

InterwiseConnect™

Technical Overview

Version 7.2

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The Next Dimension In Enterprise Communications

Interwise Connect offers *True Enterprise Conferencing* - Unlimited Conferencing, Unprecedented User Experience, and Unrivaled Savings. Interwise Connect is a single platform offering six distinct modes of interactive experiences to accommodate different sessions according to their context.

- ◆ **iMentoring:** for 1:1 tutoring and consulting.
- ◆ **iMeeting:** for small group meetings and video conferences.*
- ◆ **iClass:** for knowledge transfer and training.
- ◆ **iSeminar:** for online seminar-style Events with hundreds of users.
- ◆ **iCast:** for live broadcasts to thousands.
- ◆ **On Demand:** for pre-recorded stand-alone sessions.

* The features and capabilities available in an iMeeting Event are also used in personal 'My Meeting Room' sessions.

“At Your Fingertips”

One single application is used for all six modes and operates over any connection speed equal to or above 12.8 Kbps. The client software that runs on the Participant's computer is available as a thin Java client that does not require any pre-Event installation OR as a full, feature-rich version.

On the server side, the users access all Event information through a single internet-based interface, the Interwise Communications Center (ICC). Events can be initiated and accessed on a single mouse click.

Communication. Unlimited.

Users can select to use a *telephone* or an *Internet phone* in the Event. The audio in the Event is available for users either via a mobile telephone, a desktop telephone or headset/speaker and microphone connected to a PC. Users with Internet access can connect using their PC, in addition or instead of, using a telephone.

Interactive

Full-duplex audio allows numerous users to communicate in clear voice lectures and discussions, *multi-point video* enables visual conferencing, the *Whiteboard* and its marking capabilities permit annotating by simultaneous users, *application sharing* allows the Event leader to share any Windows application with any or all Participants, *questions and polls* provide instant feedback from the group, while *surveys and tests* are available whether on-need or prepared in advance.

Scalable, Reliable and Global

Proprietary networking technologies ensure optimal performance for an infinite number of scenarios – from 10,000 audiences of one, to one audience of 10,000. An intelligent global server infrastructure, the Interwise Expressway™, enables any enterprise to scale up its operations to the extended business environment as well as to infinite other users.

The Interwise Connect architecture enables full access and capabilities behind firewalls and proxy servers, without compromising your network topology and security standards in any way.

Interwise Connect also utilizes LDAP to integrate with existing Directory Servers and synchronize between the organizational directory and the Interwise Connect user database. As a result, user management in Interwise Connect is simplified, streamlined and becomes scalable to many thousands of user accounts.

A backup server infrastructure ensures reliability; when any server hosting an Event fails it is immediately replaced with another server, without disrupting the Event and its Participants. Monitoring tools ensure each of the Interwise Connect components can be checked for the quality of service provided.

Customizable

Interwise Connect provides full flexibility in determining the appearance and the content of the system. Using an advanced API toolkit, Interwise Connect enables full integration with your enterprise's existing web site, Learning Management System or any other enterprise platform for maximizing resource utilization and conforming to your working standards.

Reusable Content and Knowledge Repositories

Every live Event - in any of the five live Event types - can be recorded for later use. The recordings can then be edited, protected and distributed for commercial, educational or business use, at any time. Interwise Connect also enables "studio" creation of self-paced, stand-alone recordings for viewing by designated Participants.

6-in-1: Multiple Modes for Singular Success

Interwise Connect is the first and only integrated platform to address the six primary experiences that comprise live interaction, collaboration and learning across a global organization. All six modes are integrated into Interwise Connect – one product, six modes.

The Interwise Connect applications, described in greater detail on page 5, are compatible with almost every file type, including Microsoft Office™ documents, native Microsoft PowerPoint™ presentations, graphics, video files and Macromedia Flash™ movies.

Interwise Connect Environment

Interwise Connect is comprised of the following components:

- ◆ **Interwise Communications Center (ICC)**, see below
- ◆ **Interwise Catalog Portal (ICP)**, page 6
- ◆ **Interwise Participant**, page 6
- ◆ **Interwise Communications Server**, page 8
- ◆ **Interwise Server Manager (ISM)**, page 8

Interwise Communications Center (ICC)

The Interwise ICC is a web-based application that handles administration and maintenance of live Events, Participants, content and Servers that are part of the Interwise environment. The ICC displays information about Events and enables users to create and register to them, view their personal data and schedules, search for specific Events etc.

