
Asynchronous Transfer Mode ATM Protocol Analysis and Emulation

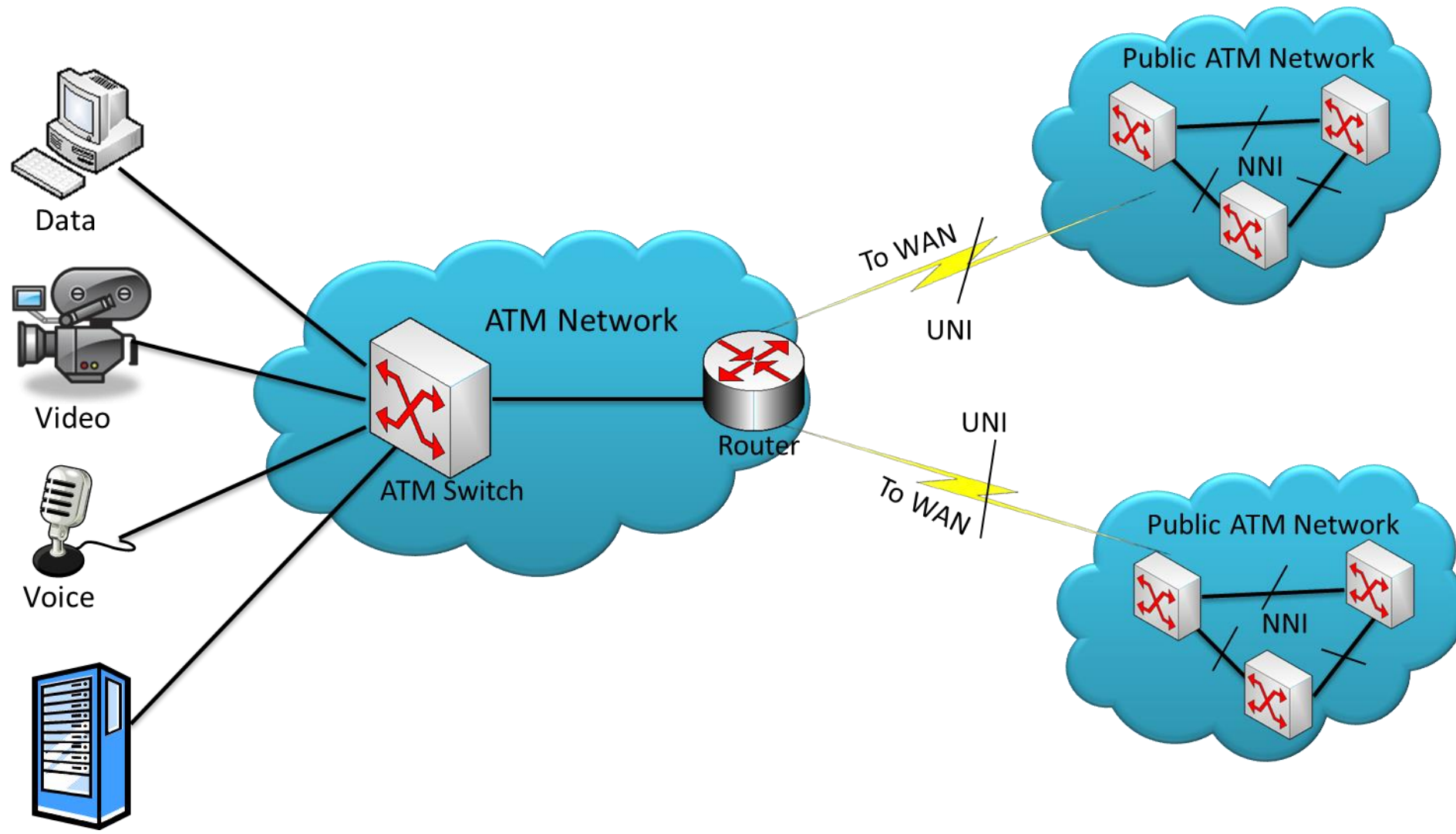


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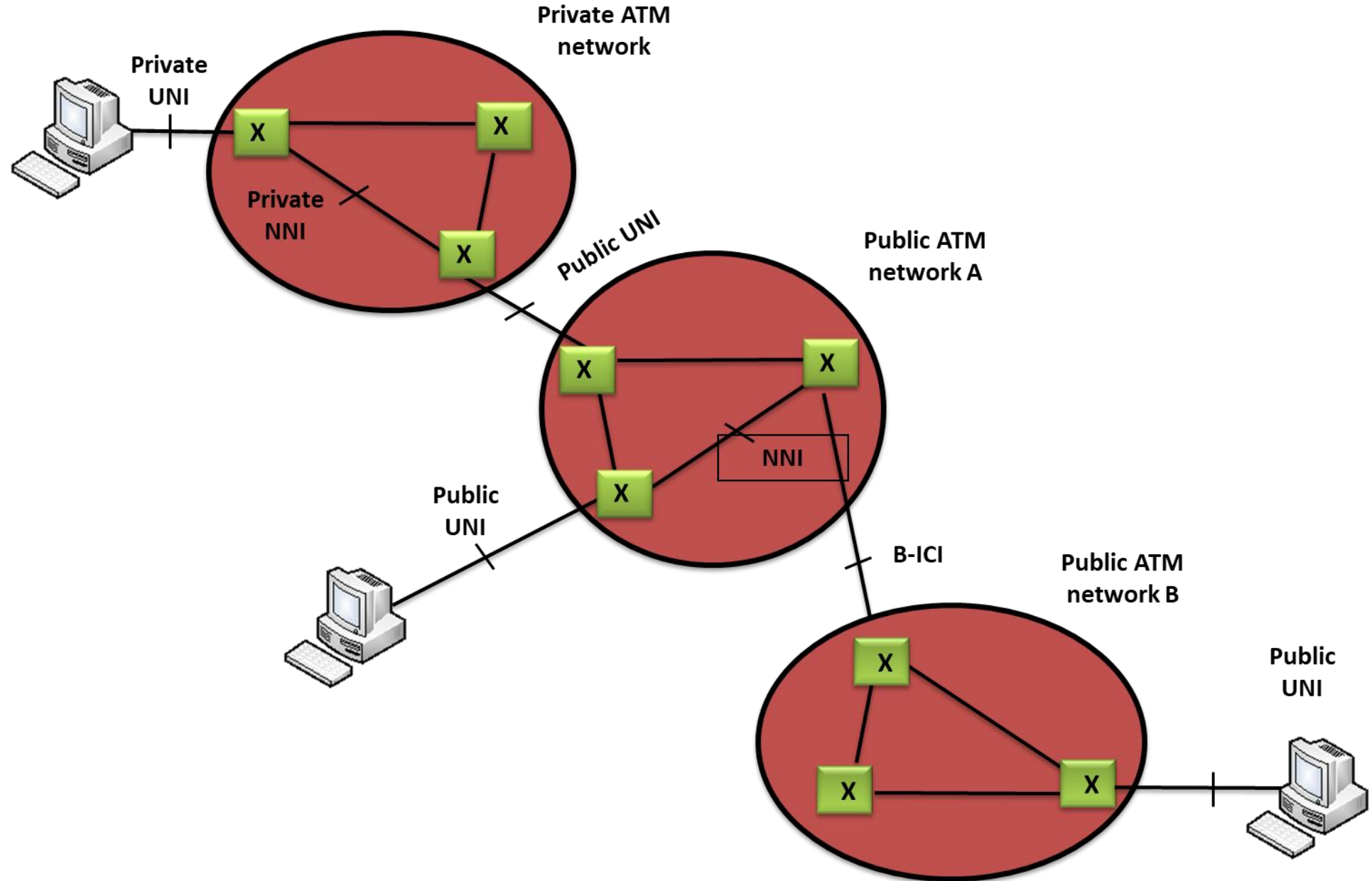
What is ATM ?

- Asynchronous Transfer Mode (ATM) is a switching and multiplexing technology
- Flexible network that carries voice, video, and data, quickly and efficiently
- Circuit switch and Packet switch network
- Protocol standards are developed by ITU; Consists of 3 layers – ATM Adaptation Layer (AAL), ATM layer, and Physical layer
- 2 levels – Transport and Switching; carries all traffic on a stream of fixed-size ATM cells
- ATM is a core protocol used in SONET / SDH backbone of the PSTN
- Support for multimedia traffic, efficient bandwidth management for burst traffic and for LAN/WAN architecture and high performance via hardware switching

ATM Network Model

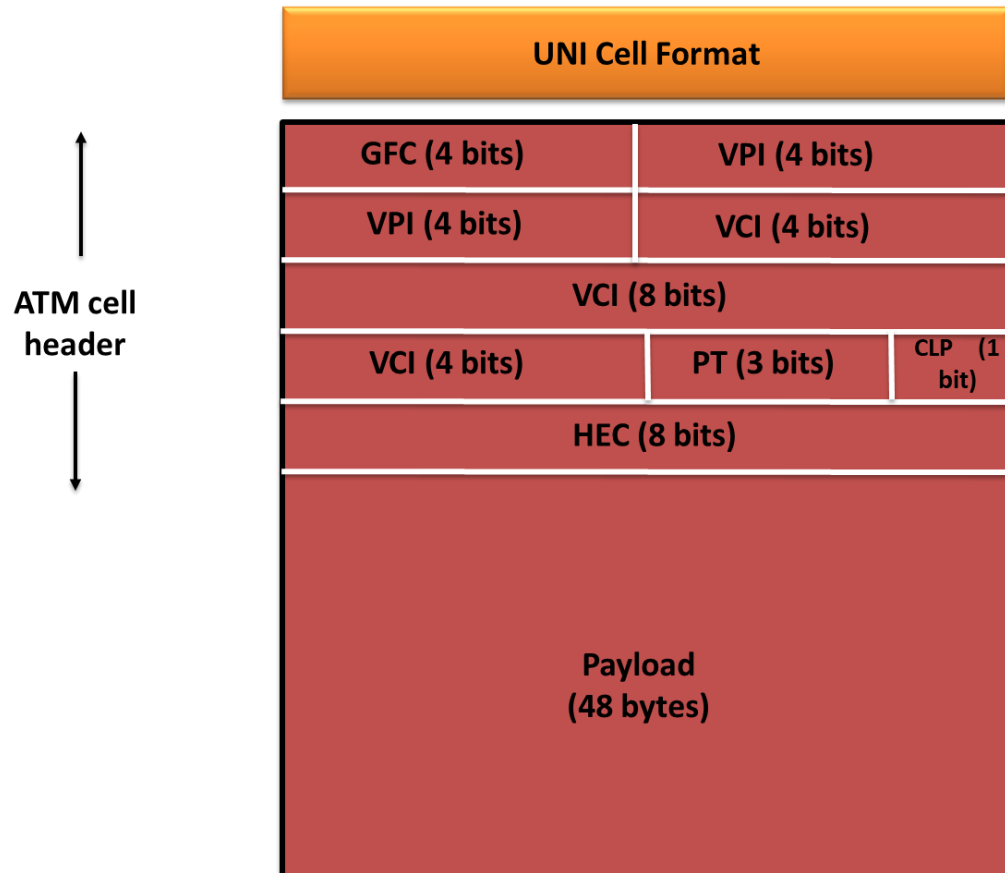


ATM Network Interface

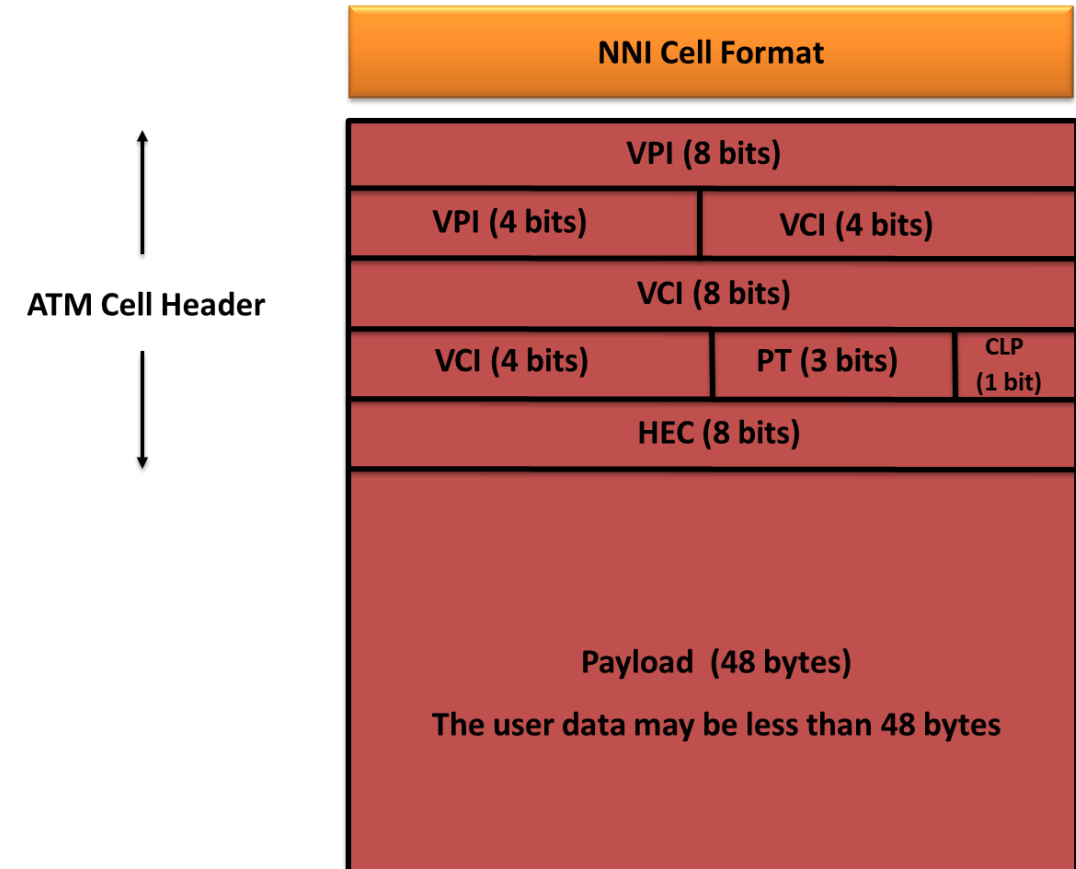


UNI and NNI ATM Cell

UNI (User-Network Interface)

