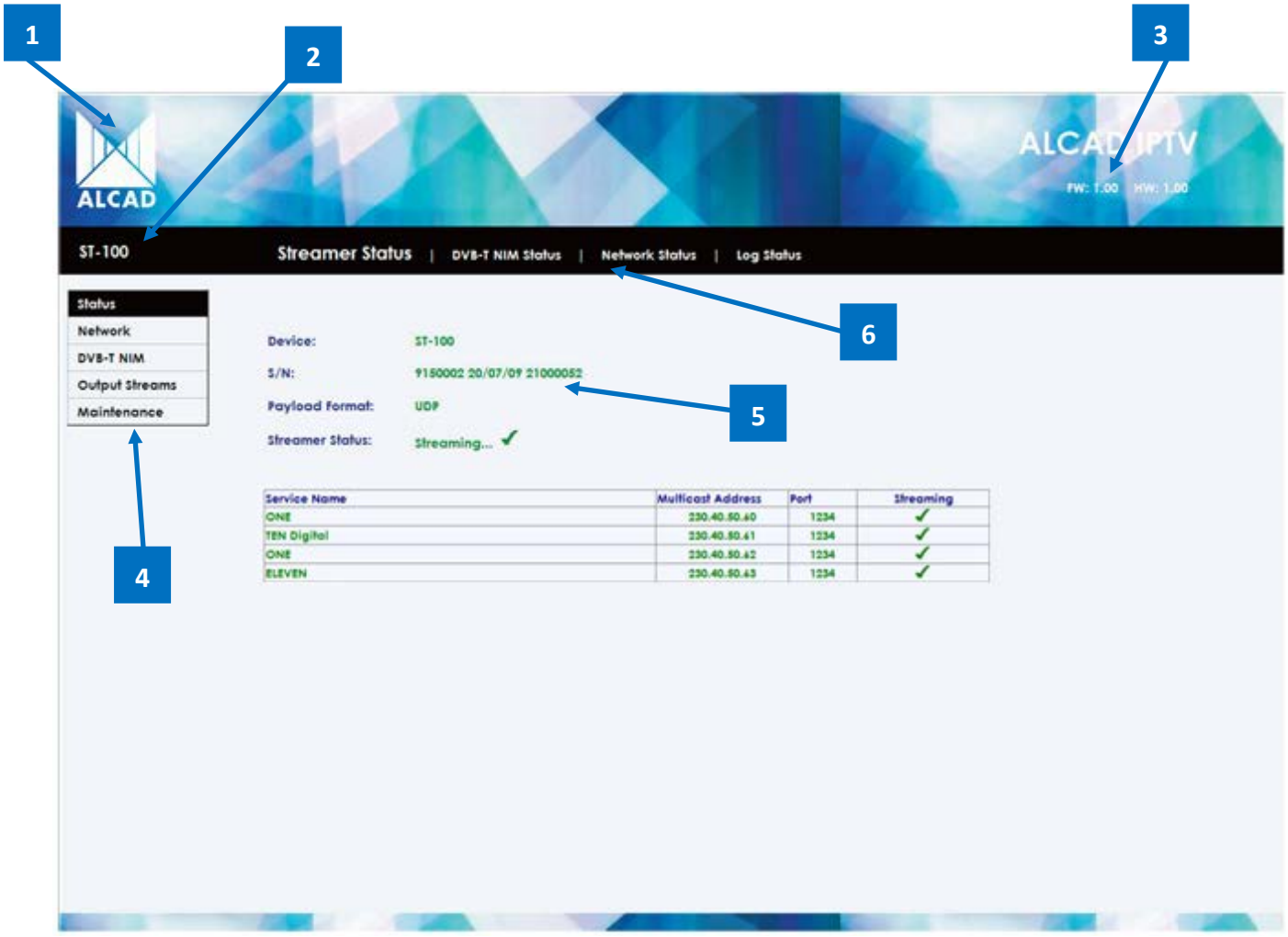
The 5 main navigation menus open several configuration screens (Sub-menus) which are selectable on the configuration bar. To switch between the different configurations screens of the main menu, click on the tabs of the black configuration bar at the top which can be seen below



DESCRIPTION OF THE ALCAD IPTV Graphical User Interface

The different parts of the ALCAD IPTV Graphical User Interface are shown below:

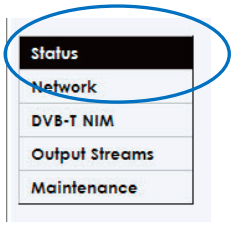
1 - Click on the ALCAD logo to go to our website: www.alcad.net
2 - ST series model
3 - Version of Firmware (FW) and Hardware (HW) of the module
4 - Main navigation menu
5 - Configuration area
6 - Configuration Bar with tabs



MAIN NAVIGATION MENU OF THE ALCAD IPTV Graphical User Interface

1.0 Status

This shows information concerning the status and configuration of each block of the ST module. It is a visual menu only and cannot be modified.



Streamer status

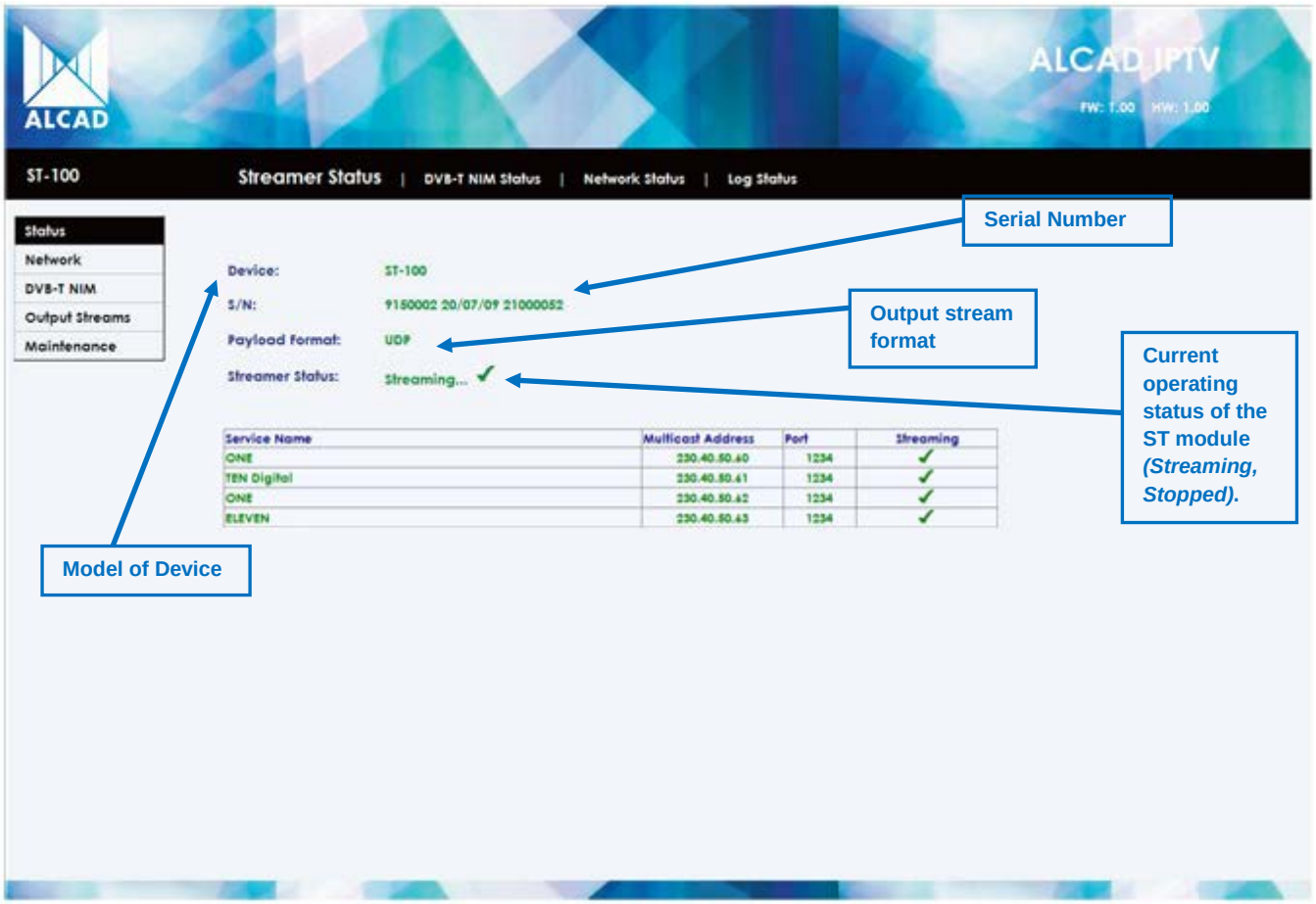
This shows the data of the ST module and a list of the multicast services selected.