The screenshot shows the Interwise Communications Center (ICC) interface. The top navigation bar includes the Interwise logo, 'Communications Center', and 'Interwise Connect'. A user welcome message is visible on the left. The main content area features a search bar and a table of events. The table has the following data:

Action	Name	Department	Type	Date & Time	Moderator
Enter	Testing Test	---	iMeeting	5/30/2006 4:30 PM	product product
Future	Documents to review	---	iMeeting	6/2/2006 9:30 AM	product product
Future	Planning for the future	---	iMeeting	6/5/2006 10:31 AM	product product
Future	Communicating with management	---	iMentoring	6/10/2006 11:00 AM	product product

Users connecting using a telephone are authenticated and directed to the Events using the data from the ICC. The information generally available for users using a web interface is 'translated' to an Interactive Voice Response (IVR) system so that the user can hear the 'displayed' information.

ICC data can also be managed through an API and presented on customers' portals and Learning Management Systems. This transparent access to ICC functionality allows for a customized user experience in any environment. The ICC also generates attendance reports (for tracking purposes, such as billing).

Interwise Catalog Portal (ICP)

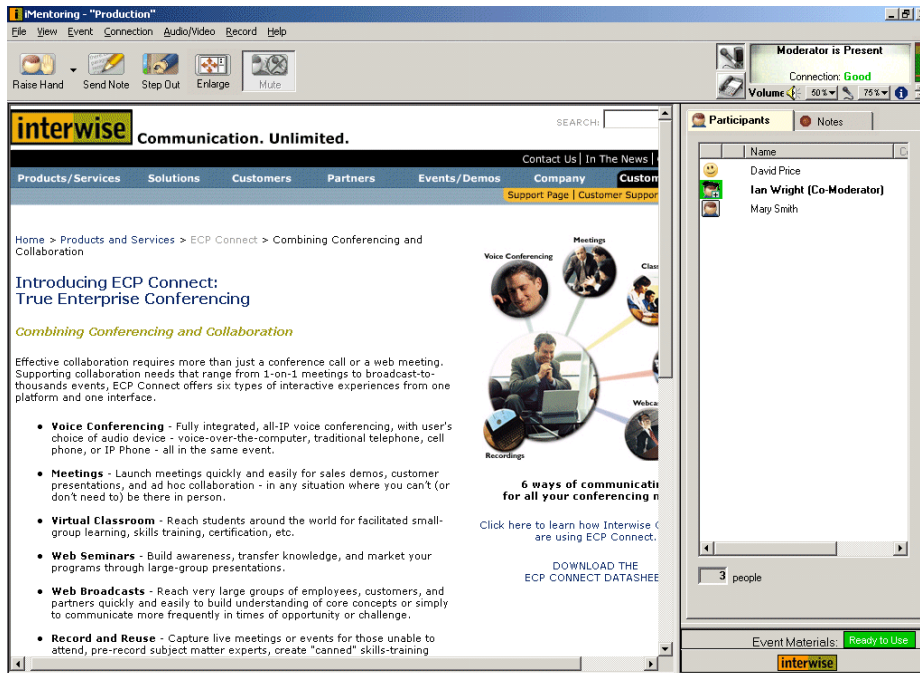
Interwise Connect offers the ability to publish live and on-demand Events to individual portals, known as Interwise Catalog Portals. Each Interwise ICC can have an unlimited number of ICPs assigned to various departments or groups.

Using an ICP, you can:

- ⇒ Publish Interwise Events and recordings for particular departments or initiatives, as well as for guest (external to your organization) users.
- ⇒ Integrate news, hyperlinks and special messages with Event information.
- ⇒ Brand the portal with your corporate logo, messaging, graphics and colors.

Interwise Participant

Interwise Participant is a Windows™ application (though is also available as a thin Java client) enabling Participants and Moderators at remote locations to connect by means of their personal computers to a live, interactive Event.



Participants can:

- ⇒ View what the Moderator is doing on the Whiteboard.
- ⇒ Activate a live video stream.
- ⇒ View and interact with a shared application.
- ⇒ Speak and exchange notes with the Moderator and other Participants.
- ⇒ Participate in Breakout Sessions during an iClass with full collaboration capabilities.
- ⇒ Point at or mark-up the screen display when leading an iMeeting or when given permission by the Moderator of an Event.
- ⇒ Answer verbal questions from the Event Moderator or “raise a hand” to ask a question.
- ⇒ Express themselves using emoticons.
- ⇒ Respond to questions, tests, or surveys from the Moderator.
- ⇒ Make a recording of a live Event or parts of it (when this permission is set).
- ⇒ Playback recordings of live or pre-recorded Events.

