



**Lab Testing Detailed Report**

**DR101117B**

**Microsoft Lync 2010**

*25 January 2011*



Miercom  
[www.miercom.com](http://www.miercom.com)

## Table of Contents

1.0 Executive Summary .....	4
2.0 Overview: Client-side Features .....	5
2.1 Instant Message.....	5
2.2 Conferencing Features.....	5
2.3 Dial-In Conferencing Features.....	6
2.4 Phone, Optimized Phone Devices.....	6
3.0 Overview: Server-side Features.....	7
3.1 Presence.....	7
3.2 Response Groups .....	7
3.3 Call Park .....	7
3.4 Mediation Server Bypass .....	8
4.0 Operations, Administration and Management.....	9
4.1 Operations .....	9
4.2. Setup .....	9
4.3 Administration .....	9
4.4 Management.....	10
4.5 Monitoring and Call Detail Recordings (CDRs).....	10
4.6 Sample Drilldown Reports Showing Usage, Diagnostics and Failures.....	11
4.7 Sample Drilldown Reports.....	12
4.8 Call Admission Control (CAC) .....	13
4.9 Topology .....	14
5.0 Branch Resiliency .....	15
5.1 T1 failover to PSTN using NET Survivable Branch Appliance. ....	15
5.2 Microsoft Lync Branch UX 2000 SBA Failover Survivability.....	16
6.0 Security Testing .....	17
6.1 TLS/SSL Mutation Attack against Lync Server .....	17
6.2 TCP Mutation Attack against Lync Server .....	17
6.3 IPv4 Mutation Attack against Lync Server .....	18
6.4 ICMPv4 Mutation Attack against Lync Server.....	18
7.0 Load Test.....	19
7.1 SIP Load Test .....	19

8.0 Test Bed Diagram .....22  
8.1 How We Did It .....22  
Bottom Line:.....24

## 1.0 Executive Summary

Miercom reviewed the latest unified communications offering from Microsoft applying an in depth methodology developed over the last 7 years in studying the development of UC products. Microsoft Lync 2010 now affords Microsoft what it needs to compete and win in the battle for enterprise UC market share.

Significant developments in reliability, security, and a business enabling features make Microsoft Lync a viable option for businesses looking to revolutionize their current communications platform. Components for Microsoft Lync are far less complicated than they were for the preceding product Microsoft Office Communications Server (OCS) 2007 R2. Installation for both Server and Client are now clean and straight forward.

The evaluation of MS Lync included exercise of the client and server side feature set as well as active or delivered tests using test systems for Performance, Resiliency, and Security.

**Performance** - Microsoft Lync successfully passed voice and video Quality of Experience (QoE) tests under heavily loaded and degraded network conditions. Even with significant jitter and a packet loss percentage in excess of 5% the voice and video quality of the Lync client with High Definition Video was superb. High Definition Video Conferencing was conducted over T1 bandwidth with an average bandwidth of only 142 Kbps needed to maintain the connection. Peak traffic utilization did hit 1.5 Mbps at times when there was full motion in the video sessions.

**Resiliency** testing on Microsoft Lync Client: To verify the branch resiliency Microsoft Lync 2010 was submitted through a series of tests including failing connections between Lync Client and the Lync Server as well as a failed WAN connection. We found the Lync Client to recover quickly (within seconds) upon restoration of the network connection to the Lync 2010 Server.

We also conducted failover scenarios for simulated branch location using a Survivable Branch Appliance (SBA) from NET the SX 20000. This appliance provided basic voice services to users in the branch during a WAN outage. Microsoft Lync passed resiliency tests for local client as well as branch office deployment.

**Security** testing for the Microsoft Lync Server revealed a “pass” rating for security testing for Microsoft Lync 2010 (with an appropriate network firewall employed). No inherent vulnerabilities were discovered in Microsoft Lync Server 2010 outright using a battery of vulnerability and protocol analysis tests from leading test and measurement vendors Ixia, Mu Dynamics, and Touchstone.

**Bottom Line** Microsoft Lync 2010 is a resilient, scalable, feature rich Unified Communications System. Microsoft Lync 2010 should be in the short list of top three to consider for enterprises communications infrastructure upgrades. Quality third party peripherals from Aastra, Polycom and SNOM will help Microsoft achieve more market acceptance at the Enterprise Desktop. Third party hardware such as the survivable branch appliance UX 2000 from NET will enable branch offices the resiliency needed for enterprise communications.

Rob Smithers

CEO

Miercom

## 2.0 Overview: Client-side Features

The following features with overview description provided by Microsoft were all functionally evaluated with performance verified by Miercom Engineers in a test network built in Miercom's lab.

### 2.1 Instant Message

Running Microsoft Office with Lync 2010 allows you to perform many of the same actions in Office programs that are available in Lync 2010. These supported features include Instant Messaging, document, graphic, spreadsheet sharing and SharePoint Services.

### 2.2 Conferencing Features

Several new features that enhance conferencing are described below:

#### **Single meeting client**

Microsoft Lync 2010 is the only client needed for both scheduled and ad hoc meetings. This client replaces the need for the Live Meeting client and the Outlook Add-In.

#### **Downloadable meeting client**

Lync 2010 Attendee is a downloadable client that enables users without Lync 2010 to attend meetings but does not include any functionality for IM, presence, or meeting scheduling.

