



Technical Considerations for Microsoft Office Live Meeting Service Deployment

Whitepaper

Published: April, 2007

For the latest information, please see <http://www.microsoft.com/uc/>

Information in this document, including URL and other Internet Web site references, is subject to change without notice. Unless otherwise noted, the companies, organizations, products, domain names, e-mail addresses, logos, people, places, and events depicted in examples herein are fictitious. No association with any real company, organization, product, domain name, e-mail address, logo, person, place, or event is intended or should be inferred. Complying with all applicable copyright laws is the responsibility of the user. Without limiting the rights under copyright, no part of this document may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), or for any purpose, without the express written permission of Microsoft Corporation.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except when expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

This White Paper is for informational purposes only. MICROSOFT MAKES NO WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, AS TO THE INFORMATION IN THIS DOCUMENT.

© 2007 Microsoft Corporation. All rights reserved.

Microsoft, Windows, Windows Vista, Active Directory, Excel, Outlook, PowerPoint, RoundTable, SharePoint, and SQL Server are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

All other trademarks are property of their respective owners.

Table of Contents

Introduction.....	4
Scope of this Whitepaper	4
New in 2007 Release of Live Meeting	5
3.1 Integrated Media	5
3.2 Training and Events	6
Network Planning	6
Bandwidth Considerations	8
5.1 Downloading the Live Meeting client	8
5.2 Uploading Meeting Content.....	9
5.3 PowerPoint Presentations.....	10
5.4 Microsoft Office and Other Document Types	11
5.5 Whiteboards and Polls	12
5.6 Application Sharing	12
5.7 Desktop Sharing and Remote Control	14
5.8 Desktop Snapshots	14
5.9 PSTN Audio Conferencing	14
5.10 VoIP Audio	14
5.11 Hybrid VoIP and PSTN Audio	15
5.12 Webcam and Microsoft RoundTable Video	15
5.13 Viewing Recordings.....	15
5.14 Downloading/Printing Meeting Slides and Results to the Desktop.....	15
Security Considerations	16
6.1 Data Protection.....	16
6.2 Connection Security	16
6.3 Access Security	17

User Provisioning.....	18
Live Meeting Client Deployment	18

Introduction

The 2007 release of the Microsoft® Office Live Meeting service is the latest version of Microsoft's enterprise class solution for delivering Web-based, real-time, and location-independent interactive meetings and collaboration capabilities to business users.

The ability to organize, present, and attend interactive meetings, from any Internet connected location is appealing to organizations that are dispersed over any significant geographic area or want to provide real-time interactive content to customers, vendors, and remote employees. Reducing potential travel expenses, while providing more timely and efficient distribution of information, make the Office Live Meeting service a practical solution for any size business.

The Live Meeting service is a hosted conferencing service. The infrastructure needed to provide interactive conferencing and real-time collaboration capabilities is hosted and maintained in Microsoft Live Meeting data centers.

In addition to the Live Meeting service, Microsoft offers on premise conferencing using the same Live Meeting client, as part of Microsoft® Office Communications Server 2007. Office Communications Server also enables several other communication technologies, such as presence, instant messaging (IM), and voice. Both Office Communications Server and the Live Meeting service satisfy the core conferencing scenarios, but enhanced functionality around training and events is available only with the Live Meeting service. These differences are described in Table 3 in the Appendix.

Scope of this Whitepaper

This white paper explains the new features available in the 2007 release of the Live Meeting service, describes the hosting architecture, and provides technical information on commonly asked questions regarding implementation, networking issues, and meeting and data security.

Section	Topics Covered
New in 2007 Live Meeting Release	New features and changes in Live Meeting
Network Planning	Network configuration for optimal utilization of Live Meeting
Bandwidth Considerations	Actions and features that affect bandwidth utilization
Security Considerations	How data and connection security features are provided in Live Meeting
User Provisioning	How users are added to the Live Meeting environment
Live Meeting Client Deployment	Getting the Live Meeting client to the user

New in the 2007 Release of the Live Meeting service

The 2007 release of the Live Meeting service contains many new features and capabilities added since the introduction of Live Meeting 2005. These features are not limited to what the user can see (we will discuss this in some detail later in this document) but also include changes in the infrastructure, such as the Intrusion Detection System and Microsoft® Forefront™ virus scanning of all Live Meeting traffic.

Customers are able to tailor the capabilities and functionality of the Live Meeting service to the needs of their organization and provide varying levels of services to different individuals and groups within their organization. A Web-based administration console is available to administrators of the Live Meeting service, giving them the access they need—from any location with an Internet connection—to create, manage, and monitor the corporate use of the Live Meeting service.

3.1 Integrated Media

It is in the rich Windows-based Live Meeting client that you will see the most significant changes. The new Live Meeting user interface ties together a multitude of media types into a single integrated experience. The Web-based client for users on locked-down computers, Solaris operating system, or Macintosh operating systems (or any Java-based system that meets the necessary requirements), has been updated so that the presentation experience for these users is similar to that of users using the Windows-based client.

