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# Lecture Notes

# on

# *INFORMATION RESOURCES*

# Part II

# Introduction to Lotus Notes Collaborative Software

**CONTENT**

# 1    COLLABORATIVE SOFTWARE

**Collaborative software** is software designed to help people involved in a common task achieve their goals. Collaborative software is the basis for computer supported cooperative work.

Such software systems as email, calendaring, text chat, wiki (a website that allows visitors to add, remove, and edit content) belong in this category. It has been suggested that Metcalfe's law (states that the value of a telecommunications network is proportional to the square of the number of users of the system $(n^2)$) — the more people who use something, the more valuable it becomes — applies to such software.

The more general term social software applies to systems used outside the workplace, for example, online dating services and social networks like Friendster (an Internet social network service) and Facebook (a social networking website). The study of computer-supported collaboration includes the study of this software and social phenomena associated with it.

Other words, collaborative software is a class of software that helps groups of colleagues (*workgroups*) attached to a local-area network organize their activities.

Groupware is sometimes called *workgroup productivity software.*

Groupware is software intended create an environment that will foster communication and coordination among a group of people. There are numerous products available that fit the "groupware" definition; each product having its own distinctive functions in addition to, what might be known as, core functions. Some examples of core functions might include the following:

- Project and task definition;
- Collaborative writing;
- Workflow systems;
- Group calendaring;
- Hypertext linking;
- Email and mailing lists;
- Newsgroups.

Any groupware solution should provide users with the ability to create a work area or project, define and schedule tasks for the project, manage and share documents, images, data or messages associated with the project and define who can access information associated

Groupware is software that facilitates a group of people working within the same system or application, no matter where they happen to be. Such groupware applications are commonly email,

newsgroups, and chat. Common groupware applications that are easily recognized by today's computer users include Lotus Notes, email server systems such as FirstClass and Microsoft Exchange, 24Seven Office, Livelink, and Workspot.

Some experts divide groupware into three categories: communication tools, conferencing tools, and collaborative management tools. Communication tools include email, FAX, and voice mail. Conferencing tools include data, voice, and video conferencing; and message boards and chat rooms. Collaborative management tools include electronic calendars, project management systems, and workflow systems.

Other experts divide groupware into two categories related to time and two other categories related to place. When employees are using an application at the same time, it is synchronous groupware; workers using the same application at different times, however, are using asynchronous groupware. The place-related categories are collocated, groupware that is used by people in the same place; and distance, groupware that is used by people in different places.

Businesses use groupware for a variety of reasons. One primary reason is to bypass the traditional problem of having employees in different places who need to work on the same application. By logging in to a network or intranet server, employees in different places can access the same application and benefit from the various perspectives and opinions of others. This functionality is a primary facet of telecommuting. If you can log in to the company server from anywhere, then you don't need to be in the office in order to access certain groupware.

Telecommuting can save on travel costs for both companies and employees. It can also enable real-time communication when it would otherwise be impossible. This communication can foster a greater understanding of the targets and goals of a business's projects, through group discussion of each step along the way to achieving those targets and goals.

Another use for groupware is group problem-solving. Many times, some employees see things differently from other employees. If they are all working within the same application framework, they can solve problems collectively, saving the company time and money. Without groupware, such real-time cooperation would not be possible.

If you have ever heard anything about groupware, you have probably also heard of CSCW. CSCW stands for Computer Supported Cooperative Work and is the study of groupware, i.e. how it is designed, developed, adopted, and used. People that are involved with the study of CSCW not only include software designers and computer scientists, but also researchers and people that study organizational behavior.

## 1.1   Overview

Collaboration, with respect to information technology, seems to have several definitions. Some are defensible but others are so broad they lose any meaningful application. Understanding the differences in human interactions is necessary to ensure the appropriate technologies are employed to meet interaction needs.

There are three primary ways in which humans interact: conversations, transactions, and collaborations.

*Conversational interaction* is an exchange of information between two or more participants where the primary purpose of the interaction is discovery or relationship building. There is no central entity around which the interaction revolves but is a free exchange of information with no defined constraints. Communication technology such as telephones, instant messaging, and e-mail are generally sufficient for conversational interactions.

*Transactional interaction* involves the exchange of transaction entities where a major function of the transaction entity is to alter the relationship between participants. The transaction entity is in a relatively stable form and constrains or defines the new relationship. One participant exchanges money for goods and becomes a customer. Transactional interactions are most effectively handled by transactional systems that manage state and commit records for persistent storage.