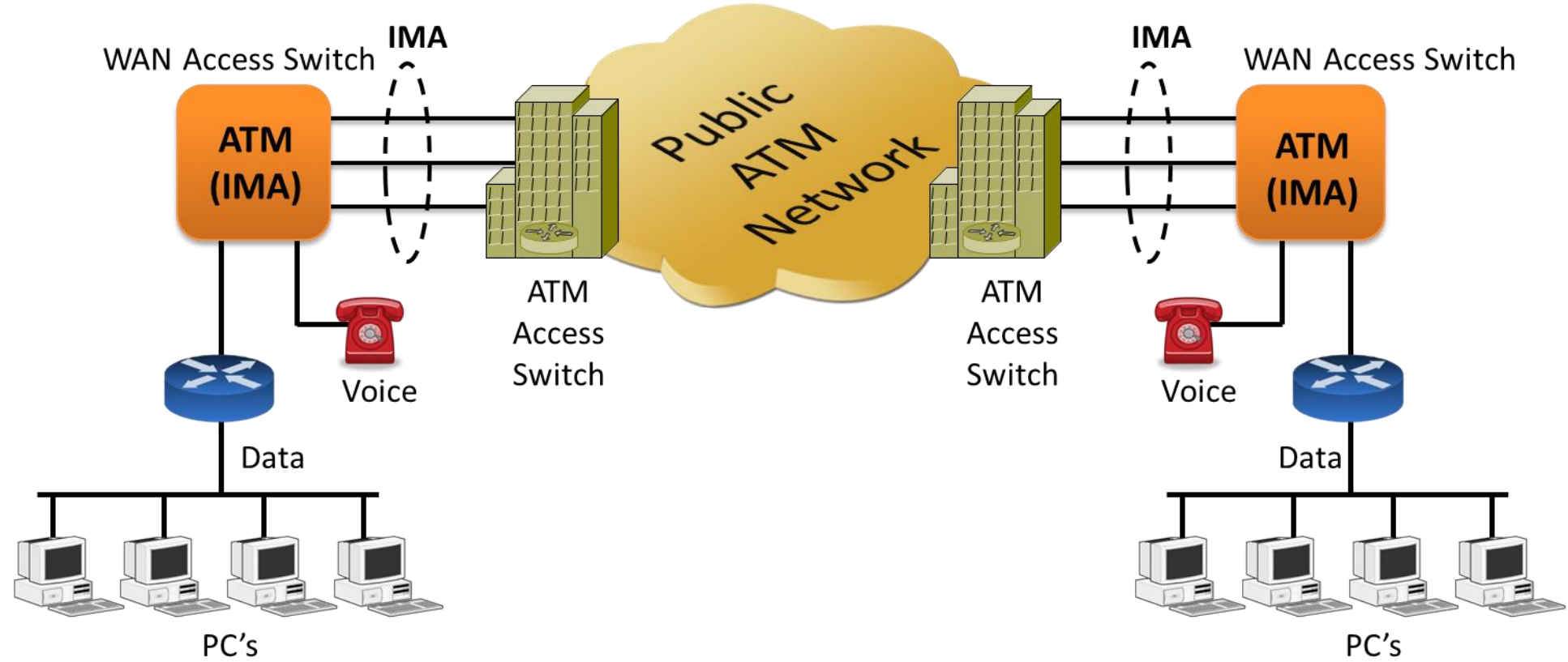


NNI (Network-Network Interface)

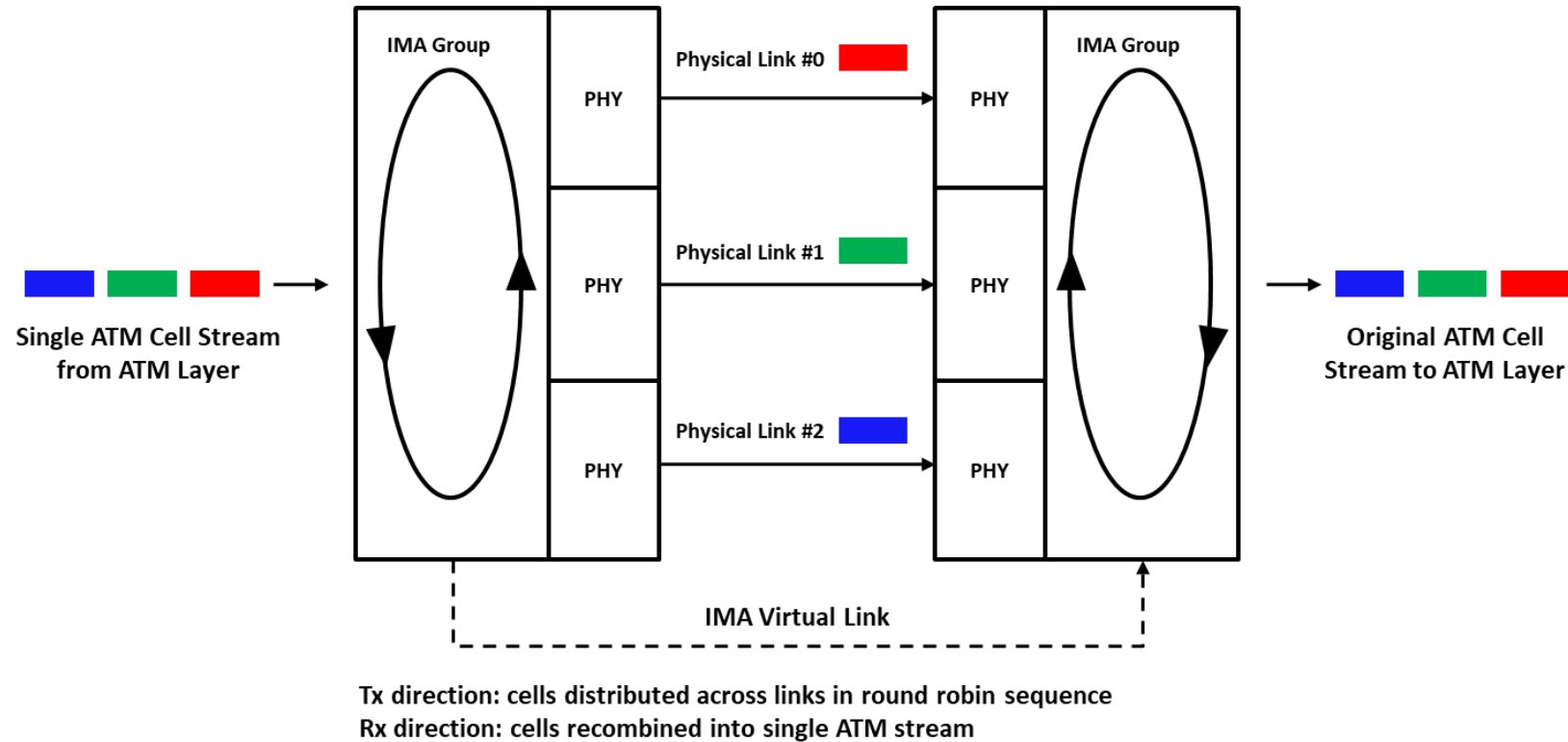


IMA Network

General ATM IMA Network



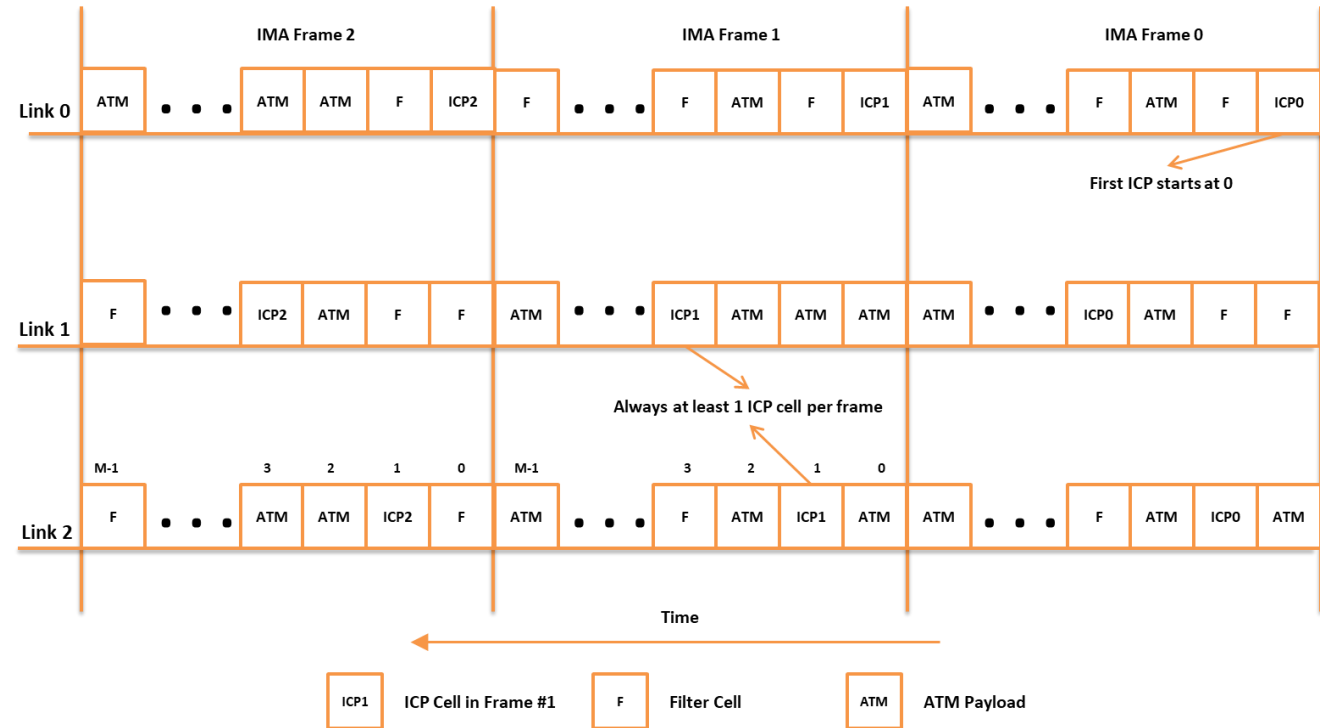
Inverse Multiplex over ATM (IMA)



- ATM Inverse Multiplexing technique involves inverse multiplexing and de-multiplexing of ATM cells in a cyclical fashion
- IMA combines multiple T1 or E1 links to form a single high-speed connection
- IMA provides flexible bandwidth options to achieve rates between the DS1/E1 and DS3/E3

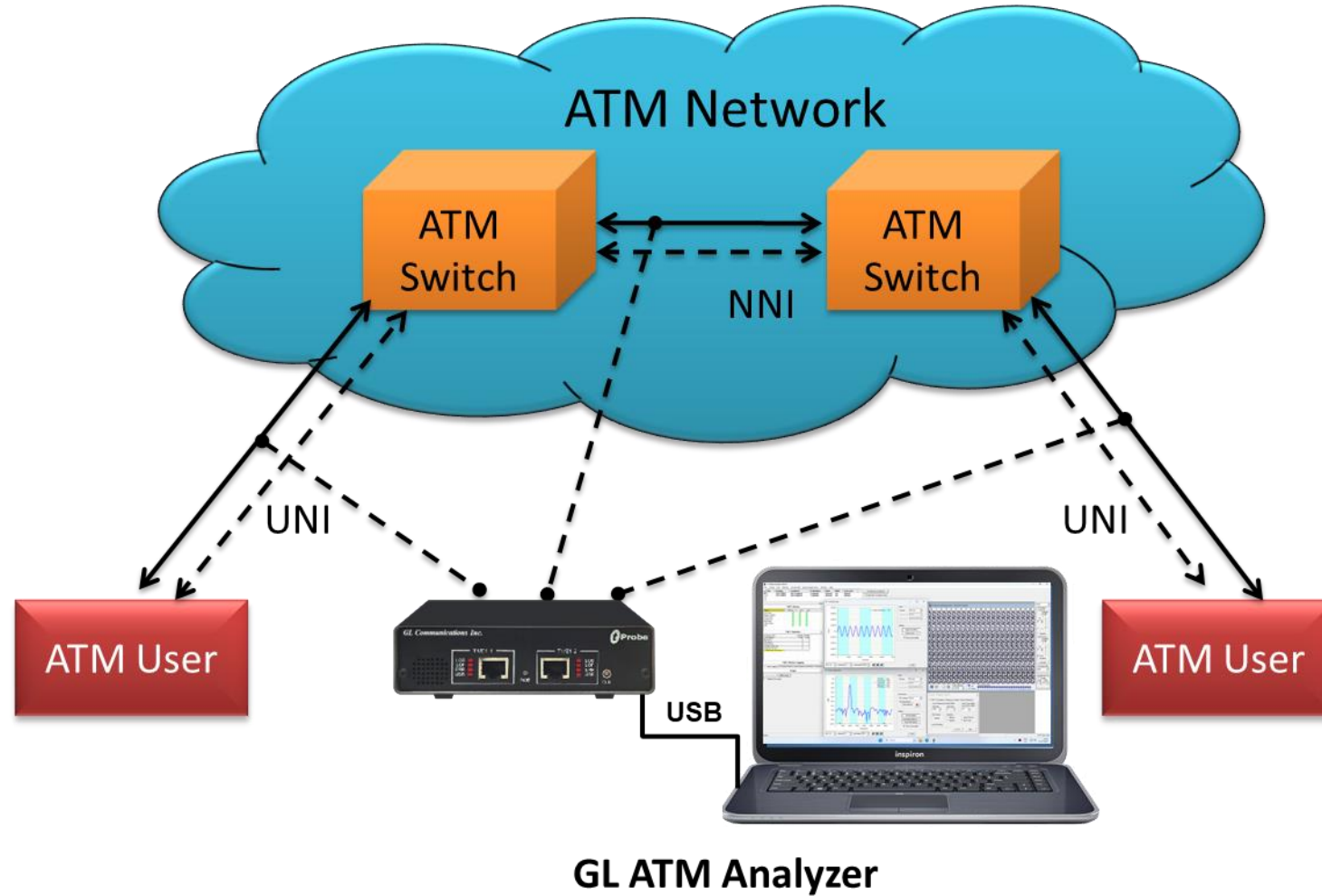
IMA Frames

- IMA links transmit IMA control protocol (ICP) cells on each link in a group - once per IMA frame
- ICP cells define and separate IMA frames and enable reconstruction of the original ATM cell stream
- IMA group can have a frame size of 32, 64, 128, or 256. If an IMA frame length is of 128 cells, one out of every 128 cells on a physical link is an ICP cell
- If no ATM layer cells are being sent, then an IMA filler cell is transmitted to provide a constant stream at the physical layer. Filler cells are discarded by the receiver