Some of the functionality available to the Moderator during live Events includes:

- ⇒ Two-way voice (full duplex–natural conversation).
- ⇒ Present PowerPoint presentations and other materials on the Whiteboard and mark them up in real-time.
- ⇒ Establish a two-way video connection (Moderator and the active Participant).

- ⇒ Make recordings of live or offline Events or any part of an Event, play them back as required during a live Event, or make them available later for on demand viewing. Recordings can include any component of an Interwise Event, including application sharing. Recordings can be edited and may also be protected from copyright infringement.
- ⇒ Designate when a Participant may speak during a live session, assume control of a conversation at any time, and point at, mark-up, or type on the screen display. Submit questions, tests and surveys for the Participants to answer, monitor Participant responses and later publish the results to all Event attendees.

An additional AddIn to the Participant application (the Materials Editor AddIn) enables Moderators to create and define Event Materials offline.

Interwise Communications Server

The Interwise Communications Server is an application that acts as a multiplexor for the transfer of Interwise data. Live Event data (materials, live data streams, etc.) can easily be passed to multiple Participants spread over many sites. The Communications Server also includes a telephony module to support Interwise Audio Conferencing.

The Communications Server also includes the Interwise Push Server, which sends Participants both pre-prepared content used for live Events and any pre-recorded materials such as self-paced lessons. Materials are sent to the Participants through Server Trees, leveraging server network infrastructure and thus keeping bandwidth usage to an absolute minimum.

Interwise Server Manager (ISM)

A utility that enables you to manage Interwise Communications Centers (ICCs – see above), Server machines, Sites (groups of servers), and Trees.



Notes:

1. Both the ISM and ICC require a MSSQL Server 2000 database. It is recommended to have one SQL server supporting the ISM and ICCs on the hosting site.
2. The ISM, ICC and Communications Servers can either be hosted by Interwise or installed on-site.

System Requirements

You should refer to the *Interwise Connect System Requirements* documents for specific details about the minimum required software and hardware for participating in an Interwise Event (either as a Moderator or Participant).

Firewall Support

All Interwise Connect applications offer a wide set of firewall support configuration options. All applications work transparently from behind firewalls and web proxy servers without any loss of functionality – any Participant that can access a public website can access and fully participate in an Interwise Event. The applications support any and all of the following scenarios:

- ◆ Working through a firewall that limits connections to TCP or HTTP 1.1 on all ports.
- ◆ Working through a firewall that requires all Internet traffic to go through a web proxy server.
- ◆ Any combination of the above firewall configurations and Participants connecting through dial-up connections.
- ◆ NAT support - the firewall or Microsoft proxy server replaces the Participant computer's IP address with a different IP address.

Participants behind firewalls are automatically configured to work in TCP mode. The Server feeding the Participant behind the firewall will automatically wrap the data stream with the appropriate protocol elements to accommodate the security requirements as defined by the Participant's firewall.

Any Communications Server in the Server Tree can transparently support this. Using TCP increases bandwidth overheads by about 2 KBit/sec. Field experience has shown that this increase in overhead is of no practical significance.

Bandwidth Issues

The Interwise Connect Server architecture requires ONLY ONE data stream between servers regardless of the number of Participants or additional servers connected at each location. This is a significant advantage over other architectures that require a single data stream per client. By supporting a single stream per site, Interwise Connect is scalable and does not exact a heavy toll on network resources. The low bandwidth requirements improve the end user experience while avoiding unnecessary WANs.

Multi-Stream Unified Time Code

The Interwise Unified Time Code allows for complete synchronization between audio, video, data and control commands. Connected Participants each receive a complete and fully synchronized presentation even though the quality of their communications may vary.

The Participant application uses a dynamic buffer that enables it to independently and synchronously display the various streams sent to it from the Server. The Participant is not aware of the small time delay created by the synchronization between voice, data and video streams.

True Push Technology

All previously prepared materials (slides, pictures, video clips, files) are "pushed" to Participants in advance of a live Event. A Push Server resides in each of the Communications Servers and sends Participants both content used for live Events and pre-recorded materials. Materials are downloaded automatically by the Participant applications from the Server closest to them, thus keeping bandwidth usage to an absolute minimum.

