3. Enabling Technologies of the World Wide Web

3.1 World wide web

- **WWW** is an information system of **interlinked hypertext documents** that are accessed via the Internet.
- Individual document pages on the WWW are called **web pages** and are accessed with a software application running on the user's computer, commonly called a **web browser**.
- Web pages may contain text, images, videos, and other multimedia components, as well as web navigation features coisting of hyperlinks.

1

3. Enabling Technologies of the World Wide Web

3.1 World wide web

- Tim Berners-Lee, a British computer scientist and former **CERN (European Organization for Nuclear Research -** French: *Conseil Européen pour la Recherche Nucléaire"***)** employee, is the inventor of the Web.

2

3. Enabling Technologies of the World Wide Web

3.1 World wide web

- Abbreviated as Web, WWW, or W3 is a system of internet servers that supports hypertext to access several internet protocols on a single interface.
- It is actually a service on the internet and is based on the internet infrastructure.
- Almost every protocol type available on the internet is accessible on the Web
- Includes e-mail, File Transfer Protocol (FTP), Telnet, etc along with its own protocol, the HyperText Transfer Protocol (HTTP).

3

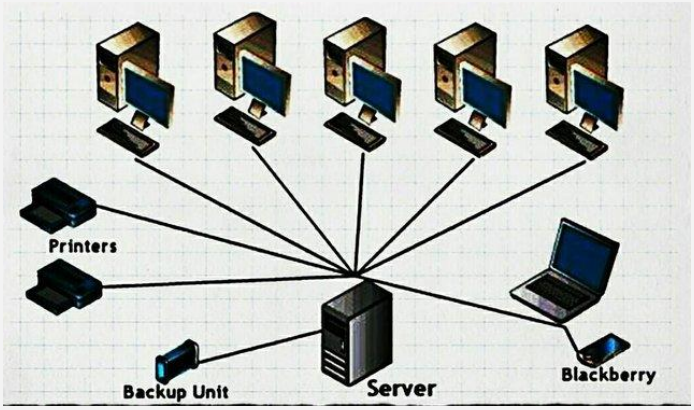
3. Enabling Technologies of the World Wide Web

*The **Internet** is a massive network of networks, a networking infrastructure. It connects millions of computers together globally, forming a network in which any computer can communicate with any other computer as long as they are both connected to the Internet.*

*The **World Wide Web**, or simply Web, is a way of accessing information over the medium of the Internet. It is an information-sharing model that is built on top of the Internet.*

4

Client/Server Computing



5

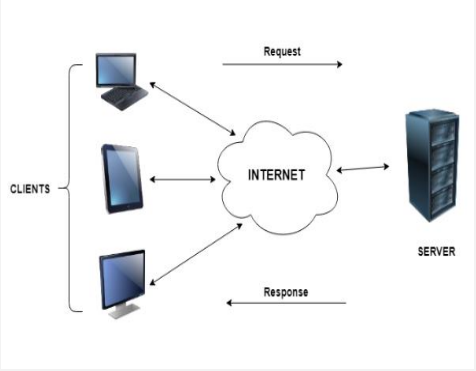
Client / Server Computing

Definition

Client/Server Computing is a computing model in which computers determined as Client and Server communicate with each other over a network.

Client makes requests for services, resources, application, data or information that resides on the server.

Server takes the request and responds to the client requests same system.



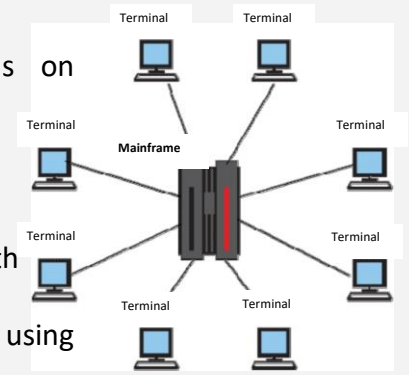
6

Client / Server Computing

How the concept of Evolved ?

After 1950s, Mainframes came into existence with

- Dumb Terminals
- All processing/data storage was on mainframe computers
- Handle large number of users
- Expensive



Later Personal Computers evolved with

- Single user system
- Word processing, data analysis using spreadsheet
- Multimedia applications & Games

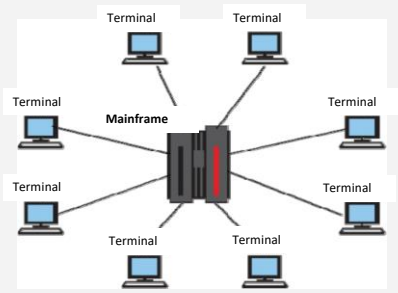
7

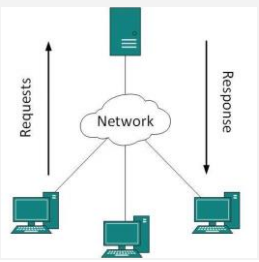
Client / Server Computing

How the concept of Evolved ?

i.e. The improved capacity of personal computers were largely ignored or used on an individual level.

Client/server technology then evolved for greater computing control and more computing value so as to share or split, some of the processing demands between the mainframe and the PCs.





8

Client / Server Computing

Characteristics of Client/Server Computing

- Clients and Server resides on different computer systems
- Works with a system of request and response, where client sends a request to the server and the server responds with the desired information.
- Few number of servers and many number of clients may exist in a network.
- Servers have higher capability than clients in terms of storage and processing.
- The client and server should follow a common communication protocol so they can easily interact with each other.

9

Client / Server Computing

Characteristics of Client/Server Computing

- All the communication protocols are available at the application layer.
- Server has the control over all the communication.
- Server must be non-dormant (i.e. running all the time)
- Server may or may not respond based on client priority.
- A server can only accommodate a limited number of client requests at a time. So it uses a system based to priority to respond to the requests.

An example of a client server computing system is a web server. It returns the web pages to the clients that requested them.

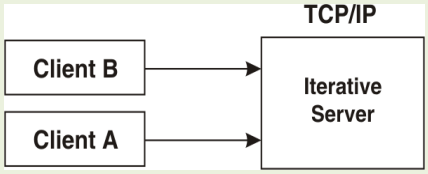
10

Client / Server Computing

Iterative Vs. Concurrent Server

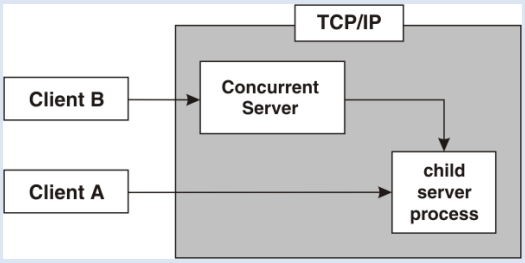
Iterative Server handles one client at a time, in series.

Suitable for transactions that do not last long.



Concurrent Server handles multiple clients at the same time.

Suitable for lengthy transactions.