Device: model of the ST module.

S/N: serial number of the ST module. *Code of the ST module, date of manufacture, and MAC address (only the last 8 digits)*.

Payload Format: data format of output streams *(UDP, RTP)*.

Streamer Status: Displays streaming status of the ST module *(Streaming, Stopped)*.



DVB-T NIM Status

From the Configuration bar the next sub-menu tab is "*DVB-T NIM Status*"

DVB-T NIM Status

Displays the programmed data of the input tuner of the ST module at a point in time. To see the BER values at a given instant, press the Refresh button on your web browser.

Signal Status: Input signal hook-up indicator.

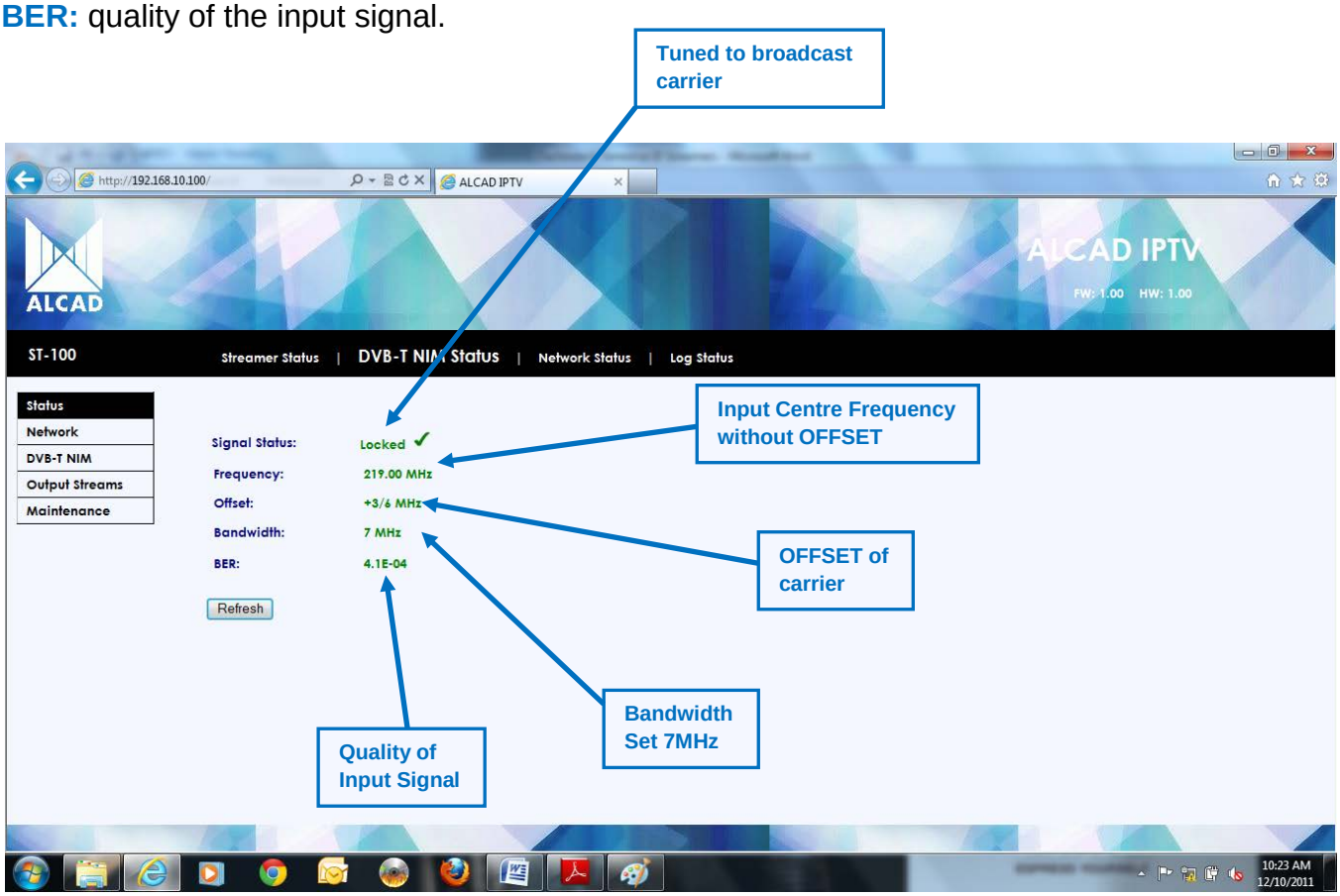
Channel or Frequency: Input channels (C5–69) or input frequency.

Standard: Standard of the country BG, D/K, I. **Australia Select BG ONLY**

Offset: Offset of the input signal (Auto, -3/6 – +3/6 MHz).

Bandwidth: Bandwidth of the channel (6, 7 or 8 MHz). **Australia Select 7MHz ONLY**

BER: quality of the input signal.



Network status
From the Configuration bar the next sub-menu tab is "*Network Status*"

Network Status

Displays the network data programmed on the streamer.

Link: correct connection with the network.

Link Speed: bit speed and Ethernet output.