The bandwidth used can be controlled to set the bandwidth limit per time of day (between 0 and the maximum available bandwidth). This enables the system administrator to tune the Push mechanism according to the organization's requirements and constraints.

The Push process begins when a Participant is connected to the network and continues in the background. The Push mechanism recognizes the order of Events that the Participant is registered to and pushes the materials in that sequence. Participants that were not able to connect to the network before the Event will receive the materials in ASAP mode. Materials that were pushed to the Participants' hard drives are managed by Interwise and will never consume more than the allocated space.

Video

Video clips are pre-pushed so there is no limit on the format, frame-rate resolution and so on. The only practical limit is file size.

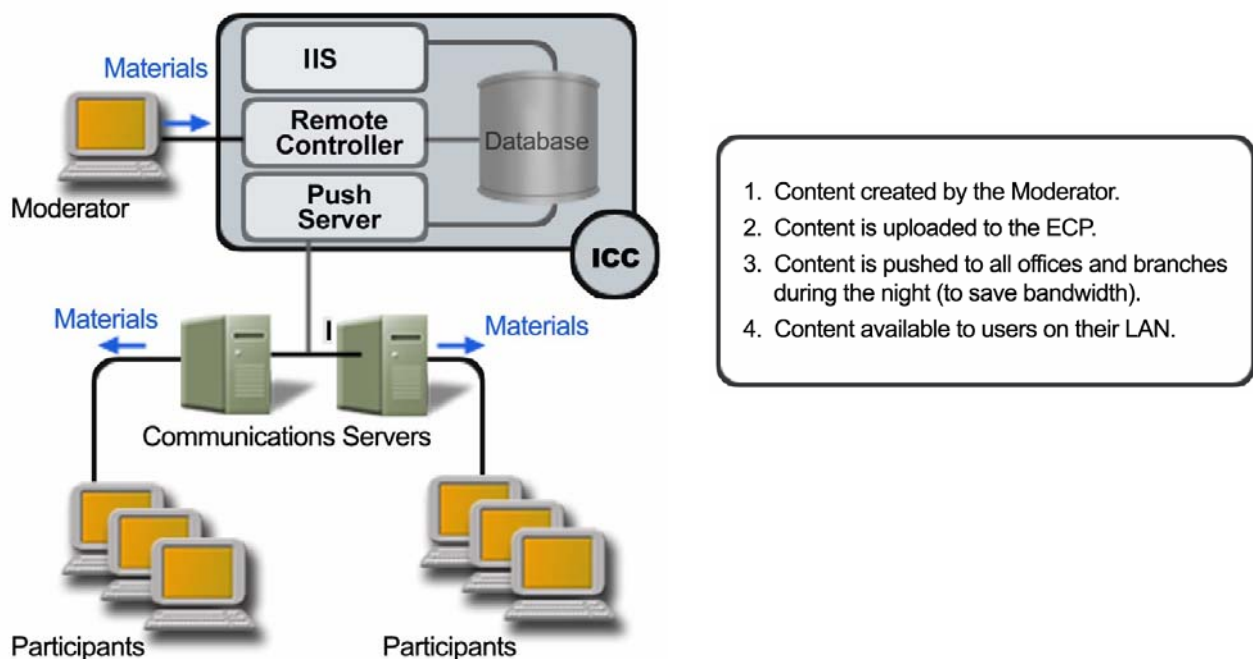
Interwise Connect supports up to five concurrent Participants with webcams per Event. At any given moment, the two active speakers' streams will be updated. The Communications Server automatically detects that a Participant does not have the required bandwidth to receive live video. In such a case, the Server will automatically strip the video stream from that Participant to prevent congestion problems.

Live streaming video is available in H.261 and H.263 formats. Resolution is QCIF (176x144 pixels). The frame rate depends on available bandwidth and the dynamics of images and will typically range from 3-30 Fps. Compression is software based.

Push Server Architecture

The following diagram shows the Push Server system architecture.

- ◆ The materials are first uploaded from the Moderator/user's desktop to the ICC.
- ◆ From the ICC, they are then pushed to the Participants by the secondary Push Servers in the Push Server Tree.