In *collaborative interactions* the main function of the participants' relationship is to alter a collaboration entity (i.e., the converse of transactional). The collaboration entity is in a relatively unstable form. Examples include the development of an idea, the creation of a design, the achievement of a shared goal. Therefore, real collaboration technologies deliver the functionality for many participants to augment a common deliverable. Record or document management, threaded discussions, audit history, and other mechanisms designed to capture the efforts of many into a managed content environment are typical of collaboration technologies.

An extension of groupware is *collaborative media*, software that allows several concurrent users to create and manage information in a website. Collaborative media models include wiki (Comparison of wiki software) and Slashdot models. Some sites with publicly accessible content based on collaborative software are: WikiWikiWeb, Wikipedia and Everything2. By method used we can divide them in:

- o   Web-based collaborative tools;
- o   Software collaborative tools.

By area served we can divide them in:

- o   Knowledge management tools;
- o   Knowledge creation tools;
- o   Information sharing tools;
- o   Collaborative project management tools.

## *1.2    The Three levels of collaboration*

Groupware can be divided into three categories depending on the level of collaboration—communication tools, conferencing tools and collaborative management (Co-ordination) tools.

Communication can be thought of as unstructured interchange of information. A phone call or an IM Chat discussion are examples of this. Conferencing (or collaboration level, as it is called in the academic papers that discuss these levels) refers to interactive work toward a shared goal. Brainstorming or voting are examples of this. Co-ordination refers to complex interdependent work toward a shared goal. A good metaphor for understanding this is to think about a sports team; everyone has to contribute the right play at the right time as well as adjust their play to the unfolding situation - but everyone is doing something different - in order for the team to win. That is complex interdependent work toward a shared goal: co-ordination.

## *1.3    Electronic communication tools*

Electronic communication tools send messages, files, data, or documents between people and hence facilitate the sharing of information. Examples include:

- synchronous conferencing;
- e-mail;
- Instant Messaging;
- Faxing;
- voice mail;
- Wikis;
- Web publishing.

## *1.4    Electronic conferencing tools*

Electronic conferencing tools facilitate the sharing of information, but in a more interactive way. Examples include:

- Internet forums (also known as message boards or discussion boards) — a virtual discussion platform to facilitate and manage online text messages;

- Online chat — a virtual discussion platform to facilitate and manage real-time text messages;

- Telephony — telephones allow users to interact;

- Video conferencing — networked PCs share video and audio signals;

- Data conferencing — networked PCs share a common whiteboard that each user can modify;

- Application sharing — users can access a shared document or application from their respective computers simultaneously in real time;

- Electronic meeting systems (EMS) — a conferencing system built into a room. The special purpose room will usually contain a large video projector interlinked with numerous PCs.

## 1.5   Collaborative management tools

Collaborative management tools facilitate and manage group activities. Examples include:

- electronic calendars (also called time management software) — schedule events and automatically notify and remind group members;

- project management systems — schedule, track, and chart the steps in a project as it is being completed;

- workflow systems — collaborative management of tasks and documents within a knowledge-based business process;

- knowledge management systems — collect, organize, manage, and share various forms of information;

- extranet systems (sometimes also known as 'project extranets') — collect, organize, manage and share information associated with the delivery of a project (eg: the construction of a building);

- social software systems — organize social relations of groups;

- online spreadsheets — collaborate and share structured data and information.

Collaborative software can be either web based (such as UseModWiki or Scoop), or desktop systems (such as CVS or RCS).

## 1.6   Implementation

The biggest hurdle in implementing groupware is convincing people to use it. Training is required to make people comfortable using it, and if people don't feel comfortable with the software, they won't use it. Employees should be given incentives to contribute: the rewards could be either financial or psychological.

In many cases collaboration is at odds with the company's corporate culture so implementation will be disruptive. Shifting a corporate culture from being competitive to being cooperative is no small undertaking.

One of the biggest hurdles is the typical large enterprise desire to standardize knowledge practice across that enterprise and to implement tools and processes which support that aim. Much greater value and quicker implementation can be achieved by avoidance of the "one size fits all" meme. Driving people to adopt the same active role (for example: contribution measured by number of uploads) only produces the behavior driven by the metric - "the game exists of the rules by which it is played". Cultivate the practice of collaboration where it flourishes of its own volition to gain the quickest return.

## 1.7   Voting methods

Voting has many uses in collaboration software. Condorcet voting (a single winner election method in which voters rank candidates in order of preference) offers input from multiple experts or perspectives and may reduce intransitivity problems in decision making. In recommendation systems, rating or voting on many items can be used to formulate profiles for highly successful recommendations; and in document collaboration, such as Wikipedia, voting methods help to guide the creation of new pages.

Use of voting to order lists of *sections* such as this one remains largely unexplored. This also pertains to collective intelligence.