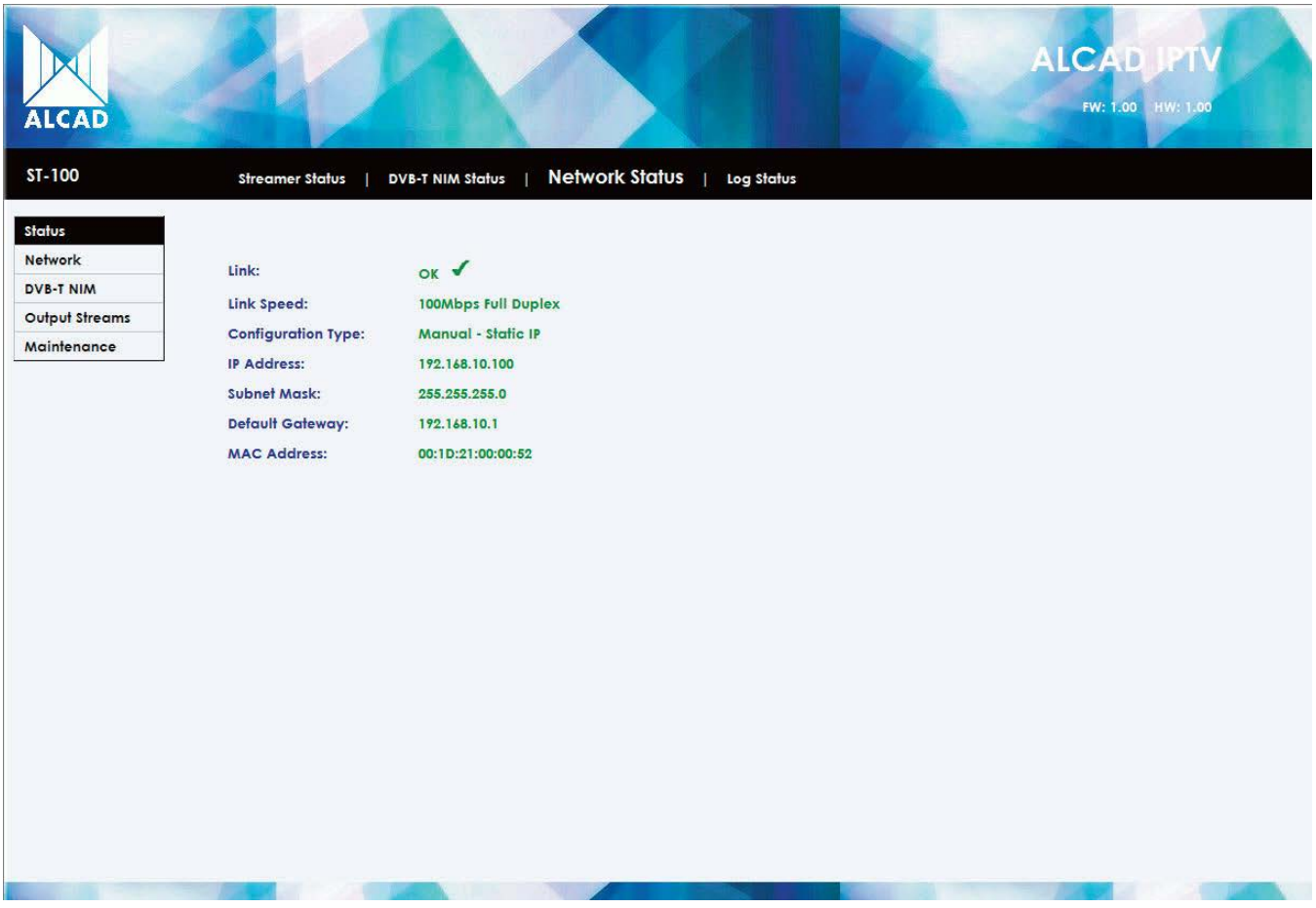
Configuration Type: fixed or random IP *(Static IP, Automatic DHCP)*.

IP address: IP address of the ST module *(Factory-set IP: 192.168.10.100)*.

Subnet mask: subnet mask

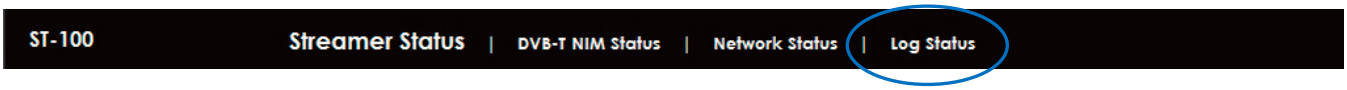
Default Gateway: gateway for access to Internet, predetermined as 192.168.10.1

MAC address: identifying address of each ST module *(00:1D:21:XX:XX:XX)*.



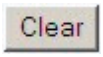
Log status

From the Configuration bar the next sub-menu tab is Log *Status*"

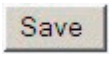


Log Status

Displays a log of timed events that have occurred within the module. Each event that has occurred in the ST module has a date and time. If events are marked with an asterisk (*), it indicates that at the moment at which the event occurred, the date and time displayed were not synchronised. The list shows the last 10 events to have occurred.

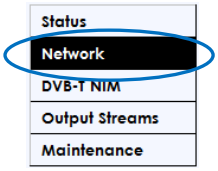
To empty the list of messages, click 

The time synchronization of ST-module comes from incoming broadcast carrier.

Logged events can be saved onto a local file, click 

2.0 Network

From the “Main Navigation Menu” network settings can be configured from Network tab



The network configuration can either have a fixed IP address (Static IP) or have one which is automatically assigned by a DHCP server (Automatic DHCP).

Configuration Type: Static IP, Automatic DHCP

IP address: IP address of the ST module (factory-set value of 192.168.10.100).
The range of configurable IP addresses is: 192.168.0.2 – 192.168.255.254

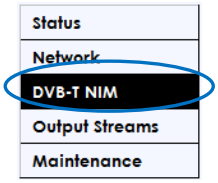
Subnet mask: factory-set value of 255.255.255.0
Configuration range: 0.0.0.0 – 255.255.255.0

Default Gateway: gateway for access to Internet (factory-set value of 192.168.10.1)
The range of configurable IP addresses is: 192.168.0.1 – 192.168.255.254

To save any changes made to Network settings click 

DVB-T NIM

From the “Main Navigation Menu” changes to the input carrier frequencies are made from the DVB-T NIM tab.



