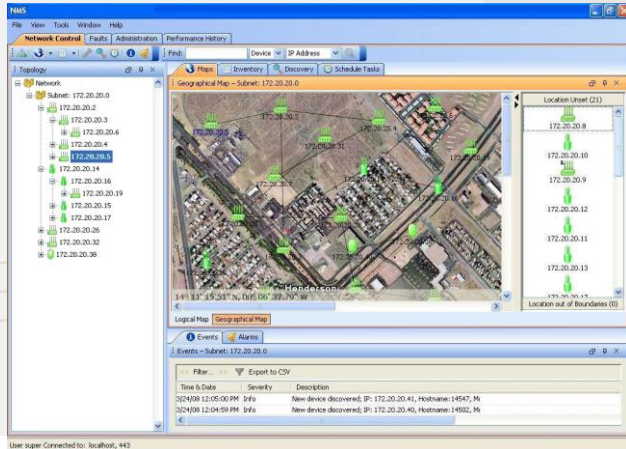


# WebSilicon WS-NMS Platform



*State-of-The-Art  
Network Management  
System Platform*

*Fully customized, generic, scalable, carrier-grade Network Management System (NMS) for control and monitoring of thousands of devices. WS-NMS is built to facilitate large network operations with auto-discovery of network topology, bulk operations and comprehensive inventory & statistics views.*

The WS-NMS platform provides a comprehensive and intuitive interface for non-stop, real time management of networks and devices. It offers tools for monitoring and control including:

- Network discovery and mapping
- Fault and alarm management
- Device monitoring, configuration and provisioning
- Scheduled bulk operations and tasks
- Device and Network performance management
- Northbound interface towards OSS/BSS systems
- Security and users management
- Multilingual support
- OEM support

The management platform scales from small networks of 10s devices up to large networks of 1000s devices.

The WS-NMS is based on highly scalable client/server distributed architecture and uses standard and proprietary protocols to remotely managed the devices over inband and out-of-band networks.

The WS-NMS platform is an OS independent solution that was tested and installed on most Windows, Unix and Linux distributions.

The WS-NMS platform is used by many datacom and telcom vendors, it is installed in over 500 sites all over the globe.

## TYPICAL APPLICATIONS

- WiFi/WiMAX/LTE systems
- 2G/3G Cellular infrastructure
- Satellite earth stations
- Optical datacom systems
- DSL telecom equipment
- Defense and Security systems

## KEY FEATURES

- Automatic discovery of network topology supporting small networks as well as large scale deployments.
- Non-stop, real time monitoring and control of networks and devices
- Proactively monitor and control network, devices and network health
- Sophisticated network and device performance management capabilities.
- Highly-scalable system architecture.

## SOLUTION BENEFITS

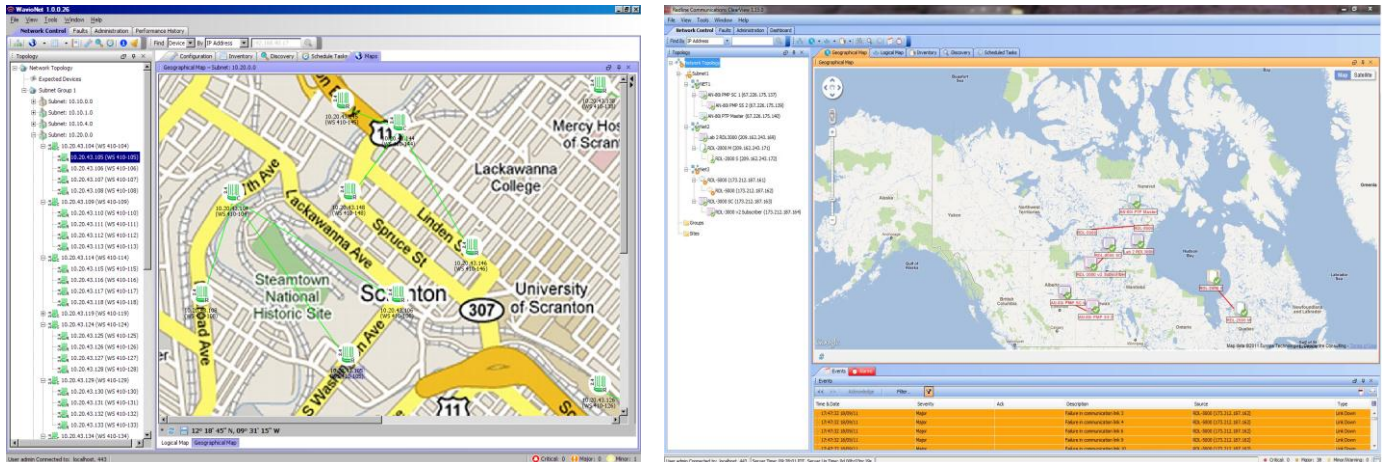
- Fully customized NMS application with the shortest time to market.
- Stable solution with large install base.
- Provides full featured NMS system starting of the first release.
- Supports both standard protocols as SNMP as well as proprietary protocols.
- Robust northbound interface towards OSS/BSS systems.