#### **URL for meetings**

A simple URL for meetings, dial-in conferencing, and administrative tasks can be created that are easy to remember, and users can click on to join conferences.

#### **Conferencing Modes**

During a conference you can share your entire desktop or an individual application. Lync Server also provides client-side meeting recording and playback, whiteboard and annotation tools, and presentations. Uploaded files can be viewed and saved in the original file format.

#### **Meeting admission policy and controls**

Users who organize meetings can change authorization types after sending the invitation and during the meeting.

#### **Enhanced meeting access levels**

Users can specify a more granular set of access permissions on meetings they organize.

#### **Assigned Conference IDs**

By default, every meeting organized by a particular user has the same conference URL and conference ID for dial-in users. This enables dial-in users to remember just one conference ID for that organizer.

#### **Presentation Mode**

In an A/V conference, the presenter can set the conference state so all participants are muted. While in this state, participants cannot unmute themselves. The presenter can open the conference for questions later.

#### **Entry and Exit Announcements controls**

By default, entry and exit announcements in an A/V conference are audible to everyone. Each user can turn these announcements on or off for his or her own client.

## 2.3 Dial-In Conferencing Features

### **Improved user join experience**

Participants who use dial-in conferencing, but for whom authentication fails, no longer need to disconnect and retry. The users are transferred to the lobby, where the leader is notified and can either accept or reject the caller, or the connection times out.

### **Access to DTMF commands during call**

After participants are in a conference, they can issue dual-tone multifrequency (DTMF) commands from the phone keypad. Leaders can issue DTMF commands to admit people, toggle mute, lock or unlock the conference, and turn entry and exit announcements on or off. Participants can use DTMF commands to hear Help, play a private roll call, and mute themselves.

### **Recorded name for anonymous callers**

Users who are not authenticated are prompted to record their name. The recorded name identifies unauthenticated users in the conference.

### **Simplified leader join**

When dialing into a conference, a leader can join more easily than in previous versions of Lync Server 2010 and Office Communications Server. Entering the caller's phone number is no longer required.

## 2.4 Phone, Optimized Phone Devices

The updated infrastructure in Microsoft Lync Server 2010 communications software includes new features and capabilities. There is also support for new devices and improved management and troubleshooting tools.

Lync Server 2010 introduces support for five new IP phones. The phones are built by Aastra and Polycom and include two desk phones, two common area phones, and a conferencing device.

## 3.0 Overview: Server-side Features

The following features with overview description provided by Microsoft were all functionally evaluated with performance verified by Miercom Engineers in a test network built in Miercom's lab.

### 3.1 Presence

#### **Enhanced privacy controls**

Allows users more choices in how much personal information is made available to others.

#### **Photographs in contact lists**

#### **Message waiting indicator**

A message waiting indicator is provided by Exchange Server 2010 Unified Messaging.

### 3.2 Response Groups

#### **Anonymous calls**

When a call is anonymous, callers cannot call agents directly. Anonymous calls do not support conferencing, application sharing and desktop sharing, file transfer, white boarding and data collaboration, or call recording.

#### **Attendant routing method**

With this routing method, all agents in a Response Group are called simultaneously for every incoming call, regardless of their presence. This method allows Microsoft Lync 2010 Attendant users (agents) to see all the calls that are waiting and answer them in any order.

#### **Integrated manageability**

Response Group manageability is integrated with Lync Server 2010 manageability: Lync Server 2010 Management Shell cmdlets support all Response Group management tasks, and Microsoft Lync Server 2010 Control Panel supports common Response Group management tasks.

#### **Caller experience improvements**

Response Group supports more flexible IVR configurations and prompts.

#### **Web service**

A full Web service that supports customized agent consoles is provided. The Web service can be used to retrieve information about agents, agent group membership, agent sign-in status, call status for groups, and the response groups that support anonymous calls.

### 3.3 Call Park

The new Call Park application allows an Enterprise Voice user to put a call on hold and then retrieve it later from any phone. Call Park is useful for continuing a call from a different location and for transferring a call when the final recipient is unknown.

### 3.4 Mediation Server Bypass

Media flow can bypass the Mediation Server with a configuration change. This can improve call quality by optimizing the media path, reducing latency, minimizing unnecessary transcoding, limiting packet loss, and eliminating potential points of failure. It can offer bandwidth savings where a Mediation Server, a PSTN gateway or PBX are connected by WAN links with constrained bandwidth. Offloading the media processing from the Mediation Server to pool servers for bypassed calls also improves scalability.

## 4.0 Operations, Administration and Management

### 4.1 Operations

Several different products were examined, showing how the Microsoft Lync Server 2010 operates.

Topology Builder is an easy to use tool to configure the Microsoft Lync Server 2010 topology. As presented by Microsoft engineers, topologies can be created and exported as image files for use with specific servers in a Lync environment. Within the Topology Builder, a user can edit their topologies to meet future changes in an environment without having to create a brand new one.

Another feature demonstrated by Microsoft was the ability to analyze a topology scheme for errors before it is used in a live network, thereby saving time to troubleshoot when a problem arises. Comprehensive log files are created when an error is detected. Once a topology is created and validated it may be committed and deployed for use later in the Microsoft Lync environment.

The Central Management Store is used to gather configuration data about servers and services from the Microsoft Lync server environment. The Central Management Store is capable of handling and storing data for the operation of a Microsoft Lync environment. All servers in the Microsoft Lync environment read configurations directly from the Central Management Store and only need a read-only copy of data located on each physical server.