Table 1: Integrated Media Features

Feature	Live Meeting 2007	Live Meeting 2005
Rich media presentations (including Microsoft Windows Media® Player and Adobe Flash Player)	NEW	
Live webcam video	NEW	
Integrated Microsoft® Office PowerPoint® viewer	√	√
Drag and drop upload to view a wide range of documents	√	
Panoramic video with Microsoft® RoundTable™	NEW	
Multi-party two-way VoIP audio	NEW	
PSTN and VoIP audio integration	NEW	
Audio conference call controls	√	√
Active speaker indicator	NEW	

3.2 Training and Events

The ability to host training and events are key benefits of the Live Meeting service. The Live Meeting service has been updated in many areas to improve the attendee and presenter experience for classes and presentations.

Table 2: Training & Event Features

Feature	Live Meeting 2007	Live Meeting 2005
Polling	√	√
Shared recordings	√	√
Microsoft event services	√	√
Event and class registration	IMPROVED	√
APIs for integration with e-learning systems	IMPROVED	√
Public events page	NEW	
Advanced testing and grading	NEW	
High fidelity recordings	NEW	
Personal recordings	NEW	
Virtual Breakout Rooms	NEW	
Handout distribution (file transfer)	NEW	
Shared Notes Pane	NEW	

Network Planning

As a hosted service, Live Meeting can operate in a large variety of network topologies. Ideally, the administrator is able to make minor configuration changes to routers and firewalls to provide an optimized user experience. However, the changes that may be required are minor and do not interfere with the customer's ability to secure their own network. The configuration changes include:

- Enabling ports 80 and 443 to access LM servers
- Disabling authentication for Live Meeting audio and video traffic when an authenticating HTTP proxy is employed
- Allowing UDP traffic for better audio and video performance

- (Optional) Adjusting internal routers and optimizing internal network path for audio and video traffic
- Filtering traffic, if required by ISP SLA

These relatively minor changes to your network configuration will provide a significant improvement for your Live Meeting users. Smooth integration and ease of use will make it more likely for your users to quickly integrate the features of Live Meeting into their workflow. These network configuration changes are also the most significant actions for the IT department to enable the smooth adoption of the Live Meeting technology.

At a minimum, the Live Meeting client must be able to access the Live Meeting servers over ports 80 and 443. If you already allow your users to access Web sites on the Internet, there is a good chance that your perimeter firewalls already allow traffic on these two ports. It is possible, however, that only port 80 is currently open, so in that case it would still be necessary to configure your firewalls to allow traffic on port 443. Making these ports available will give your users of Live Meeting client software full access to the capabilities of Office Live Meeting.

If you employ an authenticating HTTP proxy, you must disable authentication for all Live Meeting traffic travelling over the HTTP and HTTPS ports (80 and 443). This ensures that Live Meeting audio and video packets successfully pass the perimeter.

To provide an optimized user experience, with better video and audio performance, it is advisable to allow UDP traffic for the Live Meeting client. The Real-time Transport Protocol (RTP) that Live Meeting uses works best over UDP connections. The Microsoft RTP, which is based on IETF Standard 3550 and uses ports 8057 and 3478, is designed to provide end-to-end network transport functions for applications transmitting real-time data. The intent of the protocol design is to specifically provide a mechanism for getting real-time audio and video from point to point.

If your network traffic control is not perimeter-based, you may need to enable the required port access and UDP traffic, not only on the routers that connect your users to the outside world, but also on routers that deal with internal traffic only. Fundamentally, you need to know what the network traffic path will be between your users and the Internet-based Live Meeting service. You want to be able to optimize the path between the Live Meeting client and Live Meeting backend, limiting the number of hops and optimizing UDP traffic to provide the necessary quality of service on the desktop-Internet path.

If your users are complaining of dropped voices and video jitter or lockup, it is most likely due to the use of the Transmission Control Protocol (TCP) as the primary network transport, rather than the use of the User Datagram Protocol (UDP), and thus not a software issue with the Live Meeting client. Optimizing your network path can prevent help desk calls relating to the use of Live Meeting.

Your contract with the service provider that provides your Internet access may require that they filter traffic that is delivered to your site. In these cases you must make sure that the appropriate

changes are made to the filtering requirements specified by your service level agreement (SLA) with your provider.

Bandwidth Considerations

Given that Web conferencing use may increase bandwidth needs, it is important that corporate IT departments understand these conditions so that they can plan accordingly and establish policies to optimize their organization's Web conferencing experience. Microsoft has developed Live Meeting to deliver high-quality Web conferencing solutions using minimum network bandwidth.

