Collaboration Architecture

NIH Enterprise Architecture

Version 1.0

FINAL

January 25, 2006

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1.0 Introduction

Collaboration technologies that facilitate web-based meetings, shared work space environments, and resource scheduling are becoming increasingly important to the execution of National Institutes of Health's (NIH) mission — both its scientific mission and its administrative operations. To ensure interoperability between the various components that collectively provide these collaboration capabilities, the NIH Chief Information Technology (IT) Architect commissioned a team composed of IT and mission operations professionals throughout the NIH's various Institutes and Centers (ICs). This "Collaboration Domain Team" developed and recommends the technology standards and guidelines in this report for establishing these collaboration capabilities at the NIH.

This report documents the Collaboration Domain Team's analysis and describes the recommended architecture standards and guidelines to be implemented across the NIH. These standards and guidelines specify how common components will be implemented enterprise wide. The team was chartered to produce standards for the following collaboration technologies, listed in alphabetical order:

- Desktop web conferencing
- Instant messaging
- Resource scheduling
- Shared virtual workspace

The team's primary objective was to address specific NIH business needs around complex scheduling of resources (primarily scientific resources such as scientific and laboratory equipment, facilities, consumables, and research subjects) and structured Internet-based collaboration such as training and grants review meetings. Specific outcomes of the domain team's analysis are:

- A validation of existing architecture principles associated with managing collaboration-enabling information technologies
- Five recommended solution design patterns that identify logical designs to be employed and leveraged across the NIH enterprise (listed in alphabetical order):
  - Complex Resource Scheduling Pattern
  - Shared Virtual Workspace Pattern
  - Standalone Instant Messaging Pattern
  - Web Collaboration Pattern
  - Web Conferencing Pattern
- Five recommended technology bricks that identify baseline and target technical standards, protocols, technologies, and products (listed in alphabetical order):
  - Desktop Web Conferencing Brick
  - Instant Messaging Client Brick
  - Instant Messaging Server Brick

- Resource Scheduling Brick
- Shared Virtual Workspace Brick

The information and recommendations documented in this report are accurate and current as of its published date. These recommendations are not to be considered part of the NIH Enterprise Architecture (EA) until they are approved by the NIH Architecture Review Board (ARB)[1].

1.1 Collaboration IV Domain Team

This report comprises the compilation of the Collaboration Domain Team's findings and recommendations. A team of 17 subject matter experts from various NIH ICs worked together for nine weeks to develop the proposed collaboration patterns and bricks that are presented in this report. The following list identifies the domain team members who contributed to this effort and the ICs they represent:

- Catherine Amores, NIA
- Alesia Booth, OD
- Roger Brtva, NLM
- Adriane Burton, CIT
- Dr. Eileen Bradley, CSR
- Daniel Fox, OD
- Melanie Huston, NLM
- Mark Langer, NIAMS
- Richard McKay, CSR
- Cyrus Mirakhor, CIT
- Charles Mokotoff, CIT
- Heather Nicholas, NICHD
- Chris Olaes, NHLBI
- Ricardo Rodriguez, OD
- Chris Santos, CIT
- Jeff Shilling, NCI
- Tracy Soto, OD
- Doug Wilson, CIT

1.2 Scope

The scope of this domain team's work, as specified by the Office of the Chief IT Architect (OCITA) and approved by the NIH Architecture Review Board (ARB), was to augment the existing collaboration technology architecture with patterns and bricks that support the following functional requirement areas:

- Web Conferencing Solutions: Software solutions for establishing an environment that enables the conduct of web-based meetings, which allows geographically distributed meeting attendees to work interactively in both real-time and non-real time. The solution must:
  - Accommodate internal (NIH) and external (non-NIH) participants. Internal participants include employees and on-site contractors. External participants include extramural scientists, other government users, off-site contractors, and other consumers of NIH information. Our user scope includes those

[1] At which time they will be published on the NIH EA website (http://enterprisearchitecture.nih.gov), which is the authoritative source for current NIH EA standards.

individuals who are listed in the NIH Enterprise Directory (NED) directory as well as users who are not.[2]

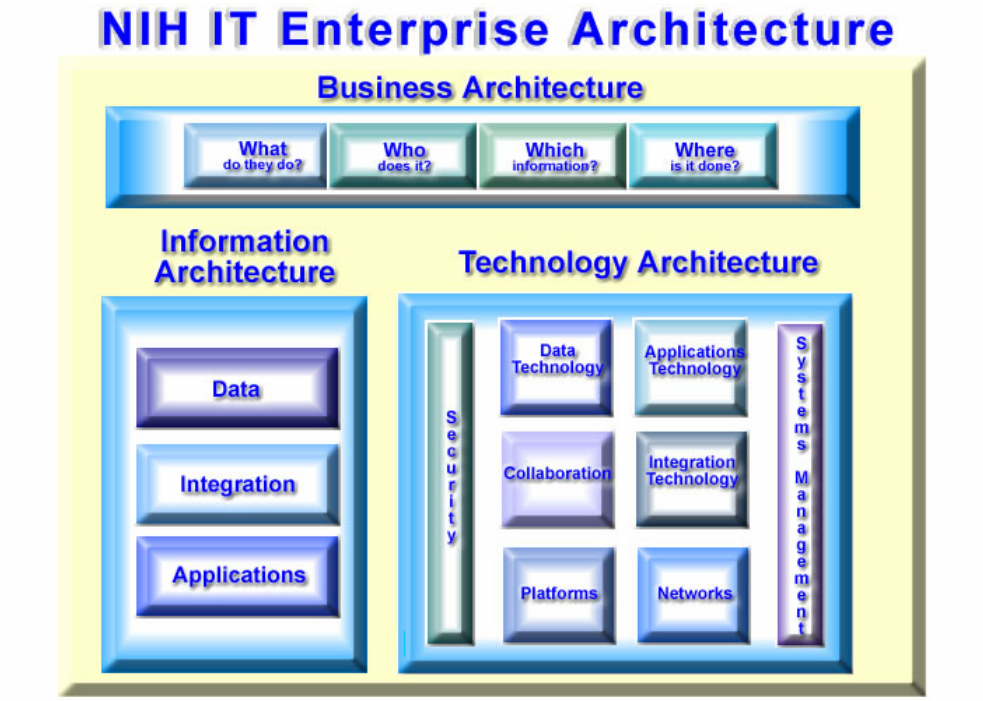
- Support real-time interaction between geographically distributed participants in a meeting or presentation format. This includes file, screen and application sharing; chatting; voice; streaming video, and electronic white-boarding.
- Support non-real-time collaboration between participants through team-based capabilities such as: shared folders and workspaces; threaded discussions; document-based collaboration; and a persistent, easy-to-access archive of discussions and stored content.

- Resource Scheduling Software: Software solutions that provide project-to-resource and resource-to-project scheduling (reservation) and tracking capabilities.

1.3 Alignment With the NIH Enterprise Architecture Framework

The NIH EA framework recognizes three distinct component architectures — the business architecture, information architecture, and technical architecture. *Collaboration* is a technical domain of the technology architecture[3].

Figure 1. NIH EA Framework



[2] Standard NED definitions for internal and external users were being refined as of this report's publication. For the purpose of the domain team's scope, collaboration technologies should accommodate all users.

[3] To learn more about the NIH EA Framework, visit the NIH EA web site (http://enterprisearchitecture.nih.gov).

1.4 Analysis

"Collaboration" technologies represent one of the eight technology domains that comprise NIH's technology architecture (reference Figure 1, *NIH EA Framework*, in the preceding section). The collaboration domain consists of the specific technical solutions that enable electronic collaboration. Electronic collaboration can take on many styles — face-to-face, geographically distributed, real-time ("synchronous"), and non-real time ("asynchronous"). The primary objective of collaboration technologies is to provide the collaborators with the tools they need to provide their input to a joint initiative or shared objective within one of these styles.

As defined in Section 1.2, *Scope*, the domain team focused its analysis on developing technology standards and high-level solution design patterns upon which NIH web conferencing solutions and resource scheduling tools will be developed (or procured) and implemented. The domain team analyzed the component technologies that comprise web conferencing and resource scheduling solutions. The domain team's recommended patterns illustrate how these component technologies are integrated to provide either a web conferencing or resource scheduling solution. The domain team's recommended bricks illustrate the technical standards upon which the NIH is either building or procuring these component technologies today; and upon which the NIH will build or procure these component technologies over the next 2 – 5 years.

The component technologies, listed alphabetically, that address the scope requirements for web conferencing solutions are:

- Desktop Web Conferencing technologies
- Instant Messaging Client technologies
- Instant Messaging Server technologies
- Shared Virtual Workspace technologies

The component technologies, listed alphabetically, that address the scope requirements for resource scheduling solutions are:

- Resource Scheduling solutions
- Calendaring solutions

Each of these technologies, with the exception of "Calendaring solutions", is addressed in this report by technology bricks that identify the domain team's recommendations for NIH EA-aligned products for providing these technologies. The Calendaring solutions brick was defined during the work of a previous domain team.

1.5 Principles

The Collaboration Domain Team reviewed NIH's existing Collaboration principles and endorsed them as relevant and useful for future architecting efforts at the solution or enterprise level. Therefore, no changes were recommended. Table 1 below presents the Collaboration principles at the time of the domain team's analysis.

Table 1. Collaboration Architecture Principles

Principle	Rationale
Level of Security: Security is fundamental to collaboration systems. The level of security will be based upon the sensitivity of data generated and maintained and will meet or exceed the directives of departments or agencies with oversight.	With the introduction of stricter government mandates, such as HIPAA, and the increasing digitization of sensitive information, any Collaboration system must be grounded in an appropriate level of security, balancing the sensitivity of the data with ease of use.
Investment Leverage: Collaboration systems will leverage existing and future enterprise software, management systems, infrastructure and standards.	As a practical matter, NIH has invested heavily in a number of technologies, infrastructures and standards. Therefore, any system that is expected to be widely used will need to leverage as much investment as possible.
Integration: Collaboration systems will integrate with enterprise application and directory structures and support the import and export of information, facilitating sharing at NIH and external organizations as needed to accomplish the NIH mission.	Any Collaboration system used will need to interface with the appropriate existing systems at NIH and to external organizations to better facilitate sharing and communication.
Common Access: Collaboration systems will provide common access for authorized personnel and offer full access from standard platforms. Common access for authorized personnel includes: ❑ Access from supported platforms and user interfaces ❑ Access within NIH ❑ Access via remote connectivity ❑ Access by other entities to NIH-wide collaboration systems	Because of NIH's global character, any successful enterprise collaboration system must address the requirements of NIH's user communities, especially in regard to remote access, access within NIH, access by other entities, and platform support.
Best Practices and Open Standards: Collaborative systems will be based upon industry best practices and open standards.	In order to effectively manage risk, NIH requires that any Collaboration system employed be based upon open standards, when possible, and best practices.
Reliability and Availability: Collaborative systems will be highly reliable, striving for 24x7 service.	In order to provide maximum value to NIH, Collaboration systems must be available round the clock to its users.
Resources: Collaboration systems will support the effective use of NIH resources, enabling them to meet user needs while allowing minimal duplication of effort and technologies between ICs.	Collaboration systems need to keep in mind the efficient use of NIH resources and should eliminate redundancy of efforts across the organization.
User Rights: Collaboration systems will allow a user to control accessibility and define managerial privileges as appropriate to one's role.	NIH's Collaboration systems must provide the capability for controlling accessibility based on user privileges.

1.6 Benefits

In addition to the general benefits of enterprise architecture, the Collaboration domain architecture provides substantial benefits by improving NIH's ability to fulfill their mission as well as save costs. These benefits include:

- Improving the effectiveness and quality of grants peer review and council meetings by including participants who may not be available to travel, thus improving NIH's ability to attract and utilize scientific talent otherwise not available.
- Achieving greater knowledge sharing across the enterprise and with external experts achieved via collaboration systems will improve NIH's mission effectiveness and productivity and efficiency within the NIH workplace.
  - Efficient sharing of data and information across NIH will reduce duplication and redundancy of data and content.
  - Greater insight into information through document sharing, knowledge sharing, and data reporting can lead to better business decisions at NIH.
- Realizing cost avoidance, improved productivity and improved quality of life through facilitating "virtual, face-to-face" collaboration over the Internet in the following situations:
  - NIH employees can telecommute more effectively and productively, thus allowing NIH to retain employees and receive better productivity from their work efforts.
  - The overall training environment is improved by allowing more cost-effective delivery of course material to NIH employees and enabling remote instruction from outside NIH, thereby reducing the cost of training and enabling a more agile and tailored curriculum. By eliminating the need to travel, curriculum designers can incorporate shorter classes on more specific topics rather than having to assemble a half or full-day's worth of material. External instruction can also be incorporated more easily into the curriculum since instructors can avoid travel.
- Improving productivity by reducing manual intervention with improved scheduling capabilities in the following situations:
  - Scheduling external parties for meetings or events
  - Scheduling research equipment and subjects for intramural research/clinical trials

2.0 Collaboration IV Patterns

A pattern is a design idea that can be reused and leveraged across the enterprise. It is a blueprint that identifies components at a design or logical level (for example, a data server or an application server), and shows the roles, interactions, and relationships of components at that level.

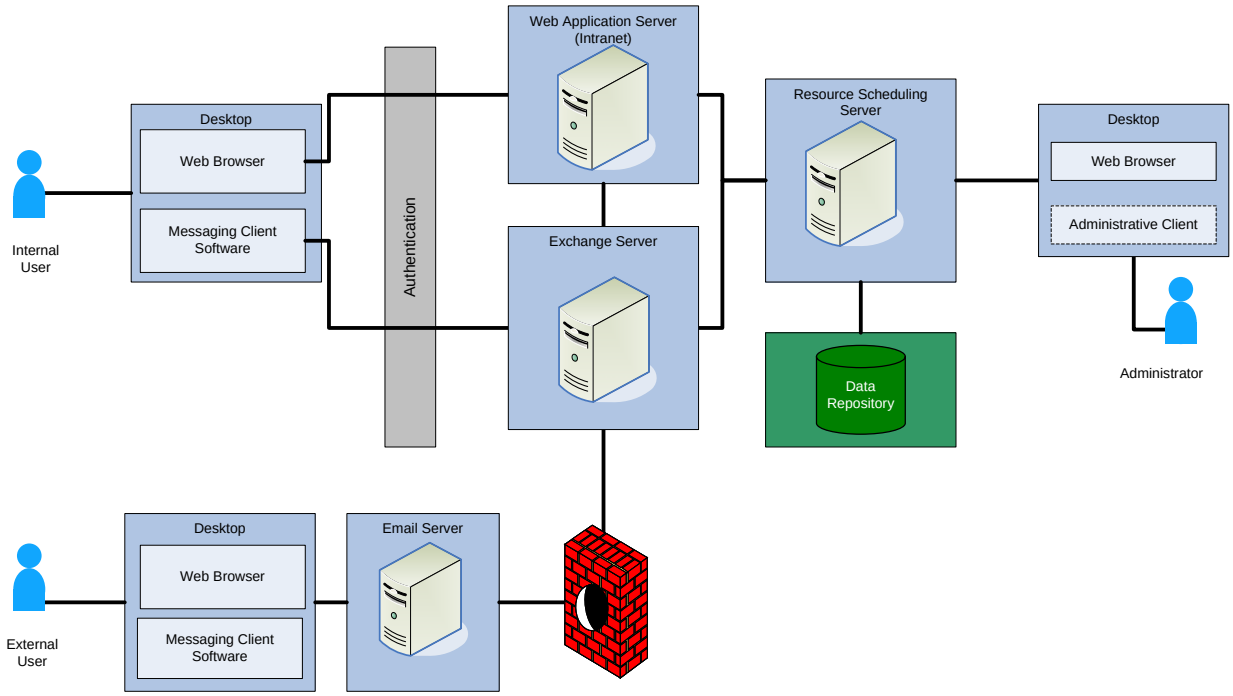
The following sections detail the domain team's five recommended Collaboration patterns.

2.1 Pattern 1: Complex Resource Scheduling Pattern

2.1.1 Complex Resource Scheduling Solution Pattern Description

Complex resource scheduling allows users to invoke their email client software to schedule resources for meetings, events (which could include a scientific/research protocol), or appointments. The pattern addresses application integration and workflow requirements that are not addressed with standard email calendaring/scheduling functions.

