

# IxVerify – Industry’s Only Solution Purpose-Built for Pre-Silicon Testing

## Problem: Complexity of Verifying Ethernet Networking Chips Before Tape-Out

Trends such as cloud computing, mobile edge computing, and 5G are pushing the boundaries of network capacity. To support this demand, network equipment and semiconductor manufacturers need to keep up by delivering ultra-high-density devices powered by state-of-the-art application-specific integrated circuit (ASIC) and system-on-a-chip (SoC) solutions.

Producing a SoC capable of handling terabits of traffic across hundreds of ports at speeds up to 400Gbps, is a costly and lengthy process. And with increased time-to-market pressures, all semiconductor and systems manufacturers are looking to optimize their development cycles. The costs associated with fixing bugs after chip tape-out are substantial and can easily be millions of dollars. To de-risk schedules, Ethernet testing needs to happen early and often in the chip lifecycle.

## Solution: Virtualized, Scalable, and Automated Chip Testing

Introducing IxVerify, the industry’s only test solution purpose-built for pre-silicon verification.

With IxVerify, Ixia and its partners are leading the way in transforming the EDA market by offering virtualized test solutions that work in conjunction with next-generation verification flows—leveraging virtualization to reduce costs and offer increased flexibility.

**IxVerify extends Ixia’s intellectual property and test expertise into the EDA space. It enables new and improved test methodologies to simplify pre-silicon testing and shifts testing ‘further-left’ into the chip lifecycle.**

## Highlights

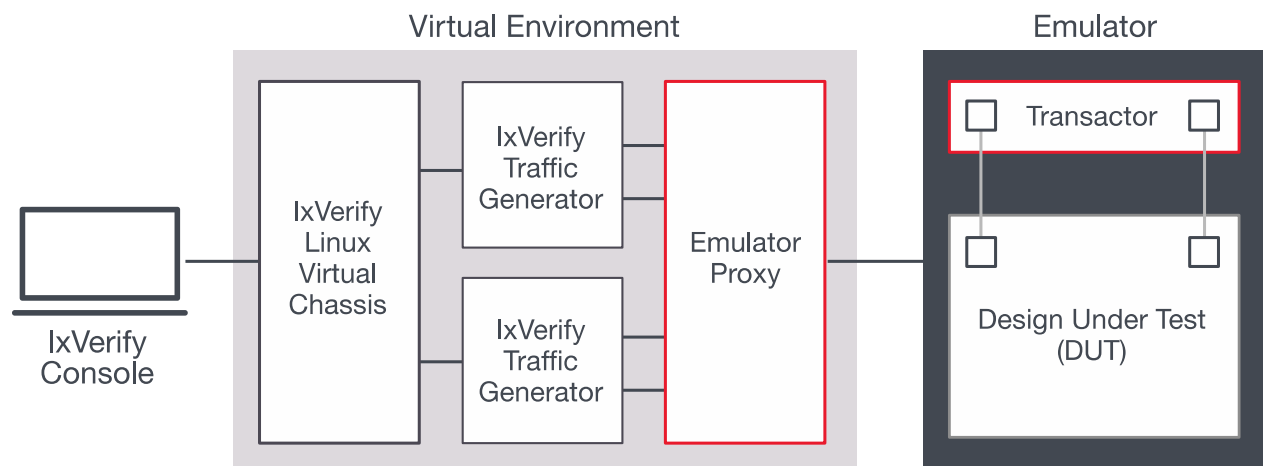
- Verify networking chip design earlier in the development cycle
- Generate custom Ethernet traffic by using predefined packet templates
- Leverage powerful statistics with bandwidth analysis and latency measurements
- Ensure zero packet loss with dynamic traffic rate shaping via backpressure
- Share test configurations between IxVerify and IxNetwork VE
- Automate tests using multiple languages, including REST API
- Support multiple users with flexible test environment definition
- Enable faster time to market for next-generation networking chips

**IxVerify** <sup>VE</sup>

IxVerify provides hundreds of predefined packet templates for testing Ethernet and TCP/IP protocols and is capable of generating high volumes of traffic. With its ability to run hundreds of virtualized test ports at once, it offers the unique ability to verify the largest chip designs with dynamically shaped traffic, ensuring zero packet loss at maximum emulation speeds.