DVB-T NIM

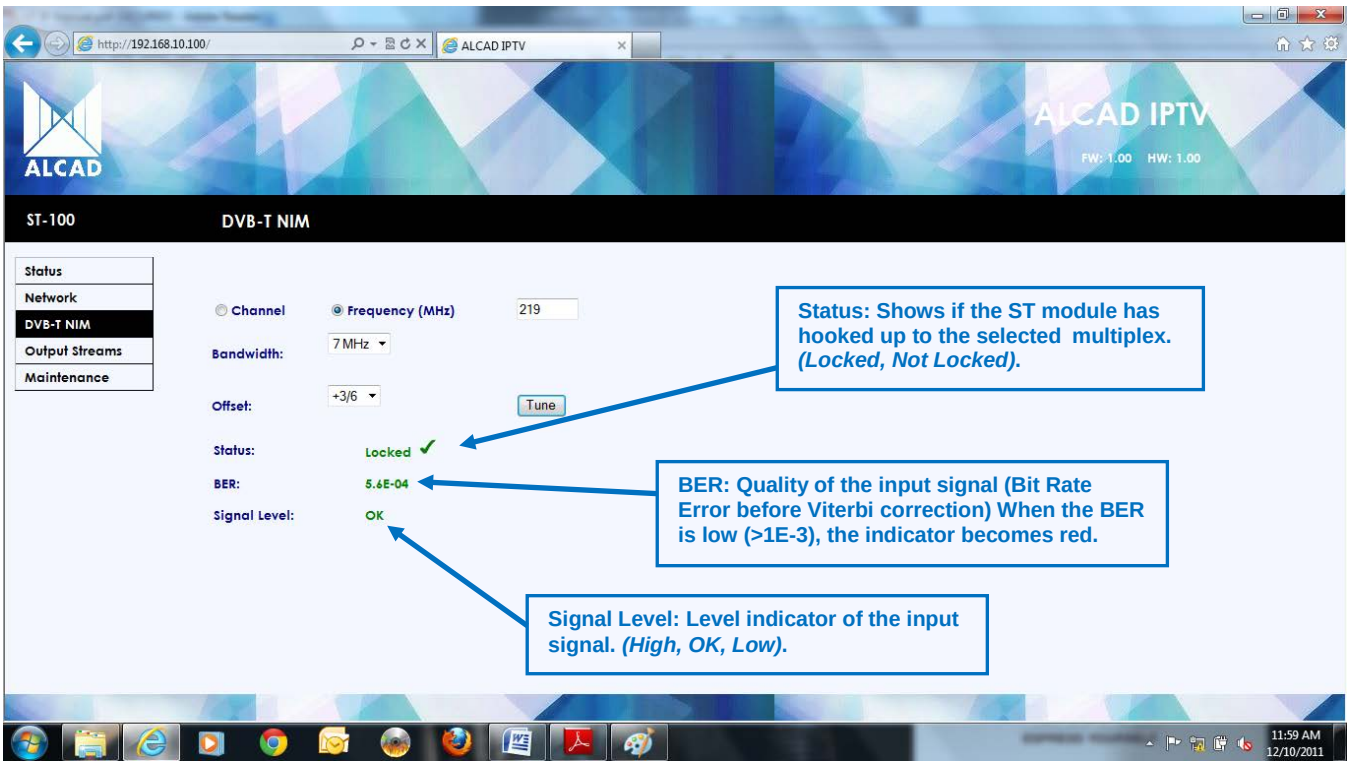
Displays parameters of the input multiplex and status, levels and quality of the input signal. The data must be entered in compliance with the broadcasting configuration of the transmitter at which the antenna is receiving the signal from.

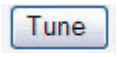
Channel: Used to select the tuning mode of the input signal by choosing the channel.

Frequency: Used to select the tuning mode of the input signal by entering the frequency (central frequency of the multiplex). *The range of frequencies to be programmed is: 174-230 / 470-862 MHz.*

Bandwidth: Selection of the bandwidth of the multiplex. *The configuration range is: 6, 7 or 8 MHz.*

Offset: Configuration of the offset of the input multiplex. *Configuration values: Auto, -3/6, 2/6, 1/6, 0, 1/6, 2/6, 3/6 MHz*



To save the input parameters you have entered, click on the *Tune*  button.

Output Stream

From the “Main Navigation Menu” selections can be made to the TV/radio services that are to be broadcast on the TCP/IP network, and are made from the Output Streams tab.

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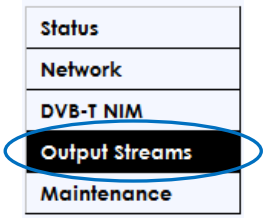
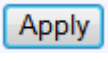


Service selection

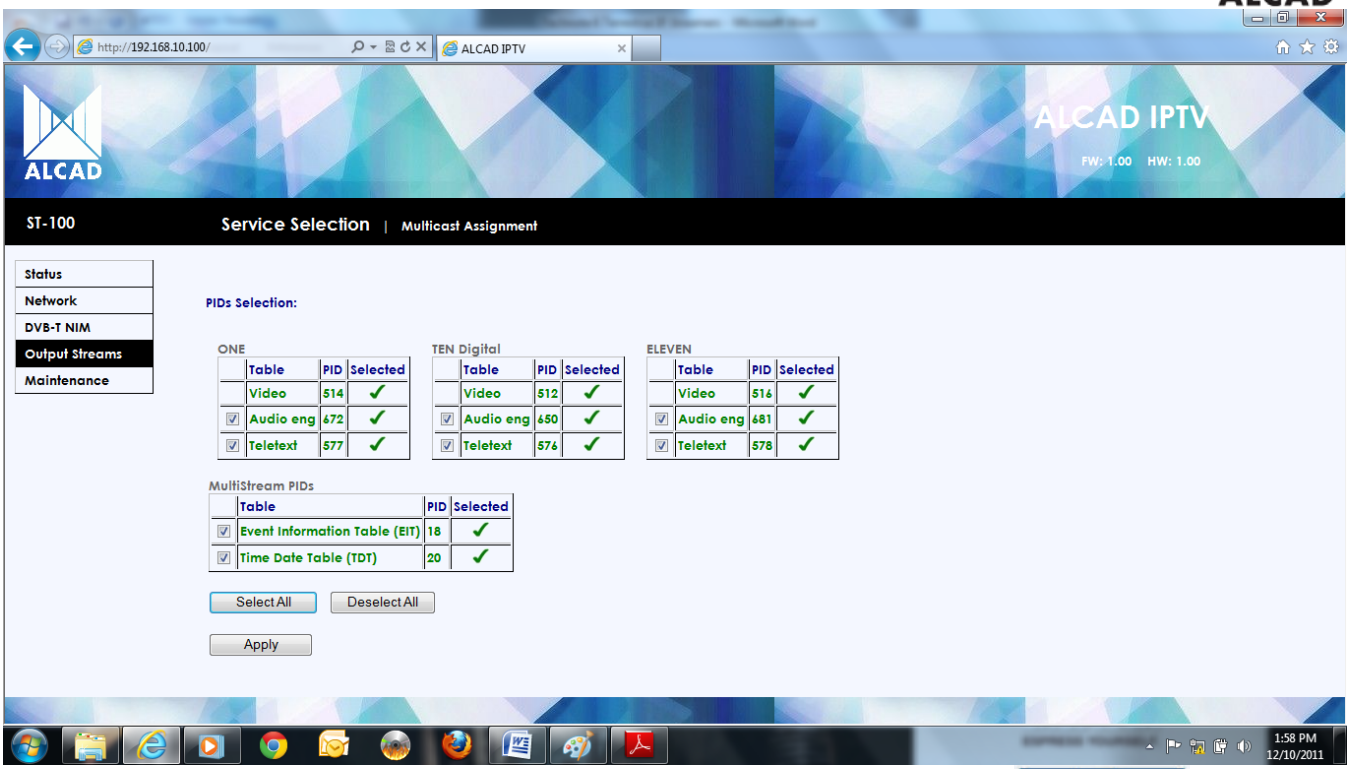
From the list of services (acquired from the previously-tuned TDT multiplex) that appears in the screen, a maximum of 8 services can be selected.

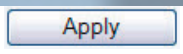
To select the services you wish to broadcast over the TCP/IP network the checkbox must be ticked in the service list table. Once the selections have been made, click  button.

For advanced users options related to the services to be broadcast. To open this menu, click on the Select PIDs button. Within this menu it is possible to select the PIDs to be broadcast for each service (the video PID cannot be disabled). It is also possible to select or deselect all the PIDs simultaneously by clicking on the Select All or Deselect All buttons.

By default, all the PIDs are selected and remain so until this configuration is altered.

PIDs Selection: enables you to select the PIDs associated with each service *(audio, teletext, subtitles)*.



After you have made your selection, confirm it by clicking on the *Apply*  button.

Multicast Assignment

This is used to configure the multicast addresses for the services to be broadcast.