### 4.2. Setup

New features for installation and updates are in the distribution of setup as an executable file, and an update link option to Lync Server 2010 Client Version Check.

Lync 2010 Setup Executable: Previously setup was provided as an installer package. We observed that in the Microsoft Lync 2010 the setup files are provided as executable programs. The Microsoft Silverlight browser plug-in, a prerequisite for Lync Web App, is also installed by using an .exe program.

### 4.3 Administration

We observed how an administrator could use the Microsoft Lync Server 2010 Management Shell for configuration changes or installations. All changes done in the Management Shell are pushed to the Central Management Store and replicated to all servers in the Microsoft Lync Server environment.

The Management Shell is built off the Windows PowerShell command line interface. With the correct commands, it can manage the entire Microsoft Lync 2010 Server deployment. It is used for basic stopping and starting services or for advanced Management Store replication configurations.

Role-Based Access Control allows assignment of administrative privileges. We noted that there were many predefined roles covering common admin tasks. We were able to assign various privilege levels based upon job requirements. Each role is associated with a specific list that users are allowed to run.

## 4.4 Management

Web-Based Management interface can be accessed from anywhere in the corporate network without having to install any special software. The secure HTTP web interface allows an administrator to perform many tasks such as monitoring call information on a specific date or time. Call information can be drilled down to call quality, dropped calls, how many calls were placed in a chosen period and what users were registered to the Lync server.

A DNS Load Balancing feature can be used as a software based solution to balance all traffic related to Microsoft Lync, such as SIP and media traffic. Having the DNS Load Balancing software in conjunction with Microsoft Lync Server 2010 reduces the administration overhead for hardware load balancers.

The user sign-in mode allows a server to be taken offline for administration purposes without the need to end current conversations. With user sign-in mode calls can be routed to different servers in the pool, this ensures that callers will not lose service in the middle of a server upgrade. All current and new calls will be placed through the new routed server in the pool.

## 4.5 Monitoring and Call Detail Recordings (CDRs )

Lync Server 2010 has a Dashboard View which provides easier access to reports. Our team was impressed with the drill down capabilities of these reports. Below is the Monitoring Server dashboard. We were able to obtain additional information by clicking on any linked item in the dashboard. Additional drill down screenshots are presented on the following pages.

Figure 1 : Monitoring Server Dashboard

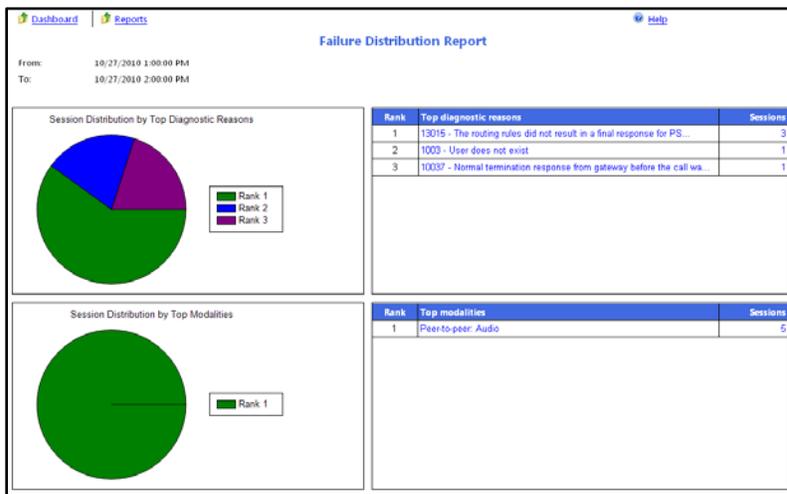


Screen shot of Dashboard. Linked items on the report can provide additional information by using the drill down capability.

Monitoring Server takes advantage of SQL Server Reporting Services to provide a richer reporting on system usage for analysis, voice quality for diagnostics scenarios, and IP phone and media device asset management. A dashboard presents an aggregation of these reports, proactively informing administrators about usage trends and the health of the deployment.

Call Detail Recording (CDR) and Quality-of-Experience (QoE) databases have been updated to include new usage and diagnostic data for all new Lync Server 2010 features, conferencing, registration, and device diagnostics.

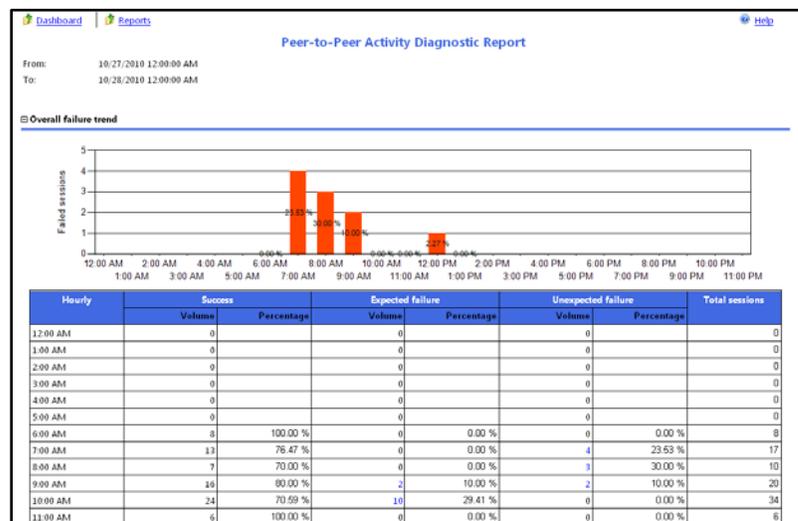
#### 4.6 Sample Drilldown Reports Showing Usage, Diagnostics and Failures



Failure Distribution Report Screen shot showing reasons for call failures as well as ranking.