IxVerify is the EDA-focused version of Ixia's award-winning IxNetwork VE Layer 2/3 test solution, and as a result, test configurations can be reused to test from the earliest stages of chip design and verification through post-silicon quality assurance (QA).

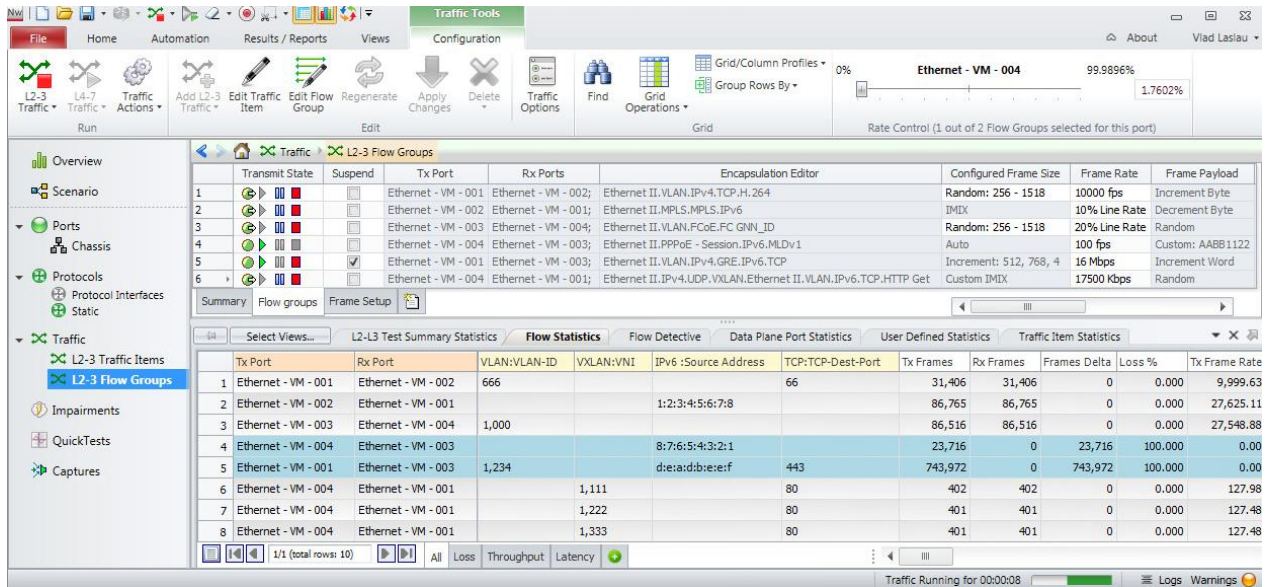
IxVerify is the perfect solution for de-risking complex networking chips to ensure faster time to market for the next generation of networking devices.



IxVerify deployment in an emulation-based design verification environment

## Key features

- Generate custom Ethernet traffic with hundreds of predefined packet templates
- Powerful statistics, including bandwidth analysis and latency measurements based on emulation time
- Unique dynamic traffic shaping via back-pressure ensures zero packet loss
- Share test configurations between IxVerify and IxNetwork VE for both pre-silicon and post-silicon testing
- Full automation capabilities with REST, TCL, Perl, Python, and Ruby API support
- Flexible virtual test environment with support for multiple users
- Support for Ixia's IxNetwork and IxExplorer for L2/3 traffic generation and analysis



IxVerity real-world traffic and analysis

## Specifications

IxVerity features, functions, and capacities for the Ixia Virtual Chassis and Virtual Load Modules.

Feature	Virtual Chassis	Virtual Load Module
<b>Maximum # of Virtual Ports</b>	128	32
<b>Maximum # of Virtual Load Modules</b>	32	N/A
<b>Guest OS</b>	CentOS 7	CentOS 6.3 / Linux 3.10 enhanced kernel
<b>Distribution/Packaging</b>	QCOW2	QCOW2
<b>Hypervisor and Host OS</b>	<ul style="list-style-type: none"> <li>• KVM over CentOS 7.X</li> <li>• KVM over Ubuntu 14.04 LTS</li> </ul>	
<b>Network Connection and vNIC Driver</b>	Virtual Switch (with customized VIRTIO driver)	

## Network packet templates

To validate traffic performance, IxVerify formulates and transmits a wide variety of Ethernet packet types, including custom packets.