11

Client / Server Computing

Examples of Client/Server Computing

- **Web Server**
- **Mail Server**
- **FTP Server**
- **File Server**
- **Application Server**
- **Telnet Server**
- **Print Server**

Etc…

12

Client / Server Computing

Advantages of Client/Server Computing

- All the required **data is concentrated in a single place** i.e. the server.
- **Easy to protect the data and provide authorization and authentication** due to central control
- The data and information can be **accessed efficiently though on remote system**.
- It is **easy to replace, upgrade or relocate the nodes** in the client server model because all the nodes are independent and request data only from the server.
- All the nodes i.e clients and server may not be build on similar platforms yet they can easily facilitate the transfer of data.

13

Client / Server Computing

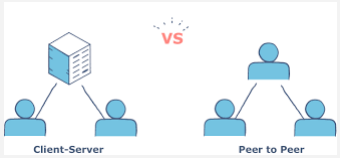
Disadvantages of Client/Server Computing

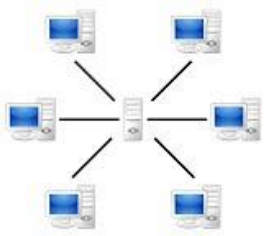
- If all the clients simultaneously request data from the server, it may get overloaded and result into congestion in the network.
- If the server fails for any reason, then none of the requests of the clients can be fulfilled. This leads of failure of the client server network.
- The cost of setting and maintaining a client server model are quite high.

14

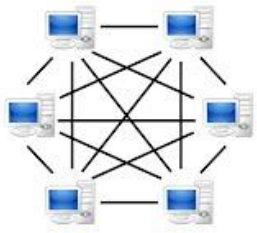
Client / Server Computing

Client/Server Vs. Peer to Peer Computing

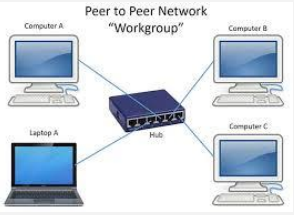




Server-based



P2P-network



15

Client / Server Computing

Client/Server Vs. Peer to Peer Computing

	Peer-to-peer	Client/Server
Type of user	Homes and small businesses	Large corporations, schools, and hospitals
Size of organization	Limited number of workstations	Large number of workstations
Administration	User	Central administrator
Security	Individual users	Network administrator
Network traffic	Limited number of users	Large number of users
Cost	Inexpensive to implement	Usually more expensive than peer-to-peer
Scalability	Limited growth	High growth projected

16

3. Enabling Technologies of the World Wide Web

3.1 Internet Client Server Applications

- Several client server applications are available through which users on internet interact.
- Basically two classifications in client server application - one is the Client Software and the other one is the Server Software
- Client Software usually exists on an end-user's desktop and provides navigation and display.
- Server Software usually exists on a workstation or a server-class machine and provides back-end data access services.

17

3. Enabling Technologies of the World Wide Web

3.1 Internet Client Server Applications

Some of the commonly used client-server applications are as follows;

Application : World Wide Web

Protocol : HTTP

Purpose :

Offers access to hypertext documents, executable programs, and other Internet resources

18

3. Enabling Technologies of the World Wide Web

3.1 Internet Client Server Applications

Application : E-Mail

Protocol

SMTP (Simple Mail Transfer Protocol)
POP3 (Post Office Protocol Version 3)
MIME (Multipurpose Internet Mail Extensions
IMAP (Internet Message Access Protocol)

Purpose

Allows the transmission of text messages and binary attachments across the Internet

19

3. Enabling Technologies of the World Wide Web

3.1 Internet Client Server Applications

Application : File Transfer

Protocol

FTP (File Transfer Protocol)

Purpose

Enables files to be uploaded and downloaded across the Internet

FTP transfers can be performed on the WWW even without a special software. Web Browsers can suffice FTP transfers.

20

3. Enabling Technologies of the World Wide Web

3.1 Internet Client Server Applications

Application : Chat

Protocol

IRC (Internet Relay Chat Protocol)

Purpose

Provides a way for users to talk to one another in real-time over the Internet. The real time chat groups are called channels

To have access to IRC, IRC software program must be installed. Eg. UNIX/shell : ircII, Windows : mIRC or PIRCH

21

3. Enabling Technologies of the World Wide Web

3.1 Internet Client Server Applications

Application : UseNet Newsgroups

Protocol

NNTP (Network News Transfer Protocol)

Purpose

Discussion forums where users can asynchronously post messages and read messages posted by others.

Newsreader software is used to read newsgroups.

22

3. Enabling Technologies of the World Wide Web

3.1 Internet Client Server Applications

Application : Telnet

Purpose

Allows users to log into computers on the internet and use online databases, library catalogs, chat services & more.

Only character-based interfaces and applications are supported.

Has no graphics capability.

Uses port no. 23.

23

3. Enabling Technologies of the World Wide Web

3.2 Software Agents

Traditional businesses have changed to a new perspective with the electronic business models.

To cope with the market competition, the models further need new computational models and infrastructure.

24

3. Enabling Technologies of the World Wide Web

3.2 Software Agent

Businesses are now developing a model of inter-organizational e-commerce according to which different users are represented by autonomous software agents interconnected via the Internet.

A software agent is an piece of software that functions as an agent for a user or another program, working autonomously and continuously in a particular environment.

It acts on behalf of their human users/organizations to perform information gathering tasks, such as locating and accessing information from various sources, filtering unwanted information and providing decision support.

25

3. Enabling Technologies of the World Wide Web

3.2 Software Agents

Among a great many other applications, software agents:

- Conduct targeted Internet searches.
- Check and prioritize incoming e-mail.
- Test new computer games.
- Fill out e-forms.
- Conduct online job searches.
- Synchronize social networking profiles.
- Assemble customized news reports.
- Find good deals in e-commerce.

26

3. Enabling Technologies of the World Wide Web

INFORMATION OVERLOAD

Let us observe some simple facts:

The number of **worldwide email accounts** continues to grow from over **4.1 billion accounts in 2014 to over 5.2 billion accounts (estimated) by the end of 2018.**

The total number of **worldwide email users**, including both business and consumer users, is also increasing from over **2.5 billion in 2014 to over 2.8 billion in 2018.**

In 2014, the majority of **email traffic** comes from the business world, which accounts for over **108.7 billion emails sent and received per day.**

27

3. Enabling Technologies of the World Wide Web

INFORMATION OVERLOAD

Email remains the most common form of communication in the business space.

Email use is growing in the business sector and by 2018, **business email will account for over 139.4 billion emails sent and received per day.**

Business users send and receive on average 121 emails a day in 2014, and this is expected to **grow to 140 emails a day by 2018.**

28

3. Enabling Technologies of the World Wide Web

INFORMATION OVERLOAD

Unfortunately, end users are often overwhelmed due to enormous volume of services and information resources.

They spend most of their time navigating and sorting through the available data, spending little time interpreting, and even less time actually doing something about what they find.