#### Peer to Peer Activity Diagnostic Report

Screen shot:  
 Top half: failed sessions by %;  
 Bottom: showing successful, expected and unexpected failures and number of sessions.

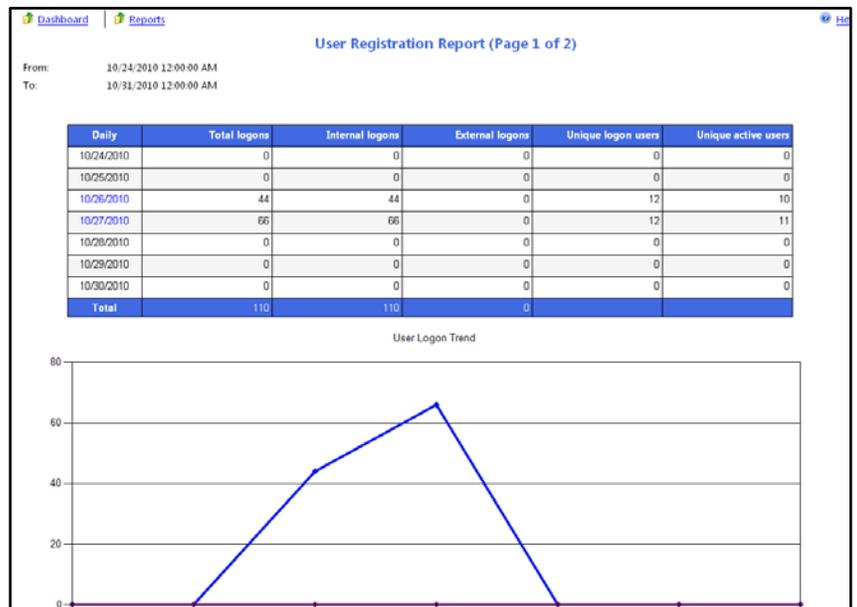


## 4.7 Sample Drilldown Reports



Top Failures Report

Screen shot with detailed description failures. Includes data regarding ID, users impacted, cause, location and other data.



User Registration Report

Daily trend report of users with graphical representation.

## 4.8 Call Admission Control (CAC)

### Diagnostic Report For CAC

**Report time:** 10/28/2010 5:54:57 AM  
**Response code:** 200  
**Request type:** INVITE  
**Source:**  
**From user URI:** erica@fabrikam.com  
**From user agent:** UCCAPI/4.0.7546.0 OC/4.0.7546.0 (Microsoft Lync 2010)

**Diagnostic ID:**  
**Content type:** multipart/alternative  
**Application:**  
**To user URI:** carlosg@fabrikam.com

**Diagnostic header:**

Additional diagnostic information

Seq #	Diagnostic ID	Source	Application	Diagnostic Header
1	13004	CS-SE.fabrikam.com	InboundRouting	13004; reason="Request was proxied to one or more registered endpoints"; source="CS-SE.fabrikam.com"; Count="1"; appName="InboundRouting"
2	5	CS-SE.fabrikam.com	InboundRouting	5; reason="Insufficient bandwidth to establish session. Attempt PSTN re-route"; source="CS-SE.fabrikam.com"; appName="InboundRouting"
3	5	CS-SE.fabrikam.com	InterClusterRouting	5; reason="Insufficient bandwidth to establish session. Attempt PSTN re-route"; source="CS-SE.fabrikam.com"; appName="InterClusterRouting"
4	25002	CS-SE.fabrikam.com	InterClusterRouting	25002; reason="Routing to best pool"; source="CS-SE.fabrikam.com"; clusterFqdn="CS-SE.fabrikam.com"; routingType="ToRouting"; appName="InterClusterRouting"
5	13004	CS-SE.fabrikam.com	InboundRouting	13004; reason="Request was proxied to one or more registered endpoints"; source="CS-SE.fabrikam.com"; Count="1"; appName="InboundRouting"
6	5	CS-SE.fabrikam.com	InboundRouting	5; reason="Insufficient bandwidth to establish session. Attempt PSTN re-route"; source="CS-SE.fabrikam.com"; appName="InboundRouting"
7	13007	CS-SE.fabrikam.com	InboundRouting	13007; reason="Request was proxied to an application."; source="CS-SE.fabrikam.com"; targetApp="voicemail"; appName="InboundRouting"
8	15010	CS-SE.fabrikam.com	ExumRouting	15010; reason="Routing to UM for voice mail deposit"; source="CS-

In this test we restricted new video and voice call requests from being initiated based on available bandwidth. Microsoft Lync 2010 has very extensive call admission control capabilities to ensure QoE is maintained for customer networks. If resources are insufficient for a quality experience the session is refused and alert is generated.

## 4.9 Topology

A site in Lync Server is a set of Lync Server computers that are connected by a high-speed, low-latency network, such as a LAN or two LANs connected by a high-speed fiber optic network.