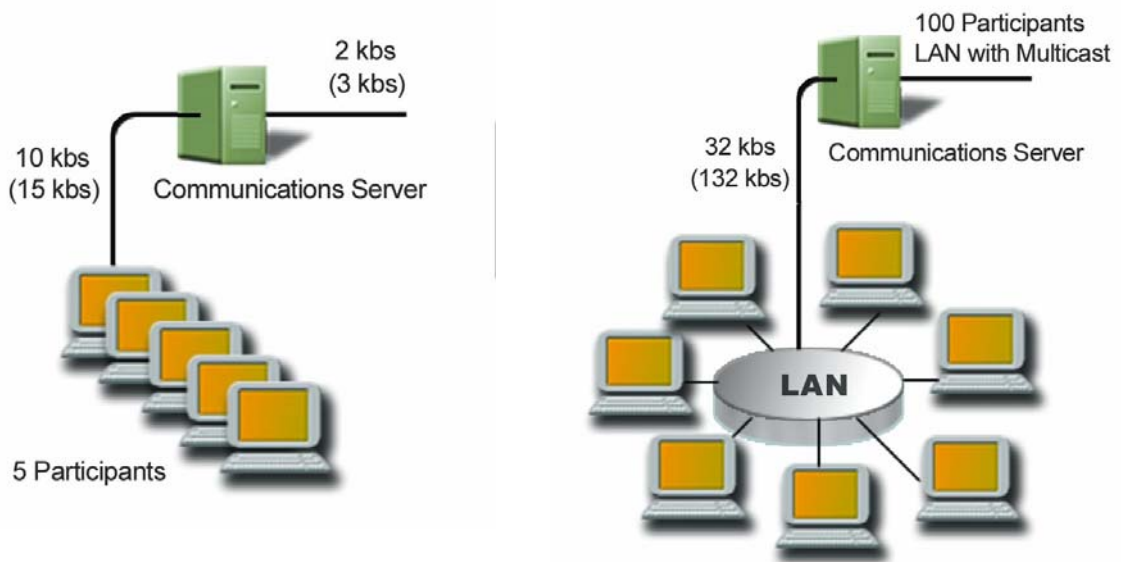


Multicast

The use of multicast over LAN segments significantly reduces the bandwidth requirements. Only the voice and video portion of the Interwise Connect data stream is multicast. Interwise Connect applications only multicast between a Server and its directly connected Participants. This means that the routers between the Servers are not required to support multicast. If ALL the routers between a Server and its Participants support multicast, then the applications will use multicast. No configuration of any of the components is needed.

Where multicast is not available (such as on the open Internet or on corporate WANs), the Interwise Server Tree mimics multicast. This way, only a single data stream is sent between servers regardless of the number of clients connected to them.

Multicast Advantages



Communications Server Feeding 5 Participants without Multicast

Communications Server Feeding 100 Participants with Multicast

Numbers in parenthesis are for 1 KBPS of Application Sharing.

Interwise Servers use the following defaults for streaming, conversational and media exchange g:

Voice	TCP
Video	TCP
Application Sharing	TCP
Slide commands	TCP

Interwise servers could be configured to other transport modes including UDP for media to be used in Multicast as follows:

Voice	UDP(*)/TCP
Video	UDP(*)/TCP
Application Sharing	TCP
Slide commands	TCP

(*) UDP transport is required for multicast and enabled via "Tunneling=NONE" connection configuration.

All audio and video data will be multicast (UDP) if so configured. For configuring the media transmission of audio and video to be using UDP the connection shall be configured as "Tunneling=NONE". The multicast support requires routers that support multicast and Winsock 2. When a Participant sends out voice, it is Unicast to the closest Server and between Servers, and multicast to all other Participants if their respective networks support Multicast. Application Sharing and Event control commands (slide changing, Whiteboard commands etc.) are TCP (Unicast). In secured sessions SSL is configured to be active and the TCP is used for both audio and media. For firewall traversal purposes "Tunneling=Full" is configured to reduce the number of open ports to only 443 and 80. In such a configuration the TCP is used for media and other exchanged information.

Bandwidth Requirements for a Live Event

The basic required bandwidth for moderated Events is 0.3 KBps between a Participant and the Participant's site. This includes the following bandwidth requirements:

1. The basic configuration requires 0.3 KBps for the data stream. This assumes that the audio channel is using a telephone.
2. If the user chooses to record the Event or listen and speak using microphone and speakers/headset, the basic configuration requires 2 KBps for half duplex audio stream, 2 x 2KBps when two speakers talk simultaneously (full duplex, 2KBps for the upward connection

and 2KBps for the downward connection) and up to $n \times 2$ for n speaker. In addition, there is 0.3 KBps for the data stream. This assumes that the audio channel is always open. Since Interwise Connect applications do not send 'silence', the actual requirements will be less than what is stated above.