The end result is that much of the data we gather goes unused.

29

3. Enabling Technologies of the World Wide Web

INFORMATION OVERLOAD

The other analytical fact is :

The amount of data collected by large enterprises doubles every year.

Knowledge workers can analyze only about 5 percent of the data.

30

3. Enabling Technologies of the World Wide Web

INFORMATION OVERLOAD

The other analytical fact is :

Most of knowledge workers' efforts are
spent trying to discover important patterns in the data **(60 percent or more),**

a much smaller percentage is spent determining what those patterns **mean (20 percent or more)**, and

very little time **(10 percent or less)** is spent actually doing something based on the patterns. ***Due to which……***

Information overload reduces knowledge workers' decision-making capabilities by 50 percent.

3. Enabling Technologies of the World Wide Web

INFORMATION OVERLOAD

So…….

What is the solution to the problem of data overload?

Simple solution is to workout with the Software Agents

3. Enabling Technologies of the World Wide Web

Value of Software Agents in Networked World

A major value of employing software agents with intranet, Internet, and extranet applications is that they are able to assist in locating and filtering data.

They save time by making decisions about what is relevant to the user.

They are able to sort through the network and the various databases effortlessly and with reliable attention to detail in order to extract the best data.

33

3. Enabling Technologies of the World Wide Web

Value of Software Agents in Networked World

Not limited to hard (quantitative) data;
they can also obtain soft data about new trends that may cause unexpected changes (and opportunities) in local or even global markets.

With an agent at work, the competent user's decision-making ability is enhanced with information rather than paralyzed by too much input.

34

3. Enabling Technologies of the World Wide Web

Value of Software Agents in Networked World

An agent can be an autonomous, (preferably) intelligent, collaborative, adaptive, computational entity.

The Intelligent Agent (IA) is an agent which has the capability to deal with new and trying new situations.

The range of firms and universities actively pursuing agent technology is quite broad and is always ever-growing.

It includes small, medium to large multinational organizations.

35

3. Enabling Technologies of the World Wide Web

Value of Software Agents in Networked World

The software agents have synonyms like
Knowbots (i.e. knowledge-based robots),

Softbots (software robots)

Taskbots (task-based robots)

Userbots

Robots

Personal agents

Autonomous agents, and

Personal assistants

36

3. Enabling Technologies of the World Wide Web

Value of Software Agents in Networked World

Information access and navigation are today's major applications of software agents in the intranet, Internet, and extranet worlds,

There are also other reasons why this technology is expected to grow rapidly:

- **Mundane (Routine) personal activity.**

In a fast-paced society, time-strapped people need new ways to minimize the time spent on routine personal tasks such as shopping for groceries or travel planning, so that they can devote more time to professional activities.

37

3. Enabling Technologies of the World Wide Web

Value of Software Agents in Networked World

- **Search and retrieval**

It is not possible to directly manipulate a distributed database system containing millions of data objects.

Users will have to refer the task of searching and cost comparison to agents.

These agents will perform the tedious, time-consuming, and repetitive tasks of searching databases, retrieving and filtering information and delivering it back to the user.

38

3. Enabling Technologies of the World Wide Web

Value of Software Agents in Networked World

- **Repetitive office activity**

There is a pressing need to automate tasks performed by administrative and clerical personnel in functions such **as sales or customer support in order to reduce labor costs and increase office productivity.**

Today, labor costs are estimated to be as much as 60 percent of the total cost of information delivery.

39

3. Enabling Technologies of the World Wide Web

Value of Software Agents in Networked World

- **Decision support**

There is a need for increased support for tasks performed by knowledge workers, especially in the decision-making area.

Timely and knowledgeable decisions made by these professionals greatly increase their effectiveness and the success of their businesses in the marketplace.

40

3. Enabling Technologies of the World Wide Web

Value of Software Agents in Networked World

- **Domain experts**

It is advisable to model costly expertise, and make it widely available.

Expert software agents could model real-world agents such as translators, lawyers, diplomats, union negotiators, and stockbrokers.

41

3. Enabling Technologies of the World Wide Web

Value of Software Agents in Networked World

Thus the list of tasks to which commercially available agents and research prototypes have been applied includes

advising alerting broadcasting browsing critiquing(evaluating)
distributing enlisting empowering
explaining filtering guiding identifying
matching monitoring navigating negotiating
organizing presenting querying reminding
reporting retrieving scheduling searching
securing soliciting sorting storing suggesting
teaching summarizing translating, and watching.

42

3. Enabling Technologies of the World Wide Web

Value of Software Agents in Networked World

This shows that software agents make the networked world less forbidding, and

save time by reducing the effort required to locate and retrieve data, and improve productivity by off-loading a variety of mundane, tedious, and mindless tasks.

Which thus makes the significant value of software agents in the networked world.

43

3. Enabling Technologies of the World Wide Web

A Typology of Agents

First Classification:
The software agents can be classified **based on their mobility** as the first classification, i.e. by their ability to move around some networks.

as ***static*** *or* ***mobile*** *agents*

44

3. Enabling Technologies of the World Wide Web

A Typology of Agents

Second Classification is either ***deliberative or reactive.***

Deliberative (purposeful) agents **-** the agents possess an internal, symbolic, reasoning model and they engage in planning and negotiation in order to achieve coordination with other agents.

Reactive agents are able to reach their goal only by reacting reflexively on external stimuli, a deliberative agent's internal processes are more complex.

45

3. Enabling Technologies of the World Wide Web

A Typology of Agents

The ***Third classification*** is based on several ideal and primary attributes which they need to exhibit.

Some of them are; **autonomy, learning and cooperation**.

Autonomy refers to the principle that agents can operate on their own without any need for human guidance, even though this would sometimes be invaluable

A key element of autonomy is their ***proactiveness*** i.e. an ability to take the initiative rather than acting reactive.

46

3. Enabling Technologies of the World Wide Web

A Typology of Agents

Cooperation with other agents is also of great importance. For cooperation, agents need to possess a social ability to interact with other agents and possibly humans via some communication language. It involves multiple agents rather than single agent.

Lastly, for agent systems to be truly smart, they need to ***Learn*** as they react and/or interact with their external environment. Learning is a key attribute for any intelligence.

Intelligence is gained through ability to learn and learning could further increase the performance as well.

47

3. Enabling Technologies of the World Wide Web

A Typology of Agents

These three minimal characteristics (autonomy, cooperation & learning) could be used to derive four types of agents ;

collaborative agents, collaborative learning agents, interface agents and truly smart agents.