A Lync Server site can be different from the Active Directory Domain Services and Microsoft Exchange Server sites. Lync Server does not use the sites defined for Active Directory Domain Services.

A Lync Server site can be either a central site or branch site. A central site contains at least one Front End pool or one Standard Edition server. A branch site is associated with one central site. Each branch site contains a PSTN connection. It can also have a Mediation Server. A branch site could run a Survivable Branch Appliance that combines a PSTN gateway with a Lync Server Registrar and Mediation Server.

Audio/Video Conferencing Server functionality, which normally runs on the Front End Server, can also run in a standalone server role called A/V Conferencing Server. The A/V Conferencing Server was deployed as a load-balanced pool. We observed greater scalability and improved performance for audio/video (A/V) conferencing.

There is the ability to run a virtualized topology of Microsoft Lync Server 2010 in both small and enterprise topologies. All virtualized topologies support all workloads, including Enterprise Voice. Scalability is roughly 50% of the scalability offered by a Lync Server 2010 topology running only on physical servers.

We noted other topology changes concerning the Director, Mediation Server, Archiving Server, and Monitoring Server during our review:

In Lync Server 2010, the Director is now a unique server. A Director is not designated as either a Standard Edition server or an Enterprise Edition server; it does not require any type of Microsoft Lync Server 2010 license.

The Director does not require a separate back-end database; it uses a local version of the SQL Server Express Edition database software, which is installed automatically when you deploy a Director.

## 5.0 Branch Resiliency

Smaller branch sites without on-site administrators use the Survivable Branch Appliance (SBA). It can provide basic voice services to users in the branch during a WAN outage.

The SBA is a combination of a server and a PSTN gateway, and runs in branch sites that do not have a Lync Server 2010 Front End pool or Standard Edition server. The Survivable Branch Appliance can provide basic phone services to users at the branch site when the WAN link to the data center is down.

Because the Survivable Branch Appliance runs at a remote site that may not have IT personnel, it is designed for easy deployment and remote management. A Survivable Branch Appliance can be set up at the central site.

In the event a branch office's WAN connection to a data center fails, the Survivable Branch Appliance provides voice features to users in that branch office such as, PSTN in- and out-bound calling, intra-and inter-site calls, authentication, voice mail, CDR, IM and AV conferencing.

To verify the branch resiliency the Miercom engineers put Microsoft Lync 2010 through a series of tests. They included mutation attacks, failover scenarios, survivability, high availability and load testing. The results of these tests are described in detail on the following pages.

### 5.1 T1 failover to PSTN using NET Survivable Branch Appliance.

#### Test

Branch resiliency will be tested by physically removing the WAN link while calls are up. T1 service to an Adtran Atlas 800 and channel bank for Public Switched Telephone Network (PSTN) connectivity will be provided by a Network Equipment Technologies UX-series Survivable Branch Appliance (SBA). Record whether calls remain up, and whether new calls can be placed. Observe and record any lost connectivity and the behavior of Lync clients.

#### Observations

We established intra-branch calls between multiple Lync clients, and then pulled the WAN cable at the SBA. We observed that intra-branch calls remained up, and the Lync clients did not log off or on during failover. We were able to place new calls successfully during failover. Conferencing was observed to drop, and Microsoft Exchange connectivity was lost. User presence was also lost during the failover. Phones and clients keep local copies of call logs and contact lists until connectivity to the Address Book server was restored. WAN link was then replaced and we observed that presence connectivity was reported available after 8 to 15 minutes.

#### Analysis

Branch connectivity to place outside calls was maintained after this WAN interruption. The ability to use the Lync Client upon recovery of a WAN failure needs further investigation. Support engineers advise a polling timer may need adjustment.

## 5.2 Microsoft Lync Branch UX 2000 SBA Failover Survivability

### Test

The purpose of this test is two-fold. First, we wanted to see if a registered user to the UX2000 on the branch side is able to maintain basic calling functionality; to determine if the local SBA loses connectivity to the Lync server when connectivity from the UX2000 to the Lync server has failed. The second part of the test is to determine whether the Lync client recovers full functionality once the connection to the Lync server is restored.

### Observation

Once the simulated WAN was disrupted, the Lync client went into survivability mode in about 40 seconds and maintained basic call functionality with the UX2000. The Lync user at the branch site was able to make local calls within the branch site and also make calls through the PSTN. When the WAN link connection was restored, the Lync client regained full functionality according to its pre-configured refresh time of 15 minutes. The Lync client refresh rate is 15 minutes, according to Microsoft, and this process happens automatically. During our testing, we found that the refresh time was only 8 minutes.

## 6.0 Security Testing

### 6.1 TLS/SSL Mutation Attack against Lync Server

#### Test

The TLS/SSL protocol mutation was run from the Mu Dynamics against the Microsoft Lync server on IP address 192.168.0.20. The target was analyzed using 16,209 protocol mutations which were generated from 633 variant types. The different variants were implemented for SSLv3 messages and TLSv1 messages.

#### Observation

The Mu found a level 4 confidence level protocol fault. Referenced as TLSv1 Messages-tls\_v1.record-client-cert.verify.version.major.values(1). The high level confidence protocol mutation crashed the Lync server and eventually made the server restart. Since the Lync server was restarting the phones on the LAN, we were not able to make any calls. Users located on the branch side or SBA were able to place calls. After reviewing the server logs, we saw many lsass.exe errors. A fix for this issue is to install a Windows Server 2008 R2 QFE prior to the installation of Microsoft Lync Server 2010.