## 1.8   The differences between groupware and traditional user interface

Where a traditional user interface generally focuses on the use of only one person, groupware relates to groups and understanding how people work and function in a group. Groupware is also more focused on the ease of use for the user because the system must be more responsive as the pace of a particular application is generally driven by the pace of the conversation. Other factors, such as the size of the group, and the roles that people play are taken into consideration when designing groupware.

Groupware has many functions and can be a very useful tool to keep your company organized and your employees working in unity. While there are many advantages to using groupware I have listed a few key ideas below. By having some sort of groupware in your company you can allow your employees to:

- Share information;
- Keep common schedules;
- Manage e-mail;

- Maintain bulletin boards;

- Have several people work on one document;

- Write collectively;

- Hold real-time network meetings;

- Share files;

- Share calendars;

- Share database access;

- Share spreadsheets;

- Have electronic conferencing;

- Have cooperative project management.


As you can see, there are several advantages to using groupware to keep your company more organized and unified. Groupware will allow your employees to collaborate on information, ideas, and many other facets of their work and allow them to be more effective, productive, and organized. We already know that when we combine the efforts of each individual in an organization, we will see greater achievements and more success. If your company could benefit from groupware, then I encourage you to find out more about it and explore different possibilities to see which one will fit your needs the best. It will be one of the best decisions you will make with regard to the organization of your company documents, ideas, and information.

## 2    IBM LOTUS NOTES

### 2.1    History

Lotus Notes has a history spanning more than 20 years. Its chief inspiration was *PLATO Notes*, created by David Woolley at the University of Illinois in 1973. In today's terminology, PLATO Notes was a message board, and it was the basis for an online community which thrived for more than 20 years on the PLATO system. Ray Ozzie (He was formerly best known for his role in creating Lotus Notes), who in 2006 succeeded Bill Gates as Chief Software Architect at Microsoft, worked with PLATO while attending the University of Illinois in the 1970s. When PC network technology began to emerge, Ozzie made a deal with Mitch Kapor, the founder of Lotus Development Corporation, that resulted in the formation of Iris Associates in 1984 to develop products that would combine the capabilities of PCs with the collaborative tools pioneered in PLATO. The agreement put control of product development under Ozzie and Iris, and sales and marketing under Lotus. In 1994, after the release and marketplace success of Notes R3, Lotus purchased Iris. In 1995 IBM purchased Lotus.

When Lotus Notes was initially released, the name "Notes" referred to both the client and server components. In 1996, Lotus released an add-on for the Notes 4 server called "Domino". This add-on allowed Notes documents to be rendered as web pages in real time. With the release of Notes 4.5, later that year, the Domino web server was integrated into the core Notes server, which was itself renamed to "Domino". The client is still called "Notes", while the server component is now known as "Domino". However, one may frequently see the terms used interchangeably.

### 2.2    What is Lotus Notes?

The design of Notes is based around the sharing of "Notes databases" held on a network of connected server computers. Since these databases can be accessed across the computer network, Notes allows information to be distributed between different users, using these shared databases.

Databases might contain anything: company reports, telephone numbers, or any form of data which can be put into a computer. In this, Notes has similarities with many other database systems. Notes, however, is designed to be used on a far smaller scale. Whereas computer databases traditionally hold large amounts of data, Notes databases usually hold less than a few thousands records. These smaller applications take the form of notice boards, restaurant menus, discussion databases, and the like. These databases allow groups of users to share information in a structured or semi-structured way. It is Notes' flexibility and ease of use which make it possible to use a database on this small scale,

where traditional databases would be too cumbersome. For it to be economic to develop these small databases the designing of a database has to be a relatively straightforward task. Accordingly, Notes has rapid development tools, and a straightforward programming language similar to that used in spreadsheets such as Microsoft Excel, which makes developing databases a relatively rapid activity. As with spreadsheets, a visual nature and language based on formulas rather than procedures helps the novice user to quickly create applications (Nardi and Miller 1990). Notes is commonly described as 'groupware' (Lou 1994; Lloyd and Whitehead 1996) since by providing a facility for data sharing, these databases become sites for collaboration. Many of the classic collaborative applications such as collaborative writing, discussion groups and workflow systems can be implemented using Notes databases. Another example of Notes used as groupware is Winograd and Flores' action workflow system, which is implemented on top of Notes (Medina-Mora, Winograd et al. 1992). So while Notes has similarities to traditional databases, the quantitative difference in scale results in a qualitative difference in capability. Electronic mail functionality is also incorporated into Notes through databases which act as the equivalent of individual mail folders. For this reason Notes is sometimes used solely as an email platform, ignoring its more advanced functionality.