Table 3: Activity description summary

Activity	Description
Downloading the Live Meeting Client	Acquiring and configuring the client
Uploading Meeting Content	Preloading content for presentations
PowerPoint Presentations	How PowerPoint presentations are handled in Live Meeting
Office and other Document Types	Supported document types
Whiteboards and Polls	What can be done with these features
Application Sharing	Sharing applications and bandwidth requirements
Desktop Sharing and Remote Control	How this feature differs from application sharing
Desktop Snapshots	Grabbing and annotating a desktop image
PSTN Audio Conferencing	Voice access via PSTN
VoIP Audio	Two-way VoIP for Live Meeting 2007
Hybrid VoIP and PSTN Audio	Attendee access over VoIP and PSTN simultaneously
Webcam and Microsoft RoundTable Video	Bandwidth requirements
Viewing Recordings	Live Meeting Replay and High Fidelity Recordings
Downloading and Printing Slides, Results to Desktop	Controlling availability to attendees

5.1 Downloading the Live Meeting client

The Live Meeting Windows-based client is downloaded when the user first attends a meeting through the Live Meeting service. When upgrades to the client are made available, the user is prompted to download the upgrade before attending their next meeting, without requiring a

reboot or re-launch of the browser. IT managers can choose to disable automatic upgrades to the client and instead roll out upgrades at their discretion.

A user can set preferences on the **Options** dialog box, under **Connection speed**. If a user sets their connection speed to a dial-up connection, the Live Meeting server does not download an entire Office PowerPoint file and instead sends only the PNG files, thus using less bandwidth. The Live Meeting server will also note these preferences and send fewer frames per second during an Application Sharing session.

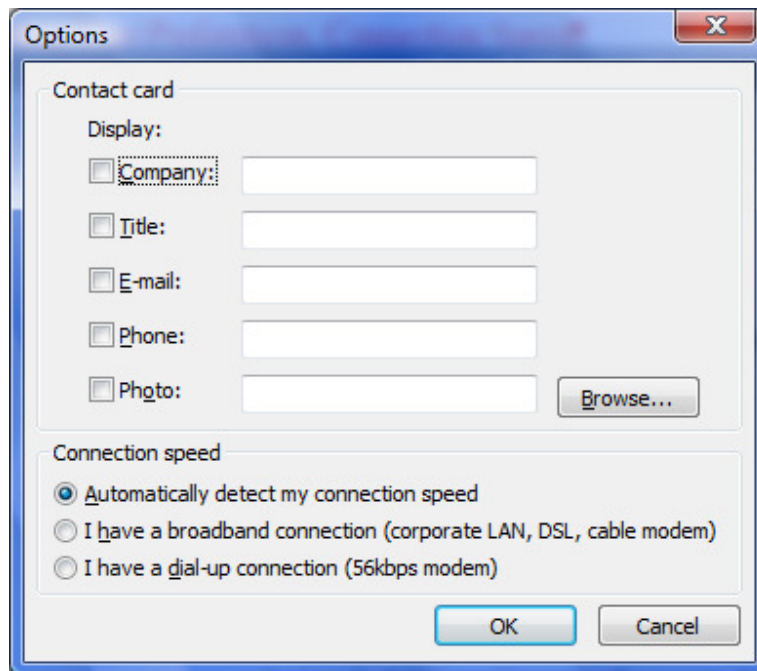


Figure 1: Live Meeting Connection speed user preferences

Microsoft Office Live Meeting Web Access is an alternative for users who cannot install or run the Windows-based Live Meeting client. Users running an operating system that is not compatible with the Windows-based Live Meeting client, such as Windows 98, Sun Solaris, or Apple Macintosh operating systems, can access Live Meeting sessions through Live Meeting Web Access. Live Meeting Web Access does not require the installation of any files; however it does download a Java applet for each meeting. The Java applet does not persist on the desktop; instead the browser downloads the necessary applet from the Live Meeting server each time the participant joins a meeting.

5.2 Uploading Meeting Content

The foundation for Live Meeting interactivity is the application's ability to broadcast visuals of any type, including presentations, commonly used document types, such as Microsoft Office Word and Microsoft Office Excel®, or any documents that can be rendered as a MODI file, to remote participants in real time. With Live Meeting and the ability to share just about any document over the Internet, there are virtually no boundaries to what, when, where, or with whom users can communicate.

Meeting presenters can choose to upload meeting content prior to the Live Meeting session. Content only needs to be uploaded into a meeting space once. Live Meeting organizers can choose to populate their meeting place with persistent content that eliminates the need to upload the same content repeatedly, thus greatly reducing bandwidth requirements.

5.3 PowerPoint Presentations

The bandwidth requirements for viewing PowerPoint presentations differ based on which of the following two clients the participant is using when attending the meeting:

- Windows-based Live Meeting client
- Live Meeting Web Access

The Windows-based Live Meeting client gives the meeting participant a larger array of options and features, as well as the ability to view PowerPoint slides with full support for animations and transitions.

The Live Meeting PowerPoint Viewer, available as part of the Windows-based Live Meeting client, displays PowerPoint slides with full support for animations and transitions, allowing presenters to take advantage of compelling effects in the online meeting. Dynamic slide support helps to focus audience attention and make presentations more engaging for remote participants. Animation support lets presenters or organizers select slide elements to appear at certain times and in a particular order (such as fly in, fade, and so on). Transitions are supported for effects when moving from slide to slide (such as wipe, cover, push, and so on) and **Full Screen Mode** allows participants to view a slide that fills the entire screen.

