Axerra Networks’ AXNVision™ provides a carrier-class, comprehensive management solution for both the Network and the Element System levels (NMS/EMS). Deployed in the service provider’s Network Operation Center, AXNVision offers the network operator a broad set of tools that simplify the operation, administration, maintenance, and provisioning of AXN Pseudo-Wire Gateways as well as provide extensive fault management, performance monitoring, and security management capabilities.

The AXNVision software management suite has been developed according to the layered architecture specified in the Telecommunications Management Network (TMN) framework for monitoring and controlling telecommunications networks. Its advanced architecture is based on an innovative and scalable application server, supported by a user-friendly, Java-based Graphical User Interface (GUI) that furnishes a real-time graphical representation of the network’s topology, connectivity, and operational status.

AXNVision utilizes industry-standard technologies to enable ease of integration to network elements and to third-party applications. Its sophisticated software design allows the network operator to respond quickly to configuration change requirements and to reduce operating costs by minimizing time-to-service, resulting in a highly flexible, scalable, and leading-edge management solution.
AXNVision System Architecture

Innovative and Scalable Application Server Architecture

AXNVision features an advanced, flexible, and open client-server based architecture that service providers’ mission-critical operations environments require. Its advanced architecture incorporates industry-standard technologies such as SNMP, SQL, JAVA, XML and Remote Method Invocation (RMI), resulting in a highly robust, scalable, and leading-edge management suite.

The AXNVision server architecture is based on two internal management layers, plus standard interfaces to communicate with other network elements. The internal layers consist of a Network Management Layer (NML) and an Element Management Layer (EML). The NML is responsible for operations performed at the network level, such as service provisioning, fault management, domain management, and security capabilities, while the EML is responsible for operations performed at the element level, such as node configuration and performance monitoring.

The AXNVision application utilizes an SNMP interface to communicate with the AXN network elements and RMI/SNMP as the northbound interfaces for AXNVision clients and/or third-party Operation Support Systems (OSS).

The AXNVision leading-edge server technology is based on an object-oriented Enterprise Java Beans (EJB) application server. This technology allows the AXNVision to furnish a true platform-independent management system, which is able to run seamlessly on Microsoft Windows XP/2003 or Unix operating systems. In addition, the Java Data Object (JDO) layer enables smooth integration between AXNVision and different types of databases, either relational, such as SQL, or object-oriented.

Another advantage of the application server technology is its ability to support distributed configuration topologies of servers for load sharing, redundancy, and scalability. To the network operator, a distributed configuration of multiple servers appears as a single element while it enables simultaneous, secured access to multiple clients without any practical limitation on the number of network elements or end-to-end connections that can be managed. The information on all the servers is synchronized in real time and displayed by the AXNVision GUI views.

Friendly, Easy-To-Use Graphical User Interface

The AXNVision supports a Java-based client and a Web-based client. The clients implement an advanced, intuitive, color-rich, and easy-to-use Graphical User Interface (GUI). The GUI design is based on the Model, View, and Controller (MVC) Pattern, and supports topological maps with zooming in/out capabilities. The AXNVision client GUI consists of a navigation tree on the left part of the screen, a network topology view on a geographic map on the main part of the screen, and other views, which can be individually selected by the network operator, on the bottom part of the screen.

AXNVision Java Client – The AXNVision Java client is a dynamic, highly customizable, feature-rich and extensible client interface. The client interface has been built with the goal of capturing and presenting management data in an informative, intuitive, and easy-to-use user interface. Some of the rich features include topology, map-based representation of devices, easy-to-use table-based network data representation, and powerful run-time administration functionality.

The AXNVision client main window presents a high-level view of the network which provides the network operator with the ability to quickly grasp the overall network status. The high-level view is scalable in design, supporting both small and large networks. The operator has the ability to drill down to view or configure a specific hardware component or a service, as needed.
The point-and-click GUI greatly simplifies the service provider’s ability to quickly launch new services, track network performance, and enforce Service Level Agreements (SLAs). Some of the viewing capabilities supported by the AXNVision client GUI include:

- Detailed view of AXN nodes and the provisioned connections on a geographic map
- View of newly-detected AXN nodes for further processing
- View of AXN nodes with real-time system configuration, cards, and port LED status
- Views of pseudo-wire tunnels, pseudo-wire services, performance monitoring and clock synchronization
- View and management of the AXN node software, including upgrade, backup, restore, and timed activation
- View and management of user security parameters, including Network Elements (AXN nodes) access groups and the user’s authorizations and permitted operations
- View of alarms and events with color coding, alarm filtering, and logs

AXNVision Web Client – The AXNVision Web client is an interactive and user-friendly interface that enables the accessing of AXNVision through a Web browser for AXN nodes, service, and alarms status. The status views are easily filtered and sorted, providing fast and easy access to the required information.

**AXNVision Management Applications**

**End-to-End Pseudo-Wire Service Provisioning Management**

A key advantage in a network-based management system is the ability to simplify the provisioning of end-to-end connections between two network elements. Rather than accessing and configuring each network element individually, as performed by typical Element Management Systems, the AXNVision Pseudo-Wire Service Provisioning Management application enables the network operator to provision end-to-end connections by means of a single point-and-click operation.

Provision of a new connection of any type of service (CES, CES-Bundle, FR, HDLC, ATM, IP, ETH/VLAN) between two AXN nodes is accomplished by a single point-and-click operation on the Packet-Switched Network (PSN) tunnel associated with two AXNs and specifying the service parameters on the service configuration template. The system then verifies the configured parameters and, based on available up-to-date AXN resources, it communicates with both AXN nodes and downloads the new configuration.

The interactive configuration templates enable the network operator to rapidly configure the parameters of a new connection whether the type is CES, CES-Bundle, FR, HDLC, ATM, IP, or ETH VLAN and thus eliminate errors and reduce overall provisioning time and time to service.
Real-Time Configuration Management

AXNVision’s Configuration Management application offers the network operator a set of interactive configuration templates that greatly simplify the configuration of network element equipment modules such as system, chassis, system cards, and physical as well as logical port parameters. To ensure ease of operation, all the AXN hardware modules are graphically represented and can be selected individually through a point-and-click operation on the requested module.

The AXNVision system executes a process of auto-discovery to detect and present the topology of the AXNs deployed in the network. Real-time configuration and status information are obtained from each AXN node, creating an up-to-date, network-wide view of the managed AXN Pseudo-Wire Gateways’ nodes.

Node configuration is constantly updated through a refresh procedure that accesses the managed AXN nodes at pre-configured time intervals. The refresh operation retrieves only configuration changes such as modified parameters and status update, thus reducing the amount of bandwidth consumed between the managed element and AXNVision while optimizing the system capabilities to show configuration changes in real time.

Housekeeping operations, such as database maintenance, backup and restoration, and control of remote software download and upgrade, are also supported by the configuration management application.

Advanced Domain Management

The AXNVision advanced Domain Management capabilities furnish a highly powerful management tool to the network operator. The application allows the partitioning of the managed AXN network into multiple smaller domains, thus enabling better control, extra security, and greater manageability of the network. For example, partitioning the network into geographic domains eliminates the risk that a configuration error in one geographic domain will impact the configuration in another geographic domain.

The AXNVision Domain Management capabilities enable domain sorting according to geography or service type. Once the user has been authenticated by AXNVision, he is then associated with a group of AXN elements or a service type, i.e. CES, FR etc., that he is allowed to manage. Any attempt to manage network elements or services other than the ones that user is associated with, will be rejected by the system.

Sophisticated Fault Management

The AXNVision Fault Management application provides comprehensive information on current and historical alarms through an intelligent alarms-analysis tool that allows the network operator to view, in real time, the status of the managed network elements, and to stay up-to-date on the network elements’ availability.

The Fault Management functionality includes a traps-handling mechanism and refresh procedures so that the network operator is always viewing the most up-to-date AXN network topology and network-wide active faults in real time. Detected alarms are visually displayed in the AXNVision GUI, and logged and classified according to the severity and likely cause. The severity of each alarm, critical, major, or minor, is represented by a different color on the GUI. To achieve even greater flexibility, the operator can define the thresholds that determine the alarm severity.

AXNVision Fault Management features a sophisticated filtering and alarm correlation capabilities to further assist the operator. For example, the current alarm list can be filtered according to alarm severity, registered time, acknowledgement, and more. The system also enables the definition of a customized alarm filter to achieve even greater manageability. Additionally, the list of alarms can be exported to an external server for further activities such as backup, tracking, billing, and analysis.
**Extensive Performance Monitoring and Statistics Management**

AXNVision provides extensive capabilities for obtaining, storing, displaying, and exporting Performance Monitoring (PM) and statistics information. The system polls the AXN nodes every 10 seconds (user-definable) and obtains selected PM and statistics information. This information is displayed on the corresponding graphical screen and stored in files. These files can be exported later by means of FTP to third-party billing and accounting systems. Both current and historical PM and statistics can be presented on a per-port, connection, subscriber, pseudo-wire tunnel or logical interface basis. Through the graphical interface, the network operator can select the physical or logical port statistics and performance summary information that the operator wants to view and monitor.