### 2.3    *Lotus Notes architecture*

**Lotus Notes** is a client-server, collaborative application owned by IBM Software Group. IBM defines the software as an "integrated desktop client option for accessing business e-mail, calendars and applications on [an] IBM Lotus Domino server.

**Client server** is network architecture which separates a client (often an application that uses a graphical user interface) from a server. Each instance of the client software can send requests to a *server*. Although this idea can be applied on many different kinds of applications for a variety of reasons, the basic architecture remains the same.

**Characteristics of a server:**

- Passive (slave);
- Waits for requests;
- Upon receipt of requests, processes them and then serves replies.


**Characteristics of a client:**

- Active (master);
- Initiates requests;
- Waits for and receives server replies.

Servers can be stateless or stateful. A stateless server does not keep any information between client requests. A stateful server, on the other hand, can remember information between requests. The scope of this remembered information can be global or session-specific. An HTTP server for static HTML pages is an example of a stateless server, while Apache Tomcat is an example of a stateful server.

The interaction between client and server is often described using sequence diagrams. Sequence diagrams are standardized in the UML (Unified Modeling Language, a standardized specification language for object modeling).

Another type of network architecture is known as peer-to-peer, because each node or instance of the program can simultaneously act as both a "client" and a "server", and because each has equivalent responsibilities. Peer-to-peer architectures are often abbreviated using the acronym "P2P".

Both client-server and P2P architectures are widely used in the industry.

## 2.4    Features

The Notes client is mainly used as an email client, but also acts as an instant messaging client (for Lotus Sametime), browser, notebook, and calendar/resource reservation client, as well as a platform for interacting with collaborative applications (Fig. 1). People who support the Notes client regard the easy interoperability of all of these roles as a major advantage in multiple-application business environments. In the early days of the product, the most common applications were threaded discussions and simple contact management databases. Today Notes also provides blogs (is a website where entries are made and displayed in a reverse chronological order.), wikis, RSS (a family of web feed formats used to publish frequently updated digital content, such as blogs) aggregators, CRM and Help Desk systems, and organizations can build a variety of custom applications for Notes using Domino Designer.

The Notes client can be used as an IMAP and POP e-mail client with non-domino mail servers. Recipient addresses can be retrieved from any LDAP (Lightweight Directory Access Protocol, is an application protocol for querying and modifying directory services running over TCP/IP) server, including Active Directory. The client also does web browsing although most people configure it to launch their default browser instead.

Features include group calendaring and scheduling, SMTP-based e-mail (HTML based e-mail is available to Java developers), NNTP-based news support, and automatic HTML conversion of all documents by the Domino HTTP task.

Notes instant messaging allows you to see your coworkers online and have chat sessions with them. A chat session can be with one person or multiple people (an instant meeting).

In its latest version (7), Notes provides a web services interface. Domino can be a web server for HTML files too; authentication of access to Domino databases or HTML files uses Domino's own user directory and external systems such as Microsoft's Active Directory.

A design client is available to allow rapid development of databases consisting of forms, which allow users to create documents; and views, which display selected document fields in columns.

In addition to being a "groupware" system (e-mail, calendaring, shared documents and discussions), Notes/Domino is also a platform for developing customized client-server and web applications. Its use of design constructs and code provide capabilities that facilitate the construction of "workflow" type applications (which may typically have complex approval processes and routing of data).
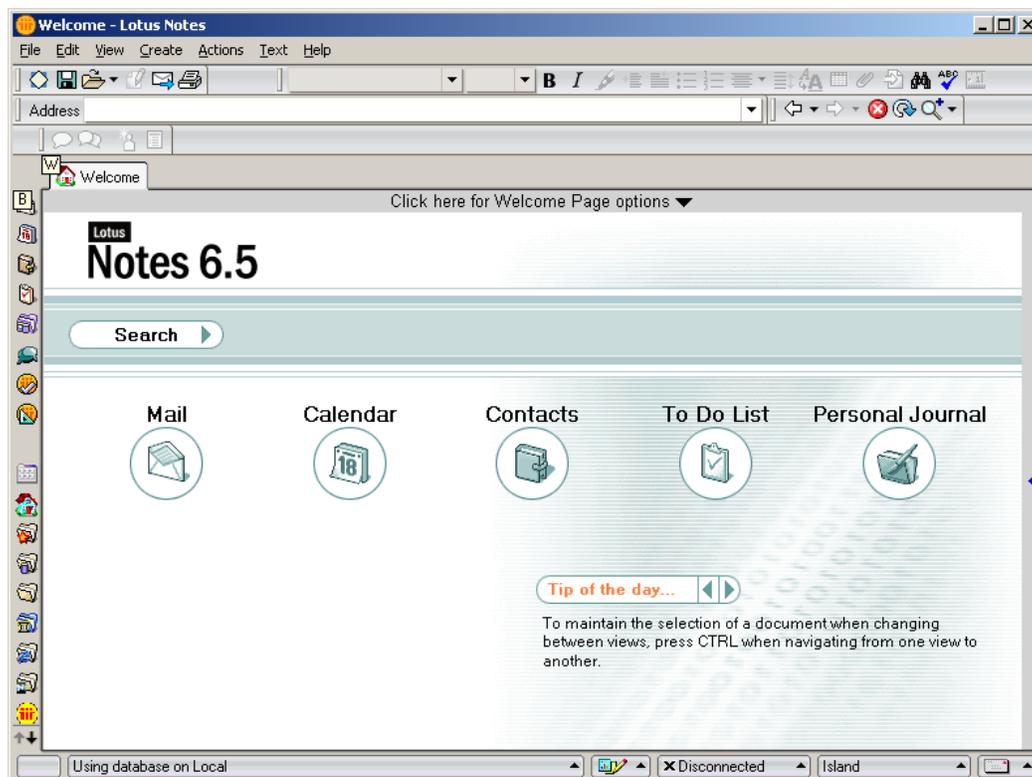