48

3. Enabling Technologies of the World Wide Web

A Typology of Agents

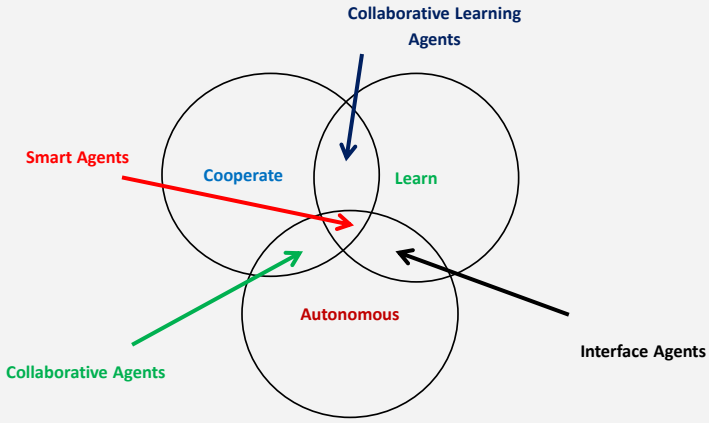
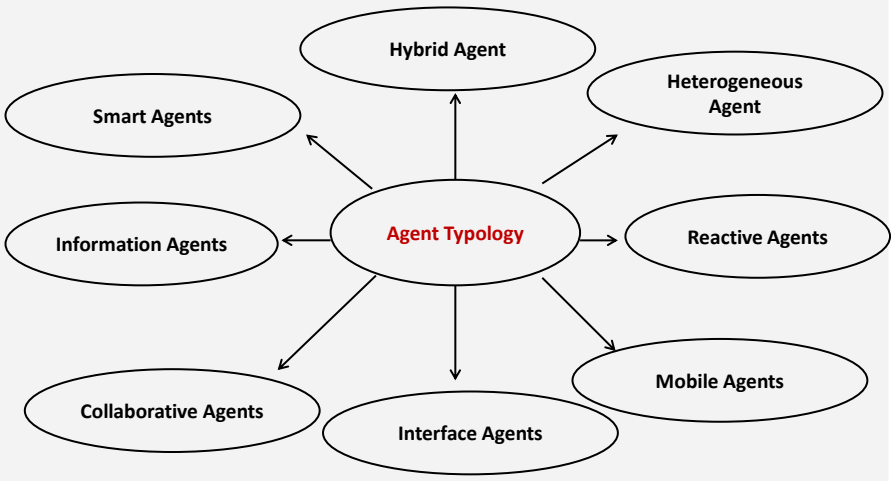


Fig. A partial view of Agent Typology

49

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types



50

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types

Collaborative Agents :

- Emphasize autonomy and cooperation (with other agents) in order to perform tasks for their owners.
- In order to have a coordinated setup of collaborative agents, they may have to *negotiate* in order to reach mutually acceptable agreements on some matters.
- The key general characteristics of these agents include ***autonomy, social ability, responsiveness*** *and* ***proactiveness*****.**

51

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types

Collaborative Agents :

- Able to act rationally and autonomously in an open and time-constrained multi-agent environment.
- Tend to be static and large.

52

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Collaborative Agents : *General Motive*

i. To solve problems that are too large for a centralized single agent to do due to resource limitations or the risk of having one centralized system

ii. To allow interconnecting and interoperation of multiple existing legacy systems, eg – expert systems, decision support systems, etc.

iii. To provide solutions to inherently distributed problems, eg – distributed sensor networks or air-traffic control.

iv. To provide solutions in the form of distributed information sources, eg- for distributed online information sources

53

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Collaborative Agents : *General Motive*

v. To provide solutions where the expertise is distributed, eg-in healthcare provisioning.

vi. To enhance ***modularity*** (which reduces complexity), ***speed*** (due to parallelism), ***reliability*** (due to redundancy), ***flexibility*** (i.e. new tasks are composed more easily due to the more modular organization) and ***reusability*** at the knowledge level (hence shareability of resources).

vii. To research into other issues, eg – understanding interactions among human societies.

54

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types

Interface Agents :

- Emphasize ***autonomy and learning*** in order to perform tasks for their owners.
- The key concept underlying interface agents is that of a *personal assistant,* rather than as an interface, who is *collaborating with the user* in the same work environment, *which is in contrast to the Collaborative Agents which collaborate with other agents.*
- Collaborating with a user may not require an explicit agent communication language as one required when collaborating with other agents.
- Employ AI techniques to provide active assistance to a user with computer based tasks like meeting scheduling, mail management, news filtering, etc.

55

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types

Interface Agents :

- Interface agents support and provide assistance, typically to a user learning to use a particular application spreadsheet or an operating system

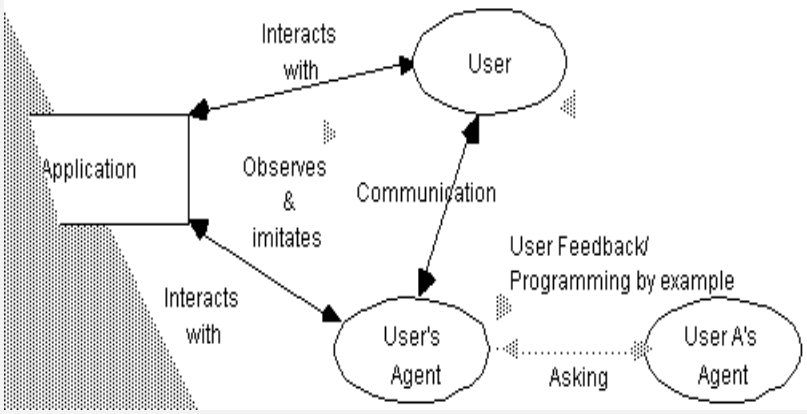
- As for learning, interface agents learn typically to better assist its user in four ways;

i. by observing and imitating the user (i.e. learning from the user);
ii. through receiving positive and negative feedback from the user (learning from the user);
iii. by receiving explicit instructions from the user (learning from the user);
iv. by asking other agents for advice (i.e. learning from peers).

56

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Interface Agents :



57

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Mobile Agents :

Mobile agents are computational software processes capable of roaming through WANs such as the *WWW, interacting with foreign hosts, gathering information on behalf of its owner and coming back home, having performed the duties set by its user.*

These duties may range from a flight reservation to managing a telecommunications network.

Mobile agents are autonomous and cooperative, however, different from collaborative agents.

58

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types

Mobile Agents :

For example, consider the scenario ;
User is required to write a program that would allow Michelle's home computer **make a flight reservation** for her by accessing several airline reservation databases.

She lists all her preferences: **non-smoking, departure between 7 and 9.30 am from Baltimore, arrival at Austin before noon, no more than one connection, and no changes at Chicago OíHare**.

59

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types

Mobile Agents : *Example*

A **static single-agent** program would need to **request for all flights leaving between these times from all the databases**, which may total more than 200 and take up **many kilobytes.**

It would also **require a list of all the connections and proceed to narrow down the search**. Each of these actions involves **selecting through plenty of extraneous information** which could/would clog up the network. Besides, she is **probably paying for this network time**.

60

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types

Mobile Agents : *Example*

Consider the **alternative**.