Meeting participants who use the Windows-based Live Meeting client will view PowerPoint presentations in two stages as the presentation downloads to their browser cache. As the presenter moves through the meeting content, the attendees download compressed preview Portable Network Graphics (PNG) files of the entire slide set for immediate viewing, while in the background the full-fidelity PowerPoint slide is downloaded. This allows the presenters to move through material quickly without requiring large amounts of bandwidth on the part of attendees in order to keep up with the pace of the presentation. The total bandwidth consumed by a meeting participant during the session is equal to the size of the original PowerPoint presentation file, plus the compressed preview PNG files.

The bandwidth requirements depend on the graphic characteristics of the source slide and the size of the displayed image. For typical business presentation slides, the size of converted preview PNG images in the Live Meeting client can range from 5 KB to 100 KB and average 40 KB. The full-fidelity PowerPoint slide will reflect the original size of the slide. Slides with bitmaps, complex graphics and animations, or deep and rich colors increase the overall slide size and bandwidth requirements.

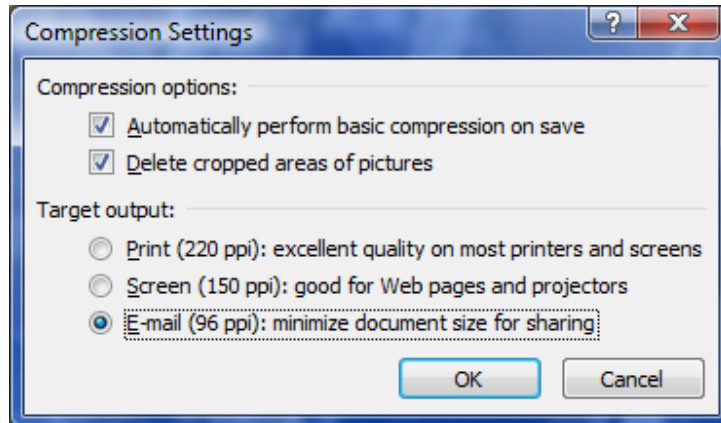


Figure 2: Compression settings

Information workers building PowerPoint files for Live Meeting sessions can minimize the time and bandwidth required for uploading their slides by incorporating best practices to lower file size. For example, compressing images such as photos to 96 dpi in PowerPoint 2007 works as follows: Select the image, click **Compress Pictures**, press **Options**, select **E-mail** (which will compress the image to 96 dpi) and then click **OK**, to compress the image.

Live Meeting Web Access does not yet support full-fidelity PowerPoint. Meeting participants attending through Live Meeting Web Access will view the presentation as static, compressed PNG files. The bandwidth requirements will equal the total size of the compressed PNG image of the static slide. The PNG files are often small, consuming less bandwidth from the network.

The Windows-based Live Meeting client begins to download the entire presentation to the browser cache as soon as the attendee joins the meeting. If the download is still in progress, or the attendee is viewing the meeting from the Web-based client, the service automatically downloads the next slide into the participant's browser cache to ensure the participant keeps up with the meeting. This caching of information enables instant responses as the presenter moves to the next slide, regardless of bandwidth connection speed. Because the average presenter typically lingers and discusses each slide for 40-60 seconds, the automatic "pre-caching" ensures that the maximum wait for a new slide, even over a low-speed modem connection, is very short. In an effort to reduce overall network bandwidth requirements, IT managers may choose to add a network caching device, but this is not required.

5.4 Microsoft Office and Other Document Types

Live Meeting allows presenters to share documents such as Office Word or Office Excel files, in addition to PowerPoint slides. Regardless of which Live Meeting client an attendee is using during the meeting, non-PowerPoint files will be downloaded as MODI files. These files are typically similar in size to the original file, so bandwidth consumption depends on the size of file being uploaded.

5.5 Whiteboards and Polls

Many media types in a Live Meeting presentation are less bandwidth-intensive than slides. Whiteboards (both graphics and text), polling questions, interactive questions and answers, and audience chat are all based on an extremely lightweight messaging architecture that minimizes bandwidth use while maximizing interactivity.

5.6 Application Sharing

Application Sharing is an extremely powerful, interactive element of Live Meeting. This compelling feature allows a presenter to share access to any selected application on his or her desktop with meeting participants. In turn, the presenter can turn over control to an attendee and allow them to operate any software application, create files, or edit documents on the presenter's computer without the need for attendee plug-ins.

Live Meeting lets users show anything on their computer instantly to remote audiences. Presenters can choose to share their whole screen or only a portion to keep the audience focused on the key information. By sharing applications from their desktops, presenters are able to engage with their audiences in interactive product or software demonstrations from any location.

Live Meeting provides the following bandwidth controls for application sharing:

- Variable download rate based on presenter's or attendees' connection speed, whichever is slower, to maintain synchronization
- Only the portion of the screen that has changed is broadcast to attendees
- Automatic adjustment of data flow to match each participant's available bandwidth
- Available bandwidth allocated across entire pool of users rather than first come, first served

Application sharing captures the graphic images on the presenter's screen and broadcasts these pictures to each attendee at a dynamic rate depending on the attendee's available bandwidth. The rate can vary anywhere from five entire screens sent to the attendee per second to less than one screen sent per second. The image on the screen is separated into smaller tiles, and image analysis is performed in such a way that only those tiles that have changed since the last screen update are broadcast to meeting attendees. Depending on how much change occurs in a given sequence of frames, this can substantially reduce the overall bandwidth used.