3. If the Moderator shares an application, 1 KBps should be added to the basic figure, resulting in a total of 3 KBps between a Participant and the Participant's site.
4. If the Moderator or the Participant uses live video in the Event, the application's basic 2.3 KBps will be supplemented by the video bandwidth, which is in the range of 8 KBps and 128 KBps (this is defined by the user and based on the video camera device).

Example

- ◆ A Moderator is located at Site A.
- ◆ 100 Participants are located at each of three locations on the company WAN.
- ◆ 50 out of the 100 Participants at each location use a telephone while the other 50 are using mics and speakers/headsets.
- ◆ Each of the locations supports Multicast (Ethernet always supports Multicast).
- ◆ The video is set to 16 KBPS.

Voice Only

2.3 KBps on each of the 3 WAN lines between Site A and the three locations. 20 KBps on the LAN at each of the three remote locations.

Voice and Live Video

18.3 KBps on each of the three WAN lines between Site A and the three locations. 33.3 KBps on the LAN at each of the three remote locations.

How Many Participants Can Participate in a Live Event?

There is no theoretical limit to the number of Participants in a live Event. With no discernable functional limitations, upwards of 1000 Participants can participate in a live Event. Each client application that receives or sends out information is indifferent to the number of Participants in the Event.

By adding servers to the Server Tree you can add as many Participants as you wish, provided that the number of connections to one Server does not exceed its capabilities, and each node (connection) has at least 16 Kbps (effective) bandwidth available. Using audio and 48 Kbps of video, the system needs 64 Kbps for a single Participant. When using multicast, adding another Participant only adds 2.4 Kbps.

Server Environment

Interwise Connect supports the clustering of Servers via the unique Interwise Expressway technology. When a Server Tree is assigned to an Event (this is done automatically by the system), each site with multiple servers will have all the servers at its disposal. When a server reaches its limit, another server is added to the Event automatically. The next user to connect to the Event through this node will be automatically connected to the new server.

When a Server recognizes that there are no Participants connected to it (directly or through other “child” Servers), it does not send out the voice, video or application sharing streams.

Interwise Expressway Technologies

The Expressway technologies include:

- ◆ Server Trees – Enables administrators to combine multiple servers into a Server Tree.
- ◆ Server clustering – Servers are managed as groups. When one becomes busy, another is used and users are connected to the new one.
- ◆ Server redundancy – When a server becomes unavailable, the clients will reconnect to another server automatically.
- ◆ Intelligent Server Selection – Each client connects to the fastest available server at any given time thus guaranteeing the best possible performance.

All server management and connection logic is completely transparent to the end users.

Concurrent Clients

The main issue with the number of clients per Server is the network interface. With n clients using mics and speakers/headsets and m users using a telephone, the Server must be able to send data at the rate of $(2n + 0.3m)$ KBps to support the basic features (audio, slides). This factor rises to $(3n + 1.3m)$ KBps with Application Sharing, and if video is used, the video bandwidth must be added to these figures.



For all practical purposes, a Server and a Participant are identical in terms of bandwidth requirements.

System Response Time

Different Participants will have different delays according to their location, connection type, etc. This is INCONSEQUENTIAL because all of the streams are time synchronized, and the Participants do not notice the delay.

Which Ports are required by Interwise Connect?

Only a single port is required. All port numbers used by the Interwise Connect applications are configurable. Furthermore, different clients throughout the system can connect via different ports in the same Event if so required. This is all configured on the ISM level and does not require changes to the clients.

Interwise Connect Security

Interwise is highly aware of the growing need for a strict security environment and communications security procedures. Consequently, Interwise has invested major resources to provide an environment compliant with market standards for communications security.

Interwise Connect Out of the Box Security Features

Firewalls and Ports

- ◆ Interwise Connect uses one port for all Interwise communications. This port is configurable.
- ◆ Interwise Connect supports the following standards:
 - ⇒ Interwise is fully functional behind all types of firewalls and web-proxies (with most common authentication methods, including NTLM)
 - ⇒ Network Address Translation (NAT).
 - ⇒ Virtual Private Networks (VPN).