She **encapsulates, object-oriented style**, her entire program within an **agent** which consumes probably less than 2K which **roams the network of airline reservation systems**, **arrive safely and queries these databases locally,** and **returns ultimately to her home computer, with a schedule which she may confirm or refute.**

This alternative **avoids the high communications costs of shifting, possibly, kilobytes of information to her local computer** - which presumably she cannot cope with.

Hence, mobile agents provide a number of real time advantages which escape their static counterparts.

61

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types

Mobile Agents : ***Benefits***

i. Reduced communication costs
ii. Overcome possession of limited local resources
iii. Easier coordination
iv. Asynchronous Computing
v. Natural development environment
vi. A flexible distributed computing architecture
vii. Rethinking on design process

62

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Mobile Agents : *Benefits*

i. Reduced communication costs

There may be a lot of raw information that need to be examined to determine their relevance. Transferring this raw information can be very time-consuming and clog of the networks.

Imagine……

63

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Mobile Agents : *Benefits*

i. Reduced communication costs

Imagine having to **transfer many images just to pick out one**. It is much **more natural to get your agents to "go" to that location, do a local search/clipping and only transfer the chosen compressed image back across the network**.

It avoids the need for costly network connections between remote computers. It provides a much cheaper alternative as we pay increasingly for network bandwidth and time

64

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Mobile Agents : *Benefits*

Overcome Limited Local Resources
Processing power and storage on the local machine may be very limited thereby necessitating the use of mobile agents.

Easier Coordination
It may be simpler to coordinate a number of remote and independent requests and only collate all the results locally.

65

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Mobile Agents : *Benefits*

Asynchronous computing:

We can set off our mobile agents and do something else and the results will be back in our mailbox, say, at some later time.

They may operate when we are not even connected.

66

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Mobile Agents : *Benefits*

Natural development environment

Provides a natural development environment for implementing free market trading services.

New services can come and go dynamically and much more flexible services may co-exist with inferior ones, providing more choices for consumers.

67

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Mobile Agents : *Benefits*

A flexible distributed computing architecture:

Provides for an unique and innovative way of doing distributed computation.

Rethinking on design process

Following on from the latter, it turns the conventional design process on its head, and some truly innovative products should/would emerge out of mobile agent technology.

68

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types

Mobile Agents : Agents

Eg;

Telescript is an interpreted object-oriented and remote programming language which allows for the development of distributed applications.

In the late 1980s, Siemens developed an application which they called Intelligent Moving Processes

Java from Sun Microsystems is other language which support mobile agent system development.

69

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types

Mobile Agents : Agents

Other Applications

TINA - Telecommunications Information Networking Architecture

TMN - Telecommunications Management Network

IN - Intelligent Networking

SCP - Service Control Points

SSP - Service Switching Points

RPC - Remote Procedure Call

70

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Information / Internet Agents

Manage the explosive growth of information we are experiencing currently.

Information agents perform the role of managing, manipulating or organizing information from many distributed sources.

71

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Information / Internet Agents

The case for having information agents should be clearer from the following.

Davies & Weeks (1995) report that **in 1982, the volume of scientific, corporate and technical information was doubling every 5 years**. Three years later, i.e. 1988, it was doubling every 2.2 years, and **by 1992 every 1.6 years.** This trend suggests **that it should now be doubling every year or even less**.

And now, much of this information is now accessible electronically on the WWW, whose phenomenal growth is again massive.

72

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Information / Internet : Agents

"We are drowning in information but starved of knowledge"

(John Naisbitt, Megatrends).

Still information agents can enhance, but certainly not eliminate all the problems.

73

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Information / Internet : Agents

The *motivation* for developing information/internet agents is at least twofold.

Firstly, there is simply a desired need/demand for tools to manage such information explosion.

Secondly, there are vast financial benefits to be gained.

74

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Information / Internet Agents

They have varying characteristics:

- they may be static or mobile;
- they may be non-cooperative or may also be social; and
- they may or may not learn.

Hence, there is no standard mode to their operation.

75

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Reactive Software Agents

Reactive agents represent a special category of agents which do not possess internal, symbolic models of their environments; instead they act/respond in a stimulus-response manner to the present state of the environment in which they are embedded.

76

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Reactive Software Agents

In its simplest form, an agent can react with a direct, predetermined response to a particular event or environmental signal. Typically, the behavior of a reactive agents is expressed in the form: WHEN event, IF condition(s), THEN action.

They are more robust and fault tolerant than other agent-based systems.

Include flexibility and adaptability.

77

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Hybrid Agents

Previous Discussions – Collaborative, Interface, Mobile, Internet and Reactive agents.

This approach brings together the strengths of both the deliberative and reactive paradigms.

Rather than just sticking to any one of the agent types, hybrid agents refer to those whose constitution is a combination of two or more agent philosophies within a singular agent.

78

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Hybrid Agents

Some criticisms labeled against software agents and their architectures are;

Firstly, there are too few applications based on them.

Secondly, the hybrid architectures tend to be very application-specific, mainly to games and simulations.

Thirdly, the theory which undermines the hybrid systems is not usually specified.

79

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types
Heterogeneous Agent

Heterogeneous agent refers to an integrated set-up of at least two or more agents which belong to two or more different agent classes.

It may also contain one or more hybrid agents.

Incorporates interoperation of multiple software agents.

For interoperation amongst heterogeneous software agents, it requires an Agent Communication Language (ACL)

80

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types

Heterogeneous Agent

Its Benefits;

1. Standalone applications can be made to provide value-added services in order to participate and interoperate in cooperative heterogeneous set-ups
2. The software legacy problem may be amended since it could avoid the need for costly software rewrites, as they are given new leases of life by their interoperation with other systems
3. Agent-based software engineering provides a new approach to software design, implementation and maintenance in general, and software interoperability in particular.

81

3. Enabling Technologies of the World Wide Web

A Panoramic Overview of the Different Agent Types

Smart Agents

Smart agents are those agents which can **learn, cooperate** and are **autonomous**.

Though all agents may be called smart, any agent should combine the above **three qualities** to be called as Smart.

82

3. Enabling Technologies of the World Wide Web

3.3 Automotive Network Exchange

The **Automotive Network Exchange** is the private extranet initially set up and maintained by the Automotive Industry Action, Telcordia, General Motors, Ford, and Chrysler.

Built as a private network for the auto industry in 1995 to provide consistent, reliable speed and guaranteed security for data transmissions between the automakers and their suppliers.

83

3. Enabling Technologies of the World Wide Web

3.3 Automotive Network Exchange

Allows trading partners to collaborate electronically on product design and development; request and process orders; and facilitate just-in-time manufacturing and post shipping schedules.

In 1999 the Automotive Industry Action Group sold the ANX Network to the Science Applications International Corporation (SAIC).

During the next six years, over 4,000 companies joined the ANX Network making it one of the largest extranets in the world.