OSI Layer	included Packet Templates
<b>Layer 2</b>	Create any custom Ethernet II packet
<b>Layer 3</b>	IPv4, IPv6, AMT, CGMP, DDP, GRE, GTPu, ICMP, IGMP, IPX, IS-IS, L2TP, Minimal IP, MLD, Mobile IPv6, NVGRE, OSPF, PIM, RGMP, RSVP, RTMP, VXLAN, custom
<b>Layers 4-7</b>	TCP, UDP, BFD, DHCP, HTTP, IMAP, iSCSI, L2TP, LDP, LISP, MobileIP, MSDP, POP, PTP, RIP, RTP, RTSP, SMTP, TDS, custom

## Traffic

IxVerify supports traffic generation and measurement that ensures precision and performance. The sophisticated traffic generator is also tightly integrated with the control-plane protocols.

Traffic Generator	Specification	
<b>Configuration</b>	<ul style="list-style-type: none"> <li>Advanced Traffic Wizard—step-by-step wizard-assisted traffic configuration</li> <li>Quick FlowGroup—granular control of packet sequence and variations</li> </ul>	
<b>Scale</b>	<ul style="list-style-type: none"> <li>Generate up to 4 million trackable flows using IxNetwork application</li> <li>Configure up to 16,000 unique Flow Groups—each supporting a unique transmit profile</li> <li>Up to 256 Flow Groups per-port</li> <li>Up to 4,096 trackable receive flows per port</li> </ul>	
<b>Dynamic Controls</b>	Change frame rate and frame size on the fly	
<b>Traffic Types</b>	IPv4, IPv6, MPLS multi-labels, Ethernet, VLAN, provider bridges (Q-in-Q), provider backbone bridges (MAC-in-MAC), PPP, L2 MPLS VPN, L3 MPLS VPN, VPLS, 6PE, 6VPE, multicast, multicast VPN	
<b>Source/Destination Ports Mapping</b>	One-to-one, many-to-many, fully meshed	
<b>Routes Mapping between Peer Ports</b>	One-to-one, fully meshed	
<b>Flow Grouping</b>	Build flow groups based on packet content (e.g., QoS or VLAN ID)	
<b>Traffic Profile</b>	Frame size	Fixed, increment, random, IMIX, custom IMIX, Quad Gaussian distribution, auto
	Rate	percent line rate, packets/sec, L2 bit rate (bps, Bps, KBps, MBps)

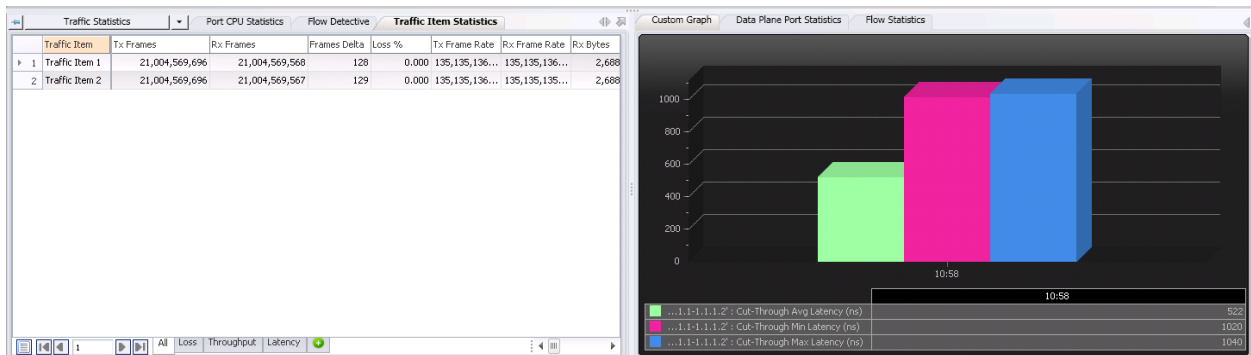
Traffic Generator	Specification	
	Payload pattern	Increment byte/word, decrement byte/word, random, custom
	QoS	TOS, DSCP, IPv6 traffic classes, 802.1p, MPLS EXP
<b>Per-Flow Traffic Tracking</b>	Single or multi-field tracking of any field including: QoS (TOS/DSCP), VLAN, source MAC address, destination MAC address, source IP address, destination IP address, MPLS label, MPLS flow descriptor, streams, Src/Dst IP pair, Src/Dst MAC pair, custom packet tracking	
<b>Real-Time Flow Filtering and Flow Detective</b>	Real-time filtering of flows based on tracking settings with user defined criteria. Single out best/worst performing flows based on Rx count, min/max/average latency, timestamp, real-time packet loss using sequence	
<b>Flow Control</b>	Custom flow control ensures zero packet loss	
<b>Packet Editor</b>	Header field value editing	
	Add tracking	Increment, decrement, list, user defined, default, link/unlink with other header fields
	Payload editing	Track user defined traffic flows
	Custom editing	Increment byte/word, decrement byte/word, repeat, fixed, user defined