## Network Discovery and Mapping

The strong network discovery capability of the WS-NMS platform can discover small and simple network architecture as well as large scale and complex network deployments. This discovery mechanism may support different device types at the same time and provides high level discovery and very low level deep discovery process that may discover specific device configuration. The WS-NMS may also use LLDP and CDP protocols for Layer 2 automatic connectivity discovery.

The WS-NMS platform supports two topology view types; a topology tree view and a graphical map presentation which may provide a logical network view as well as geographical view integrated with Google maps™ web view and Google Earth™ application.

The network topology may support multiple levels of hierarchy, grouping of devices according to user defined properties and according to polled parameters; it supports discovery and presentation of links and connections between devices, and groups of devices (subnets).



## Fault and Alarm Management

The WS-NMS offers full featured fault management functionality which includes user defined filtered, sortable and group able presentation of logged events and alarms and a current open alarms list view. It also includes counting of open alarms for high level snapshot of the entire managed network.

Events and alarms are collected by the WS-NMS and logged in the system database for future retrieval and for data mining purposes. The events and alarms are generated by the WS-NMS upon the following conditions (one or more):

- Reception of any standard or proprietary protocol notification messages, such as SNMP traps.
- Polled parameters (statuses and statistics) combined with predefined thresholds.
- Internal WS-NMS generated events/alarms, such as device connection loss and retrieval.

The WS-NMS offers forwarding of predefined events and alarms to the northbound interface. In addition, it may send messages (email, SMS and other) upon predefined conditions.

## Device Monitoring, Configuration and Provisioning

The WS-NMS platform simplifies the deployment and the maintenance of the network by providing full device provisioning, configuration and diagnostic by using an intuitive user interface. The platform also enables backup and restore of device configuration.

Monitored devices are continually polled for their current status which is presented on the different topology views, these devices may be selected by the user for inside look (drill down operation).

Device provisioning includes tools for configuration of various interfaces (logical and physical) and communication protocols (such as V5, ATM, Ethernet, IEEE802.11/802.16, SDH and PDH).

The user interfaces supports both dialog based user interface as well as multiple stage wizard based interface.