#### Analysis

With proper patches installed there is no residual vulnerability.

### 6.2 TCP Mutation Attack against Lync Server

#### Test

The TCP Protocol mutation attack was run against the Lync server on IP address 192.168.0.20. The target was analyzed using 3,417 different protocol mutations that were generated from 91 variants.

#### Observation

All attack vectors were handled successfully and no faults were found. The Microsoft Lync server dropped all mutated TCP traffic. There were no vulnerabilities in the implementation of the TCP protocol on the Lync server.

## 6.3 IPv4 Mutation Attack against Lync Server

### Test

The IPv4 protocol mutation attack was run against the Lync server located on IP address 192.168.0.20. The target was analyzed using 31,129 different protocol mutations that were generated from 113 variants. Various types of IPv4 Fragmented Datagrams and IPv4 Datagrams were included in the test.

### Observation

All attack vectors were handled successfully and no faults were found. The Microsoft Lync server dropped all mutated IPv4 Fragmented and non-Fragmented Datagrams. There were no vulnerabilities in the implementation of the IPv4 protocol on the on the Microsoft Lync server.

## 6.4 ICMPv4 Mutation Attack against Lync Server

### Test

The ICMPv4 Protocol Mutation attack was run against the Lync server located on IP address 192.168.0.20. The target was analyzed using 49,120 protocol mutations which were generated from 405 variants. Various types of ICMPv4 echo requests, fragmented echo requests and timestamp requests were included in the test.

### Observation

All attack vectors were handled successfully and no faults were found. The Microsoft Lync server dropped all mutated ICMPv4 echo requests, fragmented echo requests and timestamp requests. There were no vulnerabilities in the implementation of the ICMPv4 protocol on the on the Microsoft Lync server.

## 7.0 Load Test

### 7.1 SIP Load Test

#### Description

SUT is subject to call load from SIP call generation tool in order to establish maximum concurrent call handling processing ability, maximum sustainable calls, and total calls sustained over prolonged period of time without error.

#### Configuration

Connect Microsoft Lync 2010 to the Touchstone WinSIP generator. Configure the Touchstone WinSIP initiate client with sixty simultaneous users each calling a unique Lync client who then forwards the call to a unique WinSIP answer client. Each call connects for a total of ten seconds and then immediately disconnects. After four seconds another call is initiated. Half of the users are delayed by an additional two seconds.

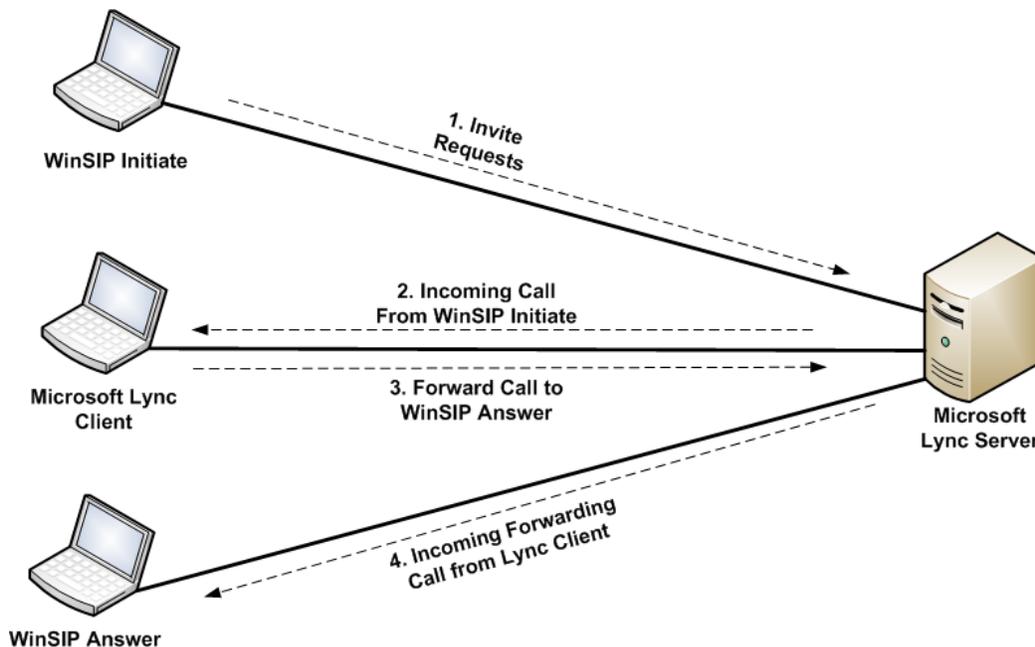


Diagram showing the process of a SIP call coming from a WinSIP client being forwarded to another WinSIP client.

## Purpose

The purpose of this test is to determine whether the Microsoft Lync Server 2010 can sustain millions of calls over a prolonged period of time without any errors or dropped calls as is the standard for Enterprise Class IPPBX products.

## Expected Results

It is expected that a threshold volume of heavy load of simultaneous phone calls through the Microsoft Lync Server 2010 or any UC product may cause errors or dropped calls.

