



Saving Time & Money Across The Organization With Network Management Simulation

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Introduction

Network management vendors are in business to help their customers manage complex and dynamic networks. Many customers face the challenge of monitoring and controlling a vast number of resources with a network topology that is in constant flux. The challenge for vendors is providing solutions that meet real customer needs in the most efficient and cost-effective way.

To develop and test network management applications, vendors must be able to recreate a customer's network environment, without having direct access to customer networks for testing and experimentation. Many vendors have discovered that the use of *network simulation* in product development and QA reduces costs and accelerates development and testing.

The potential benefits of network simulation go far beyond the development and QA groups. An effective network simulation solution can support the needs of many groups within a network management vendor's organization. The table below highlights six different groups in a typical network management company and the ways network simulation can benefit each:

Organizational Group	Role of Network Simulation	Benefit
Development	Scalability testing during design and development, without real devices	Better product quality Faster time to market
Quality Assurance	Complex error condition scenarios and scalability testing	Better product quality Faster time to market
Sales	Realistic, effective demos that highlight the features of management applications	Faster sales cycles Reduced costs of demos
Training	Effective, portable training with quick setup	Reduced training costs Improved efficacy
Professional Services	Services targeted to duplicated customer environments	Increased service revenues Accurate, on-time deliverables
Technical Support	Reproduce customer problems and environment in your lab	Faster problem resolution Improved customer satisfaction

This paper provides a brief overview of how network simulation software works. It then steps through various groups in the organization and identifies how network simulation can help each group meet the specific challenges they face. It also identifies the capabilities required of the simulator to meet those challenges.

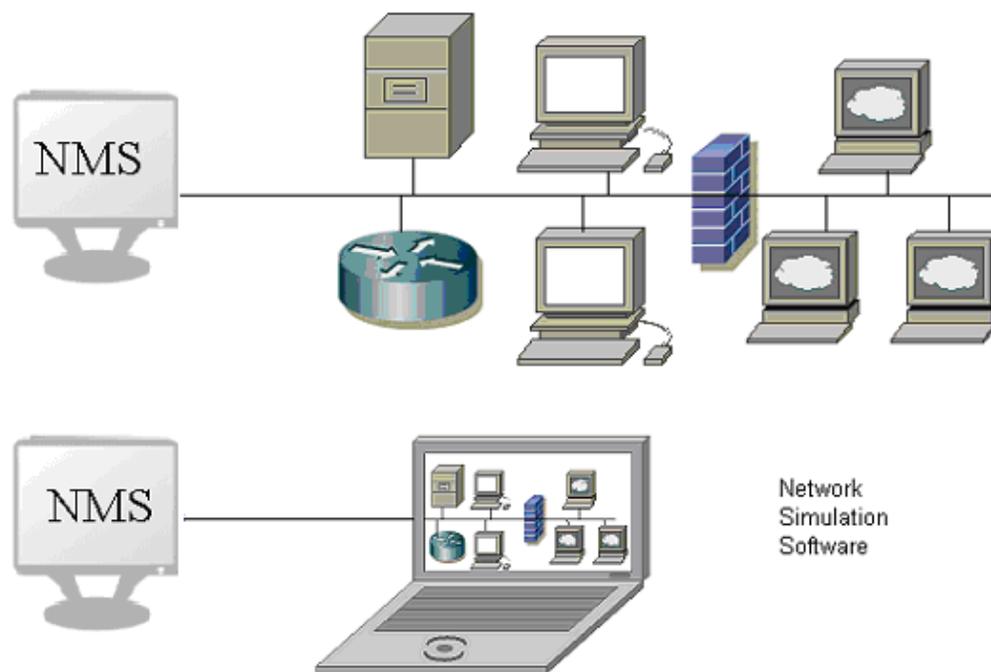
Network Management Simulation: A Brief Background

Vendors selling network management solutions must test and demonstrate their solution in a variety of networked environments that represent what their customers have. To do this, they must recreate those customer environments. This is the core function of a network simulation solution.

The Network Simulation Approach

The most obvious way to recreate a customer's network is to build your own network, with actual hardware. But the drawbacks are obvious and considerable. Using hardware to create different network environments results in an endless cycle of hardware acquisition and maintenance. This increases both capital and operating expenses. Duplicating large networks with thousands of nodes is both physically and fiscally impossible.

Simulating a network is the most efficient and cost-effective means of recreating a network environment. With recent advances in processing power and performance in off-the-shelf systems, it is possible to use software to simulate the activities of thousands of nodes in the network. Network management applications have time-out values of seconds, but simulated nodes can send responses back within milliseconds.



Network simulation software replaces the physical network with a virtual network of devices.

Using software to simulate the network offers greater flexibility than deploying actual networks:

- Network simulation reduces both capital investments and ongoing administration costs by eliminating the need to invest in a large amount of hardware.
- You can change a virtual network environment instantly, without recabling or switching out hardware.

- Deploying the simulator in various parts of the company mitigates the need to compete for test equipment resources.
- Sales or training staff can take the virtual network environment “on the road” to various customer sites, trade shows, or other facilities.

Well-designed network simulation software must have the ability to scale to the size of large networks, with a wide variety of managed elements supporting many network protocols. In addition, it should be easy to deploy and reconfigure to model different network environments or error scenarios.

How Network Management Simulation Software Works

The simulation software models the network management interface behavior of each node in the network. Each simulated device has:

- An IP address
- Management protocol understanding
- Data variables
- Scripting capabilities to handle specialized actions

For example, to simulate a Simple Network Management Protocol (SNMP) agent, the software replicates each agent’s support of a MIB, using values provided for variables. Scripting capabilities support advanced modeling such as setting dependent variables, controlling values returned, and generating alerts (SNMP traps).

The simulation software registers an IP address with the operating system for each virtual agent. When the software receives an SNMP request for an address on one of its agents, the application processes the request and generates a response based on the MIB and variables associated with the agent. To the network management system, the simulated agents appear as though they are real nodes with real IP addresses supporting actual MIBs.

Similar actions can be carried out to simulate other management protocols such as Telnet/CLI, TL1, FTP, TFTP, and HTTP.

The remainder of this paper describes ways to use network simulation software to reduce costs and improve product quality in all phases of the product lifecycle. Although frequently used in the development and testing of a product, companies can only realize the full benefit of network management simulation by deploying it in many departments throughout the organization.

1. Development: Supporting New Devices and Designing for Scalability

Although developers can find many ways to use network simulation, it is particularly valuable for supporting new devices and designing for scalability.

From a project planning perspective, one of the biggest challenges is removing dependencies for any given task. For example, an application may be ready for unit testing before the agent is completed or a new feature has been implemented in the agent. Using network simulation software, developers can simulate the behavior of an SNMP agent without having the actual device present or completed. Simulation supports the parallel development of agents and management software, thus removing dependencies that can slow the process down.

Scalability is not something that can be easily added or 'fixed' during the system test phase of a project – the product must be designed to be scalable from the beginning. Developers need to be able to test and explore their design under different loads, with different numbers and types of devices. But it is nearly impossible, and certainly impractical, to create the largest network environments in a lab environment.

With network simulation software, developers can:

- Simulate many different agents, with different source IP addresses
- Simulate large networks of a million or more manageable objects
- Simulate complex problem scenarios on large networks

The possibilities are nearly endless. For example, developers can check retransmission logic by delaying responses. Or, they could simulate dropping every third packet and generating Counter rollovers.

Simulation Requirements: The software must be able to simulate agent behavior, even before the actual agent is ready. It must be highly scalable to support testing for the very largest networks. Multiple servers may be needed to run the simulation software to recreate a network containing thousand of managed agents.

2. QA: Flexible Testing for Complex Environments

Network simulation is of great value in the QA/testing phase of network management product development. Few software vendors can set up a dedicated test environment that mirrors the complexities of real-world networks.

QA engineers can use network simulation to create and implement complex and realistic test scenarios. For example, QA can use network simulation software to:

- Test the interoperability and management of a wide variety of network devices based on the agent MIB files, without needing to have the devices themselves
- Create scripts that model the behavior of clients in complex environments
- Generate SNMP traps and trap storms to test error conditions
- Start, stop or restart individual devices
- Generate syslog events
- Test error handling by returning different SNMP errors, PDU length restrictions, and other quirks in SNMP agent implementations
- Test for scalability and load

Network simulation software allows much more rapid and thorough testing, bringing to market a better quality product in a timely manner.

“Scalability” is a vague and often over-used term. A network management product needs to be scalable along many dimensions, including:

- The size of the network (number of managed devices)
- The complexity of the network (number of types of managed devices)
- The amount of SNMP and other traffic generated by those devices
- The number of simultaneous users of the network management software

An application’s ability to scale is crucial to managing real-world environments. Network simulation can help test engineers answer questions such as: Can the application handle massive numbers of agents? How does it perform under heavy load? How does performance scale as the size of the network and number of managed devices increases?

Simulation Requirements: To best serve the needs of QA groups, the simulation software must be easily configurable, with flexible, script-based modeling capabilities. QA can then include a number of simulation scripts in the standard test beds for each product release, and change or enhance those scripts as new test scenarios are required. Simulation software should also support command line interfaces for integration into an existing test harness.

3. Sales: Realistic and Compelling Demonstrations

An effective sales demonstration can accelerate the sales cycle. Yet with network management software solutions, it is difficult for sales to give demonstrations without a network of managed nodes. A sales person giving a demonstration at a customer site or trade show cannot easily take a demonstration network with them.

Simulation software provides a means for the sales staff to give effective and meaningful demonstrations by creating a self-contained demonstration environment that simulates a real network. A single laptop system can represent a network with hundreds of managed devices. By determining in advance which agents a customer would require, a salesperson can match the demonstration to the potential customer's environment. Most importantly, the demonstrator can showcase the specific capabilities of the management application by creating network scenarios on demand.

To best showcase a network management solution's capabilities, the solution should support dynamic simulations, in which values change over time or in response to simulated network conditions. For example, time and total packet values should increment realistically. The sales representative should be able to simulate the loss in connectivity on a device such as a router by sending a Link Down trap on a specific port, and having all downstream devices stop responding to pings. These demonstrations are much more powerful and valuable than canned, 'static' demos to highlight the capabilities of a network management solution.

Simulation Requirements: The software must be able to run easily on a laptop, without requiring excessive system resources. It must support dynamic simulations. Values must change over time in response to changing network conditions. Also, to be effective, the simulation software should be easy and intuitive to use, so the salesperson can make on-the-fly adjustments based on customer questions.

4. Training: Effective Training with Realistic Scenarios

Offering effective and targeted training is important to ensuring customer satisfaction and reducing technical support calls. But setting up equipment for real-world scenarios is logistically difficult. With network simulation, the training organization can offer training anywhere – in their own facilities, at a customer site, in hotel conference facilities, or at trade shows – without lugging excess equipment and cables.

With network simulation, trainers can demonstrate and equip users to handle a variety of scenarios:

- Use scripts to generate traps or create error conditions – and reset the environment immediately once the class is done.
- Tailor the simulation to replicate the customer’s agents and network environment for customer-specific training.

For example, with network simulation software a trainer can easily recreate problems like the loss of a critical router in a network, without taking an actual router out of service. Using this information, you can demonstrate how the network management application handles alarms and alerts on conditions and establish procedures for responding to a variety of problems. Or you can train individuals in an environment that mirrors their own network environment.

Simulation Requirements: The training staff must be able to easily create and ‘reset’ network conditions. This requires flexible and extensive script-based modeling capabilities.

5. Professional Services: Targeted Service Offerings

Professional services are an increasingly important revenue source for many network management vendors. But professional services organizations typically must compete for access to limited testing/development resources within the company.

Network simulation software helps professional services offer targeted services by quickly and efficiently replicating key aspects of the customer's environment. Simulating the customer environment gives Professional Services organizations many options for enhancing offerings:

- Create targeted services by identifying which services might be most useful for the customer before pitching the service.
- When creating specialized software or SNMP agents for customers, design and test the software in a simulated environment for a pre-deployment testing.
- Offer a disaster recovery or availability assessment by testing the customer's ability to recover from simulated disaster scenarios. Offer troubleshooting and training to address the problems.

Simulation requirements: The simulation software must be able to quickly and easily "learn" customer environments for accurate simulations. Some network simulation solutions offer separate utilities for detecting and modeling the devices on the network (using "SNMP walks"). Using these utilities, service organizations can record and simulate devices at customer sites, without installing the network simulation software at the customer site. "Learning" behavior and the timing of SNMP traps from devices improves the accuracy of the simulation.

6. Technical Support: Fast Problem Resolution

Technical support is a critical part of the product offering. Done well, it enhances customer loyalty. Done inefficiently it costs both money and customer satisfaction.

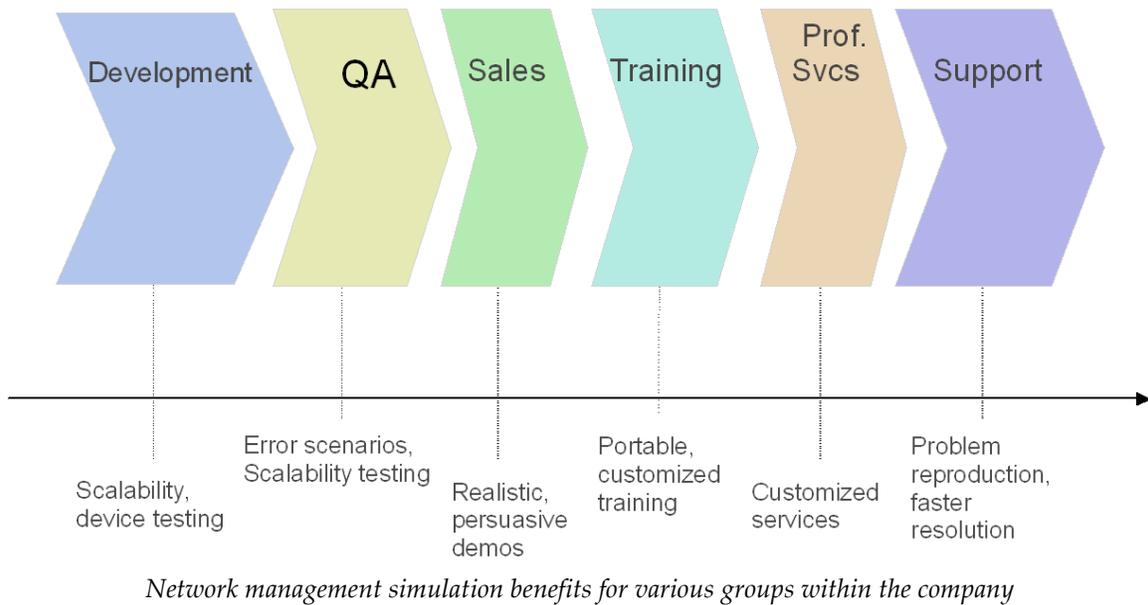
Technical support staff must identify and resolve customer problems without immediate access to the customer network environment. Network simulation can help Technical Support accelerate problem resolution:

- *Reproduce the customer problem:* After gathering information from the customer about the environment and the behavior, technical support staff can replicate the interaction of the network management product with the network. By reproducing the problem, they can more accurately find the root cause and identify potential fixes quickly and accurately.
- *Test patches or fixes before shipping them:* The network simulation solution gives Technical Support the opportunity to test a patch in the simulated customer environment, with the simulated agents for their devices, before shipping it to the customer.

Requirements: If network simulation is to be part of the problem resolution cycle, then the simulation solution must be easy and intuitive to use and reconfigure. Technical Support staff must be able to focus on the customer problem, not the network simulation, to provide the highest possible level of service.

Summary

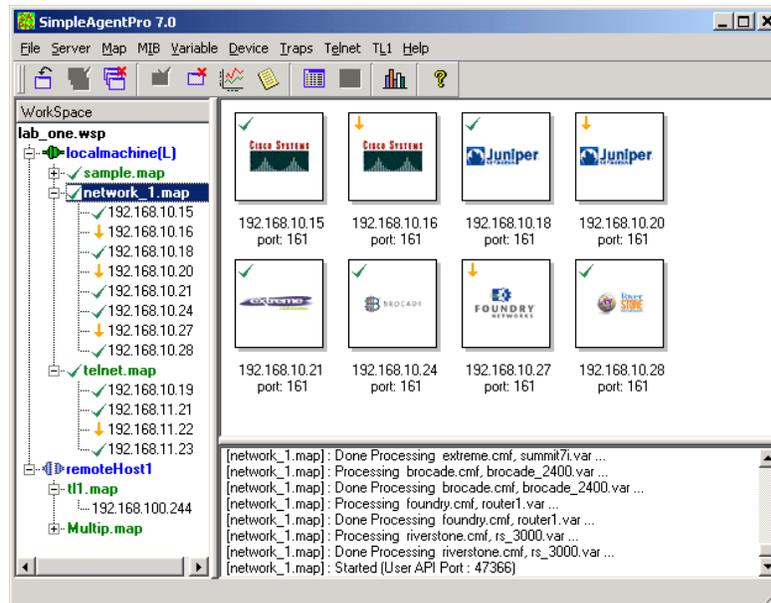
The value of an effective, well-designed network simulation software solution extends far beyond the development department to nearly all parts of the organization. Network simulation helps development and QA bring a high-quality product to market more quickly. For sales and training staff, using network simulation provides portable and highly effective demonstrations and training. And after the sale, professional services and technical support staff can use network simulation to replicate customer environments for targeted professional services and rapid problem resolution.



About SimpleSoft

SimpleSoft is the industry leader in SNMP testing and simulation tools. For over 12 years, more than 450 companies have depended on us to simplify their development, testing, demonstration and management of networks.

SimpleAgentPro® is a SNMP Agent Simulator with an easy-to-use GUI that can simulate an entire network of LAN-WAN components made up of thousands of SNMPv1,SNMPv2C and SNMPv3 manageable devices.



The SimpleAgentPro screen displaying simulated devices

Using this tool, you can develop, test and demonstrate SNMP management applications without requiring thousands of expensive and bulky hardware boxes. Enterprise-level simulations, made up of thousands of devices, can be distributed over multiple servers and controlled from one user interface.

In addition to SNMPv1, v2c, and v3, simulated devices also support many additional network management interfaces like Telnet/CLI, SSH, HTTP/HTTPs, TL1, TFTP Client and Server, FTP Client and Server, DHCP, ToD, NetFlow, sFlow, IPFIX, and even SOAP.

More information about SimpleSoft and its products is available at <http://www.simplesoft.com>

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