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A STUDY OF INTRANET IMPLEMENTATION FOR THE REPUBLIC OF CHINA NAVY

by

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This study presents a review of the Republic of China Navy's (ROCN) future intranet implementation and its potential applications. The first three chapters address the characteristics of intranet technologies, its pros and cons, its implementation issues, and the impact of the technologies on the Republic of China Navy Headquarters. The current information technology environment of the Republic of China Navy is reviewed. Some potential intranet applications are discussed in the Chapter IV. Recommendations are presented in the last chapter. These recommendations include more emphasis on information technology education in the ROCN. The overall conclusion of the study is that the ROCN leadership should embrace information technology at the highest level. Without a good implementation plan to manage and predict the growth of the information technology the Republic of China Navy will fail to realize this resource in the future.

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A STUDY OF INTRANET IMPLEMENTATION FOR THE REPUBLIC OF CHINA NAVY

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I. INTRODUCTION

An intranet is a private computer network based on the data communication standards of the World Wide Web (WWW) to enhance communication, collaboration, and information distribution. Intranets are quickly becoming valuable solutions to communications in organizations throughout the world. The term "intranet" began to be used in mid-1995 by vendors of networking products to refer to the use inside private organizations of technologies designed for computer communication.

Intranets are a direct result of the interest and explosive growth seen in the Internet and World Wide Web. The Internet is global in scope, carried over public telecommunication channels, and open to everyone with no predisposition to content. By contrast, an intranet is strictly limited in scope. It may connect a workgroup, a department, or an entire corporation, but it serves a well-defined and bounded user community. The intranet can maintain a high level of security through the use of firewalls and multiple levels of password access. The beauty about most of these technologies is that they are simple and, in their simple elegance, phenomenal power can be unleashed.

A. THESIS SCOPE

The focus of this thesis is on intranet implementation and applications for the Republic Of China Navy (ROCN). It will encompass characteristics of intranet technologies, pros and cons, implementation issues, and impacts on the organization.

The current information technology (IT) environment at Republic Of China Navy Headquarters (ROCNHQ) will be reviewed. The advantages and drawbacks of intranet will be reviewed in this study. Some potential intranet applications for the ROCN will be raised in this study. At the end of this thesis, recommendations will be made for consideration of implementation by the ROCN. It is not the intention of this thesis to go into great depth of detail in the techniques of economic analysis and provisioning process for an intranet.

B. BENEFITS AND ORGANIZATION

This study will provide upper management with a picture of how an intranet works and assist in providing appropriate support to the organization. Additionally, the study will assist an information system (IS) member in planning as for network upgrade.

II. INTRANET PROS AND CONS

A. INTRODUCTION

This chapter will present an overview of intranet and the advantages and drawbacks of it's implementation. This chapter will briefly compares the intranet concept with the related technologies it augments and the possible impacts on the organization.

B. WHAT IS THE INTRANET

The definition of intranet from NASA, it states:

> The internal Internet, or intranet, simply defined is the structured use of Internet technologies to conduct the business of an enterprise. It is an environment of network and computing tools based on those used in the global Internet that is isolated from or connected in a controlled way to the global network. This environment is completely owned by the enterprise and is generally not accessible from the Internet. (Netscape White Paper, 1996)

The "intranet" is the descriptive term being used for the implementation of Internet technologies within an organization, rather than for external connection to the global Internet. This implementation is performed in such a way as to transparently deliver the immense informational resource of an organization to each individual's desktop with minimal cost time and effort. An intranet is applied to enhance communication, collaboration, and information distribution within an organization. The chief distinction between the intranet and the Internet is more one of semantics than actual technology: both use the same tools and techniques, protocols and products; drawing heavily on the standards of the TCP/IP world. Web browsers are employed as "universal clients" that access data and information stored on organizational computers. Web servers are the medium through which information travels. Intranet are a direct result of the interest and explosive growth seen in the Internet and the World Wide Web. The impact of the intranet affects an organization's operation, efficiency, development and even it's culture.