**Fig. 1. IBM Lotus Notes 6.5 default Welcome Page**

## 2.5   *Data Replication*

A unique feature of Notes and Domino is its replication facilities. Servers and clients can replicate database designs and data across many types of networks (including modems). This enables users to take full advantage of Notes databases while being off-line—with the client synchronizing any

changes when client and server next connect. Even while off-line full security can be preserved, but only by encrypting each database to a specified Notes ID file. Prior to Notes 6, new local replicas were created without this encryption, which led some security Web sites to claim a major security back door in Notes. With Notes 6, however, new replicas are, by default, encrypted to the Notes ID that is used to create them. Replication can be scheduled, initiated manually, or initiated programmatically. Replication takes place between a client and a server (initiated by the client) or between two servers.

## 2.6    Security

Security is built into the product. Notes was the first widely adopted software product to use public key cryptography for client-server and server-server authentication and for encryption of data, and it remains the product with the largest installed base of PKI users. Until US laws regulating encryption were changed in 2000, Lotus was prohibited from exporting versions of Notes that supported symmetric encryption keys that were longer than 40 bits. In 1997, Lotus negotiated an agreement with the NSA (National Security Agency/Central Security Service (NSA/CSS) is the U.S. government's cryptologic organization) that allowed export of a version that supported stronger keys with 64 bits, but 24 of the bits were encrypted with a special key and included in the message to provide a "workload reduction factor" for the NSA. The effect of this was that users of Notes outside of the US had stronger protection against private sector industrial espionage, but no additional protection against spying by the US government. This implementation was not a secret - in fact it was widely announced - but with some justification many people did consider it to be a backdoor (a method of bypassing normal authentication or securing remote access to a computer, while attempting to remain hidden from casual inspection). Some governments objected to being put at a disadvantage to the NSA, and as a result Lotus continued to support the 40 bit version for export to those countries. Under current US export laws, Lotus supports only one version of the Notes PKI with 128 bit symmetric keys, 1024 bit public keys, and no workload reduction factor. The Domino server's security tools also include S/MIME, SSL 3.0 support with industry standard key sizes for HTTP and other Internet protocols, X.509 client certificates, and an integrated certificate authority.

## 2.7    Programming

Notes/Domino is a cross-platform, secure, distributed document-oriented database and messaging framework and rapid application development environment that includes pre-built applications like email, calendar, etc. This sets it apart from its major commercial competitors, such as Microsoft

Exchange or Novell GroupWise, which are generally purpose-built applications for mail and calendaring that offer APIs for extensibility.

Lotus Domino databases are built using the Domino Designer client, available only for Windows. A key feature of Notes is that many replicas of the same database can exist at the same time on different servers and clients, across dissimilar platforms, and the same storage architecture is used for both client and server replicas. Originally, replication in Notes happened at document (i.e. record) level. With release of Notes 4 in 1996, replication was changed so that it now occurs at field level.

A database is an NSF (Notes Storage Facility) file, containing basic units of storage known as a "note". Every note has a UniqueID and a NoteID. The UniqueID uniquely identifies the note across all replicas within a cluster of servers, a domain of servers, or even across domains belonging to many organizations that are all hosting replicas of the same database. The NoteID, on the other hand, is unique to the note only within the context of one given replica. Each note also stores its creation and modification dates, and one or more Items.

