3

Groupware Functions and Applications

Groupware is software for teamwork. Groupware works because it aids communication in a company and helps staff work together on joint tasks. It also equips them with the information needed to complete their work and can help decision making. Groupware has grown to cover a vast range of potential applications. This growth has occurred with the availability of lower cost networks such as intranets within and between businesses providing the infrastructure for improved communication.

Groupware assists teams of people to work together because it provides key group functions; the "three Cs" of communication, collaboration and coordination:

- **Communication** is the core groupware feature which allows information to be shared or sent to others using electronic mail. Groupware for conferencing is sometimes known as *computer mediated communication* (CMC) software.
- **Collaboration** is the act of joint co-operation in solving a business problem, or undertaking a task. Groupware may reduce some of the problems of traditional meetings such as: finding a place and a time to meet, a lack of available information or even dominance by one forceful individual in a meeting. Groupware improves the efficiency of decision making and its effectiveness by encouraging contributions from all group members.
- **Coordination** is the act of making sure that a team is working effectively and meeting its goals. This includes distributing tasks to team members, reviewing their performance or perhaps steering an electronic meeting.

So groupware helps communication, collaboration and coordination within a business, but which specific functions can it be used for? The key groupware functions of Table 3.1 are usually present in groupware applications to help teams collaborate. Functions 1 through 6 are considered in this chapter. Functions 7 and 8 are considered in Chapter 4.

Table 3.1 *Main groupware functions*

Groupware function	*Application*	*Notes*
1. E-mail and messaging	E-mail, electronic forms processing	Original groupware function
2. Document management and information sharing	Improved information dissemination	Main use of company intranets currently
3. Collaborative authoring	Team development of documents	Annotation, revision marking and version control are key
4. Conferencing	Text conferencing, video-conferencing, whiteboarding	Relates to electronic meeting support functions
5. Time management	Calendar and group scheduling	
6. Groupware management and decision support	Remote and distributed access facilities including replication and access control	Functions used for managing other functions. Covered in Chapter 8
7. Ad hoc workflow	Loosely coupled collaboration	Covered in Chapter 4
8. Structured workflow	Structured management of tasks	Covered in Chapter 4

In This Chapter

Chapter 3 introduces different uses of groupware in business and looks at the different categories of groupware and the functions provided. The different types of groupware in Table 3.1 are reviewed in turn. The standards which are needed to help integrate different software within a business are also covered. This chapter is supplemented by Chapter 6 in which important factors in selection of groupware tools are considered. In Chapter 6 the features of alternative e-mail and groupware packages such as Lotus Notes, Microsoft Exchange and Novell Groupwise are compared.

The Standards Game

To help people work together, standards are vital since different people in different parts of a company, or in different companies, are often using different groupware packages. To build systems which interoperate, systems integrators are continually chasing new standards as they are proposed. To help understand how the messaging standards fit together is crucial when selecting and building systems, and these are described in reasonable (but not tedious) detail in this chapter. The importance of standards is indicated by the more recent rapid adoption of group functions through intranets which has been enabled by the Internet standards.

Types of Groupware Applications

Although the functions of Table 3.1 are available in specific groupware packages such as Lotus Notes and Microsoft Exchange, increasingly general applications such as word processors and spreadsheets have added groupware features. As explained in Chapter 1, applications were traditionally centered around a single user until the early 1990s. With maturity, however, the sophistication of such software has increased and it has become rich in functions for teamwork.

A good example of this is the once humble word processor which was limited to use by single authors. Today the latest offerings from Microsoft, Lotus and Corel all have facilities for teams of people to jointly review and annotate documents, e-mail integration and web access. Table 3.2 shows the way group working functions are incorporated into different types of software. Some groupware applications just provide one function such as e-mail or conferencing, whereas others, such as Lotus Notes, aim to provide a range of functions.

Table 3.2 *Groupware functions in different types of software*

Type of software	*Functions available*	*Examples*
1. Single function groupware application	E-mail applications, Text based conferencing, Document sharing	BeyondMail, Eudora, FirstClass, Telefinder
2. Multifunction groupware application	All of above	Lotus Notes Microsoft Exchange Novell Groupwise
3. General applications software, "Office" applications	Word processors, spreadsheets with e-mail and collaborative authoring features	Microsoft Word, Excel, Lotus WordPro, Corel WordPerfect
4. Web browser software	E-mail, news conferencing, as standard (with plug-ins and Java applets for other functions)	Netscape Navigator, Microsoft Explorer and Net Meeting
5. Operating System	Bundled applications or incorporated into O/S	Windows 98 and Outlook

The diversity of groupware functions and applications leads to the partly academic problem of where you draw the boundary of groupware—where does groupware end and other types of software begin? Increasingly, the answer is that there is no boundary as applications from word processors to web browsers to vertical market applications such as manufacturing systems are providing group functions.

Classifications of Groupware

A commonly applied division of groupware is based on where, when and how it is used. The "where" can either be defined as in the same location (effectively in the same workgroup) or alternatively, a different location in another office, whether on the same company site or the other side of the world. The "when" refers to groupware assisting communication either on a real time basis (synchronous) or when events are more protracted with coworkers responding to messages at a later time (asynchronous).

Figure 3.1 shows a classification of groupware in time and space. Here, the four quadrants are a common starting point for describing how groupware can be used and we talk of same time, different place for video-conferencing and different time, different place for e-mail software. Examples of synchronous or same time use of groupware include electronic meeting software such as a whiteboarding tool for recording the main ideas and actions of a meeting.

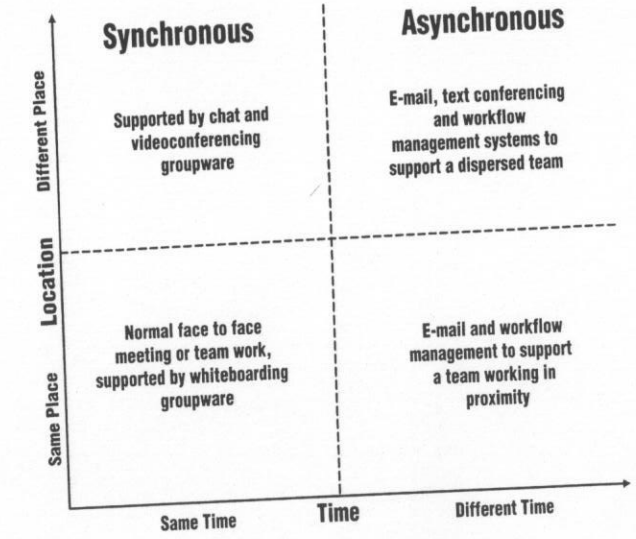


Figure 3.1 *Groupware support for different business situations*

Conversely, e-mail software or discussion threads are typically asynchronous, with a response to a query being dispatched at a later time. By providing a range of options in time and space for communication and collaboration, groupware has been effective in giving businesses a new capability—it enables a team to function when people are not available to meet at the same time and place. Many of the functions of groupware such as replication and access control features are important in making updated information available and secure on distributed servers in different locations in an organization.

An alternative way of looking at groupware is to consider *how* groupware is used. When using groupware, users may be working directly on a *common task* such as reviewing a document or they may perform a *different task*. An example of groupware being used to perform different tasks as part of a larger task is authorizing a purchase requisition. The overall goal of purchasing a new item in the company is similar, but the detailed task such as specifying the item, authorizing it or arranging the purchase is accomplished by different people.

A further way of describing types of groupware is whether the environment is shared by coworkers. This would be the case with real time conferencing software such as a whiteboard, but would not be the case with an e-mail package.

Perhaps because of the wide range of the applications it can support, groupware suffers from many different names. These sometimes originate from an academic setting, and although accurate, this is only achieved at the expense of brevity! Such terms include *Computer Mediated Communications* (CMC) and *Computer Supported Cooperative Work* (CSCW). Since you probably agree that these are quite a mouthful, my preference, which is used throughout the book, is for *collaborative software* or *groupware*.

Groupware Function: E-mail

In many ways electronic mail is the most successful of the groupware tools, certainly in terms of volume—it is currently used by 75 million world wide. In fact, one of the main reasons for the introduction of the corporate networks which have enabled group working was to get everyone connected with e-mail. Electronic mail has become so prevalent that you may say it really needs no introduction. However, there are degrees of sophistication in which e-mail can be used, and many potential problems with its implementation, that are worth guarding against. We focus on these during this coverage.

E-mail works well in offices because it is a more rapid replacement for a well established way of passing memos and messages between staff. Like voice mail it doesn't rely on the person you need to talk to being available. It offers a number of advantages over traditional mail: it is faster to send and faster to

receive; collections are instantaneous, not twice daily. It is also faster to review and then reply. These advantages of speed in decision making translate to cost savings for companies using e-mail.