Figure 2. Complex Resource Scheduling Pattern



This pattern shows an internal user who can invoke the scheduling capability of the Exchange server either through their email client (such as Outlook or Eudora) or through the web interface to Exchange. Basic scheduling functions that require reserving only attendees and simple resources can be accomplished using native

Exchange functions. However, if more complex business logic is required to confirm the availability of resources then the resource scheduling application, which runs on the resource scheduling server, addresses that need by invoking the complex resource scheduling process.

The resource scheduler regularly polls the Exchange server to execute that logic to ensure those resources are made available and then updates the calendar in Exchange. This process occurs seamlessly for the user through Messaging Application Programming Interface (MAPI) connections and custom code implemented by the administrator. The resource scheduler confirms or rejects the request, and the Exchange meeting information is updated accordingly. External users can receive iCalendar-compliant invitations through their own email servers that can be accessed by either an email client or a web browser. Both internal and external users may also use a web browser to connect to the resource scheduler directly to initiate, manage, or respond to a request.

The brick for the resource scheduler (Section 3.5 of this report) indicates that future versions of Microsoft Exchange may provide enhanced scheduling capabilities and flexibility. If that functionality is deployed and is deemed reliable and useful, the resource scheduler component of this pattern may become obsolete.

The following scenarios illustrate two ways of applying this pattern to NIH business needs when implementing a resource scheduling solution.

2.1.1.1 Laboratory Scheduling Scenario

Scenario: An intramural research team is collaborating with an external researcher, perhaps a Fellow or former Intern, and wishes to make NIH intramural resources available for an experiment. The external scientist needs to schedule a lab room, specialized scientific equipment, and possibly a subject for this experiment. Due to ethical, regulatory, and safety issues, delivery of the subject requires complex business logic to ensure that the subject is available, and appropriately trained staff is also available to perform preparation, delivery and post-experiment management of the subject (which could be an animal, a patient in the clinical center, a tissue sample, or a virus).

Solution Description: In this case, the external researcher could fill out an Exchange form and forward it to a qualified NIH sponsor who would approve the request. Exchange would then route that request to the Resource Scheduling server which could manage the request or interface through an application programming interface (API) to another application that manages inventory or workflow for the provision of the resources requested. The resource scheduling server would then respond back to Exchange with the status of the request and update the appropriate calendars on Exchange.

2.1.1.2 External Scheduling Scenario

Scenario: A Scientific Research Administrator (SRA) wants to schedule a meeting with external researchers to review some grant applications.

Solution Description: In this case, the SRA's administrative support representative would use the Exchange server to check the availability of internal resources in NIH and then send a meeting request out to the non-NIH participants. Each of those participants would receive a schedule request and reply accordingly.

Some customization will be required to make this function work. In the future, remote users could use Exchange or a calendaring system that supports Outlook Internet Free/Busy (IFB) publishing, NIH users would then be able to confirm availability real-time before issuing the invitation if Exchange is properly configured to perform a Free/Busy lookup. This approach would require advance planning by NIH with external organizations.

2.1.2 Benefits

The Complex Resource Scheduling pattern provides the following benefits:

- Provides better integration with NIH active directory
- Allows users to use Exchange scheduling instead of having to access a separate application to manage resource availability
- Provides more flexible scheduling capabilities than currently provided by Exchange.

2.1.3 Limitations

The limitations of the Complex Resource Scheduling pattern are:

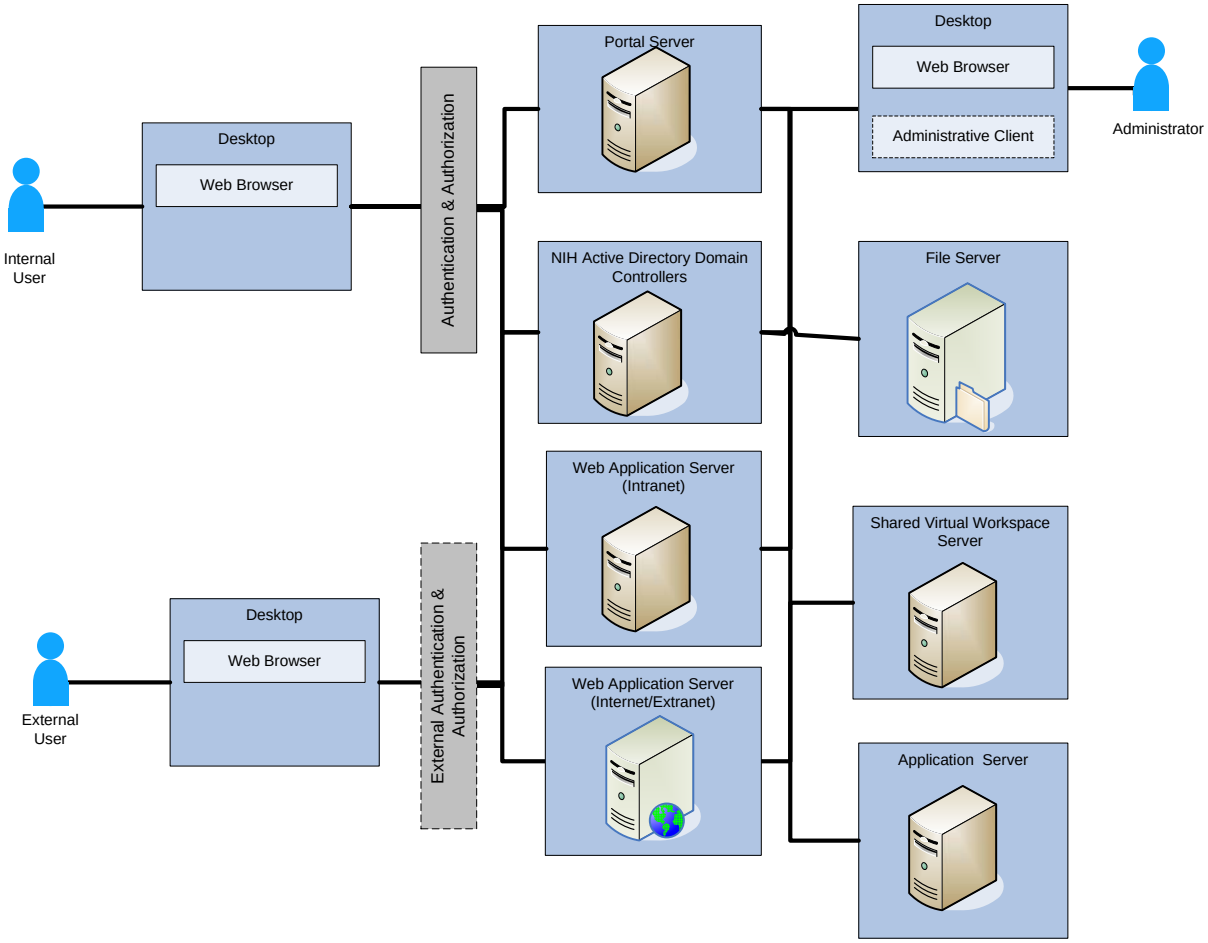
- Full functionality may not be available through tactical solutions yet
- Custom interfaces may still have to be written to interface with external inventory management or workflow applications
- Implementation needs to address security requirements when HIPAA data is involved in the resource scheduling

2.2 Pattern 2: Shared Virtual Workspace Pattern

2.2.1 Shared Virtual Workspace Pattern Description

This pattern shows how shared virtual workspace technologies provide formal, structured synchronous and asynchronous collaboration through, or instead of, formal face-to-face meetings by enabling a shared electronic workspace for developing documents or capturing asynchronous communications (e.g., forums, surveys, or application sharing) over the Internet.

Figure 3. Shared Virtual Workspace Solution



The Shared Virtual Workspace Solution pattern integrates shared virtual workspace technology into the existing NIH collaboration environment. In combination, these technologies address a broad spectrum of business needs as described in the scenario listed below.

Users inside of NIH can access shared virtual workspace services through their web browser. Those servers may require authentication or authorization, which can be handled by the NIH portal, the shared virtual workspace server, or an application server – all of which interact with the NIH Active Directory domain controllers. The shared virtual workspace server can also make use of a file server to store documents and files. These servers can also access Active Directory to verify a user's identity or access rights.

External users can access the same services with the help of the external authentication and authorization services accessed through a web application server. However, external authentication and authorization is not yet offered as an NIH shared central service as of the time this report was published (as indicated by the dashed box in the pattern). NIH's Center for IT (CIT) plans to offer external authentication and authorization through NED at some point in the future.

The black lines in the pattern represent the many-to-many connections that are possible as different servers invoke services back and forth, including services from non-web applications that may be invoked on behalf of users. Administrators in NIH can manage the servers through either a web browser or optional proprietary client code on their desktops.

The Shared Virtual Workspace Server typically provides the following functions which are often delivered in an offline or asynchronous manner (i.e., users can access these functions any time over an extended period):

- File and document sharing allows users to place documents and files in a common area where they can be accessed by other team-members.
- Check-in and check-out allows users to manage access so that they don't have to reconcile concurrent changes.
- Versioning and archiving provide a mechanism for tracking updates to files so that the team can revert to or refer to a previous version.
- Discussion forums or threaded discussions provide the ability for a user to introduce a discussion topic for others' review and comments. Comments are displayed in such a way that a reader can quickly determine who was responding to which topic or sub-topic.

The shared virtual workspace services are typically asynchronous applications that allow users to access and update content whenever it's convenient for them. Through additional integration, IM and presence management can also be accessed through the shared virtual workspace server as provided by a web conferencing service or a standalone IM service.

2.2.1.1 Grants Peer Review Meetings Scenario

Scenario: The Center for Scientific Review (CSR) and many other ICs conduct meetings of peer scientists to synthesize expert opinion on a set of grant applications in order to establish priority of approval recommendations for extramural research grants. These meetings have high security and sensitivity concerns in order to protect the integrity and openness of the discussions while avoiding any ethical conflicts that might arise if a reviewer has a personal or financial connection with another applicant. Historically, NIH has incurred substantial costs to bring these reviewers to a common location to review large paper applications. The Director of CSR (as of the publication date on this report) has indicated his support for providing an effective and efficient way to conduct these meetings virtually. This makes it possible for NIH to recruit reviewers who are willing to participate in the process but cannot, for personal or business reasons, afford to spend the time traveling to a single location. This also helps NIH avoid travel costs and the time needed to arrange and reimburse such travel.

Shared Workspace Only Solution Description: The Scientific Review Administrator (SRA) can set-up a team shared virtual workspace on the shared virtual workspace server. The grant applications can be accessed via Internet Assisted Review (IAR). This is shown in the Web Collaboration Solution pattern as the application server, which

will manage privacy and access for the applications. Reviewer critiques can be posted in the discussion threads of the shared virtual workspace server for easy reference by the designated reviewers. The SRA can segregate file and discussion forum access to more easily block participants who are excluded due to a conflict of interest. Over the course of a few days, the reviewers can access documents, interact through IM capabilities, contribute comments and rebuttals to each of the grant application discussion forums, and participate in voting on the grant applications.

2.2.1.2 Telecommuting Scenario

Scenario: An NIH employee can be more productive and improve quality of life as well as avoid commuting costs and inconvenience by telecommuting from their home offices. Telecommuting involves equipping an employee's home office, or other remote location, to provide the necessary connectivity and computing resources for effectively executing their job responsibilities from the remote location. Telecommuting enhances the NIH's ability to recruit and effectively manage employees who do not wish to physically commute to NIH. This also reduces facility expenses for NIH by working from home and reducing the environmental and traffic impacts of commuting.

This scenario is an essential part of business continuity planning and crisis management. In the event of a health epidemic or disruptions to transportation – such as a SARS scare, an avian flu outbreak or a blizzard – employees can be productive from a non-NIH location without endangering themselves.

Solution Description: The Shared Virtual Workspace server can provide the employee with shared file storage and discussion forums for each project. Employees can utilize standard telephony services or IM capabilities, as illustrated in the Standalone Instant Messaging pattern (reference Section 2.2), for synchronous communications.

2.2.1.3 Participate in EA Development Scenario

Scenario: The NIH has adopted a collaborative approach for developing EA content such as patterns and bricks. This approach coordinates the input and participation of NIH business and IT stakeholders. These stakeholders exchange knowledge, thoughts, ideas, assessments, requirements, and analyses to reach consensus on the development of recommended EA artifacts, policies, and guidelines. Sometimes this exchange cannot occur via face-to-face mechanisms and the NIH relies on collaboration technologies to bring these stakeholders together in both synchronous and asynchronous modes. The NIH Request for Comments (NRFC) process, for example, relies on collaboration technologies to enable this virtual, asynchronous discussion.

Solution Description: Shared virtual workspaces allow storage, retrieval, versioning and commenting on draft NRFCs. Additional discussions can be supported via IM capabilities. The shared virtual workspace also provides threaded discussions to allow participants to comment on a proposed EA standard and then reach consensus electronically through successive rebuttals and supporting arguments.

2.2.1.4 Grants Peer Review Meetings Scenario

Scenario: The CSR and many other ICs conduct meetings of peer scientists to synthesize expert opinion on a set of grant applications in order to establish priority of approval recommendations for extramural research grants. These meetings have high security and sensitivity concerns in order to protect the integrity and openness of the discussions while avoiding any ethical conflicts that might arise if a reviewer has a personal or financial connection with another applicant. Historically, NIH has incurred substantial costs to bring these reviewers to a common location to review large paper applications. The Director of CSR (as of the publication date on this report) has indicated his support for providing an effective and efficient way to conduct these meetings virtually. This makes it possible for NIH to recruit reviewers who are willing to participate in the process but cannot, for personal or business reasons, afford to spend the time traveling to a single location. This also helps NIH avoid travel costs and the time needed to arrange and reimburse such travel.

Solution Description: The Scientific Review Administrator (SRA) can set-up a team shared virtual workspace on the shared virtual workspace server. The grant applications can be accessed via Internet Assisted Review (IAR). The application server shown in the Shared Virtual Workspace Solution pattern will manage privacy and access for the applications. Reviewer critiques can be posted in the discussion threads of the shared virtual workspace server for easy reference by the designated reviewers. The SRA can segregate file and discussion forum access to more easily block participants who are excluded due to a conflict of interest. Over the course of a few days, the reviewers can access documents, interact through IM capabilities, contribute comments and rebuttals to each of the grant application discussion forums, and participate in voting on the grant applications.

2.2.2 Benefits

The Shared Virtual Workspace Solution pattern provides the following benefits:

- Extends participation in NIH activities to individuals who are not physically present
  - Involves individuals who cannot travel
  - Improves quality of life for those who participate in NIH activities
- Improves productivity and quality of work when individuals can be virtually convened in situations where physical meetings are impractical
- Provides richer functionality with shared virtual workspaces than can be provided through shared drives, shared email folders, or “bare portal services”
- Provides a cost-effective and flexible way to provide virtual face-to-face meetings across the Internet.
  - Reduces travel costs
  - Improves quality of life and productivity for meeting participants who avoid travel time
  - Allows participation by individuals who may not be available for travel

- Provides a more reliable and accessible history of how content evolved and how decisions were made through portal history files

2.2.3 Limitations

The limitations of the Shared Virtual Workspace Solution pattern are:

- Integration between products will need to be managed in order to streamline the user experience.
- This collaborative infrastructure may need to be centrally funded in order to be made more readily available across the entire NIH enterprise.
- Provision for training of participants before the actual meetings is critical to the success of using software, and hardware, that the meeting participants would only use on an infrequent basis.

2.3 Pattern 3: Standalone Instant Messaging Pattern

2.3.1 Standalone Instant Messaging Solution Pattern Description

Instant messaging (IM) can be incorporated into other collaborative products such as portals, shared virtual workspaces and/or desktop web conferencing solutions. The Standalone IM Solution Pattern addresses standalone, ad hoc synchronous chats between internal users or between internal and external users. The pattern shows how internal users can make use of an internal IM service, or connect through the IM Gateway (when properly registered), to conduct IM sessions with external IM servers. The IM Gateway protects NIH from viruses, authenticates other users, prevents interception, and can also monitor for inappropriate usage.

