Conformance testing is required to validate that networking devices are compliant with existing standards. This ensures that devices not only support known protocol features correctly, but also that devices will be able to interoperate with other devices in the network.

Ixia’s IxANVL (Automated Network Validation Library) is the industry standard for automated network/protocol validation. Developers and manufacturers of networking equipment and Internet devices rely on IxANVL to validate protocol compliance and interoperability. Many customers have chosen IxANVL for its ease-of-use, enhanced GUI, and flexible test automation capabilities. In addition, IxANVL offers a veritable universe of protocol libraries and utilities.

IxANVL has several test suites that cover various networking technologies and protocols. IxANVL’s layer 4 - 7 test suites provide conformance testing for such technologies as HTTP server and Telnet. An example test topology for HTTP server is shown in the figure below:

![Figure 1: HTTP server test](image)

**Benefits**

**IxANVL Saves Time and Money**

IxANVL allows vendors to verify the design during their product’s entire life-cycle. Problems can be identified earlier so as to prevent costly last-minute reworks. IxANVL emulates large, multi-node networks that previously were cost-prohibitive—resulting in more efficient tests and quicker product release times.

**IxANVL Increases Confidence**

IxANVL increases confidence in product quality by enabling extensive and thorough testing, performed automatically and without supervision. IxANVL’s test results allow users to:

- Determine exactly where a device’s protocol software does and does not meet the specification
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**IxANVL Expands Easily**

With a source code license, users can easily add new interface types, protocols, and/or test cases to their IxANVL system.

**IxANVL Supports More Protocols**

IxANVL supports a comprehensive list of protocols, including unicast/multicast routing, bridging, IPv6, VPN, MPLS, PPP, TCP/IP, RMON, voice over IP, metro Ethernet, and IP storage.
This topology consists of a proxy server that has:

- One HTTP Client located offnet with the DUT through <Dlface-0>.
- One HTTP Origin Server located offnet with the DUT through <Dlface-0>.
- Here, DUT is configured as HTTP Proxy Server.

### Test Coverage

IxANVL’s Layer 4 - 7 test suite includes the following protocol test options.

<table>
<thead>
<tr>
<th>IxANVL Test Suites</th>
<th>Reference Specification</th>
<th>Target Protocols</th>
<th>Test Case Count</th>
</tr>
</thead>
</table>
| HTTP Server        | RFC 2616 (June 1999), "Hypertext Transfer Protocol -- HTTP/1.1" – sections:  
  - 1.4  
  - 1.4 through 2.2  
  - 3.1 through 3.12  
  - 4.1 through 4.5  
  - 5.1.1 through 8.2.3  
  - 9.2 through 9.8  
  - 10.1 through 10.3.8  
  - 10.4 through 10.5.6  
  - 12.1 through 13.3  
  - 13.3.1 through 13.5.2  
  - 13.5.3 through 13.11  
  - 14.2 through 14.9.2  
  - 14.9.3 through 14.11  
  - 14.12 through 14.23  
  - 14.24 through 14.32  
  - 14.33 through 14.46  
  - 15.6  
  - 19.2 through 19.6 | HTTP Server features:  
  - Setup/Verification Tests  
  - Overall Operation  
  - Protocol Parameters  
  - HTTP Message  
  - Request  
  - Method Definitions  
  - Status Code Definitions  
  - Client Error 4xx  
  - Content Negotiation  
  - Caching in HTTP  
  - Constructing Responses From Caches  
  - Header Field Definitions  
  - Cache-Control  
  - Content-Language  
  - If-Match  
  - Proxy-Authenticate  
  - Security Considerations | 346 (10 negative) |
| Telnet             | RFC 854 (May 1983), "Telnet Protocol Specification" – sections:  
  - 2  
  - 3  
  - 3  
  - 3  | Telnet features:  
  - Setup Verification  
  - The Principle of Negotiated Options  
  - Symmetric View of Terminals and Processes  
  - General Considerations | 43 (0 negative) |
<table>
<thead>
<tr>
<th>SMB3-Server</th>
<th>SMB3-Server features:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMB3-Server</td>
<td><strong>[MS-SMB2] - v20121017</strong>&lt;br&gt;Server Message Block (SMB)&lt;br&gt;Protocol Versions 2 and 3&lt;br&gt;2.2.1.2&lt;br&gt;3.3.5.2.6&lt;br&gt;2.2.3&lt;br&gt;2.2.1.2&lt;br&gt;2.2.4&lt;br&gt;3.3.5.4&lt;br&gt;3.3.5.2.3&lt;br&gt;2.2.1.2&lt;br&gt;2.2.5&lt;br&gt;2.2.6&lt;br&gt;3.3.5.2.3&lt;br&gt;3.3.5.5&lt;br&gt;3.3.5.5.3&lt;br&gt;2.2.1.2&lt;br&gt;2.2.7&lt;br&gt;2.2.8&lt;br&gt;2.2.21&lt;br&gt;2.2.22&lt;br&gt;3.3.5.13&lt;br&gt;2.2.10&lt;br&gt;2.2.12&lt;br&gt;3.3.5.7&lt;br&gt;3.3.5.2.9&lt;br&gt;3.3.5.2.11&lt;br&gt;2.2.13&lt;br&gt;2.2.14&lt;br&gt;3.3.5.9&lt;br&gt;2.2.15&lt;br&gt;2.2.16</td>
</tr>
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Test Methodology