## Scheduled Bulk Operations and Tasks

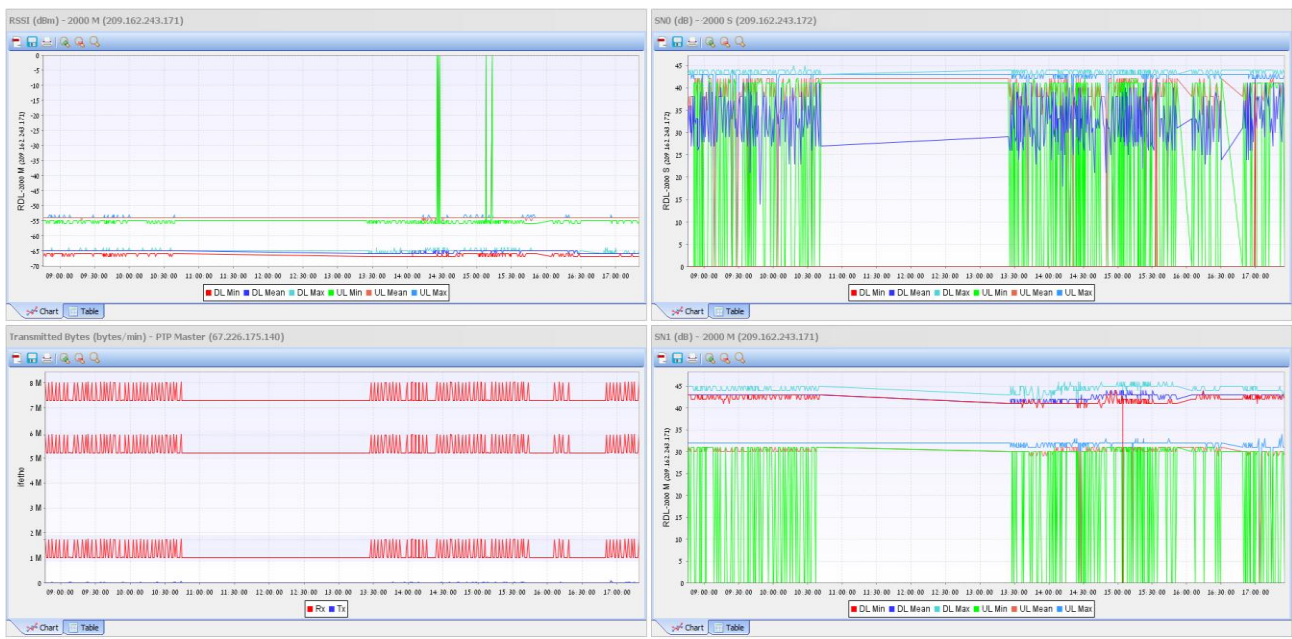
The WS-NMS platform supports application specific and generic tasks, such as system backup, remote software download and configuration upload. These tasks are deployed with the NMS and may be expanded by using an API. The tasks are loaded and executed by the WS-NMS scheduler that supports many concurrent task types and task instances. The user may create, modify and delete tasks by using four simple wizard steps: select target device(s), select task (from a list of supported tasks), define task specific parameters (such as file name for software download) and set start time (immediately or on future time).

## Device and Network Performance Management

The WS-NMS platform provides both real-time and historical performance statistics presentation. Multiple sample resolution storage and presentation are supported.

Performance data may be collected by polling the managed devices statistics counters, receiving notifications and internal WS-NMS calculations. The WS-NMS platform supports data link with 3<sup>rd</sup> party applications for external data processing.

Users may compare and correlate performance on one or more parameters on one or multiple managed entities.



## Security and User Management

The WS-NMS security management offers a complete solution to all NMS security related issues, starting from a secured login session, through auditing of all user actions and up to a full featured users provisioning. The system security is built of three layers:

- Authenticated and encrypted sessions between the clients and the server through the entire users session
- User authentication by a login session based on a user name and a password and may also include user restriction to a specific station, limitation of the usage time and additional authentication mechanisms support (such as smart card)
- All user actions are inspected and audited by the server vs. the user permissions (profile). All user actions are logged by the WS-NMS audit trail mechanism for future inspection

The user management offers the WS-NMS administrators tools for:

- Adding new users, setting their properties and linking them to a profile (set of privileges).
- Modifying existing users and deleting them
- Adding new profiles, setting the profile permissions and restrictions
- Modifying existing profiles and deleting them

The WS-NMS user management offers unlimited flexibility and supports virtually unlimited number of users and profiles.

## Northbound Interface towards OSS/BSS

The WS-NMS offers northbound interface (NBI) for exchanging data with existing OSS and BSS. The northbound functionality may include:

- Alarms/Events forwarding (SNMP trap forwarding)
- Network topology browsing (exposing the managed network structure)
- Performance management data exporting
- Single device and bulk configuration importing

The northbound interface may support the following protocols (or any other proprietary protocol):

- SNMP v1/v2c/v3
- CORBA
- X-RPC (XML over RPC)
- Web Services
- HTTP/HTTPS
- TL-1

The WS-NMS administrator may group events/alarms into several groups; each may be restricted for access by a different OSS/BSS (for read and for write permissions).

The WS-NMS was integrated with major NMS and OSS, such as:  
HP OpenView, TTI Netrac and additional customer specific system



## Southbound Interface towards Devices

The WS-NMS offers full featured southbound interface (SBI) for exchanging data with the managed devices. The southbound functionality may include:

- Alarms/Events reception (SNMP traps) and collections
- Data polling (scalars and tables)
- Configuration and commands sending (setting new values, creating and deleting instances)
- File transfer (upload and download) and file manipulation commands (copy, move, delete)

The southbound interface may support the following protocols (or any other proprietary protocol):

- SNMP v1/v2c/v3
- X-RPC (XML over RPC)
- HTTP/HTTPS
- Telnet/SSH
- FTP/TFTP/SCP/SFTP (client and server)
- TL-1

## Expanding the NMS Boundaries

The WS-NMS may support different and non-networked-managed-devices, such as test equipment, industrial equipment and much more...