Although only the differences in the screen image are sent to each attendee, broadcasting graphic images can be bandwidth-intensive. Several architectural design points in the Live Meeting implementation of Application Sharing recognize this and seek to use bandwidth more efficiently. Each attendee is given as many screen updates as their bandwidth will allow but no more, with the rate of screen updates being reactive in case the available bandwidth changes. As a result, users on slow network connections will have fewer image updates to process and receive, whereas those on faster network connections will receive more frames and a higher-

quality picture. If an attendee's available bandwidth diminishes due to other network uses (such as a background file transfer), the number of image updates sent to that attendee automatically decreases so that the attendee can still keep up with the presentation in real time.

The amount of bandwidth used by the presenter in the Application Sharing session is limited either by the bandwidth of the presenter's own network connection or that of the attendee with the fastest connection, whichever is reached first.

The bandwidth usage discussed here refers to peak bandwidth usage, when many changes are happening on the presenter's screen at once. Most software application images are comprised of a user interface image that does not change rapidly or frequently, meaning that during the Application Sharing session, average bandwidth usage is much less than the peak usage described above. Table 4 below shows peak bandwidth measurements for different scenarios.

Table 4: Bandwidth Measurements

Peak Bandwidth Measured in Microsoft® Office Live Meeting Application Sharing			
Scenario	LAN Bandwidth (100 Mbps)	LAN Bandwidth (10 Mbps)	Modem Bandwidth (56 Kbps)*
Web browsing an online application with Internet Explorer	138 Kbps	102 Kbps	56 Kbps
Sharing a CAD application rendering in 2D and 3D views	106 Kbps	102 Kbps	56 Kbps
Sharing a Microsoft Office Excel spreadsheet containing 3D charts	38 Kbps	39 Kbps	13 Kbps

*User Preferences were set to **Automatically detect my connection speed** for purposes of this test. Bandwidth consumption may be lower if the user selects **I have a dial-up connection 56K modem**.

In each of the above scenarios, the bandwidth is given for a client on a 100 Mbps local area network connection, a 10 Mbps local area network connection, and a client using a standard 56 Kbps dial-up connection. The highest bandwidth use is for Web browsing on the 100 Mbps local area network. In that case, Application Sharing uses only 138% of a typical 100 Mbps Ethernet. The scenarios tested use screen sizes up to 1024 x 768 pixels. Smaller images lower the corresponding bandwidth requirement.

Because Live Meeting Application Sharing automatically adjusts to available bandwidth, it can also share a connection with other sharing sessions and applications. So, if the total bandwidth on a LAN is limited by existing traffic, the application gracefully allocates the remaining

bandwidth available to it across the entire pool of users, rather than prioritizing access to the first to arrive and allowing the remaining users to fall behind in the presentation.

Application Sharing is not typically used throughout the entire presentation. Presenters may employ Application Sharing for a fraction of the total meeting period — most often less than 15% of an entire Web conferencing session. The above bandwidth figures reflect only the peak bandwidth required during Application Sharing. To calculate the average bandwidth needs of a complete presentation, the appropriate adjustments must be made.

5.7 Desktop Sharing and Remote Control

The Sharing Frame lets presenters select a specific area of their desktop that they want to share with meeting participants. For example, if there is only a portion of a confidential Word or Excel document the presenter wants to show to an audience, Live Meeting lets him or her select and share only that portion, while keeping the rest of the document private and unseen. Remote Control allows the presenter to transfer control of any document, application, or even his or her desktop to any remote participant. This means that both the presenter and the participant have full control of that application. This can be especially useful in environments where interactive collaboration with co-workers is necessary.

Bandwidth consumption on the part of Desktop Sharing and Remote Control is similar to Application Sharing.

5.8 Desktop Snapshots

In addition, the Snapshot feature allows a presenter to quickly capture any visual on their computer as a PNG file and show it to their audience. After a snapshot is taken, annotation tools can be used to highlight information quickly and conveniently. A snapshot can be effectively used in numerous situations, such as when the presenter wants to show all or a portion of the desktop or application, but does not want to use Application Sharing. The compressed PNG file will vary in size based on the presenter's screen resolution; however these files are rarely more than 250 KB in size.

5.9 PSTN Audio Conferencing

Many Live Meeting customers combine Web conferencing with an audio conference call to deliver a complete communications solution. In these cases, no data network bandwidth is consumed for audio, because the conversation is conducted through the phone network.

5.10 VoIP Audio

VoIP audio is often used as the vehicle to deliver the audio portion of a meeting or event. Previous versions of Live Meeting included the one-way Internet Audio Broadcast technology for streaming Voice over Internet Protocol (VoIP) audio to other participants in the meeting. Because this was done over the Internet, participants needed only the speakers on their computer or a headset to participate. The 2007 release of Live Meeting adds the ability of two-way interactive VoIP audio, enabling meeting scenarios where multiple participants collaborate on a

document or co-present a deck. The minimum bandwidth requirements for VoIP audio are 50 Kbps, while 80 Kbps are recommended for higher-quality experience. For additional information, see Table 2 in the Appendix.

