

**Portable Quad Port USB-based  
10/100/1000 Ethernet/IP Tester**

**4 Electrical + 2 Optical Ports**

**BERT and RFC 2544 over  
Layer2 through Layer4**

**Wire speed BERT on all Ports**

**Industry Standard PRBS  
Patterns ( $2^9-1$  to  $2^{31}-1$ )**

**Throughput, Latency, Frame  
Loss Rate, & Back-to-Back  
Measurements - RFC 2544**

**Supports Stacked VLAN (QinQ)  
up to 3 Levels**

**Supports Stacked MPLS (up to  
3 Levels)**

**User-defined VLAN ID, and  
MPLS Labels**

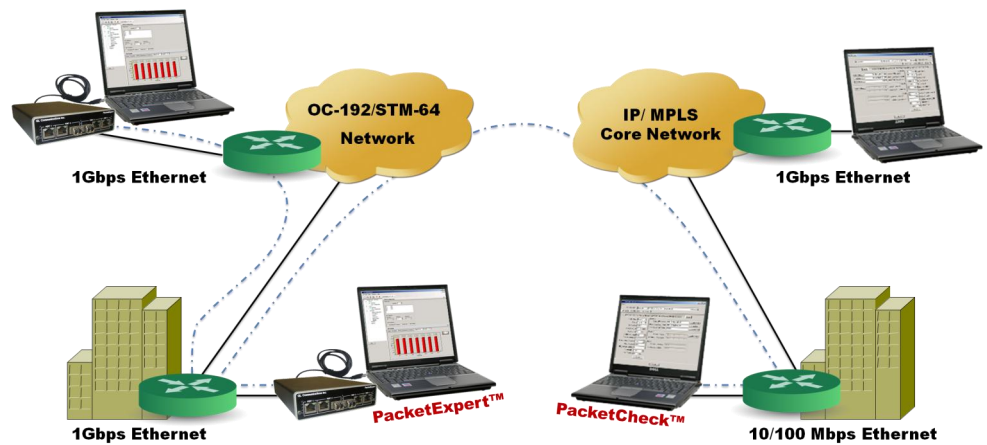
**Report Generation in PDF &  
CSV Formats**

**Manual and Smart Loopback**

**Graphical Display for Easy to  
Visualize Test Results**

**Console & WCS based  
Command Line Interface**

## PacketExpert™ - Quad Port Ethernet / IP Tester



### Overview

GL's PacketExpert™ is a portable (USB based) Quad Port Ethernet /VLAN /MPLS /IP /UDP Tester with 4 Electrical Ethernet ports (10/100/1000 Mbps) and 2 Optical Ports (1000 Mbps). The PacketExpert™ connects to a Notebook PC through a USB 2.0 interface. Each port provides independent Ethernet/VLAN/MPLS/IP/UDP testing at wire speed for applications such as BERT, RFC 2544, and Loopback.

PacketExpert™ truly takes confusion out of Ethernet testing at all protocol layers - from Layer1 frames to IP/UDP packets. It can be used as a general purpose Ethernet performance analysis tool for 10/100 Mbps and 1Gbps Ethernet local area networks (LAN) and wide area networks (WAN). Two of the 4 ports have both Electrical and optical interfaces, enabling testing on optical fiber links as well.

With the capability to generate/receive traffic with stacked VLAN (Q-in-Q) and stacked MPLS, PacketExpert™ finds use in testing a wide range of networks – from testing individual links/switches, testing local Ethernet/IP networks (LAN), end-to-end testing of Wide Area Networks, testing Core/MPLS networks, and much more.

PacketExpert™ supports wire speed BERT, RFC 2544 testing, and Smart Loopback over Framed Ethernet (Layer2), Stacked VLAN (Q-in-Q), Stacked MPLS (Layer 2.5), IP and UDP. Also, BERT and Loopback testing are supported over Layer 1. The detailed statistics and reports can be generated for any tests conducted. The results are displayed in tabular as well as graphical format. For detailed information on PacketExpert™, visit <http://www.gl.com/packetexpert.html>

### Main Features

- Capable of generating/receiving Ethernet to IP traffic at wire speed.
- Supports Loopback, allowing for easy test setup.
- Easily control multiple hardware units from a single GUI, multiplying the number of ports available per system.
- Remote access with Console based CLI as well as GL's WCS based CLI.
- Wire speed BERT (full duplex) on all the ports simultaneously over Layer1, Framed Ethernet (Layer2), Stacked MPLS (Layer2.5), Stacked VLAN (Q-in-Q), IP and UDP.
- Throughput, back-to-back, latency and frame loss testing as per RFC 2544 for unidirectional and bidirectional traffic between ports.
- User selectable Electrical and/or Optical interface for Port2 and Port3.
- Support for BERT, RFC 2544 and Loopback testing with stacked VLAN (Q-in-Q)-unto 3 levels, stacked MPLS– unto 3 levels, and over IPv6.
- Supports industry standard PRBS patterns ( $2^9-1$ ,  $2^{11}-1$ ,  $2^{15}-1$ ,  $2^{20}-1$ ,  $2^{23}-1$ ,  $2^{29}-1$ ,  $2^{31}-1$ ), constant patterns like all ones, all zeroes, alt ones-zeroes and user-defined test patterns up to 32 bits.
- Optional sequence number insertion allows detecting out-of-sequence and packet lost.
- Error Insertion capability - Single as well as constant rate Bit Error and FCS Error Insertion.
- Support for frame lengths from 64 bytes to Jumbo frames (unto 2048 bytes).
- User defined header parameters for MAC, VLAN, MPLS, IP and UDP layers.
- Supports PDF & CSV Test Report Generation.



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## Wire speed BER Testing with Traffic Generation

Wire speed BERT measures Bit Error Rate on Layer1, Framed Ethernet (Layer2), Stacked VLAN (Q-in-Q), Stacked MPLS (Layer 2.5), IP and UDP layers.

Supports generating various PRBS patterns such as  $2^9-1$ ,  $2^{11}-1$ ,  $2^{15}-1$ ,  $2^{20}-1$ ,  $2^{23}-1$ ,  $2^{29}-1$ ,  $2^{31}-1$ , including constant patterns such as All Ones, All Zeroes, Alternate Ones-Zeroes and user-defined test patterns ranging from 1 bit to 32 bits. Selection of optional sequence number insertion allows detection of out-of-sequence packets and packet loss. Rx Config includes an option to process received packets for FCS errors. BERT can be run simultaneously on all ports or can be combined with Loopback to run BERT. In addition, the PacketExpert™ also allows sending traffic of specific frame length and rate.

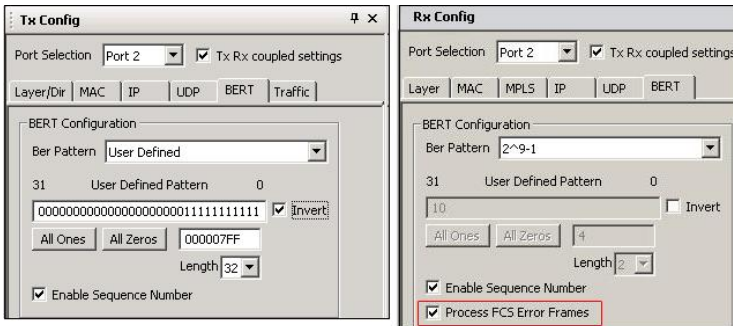


Figure: BERT payload with various PRBS patterns

## Wire speed BERT Results (with LEDs and Graph)

PacketExpert™ analyzes the received BER pattern and provides various vital measurements such as Bit Error Rate, Bit Error Count, Bit Error Seconds, Sync Loss Count, Sync Loss Seconds, Error Free Seconds, No Rx Data Count/Seconds, and Bert Status. It also gives a real time graphical representation of the Bit Error count, plotted over time as shown in figure below. Supports Test Report Generation in PDF and CSV file formats.

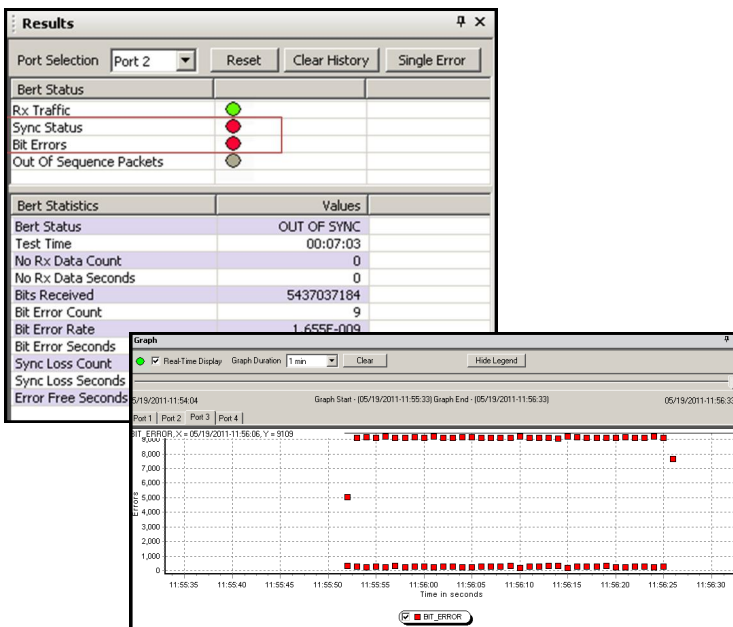


Figure: BERT Results (with LEDs) and Graph

## RFC 2544 Testing

PacketExpert™ supports Throughput, Latency, Frame Loss, and Back-to-Back tests as specified in RFC 2544. Similar to BERT, RFC 2544 can be done over Framed Ethernet (Layer2), Stacked VLAN (Q-in-Q), Stacked MPLS, IP and UDP. It includes various parameter configurations such as Test Selection, Frame Sizes, Unidirectional/Bidirectional, Number of Trials, Trial Duration, and many more. User-defined options to configure various packet header parameters like, MAC addresses, IP addresses, UDP ports, VLAN ID, MPLS Labels, and others.

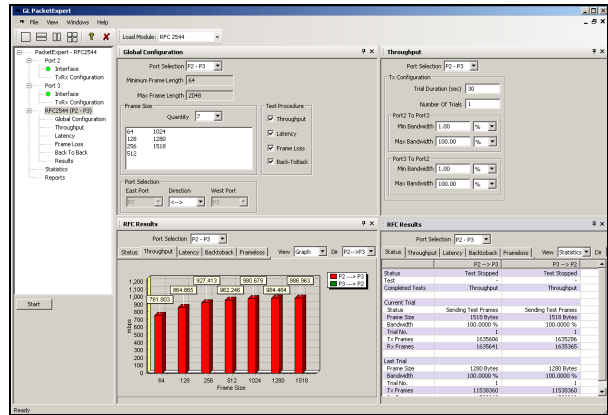


Figure: RFC 2544 Configurations

## RFC 2544 Test Results

Results are displayed in both tabular as well as graph format. Supports test report generation in both PDF and CSV formats.

**Status** – displays test status such as In Progress, Completed, and Aborted. In addition, it displays status of learning frames and test frames for the current trial along with Bandwidth, Frame Size, and Frame Count.

**Throughput** – Throughput results are displayed in terms of bandwidth (both in percentage as well as Mbps) for each frame size. Graphically, it is plotted as throughput vs frame size.

**Latency** – Latency values are displayed in terms of microseconds for each frame size. Graphically, the latency value is plotted against frame size.

**Back-to-Back** – Back-to-Back values are displayed in terms of the burst size (in milliseconds) for each frame size. Graphically, the burst size is plotted against frame size.

**Frame Loss** – Frame Loss results are displayed in terms of the throughput (in percentage) measured over the range of input rates (in percentage) for each frame size. Graphically, for each frame size, the throughput is plotted against the test rate.

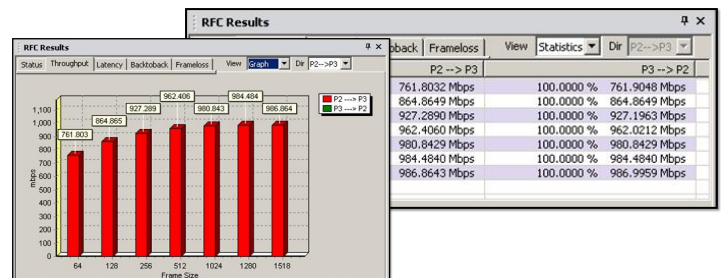


Figure: RFC 2544 Tabular and Graph Results



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## Link Status and Configuration

Hardware Interface details are displayed independently per port. It includes:

- Hardware MAC address
- Link status
- Current Operating Mode (Electrical/Optical)
- Auto Negotiated Status and Link Speed
- Duplex Mode
- Flow Control

Users can put the port to either Electrical or Optical operating mode. Also, users can opt for Auto negotiated speed or force the speed to one of 10/100/1000 Mbps. Default IP address settings for the port can be configured.

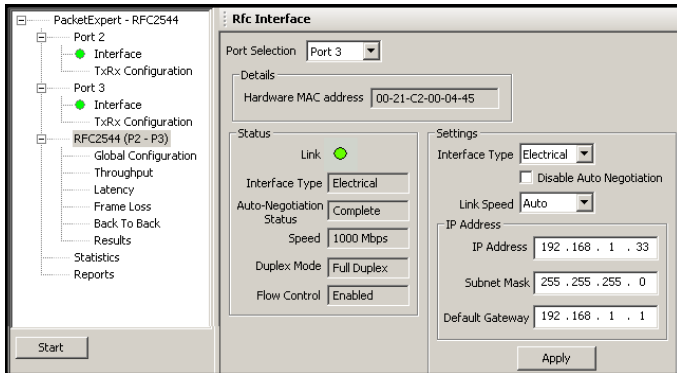


Figure: Interface Dialog & Link Status

## Packet Configuration over Ethernet [Layer2], Stacked VLAN (Q-in-Q)

BERT and RFC2544 testing over Layer2 allows configuration of Source & Destination MAC Addresses (6 byte hex format), Len/Type field, and VLAN parameters.

PacketExpert™ supports up to 3 level stacked VLANs (Q-in-Q) headers. User can enable VLAN stacks and configure the required stack levels (from 1 to 3, numbered VLAN#1, VLAN#2, and VLAN#3). For each VLAN tag, user can specify the VLAN Type Field, VLAN Id and Priority.

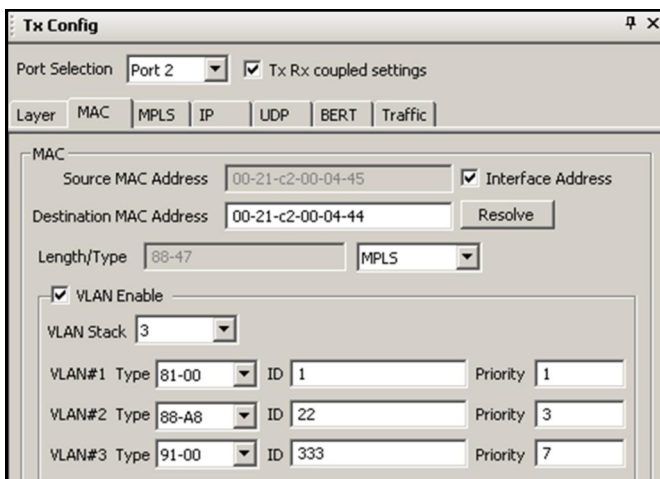


Figure: MAC with Stacked VLAN Configuration

## Packet Configuration over MPLS [Layer 2.5]

PacketExpert™ supports BERT & RFC2544 testing over stacked MPLS (Layer 2.5). Up to 3 stacked MPLS headers can be configured. MPLS (Multi Protocol Label Switching) works by prefixing packets with an MPLS header, containing one or more "labels". This is called a label stack.

User can specify MPLS Label ID, CoS (*class of service*) bits and TTL field for each MPLS level (MPLS#1, MPLS#2 and MPLS#3).

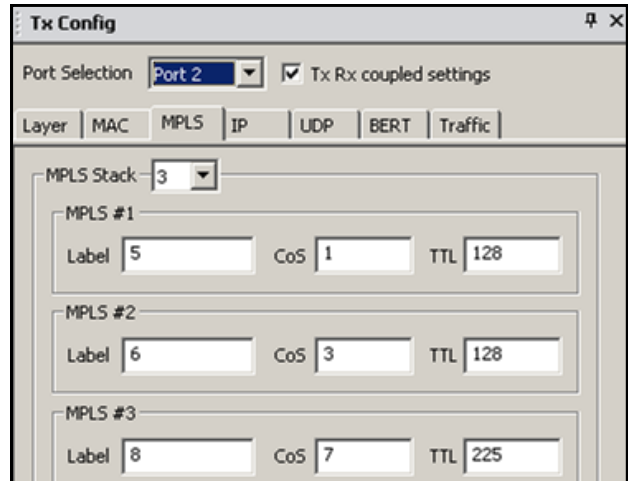


Figure: Stacked MPLS Layer Configuration

## Packet Configuration over IP and UDP

PacketExpert™ allows users to configure Ethernet/MPLS/IP/UDP header parameters, including stacked VLAN IDs, stacked MPLS labels, Frame Size, and Rate.

Users can edit various packet header parameters at Layer2 (framed Ethernet), Layer 2.5 (stacked MPLS), Layer3 (IP) & Layer4 (UDP) for both BERT and RFC 2544 testing.

**[Layer 3] - IP** - allows Source and Destination IP Addresses. Users can configure various IP header fields like TOS, TTL, Protocol, Header Checksum, and Identification field.

**[Layer 4] - UDP** - allows Source and Destination UDP ports to be defined. User can choose to allow hardware to calculate/verify checksum or provide a fixed value.

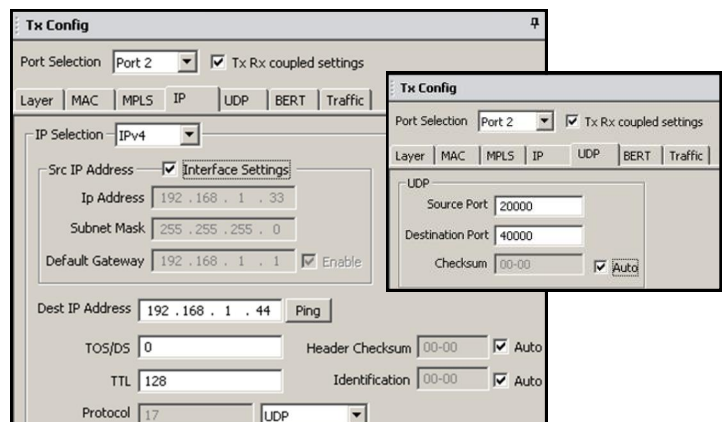


Figure: IP & UDP Layers Configuration



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## Tx and Rx Frame Statistics

Detailed statistics per port are provided. In addition to statistics like Frame Count, Frame Rate, others are provided based on various categories like Frame Type (Unicast/Broadcast/Multicast, VLAN), frame lengths (64, 65-127, 1024-1518, Oversized, Undersized), Protocol Type (IPv4, IPv6, UDP, TCP, ICMP, IGRP, etc). VLAN Statistics (per Stack position), MPLS Statistics (per stack position) are also displayed for the configured stacks.

Description	Tx	Rx
Valid Frames	979458	979458
Number of Bytes	62674880	62669520
Rate (Mbps)	7.625	7.701
Frame Rate (Frames/Sec)	14880	15106
Broadcast Frames	0	0
Multicast Frames	0	0
Control Frames	0	0
VLAN Frames	979397	0
Pause Frames	0	0
Wrong Opcode Frames	0	0
64 Byte Length Frames	979450	979857
65-127 Byte Length Frames	0	0
128-255 Byte Length Frames	0	0
256-511 Byte Length Frames	0	0
512-1023 Byte Length Frames	0	0
1024-1518 Byte Length Frames	0	0
Oversized Frames	0	0
Undersized Frames	0	0
FCS Error Frames	0	0
Non Test Frames	0	0
Non Test VLAN Frames	0	0
Non Test MPLS Frames	0	0
1 Level Stacked VLAN Frames	0	0
2 Level Stacked VLAN Frames	0	0
3 Level Stacked VLAN Frames	0	980193
1 Level Stacked MPLS Frames	0	980207
2 Level Stacked MPLS Frames	0	0
3 Level Stacked MPLS Frames	0	0
IPv4 Checksum Errors	0	61440
IPv4 Packets	0	61440
IPv6 Packets	0	61440
IP Non Test Packet	0	0
IP in IP Packet	0	3797
UDP in IP Packet	0	3788
TCP in IP Packet	0	3791
ICMP in IP Packet	0	3788
IGMP in IP Packet	0	3789
IGRP in IP Packet	0	3807
Other Protocols in IP Packet	0	957662
UDP Checksum Errors	0	7510
UDP Packets	0	7510
UDP Non Test Packets	0	0