There are several classes of notes, including design notes and document notes. Design notes, which are created and modified with the Domino Designer client, represent programmable elements, such as the GUI layout of forms for displaying and editing data, or formulas and scripts for manipulating data. Document notes, which are created and modified with the Lotus Notes client, via a web browser, via mail routing and delivery, or via programmed code, represent user data.

Document notes can have parent-child relationships, but Notes should not be considered a hierarchical database in the classic sense of IMS (Information Management System, is a joint hierarchical database and information management system with extensive transaction processing capability). Notes databases are also not relational, although there is a SQL driver that can be used with Notes, and it does have some features that can be used to develop applications that mimic relational features. There is no support for atomic transactions in Notes, and its file locking is rudimentary at best. Notes is essentially a document-based, schemaless, loosely structured database with support for rich content and powerful indexing facilities. This structure closely mimics paper-based workflows that Lotus Notes is typically used to automate.

Items represent the content of a note. Every item has a name, a type, and may optionally have some flags set. A note can have more than one item with the same name. Types include Number, Number List, Text, Text List, Date-Time, Date-Time List, and Rich Text. Flags are used for managing attributes associated with the item, such as read or write security. Items in design notes represent the programmed elements of a database. For example, the layout of an entry form is stored in the rich text

Body item within a form design note. This means that the design of the database can replicate to users' desktops just like the data itself, making it extremely easy to deploy updated applications.

Items in document notes represent user-entered or computed data. An item named "Form" in a document note can be used to bind a document to a form design note, which directs the Lotus Notes client to merge the content of the document note items with the GUI information and code represented in the given form design note for display and editing purposes. The resulting loose binding of documents to design information is one of the cornerstones of the power of Lotus Notes. Traditional database developers used to working with rigidly enforced schemas, on the other hand, may consider the power of this feature to be a double-edged sword.

Notes applications development uses several programming languages. Formula (a scripting language used by Lotus Notes) and LotusScript (a dialect of the BASIC programming language used by Lotus Notes and other IBM Lotus Software products) are the two main ones. LotusScript is similar to, and may even be considered a specialized implementation of, Visual Basic, but with the addition of many powerful native classes that model the Notes environment, whereas Formula is unique to Notes but similar to Lotus 1-2-3 formula language.

Since Release 5, Java and JavaScript are also integrated into Lotus Notes. LotusScript is the primary tool in developing applications for the Notes client, as well as server-based processing. Java and JavaScript are the primary tools for developing applications for browser access, allowing browsers to emulate the functionality of the Notes client. The Notes client can now natively process Java and JavaScript code, although applications development usually requires at least some code specific to only Notes or only a browser. However, the Mac client does not support Java and the Windows client usually does not support the most recent version of Java.

As of version 6, Lotus established an XML programming interface in addition to the options already available. The Domino XML Language (DXL) provides XML representations of all data and design resources in the Notes model, allowing any XML processing tool to create and modify Notes/Domino data.

External to the Lotus Notes application, IBM provides toolkits in C, C++, and Java to connect to the Domino database and perform a wide variety of tasks. The C toolkit is the most mature and the C++ toolkit is an objectized version of the C toolkit, lacking many functions the C toolkit provides. The Java toolkit is the least mature of the three and can be used for basic application needs.

## 2.8    Database

Notes databases are different from RDBMS (relational database management system) since they are document centric, allow multi values in items (fields), don't require a schema (they use a meta schema instead), come with built-in document-level access control and store RichText data. However, you can map a Notes database to a relational database by tools like JDBCSql for Domino or NotesSQL.

RDBMS developers often find it difficult to conceptualise the difference. It may be useful to think of a Notes document (a 'note') as analogous to an xml document natively stored in a database (although with limitations on the data types and structures available).
The benefits of this data structure are:

1.  No need to define size of fields, or datatype — although you can if you want to.
2.  Attributes (= Notes fields) which are null, take up no space in a database.
3.  Built-in full text searching.

## 2.9    Use as an email client

Lotus Notes is commonly deployed as an end-user email client in larger organizations, accounting for more than 120,000,000 total users according to IBM's latest figures.

When an organization employs a Lotus Notes server, it usually means all its users use the Lotus Notes client for reading mail and for using databases. However, the Domino server also supports POP3 and IMAP mail clients, and through an extension product (DAMO - Domino Access for Microsoft Outlook) supports native access for Microsoft Outlook clients. Lotus also provides Domino Web Access, to allow the use of email and calendaring features through Internet Explorer and Firefox web browsers on Windows, Mac and Linux client platforms.

There are several spam filtering programs available, and a rules engine allowing user defined mail processing to be performed by the server.