Supporting such equipment stretches the standard NMS boundaries and enables the WS-NMS to provide a complete solution for customers.

The WS-NMS supports interfaces such as, HPIB/GPIB, RS232/422/485, Ethernet, Modbus, USB and Parallel I/O.

## Notifications

The WS-NMS may offer notifications (by using external aids) upon predefined events and alarms. The supported notification methods are:

- Send SMS/Email
- Play sound files
- Send commands to external devices (for turning lights and sounds)

The administrator may configure when notifications are required and then set specific notification properties including message text, destination properties (address, phone number) and thresholds.

## Licensing

The WS-NMS licensing mechanism protects the system of unauthorised usage. The platform is protected in the following categories:

- Maximum number of managed devices
- Maximum number of concurrent user sessions
- Time limit (the system will stop working after specific date)
- Specific features support (full/partial/no support)

The WS-NMS offers scalability to customers by simply ordering what they need, when they need it.

## OEM

Offering easy OEM supports was additional mandatory requirement for the WS-NMS design and development group. Three levels of OEM support may be offered:

- Pluggable look & feel offers custom graphics, texts and color scheme
- Different MIB structures, starting from different SNMP enterprise numbers up to completely different MIBs
- OEM dependant features support, some OEM customers may get more features than other customers

## Multilingual

The WS-NMS is targeted to the global market where localization is a mandatory requirement. The built-in localization support makes this market requirement achievement an easy task by simple translating plain text file content to the target language. The WS-NMS may support several languages at the same time, where each client session is localized according to the client's machine local settings; it allows users from different countries to use the same centralized network management system.

WS-NMS deployments already support: Japanese, Korean, Russian, French and Chinese (Mandarin).

## OS Independent

The WS-NMS was developed as a pure Java™ application which offers true cross platform solution. The server is deployed as an installable application and the client is deployed as both installable application and web based install free application.

The WS-NMS server was tested on the following operating systems:

- Microsoft Windows 2000/2003 Server
- RedHat Linux Enterprise
- Sun Solaris 9/10

The client was tested on the following operating systems and browsers:

- Microsoft Windows XP/2000/2003/Vista
- RedHat and Ubuntu Linux
- Sun Solaris 9/10
- Microsoft Internet Explorer 6/7/8
- Mozilla Firefox 2/3
- Google Chrome