C. BACKGROUND

The Internet began in the 1960s as a project of the U.S. Department of Defense. The growing importance of computers gave rise to multiple challenge both in sharing information among diverse sites and networks and in keeping the information flow intact during potential disruption at individual sites. The Internet is based on a set of protocols developed to allow these distributed networks to route and pass information to each other independently. The protocol developed for this purpose was called the Transmission Control Protocol/Internet Protocol or "TCP/IP" for short. The TCP/IP protocol came into widespread use in the military community as a way for people to share their computerized information. It provides an effective way to transfer information across diverse networks. The IP protocol is a ubiquitous standard World Wide and hence the Internet.

The World Wide Web is an entirely Internet-based concept but primarily on a new protocol, Hyper Text Transfer Protocol or HTTP. HTTP provides users access to the files that make up the Web. These files may be in many different formats, such as text, graphics, videos, and audio, but the most common format is Hyper Text Markup Language or HTML. HTML is the standardized page description language used for creating Web pages; it provides basic document-formatting capabilities, and allows the user to specify hypertext links to other serves and files. (Telleen, 1996) These two standards provides the basis for a whole new kind of access to computerized information. Since the file can contain hyperlinks to other files, a user now has the ability to navigate information with a point-and-click interface from what looks to them like they are looking for. In the meantime, this technology takes away the complexity of accessing information on distributed computers.

D. INTRANET ADVANTAGES

The term intranet is coming into common acceptance since the early 1995.

Ward J., Griffith P. and Whitmore P., Strategic Planning for Information Systems, John Wiley, 1990.(Tittel and Stewart, 1997) In a business, the quality of decisions translates directly into material success or failure. Even in a noncommercial venue, decision quality

determines how effective the organization is. However, people can only make decisions as good as the information available to them. Information systems have value because organizational effectiveness is very much a function of the quality of information to which people have access.

Today's budget-cutting environment demands that we do more for less. Also, we know the increased demands on our busy staff mean they do not have the time to waste chasing down the correct documentation or project description. Intranet technologies provide the tools, standards and new approaches for meeting the problems of administrative efficiency.

The beauty about most of these technologies is that they are simple to use and provide a cost-effective method of sharing organizational information within an existing network architecture at minimum cost, effort, and time. The reasons for implementing an intranet are varied and numerous; they include:

1. Ease of Use

The Internet technologies produce a very intuitive point-and-click interface which makes it possible for any computer to display a document, no matter what kind of computer created it. It offers a very simple way for the user to navigate through the system and retrieve information or data without worry about where the information is actually stored.

2. A More Secure Environment

The sensitive or secret data that reside on intranet are protected from the outside world by security software called firewalls. Firewalls can prevent unauthorized access to sensitive information, and additional protective measures may be needed if users will dial into the internal network from remote locations. The firewall request a password and other forms of identification when anyone on the Internet (or intranet) tries to get into the confidential material. While hardly impregnable, firewalls are providing better protection. But if the intranet servers properly isolated from the public Internet connection, the risks from outside source, at least are minimized.

3. Low Cost to Implement, Operate, and Maintain

The technologies of the intranet are quantifiably cheaper to acquire and operate. Rather than discarding older systems, intranet make it possible to incorporate older legacy systems within an organizational network. Additionally, personal computer with relatively old processors, such as 286s, and 386s, can have their useful lives extended with the implementation of a TCP/IP stack, which then make them viable platform in an organizational network.

Intranet extends existing infrastructure and decentralized computing infrastructure. In the other hand, only a minimal dedicated staff may be required to maintain the system and most of the work will be done by the users. The basic system configuration consists of a server hardware platform/operating system and WWW server software. The Web server software provides the functionality enable to manage the internal WWW presence, and is also capable of integrating existing internal database and backroom applications into the organizational intranet. The LAN cards for TCP/IP connection over the network to the clients are required in order to communicate with the server and clients. By using a WWW on the LAN, the organization can easily disseminate and update a variety of information, improve productivity, and significantly reduce paper and distribution cost. On the client side, each user will need a browser software package. The client browser can launch a variety of applications, access disparate database, retrieve information from across the intranet (and Internet). Organizations can set up a Home Page for each department or functional area. And since the server is configured on a LAN, it's higher bandwidth capacity and performance can enrich the documentation content. Assuming the organization already has client PCs in place, the client investment should be relatively small. Instead of maintaining information in many different formats and mediums, and having to address the problem of version control, an intranet permits the maintenance of a single copy of that persistent information in one place, where it can be easily updated and kept accurate. (Seymour, 1996)