**Comprehensive Security Management**

AXNVision Security Management provides a broad set of security mechanisms to restrict access to the managed AXN nodes as well as to control the management operations of users. The restriction rules can be enforced on a group of users or on an individual user. The security management application is based on standard access login security (user name and password), which is performed through an integrated RADIUS client and user-definable privileges. When logging into the system, users are assigned to a particular user group, each of which is authorized to perform certain operations in accordance with the group’s predefined privileges. For example, a user who has been assigned to the ‘viewers’ group is allowed only to view information such as configuration, status, and statistics, but is not allowed to modify any configurable parameter of any managed AXN node. Restrictions can be also applied to geographic domains to achieve extra security.
AXNVision Features and Specifications

MANAGEMENT FUNCTIONS

Fault Management
• Alarms and events collection with graphical representation and audio notification
• Alarm Masking- makes it possible to hide alarms on an individual or site basis
• Logging and advanced filtering capabilities
• Alarm handling – Logging of network operator comments and alarm assignment
• Cause analysis and fault correlation functionality
• Fault synchronization and propagation after connection loss
• Color-based alarm severity visual identification

Configuration Management
• Auto-discovery of AXN network connectivity
• AXN provisioning: End-to-end CES/FR/HDLC/ATM/ETH connection end points
• Off-line configuration and pre-provisioning features
• Configuration synchronization between database and network elements
• Bulk and flow-through provisioning via user-definable parameters
• Device back-up and restore
• Remote and local software upgrade with timed activation

Service Provisioning Management
• End-to-end connections by means of a single point-and-click operation
• Interactive configuration templates to reduce overall provisioning time and time to service

Performance Monitoring
• Per-port statistics and summary information
• Real-time performance monitoring
• Historical storage and reporting capability

Security Management
• Standard access login security (user name and password)
• User-definable privileges
• Network domain restriction capabilities
• Automatic lock screen
• RADIUS authentication and authorization
• Access Lists (ACLs)
• RMI between the AXNVision server and its clients

Graphical Interface Features
• Multi-manager: Multiple simultaneous AXNVision clients connecting to the AXNVision server
• AXNVision Java-Client with rich control and functionality or AXNVision Web-Client
• Topological/geographic maps with zooming capabilities
• Detailed tree-view of nodes, cards, ports, regions, and provisioned connections
• Views of pseudo-wire tunnels, performance monitoring, clock synchronization, software upgrade/backup, and user security
• Alarm and event view with color coding, alarm filtering, and logs
• Chassis view with real-time system, card, and port LED status

HARDWARE PLATFORM SPECIFICATIONS

Supported Network Elements
• Axerra’s AXN1600, AXN800, AXN100, AXN10, and AXN1

Network Elements Interfaces
• SNMP v2
• Telnet / SSHv2

HARDWARE SPECIFICATIONS

The following are recommended hardware specifications for a network of up to 500 AXN nodes.

AXNVision Client (Minimum Hardware Requirements):

<table>
<thead>
<tr>
<th>PC</th>
<th>UNIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft Windows XP</td>
<td>SUN Solaris 8/9</td>
</tr>
<tr>
<td>Microsoft Windows 2003 Server SE SP1</td>
<td></td>
</tr>
<tr>
<td>Core 2 Duo</td>
<td>Blade 2000</td>
</tr>
<tr>
<td>2 x 1.2 GHz UltraSPARC III Cu processors (64-bit)</td>
<td></td>
</tr>
<tr>
<td>1 GB RAM; DDR2 800 MHz (recommended)</td>
<td>1 GB RAM</td>
</tr>
<tr>
<td>10 GB free disk space; 7200 RPM SATA2 (minimum)</td>
<td>10 GB free disk space (minimum)</td>
</tr>
</tbody>
</table>

AXNVision Server (Minimum Hardware Requirements):

<table>
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<th>PC</th>
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</tr>
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<tbody>
<tr>
<td>Microsoft Windows 2003 Server SE SP1</td>
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<tr>
<td>Core 2 Quad</td>
<td>Blade 2000</td>
</tr>
<tr>
<td>2 x 1.2 GHz UltraSPARC III Cu processors (64-bit)</td>
<td></td>
</tr>
<tr>
<td>4 GB RAM; DDR2 1066 MHz (recommended)</td>
<td>4 GB RAM</td>
</tr>
<tr>
<td>250 GB free disk space; 7200 RPM SATA2</td>
<td>250 GB free disk space</td>
</tr>
</tbody>
</table>

*Please contact Axerra Networks for information on currently-supported northbound interfaces

Note: This document is provided for informational purpose only and may be subject to change without notice.