IxANVL follows a rigorous test suite development process:

- Analyze a protocol specification line-by-line
- Develop a test assertion list (TAL), which is a list of testable statements
- Augment TALs with more negative tests
- Prioritize and group TALs for the test suite
- Develop a test method for each accepted test assertion
IxANVL performs continual verification of protocol standard authors or implementers during the development process.

Test Configuration

The IxANVL test suite can run on a Linux or Windows PC with off-the-shelf network interface cards, or on Ixia's load modules through a virtual network interface card (VNIC) connection. The tester (PC) connects with the DUT via test interfaces. Up to four interfaces may be used, depending on the test configuration. IxANVL flexibly emulates various system topologies, and creates virtually any test scenarios for almost any DUT.

IxANVL offers both a command-line interface for test automation and a user-friendly graphical user interface, allowing intuitive test execution management and detail reporting. A batch runner is also available for scheduling regression test-run sequences.

Test Execution

IxANVL classifies test cases into three categories: MUST, SHOULD, and MAY. Tests can be selected and executed based on their categories or test topologies.

The IxANVL test can be run using two options - GUI or command line input. In GUI mode, the user selects which test suite and test cases to run. In command line mode, the user types a command with options indicating which tests should run and the desired output level.

In the test, IxANVL sends packets to the DUT based on the test designed, and compares the received DUT packets to what was expected. After receiving these packets, IxANVL reacts according to the returned information—it may continue the test, stop the test, log an error message, or a host of other functions.

During the test, IxANVL logs the progress in real-time. After completion, IxANVL indicates whether the test passed or failed. IxANVL then repeats the process with the next test until all selected tests have been run.

Platform

An IxANVL workstation supports the following configuration:

- CentOS 5.3 (kernel 2.6.18-128.e15xen); RedhatEnterprise 4.0 with kernel 2.6.9-11 or 2.6.22.0.2.EE; Redhat Enterprise 5.0 (with kernel 2.6.18-53.e15)
- Microsoft Windows XP Professional or Windows 2003 Server (US English versions)
- 1.5G Hz Pentium CPU or faster (32 bit system only)
• 1G MB RAM
• 512 MB Free Disk Space

Product Ordering Information

924-00x-10xx
IxnANVL Framework license

924-030-xxx
Interface Support Software for each individual test interface. This is the custom interface driver needed to run
IxnANVL test suite

924-214-10
IxnANVL, Conformance Test Suite, HTTP, Source License

924-214-10B
IxnANVL, Conformance Test Suite, HTTP, Binary License

924-214-10BF
IxnANVL, Conformance Test Suite, HTTP, Floating Binary License

924-214-10F
IxnANVL, Conformance Test Suite, HTTP, Floating Source License

924-219-10
IxnANVL, Conformance Test Suite, Telnet, Source License

924-219-10B
IxnANVL, Conformance Test Suite, Telnet, Binary License

924-219-10BF
IxnANVL, Conformance Test Suite, Telnet, Floating Binary License

924-219-10F
IxnANVL, Conformance Test Suite, Telnet, Floating Source License

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