Figure 4. Standalone Instant Messaging

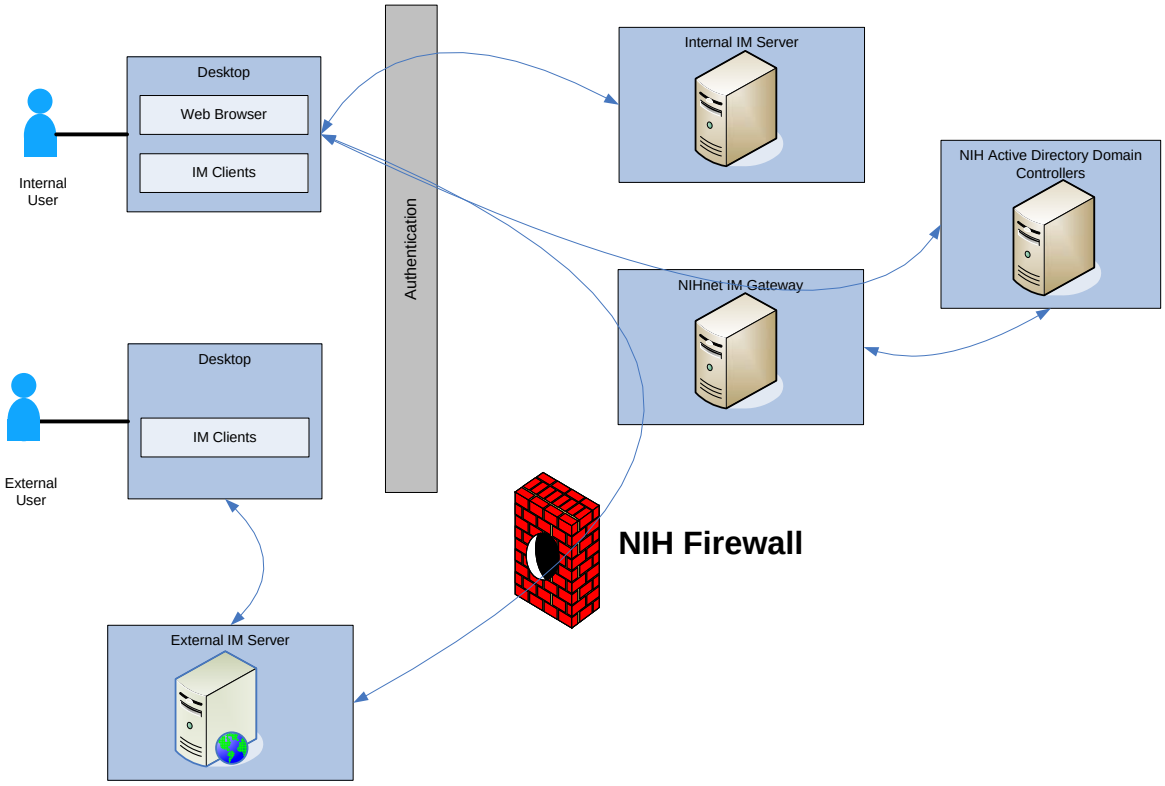


Figure 4, Standalone Instant Messaging, shows an internal user who is running both a web browser and an IM client on their desktop. Using the web browser, the user would download a copy of the IM client that corresponds to the service they want to use (such America Online (AOL) IM™, Yahoo!™, or Microsoft Messenger™) from http://www.mail.nih.gov/im, and register their screen-name. This interaction is illustrated by the double-ended arrow that passes through the NIHnet IM gateway to the NIH Active Directory domain controller. Once they have established their identity, they can use the IM client to connect to the IM service, as shown by the arrow that passes through the NIH IM gateway and the Firewall to connect to an external IM server.

External IM servers such as AOL IM™, Yahoo! Messenger™ or Microsoft Messenger™ are not operated by NIH and are located outside the NIH network. Therefore, in order to improve security and protect NIH from viruses, all requests for external IM sessions are routed through a gateway that performs a virus scan on incoming traffic. The NIH IM Gateway can also filter on content to reduce unsolicited transmissions, such as spam. Users may also invoke the services of an internal IM server for ad hoc communications with other NIH users.

External users establish sessions with external IM servers using their corresponding client software that they have loaded. This is represented by the double-ended arrow between the desktop and the external IM server. The services provided by the NIH IM gateway will be transparent to external users who conduct IM sessions with NIH users.

IM servers provide the following capabilities:

- User list management, or "buddy lists", allows users to initiate interaction with another user on a customized list that they have set up.
- Presence management monitors which users have active (or idle) client sessions and reports on their availability to others. This allows a user to create lists of experts who can be located and consulted to resolve ad hoc issues.
- Chat allows a group of users to interact in real-time by sending IMs via a virtual location, which is most commonly referred to as a "chat room."

As of the publication date on this report, NIH's IM policy (http://irm.cit.nih.gov/nihsecurity/NIHIMPol.doc) stipulates that users should disable the file-sharing capabilities of external IM servers. Within NIH, and when using an internal IM server, IM may be a faster, more efficient way of sending files than using email. Some IM services also provide desktop video capabilities, however the preferred approach is described in Pattern 4: Web Collaboration Pattern, Section 2.4.

2.3.2 Benefits

The Standalone Instant Messaging pattern provides the following benefits:

- Protects NIH from viruses and other undesirable traffic, such as spam, by using the NIH IM Gateway
- Ensures users that their conversations are not intercepted by impersonators
- Allows a virtual "conversation" with multiple people
- Allows sending images or URLs while reducing email usage
- Provides quick communication between onsite and offsite users
- Provides quick communication between onsite users

2.3.3 Limitations

The limitations of the Standalone Instant Messaging pattern are:

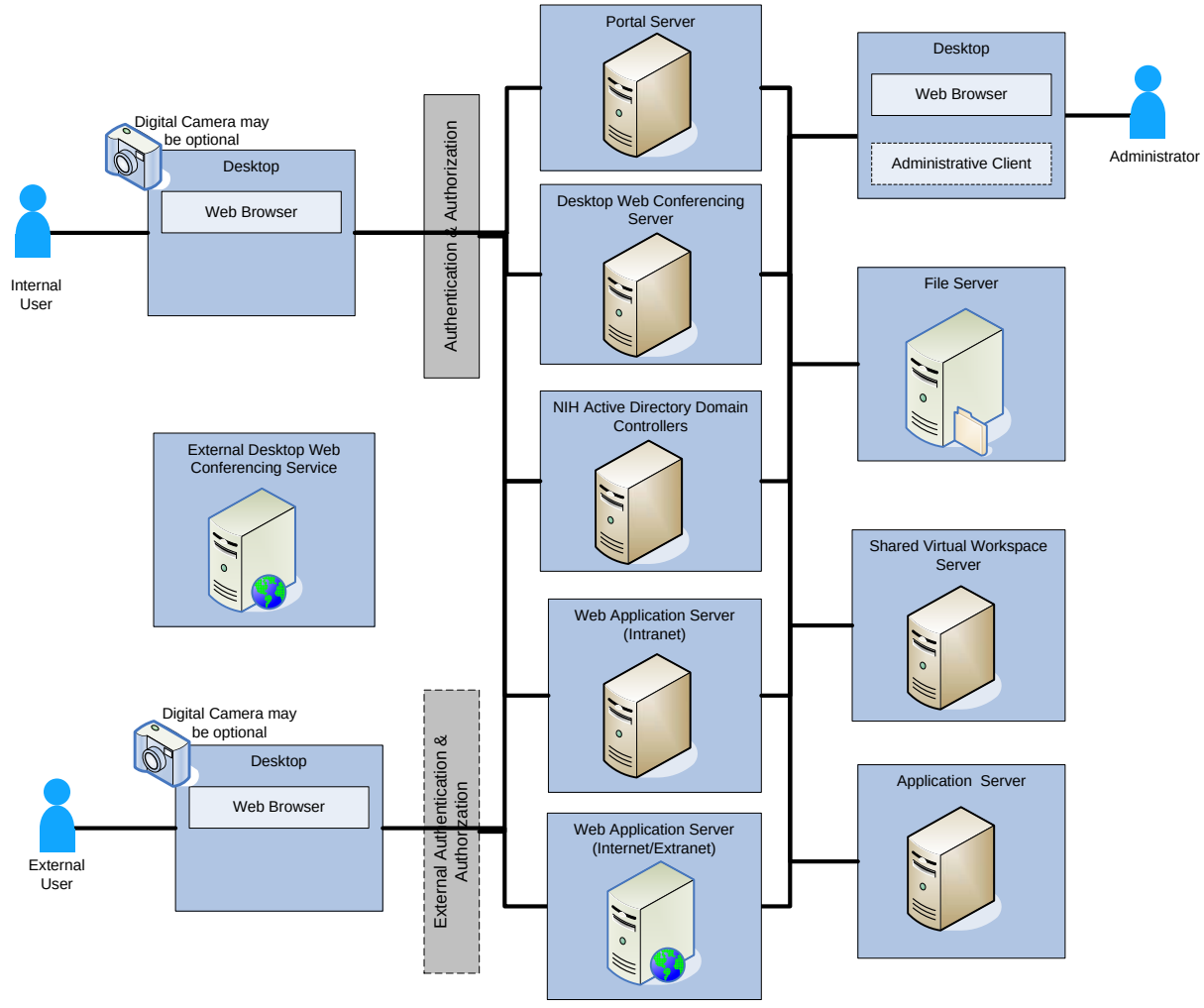
- NIH IM Gateway does not allow client software that is "reverse-engineered" from other client software such as AOL or MSN.
- The ability to provide history and accountability for interaction between users depends on the IM client/server chosen by the user (Note: some IM servers provide for the logging of conversations).
- Users may need to load additional IM clients in order to connect to users using different IM services.

2.4 Pattern 4: Web Collaboration Pattern

2.4.1 Web Collaboration Solution Pattern Description

The Web Collaboration Solution pattern shows how web conferencing and shared virtual workspace technologies provide formal, structured synchronous and asynchronous collaboration through, or instead of, formal face-to-face meetings by enabling audio-visual interaction across the Internet and shared electronic workspace for developing documents or capturing asynchronous communications (e.g., forums, surveys, or application sharing).

Figure 5. Web Collaboration Solution



The Web Collaboration Solution pattern integrates technologies from web conferencing and shared virtual workspace into the existing NIH collaboration environment. In combination, these technologies address a broad spectrum of business needs as described in the scenarios listed below (Sections 2.2.3.2 – 2.2.3.5).

Users inside of NIH can access desktop web conferencing or shared virtual workspace services through their web browser. Those servers may require authentication or authorization, which can be handled by the NIH portal, the desktop web conferencing server, or an application server – all of which interact with the NIH Active Directory domain controllers. Both the desktop web conferencing server and the shared virtual workspace server can make use of a file server to store documents and files. These servers can also access Active Directory to verify a user's identity or access rights.

External users can access the same services with the help of the external authentication and authorization services accessed through a web application server. However, external authentication and authorization is not yet offered as an NIH shared central service as of the time this report was published (as indicated by the dashed box in the pattern). NIH's CIT plans to offer external authentication and authorization through NED at some point in the future.

The black lines in the pattern represent the many-to-many connections that are possible as different servers invoke services back and forth, including services from non-web applications that may be invoked on behalf of users. Administrators in NIH can manage the servers through either a web browser or optional proprietary client code on their desktops.

The Desktop Web Conferencing Server typically provides synchronous, real-time functions such as:

- Audio/video interaction between users who are participating in an online meeting. Audio can be supported by a separate voice conference call connection or through Voice over IP (VoIP). Video interaction is enabled when users have desktop digital cameras. Without a digital camera, a user can see other participants, but cannot be seen by others.
- Application sharing allows users to share visibility or control of an application with other users so they can see or interact with an application. This function is useful when one user needs support in using application functionality or when multiple users want to whiteboard or show content without shipping large files around the network.
- Instant Messaging (IM) allows meeting participants to initiate text-based chat with other meeting participants.
- Presence management allows meeting participants to see who else is attending the meeting.
- Surveys can be initiated by the meeting administrator to poll the participants' opinion or test the participants' understanding of a topic that has been presented. Surveys can facilitate consensus or help document demographic opinions.[4]

The desktop web conferencing service is typically an online, synchronous application that facilitates real-time interaction between users. However, recorded meetings can be

[4] Note that surveying the external community may require OMB clearance.

accessed by authorized users if so permitted by the administrator. This pattern also shows that this service can be provided from within NIH or as an external service.

Given the likelihood that collaborative benefits will increase as collaboration capabilities become more integrated, and in order to simplify security administration, the domain team recommends that internal services be used. Furthermore, as of the publication date of this report, internal services are more cost-effective than most external services. Although some external desktop video conferencing services, such as those supported by external IM providers, may be free, security concerns may make those services generally unacceptable for NIH business usage, depending on the content and purpose of the meeting. Additional integration is also possible between desktop web conferencing products and standalone IM products. In fact, the domain team's research suggests that, vendors may pursue additional integration opportunities such as the recent partnership between Macromedia and Jabber, Inc.

The Shared Virtual Workspace Server typically provides the following functions which are often delivered in an offline or asynchronous manner (i.e., users can access these functions any time over an extended period):

- File and document sharing allows users to place documents and files in a common area where they can be accessed by other team-members.
- Check-in and check-out allows users to manage access so that they don't have to reconcile concurrent changes.
- Versioning and archiving provide a mechanism for tracking updates to files so that the team can revert to or refer to a previous version.
- Discussion forums or threaded discussions provide the ability for a user to introduce a discussion topic for others' review and comments. Comments are displayed in such a way that a reader can quickly determine who was responding to which topic or sub-topic.

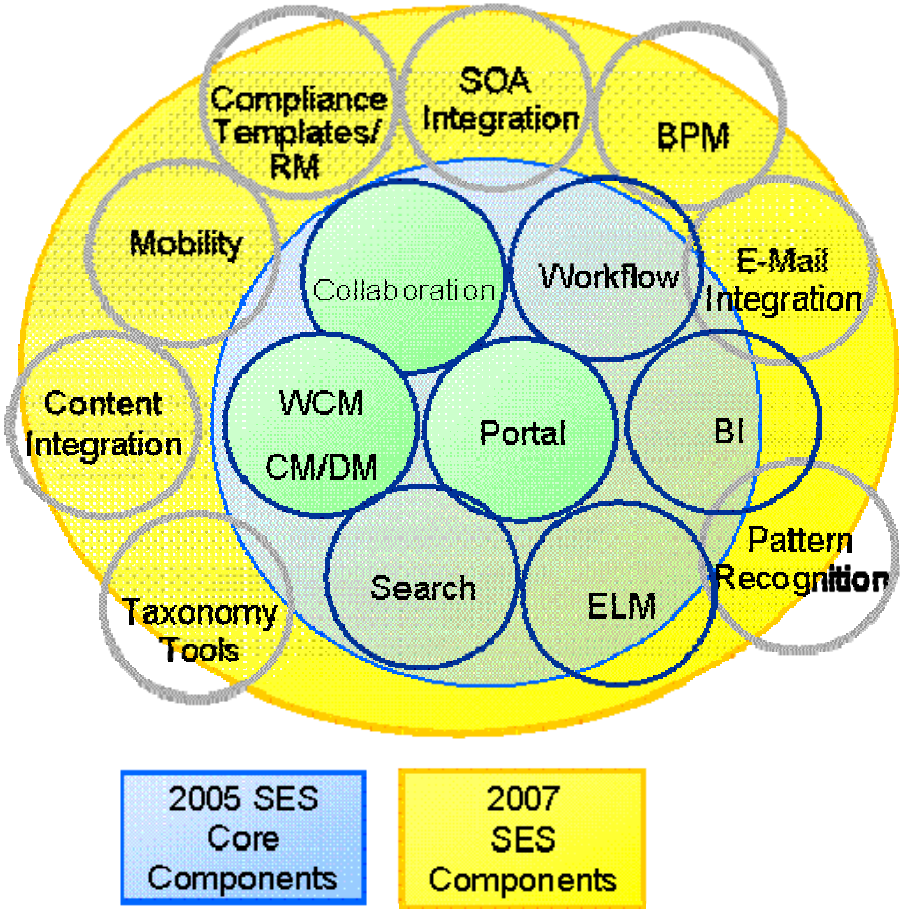
The shared virtual workspace services are typically asynchronous applications that allow users to access and update content whenever it's convenient for them. Through additional integration, IM and presence management can also be accessed through the shared virtual workspace server as provided by a web conferencing service or a standalone IM service.