E-mail Features and Functions

E-mail shares many terms with traditional mail and this is one reason for its widespread use. We talk about in- and out-boxes, post offices, collection and delivery. As with postal mail we must have features available to create, compose, address, send and receive mail. In the client application the user has an in-box giving a list of mail received from others with details of who sent it and when, a priority and a summary of the contents. Messages sent can also be reviewed in the out-box to see who has not replied. Figure 1.1 is an example of a typical mail client which features three panes. On the left is a tree of folders containing messages, on the right a list of the messages in each folder and below the contents of the highlighted message. Both messages received and sent can be deleted, when they have been acted on. To send e-mail, a form is available where the user composes their own message and can assign a priority and add attachments. Attachments are a handy feature of mail which enable users to send documents or data to other users to work on. So a sales manager might ask a sales team to submit their weekly sales figures as data typed into a spreadsheet template or an electronic form. How easy this feature is to use is important in selecting an e-mail package. It should be possible to view mail received in a number of ways according to different attributes of the mail, such as by date, person, size or category.

Addressing

The mail address of the recipient is normally selectable from an address book. In some basic packages, such as those included with web browsers, individual users will have to set these up manually. However, for corporate packages it is important that an address list for all members of the company is automatically available.

Dealing with Old Messages—Archive, Archive, Archive!

It is good practice to save mail for reference to different *folders* such as marketing, finance or personal. Most packages now provide this feature. Saving e-mail permanently is also important if you want traceability of company information down the line. I know of one business who had a "million-dollar e-mail" which had to be traced to resolve a dispute with a vendor. Increasingly, information contained in e-mail is used to obtain legal redress. In the UK, in 1997 a court found against finance company Norwich Union when a competitor's financial performance was devalued in an internal staff e-mail. The award for damages was over $700,000.

Given that e-mail may well need to be traced in the future it is important that e-mail be archived by system administrators and cannot be removed from company systems by end users. The move to Internet based e-mail using POP3 clients (see below for a definition) is a dangerous trend here. POP3 clients such as those provided with web browsers can be configured to remove messages stored on the POP3 mail server. The message may then reside on the user's hard drive or it could be deleted from here also.

The distinction should be drawn between deleting messages, when they will no longer be available (unless restored from an earlier backup) or archiving, when they will be accessible. Sometimes so-called archived mail is stored as text files created by the user on the hard drive. Better systems have a structured means of reviewing the archived messages to aid retrieval.

There are two approaches to deleting e-mail. One is the "I'm an important person, I have the most messages in the company displayed" and the other is "I'm real efficient and only have messages from the last day displayed." Users in the first category should be educated to act more promptly on messages and archive them to reduce the build-up of messages on the server, which can be a major problem of e-mail usage for the mail administrator. Similarly, traditionalists who insist on printing out every message to justify their actions should also be trained in the use of the archiving facilities.

Guidelines for implementation and maintenance of a mail system are given in Chapter 9. This also examines the "flame-mail phenomenon" where the ease of criticizing others causes problems since people write what they wouldn't dare say face-to-face.

E-mail Features for Power Users

Since e-mail is a deceptively easy tool to understand, users are often not trained in its use. This is unfortunate since there are a number of less accessible features available to the user to increase the efficiency of their work and the company.

- **Document attachments** are used routinely, but a lot of documents are still transferred by post or on disk because this feature is unknown or difficult to find, or because the e-mail client does not handle standards for attachments such as Multipurpose Internet Mail Extension (MIME) (see the later section on standards).
- **Notification** is a very useful, but rarely used option. This indicates whether a message you sent has been received or opened after it is sent. This allows the power user to use e-mail more effectively—they will know if an e-mail message has been opened, but not acted upon. In this

case they can send a follow up e-mail to chase the action or even use the phone! This feature is easier to implement on local area networks using a single mail package. It is not usually possible when using Internet mail between different types of mail systems.

- **Group broadcasting** can be used to quickly mail a group of people such as a project team. It should be straightforward to set up groups of other users who you commonly send e-mail to. Using this technique it is possible to "broadcast" a message to all members of a team such as a weekly progress report. This tool is a neat solution to help increase information flow within a company; managers can mail all staff in the department or whole company regularly with company news. It is of course necessary to be able to re-use these groups to avoid having to multiply address each mail each time.

- **Security.** If the security of a message is important, some systems such as Notes mail have facilities to encrypt mail and also to provide a digital signature or key. Messages encoded in this way may only be read by people who possess the correct keys. Pretty Good Privacy (PGP) is a freely available program developed by Phil Zimmerman which offers encryption and digital signatures using the private and public key technique. This can be integrated with other mail packages such as Eudora.

  Web reference: http://web.mit.edu/network/pgp.html

- **Agents.** Agents, wizards or rules give the power user tools to automate administration tasks and save time. For example, Beyond Mail has a rules based feature called Message Minder which places incoming messages in a particular folder. In the example shown in Figure 3.2, when a new request form such as a purchase requisition arrives, it is automatically placed in the request folder to help the user manage the many messages they receive. Other applications could include the following:

  - You can route e-mails to different in-boxes or category folders such as sales, or finance according to the sender's address or keywords contained within the message
  - Similarly an agent could automatically detect and delete junk e-mail from a particular address or containing a certain phrase
  - Delete or archive e-mail after it has been on the system for a length of time

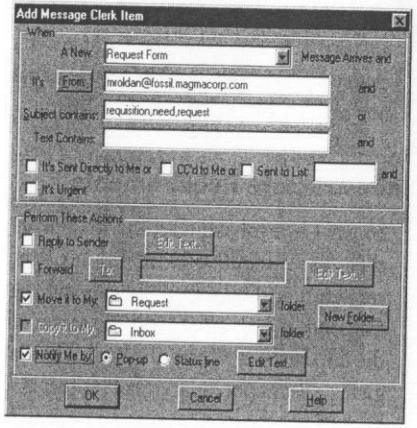


Figure 3.2
Beyond Mail rule based dialog to automatically place a request form message in a request folder

What Types of E-mail Packages Are Available and Who Is Using Them?

In the beginning, e-mail was available in standalone packages with no other group functionality. The most popular standalone packages used were cc:Mail from Lotus and Microsoft mail on the PC and standard mail tools for Macintosh, UNIX and mainframe users. Enterprise systems running on a mainframe may use SNA Distributed Services or PROFS, the IBM Professional Office System. VAXmail is still used in the DEC environment.

Today e-mail is often integrated as a feature of the operating system (Windows 98) or part of a groupware package such as Microsoft Exchange and Outlook or Lotus Notes. The publication of e-mail APIs has also made it straightforward to build e-mail into other applications such as spreadsheets. This does not mean that the standalone e-mail package is dead. Today, Lotus estimates that there are more than 13 million cc:Mail users, making it the most popular e-mail package on the market.

The standalone e-mail packages have also evolved such that they support filling in of forms such as a purchase requisition. This has extended their use to simple office automation tasks. There are now many forms packages with this type of functionality such as Beyond Mail from Banyan Systems. These applications may have standard forms to perhaps record a phone message or submit hours worked each week on different accounts. If your needs are not met by standard forms you should check the ability to tailor forms. This will usually require simple programming skills.

With the rise in popularity of Web browsers such as Netscape Navigator and Explorer, e-mail has also become available through these clients. Netscape claimed in late 1996 that their package had 12 million e-mail users, making it one of the most popular on the planet.

E-mail Infrastructure Requirements

So what is involved in setting up e-mail? E-mail works within the standard client/server framework detailed in Chapter 8. The way in which the services are partitioned between the client and the server is shown in Figure 3.3. Mail transport is controlled from the server with a post-office module managing the dispatch and receipt of e-mail. The server will also have a directory service giving a list of potential e-mail recipients within the organization. E-mail may be sent over the internal company network or may be sent to other companies via the Internet or leased lines. A list of all incoming and outgoing messages is also stored on the server. The client application has facilities for reading the mail received and sent by an individual and also composing messages to other users which are then sent via the post office. Services available on the server can be summarized as follows:

- Directory services provide a lookup table to allow routing of e-mail to the correct address.
- Different transport service standards such as X.400.
- A message store contains all messages currently available on the system, both read and unread together with their attachments.

The client/server infrastructure is based on the *Open Systems Interconnection* (OSI) model. This defines a layered model which enables servers to communicate with other servers and clients. The seven layers of the OSI model are:

- **Application.** Directory services and message handling services are included at this level.
- **Presentation.** These protocols are usually part of the operating system.
- **Session.** This includes data transfer protocols such as SMTP and FTP.
- **Transport.** This layer ensures the integrity of data transmitted. Examples include the Internet Transmission Control Protocol and Novell SPX.
- **Network.** Defines protocols for opening and maintaining links between servers. The best known are the Internet IP protocol and Novell IPX.
- **Data-link.** Defines the rules for sending and receiving information.
- **Physical layer.** Low level description of physical transmission methods.

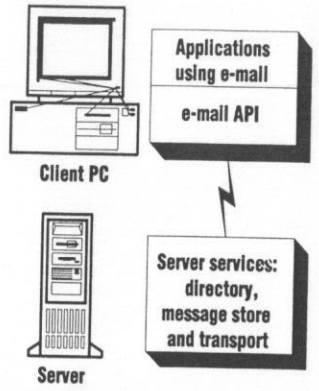


Figure 3.3
A client/server e-mail architecture

Together these layers form a "protocol stack." Before messages are sent as packets around a network, information related to each layer is added to the packet. The e-mail standards described in the next section usually relate to the higher levels in the protocol stack.