5.11 Hybrid VoIP and PSTN Audio

For attendees who might be connecting from remote locations over dial-up modem lines, it is possible to integrate PSTN audio conversations and VoIP communication in the same meeting. It is possible for attendees on low-speed network connections to participate in Live Meeting events as long as they can provide separate connections for voice and data. The remote user, joining a meeting from a hotel room with poor data connectivity, can use a dial-up modem connection for the data part of the meeting and their cell phone for the voice connection.

5.12 Webcam and Microsoft RoundTable Video

The video component of any Live Meeting presentation or event can be the key that keeps the attendees involved and participating. To facilitate the use of video, Live Meeting supports both traditional webcams and the Microsoft RoundTable video camera, which allows for a 360 degree view of the conference room. A basic webcam requires from 50 to 350 Kbps of bandwidth; the added capability of the RoundTable camera doubles the bandwidth requirements, pushing them to a minimum of 100 Kbps and a maximum of 700 Kbps.

5.13 Viewing Recordings

Live Meeting organizers often use the recording feature to record a session for playback at another time, either for training or to capture the information in the meeting for someone who may have been unable to attend.

If Local Recordings are used, no data travels between the client computers and the Live Meeting service. When Shared Recordings are used, the Live Meeting service creates recordings in two formats: Live Meeting Replay and High-Fidelity Format.

For Live Meeting Replay, standard streaming media is used, and is encoded at 220 Kbps. As a result, each viewing consumes approximately the same amount of bandwidth. As this is an industry-standard encoding format, there are several options available from network equipment and service providers to help optimize your bandwidth consumption.

5.14 Downloading and Printing Meeting Slides and Results to the Desktop

With Live Meeting, participants are able to download local copies of presentations and meeting content. The results are delivered in Adobe Portable Document Format (PDF) in a similar size to the original uploaded slide set or document. The PDF files are delivered or “streamed” from the Live Meeting data center, once per requestor. Live Meeting gives meeting organizers control over download permissions, and content download on a per meeting basis.

Security Considerations

Because security is such an important issue for every business today, Microsoft incorporated security features into the Live Meeting network, for users connecting to the network and the customer data that is stored on the Live Meeting service database servers. Remember that development for Live Meeting, as with all current Microsoft projects, is done under the auspices of the Microsoft Trustworthy Computing Initiative, the details of which can be found at <http://www.microsoft.com/mscorp/twc>.

Three aspects of security are reviewed in this paper: data protection, connection security, and access security.

6.1 Data Protection

The actual data customers upload to the Live Meeting data centers is regularly backed up across data center boundaries. Thus, if a single data center goes down, while there might be some minimal disruption of service to customers, the customer data remains intact.

Data stored on the Live Meeting network is protected regardless of location. All content uploaded to the data centers on the Microsoft servers uses 128-bit AES encryption.

The data centers also receive third-party certification in the form of the Cybertrust Security Certification for both the Live Meeting client and the infrastructure of the data centers. This certification, among other things, can help businesses enact policies to become or stay compliant with compliance regulations, such as Sarbanes-Oxley and HIPAA.

All meeting content moved to and from the Live Meeting service data center servers is processed through a Microsoft Forefront front end, which does real-time scans for viruses and malware, adding an additional layer of data protection.

6.2 Connection Security

All data sent over the network is encrypted and connections are made using Secure Sockets Layer (SSL) and Transport Layer Security (TLS). Data is not sent in the clear to reduce the risk of packets being intercepted and decoded to provide usable information to an unauthorized access attempt.

The data centers themselves maintain eight separate layers of software security to help protect the Live Meeting infrastructure:

- Filtering Routers
- Firewalls
- Intrusion Detection Systems
- System Application Authentication

- Application Level Countermeasures
- Separate Data Network
- Authentication to Data ms Level Security

These layers of protection include some things you would expect, such as firewalls, filtered routing, application authentication, and locked down Windows servers that only have the necessary services for Live Meeting running. Also included are a few features you might not have considered, such as a keeping the Live meeting network completely separate and isolated from the rest of the network communications that take place in the Live Meeting data center facilities.

There are also application level countermeasures running which can help catch common attacks such as buffer overruns. Lastly, an Intrusion Detection System (IDS) provides real-time monitoring of all inbound and outbound Live Meeting traffic. The monitoring is heuristic and notifies the administrators in the event of changes in the usual traffic behavior patterns. The IDS performs protocol analysis and is constantly watching for port scanning and other precursor activities for network-based attacks.

6.3 Access Security

Another important area is access security. Access security makes use of the controls that the Live Meeting Administrator can place on the access, participation, and content that users have with the Live Meeting service. Live Meeting delivers the following three levels of access control, ranging from public meetings—where anyone with knowledge of the meeting ID can attend a meeting—to password-protected meetings, to meeting access control lists—where an attendee must not only know of the meeting, have the location and a password for access, but also be on a pre-existing list of invited attendees.