2.4.1.1 Future of Web Collaboration Pattern

This web collaboration pattern and other collaboration patterns in the NIH EA are designed to position NIH for future evolution of collaboration technologies. Because the collaboration marketplace is dynamic and vendors are improving integration and functionality, NIH will monitor these developments and update these patterns to incorporate new capabilities. One trend of particular interest is the development of what Gartner, Inc. Research has labeled the Smart Enterprise Suite (SES), as shown in Figure 6. SES integrates all aspects of collaborative technology, including portal interface and content management. Furthermore, within components of the SES products, functionality is expanding and overlapping. For example, there are many similarities between shared virtual workspace and document management products that

were architected in a prior NIH technology domain team. Over time, this overlap is expected to increase.

Figure 6. Smart Enterprise Suite (SES) Context



Source: Gartner, Inc.

Through its market research, the domain team expects that the distinction between all the functions included in Figure 6 will decrease as the collaboration architecture of the future develops into a service-oriented approach. Recent collaboration trends bear out this prediction as the Smart Enterprise Suite concept expands as shown in Figure 6, Smart Enterprise Suite (SES) Context. As of the publication date on this report, these products have already begun to integrate functions that used to be distinct, products. Research by Gartner, Inc. suggests that by 2007 these products will expand even further to integrate additional capabilities.

Given the strategic importance of collaboration to NIH's core mission of creating new biomedical knowledge to improve the health of the world, NIH's collaboration environment should evolve rapidly in order to provide the benefits of collaboration to the NIH stakeholders. The convergence of the following services shown in Figure 5 will lead to a much richer environment for discovering, sharing and managing knowledge:

- Portal – provides user interface and security integration

- Workflow – provides the ability to manage and route tasks to complete a business function (refer to Workflow Brick defined in 2004)
- Business Intelligence – allows users to query data warehouses and data marts to create reports and analyze data
- Expertise location and management – indexes who knows what
- Search – indexes web content and allows users to retrieve content containing words they specify
- Web Content Management – provides a mechanism for authoring and publishing web content (refer to Content Management Brick defined in 2004)
- Content/Document Management – provides an electronic library of documents and metadata and document authoring workflow (refer to Document Management Brick defined in 2004)
- Collaboration – provides discussion boards and forums
- Taxonomy Tools – provide an organizational construct for organizing metadata that can be used to classify information and documents
- Content Integration – provides a single view into content resident in multiple repositories within an enterprise
- Mobility – interfaces with mobile devices
- Compliance Templates/Records Management – provides standard forms and a mechanism for managing them
- SOA Integration – provides the ability to call web services that are published by other applications and to publish web services that can invoke SES functions on behalf of other applications (refer to Application Integration Architecture)
- Business Process Management – interfaces to business applications so that workflow can be customized and exceptions automated
- Email Integration – interfaces to email systems to provide notifications
- Pattern Recognition – automated analytics that recognize trends and patterns in data

2.4.1.2 Grants Peer Review Meetings Scenario

Scenario: The CSR and many other ICs conduct meetings of peer scientists to synthesize expert opinion on a set of grant applications in order to establish priority of approval recommendations for extramural research grants. These meetings have high security and sensitivity concerns in order to protect the integrity and openness of the discussions while avoiding any ethical conflicts that might arise if a reviewer has a personal or financial connection with another applicant. Historically, NIH has incurred substantial costs to bring these reviewers to a common location to review large paper applications. The Director of CSR (as of the publication date on this report) has indicated his support for providing an effective and efficient way to conduct these meetings virtually. This makes it possible for NIH to recruit reviewers who are willing to participate in the process but cannot, for personal or business reasons, afford to spend

the time traveling to a single location. This also helps NIH avoid travel costs and the time needed to arrange and reimburse such travel.

Solution Description: As described in the *Shared Workspace Only Solution Description* above, the SRA can set-up a team shared virtual workspace on the shared virtual workspace server. Reviewers can access documents, interact through IM capabilities, and contribute comments and rebuttals to any issues requiring discussion before the virtual review meeting. At a specified time, a virtual review meeting can be scheduled through the desktop web conferencing server. Prior to this meeting, CSR will send out digital cameras, software and instructions for connecting to the meeting. During the meeting, the SRA will manage file, discussion and IM access to facilitate the scoring of the grant applications. A recording of this meeting will be available to the SRA after the meeting to assist him or her in documenting the results. All meeting proceedings can be archived (or disposed of) later according to records retention policies.

2.4.1.3 Telecommuting Scenario

Scenario: An NIH employee can be more productive and improve quality of life as well as avoid commuting costs and inconvenience by telecommuting from their home offices. Telecommuting involves equipping an employee's home office, or other remote location, to provide the necessary connectivity and computing resources for effectively executing their job responsibilities from the remote location. Telecommuting enhances the NIH's ability to recruit and effectively manage employees who do not wish to physically commute to NIH. This also reduces facility expenses for NIH by working from home and reducing the environmental and traffic impacts of commuting.

This scenario is an essential part of business continuity planning and crisis management. In the event of a health epidemic or disruptions to transportation – such as a SARS scare, an avian flu outbreak or a blizzard – employees can be productive from a non-NIH location without endangering themselves.

Solution Description: Employees can make use of desktop web conferencing to provide virtual face-to-face interaction with their co-workers. IM capabilities, as illustrated in the Standalone Instant Messaging pattern (reference Section 2.2), can provide the electronic equivalent of a coworker dropping by to ask a question or discuss an issue. The Shared Virtual Workspace server can provide the employee with shared file storage and discussion forums for each project.

2.4.1.4 Workgroup Scenario

Scenario: This scenario applies to:

- Geographically separated employees working together who do not wish to spend time traveling from location to location. This can include cross-function, cross-IC, and intra-IC workgroups.
- Groups consisting of NIH employees and participants external to NIH that need to:
  - Present proposal or draft work products (such as study section guidelines)
  - Discuss proposal or edit draft work products

- Obtain consensus or finalize work products

Solution Description: Employees can make use of desktop web conferencing to provide virtual face-to-face interaction with their co-workers and with people external to NIH. IM capabilities, as illustrated in the Standalone (reference Section 2.2) Instant Messaging pattern, can provide the electronic equivalent of a coworker dropping by to ask a question or discuss an issue. The Shared Virtual Workspace server can provide the employee with shared file storage and discussion forums for each project.

2.4.1.5 Participate in EA Development Scenario

Scenario: The NIH has adopted a collaborative approach for developing EA content such as patterns and bricks. This approach coordinates the input and participation of NIH business and IT stakeholders. These stakeholders exchange knowledge, thoughts, ideas, assessments, requirements, and analyses to reach consensus on the development of recommended EA artifacts, policies, and guidelines. Sometimes this exchange cannot occur via face-to-face mechanisms and the NIH relies on collaboration technologies to bring these stakeholders together in both synchronous and asynchronous modes. The NIH Request For Comments (NRFC) process, for example, relies on collaboration technologies to enable this virtual, asynchronous discussion.

Solution Description: The same solution that applies to workgroups (reference Section 2.3.1.5) is applicable to the development of NIH EA artifacts. Domain teams can meet in a large conference room and use Macromedia Breeze™ web-conferencing services hosted by the NIH CIT so that remote individuals can participate via desktop web conferencing. Additional discussions can be supported via IM capabilities, while attendee polling and surveying can be accommodated by the web conferencing service. The shared virtual workspace can provide threaded discussions to allow participants to comment on a proposed EA standard and then reach consensus electronically through successive rebuttals and supporting arguments.

2.4.2 Benefits

The Web Collaboration Solution pattern provides the following benefits:

- Extends participation in NIH activities to individuals who are not physically present
  - Involves individuals who cannot travel
  - Improves quality of life for those who participate in NIH activities
- Improves productivity and quality of work when individuals can be virtually convened in situations where physical meetings are impractical
- Provides richer functionality with shared virtual workspaces than can be provided through shared drives, shared email folders, or “bare portal services”
- Provides a cost-effective and flexible way to provide virtual face-to-face meetings across the Internet.
  - Reduces travel costs

- Improves quality of life and productivity for meeting participants who avoid travel time
- Allows participation by individuals who may not be available for travel

- Provides a more reliable and accessible history of how content evolved and how decisions were made through portal history files

2.4.3 Limitations

The limitations of the Web Collaboration Solution pattern are:

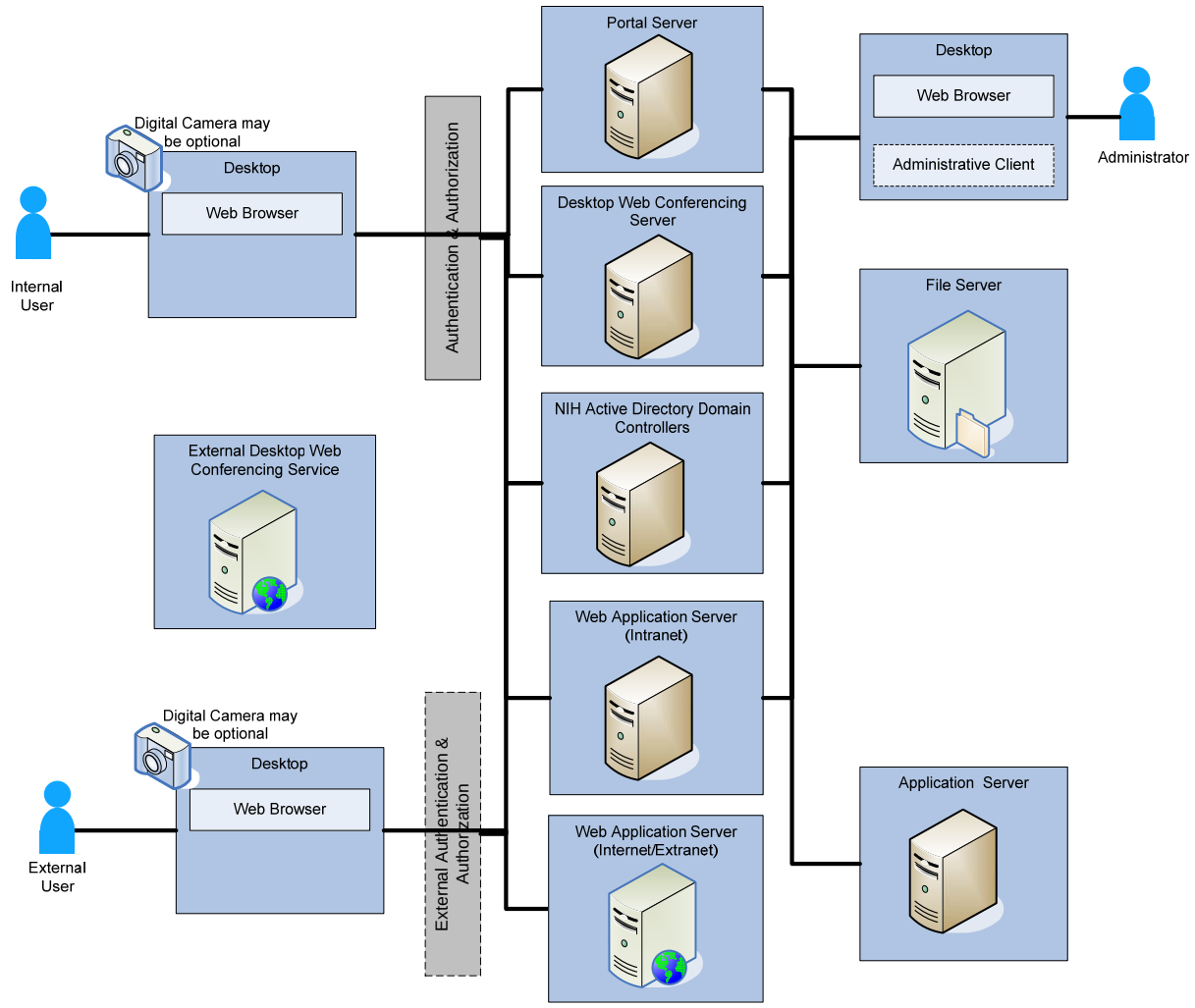
- Integration between products will need to be managed in order to streamline the user experience.
- This collaborative infrastructure may need to be centrally funded in order to be made more readily available across the entire NIH enterprise.
- Provision for training of participants before the actual meetings is critical to the success of using software, and hardware, that the meeting participants would only use on an infrequent basis.

2.5 Pattern 5: Web Conferencing Pattern

2.5.1 Web Conferencing Solution Pattern Description

The Web Conferencing Solution pattern shows how web conferencing technologies provide formal, structured synchronous collaboration instead of formal face-to-face meetings by enabling audio-visual interaction across the Internet.

Figure 7. Web Conferencing Solution



The Web Conferencing Solution pattern integrates web conferencing technologies into the existing NIH collaboration environment to address a broad spectrum of business needs as described in the *Training Session Scenario* below (Section 2.5.1.1).

Users inside of NIH can access desktop web conferencing services through their web browser. Those servers may require authentication or authorization, which can be handled by the NIH portal, the desktop web conferencing server, or an application server – all of which interact with the NIH Active Directory domain controllers. The desktop web conferencing server can make use of a file server to store documents and files. Any of these servers can also access Active Directory to verify a user's identity or access rights.

External users can access the same services with the help of the external authentication and authorization services accessed through a web application server. However, external authentication and authorization is not yet offered as an NIH shared central service as of the time this report was published (as indicated by the dashed box

in the pattern). NIH's CIT plans to offer external authentication and authorization through NED at some point in the future.

The black lines in the pattern represent the many-to-many connections that are possible as different servers invoke services back and forth, including services from non-web applications that may be invoked on behalf of users. Administrators in NIH can manage the servers through either a web browser or optional proprietary client code on their desktops.

The Desktop Web Conferencing Server typically provides synchronous, real-time functions such as:

- Audio/video interaction between users who are participating in an online meeting. Audio can be supported by a separate voice conference call connection or through Voice over IP (VoIP). Video interaction is enabled when users have desktop digital cameras. Without a digital camera, a user can see other participants, but cannot be seen by others.
- Application sharing allows users to share visibility or control of an application with other users so they can see or interact with an application. This function is useful when one user needs support in using application functionality or when multiple users want to whiteboard or show content without shipping large files around the network.
- Instant Messaging (IM) allows meeting participants to initiate text-based chat with other meeting participants.
- Presence management allows meeting participants to see who else is attending the meeting.
- Surveys can be initiated by the meeting administrator to poll the participants' opinion or test the participants' understanding of a topic that has been presented. Surveys can facilitate consensus or help document demographic opinions.[5]

The desktop web conferencing service is typically an online, synchronous application that facilitates real-time interaction between users. However, recorded meetings can be accessed by authorized users if so permitted by the administrator. This pattern also shows that this service can be provided from within NIH or as an external service.

Given the likelihood that collaborative benefits will increase as collaboration capabilities become more integrated, and in order to simplify security administration, the domain team recommends that internal services be used. Furthermore, as of the publication date of this report, internal services are more cost-effective than most external services. Although some external desktop video conferencing services, such as those supported by external IM providers, may be free, security concerns may make those services generally unacceptable for NIH business usage, depending on the content and purpose of the meeting. Additional integration is also possible between desktop web conferencing products and standalone IM products. In fact, the domain team's research suggests that, vendors may pursue additional integration opportunities such as the

[5] Note that surveying the external community may require OMB clearance.

recent partnership between Macromedia and Jabber, Inc. By adding and integrating shared virtual workspace services, this pattern evolves naturally into the Web Collaboration Pattern described in Section 2.4.

2.5.1.1 Training Session Scenario

Scenario: In order to provide a more convenient and agile training environment, NIH Human Resources (HR) and other training organizations can schedule virtual classes.

Solution Description: Instructors can be on-site or off-site as long as they have been registered and authenticated as a meeting facilitator to the desktop web conferencing server. Although instructors can instruct with only audio and video access to a presentation or application, many instructors will find it useful to have a digital video camera so that the classes can observe the instructor's body language and expressions. Students can attend the course from their offices or in small cluster classrooms. At the option of the course administrator, students can also be issued cameras so that the instructor can observe their participation. Classroom sessions can be recorded and accessed later by students who were not available during the scheduled live session. One-on-one instruction can also be scheduled by this mechanism. Course delivery can also be augmented by publishing course materials on a shared virtual server which would reflect the Web Collaboration Pattern described in Section 2.4.