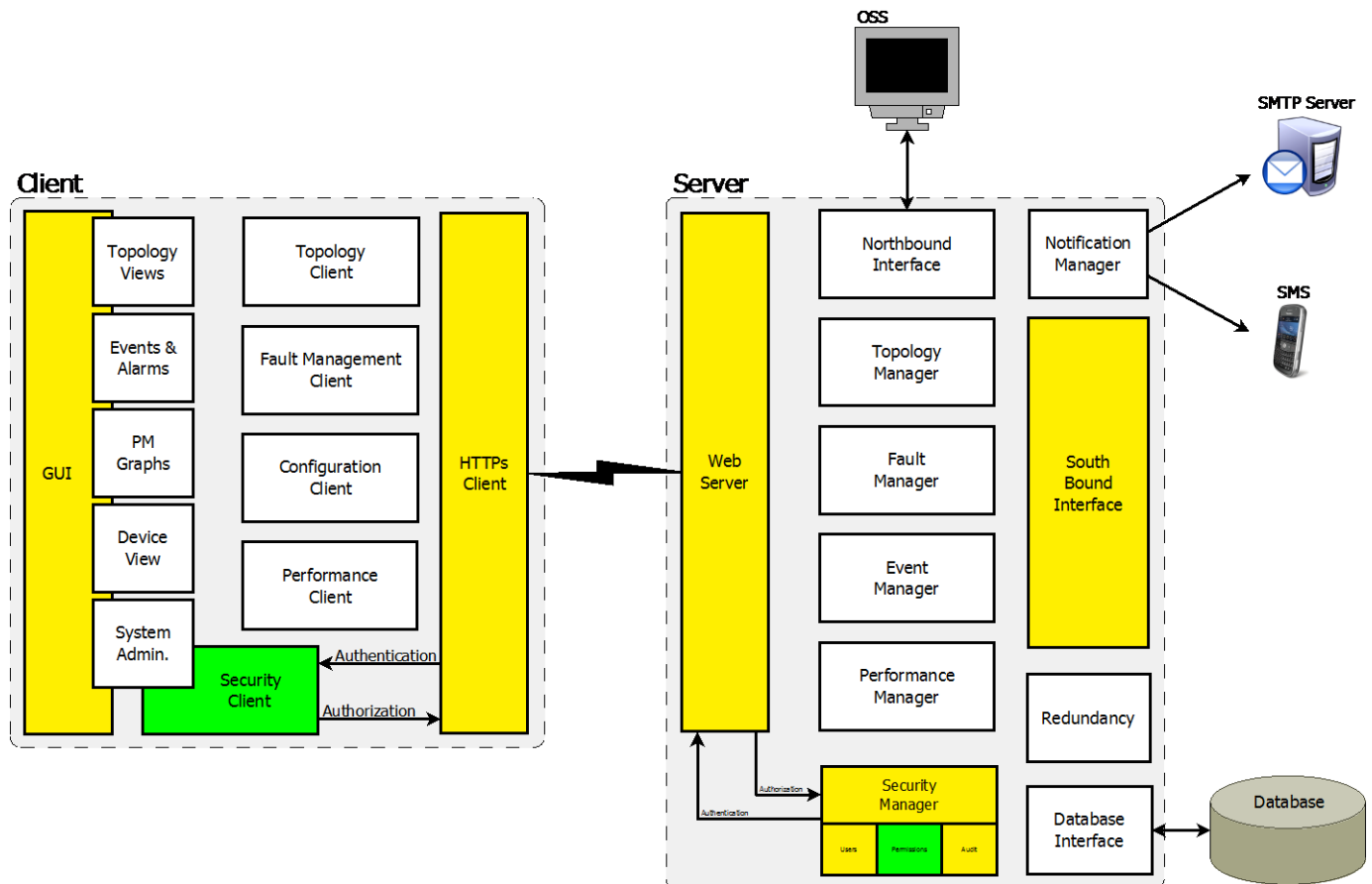
## Database

The WS-NMS data is stored in a database server which may be installed on the same NMS server machine or on a different machine. The WS-NMS supports connection to one or two databases for redundancy purposes and it supports both standalone and cluster installations. The WS-NMS was integrated with most of the major database servers, such as Oracle, Microsoft SQL Server, MySQL and Sybase, supporting other databases is easy and requires simple integration process. The WS-NMS database management feature includes continuous monitoring of the database health, status and work space and it alerts upon failures. The WS-NMS provides tools for manual data backup and restore as well as periodical backup.



## System Architecture

The WS-NMS architecture is based on a trivial client/server scheme, the client is a user interface application responsible for data presentation; it connects to the server by using secured HTTP socket. The server holds the entire business logic (the managers), security, polling mechanism (southbound) and interfaces (northbound, notifications, database).



## Redundancy

The WS-NMS offers two aspects of redundancy, one is database redundancy by supporting concurrent connections between the database interface and two database servers, the second aspect is NMS server redundancy.

The WS-NMS server redundancy is achieved by installing two NMS servers; one is configured as master and the second as the backup. The backup server continually monitors the master server and upon failure, it becomes active until the master operation is restored.

## Lightweight Solution

The WS-NMS architecture offers a lightweight solution for management of large scale networks by using low cost server machines and low bandwidth consumption between the client and the server and on the southbound traffic.

## Zero Maintenance

The WS-NMS does not require any maintenance operations by users. It automatically maintains itself; database is periodically backed up and protected of data explosion, logs are created upon any system error and event.

## Sample Applications

The WS-NMS was designed as generic NMS platform; it is used for management of many different device types, such as:

- Datacomm devices (such as Ethernet switches)
- Telecom systems
- Infrastructure systems (such as electrical generators)
- RF systems

The following examples are real WS-NMS implementations.

### Ethernet Switches

Management of L2/L3 Ethernet switches including monitoring of the physical and the logical ports, collection of statuses and RMON statistics, configuration and provisioning of ports, service flows, VLANs and collection of events and alarms.

The system offers several network wide features, such as bulk software download, mapping of network topology including uplink connection between devices, network wide traffic presentation and analysis and alarms correlation between devices.