GL's ATM Analysis

GL's ATM Protocol Analyzer



- The protocol analysis tool is used to study the total system effect of a particular network protocol

Applications

- Can be used as independent standalone units as "probes" integrated in a network surveillance system
- Triggering, collecting, and filtering for unique subscriber information and relaying such information to a back-end processor
- Collecting Call Detail Records (CDR) information for billing

Features

- Perform real-time / offline / remote analysis
- Consolidated GUI – Summary of all decodes, detail and hex-dump views of each frame, statistics view, and call detail record views
- Fine tune results with filtering and search capability
- Extensive statistics measurement ability
- Any protocol field can be added to the summary view, filtering, and search features providing users more flexibility to monitor required protocol fields
- Call trace capability based on UNI signaling parameters, VPI/VCI etc.
- Option to create multiple aggregate column groups and prioritize the groups as per the requirement to display the summary results efficiently
- Allows the user to create search/filter criteria automatically from the current screen selection

Features (Contd.)

- Ability to configure .ini file for PVC carrying UNI signaling messages to get the proper decoding options
- Supports search and filtering capabilities
- CRC verification for AAL5 carrying packet data
- Captures, decodes, filters, and reassembles AAL2 and AAL5 frames in real-time, from within the ATM cells according to user defined VPI/VCI
- Capturing and reassembling frames that were transmitted with Inverse Multiplexing. IMA combines up to 8 T1 E1 links to form a single high-speed connection with flexible bandwidth options
- Unscrambling of ATM cells based on SDH $X^{43} + 1$ algorithm
- Recorded raw data can be played back using raw data playback application

Supported Platforms



Front Panel



Back Panel

tProbe™ - Portable USB based T1 E1 VF FXO FXS and Serial Datacom Analyzer



Quad / Octal T1 E1 PCIe Card



Dual T1 E1 Express (PCIe) Board

tScan16™ with 16-port T1 E1 Breakout Box



Supported Adaptation Layers (AAL)

- AAL 1
 - AAL1, a connection-oriented service, is suitable for handling circuit emulation and constant bit rate sources (CBR), such as voice and videoconferencing
- AAL2
 - used for variable bit rate (VBR) services, Typically includes services characterized as packetized voice or video that do not have a constant data transmission speed but that do have requirements similar to constant bit rate services
- AAL3/4
 - Used for variable bit rate (VBR) services, Used to transmit SMDS packets over an ATM network
- AAL5
 - Used to transfer most non-SMDS data, such as classical IP over ATM and LAN Emulation (LANE)

GL's ATM Protocol Analyzer Display

PPP Protocol Analysis PPP 64-bit

File View Capture Statistics Database Configure Help

0 GoTo

Dev	TSlot	SubCh	Frame#	TIME (Relative)	Len	Error	Protocol PPP Link	Code Link Control	Code IPCP	Protocol PPP Link(Level 1)	Protocol PPP Link(Level 2)	Source IP Address IP	Destination IP IP
✓ 258	1-31		0	00:00:00.000000	208		ML PPP			Internet Protocol (IPv4)		192.168.1.200	192.168.1.11
✓ 258	1-31		1	00:00:00.019548	208		ML PPP			Internet Protocol (IPv4)		192.168.1.200	192.168.1.11
✓ 258	1-31		2	00:00:00.040080	208		ML PPP			Internet Protocol (IPv4)		192.168.1.200	192.168.1.11
✓ 258	1-31		3	00:00:00.059556	208		ML PPP			Internet Protocol (IPv4)		192.168.1.200	192.168.1.11
✓ 258	1-31		4	00:00:00.080048	208		ML PPP			Internet Protocol (IPv4)		192.168.1.200	192.168.1.11
✓ 258	1-31		5	00:00:00.100560	208		ML PPP			Internet Protocol (IPv4)		192.168.1.200	192.168.1.11
✓ 258	1-31		6	00:00:00.120076	208		ML PPP			Internet Protocol (IPv4)		192.168.1.200	192.168.1.11

Card258 TimeSlots=1-31 Frame=0 at 00:00:00.000000 OK Len=208 *** Right click to SHOW/HIDE layer details or copy ***

HDLC Frame Data + FCS

```

===== PPP Link Layer =====
0000 Protocol = 00111101 ML PPP
===== ML PPP(Level 1) Layer =====
0001 Beginning Fragment = 1..... Yes
0001 Ending Fragment = 1..... Yes
0001 Mlppp Class = ..0000.. (0)
0002 Sequence Number(Long) = 9090 (x002382)
===== PPP Link(Level 1) Layer =====
0005 Protocol = 00100001 Internet Protocol (IPv4)

```

Hex Dump of the Frame Data

```

+-----+-----+-----+-----+-----+-----+-----+-----+
3D C0 00 23 82 21 45 00 00 C8 C1 C3 00 00 80 11 =A #!E EAÄ e
F3 D6 C0 A8 01 C8 C0 A8 01 72 07 D0 0F A0 00 B4 60Ä EA r Ð
75 DA 80 00 A5 34 A2 D4 12 4C C3 59 4F 01 FF FF uÙ #4cÖ LÄYO yy
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF yyyyyyyyyyyyyyyy
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF yyyyyyyyyyyyyyyy
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF yyyyyyyyyyyyyyyy

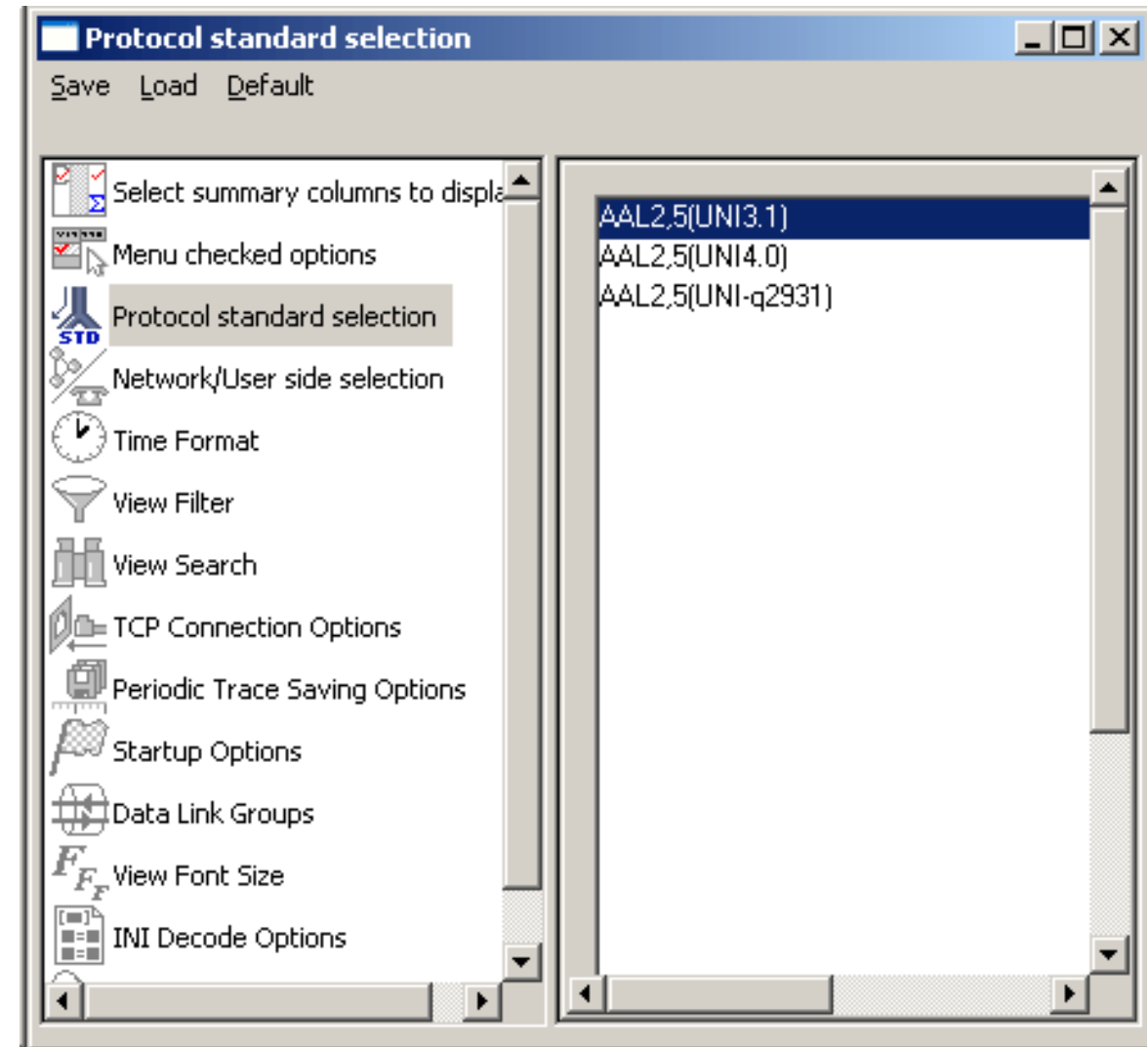
```

Σ	Device #	Frame Count(Device #)
2		1487
total	2	1487

C:\Program Files\GL Communications Inc\Usb E1 Ar | 1487 Frames

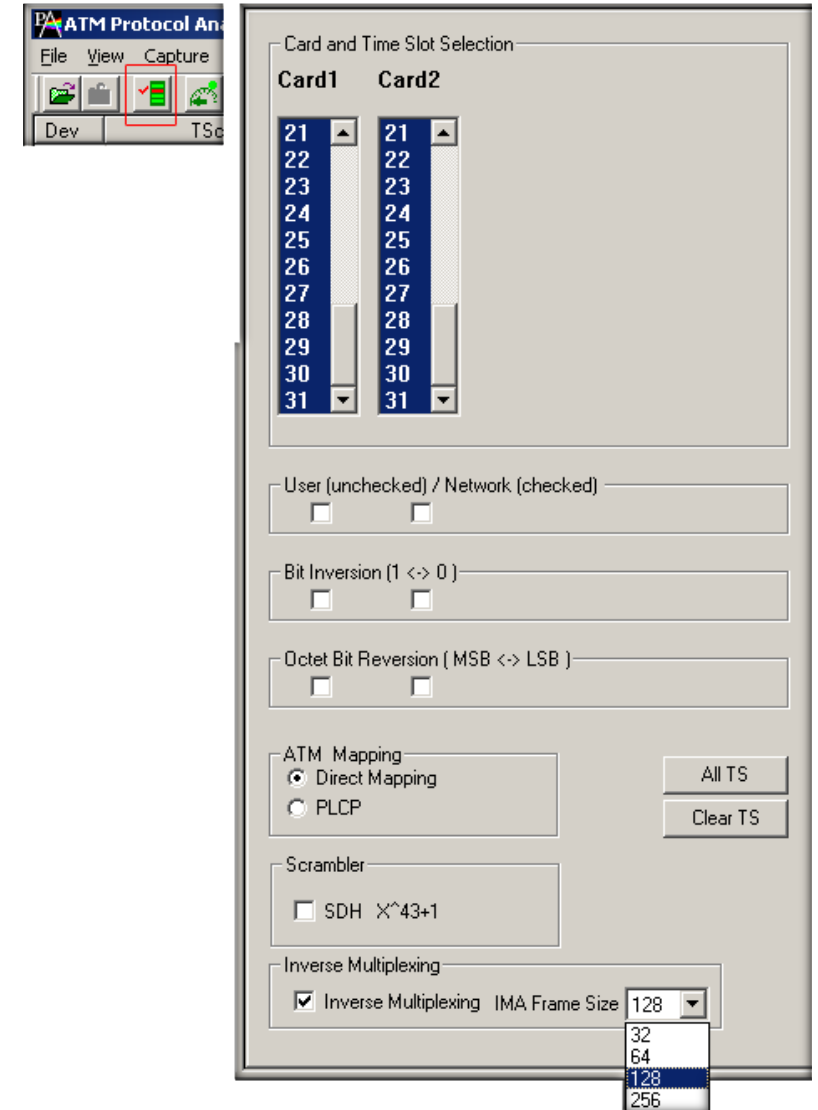
Protocol Standards

- ITU-T Recommendation I.361, I.366.1, I.366.2
- ITU-T Standard Interfaces(UNIQ.2931), ATM Forum Standard Interfaces (UNI 3.0, 3.1, 4.0)