2.5.2 Benefits

The Web Conferencing Solution pattern provides the following benefits:

- Extends participation in NIH activities to individuals who are not physically present
  - Involves individuals who cannot travel
  - Improves quality of life for those who participate in NIH activities
- Improves productivity and quality of work when individuals can be virtually convened in situations where physical meetings are impractical
- Provides a cost-effective and flexible way to provide virtual face-to-face meetings across the Internet.
  - Reduces travel costs
  - Improves quality of life and productivity for meeting participants who avoid travel time
  - Allows participation by individuals who may not be available for travel
- Provides evolution path into the Web Collaboration Pattern

2.5.3 Limitations

The limitations of the Web Conferencing Solution pattern are:

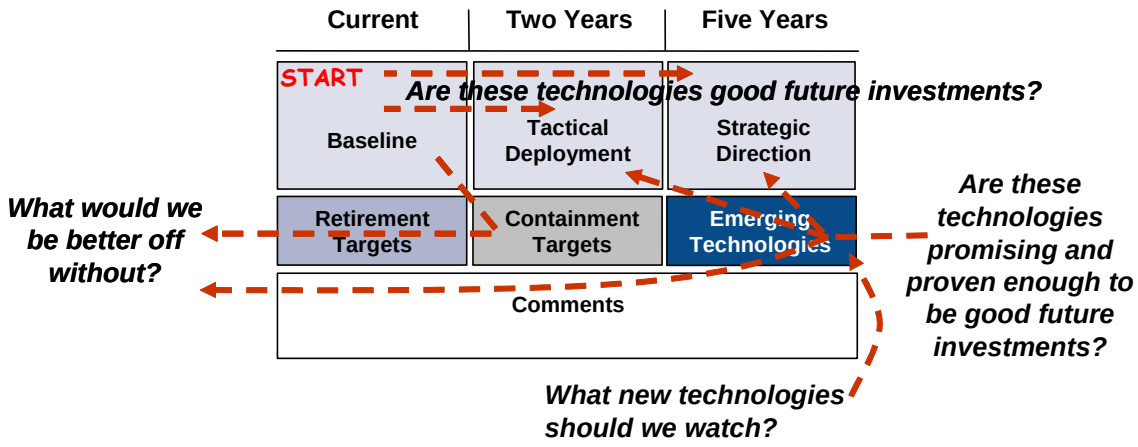
- This collaborative infrastructure may need to be centrally funded in order to be made more readily available across the entire NIH enterprise.

- Provision for training of participants before the actual meetings is critical to the success of using software, and hardware, that the meeting participants would only use on an infrequent basis.

3.0 Collaboration IV Bricks

Technical Bricks are a tool that documents and communicates NIH's out-going, current, planned, and future (2 – 5 year horizon potential) technology standards. As such, they depict both the current (as-is) and future (to-be) states of NIH's technical environment. A single brick represents a very specific component of NIH's technology architecture. The following diagram depicts a technical brick.

Figure 8. The Technical Brick



Bricks represent the physical building blocks of the technical architecture upon which NIH IT solutions are developed and deployed -- both hardware and software. They describe both the baseline and target technologies for the components identified in design patterns. Bricks provide device-specificity for the patterns, specifying the technology to be used in the architecture. Bricks capture:

- A description of the technology and its role.
- Specific implications, dependencies, and deployment and management strategies.
- The maturity of the specific piece of technology. Maturity is monitored as follows:
  - *Baseline*: Technology or process element(s) currently in use at the NIH.
  - *Tactical*: Technologies that are to be used in the near or tactical time frames (next two years). Currently available products needed to meet existing needs are identified here.
  - *Strategic*: Technologies that provide strategic advantage and are to be used in the future. Anticipated marketplace products are usually identified here.
  - *Retirement*: Technology and/or process elements that are targeted for divestment over the architecture planning horizon (five years).
  - *Containment*: Technology and/or process elements targeted for limited (maintenance or current commitment) investment during the architecture planning horizon. Items placed in containment require a waiver prior to implementation.

- *Emerging*: Technology and/or process elements to be evaluated for future integration into the target architecture) based on technology availability and business need (key for evergreening).

3.1 Brick Development Methodology

The Collaboration Domain Team developed and followed a structured methodology for evaluating potential technical standards and proposing NIH's current and future direction for these standards (as documented in the bricks in Sections 3.2 – 3.6). This methodology included the following activities:

- An assessment of NIH's baseline environment to understand the breadth of collaborative technologies, within the domain team's defined scope, with which the NIH currently has experience. This baseline assessment also indicated the extent to which specific products or standards represent de facto standards.
  - Prior to the beginning of this domain team, the Office of the Chief IT Architect (OCITA) conducted a survey which was sent to all ICs, to define the baseline technologies currently in use at NIH that meet the needs described in the scope.
- A market assessment of the maturity, trends, capabilities, and availability of products and solutions for providing the web conferencing and resource scheduling capabilities as defined in the domain team's scope. This assessment was supported by independent industry research and two formal Requests For Information (RFI). Both RFIs are included in Appendix B.
  - The Collaboration Domain Team released two RFIs; one for web collaboration and one for resource scheduling. The web collaboration RFI requested input for team collaboration technologies such as instant messaging, desktop web conferencing, and shared virtual workspace collaboration. The resource scheduling RFI requested input for the resource scheduling technologies.
  - The RFIs were used in combination with independent industry research and domain team member experience to evaluate the strengths, weaknesses, and risks of these technologies. Therefore, the domain team also evaluated technologies for which a response to the RFI was not received.
- An evaluation of potential products or solutions based on a set of defined decision criteria. Using these decision criteria, the domain team "scored" potential standards based on what they learned from the baseline and market assessments. It is important to note that *decisions were not made exclusively from the resulting "scores", but rather were considered as decision support information only*.

This domain team used the following decision criteria to evaluate collaboration technologies:

- Availability – evaluates the availability, failover and performance of the collaboration technology as it relates to server uptime, client uptime and network uptime.

- Cost – estimated total cost of ownership (based on market research statistics and independent research opinions).
- Existing NIH installed base – NIH experience with the technology and the use and adoption of the standard throughout NIH.
- Fit with existing NIH standards, technologies, and systems – any known interoperability issues a potential standard may have with existing technology standards.
- Flexibility – the breadth of the standard's applicability to multiple NIH stakeholder classes.
- Industrial installed base – the use and adoption of the standard throughout industry in general (both commercial and public enterprises).
- Maintainability/supportability – the effort and specialized skill sets required to support a technology standard.
- Product Life cycle – evaluates the expected time the product will be in use and supported by the vendor and the ability to maintain currency of its functionality and operation. A longer life cycle is desirable from a training and hardware investment perspectives.
- Security – the ability and/or effectiveness and fit of the technology within the NIH security environment.
- Strategic value – the breadth of product capabilities in order to leverage an investment.
- Vendor viability – the health of the product vendor in terms of its stability, projected longevity, and likelihood it will exist in the future to support the product and later versions of the product.

As a result of its analysis, the Collaboration Domain Team developed the following bricks, which are listed alphabetically:

- Desktop Web Conferencing
- Instant Messaging Client
- Instant Messaging Server
- Resource Scheduling
- Shared Virtual Workspace

3.2 Brick 1: Desktop Web Conferencing

Desktop Web Conferencing is defined as applications that enable Internet-based synchronous, real-time meetings with participants in multiple, geographically distributed locations using audio and video input devices such as desktop cameras and speaker phones. Desktop Web Conferencing allows meeting participants to view and hear each other, access shared content, share applications and screens with remote control, markup documents, perform electronic white-boarding, and present slide-shows.

Additional functions may include surveys, integration with shared virtual workspace, and presence management. These applications may be hosted internally by NIH or by an external service provider.

Desktop Web Conferencing typically provides synchronous, real-time functions such as:

- Audio/video interaction between users who are participating in an online meeting. Audio can be supported by a separate voice conference call connection or through using VoIP. Video interaction is enabled when the users have desktop digital cameras. Without a digital camera, a user can see other participants, but cannot be seen by others.
- Application sharing allows users to share visibility or control of an application with other users so they can see or interact with an application. This function is useful when one user needs support in using application functionality, or when multiple users want to whiteboard or show content without shipping large files around the network.
- Instant Messaging (IM) allows meeting participants to initiate text-based chat with other meeting participants.
- Presence management allows meeting participants to see who else is attending the meeting.
- Surveys can be initiated by the meeting administrator to poll the participants' opinion or test the participants' understanding of a topic that has been presented. Surveys can facilitate consensus or help document demographic opinions.[6]

Given the likelihood that collaborative benefits will increase as collaboration capabilities become more integrated, and in order to simplify security administration, the domain team recommends that internal services be used as the preferred mode. As of this report's publication date, the internal service is more cost-effective than most external services. Although some external desktop video conferencing services, such as those supported by external IM providers may be free, security concerns may make those services generally unacceptable for NIH business usage, depending on the content and purpose of the meeting.

Note that conference room-based Video Teleconferences (VTC) utilize different technologies and, as such, were not analyzed by the Collaboration Domain Team. VTC technologies will be addressed in the network domain.

[6] Note that surveying the external community may require OMB clearance.

Table 2. Desktop Web Conferencing Brick

Baseline Environment (Today)	Tactical Deployment (0-2 years)	Strategic (2-5 year)
■ Centra 7 eMeeting ■ Macromedia Breeze 4.1/5.0 ■ Microsoft LiveMeeting – externally hosted service ■ Microsoft NetMeeting – externally hosted service ■ WebEx Meeting Center – externally hosted service	■ Macromedia Breeze 5.1+ ■ Microsoft LiveMeeting (for externally hosted service) ■ WebEx Meeting Center (for externally hosted service)	■ Macromedia Breeze future versions
Retirement (Technology to eliminate)	**Containment (No new deployments)**	**Emerging (Technology to track)**
■ Macromedia Breeze 4.1/5.0 ■ Microsoft NetMeeting – externally hosted service	■ Centra 7 eMeeting	■ IBM Workplace Collaboration Services ■ Integrated Microsoft LiveMeeting as an enterprise service ■ Microsoft Live Communication Server ■ WebEx Meeting Center as product offering
Comments		
■ CIT offers Macromedia Breeze as an internal service. ■ Consider internally hosted solutions or secure external service providers for security purposes and to protect sensitive data.		

3.3 Brick 2: Instant Messaging Client

The Instant Messaging Client is the user's desktop-resident software that enables users to send short, text-based messages or files to other users. IM also provides presence management to show who is online and any optional status messages posted by users. These applications allow a user to start a chat session, record the chat interchange, and invite participants to a chat room.

Note that this brick applies to standalone IM services and that this function is often available in other applications, such as Desktop Web Conferencing and Shared Virtual Workspace.

Table 3. Instant Messaging Client Brick

Baseline Environment (Today)	Tactical Deployment (0-2 years)	Strategic (2-5 year)
■ AOL Instant Messenger Client ■ Apple iChat ■ GAIM ■ Google Talk Client ■ IBM Lotus Sametime Connect Client ■ Jabber/Jive Client ■ Microsoft MSN Messenger Client ■ Nextalk 4.0 ■ Trillian ■ Yahoo! Instant Messenger Client	■ AOL Instant Messenger Client ■ Apple iChat ■ Jabber/Jive Client ■ Microsoft MSN Messenger Client ■ Yahoo! Instant Messenger Client	■ Microsoft Office Communicator
Retirement (Technology to eliminate)	**Containment (No new deployments)**	**Emerging (Technology to track)**
	■ GAIM ■ Google Talk Client ■ IBM Lotus Sametime Connect Client ■ Nextalk 4.0 ■ Trillian	■ Google Talk Client *future versions* ■ IBM Workplace Collaboration Service IM Client
Comments		
■ Users must implement the client software that matches the IM service they wish to use. For example: ❑ AOL Instant Messenger (AIM) client talks to the AIM Server ❑ Apple iChat client allows Macintosh users to talk to an AIM Server or a Jabber server ❑ Microsoft Office Communicator client talks to the Microsoft Live Communications Server ❑ Jabber is the best-known example of an XMPP-based IM service. Jive is an open source IM client that talks to the Jabber server. ■ There are two IM protocols: SIP/SIMPLE and XMPP. Although both protocols are allowed and will continue to exist in the NIH environment, SIP/SIMPLE is expected to take precedence over XMPP in the marketplace in the long-term. ■ Note that Tactical choices include only those protocols that are supported by the NIH IM gateway, and therefore do not include clients that are "reverse engineered".		

3.4 Brick 3: Instant Messaging Server

The Instant Messaging Server is the application software that enables users to send short, text-based messages or files to other users. The server software receives presence management status from the client software and shows other users who are online and any optional status messages posted by users. These applications allow a user to start a chat session, record the chat interchange, and invite participants to a chat room.

Note that this brick applies to standalone IM services and that this function is often available in other applications, such as Desktop Web Conferencing and Shared Virtual Workspace.

Table 4. Instant Messaging Server Brick

Baseline Environment (Today)	Tactical Deployment (0-2 years)	Strategic (2-5 year)
Internal Services: ■ IBM Lotus Sametime ■ Jabber/Jive Server External Services: ■ AOL Instant Messenger ■ Google Talk ■ Microsoft MSN Messenger ■ Nextalk 4.0 ■ Yahoo! Instant Messenger	■ AOL Instant Messenger ■ Jabber/Jive Server ■ Microsoft MSN Messenger ■ Yahoo! Instant Messenger	■ Microsoft Live Communications Server
Retirement (Technology to eliminate)	**Containment (No new deployments)**	**Emerging (Technology to track)**
	■ Google Talk ■ IBM Lotus Sametime ■ Nextalk 4.0	■ Future integration between Jabber Extensible Communications Platform (Jabber XCP) and Macromedia Breeze ■ IBM Workplace Collaboration Services ■ Unified Messaging and Unified Communications
Comments		
■ External services include those IM servers that are hosted outside of NIH. These servers will provide IM capabilities between NIH and non-NIH users. Internal services are hosted within the NIH environment and will allow IM between NIH users who have the appropriate client software loaded, activated and registered with the NIH IM Gateway. ■ Implementation of Microsoft Live Communications server should allow for integration with Active Directory that provides a more end-to-end enterprise solution. ■ Unified Messaging makes available voice mail, fax and email messages through a single user interface. ■ Unified Communications is an emerging technology that will bring together varied communications technologies, including unified messaging, into a coherent architecture. At its broadest level, unified communications supports user interaction with any content transmitted through any network to any device, any place, any time, via any media.		

3.5 Brick 4: Resource Scheduling

Resource Scheduling is a utility or feature that facilitates commitment of any resource(s) (person, room, office, subjects, equipment, etc.) for either a single time period or a series of times. These products may provide interfaces to project management, email calendaring, workflow, inventory management and other applications. NIH currently uses Microsoft Exchange Scheduling to meet most general-purpose scheduling needs. This brick addresses the more complex business requirements that necessitate invoking business logic or an interface to other functions to manage the scheduling of a resource.

Table 5. Resource Scheduling Brick

Baseline Environment (Today)	Tactical Deployment (0-2 years)	Strategic (2-5 year)
■ Brown Bear Software Calcium ■ Custom: Calendar of Events ■ Custom: Planned Event Meeting Applications ■ Custom: Custom extensions to Outlook & Web App ■ EMC Documentum eRoom ■ Microsoft Exchange/Outlook ■ Mozilla Calendar ■ netSimplicity Meeting Room Manager ■ Plumtree Collaboration Server ■ Schedule Source	■ Microsoft Exchange ■ netSimplicity Meeting Room Manager ■ Plumtree Collaboration Server ■ Portal Insight Asset Manager Portlet suite ■ Schedule Source	■ Microsoft Exchange
Retirement (Technology to eliminate)	**Containment (No new deployments)**	**Emerging (Technology to track)**
	■ Brown Bear Software Calcium ■ Custom: Calendar of Events ■ Custom: Custom extensions to Outlook & Web App ■ Custom: Planned Event Meeting Applications ■ EMC Documentum eRoom ■ Mozilla Calendar	■ Agenda/X ■ IBM Collaboration Services ■ Microsoft Exchange *future versions* ■ Portlet technology
Comments		
■ Microsoft Exchange may not be able to meet complex resource scheduling needs that require interfaces to other systems, in which case Tactical and Strategic products should be considered. This functionality will probably require extensive application development effort to implement. ■ Plumtree Collaboration Server provides some scheduling functionality. However, other products may be a better match for pure scheduling, therefore it is listed here as a tactical choice to accommodate some scheduling functions as part of a larger solution. ■ Note that some scheduling functions are also accommodated in the Shared Virtual Workspace Brick. ■ Portlet technology includes gadgets, web-parts and other vendor-specific terms.		