- Open Meetings (Public Sessions, Minimum Security)
- Meeting Key (Optimum Security)
- Access Control Lists (Maximum Security)

Meetings with access control lists assure users of who the attendees are (only the authorized name is permitted; users can not enter any other screen name and get access) and lets the organizers control who remains in the meeting in the event that the sensitive nature of content being discussed should be restricted to a different group of people than all of those who were originally permitted to attend.

Meeting organizers can decide what level of access is appropriate for any meeting, and can, in fact, have different levels of access control for attendees based on their role, either as presenters or attendees. This granularity ensures that meetings can be configured to suit the needs of all involved. Customized security is available by integrating LDAP and a central directory service to provide a specific level of security linked to a user account.

Within meetings, the meeting organizer is able to designate one of the two roles—attendee and presenter—of attendees within the meetings, granting them pre-defined capabilities within that role. This prevents unauthorized access to materials or even the group of attendees, within a meeting, keeping the organizer in control, and helping to keep the meeting on track. Meeting organizers can give presenters the ability to disconnect any user from the meeting at any time, without disrupting the meeting.

This real-time control and monitoring of meetings is an important feature of Live Meeting, allowing the organizers of a Live Meeting event to retain control of the meeting without the need for administrative intervention.

User Provisioning

There are two methods to set up users in the Live Meeting service: using the Live Meeting Service Portal and manually creating user accounts in Live Meeting Manager.

For companies that are already using Active Directory® Domain Services, the Live Meeting Service Portal can be used to automatically create Live Meeting accounts based on the organizational information in the corporate Active Directory. This allows authenticated Windows users to log into Live Meeting without entering a Live Meeting-specific user ID and password. The Live Meeting account settings (such as default meeting options) will be synchronized automatically with the users Active Directory setting each time the user logs into Live Meeting through the Intranet portal.

Users can also be created from the Administrators area on the Live Meeting Manager Web site. After logging into the site, the Administrator can use the **Memberships** option to create, edit, and delete members Live Meeting accounts. When you create a user manually, you need to explicitly identify their role, as follows, in the Live Meeting hierarchy:

- **Administrator** Members with full administrative rights to Live Meeting, including creating and deleting other members.
- **Organizer** Members with the ability to schedule Live Meeting sessions.
- **Member** Members who can access Live Meeting events and features.

When these roles are assigned, there is a default set of privileges given to the member. The Administrator can selectively modify the default permissions from the Live Meeting Manager console.

Regardless of the method that is used to provision the user account, new users are automatically sent a welcome-kit -email explaining that they are now configured to access the Live Meeting service.

Live Meeting Client Deployment

The Live Meeting client can be installed on the end-user's computer in two ways.

- Pre-installed through Microsoft Systems Management Server
- Auto-installed from a Live Meeting invitation

In a corporate environment, Systems Management Server can be used to deploy the Live Meeting client to users who need the software. This puts the onus on the IT department to make sure that the client is appropriately deployed and updated as necessary. You can select a totally silent install option, which places the Live Meeting client software on the end-user computer without any interaction required.

The automatic installation is most commonly used. When a user receives a meeting invitation, it includes a link to the client installation. The user software is then installed from the link provided in the invitation e-mail. It will first attempt to install the client in the same fashion that any Windows application is installed. If the end-user does not have sufficient rights for this type of installation, the application then installs in the user directory defined for the user by their limited access to the computer. This installation technique means that you are able to provide users with access to Live Meeting without changing the local security permissions on their computer (presuming they have some capability to write data to their own computer). Therefore, there is no need to reduce the level of security that you are currently maintaining on your end-user computers.

Appendix

Table 1. Minimum system requirements for the Windows-based Live Meeting client

System Component	Minimum Requirement		
Display Resolution	Required: Super VGA 800x600 Recommended: Super VGA 1024x768 or higher		
Operating System	Windows Vista™ operating system, 32-bit Windows XP Professional with Service Pack 1 (Service Pack 2 recommended) Windows XP Professional x64 Edition in 32-bit mode Windows 2000 Professional with Service Pack 4 Windows Server 2003 with Service Pack 1		
Computer/Processor	Data and Voice: 500-megahertz (MHz) or higher processor, Intel Pentium-compatible For webcam video: 1 GHz or higher For Microsoft RoundTable™: 1.8 GHz or higher		
Memory	256 megabytes (MB) of RAM Recommended: 512 MB		
Disk Space Needed for Installation	125 MB Additional Space required for Personal Recordings		
Video Memory	Video card with 64 MB of RAM (video RAM or VRAM) and Microsoft DirectX® application programming interface generation		
For VOIP	Sound card, speaker, and computer microphone		
For Sending Video	Webcam or Microsoft RoundTable device		
Bandwidth Requirements for Data Only	56 kbps or better (Recommended: DSL or Cable high speed internet access)		
Bandwidth Requirements for Voice and Video		Minimum ¹	High-Quality ¹
	Voice	50 kbps	80 kbps
	Webcam	50 kbps	350 kbps
	RoundTable	100 kbps	700 kbps
Other Software	Microsoft Office PowerPoint® 2002 or later presentation graphics program or Microsoft Office Standard Edition or Professional Edition (which includes PowerPoint software) to upload presentations. Adobe Flash Player version 8 or higher to view Flash content in the meeting. On Windows Vista, Adobe Flash Player version 9.0.45 to view Flash content in the meeting. Windows Media® technologies player, version 9 or later (version is checked when the meeting client starts) to view Windows Media content in the meeting.		