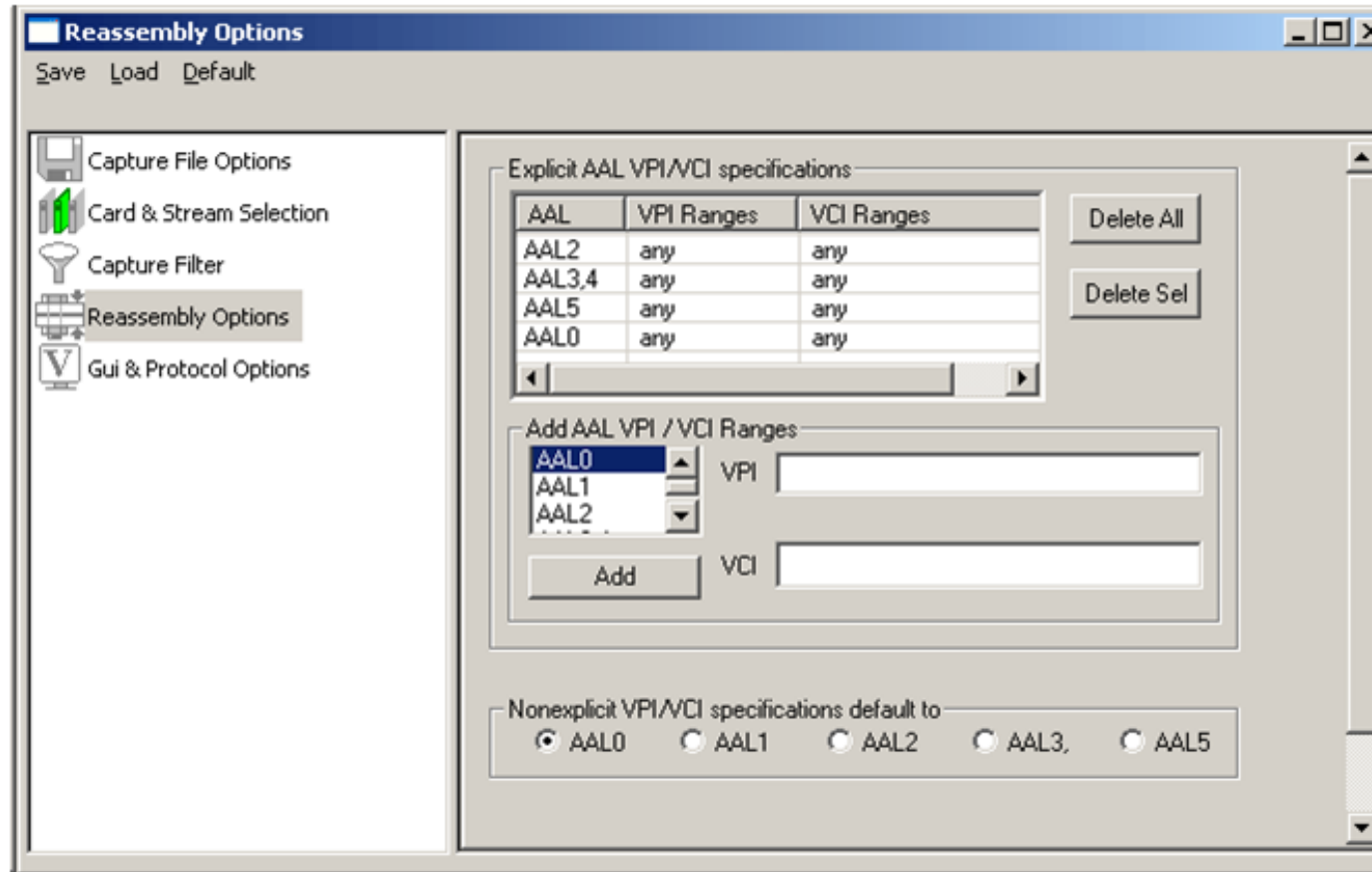


ATM Stream Interface

- Stream /Interface allows user to specify ports for monitoring, and user/network side capture
- Allows the user to select the time slot on available cards
- Bit inversion option changes each bit in received octets from 0 to 1 and 1 to 0
- Octet bit reversion option changes order of bits in each octet to make the most significant bit to a least significant bit
- ATM Mapping feature decides how ATM cells are mapped to T1 or E1 frame
- Scrambler option will perform descrambling operation when ATM cells are received
- User configurable IMA Frame Length ranging from 32, 64, 128, or 256



Reassembly Option



- Specify VPI /VCI values to reassemble as per the segmentation and reassembly rules defined by the specified AAL type
- ATM cells not satisfying the user specification will be reassembled as per the default specification

Call Detail Records

DEV	TS...	FRAM...	TIME (Relative)	LEN	ERROR	VPI	VCI	PT	HEC	OSF	AAL Type	Frame T...	CID	LI	UUI
✓ 1	30	0	00:00:00.000000	281		110	25399	6	34		AAL5	CPS-Fra...			
✓ 1	30	1	00:00:00.000000	54		110	25399	6	34		AAL5	CPS-Fra...			
✓ 1	30	2	00:00:00.000000	141		110	25399	6	34		AAL5	CPS-Fra...			
✓ 1	30	3	00:00:00.000000	33		110	25399	6	34		AAL5	CPS-Fra...			
✓ 1	30	4	00:00:00.000000	51		110	25399	6	34		AAL5	CPS-Fra...			
✓ 1	30	5	00:00:38.865750	39		110	25399	6	34		AAL5	CPS-Fra...			

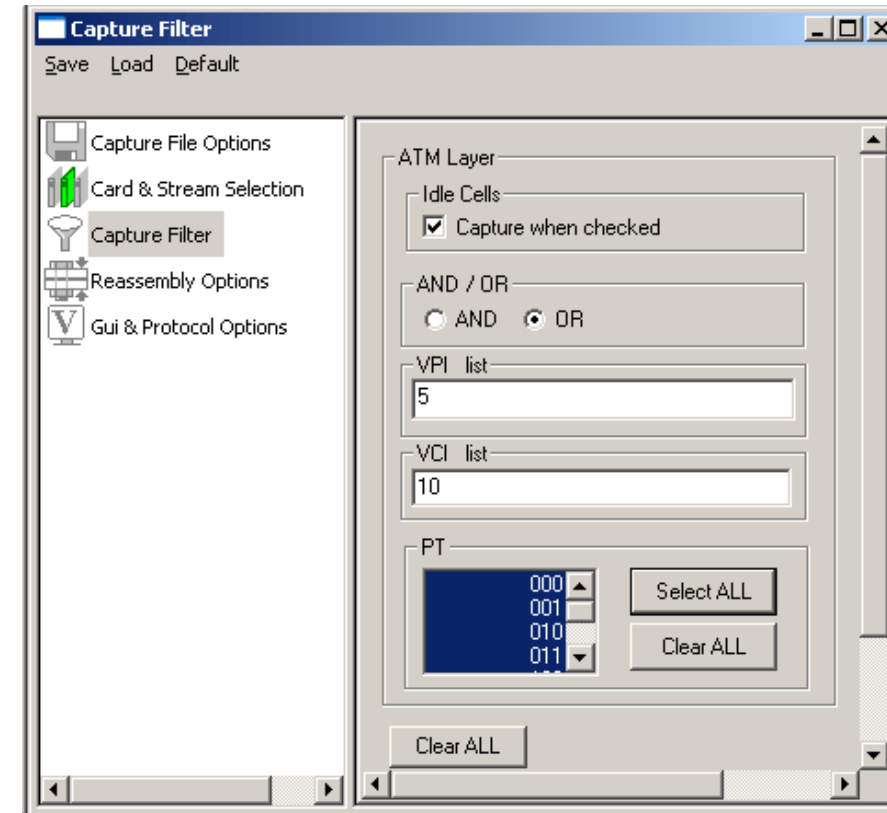
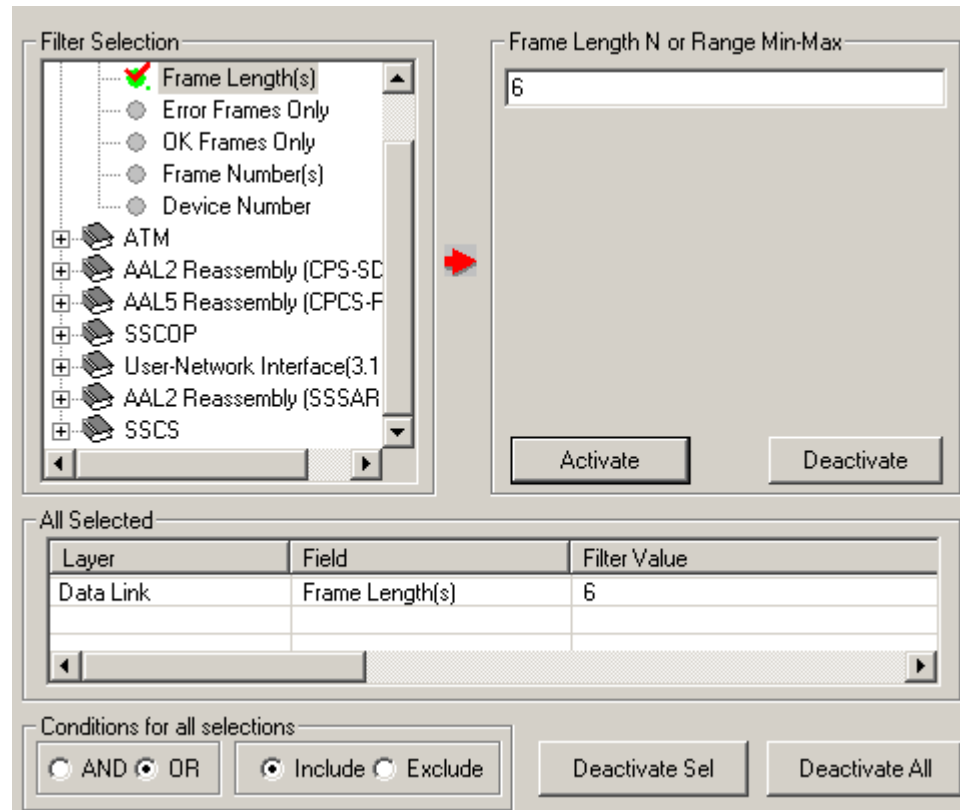
Call ID	Call Status	Calling Num	Called Num	Call Start Date & Time	Call Duration	Release Complete Cause	DevNo	CRV	VCI	VPI
0	Completed			2003-08-29 13:28:11.736500	00:00:38.865750	Normal call clearing	1	1286	25399	110

E:\Src\Test Scripts\ATMCall.hdl 6 Frames

- Call trace defining important call specific parameters such as call ID, status (active or completed), duration, CRV, release complete cause etc. are displayed

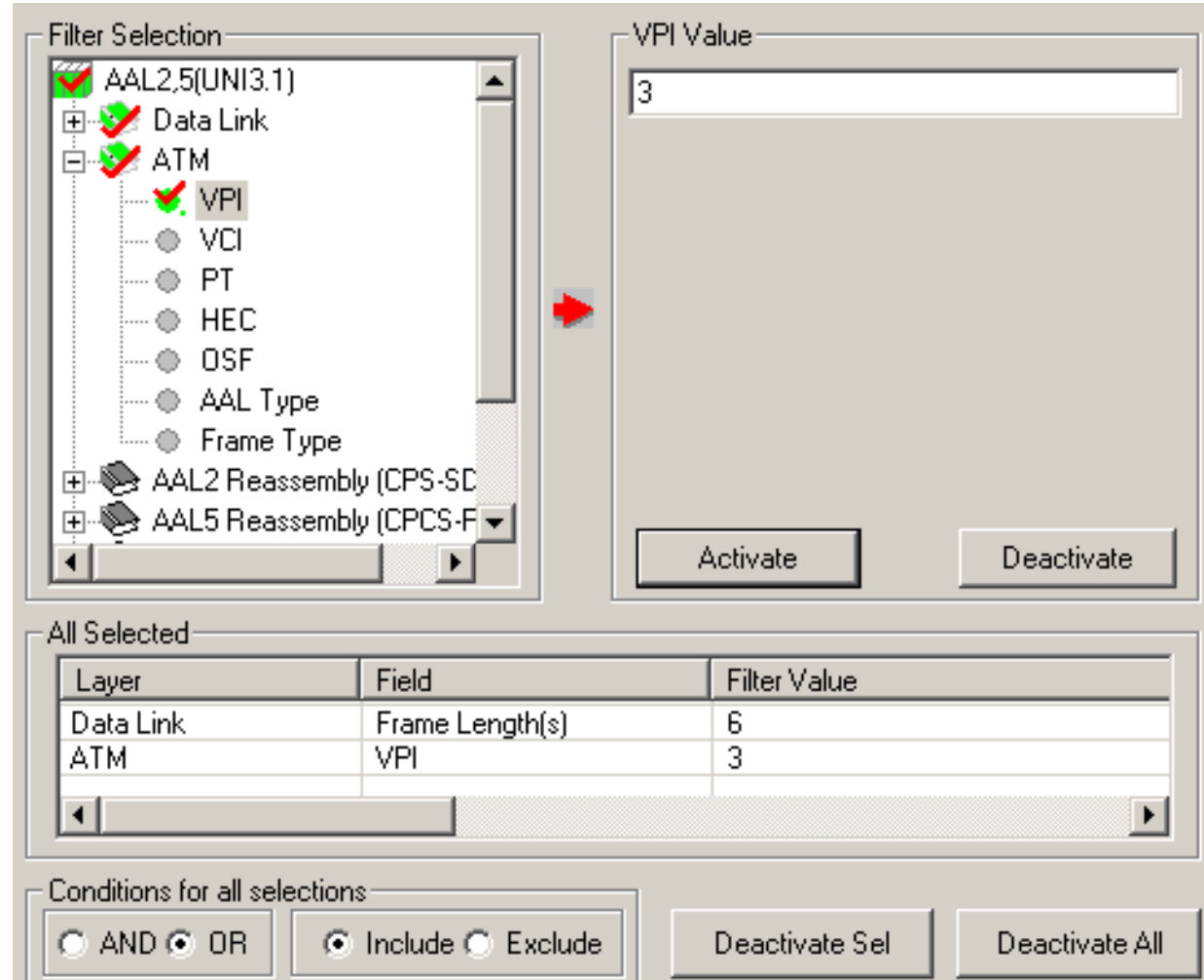
Filter Frames

Real-time Capture Filter



- Isolate certain specific frames from all frames in real-time as well as offline
- Real-time Filter applies to the frames being captured and is based on the VPI and VCI values
- The frames can also be filtered after completion of capture according to Dev#, Time Slot, Frame #, Time, Length, Error, VPI/VCI, PT (Payload Type), HEC, OSF, AAL Type, Frame Type, CID, LI, CPI, UII, and more