3.6 Brick 5: Shared Virtual Workspace

Shared virtual workspaces are team-oriented collaboration tools that provide services for sharing files and supporting asynchronous and real-time collaboration activities and commentary. These applications include support for content creation, approval, and sharing; discussion boards; and offline and/or real-time interaction. Some of these applications also enable presence management, instant messaging, task management, charting and surveys.

Shared Virtual Workspace typically provides the following functions which are often delivered in an asynchronous manner so that users can access these functions any time over an extended period:

- File and document sharing allows users to place documents and files in a common area where they can be accessed by other team members.
- Check-in and check-out allows users to manage access so that they don't have to reconcile concurrent changes.
- Versioning and archiving provide a version control mechanism for tracking updates to files so that the team can revert to or refer to a previous version.
- Discussion forums or threaded discussions provide the ability for a user to introduce a discussion topic for others' comments. Comments are displayed in such a way that a reader can quickly determine who was responding to which topic or sub-topic.

The shared virtual workspace services are typically asynchronous applications that allow users to access and update content whenever it's convenient for them. Through additional integration, IM and presence management can also be accessed through the shared virtual workspace server as provided by a web conferencing service or a standalone IM service.

This area of collaborative technology is still immature in the marketplace with several emerging areas of functionality. The products listed as tactical do not all have equivalent functionality but each offers a slightly different approach which may make it a good choice for a particular need.

Table 6. Shared Virtual Workspace Brick

Baseline Environment (Today)	Tactical Deployment (0-2 years)	Strategic (2-5 year)
■ EMC Documentum eRoom ■ IBM Lotus Quickplace ■ Microsoft Groove Virtual Office ■ Microsoft SharePoint Services ■ Plumtree Collaboration Server ■ Sitescape Enterprise Forum 7.2 ■ WebCrossing ■ Wiki (e.g. JSPWiki, Twiki and Wikipedia) ■ Zope Plone 2.0.5	■ Microsoft SharePoint Services ■ Plumtree Collaboration Server ■ Wiki (JSPWiki; Twiki; Wikipedia) ■ Zope Plone	■ Microsoft SharePoint Services ■ Plumtree Collaboration Server
Retirement (Technology to eliminate)	**Containment (No new deployments)**	**Emerging (Technology to track)**
	■ EMC Documentum eRoom ■ IBM Lotus Quickplace ■ Microsoft Groove Virtual Office ■ Sitescape Enterprise Forum 7.2 ■ WebCrossing	■ Externally hosted services ■ IBM Workplace Collaboration Services
Comments		
■ MS Exchange and shared drives can provide entry-level team workspace functionality; however, NIH's target architecture is seeking to leverage the improved functionality, user interface, and additional features offered by mature and structured virtual workspace solutions such as those in the Tactical Deployment and Strategic categories of this brick. ■ Wikis are an appropriate fit for developing web-based reference knowledge bases; however, do not enable real-time collaboration as well as other technologies listed in Tactical do. ■ SharePoint Services and Plumtree Collaboration Server may both be accessed by the Plumtree portal front-end which will provide session management and integrate with the NIH login facility. ■ These products do not currently support real-time interaction (application sharing and chatting) so users may elect to use standalone IM services or desktop web conferencing capabilities (see related bricks). ■ Tactical products include two open source options: Zope Plone and Wiki. Note that these products may involve introducing new tools, programming languages and/or technologies that have cost implications.		

4.0 Gap Analysis

The Collaboration Domain Team identified the following as gaps that need to be considered and addressed when implementing NIH web conferencing and resource scheduling solutions:

- External user authentication and authorization is needed to ensure external users can collaborate with NIH employees. This is critical for implementing the virtual grants review process.
- A simple and consistent way to manage users, their identities and their access rights is also required to enable easier collaboration.
- NIH leaders and managers need an increased awareness of their responsibilities for implementing people and process improvements in order to take advantage of the benefits of collaborative technologies.
- Administrative training and support needs to be provided so that NIH users can quickly and efficiently set-up and manage virtual meetings and workspaces.
- Communications and organizational change management techniques need to be launched to educate NIH on the culture of virtual collaboration. Group dynamics for virtual meetings differ substantially from live, face-to-face meetings. Also, management and co-workers need to be made comfortable with managing remote employees and collaborating with remote colleagues respectively.

4.1 Recommendations

The Collaboration Domain Team formulated the following recommendations for NIH mission and IT leadership to consider as the NIH expands its web conferencing and resource scheduling capabilities and services moving forward:

- Because collaboration is an emerging and dynamic area of the marketplace, NIH should continue to focus on monitoring the state-of-the-market and leading practices for leveraging these technologies.
  - For example, more research and integration work is needed to more fully integrate the strategic products in the NIH environment.
  - Collaborative meeting protocols are being developed and should be publicized so that users can manage the behavioral changes inherent in virtual collaboration.
- Domain team members should actively communicate the learnings of this effort to help educate co-workers and management on how to leverage these new collaborative technologies.
- The NIH CIT should investigate providing centralized collaboration services and additional training for collaborative technologies.
- External user authentication and authorization capabilities should be expedited.

Change History / Document Revisions

Date	Change Author	Change Authority	Change Event	Resulting Version
25 Jan. 2006	Rich McKay	Helen Schmitz	Original Production	1.0

Appendix A—Glossary of Terms

Appendix A—Glossary of Terms

Term	Definition
API (Application Programming Interface)	A set of calling conventions that defines how a service is invoked through software. An API enables programs written by users or third parties to communicate with certain vendor-supplied software.
Brick	The physical building blocks of the architecture, representing the building blocks of the architecture -- both hardware and software. They describe both the baseline and target technologies for the components identified in design patterns. Bricks document the architecture's physical technology.
BI – Business Intelligence	An interactive process for exploring and analyzing structured, domain-specific information (often stored in data warehouses) to discern business trends or patterns, thereby deriving insights and drawing conclusions. The business intelligence process includes communicating findings and effecting change. Domains include customers, suppliers, products, services and competitors.
CIT	Center for Information Technology that provides IT support to the 27 NIH ICs.
Client	A system or a program that requests the activity of one or more other systems or programs, called servers, to accomplish specific tasks. In a client/server environment, the workstation is usually the client.
Collaboration	To work with others on a non-routine cognitive task.
Desktop Web Conferencing	Applications that enable internet-based synchronous, real-time meetings with participants in multiple, geographically distributed locations using audio and video input devices such as desktop cameras and speaker phone through desktop computers. Functionality includes audio/video interaction, application sharing, Instant Messaging, presence management, and surveys.
Digital Signature	Applications that allow the identification and storage of digital signatures along with the ability of that system to validate the signature against a centrally housed database.
Document Management	Software systems that allow enterprises to generate, produce, store, manage, retrieve and distribute electronic files (e.g. text, image, audio, video) yielding greater efficiencies in the ability to reuse information and to establish workflow constructs.
Email	Any communication service that permits the electronic transmission and storage of text messages and attached or enclosed files. Some email systems are limited to communication between end users on the same network; others have gateways that allow end users to send messages to other designated computer systems or worldwide over the Internet. Once sent, email messages are stored in electronic mailboxes until the recipient retrieves them. Most Internet service providers also provide email services.
Enterprise Portal	Internet technologies that provide windows into enterprise information, applications and processes. Enterprise portals go by many names, including corporate portals, business portals and enterprise information portals. There are two types: horizontal enterprise portals (HEPs) and vertical enterprise portals (VEPs).
Enterprise Reporting Tool	A tool that allows organizations, including federal agencies, to gain a better understanding of their business by putting critical information in the hands of all those who need it – employees, managers, partners, and customers. An enterprise reporting tool must be configurable to meet the needs of its user base, capable of accessing information assets in the enterprise based on access rights, and must support wide-scale deployment.
File Server	A computer containing files available to all users connected to a local-area network (LAN). In some LANs, a PC is designated as the file server, while in

Term	Definition
	others it is a larger computer with a high storage capacity and specialized software. Some file servers offer additional resources, such as gateways and protocol conversion.
HTML (Hypertext Markup Language)	The set of markup symbols or codes inserted in a file intended for display on a World Wide Web browser page.
IC	One of the 27 Institutes and Centers that comprise NIH.
iCal	Internet calendar specification which standardizes the exchange of calendar information for meetings and appointments; allows for the import of published calendar information from the Internet to personal calendar and vice-versa.
IM – Instant Messaging	A communication service in which short messages appear in pop-up screens as soon as they are received, thereby commanding the recipient's immediate attention.
MAPI – Message Application Programming Interface	The Microsoft-developed programming interface specification that enables an application to send and receive mail over an e-mail messaging system, such as Microsoft Exchange. It was designed to separate the mail engine from the mail client.
Open Source	Describes software that comes with permission to use, copy and distribute it, either as is or with modifications, and that may be offered either free or with a charge. The source code must be made available.
Pattern	A collection of logical or physical components arranged in a specific configuration. Patterns provide design guidance to implementation teams and can occur in any of the architectural areas, and may sometimes cross-areas.
PKI – Public Key Infrastructure	Enables users of a basically unsecured public network such as the Internet to securely and privately exchange data and money through the use of a public and a private cryptographic key pair that is obtained and shared through a trusted authority.
Screen Sharing	A feature of data-conferencing and other real-time collaboration technologies that enable multiple users to view the same document or computer screen simultaneously. Unlike application sharing, screen sharing allows only one user, rather than multiple users, to control the screen or document.
Search Engine	A "robot" or "crawler" that goes to every page or representative pages on a Web site, or the whole Web, and creates an index; or, a program that receives a search request, compares it to the entries in the index, and returns results to the end user.
Server	A system or a program that receives requests from one or more client systems or programs to perform activities that allow the client to accomplish certain tasks. The term usually denotes computers that provide specific services to other computers on a network. Routing servers connect subnetworks of like architecture; gateway servers connect networks of different architectures by performing protocol conversions; and terminal, print and file servers provide interfaces between peripheral devices and systems on the network.
SES – Smart Enterprise Suite	Combines the functionality of portal, collaborative and content management technologies, and delivers these in an integrated suite.
Shared Virtual Workspace	Team-oriented collaboration tools that provide services for sharing files and supporting asynchronous and real-time collaboration activities and commentary. Through additional integration, IM and presence management can also be accessed through the shared virtual workspace server as provided by a web conferencing service or a standalone IM service.
SIMPLE – SIP for Instant Messaging and Presence Leveraging Extensions	SIMPLE is the IETF working group's attempt to address the interoperability of IM systems. SIMPLE defines how different IM systems will exchange presence information and IM traffic.

Term	Definition
SIP (Session Initiation Protocol)	A protocol used to initiate interactive communication sessions of various types — including voice, video, chat, interactive games and virtual reality — between Internet users. A proposed standard of the Internet Engineering Task Force (IETF), the protocol is administered under the IETF's SIP Working Group.
SOA – Service Oriented Architecture	An application topology in which the business logic of the application is organized in modules (services) with clear identity, purpose and programmatic-access interfaces. Services behave as "black boxes": Their internal design is independent of the nature and purpose of the requestor. In SOA, data and business logic are encapsulated in modular business components with documented interfaces. This clarifies design and facilitates incremental development and future extensions. An SOA application can also be integrated with heterogeneous, external legacy and purchased applications more easily than a monolithic, non-SOA application can.
UM – Unified Messaging	The convergence of a variety of communications media (e.g., email, fax and voice) into a single queue of messages, providing senders and recipients the freedom to choose media and access devices.
Unified Communication	Unified communications solutions enhance the effectiveness of individuals, groups and company communications between channels and with business applications. It does this by providing tools to manage and control communication channels, and by integrating communications with business applications, processes and workflows. Solutions may be offered as part of a single platform or as elements integrated from a broader portfolio.
Web Browser	Programs that "read" hypertext and display it as formatted text and images. Browsers allow users to view the contents of a site and navigate from one site to another.
Web Content Management	A technology that automates the content creation, approval and publication process of any digital items (e.g. video, audio, text, graphic, links to physical resources, etc.), there by providing internal and external web accessibility, management and search functionality based on user roles and access rights.
WebDAV	An integrated document management (IDM) protocol proposed as an extension of Hypertext Transport Protocol (HTTP) 1.1 to provide library services for Web server resources. In a WebDAV IDM implementation, library services are executed on a resource basis rather than through a traditional relational database. This architecture enables shared locking, partial updates and reservations.
Web Conferencing	Software solutions for establishing and environment that enables the execution and management of web-based meetings. It allows geographically distributed meeting attendees to work interactively in both real-time and non-real-time modes.
Weblog	A form of online publishing that uses a daily or frequently updated, log-type format. Personal weblogs (also known as "blogs") have become popular among individuals as a means of sharing their thoughts or creating informal forums for discussion. They typically take the form of a daily record of a person's thoughts, observations or opinions, posted together with links to related sites. Postings to the weblog may be limited to the individual who manages it, or others may be invited to participate. Enterprises may also use personal-publishing formats and technologies to create corporate weblogs, as a means of communicating, sharing knowledge or fostering discussions to further enterprise goals. In this respect, weblogs are a precursor to the trend of personal knowledge management becoming an important part of the enterprise environment.
Web Server	The central location that hosts Web pages or a Web site and enables a remote client (system or program) to access the material held.

Term	Definition
White-boarding	Technology that uses a large, touch-sensitive screen attached to a PC to help convey information during videoconferences and other types of network-enhanced meetings. Words and images drawn on the whiteboard (often using a specially designed, inkless pen) can be shared over a network with remote attendees. Often, the PC's display output can also be viewed on the whiteboard screen, and controlled by touching a pointing device to the menu options and icons.
Wiki	A collection of simple Web tools that can be used to create and edit content in a set of Web pages that is created and organized as desired by participants. Wikis address a subset of shared virtual workspace functionality. Wiki-style collaboration is appropriate in business environments where the final outcome can be modeled as a dynamic Web site that doesn't require strong monitoring and control of the content definition. Some users may find wiki's difficult to use because the editing capabilities are limited and workgroups need to develop their own protocols for entering, versioning and editing content. Wikis are also primarily asynchronous. Some integration work is also required to implement a wiki.
Workflow	Tools that allow the design of specific work processes, support of these processes, and improve these processes with collaborative functionality, including document management, instant messaging, chat, email, white boarding and other tools that facilitate employee coordination and collaboration.
XML – Extensible Markup Language	The set of markup symbols that provide a flexible way to create common information formats and share both the format and the data on the World Wide Web, intranets, and elsewhere.
XMPP – Extensible Messaging and Presence Protocol	XMPP is a standalone protocol for transfer of instant messages, presence and information requests as well as establishing unidirectional sessions.

Appendix B—Requests for Information

Appendix B. 1 — Web Collaboration RFI

This RFI requested two inputs from each responder: (1) a Microsoft (MS) Word™ file describing the qualitative benefits of their proposed solution and an MS Excel™ spreadsheet listing their functional and technical capabilities.

Appendix B.1.1 Qualitative Web Collaboration RFI Text

RFI Title: Web Collaboration RFI
Release Date: 10/07/05
Response Due Date: 10/21/05, 4 PM EST

REQUEST FOR INFORMATION
NATIONAL INSTITUTES OF HEALTH

Issuing Institute or Center: Office of the Chief IT Architect

This Request for Information (RFI) is for information and planning purposes only and shall not be construed as either a solicitation or obligation on the part of the National Institutes of Health (NIH), its Institutes or Centers. The purpose of this RFI is to help the NIH understand the market availability, technical characteristics, and functionality of solutions, tools, or products capable of satisfying the technical, functional, and/or operational characteristics described in this RFI. NIH will use this market research information in its evaluation of potential technical standards to be included in its enterprise technical architecture.

NIH welcomes comments from all interested parties on each or all of the questions contained in this RFI. NIH does not intend to award a contract on the basis of responses nor otherwise pay for the preparation of any information submitted or NIH's use of such information. Acknowledgment of receipt of responses will not be made, nor will respondents be notified of the NIH's evaluation of the information received.

Description of Objective:

NIH seeks information on available technologies to enable web collaboration (synchronous and asynchronous). This includes web conferencing, shared workspace and instant messaging capabilities. The NIH is interested in understanding market capabilities around both integrated solutions (i.e. that provide all of the capabilities identified above in a single offering) as well as those that provide a standalone capability.