¹ The required and recommended bandwidth speeds are cumulative. For example, if you want to use voice, webcam, and Microsoft RoundTable, the minimum bandwidth would be 50+50+100=200 kbps.

Table 2. Minimum system requirements for LM Web Access

System Component	Minimum Requirement		
Display Resolution	800 × 600 screen resolution required for meeting attendees 1024 × 768 screen resolution required for presenters		
Browser, Operating System, and Java Virtual Machine (JVM)	Browser	Operating System	JVM
	Internet Explorer® 6.0 with SP2	Windows XP SP2	Sun® 1.5.11, 1.6.x
	Internet Explorer 7	Windows XP SP2	Sun® 1.5.11, 1.6.x
	Internet Explorer 6.0 with SP1	Windows XP SP1a	Sun® 1.5.11, 1.6.x
	Internet Explorer 6.0 with SP1	Windows 2000 SP4	Sun® 1.5.11, 1.6.x
	Internet Explorer 6.0 with SP1	Windows 98 SE	Sun® 1.5.11, 1.6.x
	Internet Explorer 7	Windows Vista	Sun® 1.6.x
	Firefox 2.0	Windows XP SP2	Sun® 1.5.11, 1.6.x
	Safari 2.0™	MAC OS® X V10.4	Apple® Java™ 1.4.2
	Safari 1.3™	MAC OS® X V10.3	Apple® Java™ 1.4.2
	Mozilla 1.7	Solaris 10™	Sun® 1.5.11
Memory	64 MB RAM		
Bandwidth	56 Kbps modem (DSL, cable, or better recommended) with Microsoft Internet Explorer® Internet browser or intranet connection		
Other Software	<p>Microsoft Office PowerPoint® 2002 presentation graphics program or later, or Microsoft Office Standard Edition or Professional Edition (which includes PowerPoint software) to upload presentations.</p> <p>Flash Player version 9 or higher to view multi-media data content slides.</p> <p>Windows Media® technologies player, version 9 or 10 (version is checked when the meeting client starts) to view Windows Media content in the meeting.</p> <p>Apple QuickTime 7 or higher to view Windows Media content in the meeting on Macintosh.</p>		

Table 3: Feature comparison of Office Live Meeting and Office Communications Server

Feature	Live Meeting 2007 Standard	Live Meeting 2007 Professional	Office Communications Server 2007
Host collaborative meetings quickly and cost-effectively			
Streamlined user experience	√	√	√
Consistent user experience for Live Meeting Web Access users	√	√	
Single meeting client for on-premise and hosted conferencing	√	√	√
Interactive whiteboard and annotation tools	√	√	√
Shared notes pane	√	√	√
Train distributed employees and partners and conduct events that scale to support large audiences			
Conferencing Add-in for Microsoft Office Outlook	√	√	√
Event and class registration		√	
Public events page		√	
Advanced testing and grading		√	
High fidelity recordings	√	√	√
Shared recordings		√	
Personal recordings	√	√	√
Microsoft Event services	√	√	
Meeting reports	√	√	

Feature	Live Meeting 2007 Standard	Live Meeting 2007 Professional	Office Communications Server 2007
Meeting content storage and management tools	√	√	
Live Meeting APIs	√	√	
Keep attendees engaged with an integrated rich media and conferencing experience			
Rich Media presentations	√	√	√
Live webcam video	√	√	√
Integrated media experience	√	√	√
Integrated PowerPoint viewer	√	√	√
Drag-and-drop upload to view a wide range of document file types	√	√	√
Make meetings more interactive with two-way multi-party video and audio experience			
Panoramic video with Microsoft RoundTable	√	√	√
Multi-party two-way VoIP audio	√	√	√
PSTN and VoIP audio integration	√	√	
Audio conference call controls	√	√	√
Speaker indicator	√	√	√
Handout distribution	√	√	√
Virtual Breakout Rooms		√	

Feature	Live Meeting 2007 Standard	Live Meeting 2007 Professional	Office Communications Server 2007
Redeploy IT resources on other business-critical projects			
Telephone and email support for internal and external meeting attendees	√	√	
Automatic client installation and upgrade	√	√	√
Intranet Portal to simplify rollout	√	√	√
Depend on a reliable service with a proven track record			
Certified data centers	√	√	
Security Enhanced communication	√	√	√
Virus Scanning with Microsoft Forefront technologies	√	√	

Table 4: Maximum number of attendees in a meeting when using a specific communication mode

Communication Mode	
Slides & Chat	1,250
Application Sharing	1,250
Computer Audio	1,250
Web cam	1,250