Messaging Methods

E-mail and messaging are similar in that they operate with an asynchronous, "store and forward" method. Store and forward is used since when a message is received by the server, the packets may not be in sequence. As they arrive they are placed in order—stored, and then forwarded. A different form of storage and forwarding may also occur if the communications links are not continuously available, as in the example of a company that distributes Internet mail from its post office twice daily.

Integrating Mail Systems—The Importance of Standards

With enterprise e-mail there will often be different mail systems in different offices in different countries. Since each e-mail system has its own standards for addressing, format of message and transport method, tools and standards are required to allow the mail messages to be read transparently by different mail systems. Understanding these Internet based standards and knowing what is available in different products is clearly important when selecting products.

We will look at the different types of mail standard that are important using the categorization used by the *Internet Mail Consortium* (IMC). This is useful to provide a framework for the large number of standards in this area. "Host" in the following descriptions is analogous to "mail-server."

Web reference: http://www.img.org. Internet Mail Consortium (IMC)

Web reference: http://www.ips.id.ethz.ch/~parish/standard.html. This reference gives a source page for all important communications standards.

Directory Services

Directories act as an index of user names and devices accessible on networks. As such they are critical to a company to ensure that different users can be contacted easily using an electronic "white pages." Addresses of other network resources such as printers and servers are also listed in the directory service.

Domain Name System (DNS)

An important directory standard on the Internet and local TCP/IP networks is the Domain Name System or service referred to as DNS. A DNS is used to map the TCP/IP network address of a server such as 207.68.156.58 to a better known form such as www.microsoft.com. The DNS is hierarchical as follows:

1. Top level domain. These are sometimes referred to as "Generic TLDs" or GTLDs. The most widely used top level domain is .com. It is registered by over a million companies. It indicates a commercial organization, particularly one based in the US. Other categories include .gov, .org and .edu. Elsewhere, the top level domain indicates the country name such as .ca for Canada, or .co.uk for a British company.
2. Second level domain. This refers to the company name and is sometimes referred to as the enterprise name, for example ibm.com or novell.com.
3. Third level or sub-enterprise domain. The third level domain name can be used to refer to an individual server in an organization such as support.novell.com.

The lookup system for locating servers in the DNS is usually stored on a location server, but a local hosts file can be used for lookups on the client.

The DNS naming convention is used for Internet web and e-mail addresses which are in this well known form:

Name@hostname.organization(.com, .org, .edu, etc.) e.g. Dave.Chaffey@company.com

Netware Directory Service (NDS)

The tens of millions of Novell Netware users may use the Netware Directory Services (NDS) version of DNS. This is likely to be replaced in the future by the two X.500 based directories described next.

Active Directory Service (ADS)

Active Directory in Microsoft Windows NT version 5.0 will compete with NDS. This includes support for Internet based Domain Name Services such as the lightweight directory access protocol (LDAP) that is described below. It will give a single point of administration for a range of resources such as files, peripheral devices, host connections, databases and not least users.

X.500

This directory service is promoted by the CCITT (Consultative Committee for International Telegraph and Telephone) to operate with X.400 and other MHS. X.500 provides a lookup of names and addresses through the DIB or Directory Information Base. Each object stored in the DIB is organized into a hierarchy with user or common name objects nested within organization unit objects such as the finance department, which are in turn nested in organization objects (Figure 3.4). Individuals include both people and resources such as shared printers or storage devices. Although the hierarchy was intended to be easy to use by end users with familiar, recognizable objects, this has not been achieved because the naming convention is not easy to grasp. Another problem with X.500 is that the directory access protocol (DAP) used on the client was quite cumbersome. This led to the suggestion of LDAP by the University of Michigan.

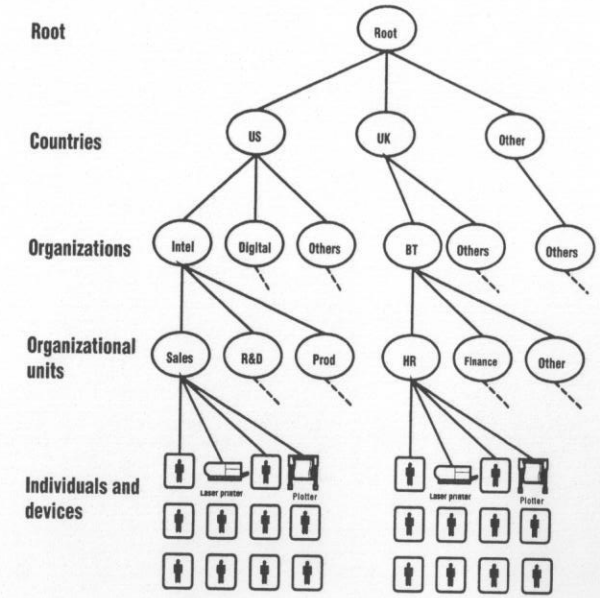


Figure 3.4 *Structure of X.500 hierarchy*

LDAP (Lightweight Directory Access Protocol)

LDAP is an Internet based method for locating users and resources on your network. It integrates with similar X.500 directory services. It is based on a similar hierarchy, but is implemented as a simpler and faster client protocol. It loses some features compared to X.500, thus the somewhat derogatory term lightweight.

It has the benefit that unlike X.500 directory entries it can be translated to the familiar address form of <name>@<host>.<domain-type>. LDAP was actively promoted by Netscape and has since been adopted by the major messaging vendors referred to in Chapter 6. Such a "white pages" directory is particularly important for large companies with users across several sites.

Web reference: http://home.netscape.com/newsref/ref/ldap.html
(a detailed description of LDAP)

Client-to-Host Communication (POP3 and IMAP4)

POP3 (Post Office Protocol) and IMAP4 (Internet Message Access Protocol) both define methods for e-mail clients to retrieve messages from a server on a TCP/IP network. POP is the earlier method, still widely used, which downloads messages from the mail server when connected. Management of these messages is then performed by the client end. Here, the burden tends to be on end users to manage their messages, rather than this being a central process. A further problem with this model is that a mobile or home user operating via a modem has to download whole messages, attachments, etc. to find out whether the information is worth downloading. Being able to query the headers, or MIME contents only, would be more efficient.

The more recent IMAP4 standard offers a server querying model more like that of the proprietary packages such as cc:mail or MS Mail. It can also operate in an offline mode similar to POP. IMAP has a further advantage over POP in that it is designed to assist sharing of mail and Usenet news articles. This is achieved by setting up shared mailboxes on the server and client. The profile of IMAP is set to increase, as it is a strand of Netscape Open Network Environment strategy and is supported in Netscape Mail server and newer versions of Groupwise, Exchange and Notes.

Host-to-Host Mail Transfer

SMTP (The Internet Simple Mail Transfer Protocol)

SMTP is the Internet e-mail standard used to enable delivery of a message between servers connected to the Internet. This could allow, for example, interoperability between a wide range of systems such as Windows NT or a

Netware based PC server and a UNIX server or a mainframe. All that is required is that the server is connected to the Internet and that it has a suitable SMTP gateway product to convert from the host mail system such as cc:Mail to the SMTP standard.

The SMTP protocol involves an SMTP server establishing a two-way transmission channel with a receiving server. The receiver may be either the ultimate destination or can be an intermediate server. Once the transmission channel is established, the SMTP sender sends a MAIL command indicating the sender of the mail. If the receiver can accept mail it responds with an OK reply. The SMTP sender then sends a RCPT command identifying the recipient of the mail. If accepted, the sender sends the mail data.

Basic Message Format and Encoding

An example header produced for an SMTP based mail messages is as follows:

From: "M MMAN <mmann@bmt.waiariki.ac.nz>

Organization: Waiariki Polytechnic Rotorua N.Z.

To: Sal Brockbank <sal.brockbank@zetnet.co.uk>

Date: Fri, 24 Jan 1997 07:55:25 GMT+1300

MIME-Version: 1.0

Content-type: text/plain; charset>US-ASCII

Content-transfer-encoding: 7BIT

Subject: Re: Tourism and Developing Countries: editorial queries batch 1

Reply-to: MMANN@bmt.waiariki.ac.nz

Priority: normal

X-mailer: Pegasus Mail for Windows (v2.42a)

Message-ID: <193BF763348@bmt.waiariki.ac.nz>

Standards for Embedded Documents—MIME and UUE

Within an SMTP message header the type of coding used for text and any embedded documents will be specified. The two most common standards for transferring attached documents or multimedia are the multipurpose Internet mail extension known as MIME and UU encoding. These are now supported by most e-mail systems, as well as standard document filters for different word processor formats.

Message Encryption and Authentication (S/MIME)

As well as PGP a more recent development is a proposed extension to MIME known as S/MIME which has a new security model including digital certificates. Details can be obtained from RSA, one of the promoters of this standard.

Web reference: http://www.rsa.com.

Gateways to Non-Internet Mail

Gateway Standards and Message Handling Services

There are two basic options for integration of different mail systems within a company. The first is the gateway approach. Here an e-mail gateway product is purchased and installed on a server to enable two-way translation of formats from one e-mail standard to another.