Search Frames



- Search features helps users to search for a particular frame based on specific search criteria

Filtering Criteria From Screen Selection

- Allows the user to create filter criteria automatically from the current screen selection

ATM Protocol Analysis AAL2,5(UNI3.1) 64-bit

Dev	TScout	Frame#	TIME (Relative)	Len	Error	Frame Type	VCI	VPI	F
✓ 2	24	0	00:00:00.000000	53		ATM-Cell	0	0	0
✓ 2	24	1	00:00:00.000276	53		ATM-Cell	0	0	0
✓ 2	24	2	00:00:00.000552	53		ATM-Cell	0	0	0
✓ 2	24	3	00:00:00.000828	53		ATM-Cell	0	0	0
✓ 2	24	4	00:00:00.001104	53		ATM-Cell	0	0	0
✓ 2	24	5	00:00:00.001380	53		ATM-Cell	0	0	0
✓ 2	24	6	00:00:00.001656	53		ATM-Cell	0	0	0
✓ 2	24	7	00:00:00.001932	53		ATM-Cell	0	0	0

Search Selected Value
Set Search Criteria as Sel Values
Set Filter Criteria as Sel Values

Use Ctrl, Shift for Extended Selection

ATM::Frame Type
ATM::PT
ATM::VCI
ATM::VPI

OK Select All Cancel

Analyzer GUI and Protocol Configuration

Save Load Default

Select summary columns to di...
Menu checked options
Protocol standard selection
Network/User side selection
Time Format
View Filter
View Search
TCP Connection Options
Periodic Trace Saving Options
Startup Options
Data Link Groups
View Font Size
INI Decode Options
Define Summary Columns
Aggregate Summary Columns
Capture Options

Filter Selection

- AAL2,5(UNI3.1)
 - Data Link
 - ATM
 - DAM
 - AAL2 Reassembly (CPS-SC)
 - SSCS
 - AAL5 Reassembly (CPCS-F)
 - SSCOP
 - User-Network Interface(3.1)
 - Multi Protocol Encapsulatio
 - IP
 - UDP

Value Selection

Activate Deactivate

All Selected

Layer	Field	Filter Value
ATM	Frame Type	ATM-Cell
ATM	PT	0

Conditions for all selections

AND OR Include Exclude Deactivate Sel Deactivate All

Search Criteria From Screen Selection

- Allows the user to create search criteria automatically from the current screen selection

The screenshot shows the 'ATM Protocol Analysis AAL2,5(UNI3.1) 64-bit' application. The main window displays a table of captured data. A context menu is open over the selected row (Frame# 3), with the option 'Set Search Criteria as Sel Values' highlighted. A dialog box titled 'Use Ctrl, Shift for Extended Selection' is open, showing a list of selected values: 'ATM::Frame Type', 'ATM::PT', 'ATM::VCI', and 'ATM::VPI'. The 'OK' button is highlighted, and a red arrow points from it to the 'Analyzer GUI and Protocol Configuration' window.

Dev	TScout	Frame#	TIME (Relative)	Len	Error	Frame Type	VCI	VPI	P
✓ 2	24	0	00:00:00.000000	53		ATM-Cell	0	0	0
✓ 2	24	1	00:00:00.000276	53		ATM-Cell	0	0	0
✓ 2	24	2	00:00:00.000552	53		ATM-Cell	0	0	0
✓ 2	24	3	00:00:00.000828	53		ATM-Cell	0	0	0
✓ 2	24	4	00:00:00.001104	53		ATM-Cell	0	0	0
✓ 2	24	5	00:00:00.001380	53		ATM-Cell	0	0	0
✓ 2	24	6	00:00:00.001656	53		ATM-Cell	0	0	0
✓ 2	24	7	00:00:00.001932	53		ATM-Cell	0	0	0

The 'Analyzer GUI and Protocol Configuration' window shows the 'Filter Selection' tree with 'AAL2,5(UNI3.1)' expanded. The 'Value Selection' area is empty. The 'All Selected' table is highlighted with a red box:

Layer	Field	Search Value
ATM	Frame Type	ATM-Cell
ATM	VCI	0

Below the table, the 'Conditions for all selections' are set to 'AND' and 'Include'.

Statistics

- Statistics is an important feature available in protocol analyzer and can be obtained for all frames both in real-time as well as offline mode
- Numerous statistics can be obtained to study the performance of the network based on protocol fields and different parameters

The screenshot shows the 'Statistics' dialog box with the following configuration:

- Field Names:** A tree view showing 'Layers' expanded to 'Physical Link', which includes 'Device #', 'Error Code', 'TS Count', and 'Time Stamp'. Other layers like ATM, AAL2, and SSOP are also visible.
- Device #:** 'Use Type (single selection)' is set to 'Key'.
- Statistic Type(s):** 'Frame Count' is selected.
- Range List:** An empty text box.
- Options:** 'Cumulative' is selected over 'Separate'.
- Buttons:** 'Add/Mod' and 'Remove' are visible.
- Selected Statistic Information:** A table with the following data:

Layer	Field Name	Use Type	Statistic Type
Physical ...	Device #	Key	Frame Count
Physical ...	Time Stamp	Total	Frame Count

Buttons for 'Remove Sel', 'Remove All', and 'Apply' are located to the right of the table.

Aggregate Group Column

- The user can create multiple aggregate column groups and prioritize the groups as per the requirement to display the summary results efficiently

Aggregate Summary Columns Dialog:

Name	Display Format	Summary Columns	Separator
Group~0	Concat	Frame Type_ATM VCI_ATM	--->
Group~1	Overlay	VPI_ATM	&
Group~2	<Col_Alias>Value	Ether Type_Multi Protocol Encapsulation	

ATM Protocol Analysis AAL2,5(UNI3.1) 64-bit Table:

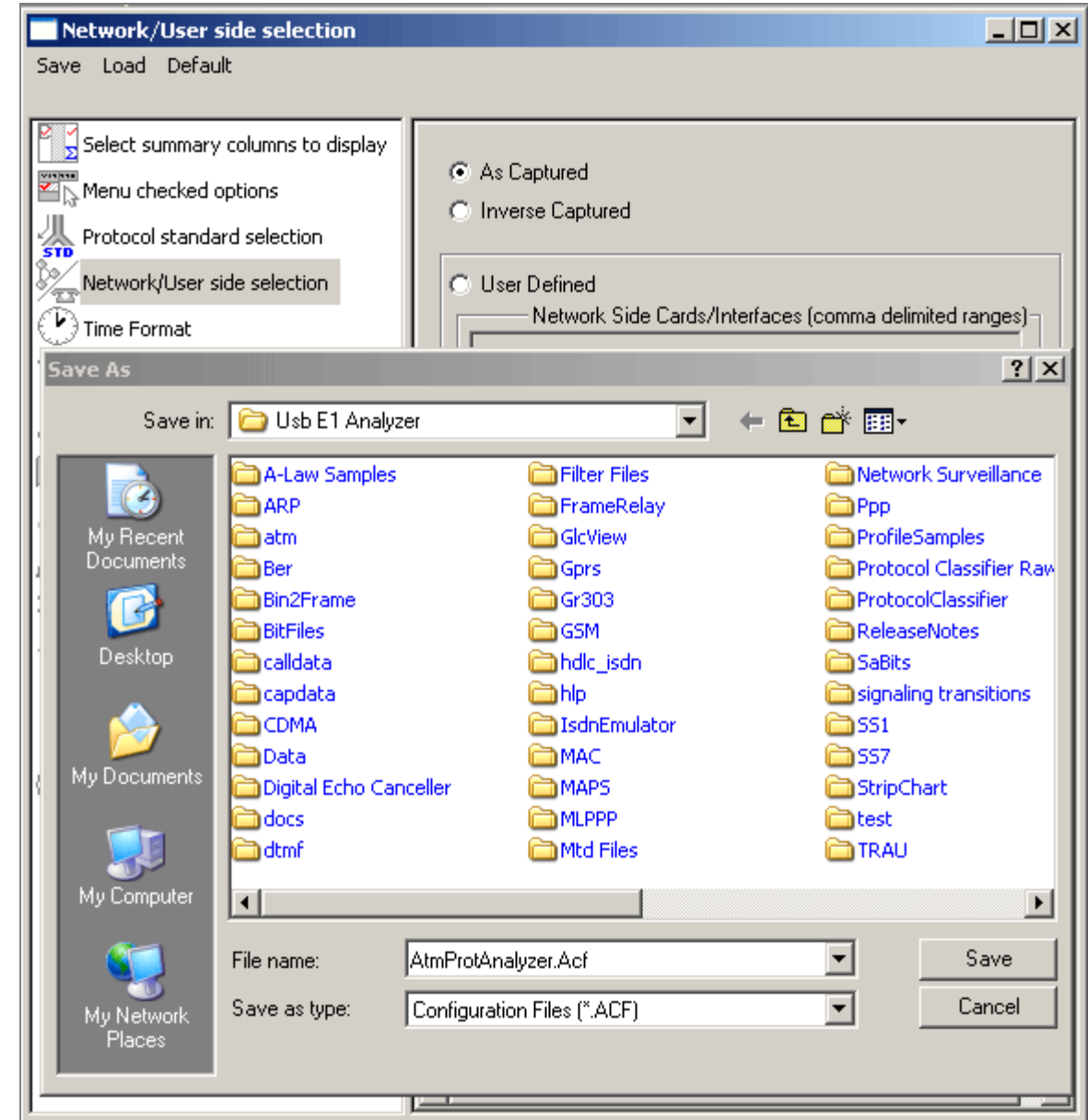
Dev	TScout	Frame#	TIME (Relative)	Len	Error	Group~0	Frame Type ATM	VCI ATM	VPI ATM	PT ATM
2	24	0	00:00:00.000000	53		ATM-Cell ---> 0	ATM-Cell	0	0	0
2	24	1	00:00:00.000276	53		ATM-Cell ---> 0	ATM-Cell	0	0	0
2	24	2	00:00:00.000552	53		ATM-Cell ---> 0	ATM-Cell	0	0	0
2	24	3	00:00:00.000828	53		ATM-Cell ---> 0	ATM-Cell	0	0	0
2	24	4	00:00:00.001104	53		ATM-Cell ---> 0	ATM-Cell	0	0	0
2	24	5	00:00:00.001380	53		ATM-Cell ---> 0	ATM-Cell	0	0	0
2	24	6	00:00:00.001656	53		ATM-Cell ---> 124	ATM-Cell	124	1	0
2	24	7	00:00:00.001932	53		ATM-Cell ---> 0	ATM-Cell	0	0	0
2	24	8	00:00:00.002208	53		ATM-Cell ---> 0	ATM-Cell	0	0	0

ATM Frame Data:

```
Device2 TScout=24 Frame=0 at 00:00:00.000000 OK Len=53
ATM Frame Data
----- ATM Layer -----
0000 GFC = 0000.... (0)
0000 VPI = 0 (...0000 0000....)
0001 VCI = 0 (...0000 00000000 0000....)
0003 PT = ....000. (0)
0003 CLP = .....0 (0)
0004 HEC = 01010101 (85)
```

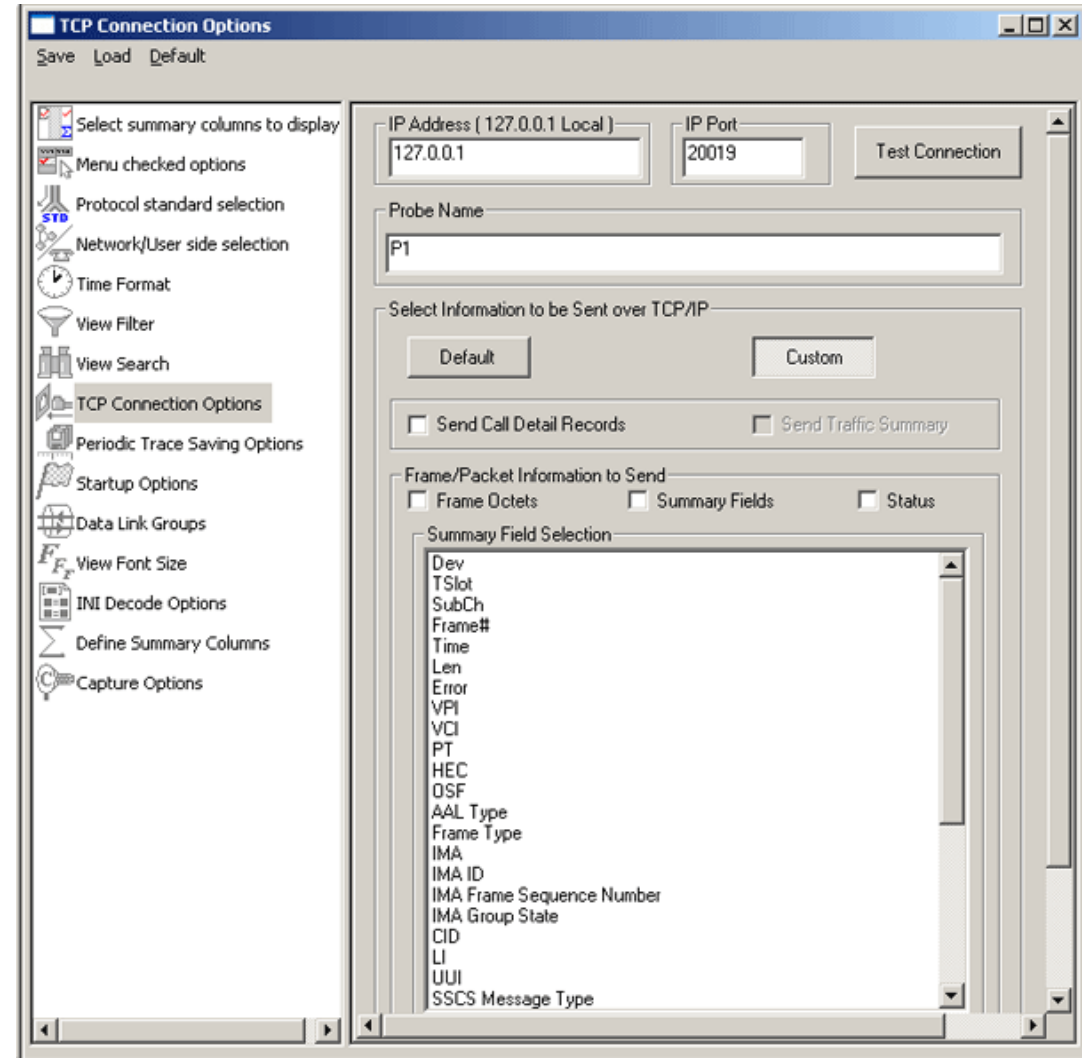
Save/Load All Configuration Settings

- Provides a consolidated interface for GUI and protocol settings required in the analyzer such as protocol selection, periodic saving options, etc.
- Configuration settings can be saved to a file, loaded from a configuration file, or just revert to the default values using the default option