Multicast Base Address/Port: used to assign IP addresses and ports to each TV/radio channel automatically. *The configuration range is: 224.0.0.1 – 239.255.255.255 Port 0 – 65535*

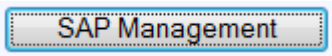
QoS (Diff Serv): assigns 4 possible levels of priority on the network stream (factory-set value:
AF33 - Highest Priority).
AF33 - Highest Priority
AF32
AF31
CS3 - Lowest Priority
Bear in mind that the switches of the network must be configured with the same priority.

Stream Payload Format: data format of the output streams *(UDP or RTP)*.
TTL: time to live of the packet measured in the number of networks crossed *(1 – 255)*.
Streamer Status: Indicator of operation of the module *(Streaming or Stopped)*.

You can now access all the configuration screens. As you will see, each screen contains a number of different fields in which to enter and validate the configuration data for each module. The following sections of this manual explain in detail how to program each screen.

To confirm the configuration, click on the *Apply & Start* button.

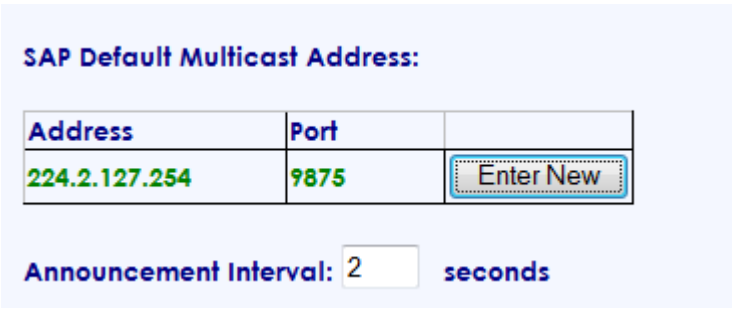
SAP MANAGEMENT

Within the Multicast Assignment menu, advanced configuration options are available. These allow you to select the Service Announcement Protocol (SAP) data to be sent and the IP address they are to be sent to. To enable SAP Management click 

SAP Default Multicast Address: sends the list of selected TV/radio services to the assigned address (224.2.127.254: 9875 is the default address of the IP receivers). This IP address can be configured by the user: to do this, click on the Enter New button, and enter the desired IP address and port in the appropriate fields.

Announcement Interval: length of time between SAP announcements (by default, 2 seconds)

SAP Service: List of services to be sent

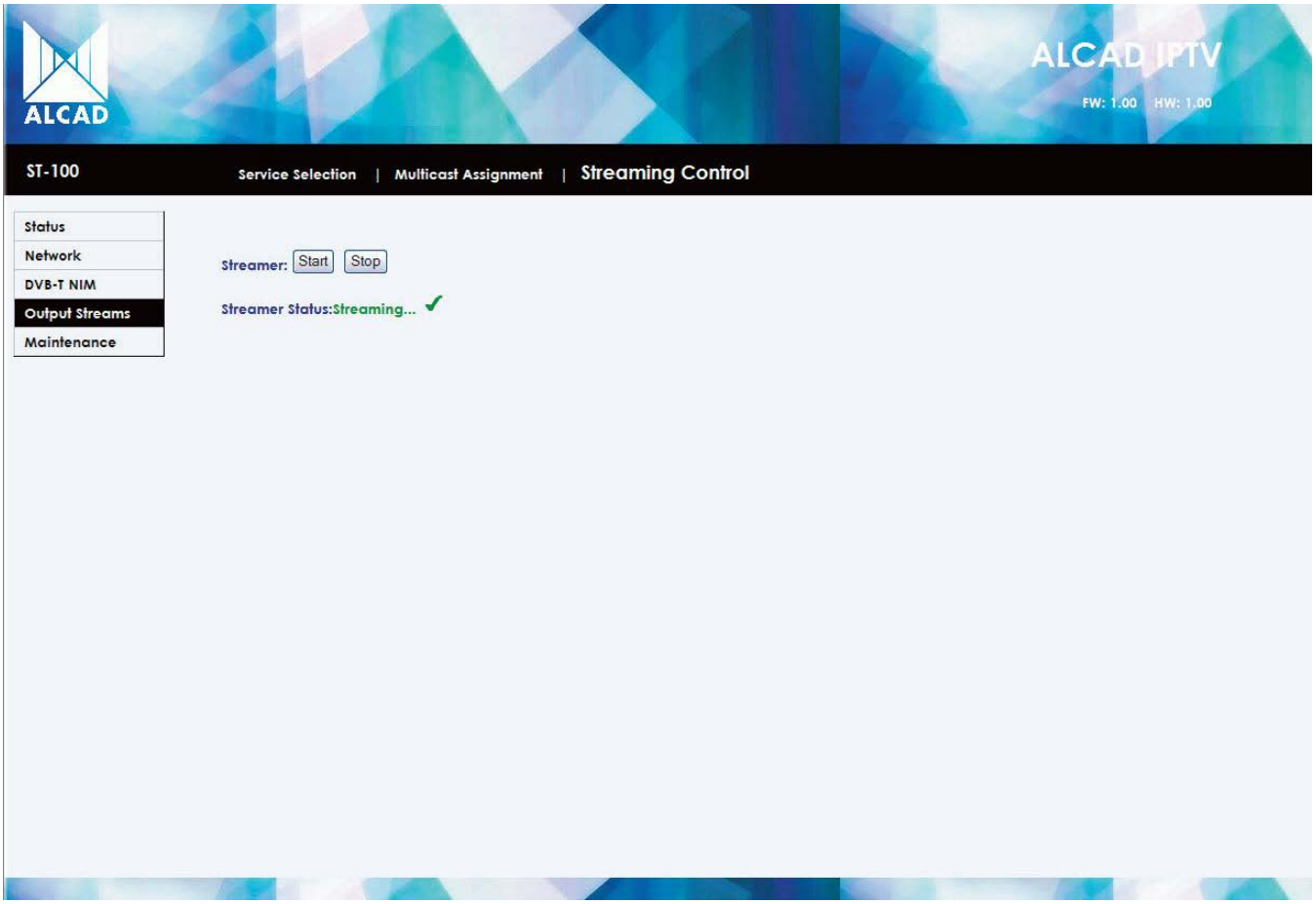


To save the changes, click on the *Apply* button.

This is used to control the status of the ST module. There are two possible states: streaming, i.e. sending a stream of data; or stopped, i.e. sending no data through the RJ-45 output.

Streamer: Start or stop the ST module by clicking on either Start or Stop.

Streamer Status: shows whether the ST module is functioning or not *(Streaming, Stopped)*.