This approach is widely used, but can be unwieldy if several different e-mail products are involved as each will require a different gateway product. However, an alternative approach is available—that of switch based backbone. This is a more flexible distributed model. The backbone consists of several interlinked servers which are typically linked by X.400. Each switch then performs the conversions.

Netware Global Message Handling Service (GMHS)

This gateway standard is based on the established Message Handling Service (MHS) for Novell based LANs. It can operate on a dedicated server or as a Netware Loadable Module (NLM). MHS supports a *Standard Message Format* (SMF). MHS can also be used for applications other than e-mail such as *Electronic Data Interchange* (EDI) and Fax. It uses a "store and forward" model.

X.400

X.400 was defined by the CCITT (now the ITU's Telecommunications Standardization Sector, ITU-TSS). This MHS provides a standard for a range of platforms. Services defined in this standard include:

- a directory service for looking up user names and addresses
- a message transfer agent (MTA)
- a message store for messages that cannot be delivered directly because they are offline
- a "user agent" for client services such as compose and read—this will usually be provided by a standard application such as Unix Mail

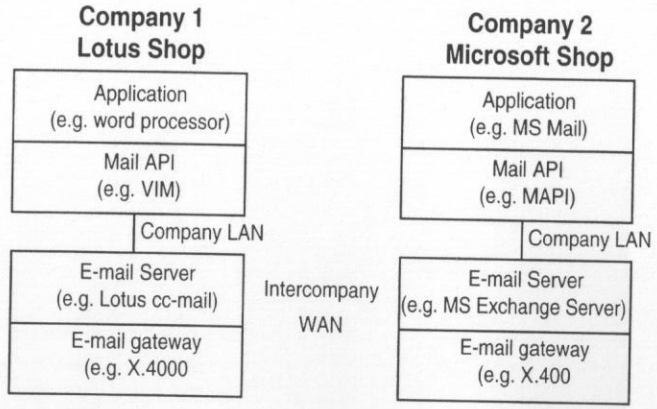
To allow the enterprise to operate e-mail, *middleware* standards are important in several areas.

Middleware

Middleware is a specialized type of software important in the implementation of these standards. It acts as an intermediary software layer between different applications, often on different platforms. Through programming APIs this layer is used to achieve translation of data or messages that are in an incompatible format. The relation between the programming API and the connectivity standard to the user applications in two different companies is shown in Figure 3.5.

In this example Company 1 mainly uses Lotus products, for example a word processor from which an end user wants to send a proposal to Company 2. When they select Send from within their word processor it will use the Lotus sponsored VIM middleware standard to communicate across the internal network to a server running cc:Mail. This server will identify the e-mail as one to be sent externally and will then pass it on to the other company via a gateway middleware product to convert to the X.400 based network that links the two companies. After conversion, the message will be received at the e-mail server of Company 2 after retranslation using the gateway. The e-mail server will then place the mail message in the in-box of the end user. Note that middleware is a general term and describes a range of methods of glueing together different software applications and messaging systems. The examples given here are only a subset of the wide variety of middleware.

Figure 3.5 *How e-mail standards are used to join companies with different products*



E-mail APIs for Applications Development

Many applications vendors incorporate e-mail functionality within an application. For example, facilities can be built to route a document straight from a word processor to its intended recipient. To enable this type of interaction, programmers call functions from a standard dynamic link library which supports one of the two common mail APIs (Application Program Interface). These are:

- MAPI—Mail API promoted by Microsoft
- VIM—Vendor Independent Messaging Service originally promoted by Lotus and supported by a range of vendors

Managing E-mail—System Management Problems

There are a number of issues involved with the management of mail systems. After backup and archiving, possibly the most important issue is the anticipated volume of usage. Sufficient server space should be allocated for each user to have thousands of messages with attachments. One of the major causes of failure of mail systems is when insufficient space remains. It will be necessary to set up an archiving system to remove messages from the server once they pass a certain age. If you are part of a company with multiple locations you will have to assess the frequency of connections to other servers as mail is distributed.

Linking different e-mail systems can cause problems, as discussed in the section on standards, so the correct gateway products have to be installed. This is particularly true when file attachments need to be received from other mail systems. Transmission rates have to be monitored to ensure delivery rates are satisfactory. Finally, the impact of network instability leading to poor availability should not be underestimated. Although not directly related to e-mail systems, downtime in company networks can cause severe problems if a company becomes reliant on e-mail for its operations, which is often the case given the success of e-mail.

Voice Mail

Voice mail shares many of the benefits of e-mail. It also has the advantage that it is clearer to understand the content of the message—you know your boss is angry when you have to hold the phone piece at arm's length. It works by converting the spoken message you record at your phone as a digital message, stored on a server. The recipient is then notified usually by a light/LCD on their phone that they have messages.

It suffers from the disadvantage that unlike e-mail there is not usually a priority system or a header summarizing what the message is about, or where it is from. Caller line identification can provide the latter. It is a lot quicker to scan through 10 e-mail messages than 10 voice mail messages. These disadvantages should reduce as voice mail is better integrated with the PC through CTI techniques. Voice messages are accessible from the in-box of Groupwise and this feature will likely be incorporated into similar packages.

In the Unified Messenger from Octel, voice messages and e-mail messages are also in a single location. The user simply clicks on a message to hear it or read it. This product has text-to-speech capabilities which converts e-mail messages to speech so that your e-mail messages can be read over the telephone.

Web reference: http://www.octel.com

Groupware Function: Conferencing

Different forms of conferencing can be used for shared discussions about particular topics. Conferencing's advantage over e-mail is that it allows many people to become involved, while e-mail is usually restricted to a small number of people receiving the message. In a business context, the discussion often revolves around proposals to solve a particular problem such as "which markets should we target to maximize revenue?" or for hosting support for electronic meetings. Computer based conferencing is an increasingly popular business application as it enables the distributed or virtual business to operate when decision makers are geographically separated. Additionally, the discussion does not have to occur as real time video-conferencing—if people are unavailable then asynchronous text based conferencing can occur. We look at the alternatives for conferencing by the media that are used.

Text Based Conferencing

Text based conferencing is usually asynchronous when used in the business world. Better choices are available for real time conferencing, such as phone or video-conferencing. Synchronous text conferencing is only really an option for 120 wpm typists—Internet Relay Chat is available for those who can make the grade. Despite lacking the immediacy of real time conferencing, asynchronous conferencing has the benefit that it gives participants the opportunity to reflect on their answers or find the information they need to contribute. A disadvantage of asynchronous text conferencing is that the user

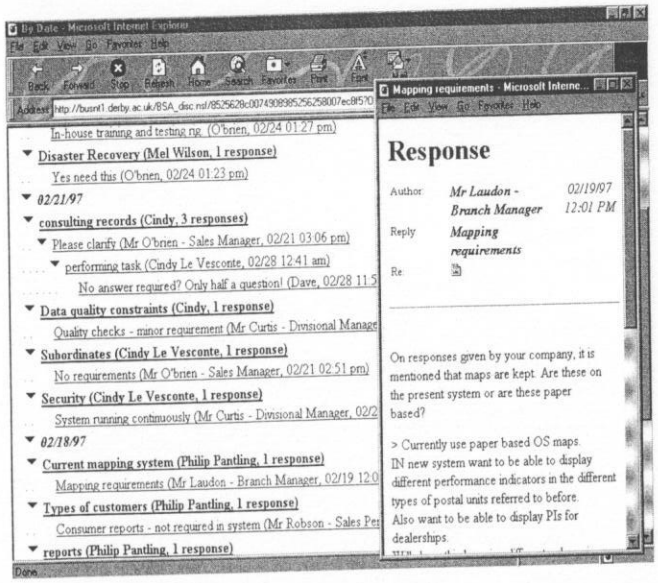


Figure 3.6
Conferencing using Lotus Domino—window on the right shows detail of discussion thread on left

often has to proactively open the application for viewing the discussion to see whether there are any new postings. So, some education of users is necessary to overcome this or the conferencing system can be integrated with a mail system to notify users of new postings.

Text based conferences are based around the concept of a *discussion thread* where different participants discuss a particular topic (Figure 3.6). Products vary in how they implement the view of all contributions. A thread consists of grouped postings from different participants indented to show replies to an original comment. Within each thread supplementary questions may develop which are indented further. Usually, clicking on the header of the posting will give the contents of the posting. Good tools will allow export of a transcript of all comments for incorporation into a word processing document. The main options available in text conferencing software are:

- create new topic or thread—an area is available to type in the text of the posting
- respond or reply to an existing thread
- review list of existing topics and responses together with their authors and time/date of creation
- search topics for a text string

Good tools allow export of a transcript of all comments for incorporation into a word processing document. A moderator or administrator of the discussion will have the option to delete any inappropriate message.

Setting Up a Text Based Conference

To set up a text based conference does not usually require the large investment in hardware and networking that may be the case with video-conferencing. Existing network servers can be used to host the conferencing server software which will store the messages and hold the details of users of the conference. The client application can run on an entry level PC or Macintosh. Many vendors are migrating their systems to web based conferencing which offers cheaper conferencing with a familiar client.