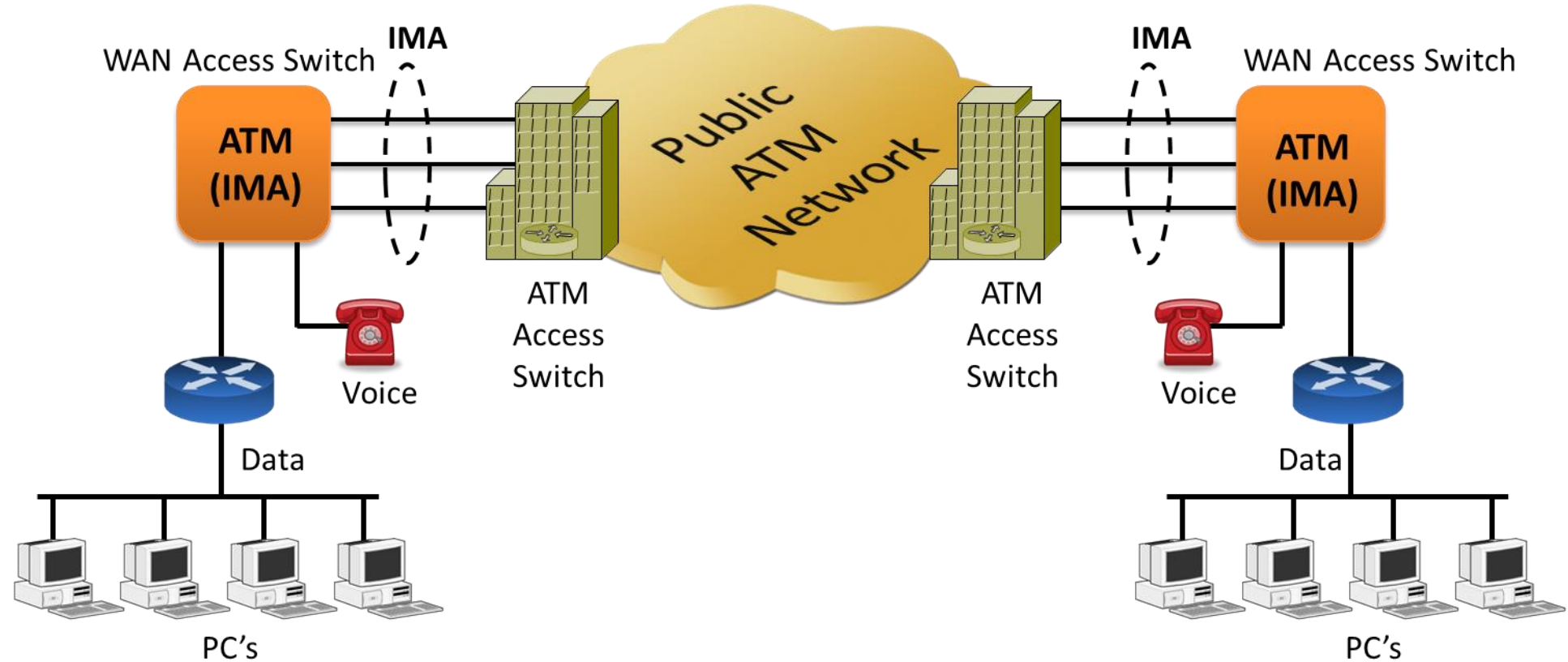
TCP Connection Options

- Used for Network Surveillance and Monitoring
- Designed to send protocol summary information and binary frame data via TCP- IP connection to a Database Loader to load data into a database



GL's Inverse Multiplexing for ATM (IMA) Emulator Using Client-Server

IMA Network



- GUI based WCS client, which simulates IMA Emulation
- Capable of generating and receiving ATM traffic
- Traffic source can be sequence number, HDL files (containing packets/frames), flat binary file, user-defined frames (ASCII HEX file), and Ethernet data

Features

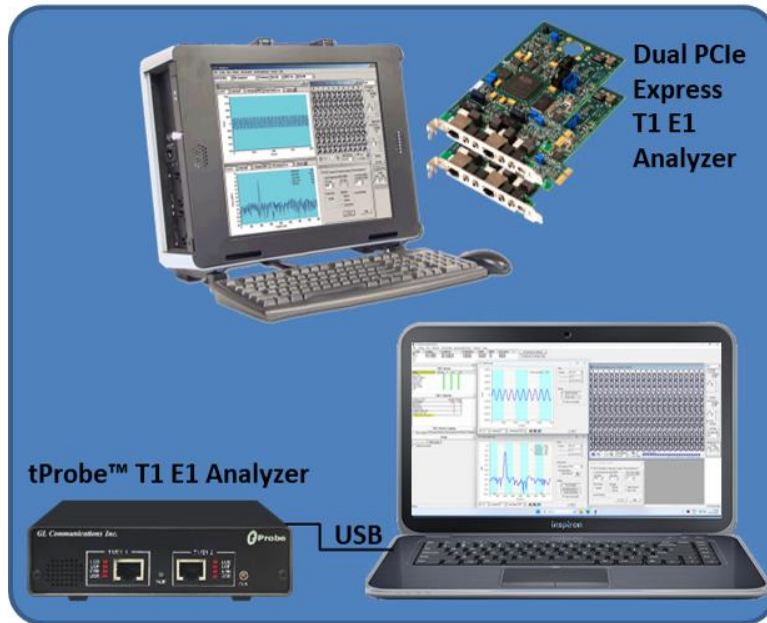
- Performs IMA simulation
- Supports 16 T1 E1 ports
- Support for Full or Fractional Timeslots for ATM Link
- Supports hyper channels with discontinuous (sparse) timeslots
- Supports IMA Frame Length ranging from 32, 64, 128, or 256
- Dynamically add/remove (Open/Close) of ATM links without loss in data
- Multiple IMA groups can be created in IMA Simulation
- Create and delete Virtual Channels on IMA group
- Generate and verify end to end traffic on each Virtual Channel
- User configurable ATM (AAL5, and AAL2) packet size
- IMA supports AAL2 which provides bandwidth-efficient transmission of low-rate, short and variable length packets in delay sensitive applications

Features (Contd.)

- Payload traffic generation and verification using Sequence number, HDL file (containing packets/frames), Flat Binary file, and User defined frame (ASCII HEX file) for each Virtual Channel independently
- Transmit and receive Ethernet traffic over T1 E1 links through bridge mode
- Provides detailed statistics for IMA group and for each Virtual Channel
- Provides end to end traffic verification statistics
- Ideal solution for automated testing using command line scripts

Windows Client Server IMA Emulator

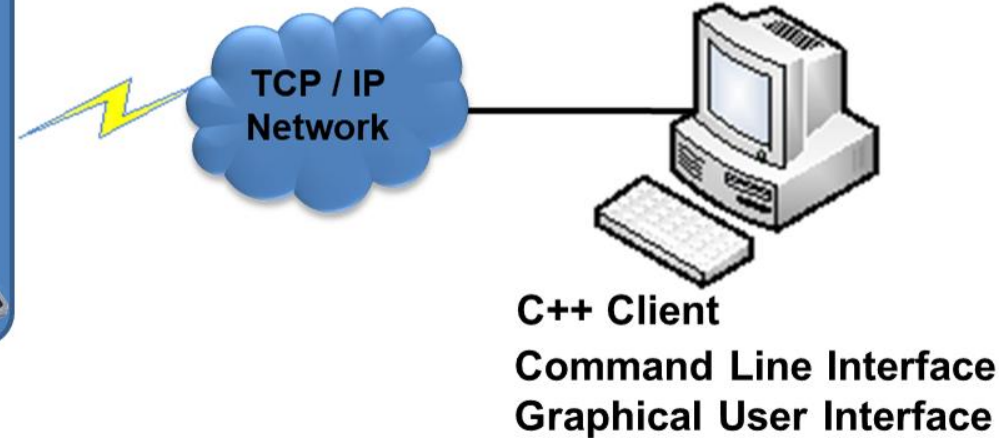
GL's T1 E1 Server



Supported Platforms-

- Dual T1 E1 Express (PCIe) Cards
- Portable USB based T1 E1 Analyzer

GL's IMA Emulation

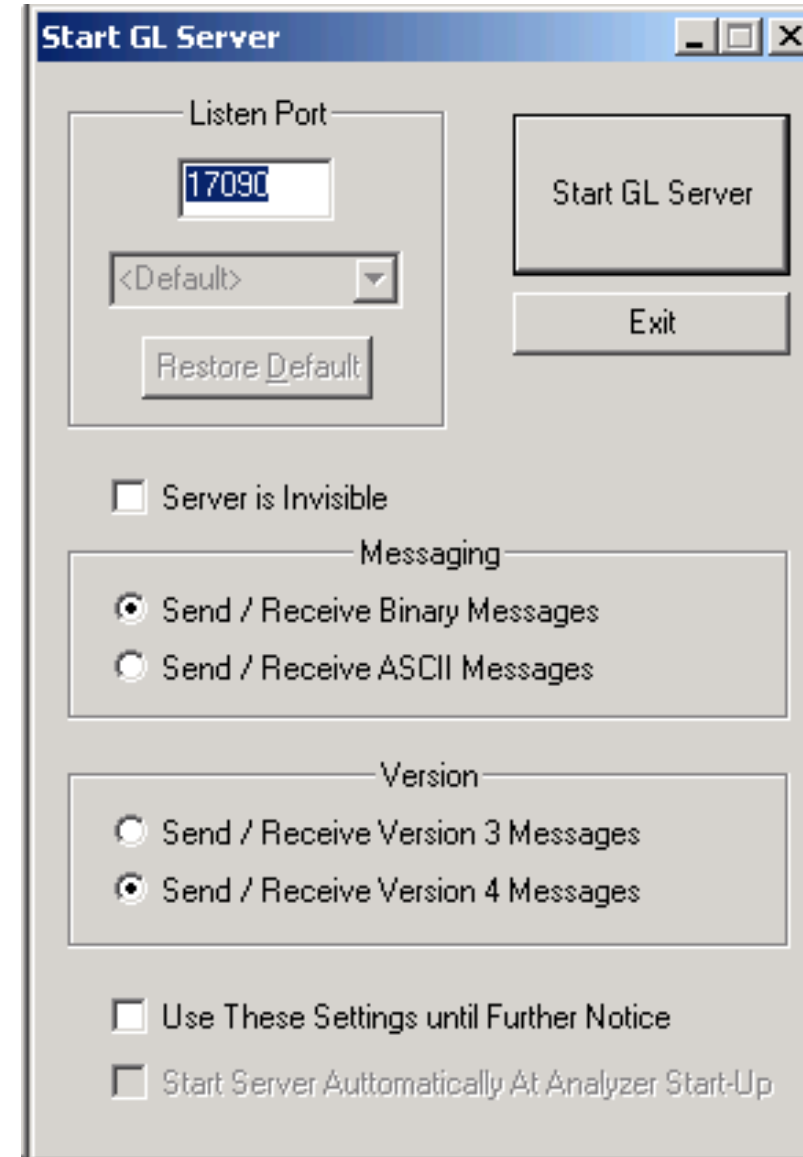


Features

Remote operation	✓
Automation	✓
Multi-site connectivity	✓
Simultaneous testing of high capacity T1 E1 systems through a single Client	✓
Integration of T1 E1 testing into more complex testing systems	✓
Intrusive / Non-Intrusive T1 E1 Testing	✓