84

3. Enabling Technologies of the World Wide Web

3.4 Intranet & Extranet

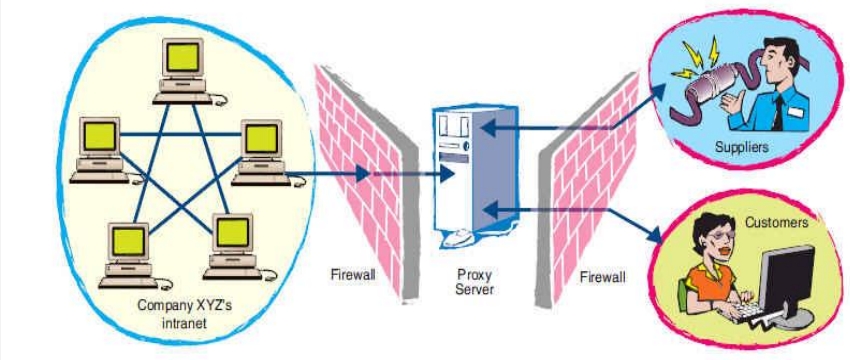
An intranet is a private computer network that uses Internet protocols, network connectivity, and possibly the public telecommunication system to securely share part of an organization's information or operations with its employees.

The same concepts and technologies of the Internet such as clients and servers running on the Internet protocol suite are used to build an intranet.

85

3. Enabling Technologies of the World Wide Web

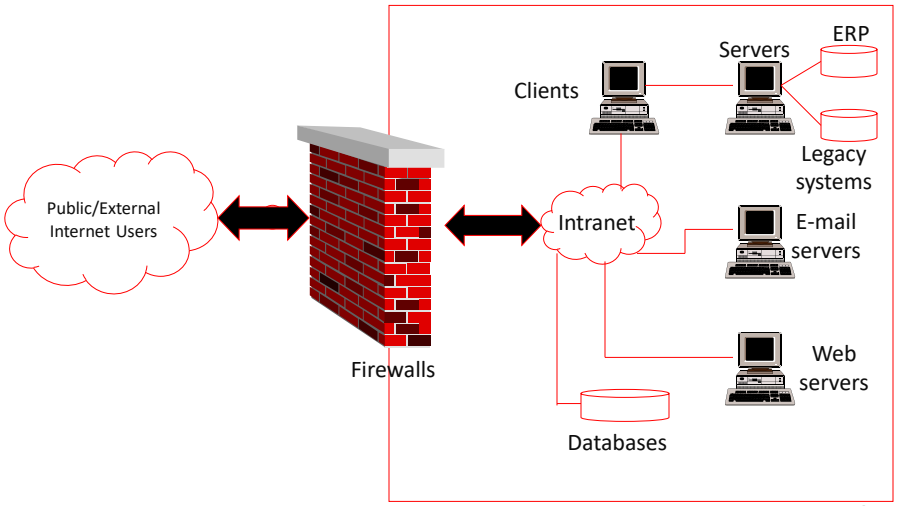
3.4 Intranet & Extranet



An intranet that extends access to customers and vendors is called an extranet.

86

The Intranet



87

3. Enabling Technologies of the World Wide Web

3.4 Intranet & Extranet

It is not available to the world outside of the Intranet. *If the Intranet network is connected to the Internet, the Intranet will reside behind a firewall.*

The firewall helps to control access between the Intranet and Internet to permit access to the Intranet only to people who are members of the same company or organization.

Thus an intranet can be understood as "a private version of the Internet", or as a version of the internet confined to an organization.

88

3. Enabling Technologies of the World Wide Web

3.4 Intranet & Extranet

An extranet is a private network that uses Internet protocols, network connectivity, and possibly the public telecommunication system to securely share part of an organization's information or operations with suppliers, vendors, partners, customers or other businesses.

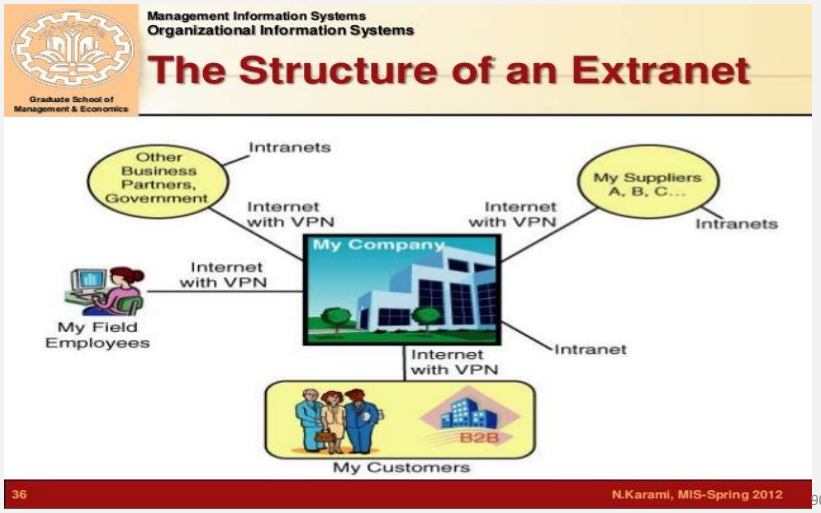
An extranet can be viewed as part of a company's Intranet that is extended to users outside the company (eg: normally over the Internet).

Thus, it is private external network.

89

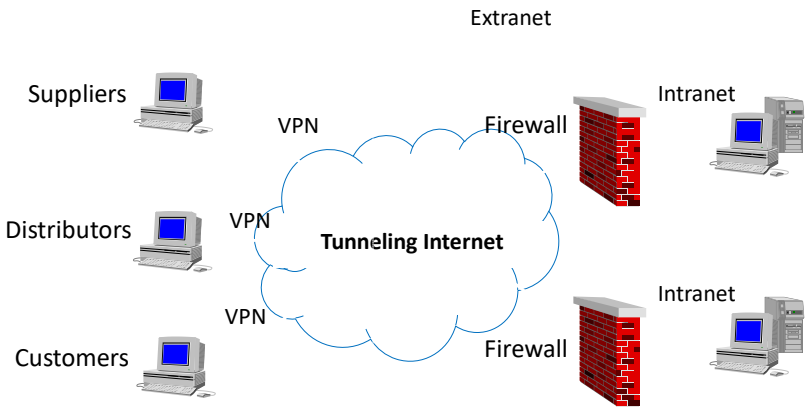
3. Enabling Technologies of the World Wide Web