### Cellular Traffic Aggregation System

Network management system for 2G/3G cellular backbone traffic aggregation system. This system offers network wide presentaion of traffic load, geograhic prenstation (on a map) of problems, main and backup paths display, automatic path search and display, configuration of protocols (such as ATM and Ethernet), collection of large arrays of counters used by a 3<sup>rd</sup> party datamining system and integration with an existing OSS.

The system supports large network depolymets of more than 10,000 managed devices connected to the WS-NMS over very low bandwidth lines (less than 32Kbit/sec).

### Cellular RF Repeaters

Control and monitoring system for high-end cellular repeaters offering full configuration of the RF parameters (such as gain, power levels, thresholds, AGC/MGC), monitoring of the RF measurements (RF power detector readings, voltages), events and alarms generation (by the WS-NMS) upon any threshold passed and long term statistics on the RF performance (power, SNR).

The system was already customized for several OEM customers and localized to several languages including Russian and Chinese.

### WiFi Outdoor System

Network management system of an outdoor wifi system, offering full network presentation (topology, geographical and network mesh), network wide inventory and fault views, SW donwload and configuration files download bulk operations, complete device view including 100s of configurable parameters, network-wide WiFi provisioning (SSIDs, security, users) and statistics collection and presentation (both history and real time).

The system supports management of 3<sup>rd</sup> party devices (CPEs) of many types (about 15 types are supported) and it includes the ability (by the system administrator) to support new CPE types.

### WiMAX System

Management of a WiMAX system including monitoring and configuration of BSS, MSS, ASN gateways and CPEs. The system offers network discovery and presentation on a map and a tree, monitoring and configuration of all WiMAX 802.16 parameters (inventory, statuses and statistics) and device specific properties, service flow and security (users) provisioning and extensive statistics collection, analysis and presentation (graphs and tables).

The system was deployed with the ability to add customer specific data collection, analysis and presentation tasks by using the WS-NMS API.

## Satellite Ground System

Multi-site management of satellite ground system including monitoring and control of all site components starting from the antennas, through the frequency converters and receivers and up to the test equipment (spectrum analyzers, power meters) and the site infrastructure devices (UPS, generator, access control, Air-Conditioner).

The system offers remote (from the other side of the world, over a satellite with cellular backup) management of several sites, each with different installation configuration from two (redundant) centers.

## Telecom Power System

Management system for a large array of telecom power systems, including power supplies (redundant chassis), chargers and batteries. The system offers presentation of the array layout (including customized editor), display of current alarms (with correlation logic), presentation of logged and current measurements (voltage, current, power, energy, efficiency), configuration of thresholds and tools for performing tests.

The system was integrated with an existing 3<sup>rd</sup> party NMS system (HP open view) and with a siren installed in the control room.

## DRP Sites

Multi element management of two redundant DRP (Disaster Recovery Plan) sites. The system monitors the sites infrastructure (air, power, temperature, radiation, water, access control), servers hardware, disks (RAID arrays), operating systems (Windows, Linux and Solaris), critical applications (web-servers, databases) and communication equipment (routers, Ethernet switches, load balancers, acceleration equipment).

The system was integrated with several 3<sup>rd</sup> party EMS applications (such as HP, Cisco, Sun, Oracle, Intel) used for configuration and monitoring of specific devices (drill down view).

## Cable System

Large scale cable system management system (>10,000 managed elements) offering monitoring and control of RF components (amplifiers, detectors and attenuators), repeaters (RF and optical), switching systems (RF and optical) and power supplies. The system provides tools for long term logging of events, alarms and measurements. The system may be connected to RF test equipment for logging of additional measurements.

## Point to Point Microwave Links

Link and service management system for point to point microwave systems. Automatic discovery and presentation (on a geographical map by reading GPS location from the devices) of network topology devices, links and paths (cascaded links), network wide fault management, performance management, bulk operations and configuration (physical ports, RF and protocols, such as ATM).

## Optical Switching System

Network management system for carrier grade very large optical array (>500 ports) switches. The network provides standard NMS features (full FCAPS) and a unique optical path automatic and manual routing tools for error free configurations. The system was integrated with an existing 3<sup>rd</sup> party provisioning system for receiving configuration and commands (as XML files).

### WebSilicon Ltd.

25 Habarzel Street, Ramat Hachayal,  
Tel-Aviv, Israel 69710  
T: (972)-3-6449991  
F: (972)-3-6449992

Distributed by: