

VoIP Network Readiness Assessment: Why it's Essential and Cost-Effective

Introduction

Integrating voice and data on the network involves more than simply buying VoIP phones and a call manager, configuring and installing them, then hoping for the best call quality. When looking at network readiness for data applications, network bandwidth and server resources are often the only items that come under consideration. However, with voice services, there are more variables to consider before they can be deployed on the network, most importantly Quality of Service (QoS). Conducting a pre-deployment network readiness assessment will save time and money when rolling out new voice services – network problems can be resolved, costly network upgrades can be qualified, and call quality configurations can be tested without impacting users.

Workflow

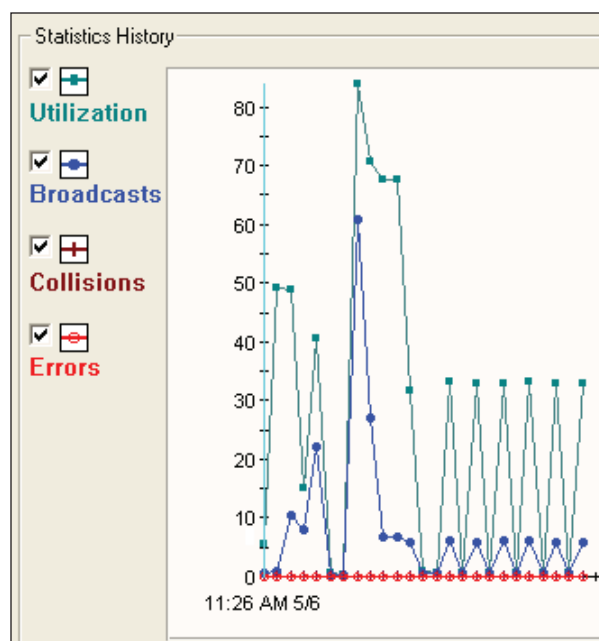
Using the Fluke Networks NetAlly® VoIP Readiness Assessment software together with the OptiView® Integrated Network Analyzer, optimum voice services can be delivered on the network with fewer costs in performance and troubleshooting time. They isolate areas on the network that need improvement, or justify replacing network infrastructure devices that may need to be upgraded. This application note covers best practices in performing a VoIP Network Readiness Assessment using these tools.

1. Baseline existing network

In some environments, network engineers install new switches, routers, and circuits to support VoIP services before validating that these upgrades are necessary. Prior to making any costly network upgrades or configuration changes on the network, check to see how it is presently configured and performing. This will assist in determining whether the network

bandwidth and utilization levels are acceptable to support VoIP or not. This network baseline can be performed in a few simple steps using the OptiView analyzer.

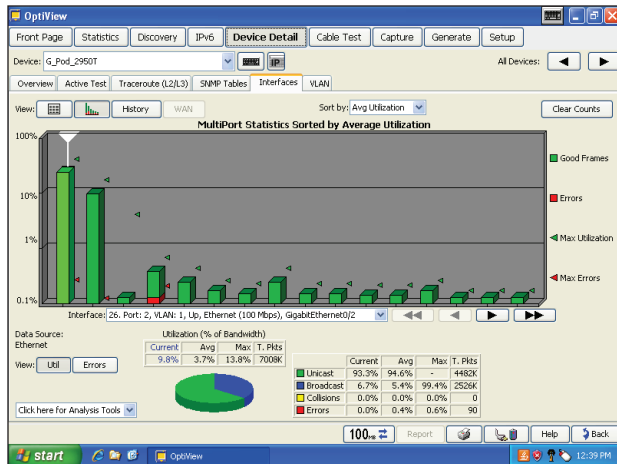
- A. Discover the Network – Using ARP, SNMP and ICMP, the OptiView analyzer can discover all devices in the enterprise and focuses on key devices such as switches, routers, and servers.
- B. Monitor switches and routers for excessive Utilization Levels – Through SNMP queries, the OptiView analyzer can graph utilization of switch ports and router WAN interfaces. Using OptiView Reporter software, key network interfaces including WAN links can be trended over time to watch for utilization spikes.



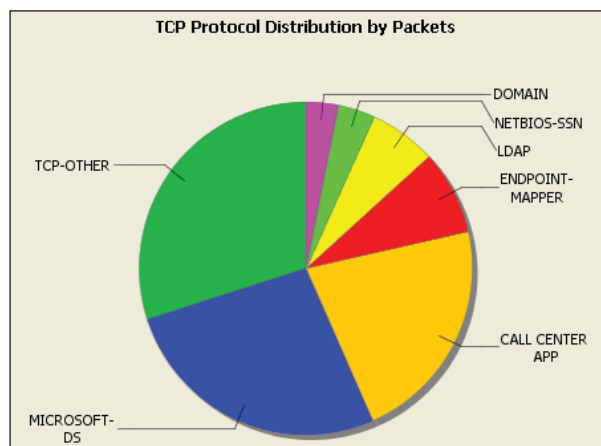
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- C. Monitor switches and routers for Ethernet Errors and resolve them. In the switch interface graphs, watch for red arrows which indicate ports with errors. An interface with these errors will most likely drop packets, crippling VoIP call quality .



- D. Monitor WAN traffic to remote offices for top applications, protocols, and unnecessary internet usage. If the WAN connection is fully utilized throughout the day, what users and applications are taking up that bandwidth? Is this acceptable usage? Answers to these questions will assist in making the decision to purchase more bandwidth or not. Perhaps unnecessary traffic may be eliminated to provide sufficient bandwidth for VoIP services.



Note: How much bandwidth do VoIP calls require? This depends on the codec in use. If the G.711 codec is implemented, it will require 64 Kbps per call. But remember, when calculating the total bandwidth required you must add all the IP and Ethernet headers into the frame, which makes a G.711 codec occupy closer to 90 Kbps. Also factor in the number of users at a remote office, keeping in mind that only a few of them may be on the phone at the same time.

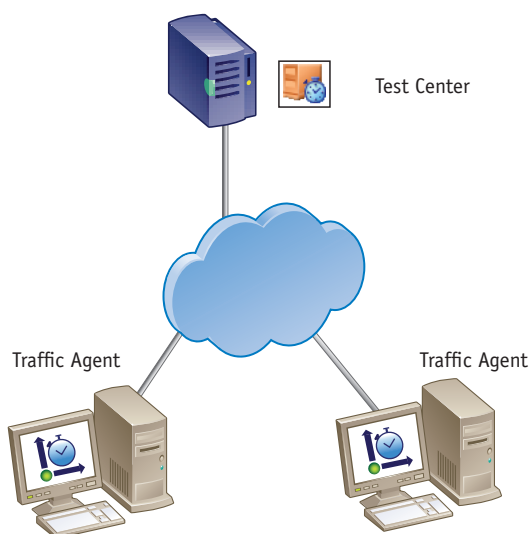
If greater bandwidth conservation is desired, a codec with higher compression may be used such as G.729. With its 8Kbps bit rate, G.729 uses a little more than 30Kbps when encapsulated, but your call quality will be reduced compared to using the G.711 codec.

2. Deploy NetAlly Test Center and Traffic Agents

After completing a basic network assessment with the OptiView analyzer, use the NetAlly VoIP software for testing real-time VoIP traffic across the network.

The first step in configuring NetAlly software is to determine where on the network VoIP traffic will be flowing and which key interfaces will be used. When establishing a call, VoIP phones first communicate to a call manager server and then directly to the partner phone, if it is in the same environment. On a network map, highlight key links that will be potentially used by voice traffic, including WAN links to remote offices and key switch uplinks. Using OptiView's Trace SwitchRoute feature, one can easily identify the path of the packets from the phone to the server.

NetAlly communicates through its Test Center with any number of software-based Traffic Agents. The Test Center is the NetAlly "control center" that runs on a fixed server or workstation. It schedules and executes VoIP tests between the Traffic Agents deployed out on the network. These Agents are installed on PCs throughout the LAN and remote sites, as required to simulate the appropriate number of callers. They are configured remotely by the Test Center to transmit a wide variety of simulated VoIP traffic. NetAlly will determine how many simultaneous calls, above a defined MOS (Mean Opinion Score) threshold, the current network can handle as well as what improvements should be made to maximize call quality.

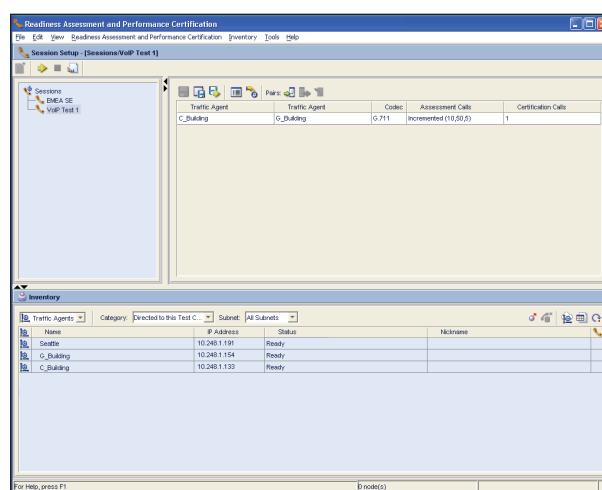


- A.** Deploy Test Center – The test center should be installed on a fixed machine near the call manager or data center.
- B.** Deploy NetAlly Traffic Agents – Deploy these at all remote offices where VoIP services will be supported, as well as at key distribution points on the LAN. A single Traffic Agent pair is capable of generating 200 simultaneous bi-directional VoIP calls

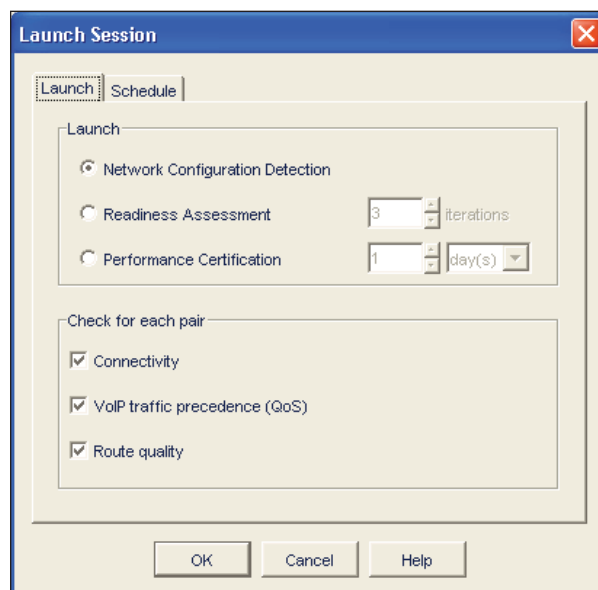
Once the Test Center has been installed and Traffic Agents have been deployed, NetAlly VoIP is ready for test configuration.

Network and performance testing

VoIP testing with NetAlly can be broken up into three phases: Network Configuration, Readiness Assessment, and Performance Certification, each with its own set of reports and goals. We will look at how to use these tests to run a comprehensive VoIP assessment on the network. Prior to running any tests, a session must be configured in the Test Center which identifies all Traffic Agents included in the assessment. At the bottom of the session screen all Traffic Agents configured in the tool are listed and can be added to the test session.



Once a session has been setup, launch the session and select a test, running only one at a time.



Network Configuration Test

This phase checks aspects of the network's configuration such as network connectivity and the quality of service settings for VoIP traffic. The goal of this test is to work along with the OptiView analyzer to proactively correct general and VoIP-specific network anomalies before starting the VoIP readiness testing. Each Traffic Agent runs a network connectivity test, a VoIP traffic precedence test, and a route quality and utilization measurement from point to point. If the network has incorrect QoS policy configuration, firewalls, or excessive utilization on infrastructure devices, this test will display these issues. It is important to correctly configure the SNMP community strings in use on the network for this test. If no network issues exist, move to the Readiness Assessment phase of the test.

Readiness Assessment Test

The objective of this phase is to simulate VoIP calls on the network, determining if it is ready to go live with real VoIP services. A range of calls between Traffic Agents can be generated according to the options specified during launch of the test. One of the key measurements of this test is to find the maximum calls that can be generated between Traffic Agents before call quality begins to degrade.

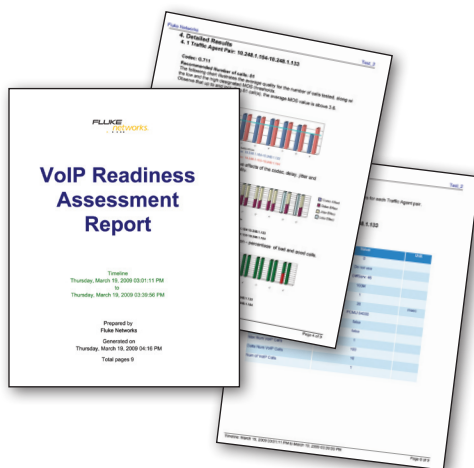
- A.** Configure a test session between key Traffic Agents, starting with 10 calls per agent and select a call increment to the maximum number of calls you think will be required for the full deployment. After the test is run, be sure to run the report of test results, taking note of the main cause of call degradation (jitter, dropped packets, or packet delay).

VoIP Test 1 (May 6, 2009 11:47 AM)								
Call View - Single Period (19)								
	MOS	Delay	Overall Loss	Jitter	Throughput	R Value	Sending CPU	Receiving CPU
		msec	percent	msec	kilobits/sec	percent	percent	percent
C_Building-G_Building-1	4.4	0.7	0.0	0.02	64.0	93.97	68.53	3.2
C_Building-G_Building-2	4.4	0.74	0.0	0.03	64.0	93.96	68.53	3.2

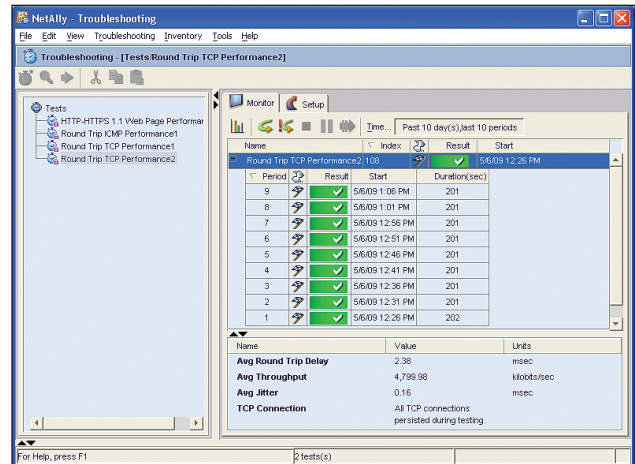
- B.** Using the OptiView analyzer, monitor the network during the NetAlly testing for switch port utilization, keeping an eye on excessive use of switch or router ports, contending traffic, and Ethernet errors.

A Readiness Assessment report may be generated which contains the detailed results of the test point pair for the number of calls tested and includes graphical information on:

- MOS value.
- Delay, loss and jitter effects on the call quality (MOS). Each bar represents the relative impact that each measurement had on the overall MOS value.
- Average values of the delay, jitter and loss during the tests.



When problems with **jitter or delay** are shown in test results, the built-in troubleshooting feature of NetAlly can be used to locate the root cause. Select the failed test and activate the troubleshooting tool for that specific failure. If these tests continue to fail, capture this activity on the network using the OptiView to get packet-level detail of the call and any factors causing degradation.



If **dropped packets** are displayed in the test report, use the OptiView to scan the path on the network between the Traffic Agents. Look for links with errors caused by duplex mismatches, bad cabling, or configuration problems. If any errors are detected, these will cause dropped packets, which will reduce call quality and may cause the NetAlly Assessment to fail. It may also be necessary to generate a throughput test with the OptiView to verify link capacity to remote offices, watching for links where levels are lower than expected.

Performance Certification Test

The last phase of the network assessment is the Performance Certification Test. This test is meant to validate the number of calls with consistent call quality attained by the Traffic Agent pairs during the readiness assessment test, but over a much longer duration of time. This test will emulate a fixed number of calls under various network conditions to simulate a real-world network environment.

Using the NetAlly session screen, define the recommended number of calls, determined by the readiness assessment, to be simulated over a specified length of time (for example, run the calls between Traffic Agents at 30 minute intervals for 10 days). During this test, the OptiView can be used to monitor traffic utilization levels across the network, watching for events which may affect test results. If this test fails use the NetAlly troubleshooting feature and OptiView to focus in on the problem.

Post Deployment Troubleshooting

When a successful pre-deployment assessment has been conducted with the NetAlly and OptiView products, the network will have been optimized and qualified for VoIP services. As with all applications on the network, there may be problems during installation, configuration, or performance over the long-term. Both of these tools can be used to troubleshoot VoIP quality issues once the users begin to make calls. At the remote client end of a quality issue, a temporary Traffic Agent (called a "NetRegard Agent") can be deployed and used to generate simulated calls back to a traffic agent at the headquarters site, while the OptiView captures the generated traffic in the live environment.

Conclusion

VoIP Readiness Assessment should play a major role in any VoIP installation. In far too many cases where a readiness assessment is not used, problems are not detected on the network until the users suffer quality degradation on production calls. Troubleshooting these issues after the fact is much more difficult and time consuming, and can sometimes lead to costly upgrades that do little to address the root cause. NetAlly VoIP software and the OptiView Integrated Network Analyzer save time and money when deploying VoIP services on the network, helping you to identify and resolve problems before they ever affect the users.



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