Measurement	Specification
<b>Loss</b>	Track Tx frames, Rx expected frames, Rx frames, Rx bytes frame delta loss %
<b>Rate</b>	Tx frame rate, Rx frame rate, Rx rate (bps, Bps, Kbps, Mbps)
<b>Latency</b>	Cut-through latency measurements, calculated by the chip emulator
<b>Sequence</b>	Small error, big error, reverse error, last sequence number, duplicate frames, sequence gaps
<b>Time Stamps</b>	N/A
<b>Packet Loss Duration</b>	Estimated time without received packets calculated by frames delta at the expected Rx rate

## Test results — statistics viewer

IxVerify uses the IxNetwork statistics viewer for viewing and analyzing real-time results and generating test reports.

- Aggregate statistics are displayed hierarchically, with the ability to drill down to group-level and flow-level statistics
- Different modes to view traffic statistics—Instantaneous, Cumulative, or both
- CSV files can be used to capture a single results view or, at the global level, to capture all results in real-time; an integrated CSV viewer is provided to view large-result files

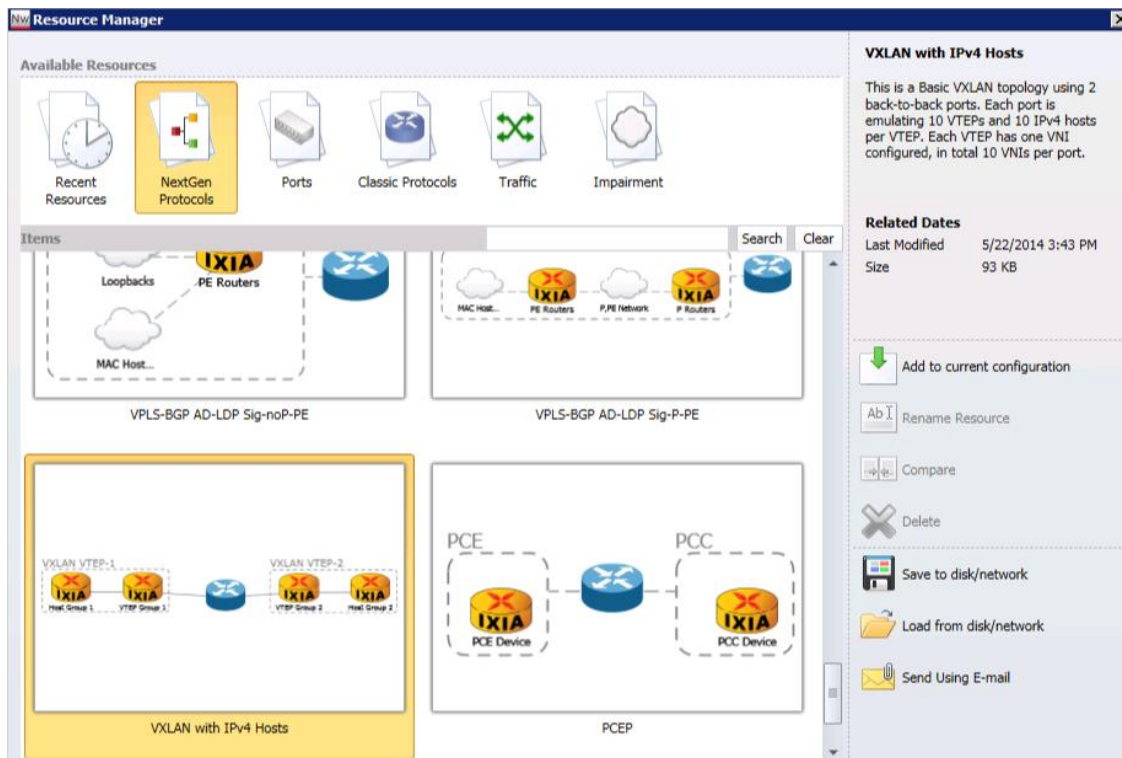


Statistics Viewer

Function	Statistics
<b>Global Protocol</b>	Port-level protocol counters
<b>Port</b>	Port mode, speed, frame and data rate, OAM statistics
<b>Tx-Rx Frame Rate</b>	Tx-Rx frame rate graph
<b>Port CPU</b>	Port CPU utilization and statistics
<b>Data Plane Port</b>	Port-based frame counts and rate excluding control-plane traffic
<b>Traffic Item</b>	Statistics provide an aggregate of all the flows in the Traffic Item