## 2.10   How Notes differs from other email clients

Lotus Notes is a unique environment. It was designed to be a collaborative application platform where email was just one of numerous applications that ran in the Notes client software. The Notes client was also designed to run on multiple platforms including Windows, UNIX, Linux and Mac. These two factors have resulted in the user interface containing some differences from applications that only run on Windows. Furthermore these differences have often remained in the product to retain backward compatibility with earlier releases, in favor of conforming to Windows UI standards. Some of Notes differences include:

- Notes requires users to select a 'New Memo' to send an email, rather than New Mail;
- Some keystrokes that some other popular mail applications bind to commonly used features do not work in Notes. Examples are:
  - o Notes uses Ctrl->M to create a new mail, whereas some other mail clients use Ctrl->N for this purpose. (However, Netscape's mail component and Mozilla Thunderbird also use Ctrl->M on a PC, or Shift->Command->M on a Macintosh);
  - o Ctrl->R, to create an email reply, also does not work in Notes, which uses Alt->2,R for this purpose;
  - o Notes uses F9 as its refresh key and F5 to log a user out without terminating the program. Some Microsoft applications (e.g., Outlook 2002, Explorer, Internet Explorer) use F5 as a refresh key, others (e.g. Outlook 2003, Word, Excel) use F9. F9's use as the refresh key in PC applications pre-dates Microsoft's choice of F5. It dates from the early 1980s, when Lotus 1-2-3 was the most popular PC application.
- Deleting a document (or email) will delete it from *every* folder in which it appears, since the folders simply contain links to the same back-end document. Some other email clients only delete the email from the current folder; if the email appears in other folders it is left alone, requiring the user to hunt through multiple folders in order to completely delete a message. In Notes, clicking on "Remove from Folder" will remove the document only from that folder leaving all other instances intact;
- To select multiple documents in a Notes view, you have to drag your mouse next to the documents that you want to select, rather than using Shift->Click action. (NB: Lotus plans to address this in the "Hannover" release of Notes, of which more below);
- The searching in Notes is a "phrase search", rather than the more common "or search", and Notes requires users to spell out Boolean conditions in search string. As a result, users must search for 'delete and folder' in order to find help text that contains the phrase 'deletes a folder'. Searching for 'delete folder' does not yield the desired result;
- Notes's built-in full text search engine will only find email in the currently selected folder or view; if you click search while you're in your Inbox, then that's the only place that the search will look. To the user, it can appear that Notes has lost the email, in this case, when in fact, the user is simply "not looking in the correct place". (The correct place to initiate search is the Notes mailbox's All Documents view, if you want to search the entire mailbox.);

- The All and Sent folders exhibit some different behaviors than other folders. Namely, you cannot drag email out of them and thereby remove the email from the folders. The email can only be "copied" from them. This is because these two folders are not, in fact, folders at all: they are views. Their membership indexes are maintained according to programmed criteria rather than user interaction (as with a folder). This technical difference is not apparent to some users. This difference does make sense, however. For example, does an email that is removed from a Sent Mail folder become an email that was never sent? And does an email that is removed from an All view (as opposed to deleted outright) then become an email that no longer exists? And if not, where *do* you look for it?

Like all popular commercial software packages, Lotus Notes has its detractors as well as supporters. Critics assert that there are dedicated email clients that are simpler, more intuitive and have a lower purchase price. Proponents argue that richer capabilities and advanced programmability are available, and that purchase price is a small fraction of total cost of ownership (is a financial estimate designed to help consumers and enterprise managers assess direct and indirect costs related to the purchase of any capital investment, such as (but not limited to) computer software or hardware. It is a form of full cost accounting limited to costs clearly associated with given devices and systems). Many of the differences mentioned above are seen by some as weaknesses in the product, especially when the user interface is compared to Windows only applications.

Later releases of the product made some headway in addressing end-user complaints. Notes 6.5 (2003), in particular, paid some long needed attention to the e-mail client, which has traditionally been regarded as the product's Achilles heel (a fatal weakness in spite of overall strength). Features added at this time include:

- drag and drop of folders;
- replication of unread marks between servers;
- follow-up flags;
- reply and forward indicators on emails;
- ability to edit an attachment and save the changes back to an e-mail.

In terms of usability, this release went a good way towards redressing the balance with arch-rival, the Microsoft Outlook/Microsoft Exchange combination, which had incorporated many of these features for a number of years.