ICC Access and Management

- ◆ User rights management – Interwise Communications Center (ICC) incorporates different user roles that are manageable (e.g. Event administrator – per Event type, Users administrator, Portal administrator, Moderator, Participant, etc.). Each ICC can be administered and managed by one ‘Super User’, who in turn can assign a number of roles and rights to any number of users.
- ◆ HTTPS (SSL encryption) is used for user login.
- ◆ All Events can be configured with SSL to secure confidential communications. The encrypted data includes all of the live interaction including voice, Whiteboard commands, notes, video and application sharing.
- ◆ The Push can be configured with SSL to secure confidential communications.
- ◆ Passwords have a minimum length of 6 characters (configurable).
- ◆ iMeetings can be setup with an access key that prevents non-invited people from entering.
- ◆ All types of Events can be setup with limited access for listed invitees only.
- ◆ ICC inactivity session timeout.
- ◆ Administration data sent from the ICC to servers participating in live Events is encrypted.

- ◆ API:
 - ⇒ API calls are authenticated
 - ⇒ API calls are encrypted (optional)
 - ⇒ API access to the ICC can be limited to specific machines

Content Protection

- ◆ The Moderator, per Event, can disable recording live Events by the Participant application or on the ICC.
- ◆ Assigning them as “Private” can restrict access to materials uploaded to the ICC. This attribute allows owner access only.

Real Time Communications

- ◆ All real-time communications uses Interwise’s proprietary non-published protocol.
- ◆ Moderators’ Over The Shoulder (OTS) access to Participants desktops is restricted. The Moderator sends an automatic request to Participants who will grant OTS access only when they feel safe to grant such access.

Interwise Server Manager (ISM)

- ◆ Registration of Communications Servers to the ISM requires a unique registration key.
- ◆ The ISM administrator can disable unauthorized Communications Servers.

Additional Enhanced Features

Application Sharing

Each Server manages the Application Sharing queues for the Participants connected to it. When a Participant's queue grows beyond 50KB, the Server switches the Application Sharing stream to an interlaced one. In this mode, only the beginnings and endings of the shared application's movements are sent over, thus reducing the amount of bandwidth required without impacting the Event. Other, faster Participants are not affected.

The Interwise Application Sharing engine was designed in-house with the following key points taken into consideration:

- ◆ The Engine is limited only by bandwidth.
- ◆ Utilizes Interwise advantages by pushing the knowledge into the servers: The engine sends the data to the servers and they distribute it to the users, according to their stream settings (fast or slow).
- ◆ Slower Participants should receive less data: Each Participant receives data according to their connection capacity.

Outlook AddIn

The Interwise Outlook AddIn enables the following:

- ◆ Users can schedule an Interwise iMeeting from within their Outlook scheduling environment.
- ◆ Displays ICC mail notifications as meetings in users' Outlook Calendar.

Client Architecture

ALL Event Participants use the Interwise Participant application or Interwise Java Participant, whereas Moderators and Co-Moderators use the Interwise Participant application for managing and leading the Participants.

There is no need for managing the versions used by each user as the ICC Administrator defines the rights and roles for each registered user. Whenever a user enters an Event, the relevant application is automatically activated according to the user's assigned rights and roles.

Participant Application Types

The Interwise system supports a mixed-environment, allowing Participants using the Interwise Java Participant or the Interwise Participant application (C++ version) to take part in the same Event simultaneously and seamlessly.

The Interwise Participant application requires 5.75 MB of disk space (InstallFromTheWeb), while the extremely light-weight Interwise Java Participant takes a mere 950 KB! All files needed to run either client are contained within the Interwise client directory.

The Java client runs on top of both the Microsoft Java Virtual Machine (version 5 or higher, which ships with most versions of Windows) and the SUN Java Virtual Machine (which ships with Netscape 4.x and above).

Installation

Each individual ICC can be configured to control the Participant applications used. The user assigned responsibility for administering the ICC can define one of three values, which determine how to prompt the user prior to launching the relevant Participant application.

Versions

Administrators can control the version of the Participant application.

The Participant application can be upgraded automatically using the Push. System administrators can configure the Push to upgrade the application from one version to another.

ICC/Event administrators can set the minimum required version of the Participant application for users. The ICC will upgrade the application when required for users entering an Event with an application of an earlier version than the one defined.