3.4 Intranet & Extranet

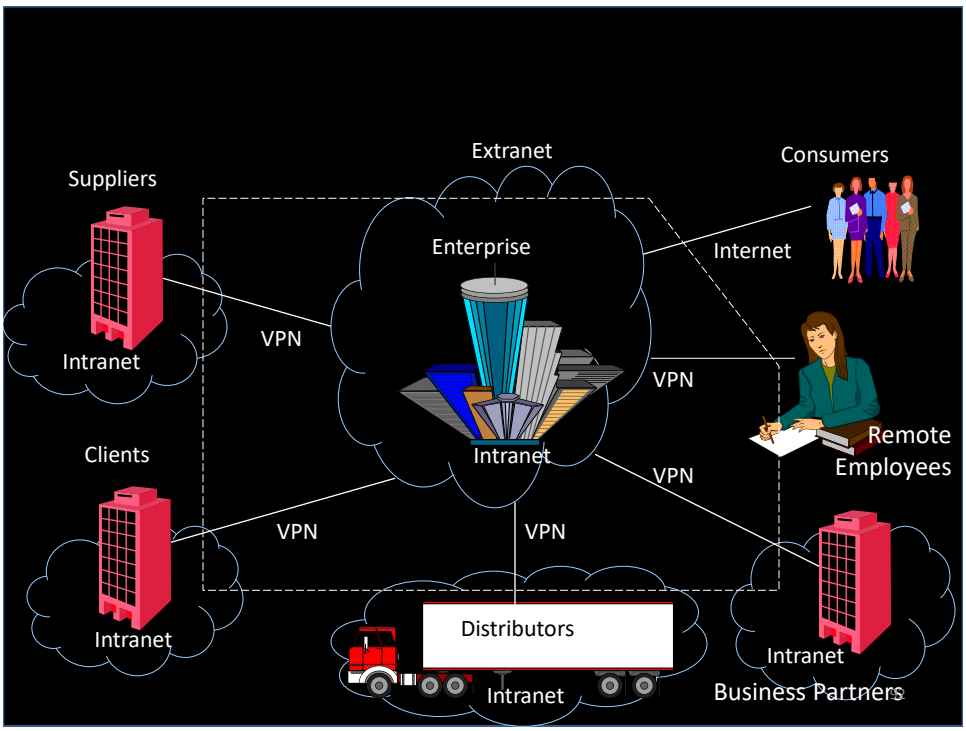


90

The Extranet



91



3. Enabling Technologies of the World Wide Web

3.4 Intranet & Extranet

An Extranet is actually an Intranet that is partially accessible to authorized outsiders.

The actual server (the computer that serves up the web pages) will reside behind a firewall.

The firewall helps to control access between the Intranet and Internet permitting access to the Intranet only to people who are suitably authorized.

Further security is maintained through cryptography & VPN.

93

3. Enabling Technologies of the World Wide Web

3.4 Considerations in Intranet Deployment

Each organization has unique business, application, and system requirements as well as a unique network infrastructure. So each Intranet is a custom implementation.

Deploying an Intranet for your organization involves many factors.

- Planning
- The Infrastructure
- Value Addition
- The People
- Administering

94

3. Enabling Technologies of the World Wide Web

3.4 Considerations in Intranet Deployment

- **Planning**

Good Intranet Implementation requires a good planning.

For instance, it would be appropriate to decide - the information that is to be made available; the users who would access; content of home page since the home page represents the organization; the role of administrator; the services that an organization wish to offer and so on.

95

3. Enabling Technologies of the World Wide Web

3.4 Considerations in Intranet Deployment

- **Infrastructure**

Evaluate the Infrastructure of your current systems and design an infrastructure to support the Intranet deployment.

One of the greatest advantages of Intranet is that we can split and share the load on multiple server machines.
For example, we can have your application data on one server, web server on another machine and Mail server on one more machine. The users would be transparent in accessing either of the systems.

96

3. Enabling Technologies of the World Wide Web

3.4 Considerations in Intranet Deployment

- **Infrastructure**

We can select the required front-end software like browsers and mail client.

We need to have a network operating system that supports TCP/IP, as this protocol is needed for the clients and the servers to get connected to the Intranet.

We need to Allocate IP addresses to all the systems that are getting connected to the Intranet as planned.

97

3. Enabling Technologies of the World Wide Web

3.4 Considerations in Intranet Deployment

- **Value Addition**

As we see value through Intranet, we can add features like a Proxy server, a Firewall Server, a DNS Server, Certificate Server, Mailing list server and so on.

On the Client side, we shall install HTML editors and Web enabled office suites of software.

98

3. Enabling Technologies of the World Wide Web

3.4 Considerations in Intranet Deployment

- **The People**

Deploying an Intranet is more of teamwork. It is not the responsibility of any single department's job.

Team spirit, openness, trust and sense of sharing contribute to the successful deployment of an Intranet.

99

3. Enabling Technologies of the World Wide Web

3.4 Considerations in Intranet Deployment

- **Administering**

Once the Intranet is deployed and running, we need to administer it effectively.

This is a two-part function:

One is maintenance of Servers/nodes & the management of software and adding value by upgrading hardware and software to suit our requirements.

Second is creating and updating content on the Intranet.

100

3. Enabling Technologies of the World Wide Web

3.4 Intranet Software

An intranet is often hosted and maintained on company servers and can only be accessed by internal employees.

Companies have the following options to create a company intranet.

- **Custom Built Intranet**
- **ASP(Application Service Provider or Hosted) Intranet**

101

3. Enabling Technologies of the World Wide Web

3.4 Intranet Software

- **Custom Built Intranet**

The first option is to create a customized, in house intranet.

Although this approach allows companies to build a highly specialized intranet, it involves;

- huge costs and effort, which makes it unsuitable for growing companies.
- maintenance and upgrade costs that are recurring and very unpredictable.
- Expert technical support staff is needed to deploy application code and data backup, software evaluations and upgrades, and bug and security checks.

102

3. Enabling Technologies of the World Wide Web

3.4 Intranet Software

- **ASP**

The second approach is the ***ASP (application service provider) or software-as-a-service approach.***

Rather than having to set up in house servers or hire expert staff, and undertake months long implementation, users can simply access all the tools they need to build their company intranet over the web.

This is commonly known as an "**asp intranet**" or "**hosted intranet**" or "saas intranet".

103

3. Enabling Technologies of the World Wide Web

3.4 Intranet Software

Some of these ASP could be;

HyperOffice

It is a privately held American corporation based in Rockville, Maryland, that offers web collaboration, online meeting, web conferencing, online database and email marketing applications to the small and mid-sized business segment.

104

3. Enabling Technologies of the World Wide Web

3.4 Intranet Software

Some of these ASP could be;

Microsoft SharePoint

SharePoint is a web application framework and platform developed by Microsoft.

First launched in 2001, SharePoint integrates intranet, content management, and document management.

SharePoint is mostly used by midsize businesses and large departments.

By default, SharePoint has a Microsoft Office-like interface, and it is closely integrated with the Office suite.

105

3. Enabling Technologies of the World Wide Web

3.4 Intranet Software

Some of these ASP could be;

Drupal

It is a free and open-source content-management framework written in PHP and distributed under the GNU-General Public License.

It is used as a back-end framework for around 2.1% of all Web sites worldwide ranging from personal blogs to corporate, political, and government sites including WhiteHouse.gov and data.gov.uk.