## Metrics

Maximum calls per second handling capacity (CPS)

Maximum concurrent calls sustainable (Calls)

Total calls completed of time (#Calls, Time d/hr/min)

## Observation

Miercom engineers decided to “bracket” a sufficient call volume that would allow for a prolonged load test and achieve at least 1 million calls running for 3 days. Since no calls were dropped, we continued the test to achieve over 4 million calls with 13,147 calls per hour through the Microsoft Lync 2010 Server. The system resources on the Lync server were analyzed to see how much of the processor capacity and memory the generated calls were using. During testing the processor on the Lync server ranged between 32% and 100% and the amount of memory used was 3.23GB out of 4GB. The entire test ran for thirteen days and twenty six minutes performing a total of 4,107,951 successful calls. Each WinSIP user completed approximately 73,350 calls total.

Duration of Test	Calls Attempted	Calls Completed	Success Completed
13 Days 26 Minutes	4,107,951	4,107,951	100%

## Calls Generated with WinSIP

The screenshot shows the WinSIP software interface with the following statistics:

- Completed: 4,107,951
- Successful: 4,107,951
- Unsuccessful: 0
- Channels Available: 14,114 of 14,114
- Currently Connected: 39 of 14,114 (0.28%)
- Errors Detected: 44 (0.001%)
- Lowest Rate: 626.09 calls/hour
- Highest Rate: 13,168.93 calls/hour
- Current Rate: 13,147.66 calls/hour

The call log table is as follows:

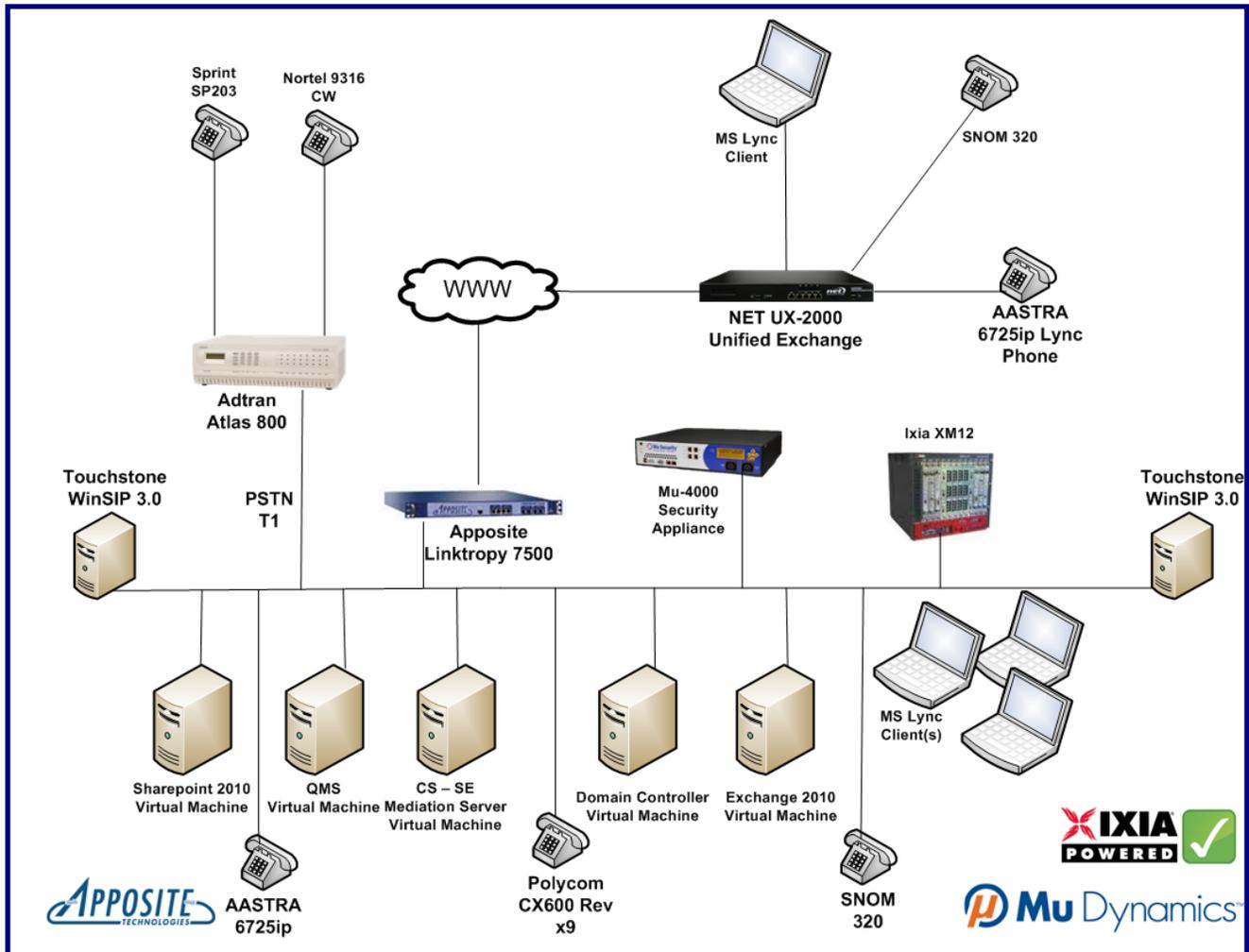
Status	Call Name	User ID	Passed	Failed	Started	Duration	Audio	Video	Call ID
Timed	Call 1	5001	73,353						
Connected	Call 2	5002	73,356		08:06:06	00:00:01	Tx		0fb2-29162265-11e8d-Call
Connected	Call 3	5003	73,356		08:06:06	00:00:02	Tx		4a59-29161203-11e8d-Call
Connected	Call 4	5004	73,352		08:06:07	00:00:00	Tx		cf80-29162937-11e89-Call
Connected	Call 5	5005	73,338		08:06:03	00:00:04	Tx		b2c9-29159281-11e7b-Call
Connected	Call 6	5006	73,360		08:06:04	00:00:03	Tx		d48a-29159750-11e91-Call
Connected	Call 7	5007	73,349		08:06:02	00:00:06	Tx		17e9-29157687-11e86-Call
Connected	Call 8	5008	73,351		08:06:01	00:00:07	Tx		07fe-29156453-11e88-Call
Connected	Call 9	5009	73,348		08:06:04	00:00:04	Tx		6145-29159390-11e85-Call
Connected	Call 10	5010	73,353		08:06:03	00:00:05	Tx		075c-29158328-11e8a-Call
Timed	Call 11	5011	73,361						
Connected	Call 12	5012	73,358		08:06:04	00:00:04	Tx		1dfd-29159718-11e8f-Call
Connected	Call 13	5013	73,358		08:06:00	00:00:07	Tx		4d75-29156062-11e8f-Call
Connected	Call 14	5014	73,362		08:05:57	00:00:11	Tx		3db3-29152859-11e93-Call