<b>User Defined</b>	User-defined view is used for drill-down to user-defined tracking options
<b>Flow Statistics</b>	Flow-level measurements
<b>Flow Detective</b>	Filtering and sorting based results

## Resource manager

Often expertise for different protocols lies within different members of a testing team. A common pain-point for our customers was the lack of a collaboration tool to aid them in incrementally building configurations. With the Resource Manager, users can now piece-meal their configurations together. The Resource Manager allows users to save different pieces of their configurations, like protocols and traffic elements, and then build a configuration by re-using saved elements in their current configuration.



## Resource Manager

It also allows users to clearly see changes made to their resources/configurations by using a “diff” functionality within the application. Using the Resource Manager is a powerful way to collaborate and quickly build expertise with a team.

## Reports

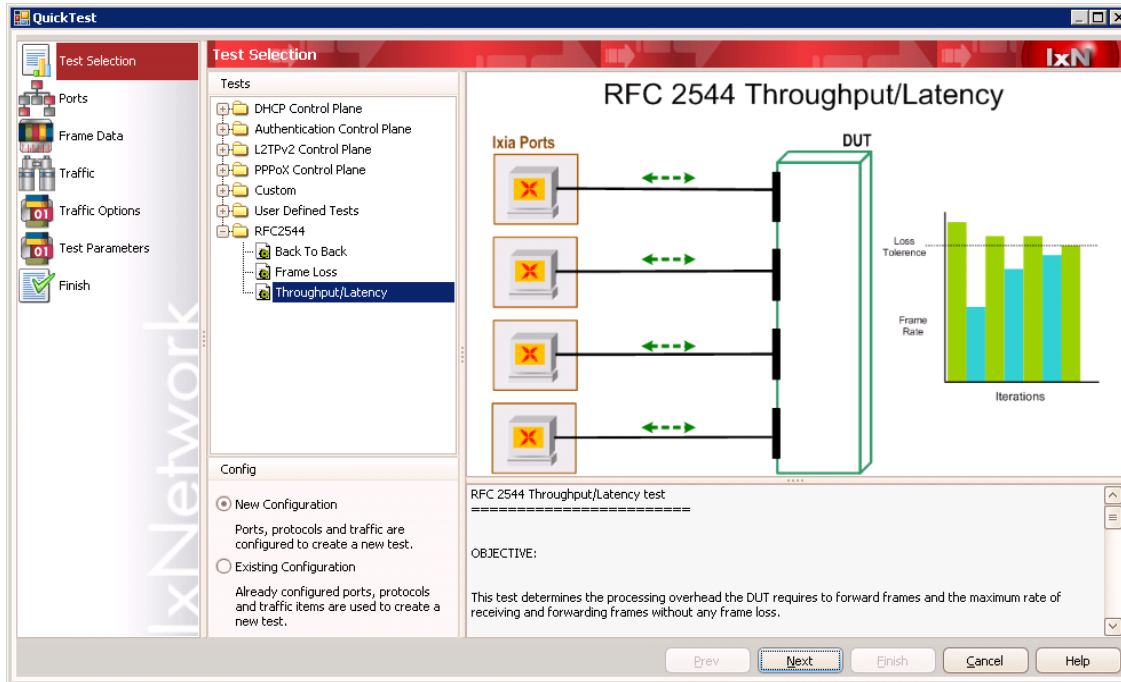
Building a test-results report requires test data. IxReporter introduces a new database, referred to in the application as an “object model.” The object model is populated with the test configuration parameters and the test results. All of these “objects” can be included in a report, usually in a table or chart. With this powerful concept, tables and charts can be created that combine statistics and configuration information as well as have multiple protocols.