Web reference: http://freenet.msp.mn.us/~drwool/webconf.html Conferencing on the World Wide Web, an index of over 60 tools and applications maintained by David R. Woolley who created one of the first computer conferencing systems, PLATO Notes.

A range of conferencing software is discussed in Chapter 6. Lotus Notes and the Domino web enabled package and Microsoft Exchange both support conferencing with independent packages such as Telefinder and FirstClass also available. Conferencing can be set up as public with open access or private with user name and password restricting participants.

Groupware Function: Video-Conferencing

Video-conferencing is not a new technology. In the early days, video-conferencing was the sole preserve of large multinationals with tailor made video suites, costing tens of thousands of dollars.

Within the last few years, video-conferencing from the desktop has become accessible to smaller companies at a fraction of the cost. This growth is being accelerated by the benefits of using the Internet, namely the lower cost of entry and usage charges.

Alternative video-conferencing products are compared in Chapter 6. Figure 3.7 shows CU-SeeMe software video-conferencing software which offers other facilities such as chat and whiteboarding. Organizations such as the World Bank are using CU-SeeMe from White Pine Software to expand their usage of video-conferencing beyond the board-room.

For large company or small, the reasons for using video-conferencing are clear. It reduces travel time and costs and offers the opportunity to arrange a meeting at relatively short notice. Unlike text based conferencing methods,

Figure 3.7 *CU-SeeMe video-conferencing software from White Pine Software showing participation of multiple sites*

video-conferencing offers an interactive virtual meeting very similar to the real thing. Above and beyond other conferencing methods, this technique offers physical expression to be conveyed, enabling a more effective meeting. The visual element also enables discussion of physical objects such as products, diagrams or charts to occur. Sharing of diagrams and applications is also helped by the whiteboard facilities which are included in packages such as CU-SeeMe (see separate section on whiteboarding).

Video-Conferencing Decisions

When deciding on a video-conferencing system there are a number of choices to be made. These are often a trade-off between quality and expenditure:

1. Do you want limited conferencing within the company on the LAN or the more common need of going beyond the local offices using leased lines or the Internet?
2. Do you go for desktop video-conferencing (DVC) between PCs and workstations or a more expensive video-suite?
3. Do you want point-to-point conferencing between two locations or multi-point conferencing involving several participants (Figure 3.7)?

4. The big question is what do you want as your quality in frames per second? This will be governed by what bandwidth you can afford and the techniques supported by the products you use to reduce bandwidth requirements. Bandwidth reduction techniques are described below. One of the methods to achieve this is multicast (see explanation below).
5. What integration with other types of groupware function such as whiteboard or application sharing is required?

Bandwidth Requirements

Video-conferencing was hyped at the start of the 1990s, but demonstrations of jerky, disembodied faces caused by dropped frames and a low number of frames per second permitted by the transmission capacity have been a key reason for the lack of popularity. Even with the compression techniques described below, there is no substitute for bandwidth. A suitable bandwidth for high end video-conferencing is between 350 to 400 Kbps, so good quality is not possible across phone lines even if using ISDN. So quality video-conferencing is not really a practical proposition for home use, even with modems running at 56 Kbps. The quality of image is, of course, also governed by your requirements for resolution and color. Color does not add much to the message content, so black and white suffices for most, while a resolution of windows of 200 by 100 pixels is a good compromise since full screen does not add much beyond the talking head.

For lower end use, White Pine support recommends a bandwidth of around 100 Kbps for "fluid motion." They illustrate the problems by showing that there are 75 Kbits in 120 × 160 pixel frame, which is equivalent to 45 Kbits/frame compressed. For 15 frames per second for fluid motion (with every frame being different) 675 Kbits/sec would be required. Fortunately, this is not required since only parts of the frame differ.

Techniques for Reducing Bandwidth Requirements

The vendors of video-conferencing solutions use a number of techniques to reduce the amount of bandwidth required to transmit the video-stream. Here we explore some of the key ones in more depth. All involve reducing the data-stream, but achieve this in a variety of different ways.

Image Quality

Reducing the number of frames per second will obviously reduce the data transmission requirements, but will result in poor quality. Thirty frames per second is necessary for excellent quality conferencing, but over a modem, less than 10 will be used. Video-conferencing servers such as White Pine

MeetingPoint can automatically detect the transmission achievable to any site and reduce the amount of data transmitted accordingly.

This is known as bandwidth pruning and offers a controlled way of reducing the number of frames per second rather than randomly dropped frames. Bandwidth needs can also be substantially reduced by going from color to black and white images. Since color does not add significantly to the message and can degrade the number of frames per second, it is only used when the highest speed links such as 10Mbps are available.

Compression

The video *codec* standard used is of vital importance in reducing the volume of data to be transmitted. The codec is used to *co*de and *dec*ode the signals from the analog video signal to the digital stream of bits that is transmitted across the network. This stream is then decoded at the receiving end to be displayed as a sequence of frames. As well as the conversion from analog to digital, a compression-decompression also occurs before and after transmission to reduce the number of bits that need to be transmitted.

Depending on the trade-off between quality and performance, lossy techniques may be used. In these the compression technique will cause a reduction in quality where some bits are discarded to give a greater reduction in the number of packets that need to be transmitted. Fractal based compression is a lossy method used for example by Iterated Systems. Non-lossy methods available include run length encoding (RLE) and pulse code modulation. Run length encoding is not "lossy" since repeating bits are stored in a more efficient form and reconstituted when decompressed. The delta technique involves only transmitting pixels varying from frame to frame. This technique works well for video-conferencing since when "talking heads" are involved the delta between frames is usually limited to changes in expressions and movement.

Local Replication

This involves using different servers at different sites to intelligently balance the amount of data that is transmitted across the slowest WAN link. Imagine a situation where four delegates are located in a headquarters and are holding a conference with a single delegate in a foreign sales office. Without replication, all data packets from the different participants at the headquarters are sent to the overseas location. With local replication this is not necessary since the server at headquarters intelligently routes all information in a single stream.

Multicasting

With simple broadcasting of video-conferencing data streams, each node on the network receives a separate data-stream regardless of whether they want to receive or not. This duplication places a severe drain on network resources. The multicast method is significant since it produces a single data stream, which is only routed to those users who request it. The multicast protocol uses a destination address to identify a multicast packet which allows a single packet of video to be sent to several destinations on the wire at the same time, i.e., its main benefit is that it is a *one to many* service rather than *one to one.*

With multicast techniques it is possible to deliver a range of business video content such as company-wide meetings, management and financial briefings, training programs and news bulletins. The H.323 standard referred to below is significant since it offers support for IP-multicasting which should improve the performance of video-conferencing across intranets and the Internet.

Video-Conferencing Standards

As with mail systems, these are important to allow interoperability between products from different vendors. The important standards are managed by the International Telecomms Union and supported by members of the International Multimedia Teleconferencing Consortium. The important emerging standard at the moment is H.323 which is supported by key players such as Intel and PictureTel. Products from these companies are described in Chapter 6.

H.323 is an audio- and video-conferencing standard supporting point to point and multicasting over IP based networks such as intranets and the Internet. It has evolved from the H.320 standard which addresses video-conferencing across ISDN and other switched networks. A further standard is H.324 for use on dial-up video-conferencing across modems using analog lines. The best known methods for video playback are Video for Windows-Indeo from Microsoft/Intel, Quicktime from Apple and MPEG.

Web reference: http://www.imtc.org. The International Multimedia Teleconferencing Consortium supports all key videoconferencing standards referred to above.

Web reference: http://www.itu.ch. The ITU manages many of the video-conferencing standards.

Why Has Video-Conferencing Not Happened Yet?

Despite years of hype, video-conferencing has not yet reached the mainstream of commodity software and hardware. According to Telespan Publishing the

number of desktop video-conferencing units shipped in 1996 was just 300,000 worldwide. Although it is often said that teleconferencing has not taken off because of technical difficulties of dropped frames and jerky images, the business reason is probably that clear tangible benefits have not been delivered.

Of course, cost is another barrier to entry. Costs for video-conferencing are high, since as well as renting high speed links, additional hardware is required for hosting servers or reflectors, video-cards in the PCs and monitor-mounted cameras and microphones. The software tends to have quite a high cost per seat in order for the software vendors to try to recover their investment. This is a minimum cost per seat of $200 to $1000 dollars depending on the quality required.

The customer's viewpoint appeared recently in *PC Week*. Quoting George Bateman of American Express in Phoenix, Arizona, as saying "We look for technology to aid us in our business and if it doesn't aid in that or bring value, it carries a low priority for us. Desktop video-conferencing will come, I'm sure, but we have higher priorities now." Instead, American Express continues to use their boardroom video-conferencing systems while the cost of desktop video-conferencing is seen as too high by Bateman. "The cost for LAN based video-conferencing could climb up to $5,000 to $7,000 per desktop," he says.

Studies have shown that the introduction of teleconferencing has had only a marginal impact on travel costs in companies. However, it can promote new ways of working, for example, joint product development between remote sites in which more staff can participate, thus reducing development costs and increasing quality.