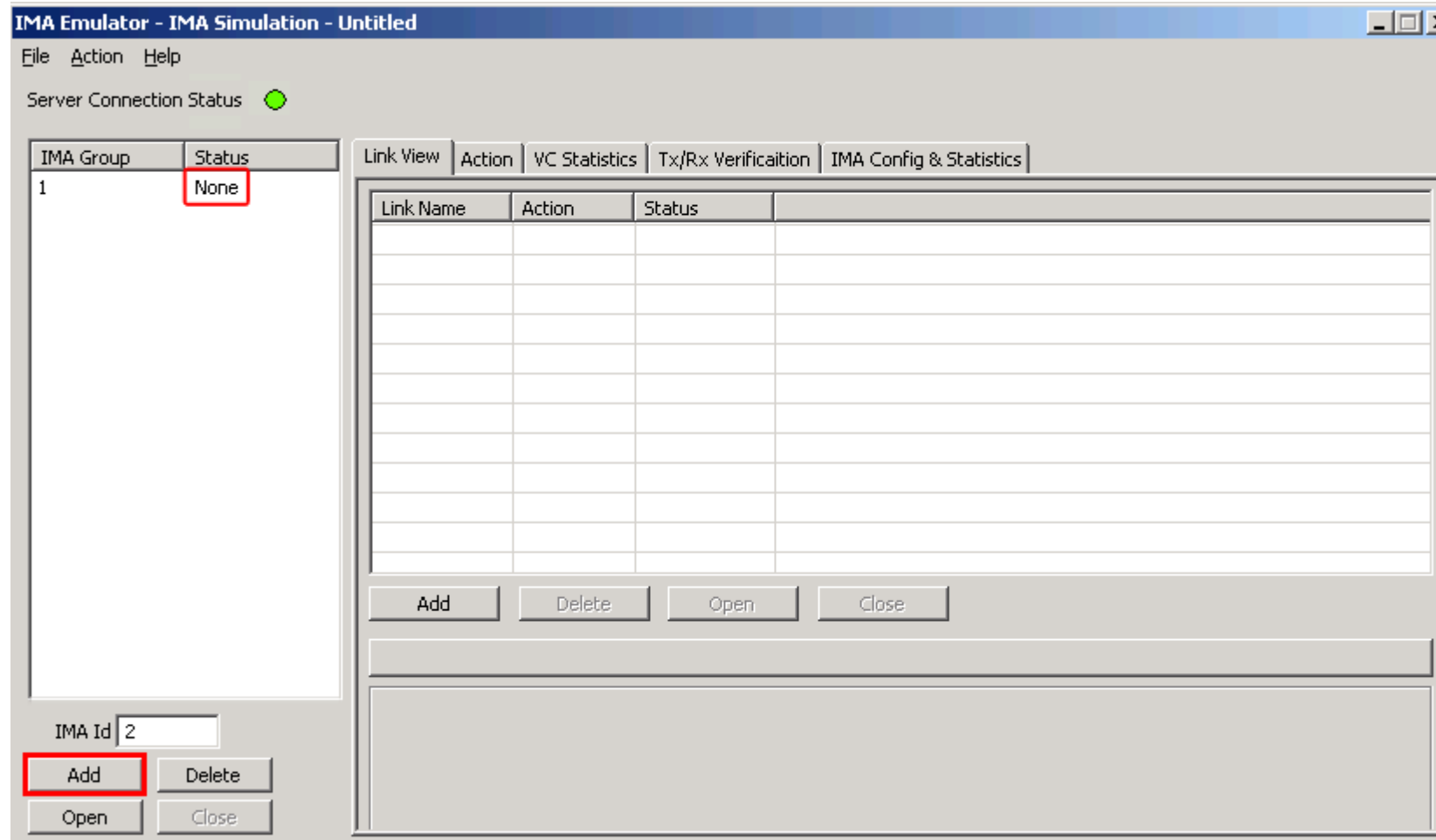
Starting the Server

- T1 E1 is software selectable
- Connects using the same parameters set in server



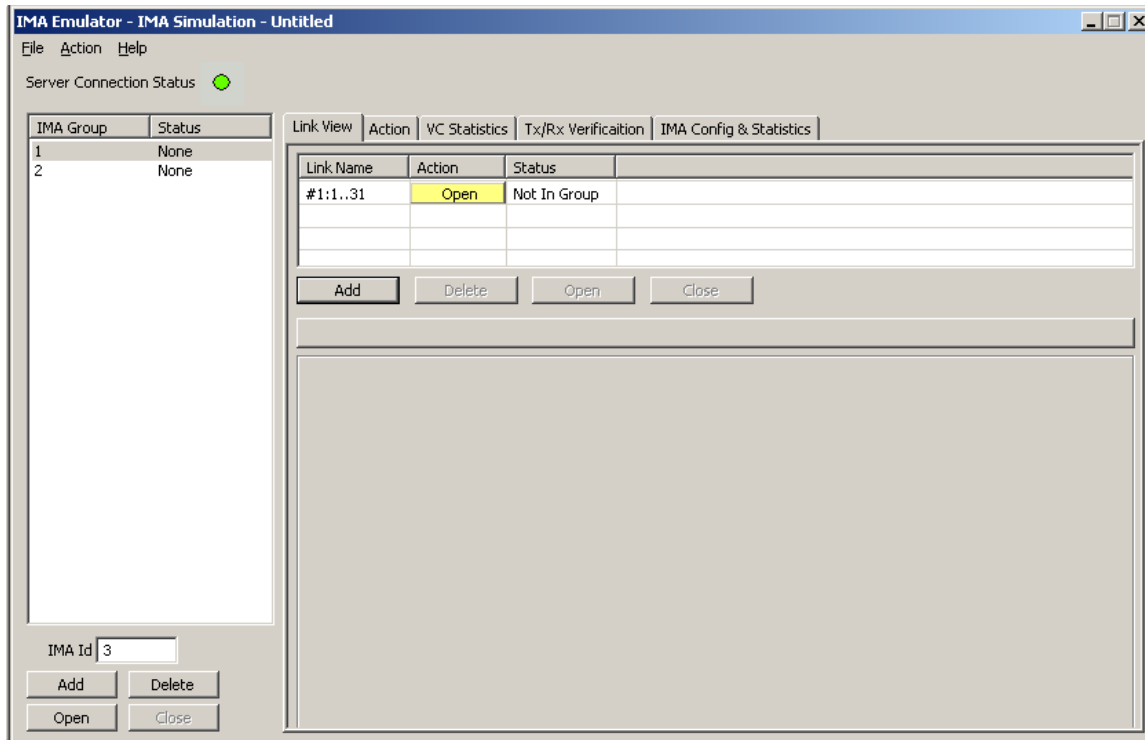
Adding Group

- On the left pane, click on Add button to add several ATM links

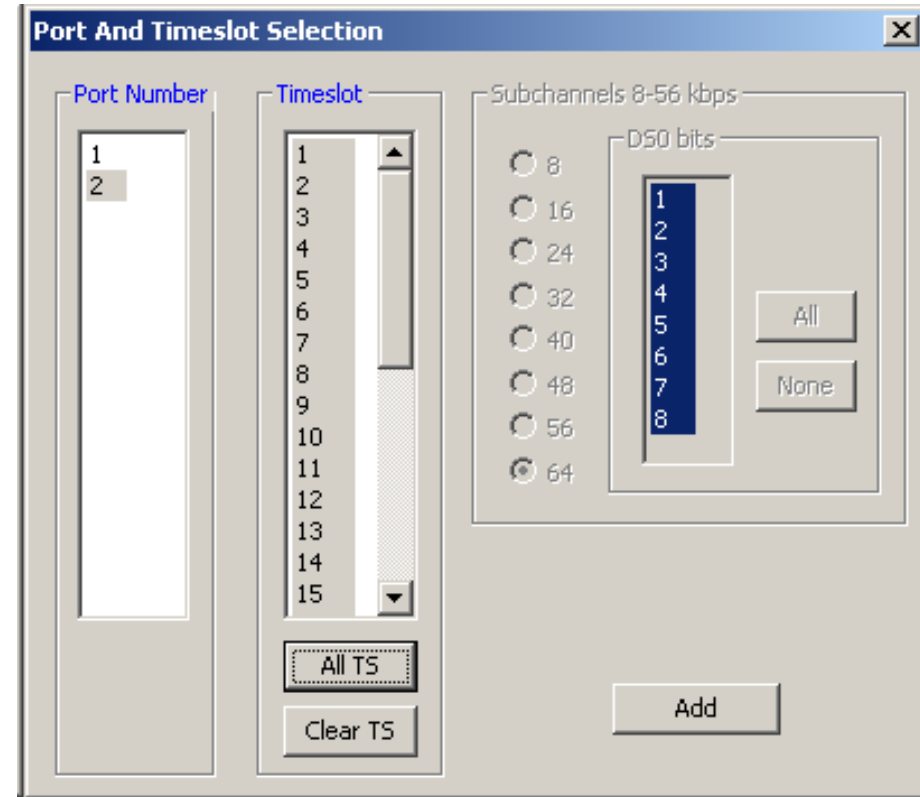


Adding links to form an IMA Group

Added Links



Link Selection



- Various links (of any bandwidth varying from 64Kbps to $n \cdot 64\text{Kbps}$ or sub channels) can be added to form an IMA Group. Within a group all links should be of equal bandwidth
- IMA group, channels into a single network-layer channel

Opening the IMA Group

The screenshot shows the 'IMA Emulator - IMA Simulation - Untitled' window. The interface includes a menu bar (File, Action, Help), a 'Server Connection Status' indicator (a green dot), and a table of IMA groups. The first group, ID 1, is selected. Below the table is an 'IMA Id' input field with the value '3' and four buttons: 'Add', 'Delete', 'Open', and 'Close'. The 'Open' button is highlighted with a red box. To the right, a 'Link View' tab is active, displaying a table of links. The first two links, '#1:1..4' and '#1:5..8', have 'Open' actions and 'Not In Group' statuses, both highlighted with red boxes. Below this table are buttons for 'Add', 'Delete', 'Open', and 'Close'.

IMA Group	Status
1	None
2	None

IMA Id: 3

Buttons: Add, Delete, Open, Close


Link Name	Action	Status
#1:1..4	Open	Not In Group
#1:5..8	Open	Not In Group

Buttons: Add, Delete, Open, Close

IMA Group Operational Mode

IMA Emulator - IMA Simulation - Untitled

File Action Help

Server Connection Status 

IMA Group	Status
1	Operational
2	Operational

IMA Id

Add Delete

Open Close

Link View Action VC Statistics Tx/Rx Verification IMA Config & Statistics

Link Name	Action	Status
#1:1..4	Close	Active
#1:5..8	Close	Active

Add Delete Open Close

Adding VC For Tx and Rx

IMA Emulator - IMA Simulation - Untitled

File Action Help

Server Connection Status ●

IMA Group	Status
1	Operational
2	Operational

Link View Action VC Statistics Tx/Rx Verification IMA Config & Statistics

101:201:1 - AAL2 101:201:2 - AAL2

Add Vc Delete Vc

VPI:VCI Number → 101:201

Connection Id → 101:201:1 - AAL2

Common Part Sublayer → Max CPS Length: 45

TX params

Source Type: SEQNUM

Source Parameters

Order: MSB Length: 4

Start: 0 Increment: 1

Prefix Header

Duration Spec

Continuous transmission

Limited frames 1000

EOF

Payload Len: 1500

Max CPS Length: 45 64

Start Tx Start Rx Start All Tx Start All Rx

IMA Id: 3

Add Delete Open Close

Link View Action VC Statistics Tx/Rx Verification IMA Config & Statistics

Add Vc Delete Vc

100:200 - AAL5

Add VC

Source Type: SEQNUM VPI:VCI: 101:201 AAL Type: AAL5

Source Parameters

Order: MSB Length: 4

Start: 0 Increment: 1

OK

Adding VC For Tx and Rx

- In IMA Simulation virtual channels are added on the selected IMA Group
- IMA Simulation supports AAL0, AAL2, and AAL5 type frames
- Different types of Payloads can be selected for each VC Such as Sequence number, HDL file (containing packets/frames), Flat Binary file, and User defined frame (ASCII HEX file) for each Virtual Channel independently
- For AAL2, one can create multiple VCs of same VPI:VCI values with a unique Connection ID for each group. Up to 255 VCs can be created with the same VPI:VCI number