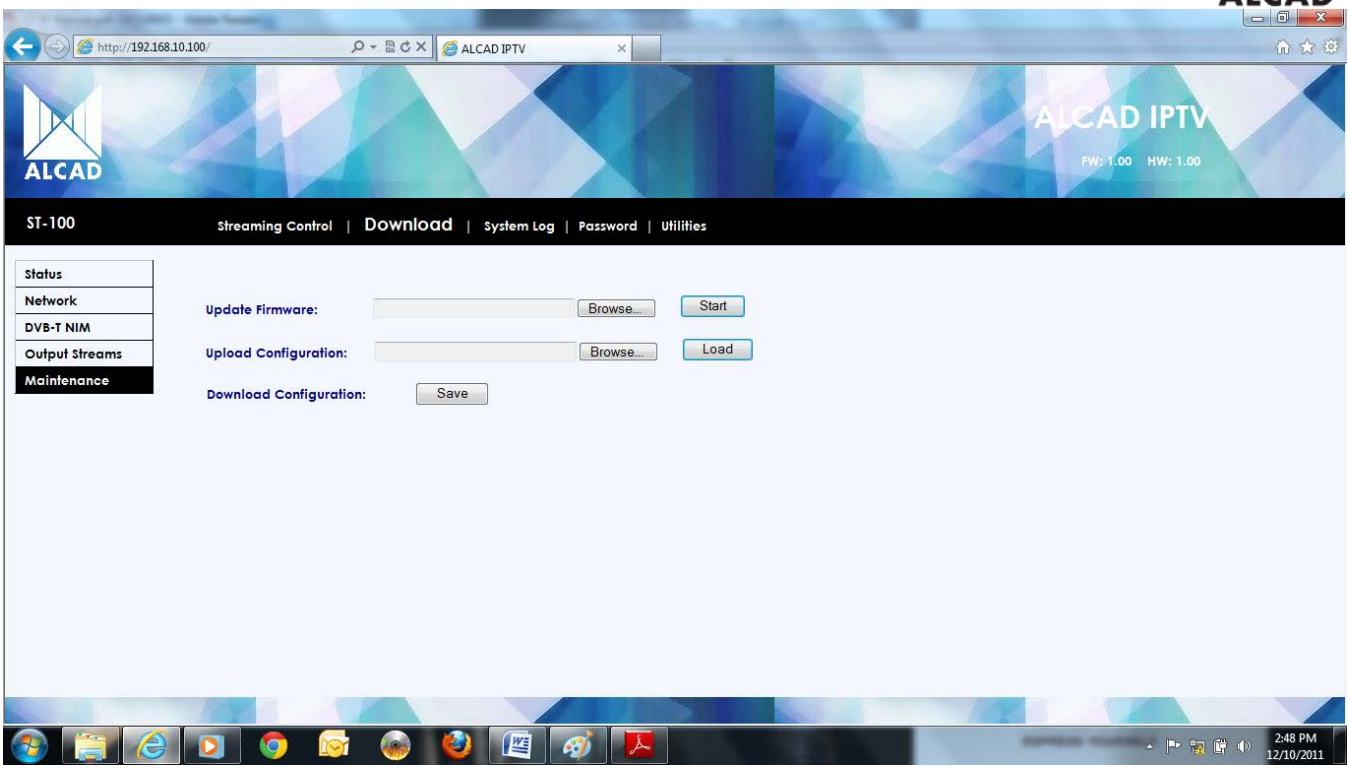
Maintenance
Maintenance and adjustment of the ST module.

Download
This is used for both the update of the firmware of the ST module and for remote configuration; and even for making backups of the configurations.

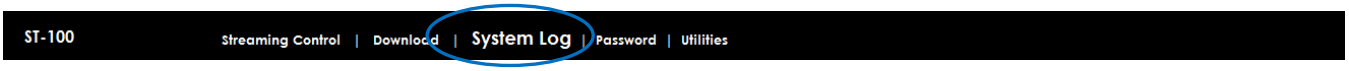
Update Firmware: updates the firmware of the ST module. *The extension used is: *.axf*

Upload Configuration: Enables you to automatically upload the configuration parameters of ST module after they have been saved. *The extension used is: *.scn*

Download Configuration: saves the configuration of the ST module in a file. *The extension used is: *scn*



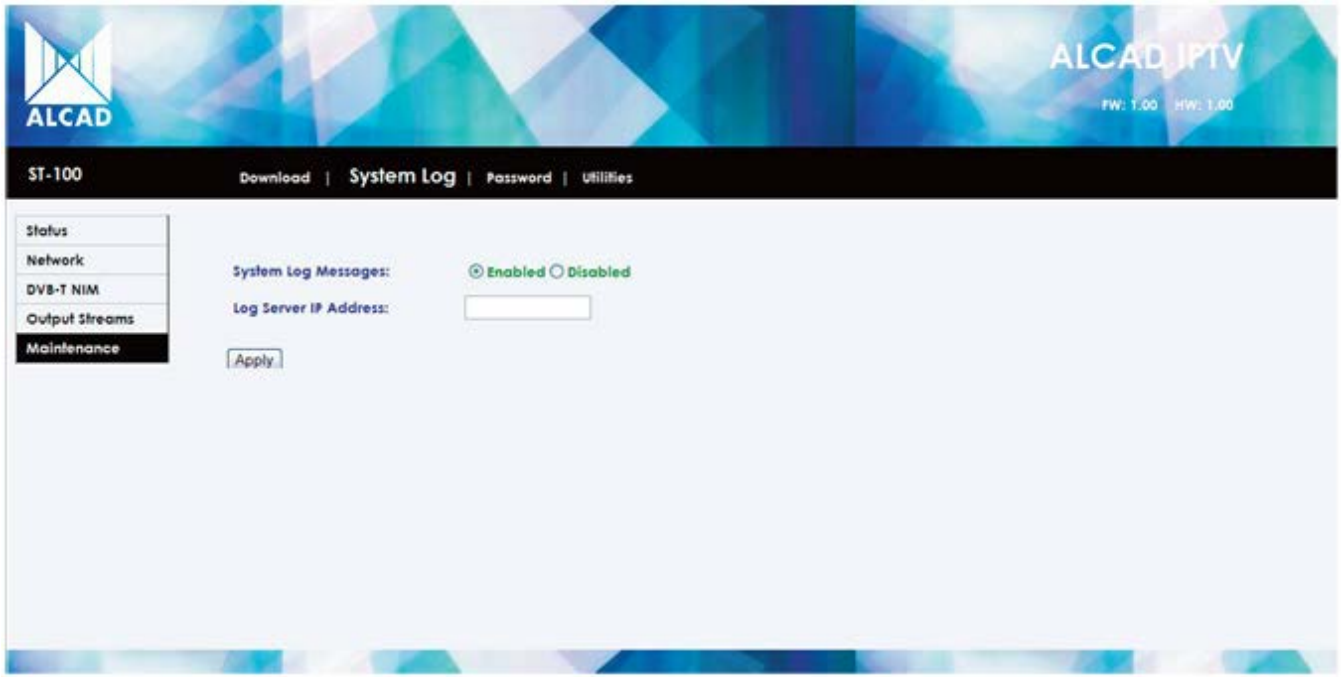
System Log



This sends incident messages generated in the ST module to a syslog server on the network.

System Log Messages: enables or disables the error-forwarding feature *Enabled, Disabled*.

Log Server IP Address: IP address of the syslog server to which data concerning incidents will be sent. *The range of possible addresses is 192.168.0.2 – 192.168.255.254*.