Screen shot showing WinSIP initiate client displaying connected calls.

### Analysis

Microsoft Lync Server 2010 was able to sustain heavy call volume without dropping any calls or reporting any errors in a 4 million call completion test. The delivery rate with sustained operation without error is the highest capacity test applied to any Unified Communications / IP PBX product we have tested to date.

## 8.0 Test Bed Diagram



## 8.1 How We Did It

Microsoft provided an 8-way core i7 server with 16GB of RAM containing five virtual machines using the Microsoft Hyper-V manager built into Microsoft Server 2008 R2. The five installed virtual machines included a Mediation Server, Domain Controller, Exchange Server 2010, SharePoint 2010 and a server running a Quality of Experience Monitor. These servers were used to view the total experience that Microsoft Lync 2010 has to offer. Other included devices and software contributed in Microsoft Lync server 2010 testing included the Aastra 6725ip Lync phones, Microsoft HD webcams and Microsoft Lync client software.

The MuDynamics Mu-4000 [www.mudynamics.com](http://www.mudynamics.com) security appliance consists of a complete service assurance solution for determining the reliability, availability and security of IP-based applications and services. The Mu solution is highly automated, with lights-out fault isolation. The Mu Test Suite speeds the remediation of software flaws by providing actionable reports and complete data on any faults. Mu-based testing is managed via a variety of interfaces, including its highly visual web-based graphical user interface or remotely controlled using REST- or XML-based APIs for integration into common laboratory automation frameworks such as HPQC or STAF. Protocol

mutation attacks were generated and directed at Microsoft's Lync server and NET's UX-2000 appliance.

Touchstone WinSIP [www.touchstone-inc.com](http://www.touchstone-inc.com) is a high-performance software-based SIP bulk call generator. The WinSIP suite was used to generate calls through the Lync mediation server to test its ability of being able to handle thousands of simultaneous SIP calls. SIP calls were generated using the G.711 uLaw audio codec and were directed to the mediation server to ring a client at the Lync site. Once the Lync client receives the WinSIP call the call will simultaneously ring another WinSIP user. The WinSIP receive side will answer the call and immediately disconnect it. Simultaneous calls were increased to stress the mediation server to see how many calls it can actually support.

The Apposite Linktropy 7500 Pro [www.apposite-tech.com](http://www.apposite-tech.com) was used to simulate the WAN link between the Microsoft Lync environment and the NET UX-2000 branch site. HD video conferencing calls were initiated across the WAN link while simulating a 1.5 mbps T1 link. Analyzing video and audio quality at both ends were observed during the T1 simulation.

The Adtran Atlas 800 [www.adtran.com](http://www.adtran.com) simulated a local PSTN which was connected with the UX-2000 branch site with a T1 connection. This connection to the local PSTN allows users at a branch site to make calls to the outside. In the event of a WAN link outage the UX-2000 can failover to the PSTN T1 connection back to the Microsoft Lync site through the Adtran Atlas 800 to maintain connectivity with Microsoft Lync.

We used an Ixia XM12 chassis [www.ixiacom.com](http://www.ixiacom.com) using IxLoad to apply IMIX background traffic while generating SIP calls for analysis. Real-world traffic was also used in testing as generated by Ixia's test platform and test applications, principally IxNetwork for Layer 2-3 routing and switching traffic and IxLoad for Layer 4-7 application traffic.

## Bottom Line:

Microsoft Lync 2010 is a resilient, scalable, feature rich Unified Communications System. Microsoft Lync 2010 should be in the short list of top three to consider for enterprise communications infrastructure upgrades. Quality third party peripherals from Aastra, Polycom and SNOM will help Microsoft achieve more market acceptance at the Enterprise Desktop. Third party hardware such as the survivable branch appliance UX 2000 from NET will enable branch offices the resiliency needed for enterprise communications.