Tx and Rx Parameters

AAL 0,5

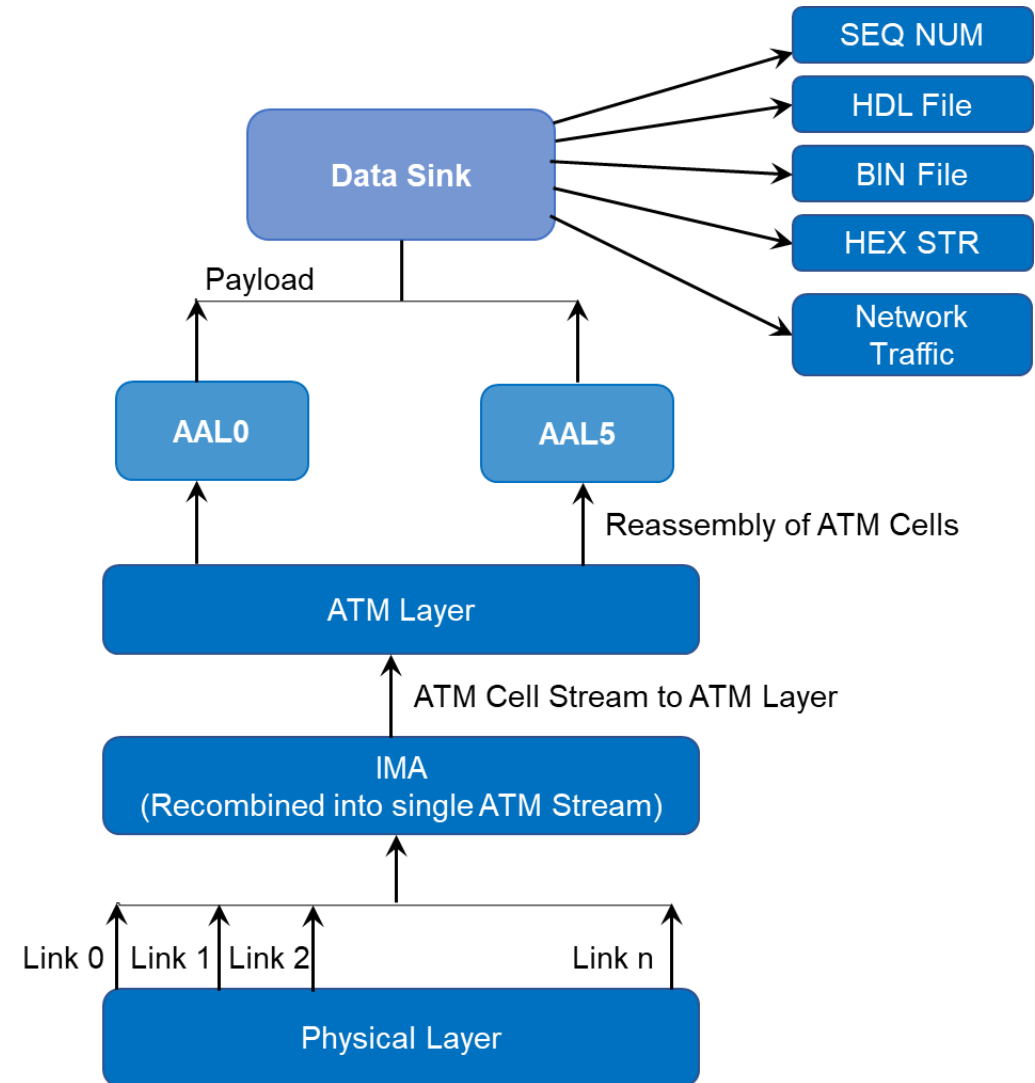
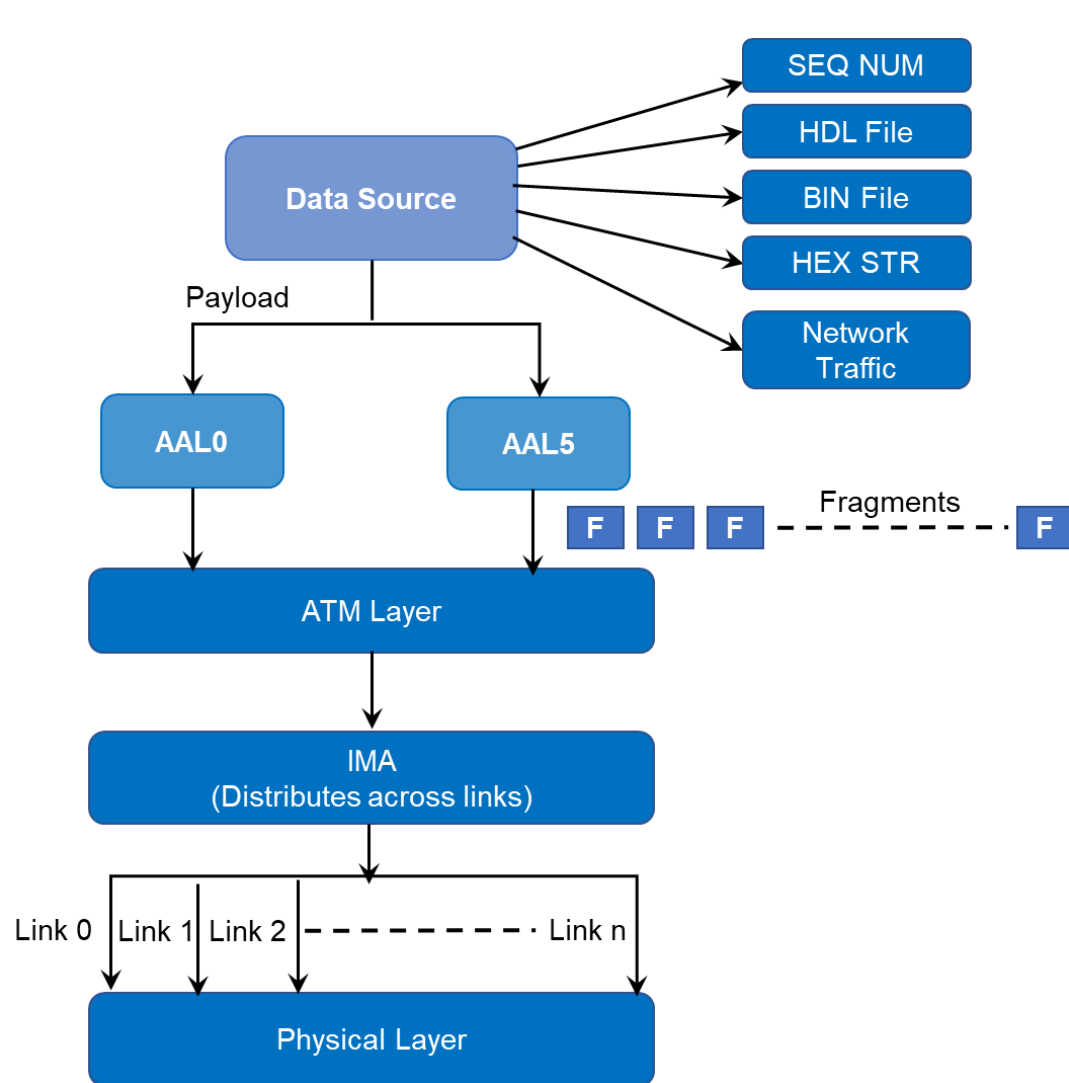
The screenshot shows the configuration dialog for AAL 0,5. It is divided into two main sections: TX params and RX params. Both sections have a Source Type dropdown menu set to 'SEQNUM'. Below this, there is a Source Parameters dropdown menu with a red box around it, containing the options: SEQNUM, HDLFILE, BINFILE, HEXSTR, and NETWORK TRAFFIC. The 'Order' is set to 'MSB', 'Start' is '0', and 'Increment' is '1'. There are checkboxes for 'Prefix Header' and 'Duration Spec'. Under 'Duration Spec', 'Continuous transmission' is selected. 'Payload Len' is set to '1500'. At the bottom, there are buttons for 'Start Tx', 'Start Rx', 'Start All Tx', and 'Start All Rx'.

AAL 2

The screenshot shows the configuration dialog for AAL 2. It is divided into two main sections: TX params and RX params. Both sections have a Source Type dropdown menu set to 'SEQNUM'. Below this, there is a Source Parameters dropdown menu with a red box around it, containing the options: SEQNUM, HDLFILE, BINFILE, and HEXSTR. The 'Order' is set to 'MSB', 'Start' is '0', and 'Increment' is '1'. At the bottom, there are buttons for 'Start Tx', 'Start Rx', 'Start All Tx', and 'Start All Rx'.

- Tx parameters are used to generate the ATM traffic and Rx parameters are used as reference to verify the received frames. The results of the verification are displayed in Tx/Rx Verification tab

Transmit and Receive Function



VC Statistics

AAL0, AAL5

IMA Emulator - IMA Simulation - test

File Action Help

Server Connection Status ●

IMA Group	Status
1	Operational
2	Operational

Reset

VC	Tx Frames	Tx Frags	Tx Octets	Rx Frames	Rx Frags	Rx Octets	Lost Frags
100:200	5393	172576	8283648	5168	165376	7938048	0
101:201	5361	171552	8234496	5135	164347	7888656	0
Total	10754	344128	16518144	10303	329723	15826704	0

AAL Type 2

IMA Emulator - IMA Simulation - Untitled

File Action Help

Server Connection Status ●

IMA Group	Status
1	Operational
2	Operational

IMA Id

Add Delete

Open Close

Reset

VC	Tx Frames	Tx Frags	Tx Octets	Rx Frames	Rx Frags	Rx Octets	Lost Frags
101:201:1	10731	364854	19906005	10733	364922	19909715	0
101:201:2	10732	364888	19907860	10733	364924	19909821	0
Total	21463	729742	39813865	21466	729846	39819536	0

- The Statistics for each of the added VCs are available in VC Statistics tab. It shows the VC statistics for the selected IMA group
- The statistics include:
 - Number of Transmitted , Received frames, Fragments, Octets, and Lost fragments

Tx/Rx Verification

AAL0, AAL5

IMA Group	Status
1	Operational
2	Operational

Reset

VC	Tx Cnt	Rx Cnt	Matched Cnt	Modified Cnt	Inserted Cnt	Deleted Cnt
100:200	21376	21378	21378	0	0	0
101:201	21377	21378	21378	0	0	0
Total	42753	42756	42756	0	0	0

AAL Type 2

IMA Group	Status
1	Operational
2	Operational

IMA Id | 3

Add Delete

Open Close

Reset

VC	Tx Cnt	Rx Cnt	Matched Cnt	Modified Cnt	Inserted Cnt	Deleted Cnt
101:201:1	8964	8964	8964	0	0	0
101:201:2	8964	8964	8964	0	0	0
Total	17928	17928	17928	0	0	0

- The results of the verification for each of the added VCs are available in Tx/Rx Verification
- The statistics include:
 - The Number of VCs Created, Transmitted Frame Count, Received Frame Count, Matched Frame Count, Modified Frame Count, Deleted Frame Count, and Inserted Frame Count

IMA Group Config and Statistics

- Group Statistics will show statistics of transmitted frames, received frames, transmitted octets, and received octets for a selected IMA group
- User can enable or disable ICP for an IMA Group
- User selectable IMA frame size can be applied for the selected Group
- Group Symmetry Modes, by default it supports only Symmetrical Config and Operation

Server Connection Status ●

IMA Group	Status
1	Operational
2	Operational

Link View | Action | VC Statistics | Tx/Rx Verification | IMA Config & Statistics

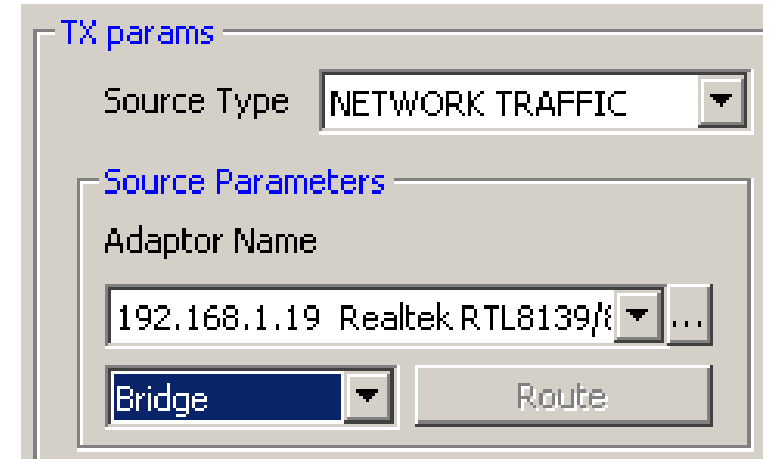
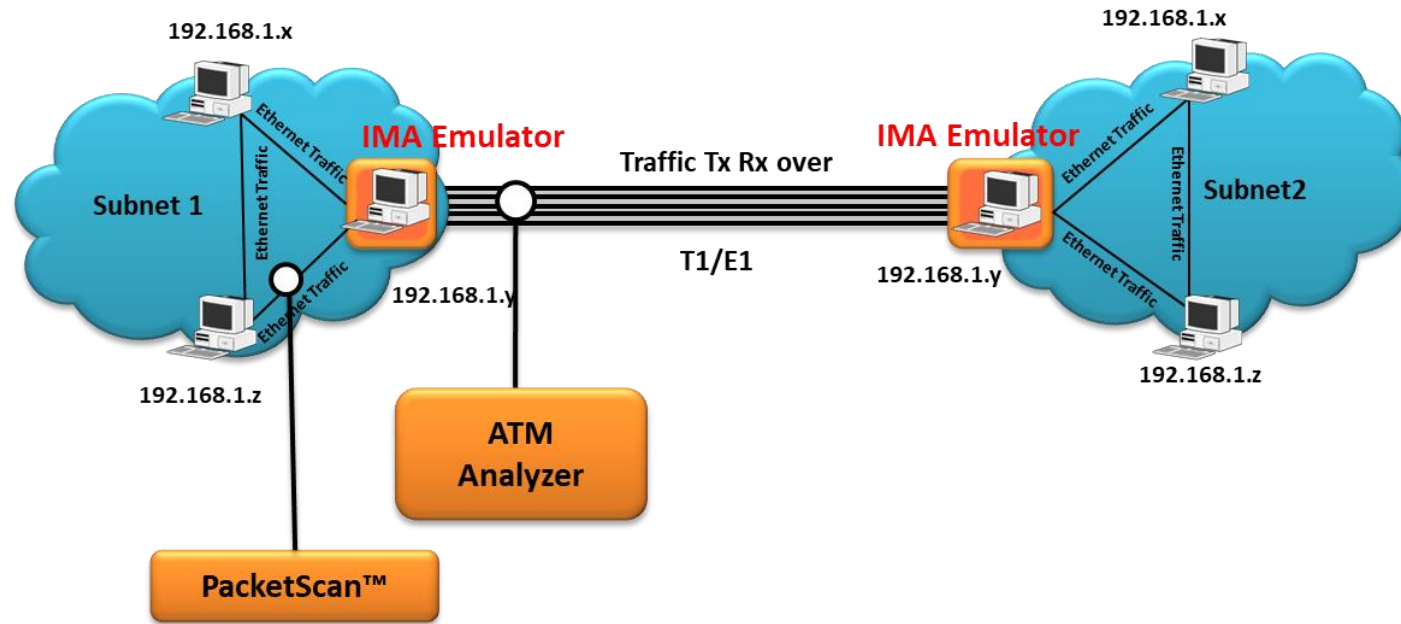
IMA Group Statistics

Number of Frames transmitted	2361	Reset
Number of Frames Received	2040	
Number of Octets transmitted	3541500	
Number of Octets received	3060000	

IMA Group Config

ICP	Enable
IMA Frame Length	128
Group Symmetry Modes	Symmetrical Config & Operation

IMA Emulator in Bridge Mode



- When the emulator is configured to act as bridge between two networks, all traffic received from the network is encapsulated into AAL5 and the ATM cells are streamed over T1 E1 links
- The Emulator on another network removes ATM header, converts to Ethernet and streams to the destination

Thank you