The creation of the H.323 standard will help the spread of video-conferencing to LAN environments, but it is difficult to see the technology becoming widespread in the near future. While it is a "nice to have" technology, the business imperative is just not there yet. Effective communications can occur via voice and e-mail—the marginal benefit of video-conferencing, of the talking head, is just not large enough for a lot of small and medium companies.

Other Varieties of Conferencing

Video-conferencing and text based conferencing are well known and widely used. There are also a number of other tools, many of which are Internet based, which are used widely for recreational use, but not by industry. A brief review of these is given here since these approaches may offer a low tech, low cost solution to businesses.

Usenet

Usenet text based discussion groups are available via the Internet through the *network news transfer protocol* (NNTP). Usenet is best known as a public method of conferencing in areas such as rec. for hobbies and games or comp. for discussions about computing related matters such as the Usenet group comp.groupware. It is also possible to set up a private company newsgroup on a news server and limit access to company users, but it is more usual to use web based conferencing because of ease of use.

In the beginning, Usenet newsgroups were accessed from newsreader applications. Increasingly they are integrated into the web browser as is the case with the Netscape newsreader. Some services such as DejaNews (www.dejanews.com) allow messages to be reviewed and posted from the browser itself.

Web reference: http://www.dejanews.com. This is useful for searching newsgroups and posting messages from a web browser.

E-mail Based Discussion

List servers such as UNIX *listserv* use e-mail to provide *e-mail based discussion* across the Internet. These function by each participant subscribing to the discussion and all messages posted by other users to the list server are then automatically sent as e-mail to all subscribers. This conferencing has the benefit that it is easy to set up and uses your existing e-mail package. It has the disadvantage that it can be difficult to follow the thread of a discussion since all other messages in your in-box will interfere unless you set up a rule to route listserv messages into a separate folder. Proprietary and web based discussion packages have the great advantage that threads can be easily reviewed.

A more primitive form of conferencing can be set up in an e-mail package by sending a message to a group of people and any person replying selects "reply to all." This has the disadvantage that each user has to remember to choose "reply to all" and again suffers from the messages being intermingled with other messages. Search facilities will not usually be available either.

Internet Relay Chat and Bulletin Boards

Internet relay chat (IRC), is a low cost Internet tool which provides a real time system that is used more for recreational than business use. It functions by the host you are connected to broadcasting what you type to all users around the world who are "tuned in" to a particular channel. It is not secure and the threads may be difficult to distinguish as several discussions may occur simultaneously.

The Internet talk utility or a secure private channel can be used for chat between two people. Telnet based bulletin boards are another alternative for conferencing which have been used in the past for product support and user groups. IChat has tried to carve a niche in the business-oriented chat market. Its iChat paging server runs on Solaris and Windows NT and offers the facilities of:

- Rooms—a standard chat facility for teams
- Paging System—for "instant" transmission and display of important messages in a global enterprise where e-mail is not sufficiently rapid since users have to proactively access their in-boxes
- Message boards—similar to traditional bulletin boards

Web reference: http://www.ichat.com

Phone Teleconferencing

As well as conferencing using analog or digital phones, there are now a number of options for using the Internet to promote phone conferencing. This is supported through Netscape cool talk and vendors of Internet phone facilities.

Groupware Function: Electronic Meetings Software

Supporting Meetings Through Electronic Meetings Software

Given that some managers can spend more than half their working lives in meetings, there are big savings available in efficiency if meetings can be made more productive. Consider these statistics from David Coleman's book on groupware applications:

- Middle managers spend 14 hours per week in meetings
- Senior managers spend as many as 23 hours per week in meetings
- Planning for the average meeting costs $55 per attendee
- The average cost of a one hour meeting of eight attendees is $692

Electronic meetings software can also reduce some of the problems of traditional business meetings such as: a lack of information, dominance by one forceful individual and the boredom and frustration of diversion onto irrelevant matters. Additionally, psychological studies have shown that decisions made through electronic meetings produce improved decisions which are more radical and polarized than those achieved face-to-face, possibly through greater equality and less inhibition of team members.

Electronic meetings software or systems (EMS) can also help with more mundane aspects of meetings through ensuring that an agenda is available, action points are noted and distributed to participants. This software is also commonly known as *group decision support* (GDS), although this term is somewhat dated now and EMS usually is used instead. Chapter 9 gives more insight into the psychology of group working, which should be considered by all embarking on the introduction of a new system. The paper by Nunamaker et al. (1991) offers a good introduction to the features and benefits of EMS.

The Functions of Electronic Meetings Software

McGrath (1984) considers a range of modes in which a group can operate, not all of which may occur in any single piece of group activity. These modes may be supported by different types of groupware, but in particular must be provided by electronic meetings software. All groups go through the stages of:

- **Inception (Mode I).** Group members are selected, roles are defined and relationships established. Problems are identified perhaps through brainstorming and plans produced by which the groups can solve them.
- **Decision making (Mode II).** Here technical problems are solved through decision making.
- **Conflict resolution (Mode III).** Problems are resolved through conflict resolution as the parties negotiate to achieve a satisfactory outcome.
- **Execution (Mode IV).** This is where the group functions effectively through performing the tasks.

Group interactions are only one part of the sequence of group functioning. Other aspects such as group forming and problem resolution also need to be built into software for group working. Additionally, group members are often not working on a single project, but several projects and groups are dynamic—software needs to be responsive to this. When a group is looking to take decisions and generate tasks to implement the ideas, the sequence of functions that must be supported are:

- arrange meeting (group scheduling software)
- generate alternatives (idea synthesis)
- choose alternatives (prioritization)
- negotiate (decision)
- execute (implementation—generate tasks)

Using a Facilitator

An additional function is that of *facilitation* of a meeting. The role of the facilitator in aiding conventional meetings is well known, but there is a danger of not bothering to appoint such a person when using *computer mediated communications* (CMC). Research has shown that the role of the facilitator or moderator in CMC is as important as in face-to-face group work. The facilitator is important to encourage participation, steer the course of the debate, resolve conflicts as necessary and ensure that clear conclusions are reached from which actions can be taken. Jay (1976) describes the role of the facilitator in down to earth terms; his suggestions for running a meeting are to:

- control the garrulous
- draw out the silent
- protect the weak
- make sure suggestions aren't squashed
- encourage the clash of ideas, but discourage the clash of individuals

We see that electronic meetings support can assist in this and reduce the risk of one of his colorful types of meeting occurring: "multi-headed beast; feuding factions; dominant species; recycling syndrome and sleeping monster."

Valacich et al. (1991) describe an early example of group decision support software and demonstrate that in a corporate environment both efficiency and effectiveness were improved in comparison with a conventional meeting. Decisions were reached more rapidly with a better quality of decision with more ideas generated than in face-to-face meetings. Questionnaires indicated that over three-quarters of participants rated electronic meetings more effective.

Support for team members in group decision support is sometimes considered as being of three types according to the level of access to the technology. With f-groupware there is a single workstation for the *facilitator* of the meeting. With k-groupware there is a *keypad* where members can make decisions through voting. Finally, the norm today is w-groupware, where *workstations* are used by each member to view information and contribute ideas. Electronic meeting support is a common application of GDS (*Group Decision Support* systems). The facilities provided by these systems are categorized according to the capabilities that are available.

- **Level 1** facilities for sharing opinions and information in a structured way, but on its own this is usually not sufficient for running meetings. Text conferencing software, software to follow an agenda, and write up minutes to help brainstorming and whiteboarding software would also fall into this category.

- **At Level 2,** additional tools are available for evaluation of proposals using statistical or decision-tree techniques, voting and viewing the relationships between ideas. Groupware that is specifically for Electronic Meeting Support will fall into this latter category.
- **Level 3** tools are largely experimental and allow for the automation of group communication and decisions through the use of rules and artificial intelligence.

An example of Level 1 or 2 meeting support software is VisionQuest from Collaborative Technologies Inc. This product is based on the idea of goal directed dialogs in which meetings focus on desired outcomes and work toward an agreement through structuring the collaboration within an agenda framework and providing documentation on idea generation, evaluation and prioritization during the group decision process. The product is well based in theory allowing for anonymous contributions as ideas are generated and prioritized and providing tools to solve well known problems of meetings. These tools include:

- brainwriting (a shared chat space)
- commenting for sharing opinions on agenda topics
- categorizing, for synthesizing views
- ranking and rating different solutions
- voting (Yes, No or Abstain to a proposal)

When "ranking and rating" individuals give their suggested rank or score to a proposal and the group averages are computed. "Reducing" is used to select a limited number of alternatives—say the top three choices to exclude unpopular alternatives. This system is not prescriptive in that people attending the meeting can roam around the agenda, although guided by the facilitator.

Web reference: http://www.netsites.net/~one/vision.htm (OneNet Inc is a reseller for VisionQuest which is principally used in government and education.)

GroupSystems, a tool originating from the University of Arizona, provides Level 2 and 3 facilities to analyze ideas by outlining and then establishing relationships between them in a matrix. Figure 3.8 shows the alternative analysis module which is used here to compare alternative employees according to differently weighted criteria shown in the columns. This can then give an objective group decision when comparing a number of alternatives.