## Automation

IxVerify uses IxNetwork's powerful GUI-based automation—Test Composer™ and QuickTests™. It also has a robust feature set for GUI-to-script and API-based automation. Test scenarios are set up using a step-by-step GUI, and then a single button-press generates a Tcl test script. Scripts may be modified and combined in any fashion. When the script is run, the IxNetwork GUI watches the execution – providing real-time statistics and state information.

Types	Test Requirement	Detail
<b>QuickTest</b>	Scalability	<ul style="list-style-type: none"><li>• Standards-based IETF RFC test methodologies, as well as a custom mode for user-defined performance tests</li><li>• Easy-to-use, configurable, pre-packaged tests</li><li>• Generate detailed reports of results</li></ul>
<b>Macro Recorder</b>	Functionality	<ul style="list-style-type: none"><li>• “Click-thru automation” means no more scripting</li><li>• Rapid capture of manual test cases</li><li>• Capture steps that cause a failure for reproducibility</li></ul>
<b>Test Composer and Tweakables</b>	Regression	<ul style="list-style-type: none"><li>• GUI-based solution to automate test actions</li><li>• Detailed control over test execution without Tcl expertise</li><li>• Complete access to the Tcl API with easy UI</li><li>• Edit “Macro Recorded” steps for customization of GUI captured events</li></ul>
<b>ScriptGen</b>	Regression	<ul style="list-style-type: none"><li>• Provides an easy, one-click GUI-to-script generation</li></ul>
<b>Low-Level and High-Level APIs</b>	Functionality and regression	<ul style="list-style-type: none"><li>• For Tcl scripting experts</li><li>• One-click GUI to Tcl script conversion available (Scriptgen)</li><li>• Complete access to and control over test configuration</li><li>• REST, Tcl, Perl, Python, and Ruby API support</li></ul>





QuickTest end-to-end wizards

QuickTest	Tests
<b>RFC 2544 Tests</b>	Throughput and latency, frame loss, back-to-back
<b>RFC 2889 Tests</b>	Broadcast Rate, Congestion Control, Frame Error Filtering, Fully Meshed, Many to One, One to Many, Partially Meshed
<b>RFC 3918 Tests</b>	Aggregated Multicast Throughput, Burdened Group Join Delay, Burdened Multicast Latency, Forwarding Latency, Group Join/Leave delay, Mixed Class throughput, Multicast Group Capacity, Multicast Group Pattern Verification, Scaled Group Forwarding
<b>Custom Tests</b>	Continuous run, fixed duration run, incremental, throughput (binary search)
<b>User-Defined Tests</b>	Tests defined in Test Composer

### Built-in data capture and analysis

Internet protocols are complex—multi-protocol emulations even more so. IxVerify includes a built-in tool that captures the data-plane traffic. IxNetwork allows you to trigger and filter data-plane packet captures based on user-defined packet field.

## Application Support

### IxVerify Combines Ixia Applications for EDA Testing

- **IxExplorer and IxNetwork VE:** Layer 2-7 stateless Ethernet traffic generation that builds realistic, dynamically controllable data-plane traffic. IxNetwork offers the industry's best test solution for functional and performance testing.
- **Automation:** Full automation capabilities with REST, TCL, Perl, Python, and Ruby API support.

## Related Technology Solutions

### Visit [www.keysight.com](http://www.keysight.com) for More Information on IxVerify and Ixia Virtualization Solutions

- IxNetwork—L2/3 Network Infrastructure Performance Testing
- IxNetwork Virtual Edition (VE)—Virtualized Network Performance Testing
- IxLoad Virtual Edition (VE)—Virtualized Multiplay Services Testing
- BreakingPoint Virtual Edition (VE)—Virtualized Application and Security Testing

## Ordering Information

### 939-9581

Ixia IxVerify, 16-port Subscription License Bundle, Floating – Mentor Graphics

### 939-9582

Ixia IxVerify, 16-port Subscription License Bundle, Floating – Synopsys

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