Description of Environment:

NIH is a highly collaborative environment that requires web-based collaboration both internal to the NIH organization as well as with external partners and non-affiliated parties that may include, but are not limited to: universities, doctors, researchers, research subjects, and advocacy groups. Authentication and authorization capabilities and integration must be provided to accommodate diverse security and confidentiality requirements. Both highly structured and ad hoc types of collaboration must be enabled

by these technologies synchronously and asynchronously. Because the NIH collaborates with many external parties, the client platforms that must be supported by the recommended products are unknown and diverse.

Description of Evaluation Criteria:

For the purpose of this RFI, the NIH defines the scope of this technical domain as web collaboration as enabled by web conferencing, shared workspace and instant messaging capabilities. The information gathered through this market research, combined with information gathered through other research and analysis methodologies, will provide the NIH with important decision support information in its evaluation. NIH will base the selection of its technical standards on the following evaluation criteria:

- Availability – Evaluates the availability, failover and performance of the collaboration technology as it relates to server uptime, client uptime and network uptime.
- Cost – estimated total cost of ownership (based on market research statistics and independent research opinions).
- Existing NIH installed base – NIH experience with the technology and the use and adoption of the standard throughout NIH.
- Fit with existing NIH standards, technologies, and systems[7] – any known interoperability issues a potential standard may have with existing technology standards.
- Flexibility – the breadth of the standard's applicability to multiple NIH stakeholder classes.
- Industrial installed base – the use and adoption of the standard throughout industry in general (both commercial and public enterprises).
- Maintainability/supportability – the effort and specialized skill sets required to support a technology standard.
- Product Life cycle – evaluates the expected time the product will be in use and supported by the vendor and the ability to maintain currency of its functionality and operation. A longer life cycle is desirable from a training and hardware investment perspectives.
- Security – the ability and/or effectiveness and fit of the technology within the NIH security environment.
- Strategic value – the breadth of product capabilities in order to leverage an investment.
- Vendor viability[8] – the health of the product vendor in terms of its stability, projected longevity, and likelihood it will exist in the future to support the product and later versions of the product.

It is important to reiterate that this RFI is not intended to gather information needed to address each of the decision criteria above. *Received data will be combined with information gathered through other research and analysis methodologies to support NIH's overall evaluation*.

[7] For information about existing technologies at NIH, please refer to the NIH Enterprise Architecture website at http://enterprisearchitecture.nih.gov

[8] Vendor viability will be determined by its financial health, position in the market place, external research sources, and any market factors that could compromise the vendor's existence.

Request for Information:

To support the NIH's market research, the NIH requests responses to the following questions. Please limit your response to no more than 15 pages (not including illustrations) in Microsoft Word format. Additionally, please complete the Microsoft Excel attachment that accompanies this RFI, and submit both together no later than the due date indicated above (responses to the Excel attachment are to be entered directly into the spreadsheets and submitted in Microsoft Excel format).

General Information

1) Please provide the following:
   - Your organization's name
   - Your organization's website
   - Contact Name
   - Contact Telephone
   - Contact Email address
   - Number of employees in your organization
   - Your organization's current and gross revenue for 2004
   - Are the products you are considering included in the GSA Schedule? Or available on another GWAC such as NITAAC?

Product Information

2) Please identify any product(s) or solution(s) you believe address the requirements for web conferencing, shared workspace, and instant messaging as listed in the Excel spreadsheet (included as attachment). For each product/solution you identify, please provide the following information as available/applicable:
   - Product/solution name
   - Date of product's first production release (v1.0, not beta versions)
   - Current production version
   - Planned product schedule (i.e. future product enhancements, upgrade cycle of the product, Next major release plan)
   - Please discuss its features, functionality, and capabilities
   - Revenue based on product sales
   - Number of customers, by private and public sectors, using the version of the product being considered in this RFI

3) Please discuss how your product(s) or solution(s) satisfy the evaluation criteria described above.

4) Do you currently have any products, solutions, or implementations at the NIH today? If so, to what extent (e.g., which Institutes or Centers? How many?).

5) Please indicate the depth and breadth of this product's (these products') usage throughout industry in general (i.e., private and public sectors)? How many customers (by private and public sectors) are using this product? In what industries? Please provide an overview of current or planned product and service partnerships for this market.

Costs and Fees Structure

6) Pricing and implementation.
   - Provide an overview of the costs and fee structure associated with your solution offerings for a very large-scale federal solution
   - Provide specific solution cost information, including software licensing, annual maintenance, discount schedules (if applicable), implementation and deployment costs. Please provide sample pricing for 100 users, 2,500 users, and 25,000 users; and provide sample hardware requirements for 100, 500 and 1000 concurrent users.
   - Please explain your pricing model(s) (i.e., license-based, unit based, usage, etc.)
   - Provide any training and/or certification program fees
   - Provide any documentation fees and media type

Services

7) Provide an overview of your services for the Web conferencing, shared workspace and instant messaging market.

8) Provide an overview of NIH required resources and effort to meet implementation needs and/or describe your relationship with any 3rd party implementation partners if applicable.

9) Describe your approach to data conversion/integration, specifically on how data is converted and accessed to/from alternative environments (e.g. Network File System (NFS), NT File System (NTFS), other collaboration and document management products) into your solution and how content is accessed, integrated, and retrieved.

10) Describe training methods (e.g., web-based, computer-based training (CBT), in-class, etc.) available with your product for both end users and system administrators.

Technical

11) How does your product(s) or solution(s) address scalability when transaction volumes or number of users increases? What impact, if any, does scalability (increase or decrease) have on cost?

12) Provide an overview of your solution's architecture and technology components. Please describe how this architecture can be distributed to provide better load balancing and availability.

13) How well does your product leverage J2EE infrastructure?

14) Provide an overview of existing integration architecture including third-party products, modules, or Application Programming Interfaces (API).

15) Provide a brief overview of the security features (i.e. authorization and authentication services) of your product.

16) How does your solution comply with government/industry standards and legislative requirements such as Health Insurance Portability and Accountability Act (HIPAA) of 1996 and Privacy Act of 1974?

17) What other applications integrate with your product?

18) Describe the supported server hardware and operating systems for your solution

19) Does your solution require or support any third party relational database management system (RDBMS) or document management system. If so, please describe.

20) Please disclose any known security vulnerabilities inherent in your product(s) and current mitigation plans.

21) How extensible and customizable is your product?

General

22) To what extent are you limited to conduct business under the Buy American Act with the Federal Government?

23) Is your product Section 508 compliant?

NIH welcomes responses from all interested individuals and organizations on each or all of these questions. Responses are due by 4 PM, EST on Friday, October 21. Responses will not be accepted after this time.

Appendix B.1.2 Quantitative Web Collaboration RFI Spreadsheet

Functional Requirements

Category	Functional Requirement	Response
A. Web Conferencing		
Synchronous Communication	Ability to provide capability of conducting real time communication with many users in a many-to-many construct.	
Contacts and Addresses - Store/Access	Ability to access contact information for members, which includes company and team email addresses, telephone numbers, member lists and websites. Explain if this information must be imported into the product or if there is an access mechanism for interfacing with external directories such as AD or LDAP.	
Contacts and Addresses - Interchange	Ability to import and export address related data (i.e. lists of members) easily into common software such as Microsoft Outlook® or Lotus Notes.	
Dual Meeting Moderator	Ability to provide two people to moderate a meeting simultaneously.	
Support Voice	Ability to provide audio capability for meetings online through ATC or other mechanism, please explain.	
Support Voice over IP (VoIP)	Ability to provide audio capability for meetings online.	
Support Use of Web cams	Ability to support the visual presentation capabilities of web cams for online meetings.	
Avatars	Ability for participants to select avatars or alternatively voluntarily post photo of self.	
Simple Meeting Setup	Ability for users to set-up new meeting, assign participants, without requiring system support staff to configure anything.	
Meeting Recording	Ability to record discussions and material of meeting, including video, audio and text.	
Meeting Storage	Ability to store and/or "own" recordings (as opposed to recordings being stored by vendor on their servers).	
Meeting Export	Ability to export meeting material to an external format (e.g. MPEG, AVI or standard office format).	
Recording Access	Ability to provide access to recordings to meeting participants with secured access.	
Slide Shows	Ability to conduct slide shows and play videos through a browser.	
Online Slide Modification	Ability to change slides or video with just a browser.	
Application Sharing	Ability to allow members to select an application on their desktop and make that viewable to other members, possibly including the ability to allow other members to control that shared application.	
On-line Polls / Survey	Ability to allow users to participate in real-time polls and surveys.	
One-to-Many Presentation Broadcast	Ability to support one-to-many broadcasts such as presentations and training sessions.	
Screen Control	Ability to allow participants to pass control of their screen to moderator.	
B. Shared Workspace		
Asynchronous	Ability to provide capability of conducting non-real time communication.	

Communication		
File Sharing	Ability to allow storage of multiple files with directory storage with checkin and checkout.	
Document Version Control	Ability to manage versions of documents, i.e. maintain tracking of new versions, authors of each versions, date/timestamp and rollback to prior versions on command.	
Document Generate/Edit Support	Ability to develop and update documents (e.g. Microsoft Office).	
Common Access	Ability to have access control and authentication.	
On-line Polls / Survey	Ability to provide multiple polls per discussion thread.	
Block Voting	Ability to block some people (conflicts) from voting.	
Poll Results	Ability to view and report poll results after voting.	
Survey Members	Ability to survey people for feedback on discussion.	
Enhanced Polling and Scoring Mechanisms	Ability to have elaborate scoring mechanisms (i.e. various scoring scales, multiple choice, establish weights and measures). Please explain.	
Discussions	Ability to support a discussion forum for solving problems and support the time delayed exchange between team members.	
Discussion Organization	Ability to organize discussions according to various topics.	
Initiate Discussion	Ability for members to start and/or add to discussions and contributions of team members.	
Block Discussion	Ability to block meeting participants from particular discussion threads.	
Moderate discussion	Ability for a moderator to review content from participants prior to posting.	
Edit Discussion	Ability of moderator to edit/delete discussion threads and posts within threads.	
Bulletin Boards	Ability to provide a "What's New" bulletin board mainly for announcements and to attach, remove and change notes and announcements.	
"Cut & Paste" into Discussion Board	Ability to cut material from another file and pasted into the discussion board, without size restriction.	
Greek Characters	Ability to allow for pasting Greek characters and picture images to discussion board.	
Expanded Search	Ability to provide search across selected or all workspaces, including full text search across all workspaces and content types (e.g. discussion, chat).	
Attached document search	Ability to perform to full text search within text in attached documents.	
Import/Export	Ability to import / export calendar, contacts, and task data and batch post them to discussion folders.	
Calendar	Ability to carry calendar functionality showing all team dates, tasks and issues.	
Email Reminder	Ability for calendar to remind members about upcoming dates by email automatically.	
Calendar synchronization	Ability for calendar data to be synchronized into common software such as Microsoft Outlook® or iCalendar.	
Brainstorming and Idea Evaluation	Ability to provide tools to conduct delayed brainstorming and evaluate incoming ideas.	

To-Do Lists	Ability to provide a personal to-do list manager.	
To-Do List Task Tracking	Ability to track tasks by priority, status, and due date.	
Color Coded To-Do List	Ability to color code list by priority or due date.	
Project and task management / action plan	Ability to plan, coordinate, process and monitor team project tasks.	
Workflow	Ability to leverage workflow (for documents and tasks) to support business processes for collaboration.	
C. Instant Messaging		
Restrictable Chat	Ability to set up a restrictable chat room that may not include all participants of the general online meeting.	
Reminders	Ability to create and send "reminders" by instant message, email or both.	
"Cut & Paste" into Chat Room	Ability to cut material from another file and paste into the chat room space, without size restriction.	
Greek Characters	Ability to allow for pasting Greek characters and picture images in chat rooms.	
Block Chat Rooms	Ability to allow moderators to disable/block multiple chats and monitor chats.	
Enterprise Address Book Interface	Ability to interface with company enterprise directory to develop buddy list to categorize users.	
Presence Management	Ability to be able to communicate availability status (i.e. online, busy, be right back, away, etc.) by selecting various options.	
Message Blocking	Ability to block messages from certain individuals and block advertisements.	
User Management of Chat Logs	Ability to have product controls that allow users to govern chat logs.	
System Administration of Chat Logs	Ability to allow system administrators block or allow chat logs.	

Technical Requirements

Number	Technical Category	Explanation
A	**Platform Support and Architecture**	
1	Describe server hardware platforms supported by your product	
2	Describe the web servers supported by your product	
3	Describe the application servers supported by your product.	
4	Describe the database servers supported by your product.	
5	Provide your product's minimum desktop requirements.	
6	Describe the requirements for client platform support. What code, browser plug-ins or cookies must be resident on the client systems.	
7	What browsers does your product support? Please list all secure versions of browsers your product supports.	

8	What tools are provided by the product to perform customized development?	
9	What tools do you support and what process do you recommend to help users migrate customization forward to major new releases of software?	
10	What reporting and visualization tools are supported by the product?	
11	At what rate can data be exchanged from and to the product and at what frequency?	
12	What kind of architecture standards does your product support (i.e. HTTP, XML, SOAP, .NET, J2EE, WebDAV, etc).	
13	Explain how different levels of functionality can be implemented as separate modules and does this improve load balancing and availability (i.e. a failure in one module doesn't bring down other modules).	
14	Is it possible to have distributed instances of your COTS product or is it necessary to have a single instance for complete integration?	
15	What is the impact of extensive customization on the ability to upgrade the product?	
16	Does your product have the capability of supporting .PDF format for Acrobat Reader for viewing and read-only?	
17	How adaptable is the look and feel of the user interface to the business requirement?	
18	Is navigation easy and intuitive with your product?	
19	How well can your product interface meld into an intranet environment?	
20	What federal mandated guidelines and compliance standards does your product adhere to?	
21	With respect to Section 508 compliance, does your product support frame rates and captioning that allow for accommodating interpreters for the deaf or hard of hearing?	
B	**Integration**	
22	Explain product support for web services including JSR168 and WSDL standards for both Java and .NET environments.	
23	What search engines are supported or provided by your product?	
24	Does your product provide out of the box integration with ERP suites (i.e. Oracle, SAP, etc.). If so, which ones?	
25	Does your product provide out of the box integration with portals (i.e. Plumtree, Sharepoint, etc.). If so, which ones?	
26	Does your product provide out of the box integration with other web collaboration tools. If so, which ones?	
27	What integration technologies are supported for those interfaces? How proprietary are those application interfaces?	
28	What debugging APIs, features or tools do you provide (or are available) to assist in integration with existing applications?	
29	What legacy system adapters are provided by your product out of the box?	
30	Which external workflow and web collaboration products can be integrated easily with your recommended solution (e.g. BizFlow, Oracle Workflow, etc.)? Do you support BPEL?	
31	What external rules engines can your product integrate with?	
32	What external project management tools does your product integrate with? How do they work?	