Web reference: http://www.ventana-east.com/ and www.ventana.com/index.html—the primary site for Group Systems from Ventana.

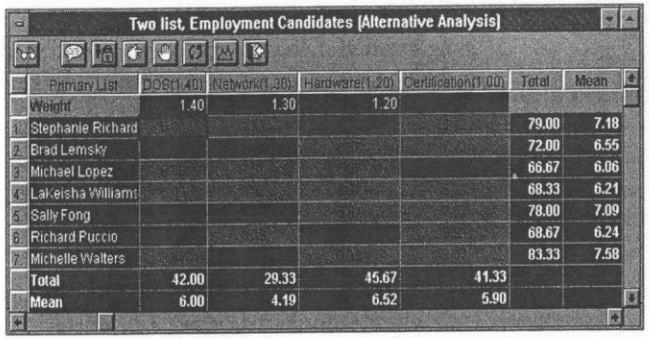


Figure 3.8
Alternative analysis tool from Group Systems

Through using GroupSystems its creators claim the following are possible:

- increase meeting preparedness and participation
- reduce the length and number of meetings by up to 50 percent
- improve the quality and quantity of creative ideas
- focus on the issues and energize the process
- quantify and compare opinions on subjective issues
- provide an electronic forum for managing ongoing communications
- encourage innovation, trust, and commitment to organizational goals
- document meeting proceedings, capture ideas and record the outcomes

Real Time Multimedia Group Conferencing Software

Multimedia conferencing software for business meetings uses a range of different media:

- video-conferencing
- whiteboard conferencing
- document conferencing
- data conferencing

This category of software is now sometimes referred to as Teamware. This is slightly confusing since there is a groupware product from ICL called TeamWare.

Whiteboard Software

Whiteboard software is a real time technology which is usually accompanied by other real time applications. It is used for brainstorming and summarizing

decisions just as with standard whiteboards. Most commonly it is an option of a video-conferencing package such as CU-SeeMe, Picture Tel Liveshare Plus or Intel Proshare. Figure 3.9 illustrates the whiteboard feature from Microsoft Netmeeting. In such products a separate window is dedicated to a shared whiteboard which is drawn on using a stylus and then the annotation replicated to all others viewing this virtual whiteboard.

The whiteboard is a graphical bit-mapped environment like the Paintbrush program. It should be possible to zoom, type text, draw lines, import images, highlight and of course erase using the mouse or a pen type of pointer. Another approach involves the use of a physical whiteboard which detects the motion of a pen and transmits the image to screens. Importing images from other screen windows that are not shared is useful, if for example, discussing a prototype of a new program. The other facilities that real time conferencing packages include are:

- **real time chat** between delegates—often unnecessary if video-conferencing is available
- **shared applications** (or remote access)—an effective way of reviewing prototypes, what-if business simulations or multiple authoring of compound documents (document sharing)
- **file transfer**—file transfer may allow financial spreadsheet data to be easily transferred between users using a similar model to e-mail with a file attachment being sent to delegates or using File Transfer Protocol

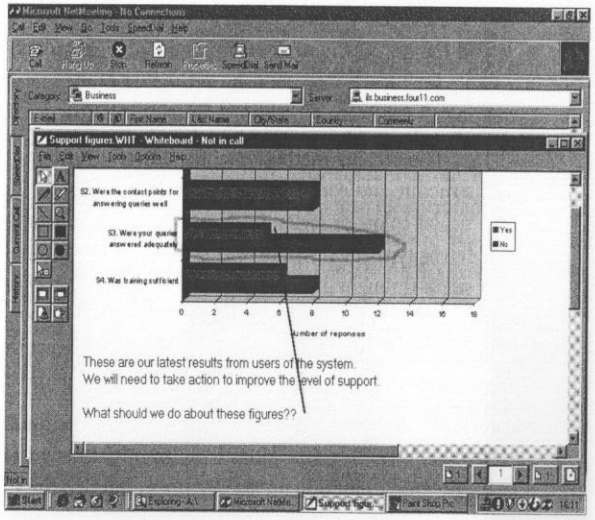


Figure 3.9
Shared whiteboard feature of Microsoft Netmeeting

Document Conferencing

Document conferencing is another form of collaborating on documents, but in real time. A primitive form of document conferencing is to capture a bitmap image of a word processed page or a spreadsheet and then annotations can be made using the whiteboard software described above. It is now possible to perform interactive document conferencing where it is the document source itself that is modified rather than a passive bitmap image of the source. This method, although more complex, has the advantage that it is only the commands to modify the document that are passed down the line rather than a modified bitmap. Similar techniques are used for shared applications.

Data Conferencing

Data conferencing is an alternative term for conferencing which includes the transmission of digitized audio or voice together with numeric data such as financial information. T.120 is the ITU data conferencing standard. This specifies standards for file transfer, whiteboards and application sharing.

Groupware Function: Collaborative Authoring and Document Sharing

The functionality to enable coauthors to work together on documents is now a mainstream feature of most word processors such as Lotus WordPro or Microsoft Word. This group working facility enables a document to be reviewed and changes suggested according to two different models.

First, it is possible for each author to insert annotations at different points in the document while retaining its original structure. In Word, annotations are shown as a separate pane at the foot of the screen with the choice of viewing all reviewers annotations, or selecting a particular coauthor.

The second method enables different authors to make revisions to the structure and content of the original document which are highlighted in particular colors or styles. Each author can be allotted a particular color and different types of revisions will be shown differently. For example, deletions as strike-through, insertions as underline. An example of a document being modified is shown in Figure 3.10. To review changes there is an option to review revisions in turn and either accept or reject them. Facilities also exist to compare separate documents and merge different versions.

When using these facilities it is important to limit access only to the authors either by using permissions assigned by the network administrator or by using password protection on the document through the authoring package.

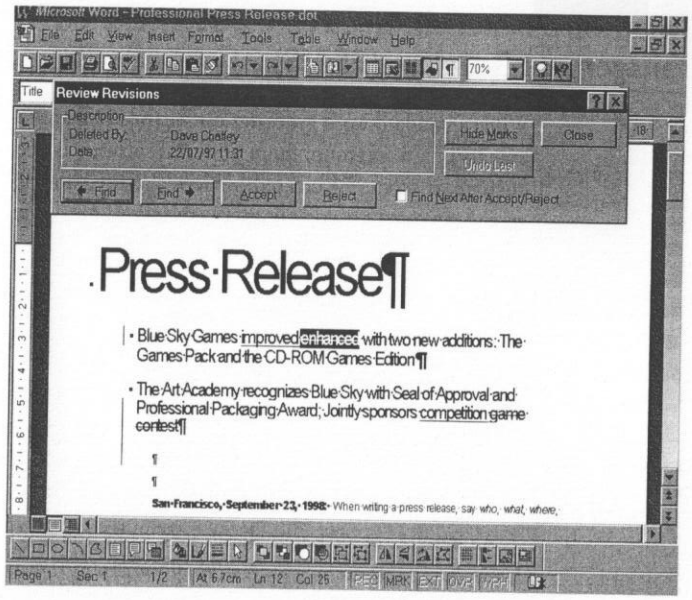


Figure 3.10 *Use of revision marks and annotations in Microsoft Word*

The adoption of these features is limited in many companies as authors prefer to review and mark up a paper copy and the use of these features needs some training. However, all that is necessary to view revisions in a Word document shared by several authors is to choose the Revisions option from the Tools menu and select "show revisions when editing." Another difficulty is that it is necessary to decide on a strategy for managing the editing process. The choices are similar to those for paper documents.

One alternative is that the common or master document can be mounted on a shared network drive and then reminders sent out by e-mail to make modifications to the document. This has the disadvantage that if multiple users wish to access the file there may be conflicts in revision. If the word processor is integrated with the mail system such as Microsoft Mail or Exchange, documents then can be routed easily to coauthors. This can be done sequentially with each author receiving the document in turn or more commonly the document is routed to all workers simultaneously and then a copy of the document returned after the individual has made the changes. The latter has the advantage that more time is available for review, but has the disadvantage that all the modifications must be reviewed and merged separately. The routing of documents is a straightforward example of workflow.

Groupware Function: Electronic Document Management Software (EDMS)

While a standard word processor can be used to manage production of documents in a workgroup, more powerful software is needed to enable large documents sets to be created, reviewed, edited and approved and subsequently accessed throughout an organization. This process is known as the document lifecycle and consists of the stages of:

- author
- review and annotate
- modify
- publish
- distribute
- modify and repeat the cycle

An example of a package that is used to help in this lifecycle is shown in Figure 3.11. *Document management software* (DMS) or electronic publishing software is used to enable people to collaborate in the production of such documents and also provide tools for the distribution and sharing of documents through the enterprise. Three of the best known companies providing document management software are Interleaf, Documentum and Filenet/ Saros Mezzanine. All are in the process of introducing web browser based access for their products. Many startups are also beginning to introduce similar tools for intranets as described in Chapter 5.