The most significant cost advantage is, however, the one that is most difficult to measure; end user productivity, both in terms of function and ease of use. The ability to instantaneously and dynamically share digital information, while at the same time requiring less training and trouble support, provides immeasurable value to the organization. (Netscape White Paper, 1996)

4. Improve Administrative Efficiency

An intranet can provide a common, integrated, user-friendly HTML-based management interface that allows all servers and resources to be managed securely from anywhere on the intranet. To a military institute, it offers a powerful management tool to enhance productivity and improve working quality. In the mean time, HTML forms extend intranet technology to allow data entry and workflow automation, offering the prospect of process cost reduction. Also the creation of departmental homepages can reduce the number and length of routine inquiries that reduce each worker's productivity. Besides above, posting documents to web server allows people to save time and energy on trying to find and read information; because document are already in HTML format, there is no need to launch a specific version of a specific application to view documents. When the load on the network and server infrastructure be reduced, it also means the Information System professionals can have more time to concentrate their effort on monitoring the organizational computer systems instead of maintaining server content (process software).

E. POTENTIAL IMPACTS AND OBSTACLES

1. Centralization vs. Decentralization

The intranet, with its emphasis on open communications, collaboration, and knowledge management, tends to break down traditional organizational structure. In addition, it introduces attention to graphical design and need improved writing skills instead of programming. The biggest challenge is moving from an attitude of control to an attitude of enabling independent decision and actions. Since the key characteristic of this technology is the ability to shift control of information flow from the information creators to the

information users. So empowering the individual requires not only a new information infrastructure, but a shift in attitude and culture. To a conservative and hierarchy-controlled military environment, it is going to have some impacts on the traditional way of doing things.

2. Potential Obstacles

As wonderful as intranets may be, they do have a few obstacle to overcome. The world of information that they open up can be difficult to deal with, and restructuring and rethinking are key considerations when deciding what will be on an intranet and how it will be controlled.

a. Security Issues

Naturally security issues is the top list of concern. Ensuring security on an intranet is a matter of verifying users are who they claim to be, restricting data access where appropriate, and encrypting confidential communications to prevent interception. (Benett, 1996) A firewall is "a system or combination of systems that enforces a boundary between two or more networks." (All definitions in quotes are from the National Computer Security Association's standard Firewall Functional Summary template.) It is a controlled gateway between one network and another. These physical devices protect the network systems and data, and insure that only authorized users can enter your protected network. Currently, there are several products available on the market which most of them use Public Key Encryption. In the other hand, the easy-to-use graphical user interface and flexible authorization options are also the important issues for considering the security software.

However, the protection that firewalls offer isn't always sufficient. Firewalls cannot prevent computer viruses from entering the network. Viruses are a growing and very serious security threat. To protect the system, the best policy is to run anti-virus software on a regular basis. Securing any network is partly a matter of technology, partly of policy. Developing a security plan outlining the type of access the staff and outsiders is necessary before the design of a firewall.

Using a strong, current combination of firewalls, passwords, and network authentication is probably the best way to arm against intranet security breaches.

b. Controls

A few control issues when considering an intranet deployment. Proliferation is the first consideration. As employees discover that setting up a basic Web service is incredibly easy, some employees are putting servers online from their own desktops. Then, closely monitoring what's being done over an individual server is very difficult, and corporations are rightly concerned about liability and security. So, how the organization's intranet will deal with this issue should be discussed and carefully planned as the intranet is being created. Meanwhile, making sure that guidelines are well publicized and templates widely available is equally important, to make it easy to follow the guidelines.

> The second one is the rate of change. The intranet's capability to exchange information and permit communication at an fast rate gives rise to a mindset among its users that information should be very fresh and hot. Although this hyperspeed mentality is not necessarily a positive thing, if the organization's Web pages aren't fresh and timely, they are not being used to the fullest advantage of the technology. In the other hand, the rapid rate of change on the intranet sometimes make it difficult to predict exactly how much growth your Internet can expect. If we fail to plan for adequate growth, we quickly be plagued with dissatisfied users and overburdened networks. So, building in at least 40 percent excess capacity to handle the potential growth is a good idea.