33	Does your product integrate with gateway products (i.e. someone on AIM chatting with someone in a closed Lotus network)?	
34	Does your product allow for import and export of data into Calendaring tools (i.e. Outlook Exchange, etc.)? Please list calendaring tools supported.	
C	**Security**	
35	How does the product authenticate users? What, if any, external single sign-on products are supported for integration with your recommended solution?	
36	What enterprise directory services (e.g. LDAP) does your product support?	
37	Can the product leverage PKI?	
38	What certificates are supported by your product?	
39	Does your product support desktop to desktop encryption capabilities for all collaborative sessions (text, video, audio)? If yes, please describe the encryption capabilities your product supports.	
40	What kind of role-based access controls are included in your product	
41	How are web collaboration access authorizations and permissions managed by your product(s)?	
42	Can security classifications be displayed on documents or when viewing documents?	
43	Does your product currently support IPv6? If not, what are your future plans for support?	
44	What kind of security controls does your product have against viruses? Please describe if you provide this capability internally, or if you integrate with 3rd party virus control products, and if so, which ones..	
45	What triggers and/or safeguards are available within your product to prevent unintentional release to external entities?	
46	Does your product keep an audit log for access and modifications to data?	
47	Does your product have any auditing/archiving capabilities to comply with legislative requirements?	
48	Does your product support firewall traversal or other techniques to enable real-time collaboration (text, video, audio) across enterprise boundaries?	
49	How does your product deal with firewall and Network Address Translation (NAT) issues?	
50	How does your product provide access to external users?	
51	What federal security standards does your product comply with?	
D	**Performance**	
52	What is your product's strategy for minimizing response times when dealing with large files and/or video?	
53	Please describe any failover strategies you recommend for product implementation and describe the availability benefits that implementation would achieve.	
54	Please describe any load balancing strategies you recommend for product implementation and describe the scalability and reliability benefits that implementation would achieve. What are the practical limits of those recommendations?	
55	What kind of backup strategies do you suggest for your product	

56	Are there any practical limitations for the total number of user which can be logged in within a single session	
57	How does your product ensure a high degree of reliability against failure?	
58	What are the quality of service requirements for your product?	
59	What are the minimum bandwidth limits for a single collaborative session?	
60	Are there practical limitations such as the size of document file packets that can affect these collaboration sessions?	
61	How do you ensure 24/7 Availability?	
E	**Additional Technical Requirements**	
62	Describe the steps for a typical product implementation.	
63	What resources and timeframes are typical for your product implementation?	
64	Does the product provide a web-based administration client?	
65	What performance monitoring and configuration management tools are available with the product?	
66	What capabilities are available to end users for self-service (i.e. changing roles and permissions, system passwords, profiles) within the product?	
67	Does the product support remote administration?	
68	What is the level of support included along with the purchase of the product? Is this support available 24/7? Is there a public or private forum of product experts and other users available to provide additional support? If so, please provide the url.	
69	Can each end user adjust his own settings, e.g. language, reports, picture?	
70	Can the administrator of the team control the overall settings, admit new members and integrate new modules?	
71	What kind of support is available during normal business hours?	
72	Is a training module included within the solution? A training module that is a simple application designed to disseminate training information throughout the organization, and to facilitate student registration for offered courses.	
73	Is a help module included in the application? Help module describes all features and can give you advice on any problem you might come across.	
74	Can the help feature be customized and modified so that different groups of users can receive different help screens?	
75	Can the error processing feature be customized and modified so that different groups of users can receive customized error messages (e.g. to initiate some remedial action or to provide additional information about the error)?	
76	Can a meeting moderator have the capability of generating new users and passwords automatically?	
77	Does the solution track access and functionality usage to give administrators feedback as to what features of the software are used most and least. Are these statistics available in table and chart format? Are these statistics exportable to other tools or databases, e.g. csv, Microsoft Access or Microsoft Excel format?	

78	Does your solution or products track and report the navigation paths and activity of participants within the system. For example: - Which team members have accessed which documents? - How much time to they spend reviewing each document? - Which members have read which discussion threads and when?	

Appendix B. 2 — Resource Scheduling RFI

This RFI requested two inputs from each responder: (1) an MS Word™ file describing the qualitative benefits of their proposed solution and an MS Excel™ spreadsheet listing their functional and technical capabilities.

Appendix B.2.1 Qualitative Resource Scheduling RFI Text

RFI Title: Resource Scheduling and Calendaring RFI
Release Date: 10/07/05
Response Due Date: 10/28/05, 4 PM EST, to enterprisearchitecture@mail.nih.gov

REQUEST FOR INFORMATION
NATIONAL INSTITUTES OF HEALTH

Issuing Institute or Center: Office of the Chief IT Architect

This Request for Information (RFI) is for information and planning purposes only and shall not be construed as either a solicitation or obligation on the part of the National Institutes of Health (NIH), its Institutes or Centers. The purpose of this RFI is to help the NIH understand the market availability, technical characteristics, and functionality of solutions, tools, or products capable of satisfying the technical, functional, and/or operational characteristics described in this RFI. NIH will use this market research information in its evaluation of potential technical standards to be included in its enterprise technical architecture.

NIH welcomes comments from all interested parties on each or all of the questions contained in this RFI. NIH does not intend to award a contract on the basis of responses nor otherwise pay for the preparation of any information submitted or NIH's use of such information. Acknowledgment of receipt of responses will not be made, nor will respondents be notified of the NIH's evaluation of the information received.

Description of Objective:

NIH seeks information on available resource scheduling and calendaring solutions for the scheduling and management of resources by stakeholders both internal and external to NIH's organization. Resources that need to be managed may include specialized resources such as scientific lab equipment and consumable lab supplies in addition to standard office meeting resources such as projectors and conference rooms.

Description of Environment:

NIH is a highly collaborative environment that requires teams to assemble and perform research both internal to the NIH organization as well as with external partners and non-affiliated parties that may include, but are not limited to: universities, doctors, researchers, research subjects, and advocacy groups. Authentication and authorization capabilities and integration must be provided to accommodate diverse security and confidentiality requirements.

Description of Evaluation Criteria:

For the purpose of this RFI, the NIH defines the scope of this technical domain as collaboration capabilities required to schedule, reserve and manage resources, which may include specialized scientific equipment and laboratory consumables. The information gathered through this market research, combined with information gathered through other research and analysis methodologies, will provide the NIH with important decision support information in its evaluation. NIH will base the selection of its technical standards on the following evaluation criteria:

- Availability – Evaluates the availability, failover and performance of the collaboration technology as it relates to server uptime, client uptime and network uptime.
- Cost – estimated total cost of ownership (based on market research statistics and independent research opinions).
- Existing NIH installed base – NIH experience with the technology and the use and adoption of the standard throughout NIH.
- Fit with existing NIH standards, technologies, and systems[9] – any known interoperability issues a potential standard may have with existing technology standards.
- Flexibility – the breadth of the standard's applicability to multiple NIH stakeholder classes.
- Industrial installed base – the use and adoption of the standard throughout industry in general (both commercial and public enterprises).
- Maintainability/supportability – the effort and specialized skill sets required to support a technology standard.
- Product Life cycle – evaluates the expected time the product will be in use and supported by the vendor and the ability to maintain currency of its functionality and operation. A longer life cycle is desirable from a training and hardware investment perspectives.
- Security – the ability and/or effectiveness and fit of the technology within the NIH security environment.
- Strategic value – the breadth of product capabilities in order to leverage an investment.
- Vendor viability[10] – the health of the product vendor in terms of its stability, projected longevity, and likelihood it will exist in the future to support the product and later versions of the product.

It is important to reiterate that this RFI is not intended to gather information needed to address each of the decision criteria above*. Received data will be combined with information gathered through other research and analysis methodologies to support NIH's overall evaluation*.

Request for Information:

To support the NIH's market research, the NIH requests responses to the following questions. Please limit your response to no more than 15 pages (not including

[9] For information about existing technologies at NIH, please refer to the NIH Enterprise Architecture website at http://enterprisearchitecture.nih.gov

[10] Vendor viability will be determined by its financial health, position in the market place, external research sources, and any market factors that could compromise the vendor's existence.

illustrations) in Microsoft Word format, and send to enterprisearchitecture@mail.nih.gov. Additionally, please complete the Microsoft Excel attachment that accompanies this RFI, and submit both together no later than the due date indicated above (responses to the Excel attachment are to be entered directly into the spreadsheets and submitted in Microsoft Excel format).

General Information

1) Please provide the following:
   - Your organization's name
   - Your organization's website
   - Contact Name
   - Contact Telephone
   - Contact Email address
   - Number of employees in your organization
   - Your organization's current and gross revenue for 2004
   - Are the products you are considering included in the GSA Schedule? Or available on another GWAC such as NITAAC?

Product Information

2) Please identify any product(s) or solution(s) you believe address the requirements for resource scheduling and calendaring as listed in the Excel spreadsheet (included as attachment). For each product/solution you identify, please provide the following information as available/applicable:
   - Product/solution name
   - Date of product's first production release (v1.0, not beta versions)
   - Current production version
   - Planned product schedule (i.e. future product enhancements, upgrade cycle of the product, Next major release plan)
   - Please discuss its features, functionality, and capabilities
   - Revenue based on product sales
   - Number of customers, by private and public sectors, using the version of the product being considered in this RFI

3) Please discuss how your product(s) or solution(s) satisfy the evaluation criteria described above.

4) Do you currently have any products, solutions, or implementations at the NIH today? If so, to what extent (e.g., which Institutes or Centers? How many?).

5) Please indicate the depth and breadth of this product's (these products') usage throughout industry in general (i.e., private and public sectors)? How many customers (by private and public sectors) are using this product? In what industries? Please provide an overview of current or planned product and service partnerships for this market.

Costs and Fees Structure

6) Pricing and implementation.
   - Provide an overview of the costs and fee structure associated with your solution offerings for a very large-scale federal solution

- Provide specific solution cost information, including software licensing, annual maintenance, discount schedules (if applicable), implementation and deployment costs. Please provide sample pricing for 100 users, 2,500 users, and 25,000 users; and provide sample hardware requirements for 100, 500 and 1000 concurrent users.
- Please explain your pricing model(s) (i.e., license-based, unit based, usage, etc.)
- Provide any training and/or certification program fees
- Provide any documentation fees and media type

Services

7) Provide an overview of your services for the resource scheduling and calendaring market.

8) Provide an overview of NIH required resources and effort to meet implementation needs and/or describe your relationship with any 3rd party implementation partners if applicable.

9) Describe your approach to data conversion/integration, specifically on how data is converted and accessed to/from alternative environments (e.g. email, portals, databases, team workspaces and other collaboration products) into your solution and how information is accessed, integrated, and retrieved.

10) Describe training methods (e.g., web-based, computer-based training (CBT), in-class, etc.) available with your product for both end users and system administrators.

Technical

11) How does your product(s) or solution(s) address scalability when transaction volumes or number of users increases? What impact, if any, does scalability (increase or decrease) have on cost?

12) Provide an overview of your solution's architecture and technology components. Please describe how this architecture can be distributed to provide better load balancing and availability.

13) How well does your product leverage J2EE infrastructure?

14) Provide an overview of existing integration architecture including third-party products, modules, or Application Programming Interfaces (API).

15) Provide a brief overview of the security features (i.e. authorization and authentication services) of your product.

16) How does your solution comply with government/industry standards and legislative requirements such as Health Insurance Portability and Accountability Act (HIPAA) of 1996 and Privacy Act of 1974?

17) What other applications integrate with your product?

18) Describe the supported server hardware and operating systems for your solution

19) Does your solution require or support any third party relational database management system (RDBMS) or document management system. If so, please describe.

20) Please disclose any known security vulnerabilities inherent in your product(s) and current mitigation plans.

21) How extensible and customizable is your product?

General

22) To what extent are you limited to conduct business under the Buy American Act with the Federal Government?

23) Is your product Section 508 compliant?

NIH welcomes responses from all interested individuals and organizations on each or all of these questions. Responses are due to enterprisearchitecture@mail.nih.gov by 4 PM, EST on Friday, October 28. Responses will not be accepted after this time.

Appendix B.2.2 Quantitative Resource Scheduling RFI Spreadsheet

Functional Requirements

Category	Functional Requirement	Response
Availability Look-up / Search	Ability to check and search availability of any user, conference/laboratory room or laboratory instrument.	
Meeting/Experiment Event Scheduling	Ability to schedule resources such as laboratories, and laboratory instrument.	
Event Invite	Ability to create and distribute invitations for meetings and events real-time (i.e. meeting is requested and the attendees are notified immediately via email).	
Interface with workflow and inventory management applications	Ability to schedule and check status of laboratory animals, for instance, through interface with inventory asset management and workflow system.	
Outlook Synchronization	Ability to synchronize resource/scheduling application with Microsoft Outlook.	
External Access	Ability to send meeting invitations to people and calendars outside of NIH via a secure web browser.	
Resource Utilization	Ability to track frequency of use of resources, such as conference rooms and/or scientific equipment.	
Recurring events	Ability to schedule customized recurring meetings (i.e. daily, weekly, bi-weekly, monthly, etc.).	
Share Availability	Ability to share free and busy time with others.	
Calendar Archive	Ability to archive historical calendar data.	
Calendar Sort	Ability to sort various view of calendars (by person, object, day, etc.).	
Calendar Minutes Archive	Ability to store calendar event minutes and logs by event date	
Calendar Import	Ability to import Calendar data from Exchange/Lotus Notes and open standard, iCalendar	

Technical Requirements

Number	Technical Category	Explanation
A	**Platform Support and Architecture**	
1	Describe server hardware platforms supported by your product	
2	Describe the web servers supported by your product	
3	Describe the application servers supported by your product.	
4	Describe the database servers supported by your product.	
5	Provide your product's minimum desktop requirements.	

6	Describe the requirements for client platform support. What code, browser plug-ins or cookies must be resident on the client systems.	
7	What browsers does your product support? Please list all secure versions of browsers your product supports.	
8	What tools are provided by the product to perform customized development?	
9	What tools do you support and what process do you recommend to help users migrate customization forward to major new releases of software?	
10	What reporting and visualization tools are supported by the product?	
11	At what rate can data be exchanged from and to the product and at what frequency?	
12	What kind of architecture standards does your product support (i.e. HTTP, XML, SOAP, .NET, J2EE, WebDAV, etc).	
13	Explain how different levels of functionality can be implemented as separate modules and does this improve load balancing and availability (i.e. a failure in one module doesn't bring down other modules).	
14	Is it possible to have distributed instances of your COTS product or is it necessary to have a single instance for complete integration?	
15	What is the impact of extensive customization on the ability to upgrade the product?	
16	Does your product have the capability of supporting .PDF format for Acrobat Reader for viewing and read-only?	
17	How adaptable is the look and feel of the user interface to the business requirement?	
18	Is navigation easy and intuitive with your product?	
19	How well can your product interface meld into an intranet environment?	
20	What federal mandated guidelines and compliance standards does your product adhere to?	
21	With respect to Section 508 compliance, does your product support frame rates and captioning that allow for accommodating interpreters for the deaf or hard of hearing?	
B	**Integration**	
22	Explain product support for web services including JSR168 and WSDL standards for both Java and .NET environments.	
23	What search engines are supported or provided by your product?	
24	Does your product provide out of the box integration with ERP suites (i.e. Oracle, SAP, etc.). If so, which ones?	
25	Does your product provide out of the box integration with portals (i.e. Plumtree, Sharepoint, etc.). If so, which ones?	
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30	Which external workflow and web collaboration products can be integrated easily with your recommended solution (e.g. BizFlow, Oracle Workflow, etc.)? Do you support BPEL?	
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33	Does your product integrate with gateway products (i.e. someone on AIM chatting with someone in a closed Lotus network)?	
34	Does your product allow for import and export of data into Calendaring tools (i.e. Outlook Exchange, etc.)? Please list calendaring tools supported.	
C	**Security**	
35	How does the product authenticate users? What, if any, external single sign-on products are supported for integration with your recommended solution?	
36	What enterprise directory services (e.g. LDAP) does your product support?	
37	Can the product leverage PKI?	
38	What certificates are supported by your product?	
39	Does your product support desktop to desktop encryption capabilities for all collaborative sessions (text, video, audio)? If yes, please describe the encryption capabilities your product supports.	
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41	How are web collaboration access authorizations and permissions managed by your product(s)?	
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43	Does your product currently support IPv6? If not, what are your future plans for support?	
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50	How does your product provide access to external users?	
51	What federal security standards does your product comply with?	
D	**Performance**	
52	What is your product's strategy for minimizing response times when dealing with large files and/or video?	
53	Please describe any failover strategies you recommend for product implementation and describe the availability benefits that implementation would achieve.	
54	Please describe any load balancing strategies you recommend for product implementation and describe the scalability and reliability benefits that implementation would achieve. What are the practical limits of those recommendations?	
55	What kind of backup strategies do you suggest for your product	

56	Are there any practical limitations for the total number of user which can be logged in within a single session	
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58	What are the quality of service requirements for your product?	
59	What are the minimum bandwidth limits for a single collaborative session?	
60	Are there practical limitations such as the size of document file packets that can affect these collaboration sessions?	
61	How do you ensure 24/7 Availability?	
E	**Additional Technical Requirements**	
62	Describe the steps for a typical product implementation.	
63	What resources and timeframes are typical for your product implementation?	
64	Does the product provide a web-based administration client?	
65	What performance monitoring and configuration management tools are available with the product?	
66	What capabilities are available to end users for self-service (i.e. changing roles and permissions, system passwords, profiles) within the product?	
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75	Can the error processing feature be customized and modified so that different groups of users can receive customized error messages (e.g. to initiate some remedial action or to provide additional information about the error)?	

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