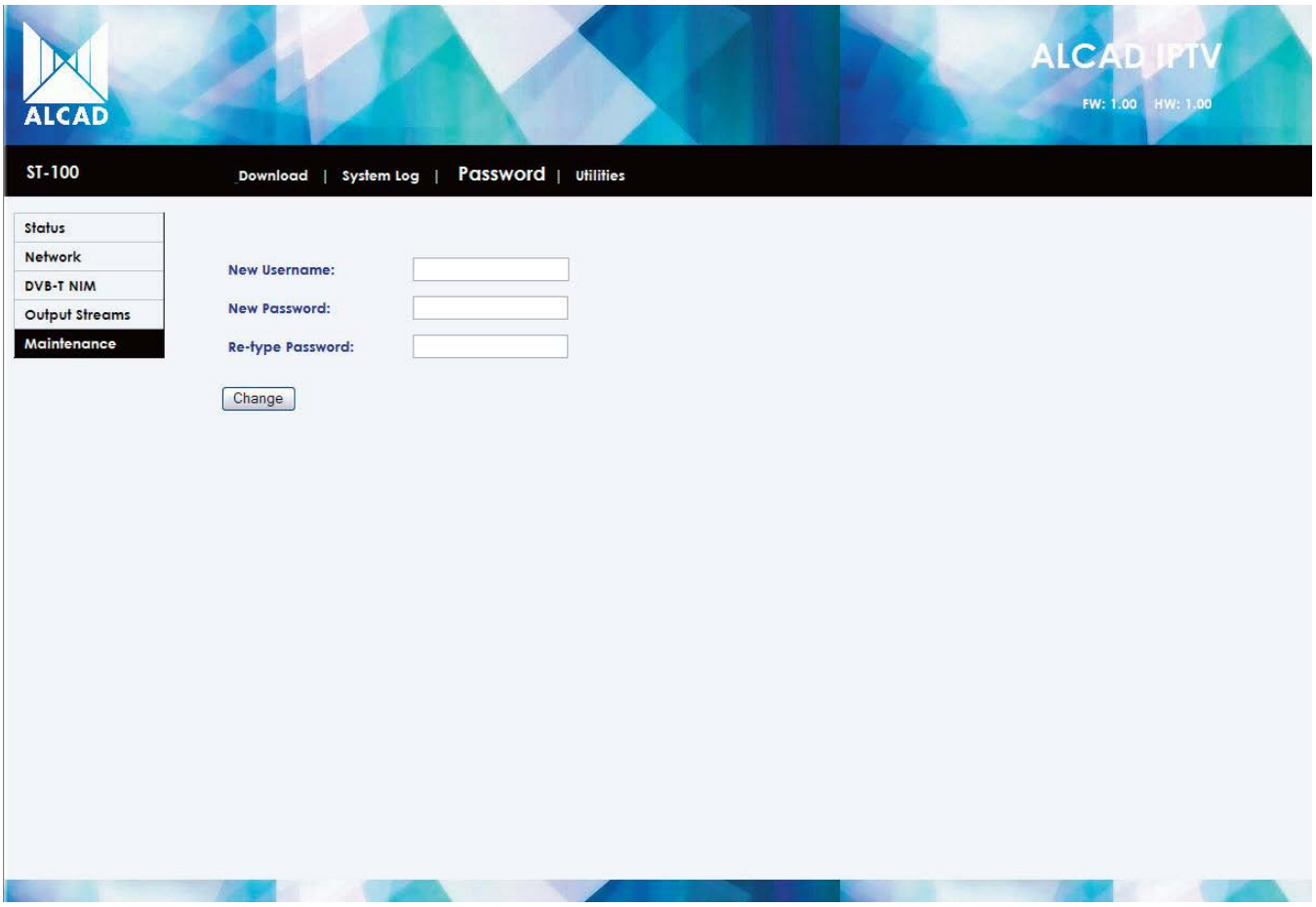
Password

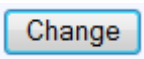
This menu item allows you to change the username and password.

New Username: enter the new username in this field.

New Password: enter the new password in this field.

Re-type Password: confirm the new password by re-typing it in this field.



Please press  **button for username and password changes to take effect.**

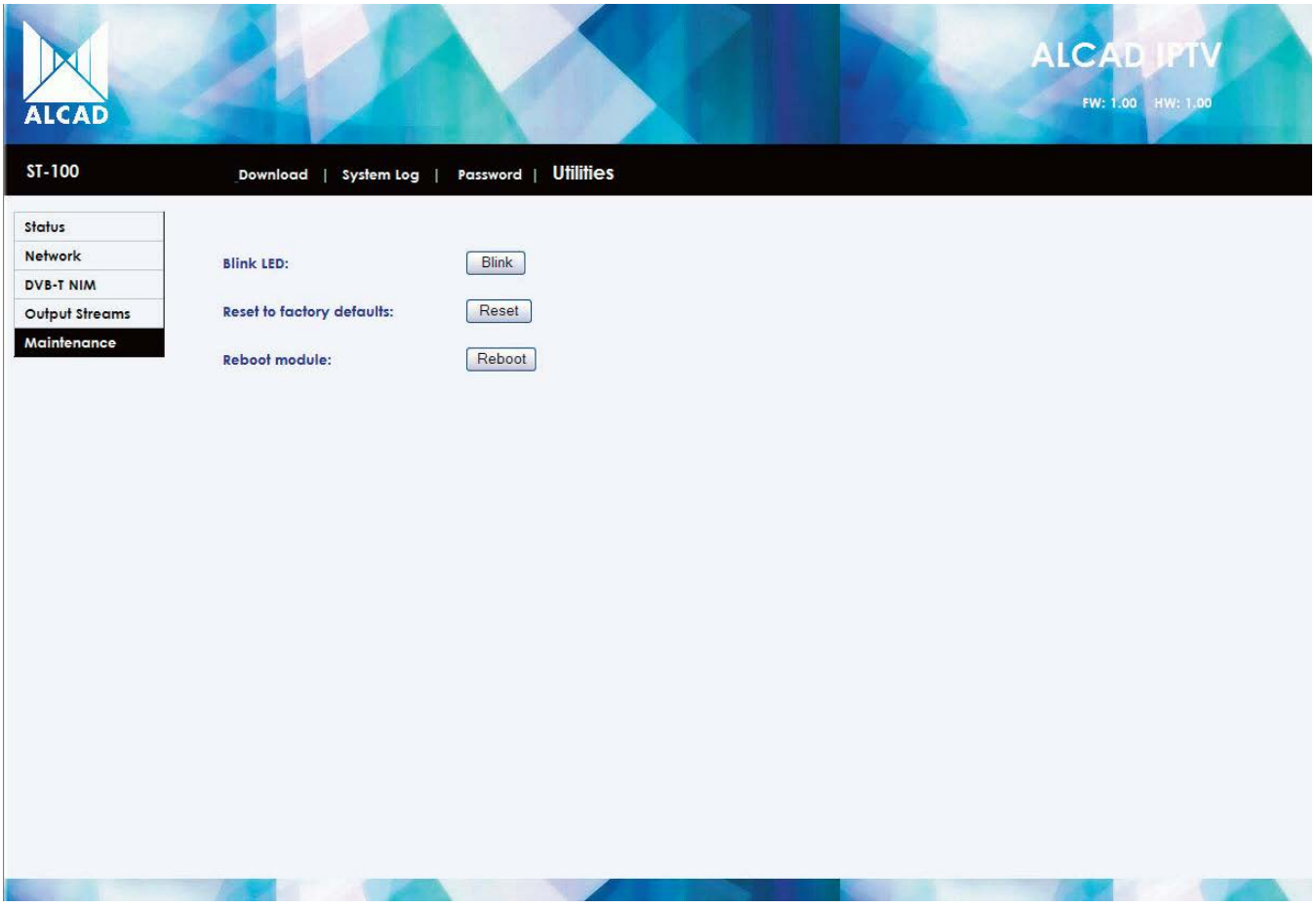
Utilities

Utilities for the ST module.

Blink LED: Clicking on the Blink button will cause the TSP indicator of the ST module to flash for several seconds. This option can be used to physically identify, on the headend, the module which is being programmed.