Figure: Statistics

## Specifications

### Interfaces:

- 2 x 10/100/1000 Base-T Electrical only
- 2 x 1000 Base-X Optical OR 10/100/1000 Base-T Electrical
- Single Mode or Multi Mode Fiber SFP support with LC connector

### Protocols:

- RFC 2544 compliance

### Bus Interface:

- USB 2.0

### Power:

- +9 volts, 2.2 Amps

### Physical Specification

- Length: 8.45 in. (214.63 mm)
- Width: 5.55 in. (140.97 mm)
- Height: 1.60 in (40.64 mm)
- Weight: 1.66 lbs. (0.75 kg)

## Buyer's Guide

[PX100](#) – PacketExpert™

[PX104](#) - With Delay (Coming Soon)

[PX106](#) - Wirespeed frame capture and analyzer (Coming Soon)

Refer <http://www.gl.com/packetexpert.html> webpage.

## Loopback Testing

PacketExpert™ has All ports/2 ports Loopback capability. PacketExpert™ supports Layer-wise Loopback as well as Smart Loopback. Supported Loopback types are -

- **Smart Loopback** - Analyses incoming traffic, automatically detects and swaps Source and Destination MAC, IP, and UDP addresses before sending back the packet.
- **Layer 1** – Loops back incoming packets as is
- **Ethernet** – Swaps Source and destination MAC addresses before sending back the packet.
- **IP** – Swaps Source and destination MAC addresses, IP addresses before sending back the packet.
- **UDP** - Swaps Source and Destination MAC addresses, Destination IP addresses, and UDP ports before sending back the packet.

## Command Line Interface (CLI)

PacketExpert™ is enhanced to support Command Line Interface (CLI) to access all the functionalities remotely via 3 different modes such as Console based CLI, Client-server CLI, and WCS based CLI.

The CLI supports all the PacketExpert™ test modules which are - All Port Bert, Bert Loopback, All Port Loopback, and RFC 2544.

The client-server based CLIs are useful for automation, where the commands need to be called from a different third-party application. In console based cli, both client and server must run on the same PC. But with GL's WCS based CLI, client can remotely send commands to PacketExpert™ server.

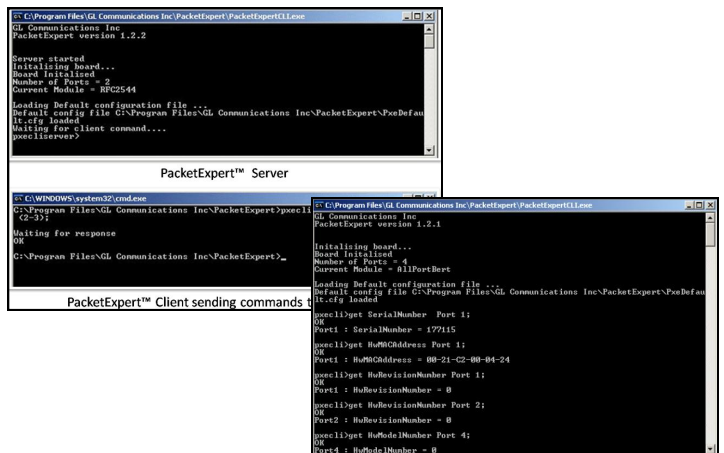


Figure: Console based Command Line Interface (CLI)

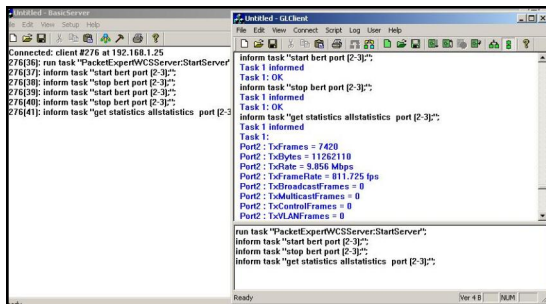


Figure: Windows based Client Server



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