106

3. Enabling Technologies of the World Wide Web

3.4 Intranet Software

Some of these ASP could be;

WordPress

It is a free and open-source blogging tool and a content management system (CMS) based on PHP and MySQL.

Features include a plugin architecture and a template system. WordPress was used by more than 23.3% of the top 10 million websites as of January 2015.

WordPress is the most popular blogging system in use on the Web, at more than 60 million websites.

107

3. Enabling Technologies of the World Wide Web

3.4 Applications of Intranet and Extranet

- **Communication**
- **Productivity**
- **Processes**

108

3. Enabling Technologies of the World Wide Web

3.4 Applications of Intranet and Extranet

- **Communication**

Article Publisher - Publishing key news articles to your intranet, extranet or portal audience

Blogging - Provide regular news style articles to employees who can comment and provide feedback.

Micro-blogging - Just like Facebook and Twitter, display status updates on your intranet to your staff.

Polls - Gather opinions to get feedback on key issues affecting your organization.

Frequently Asked Questions (FAQ) - Deliver a searchable bank of common questions by subject or category.

3. Enabling Technologies of the World Wide Web

3.4 Applications of Intranet and Extranet

- **Communication**

Promotions - Highlight the latest projects and campaigns with the facility to share audio, video and images.

Classifieds - Providing an online marketplace for the buying, selling and swapping of items or services.

RSS(Rich Site Summary) Feeds - Delivering approved RSS feeds of important information into your intranet, extranet or portal.

RSS is a format for delivering regularly changing web content.

3. Enabling Technologies of the World Wide Web

3.4 Applications of Intranet and Extranet

- **Productivity**

Contact Directory - Centrally manage and access your organization's contacts from one location.

Document Management - Manage your organization's documents in a centralized repository.

Forums - Share and collaborate with different employees through secure, internal forums.

Organization Charts - Mapping out your organization's structure delivering a clear hierarchy to your employees.

111

3. Enabling Technologies of the World Wide Web

3.4 Applications of Intranet and Extranet

- **Productivity**

Event & Resource Manager - Schedule events and manage your organization's shared resources.

Media Library - A centralized repository for all your organization's rich media, including images and video.

Resources and Inventory - Improve utilization of your shared assets with resource and inventory scheduling.

Site Stats - Providing key insights into the usage of your intranet, extranet or portal.

112

3. Enabling Technologies of the World Wide Web

3.4 Applications of Intranet and Extranet

- **Processes**

CRM(Customer Relationship Management) - Monitor, track and record customer related information within your intranet.

Helpdesk - Log, track and monitor both technical and non-technical support requests.

HR Manager - Securely record employee HR records, from the moment they start to the moment they leave.

E-Bulletins - Update staff on the latest intranet news via regular email communications.

113

3. Enabling Technologies of the World Wide Web

3.4 Applications of Intranet and Extranet

- **Processes**

E-Learning - Manage the progression of your staff's training through your intranet environment.

Absence Manager - Provide a searchable, self-service environment to record all employee absences.

Team Spaces - Share and collaborate with your teams from their own individual project areas.

114

3. Enabling Technologies of the World Wide Web

3.4 Applications of Intranet and Extranet

- **For Some other common applications;**

Refer to Electronic Commerce

Elias M. Award, Second printing-2003

Chapter – 14 Intranets & Extranets

115

3. Enabling Technologies of the World Wide Web

3.4 Extranet Products & Services

- **Typical Extranet Applications**
  - Supply-chain management
  - Customer communications
  - Distributor promotions
  - Online continuing education/training
  - Customer service
  - Order status inquiry
  - Inventory inquiry
  - Account status inquiry
  - Warranty registration
  - Claims
  - Online discussion forums

- **Secure Connections through VPNs**

116

3. Enabling Technologies of the World Wide Web

3.4 Managerial Issues

Are there new business opportunities utilizing the intranet and extranet?

Consider whether the business requirements can best be met by the intranet or the extranet.

Consult the technical people inside and outside to find the most secure and economical implementation plan.

3. Enabling Technologies of the World Wide Web

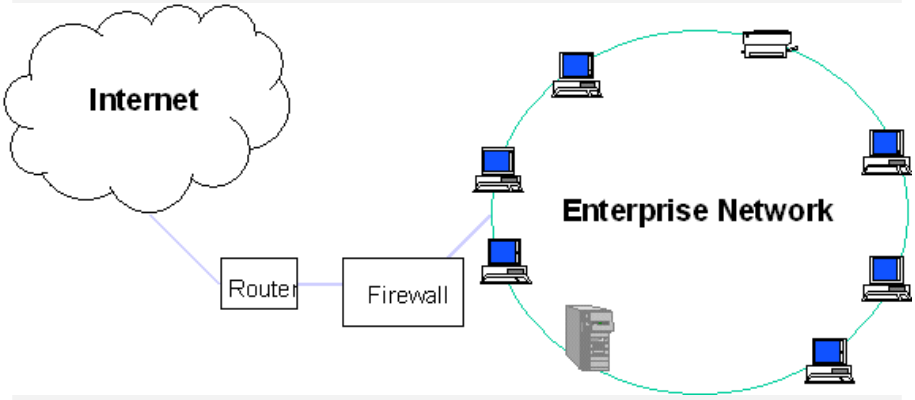
3.4 Managerial Issues

Review the current proprietary or leased network and decide whether it can be replaced by intranet and extranet.

If you are implementing the technologies of electronic commerce, find out the possible market of intranet and extranet technology, possibly with a business model.

3. Enabling Technologies of the World Wide Web

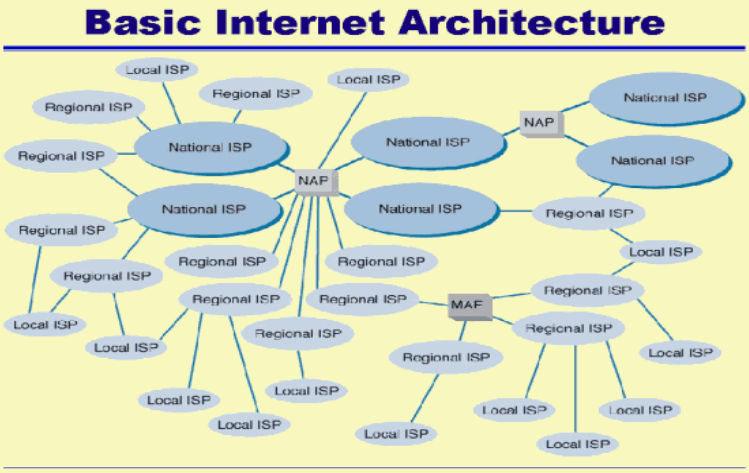
3.4 Architecture of Internet



119

3. Enabling Technologies of the World Wide Web

3.4 Architecture of Internet



120