## *2.11  Criticisms*

Criticisms of the product include:

- Many end users, particularly those mainly using it for emailing, have complained that aspects of the graphical user interface are unintuitive. Some of these criticisms have been addressed in recent versions;

- The out of office (OOO) feature was designed to limit traffic by sending the out of office messages at 2am (by default) instead of immediately after messages are received, giving the impression that it did not work. Recent releases have increased the frequency of out of office emails, which are now sent every few hours;

- Setting up archiving for the first time was complex, and often did not create an archive file straight away (the file is created when the first email is archived). This may have led some users to believe it did not work;

- Some users get confused between the "Starts with" search and the full text search features offered in the Notes UI, the former of which will only search on data that is visible in the currently sorted column of the visible folder. The product's defenders point out that the optional full text search feature has provided superior searching in Notes since the early 1990s, whereas rival Microsoft Outlook only provided that feature starting with the 2007 version, relying on 3rd-party external plugins to provide similar functionality before that; It is difficult to read your Notes email from a standalone NSF file with any other software. This can also be seen as an effective security measure.

## *2.12  Versions*

- Release 1 - 1989 - The Notes client required DOS 3.1 or OS/2. The Notes server required either DOS 3.1, 4.0, or OS/2;

- Release 1.1 – 1990;

- Release 2 – 1991;

- Release 3 - May 1993;

- Release 4 - January 1996;

- Release 4.5 - December 1996. Server renamed as "Domino", added native HTTP server, POP3 (POP) server, added Calendaring & Scheduling. Also included SMTP MTA "in the box", but not installed by default;

- Release 4.6: added IMAP support. OS/2 and Unix client support dropped. No Mac client for this particular release;

- Release 5 - 1999: Moved SMTP functionality from a separate MTA task to become a native ability of the mail routing task, improving performance and fidelity of internet email. Major improvements to HTTP server. Notes client had a major interface overhaul;

- Release 5.0.8 - Added a new webmail interface, called iNotes (later changed to Domino Web Access in Release 6);

- Release 6.0 - September 2002. Added Domino Web Access (formerly iNotes Web Access) support. Dropped OS/2 server support;

- Release 6.5 - September 2003. Added Lotus SameTime Instant Messaging integration to the Notes client (Windows only);

- Release 7.0 - August 2005. Added DB2 support as database storage;

- Release 7.0.1 - July 2006. Added native Linux client, with initial release certified for RHEL;

- Release 7.0.2 - September 2006. Added blog template, rss (a family of web feed formats used to publish frequently updated digital content) feed support, iCal (a personal calendar application made by Apple Inc) support, SAP integration and "Nomad" which allows you to take your Notes client with you on a USB device.

Current server versions available:

- 7.0.2 for All Platforms (Windows, Linux (Red Hat & SuSE x86, and zSeries), i5OS, z/OS, Solaris 9 & 10)

Current client versions available:

- 7.0.2 for Windows

- 7.0.2 for Mac OS X (since 30 Nov 2006)

- 7.0.1 for Linux/x86 (Red Hat & SuSE initially).

Various versions of the client have been run under Wine on Linux, but with varying degrees of success and no official support. The Notes 7 client and Domino Designer 7 are known to install and runs well under version 0.9.19.

Domino servers can also translate most databases into HTML for browser based users.

A public beta of version 8.0 was released on March 15, 2007.

## 3    IBM LOTUS DOMINO

**Lotus Domino** is an IBM server product that provides enterprise-grade e-mail, collaboration capabilities, and custom application platform. Domino began life as **Lotus Notes Server**, the server component of Lotus Development Corporation's client-server messaging technology. It can be used as an application server for Lotus Notes applications and/or as a web server. It also has a built-in database system in the format of NSF. From release 7, Domino server can use DB2 system as its backend database.

**Lotus Domino products:**

- Lotus Domino
    - Collaboration Express
    - Enterprise Server
    - Messaging Express
    - Messaging Server
    - Utility Express
    - Utility Server
- Lotus Domino Access for Microsoft Outlook
- Lotus Domino Designer
- Lotus Domino Document Manager (formerly Domino.Doc)
- Lotus Domino Everyplace
- Lotus Domino Unified Communications
- Lotus Domino Web Access
    - for Collaboration
    - for Messaging
    - V6
- Lotus Domino WebMail
- DominoBlog

**Lotus Domino services**

The Lotus Domino server can provide multiple services. The core services include:

- Email server (supporting Lotus Notes, POP3, IMAP, web browser and Outlook clients and SMTP support);

- Applications server (the Lotus Notes client provides the runtime);

- Web server (Lotus Notes data or other surfaced via a web browser);

- Database server (Notes Storage Format);

- Directory server (LDAP).


Add-ins to the Lotus Domino server can provide the following:

- Data integration (LEI);

- Instant messaging and Web conferencing (IBM Sametime);

- Document management (Domino Document manager);

- Collaboration space (Domino Quickplace);

- Mobile application server (Domino Everyplace).

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