Reset to factory defaults: Clicking on the Reset button resets the configuration of the ST module to the factory default values.

Reboot module: Clicking on the Reboot button causes the ST module to restart.



AUSTRALIAN DIGITAL/ANALOGUE FREQUENCY TABLE

Band	Channel	Aust. Ch.	Picture carrier MHz	Digital Freq. MHz	Sound carrier MHz
I		0	46.25		51.75
		1	57.25		62.75
		2	64.25		69.75
Low S-Band (SI)	S2		112.25		117.75
	S3		119.25		124.75
	S4		126.25		131.75
	S5		133.25		138.75
	S6		140.25		145.75
	S7		147.25		152.75
	S8		154.25		159.75
	S9		161.25		166.75
	S10		168.25		173.75
III		6	175.25	177.5	180.75
		7	182.25	184.5	187.75
		8	189.25	191.5	194.75
		9	196.25	198.5	201.75
		9a	197.25	205.5	202.75
		10	209.25	212.5	214.75
		11	216.25	219.5	221.75
		12	223.25	226.5	228.75
High S-Band (SI-1)	S11		231.25		236.75
	S12		238.25		243.75
	S13		245.25		250.75
	S14		252.25		257.75
	S15		259.25		264.75
	S16		266.25		271.75
	S17		273.25		278.75
	S18		280.25		285.75
	S19		287.25		292.75
	S20		294.25		299.75
Hyperband (SII)	S21		303.25		308.75
	S22		310.25		315.75
	S23		317.25		322.75
	S24		324.25		329.75
	S25		331.25		336.75
	S26		338.25		343.75
	S27		345.25		350.75
	S28		352.25		357.75
	S29		359.25		364.75
	S30		366.25		371.75
	S31		373.25		378.75
	S32		380.25		385.75
	S33		387.25		392.75
	S34		394.25		399.75
	S35		401.25		406.75
	S36		408.25		413.75
	S37		415.25		420.75
	S38		422.25		427.75
	S39		429.25		434.75
	S40		436.25		441.75
	S41		443.25		448.75

Band	Channel	Aust. Ch.	Picture carrier MHz	Digital Freq. MHz	Sound carrier MHz
UHF	E 21		471.25		476.75
	E 22		479.25		484.75
	E 23		487.25		492.75
	E 24		495.25		500.75
	E 25		503.25		508.75
	E 26		511.25		516.75
	E 27		519.25		524.75
		28	527.25	529.5	532.75
		29	534.25	536.5	539.75
		30	541.25	543.5	546.75
		31	548.25	550.5	553.75
		32	555.25	557.5	560.75
		33	562.25	564.5	567.75
		34	569.25	571.5	574.75
		35	576.25	578.5	581.75
		36	583.25	585.5	588.75
		37	590.25	592.5	595.75
		38	597.25	599.5	602.75
		39	604.25	606.5	609.75
		40	611.25	613.5	616.75
		41	618.25	620.5	623.75
		42	625.25	627.5	630.75
		43	632.25	634.5	637.75
		44	639.25	641.5	644.75
		45	646.25	648.5	651.75
		46	653.25	655.5	658.75
		47	660.25	662.5	665.75
		48	667.25	669.5	672.75
		49	674.25	676.5	679.75
		50	681.25	683.5	686.75
		51	688.25	690.5	693.75
		52	695.25	697.5	700.75
		53	702.25	704.5	707.75
		54	709.25	711.5	714.75
		55	716.25	718.5	721.75
		56	723.25	725.5	728.75
		57	730.25	732.5	735.75
		58	737.25	739.5	742.75
		59	744.25	746.5	749.75
		60	751.25	753.5	756.75
		61	758.25	760.5	763.75
		62	765.25	767.5	770.75
		63	772.25	774.5	777.75
		64	779.25	781.5	784.75
		65	786.25	788.5	791.75
		66	793.25	795.5	798.75
		67	800.25	802.5	805.75
		68	807.25	809.5	812.75
		69	814.25	816.5	819.75

ACRONYMS

ARP- Address Resolution Protocol is a telecommunications protocol used for resolution of network layer addresses into link layer addresses, a critical function in multiple-access networks. ARP has been implemented in many combinations of network and overlaying internetwork technologies, such as IPv4

HTTP - Hypertext Transfer Protocol is a networking protocol for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web HTTP functions as a request-response protocol in the client-server computing model. In HTTP, a web browser, for example, acts as a *client*, while an application running on a computer hosting a web site functions as a *server*. The client submits an HTTP *request* message to the server. The server, which stores content, or provides *resources*, such as HTML files, or performs other functions on behalf of the client, returns a response message to the client. A response contains completion status information about the request and may contain any content requested by the client in its message body. A web browser (or client) is often referred to as a *user agent* (UA). Other user agents can include the indexing software used by search providers, known as web crawlers, or variations of the web browser such as voice browsers, which present an interactive voice user interface. The HTTP protocol is designed to permit intermediate network elements to improve or enable communications between clients and servers.

IP Address - **Internet Protocol address** is a numerical label assigned to each device (e.g., computer, printer) participating in a computer network that uses the Internet Protocol for communication.[An IP address serves two principal functions: host or network interface identification and location addressing.

ICMP - Internet Control Message Protocol is one of the core protocols of the Internet Protocol Suite. It is chiefly used by the operating systems of networked computers to send error messages indicating, for example, that a requested service is not available or that a host or router could not be reached. ICMP can also be used to relay query messages. ICMP differs from transport protocols such as TCP and UDP in that it is not typically used to exchange data between systems, nor is it regularly employed by end-user network applications (with the exception of some diagnostic tools like ping and traceroute).

IPv4 - Internet Protocol version 4 is a connectionless protocol for use on packet-switched Link Layer networks (e.g., Ethernet). It operates on a best effort delivery model; in that it does not guarantee delivery, nor does it assure proper sequencing or avoidance of duplicate delivery. These aspects, including data integrity, are addressed by an upper layer transport protocol, such as the Transmission Control Protocol (TCP)

UDP - **User Datagram Protocol** uses a simple transmission model without implicit handshaking dialogues for providing reliability, ordering, or data integrity. UDP assumes that error checking and correction is either not necessary or performed in the application, avoiding the overhead of such processing at the network interface level. Time-sensitive applications often use UDP because dropping packets is preferable to waiting for delayed packets, which may not be an option in a real-time system.

Real-time Transport Protocol (**RTP**) defines a standardized packet format for delivering audio and video over IP networks. RTP is used extensively in communication and entertainment systems that involve streaming media, such as telephony, video teleconference applications and web-based push-to-talk features. RTP is used in conjunction with the RTP Control Protocol (RTCP). While RTP carries the media streams (e.g., audio and video), RTCP is used to monitor transmission statistics and '*quality of service'* (QoS) and aids synchronization of multiple streams. When both protocols are used in conjunction, RTP is originated and received on even port numbers and the associated RTCP communication uses the next higher odd port number.

SAP - Session Announcement Protocol is a protocol for broadcasting multicast session information. A SAP listening application can listen to the SAP multicast IP address and construct a guide of all advertised multicast sessions. SAP typically uses Session Description Protocol (SDP) as the format of the session descriptions, and the multicast sessions typically stream data using User Datagram Protocol (UDP) or Real-time Transport Protocol (RTP).