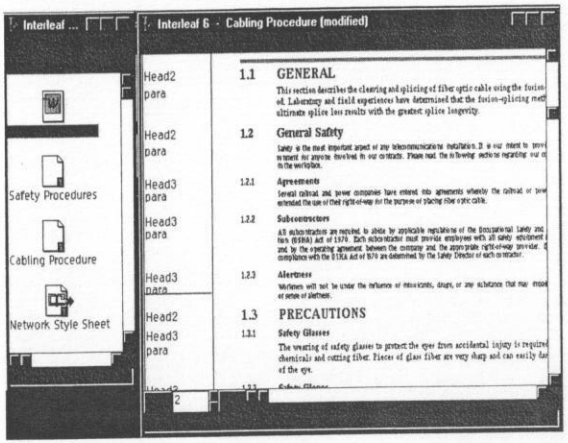


Figure 3.11
Interleaf document publishing used for larger document sets such as company procedures

Typical EDMS tools, for example from Interleaf are for:

- creation of compound documents with check-in, check-out version management of updates (Interleaf product)
- document management (WorldView and RDB product)
- document access using Internet tools across an intranet or the Internet (Intellecte/Business Web)
- document conversion and scanning
- database publishing (DBLink) for example of catalogs, directories and price lists

Web reference: http://www.filenet.com (includes information on Saros Mezzanine product).

Web reference: http://www.interleaf.com

Web reference: http://www.documentum.com

Web reference: http://www.keyfile.com

Such tools are necessary to manage the thousands of documents which exist in a large company to define processes, products and customer information. For example, the CERA bank in Belgium uses Interleaf to manage 18,000 pages containing commercial, legal and fiscal information of which 150 have to be updated each week and distributed to branches. In the UK, the Abbey National Bank may send out up to 300 changes a month to its two million pages of product information, procedures and manuals. Intereaf WorldView is used by 15,000 users to access this documentation across the company WAN.

When supporting documentation is important in product development, document management software can help reduce production times and reduce the risk of specification and design errors. Glaxo Wellcome, the multinational pharmaceutical company uses Documentum to manage their new drug development while Boeing uses a DMS to manage product information and 70,000 pages of standards that define key business processes. The sources of savings at Boeing identified by IDC are illuminating: 31% of savings are through time saved in accessing the documents with only 6% through removing the paper distribution of documents. Significantly 63% of savings come through reduction in the amount of rework caused by out-of-date documents.

As the industry matures, EDMS are increasingly being linked to workflow systems. This is reflected by the company activity. For example Eastman-Kodak with a focus on imaging has taken over document management functions from Wang and workflow vendor Filenet has bought document management specialist

Saros. Today an EDMS may provide the following functions, of which workflow functions are covered in more detail in the next chapter.

- Document management
- Imaging
- Workflow
- Computer Output to Laser Disk (COLD)

Groupware Function: Scheduling and Calendaring Software

The final category of groupware considered in this chapter is that used for diary or calendar management within an organization. When justifying groupware to managers who are unfamiliar with the technology, this is perhaps the easiest function to explain since the problems of arranging times for meetings will be known to all, and an electronic solution will have obvious appeal. The functions of these packages include calendaring (the process of entering names and times onto calendars) and scheduling (arranging a convenient time for a meeting).

These packages provide a shared diary available via the network for employees to arrange meetings quickly without clashes. Sophisticated group scheduling products automatically seek the optimum time for a given list of participants and confirm the meeting time and agenda using e-mail. Products available to provide these functions are available in a range of categories, according to the scale at which they are deployed:

1. Workgroup based applications
2. Department based applications
3. Whole enterprise applications.

Workgroup based applications are often based on Personal Information Managers. Early versions of Lotus Organizer provide an example of such a product. These products tend to focus more on individual information management rather than group features. They may not scale well to larger numbers of users. For larger numbers of users, integration with the company e-mail and directory services are required. This may be achieved though integrating products such as Lotus Organizer with Lotus cc:Mail or Notes.

An alternative approach from Lotus was to provide a special document template in Notes for calendar management. Although functional, this was quite primitive compared with more specialized solutions from other vendors.

Crosswind Technologies introduced a client/server solution in 1992 for the enterprise market and other competitors have entered the market since this time. Enterprise solutions can also be deployed using the prevalent groupware packages—Exchange, Notes and Groupwise.

One of the biggest problems of implementing a cross-enterprise solution is the popularity of this type of package. Different departments and subsidiaries and even individuals are likely already using a variety of different packages which are often incompatible. In this case, a high-level decision to standardize on a single product may be the only way to achieve a solution for the enterprise. Standards such as ICAP (see next page) are being developed to help improve interoperation between different products. If and when this standard becomes widely accepted it will greatly improve intra-enterprise scheduling and could open the door to interenterprise scheduling. Increasingly, the client parts of calendaring and scheduling functions are being built into the operating system. At the same time, there is a trend to using TCP/IP based networks, including the Internet as the means for transporting the information.

Web reference: http://www3.lotus.com/organize

A specialized type of group-scheduling software is that used for project management such as Microsoft Project. This software was originally used by the project manager as a standalone application, but group availability of the schedule is now common to many of these packages.

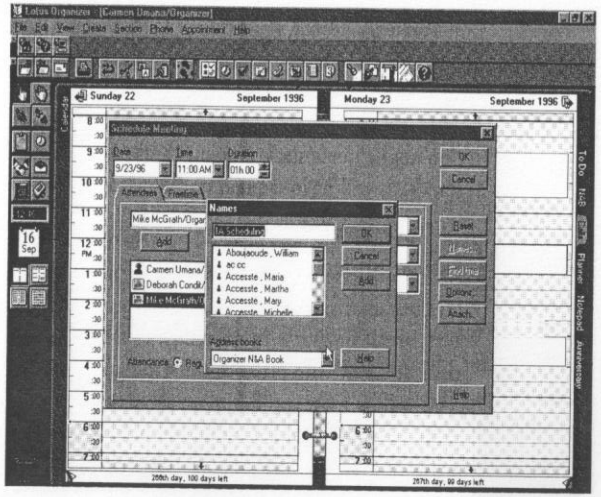


Figure 3.12 *Group-scheduling software—Organizer from Lotus*

Calendar Standards

Previous attempts at developing a single calendaring standard have been well supported, but not translated into delivered products. The XAPIA Calendaring and Scheduling API (CSA) of 1994 was one result which was not widely adopted, possibly due to its complexity. The emergence of the Internet as a medium for scheduling has resulted in further efforts to produce a standard.

The Internet Calendar Access Protocol (ICAP) has been sanctioned by the Internet Engineering Task Force under the moniker Internet calendaring and scheduling core object specification. This very likely represents the future of calendaring. It allows group schedulers, Personal Information Managers and Contact Managers to share information. The protocol has the following features which are closely linked to the IMAP4 standard referred to under e-mail standards:

1. Selective retrieval of calendar information based on date ranges. This is to minimize network traffic.
2. Permit users to browse other users' calendars, subject to access control limits. This allows a user to find free times during which to schedule meetings with other users.
3. Posting of new schedule items in another user's calendar.
4. Creating, deleting and renaming of multiple calendar stores per user. A user may want to separate their personal calendar information from their work calendar.

Web reference: http://www..ietf.org/home.html or
http://www.ietf.cnri.reston.va.us/

A closely related standard is the vCalendar format from the Versit consortium which is supported by the Internet Mail consortium. This is not a protocol, but defines the format of the data normally stored within a calendaring or scheduling application, and allows the cross platform exchange of information about items such as events and to-do items. It is probable that the two standards will be integrated in the majority of scheduling products.

Web reference: http://www.imc.org (Internet Mail consortium)

If this happens, and it is a big if, the adoption of these standards will be a big breakthrough since different calendar products do not interoperate in the way that e-mail programs do currently. Different products will be able for the first time to check with other calendar programs for the availability of participants. This will be most useful for very large organizations with different calendar systems and when different companies need to collaborate. The standard is designed to function across time zones, so this is also advantageous for the global company.

4

Workflow Management Systems

Introduction—What Is Workflow?

Workflow Management Systems (WFMS) are specialized types of software systems used to assist in computer supported collaborative work. WFMS are often referred to as workflow automation since they can automate the tasks or activities undertaken by both people and computer resources of an organization. WFMS are often introduced since they support new ways of working as businesses reengineer. They are used in mission critical areas such as in financial services for issuing loans and for common administrative functions such as processing purchase orders.

The Workflow Management Coalition (WfMC) describes workflow as:

> "The computerized facilitation or automation of a business process in whole or part."

and a Workflow Management System as:

> "A system that defines, creates and manages the execution of workflows through the use of software, running on one or more workflow engines, which is able to interpret the process definition, interact with workflow participants and, where required, invoke the use of IT tools and applications."

As an example of a workflow application, let's return to the clerk investigating a claim on a car insurance policy. The clerk will have to follow a series of steps over days or weeks in deciding whether to settle the claim. Over this period he or she will be dealing with many other similar claims and the documentation associated with them. A workflow system will assist by providing a checklist of tasks to be conducted each day and providing information on the customer and other insurers. The system will permit collaboration by enabling other clerks to share the same case if necessary or provide a manager doing the final authorization with the information they need to approve the claim. The workflow system will also provide an overview of the status of the