Ward J., Griffith P. and Whitmore P., Strategic Planning for Information Systems, John Wiley, 1990.(Tittel and Stewart, 1997)

c. Technophobia

Resistance to change can be an issue when a organization gains an intranet. Uncertainty or technophobia can prevent employees from exploiting intranet resources. Most people, even those accustomed to working with standard networked environments, aren't familiar with the technologies that intranet use. After working a certain way for many years - exchanging files full of papers rather than electronic documents, and receiving

information on memos rather than through e-mail. Organizations need to address the concerns and fears that may arise from having to deal with this new structure.

d. Performance

As with the implementation of any new technology, there going to be a few areas in which performance may degrade.

> First is the bandwidth. Higher bandwidth networks are required for an highly appealing, media-rich intranet solutions. How much bandwidth an intranet requires is definitely linked to how and why the intranet is being used. One way, the best way, to avoid a bandwidth crisis is simply to plan ahead. On bandwidth, "the safest approach is to err on the side of generosity rather than parsimony."

Ward J., Griffith P. and Whitmore P., Strategic Planning for Information Systems, John Wiley, 1990.(Tittel and Stewart, 1997)

Productivity is a significant effect that the management population has real concerns about. Organizations often fear that employees will spend time surfing the net and causing their work output to suffer. If unsanctioned Web surfing become a major concern in an organization, a firewall that restricts or limit access to specific Web sites can be helpful in limiting this potential loss in productivity. Monitoring employee activity is technologically feasible on an intranet. If employees are made aware that their intranet actions can be traced if the need arises, most of them will avoid behavior that would merit such tracking.

A preferable approach is to establish a policy of employee Web use. In the other side of this Web addiction concern. It is preferable for employees to spend time seeking out new information on the Web rather than gossiping about organization politics at the water fountain.

e. Cost

(1) Creation Cost. Despite all the wondrous economic benefits that may follow the information of an intranet, however, the fact remains that the initial expenses accompany the creation of an intranet. Because in most organizations, the greater

the initial investment, the more difficult it is to procure, the process of setting up an intranet will not be easy in economic terms. The cost of creating an intranet varies according to whether an existing network is in place. If the organization has an existing network in place, the need may still exist for specialized hardware or software to added before the organization can use TCP/IP. A most important concern when dealing with intranet cost is how important is it? This question can be applied to the technology that maybe impressive to have but not crucial, such as videoconferencing equipment. Especially because the equipment will only drop in price and rise in quality in upcoming years.

(2) Hidden Cost. The up-front cost of web server software and hardware is smaller compared to the total cost of owning and operating an intranet. An intranet must be stoked with content to create value. It must also be managed and maintained like any information system, and protected against misuse or unauthorized access with security procedures. These activities frequently go unbudgeted during an intranet procurement. Yet, they will give rise on cost over time. So, for an internal web, it is necessary to grow those skills on maintaining and application development in order to keep cost down and expedite content updates.

F. SUMMARY

This chapter has presented a brief overview of the intranet and its basic components. Except the benefits that the intranet has brought, it also caused some potential impacts on the organizational structure, culture and working habit. From a business perspective, an intranet is a private information exchange that offers unprecedented cost and capability. Nevertheless, from a military perspective, it is also a great weapon to improve the administrative efficiency. It is possible for the intranet to be a cost-effective and highly efficient way to meet different requirements, depending on the organizational goals, resources, and environments. Effective implementation requires some good planning, a clear understanding of the organizational internal communication needs, and familiarity with the appropriate tools.

III. INTRANET IMPLEMENTATION ISSUES ON ROCNHQ

A. GENERAL

The organization of the Republic of China Navy Headquarters (ROCNHQ) is a traditional hierarchy with seven levels in the chain of command. This hierarchy is shown in Figure 1 and Figure 2. Since each level of the organization may have a different approach to the implementation of the common information system, an integrated information system is necessary for cross- organizational communication improvement.

The ROCNHQ has approximately 1400 users including staff and civilian employees. Computer training programs are offered to the new staff and employees at ROCNHQ. Program contents cover basic operation of an IBM compatible PC, software

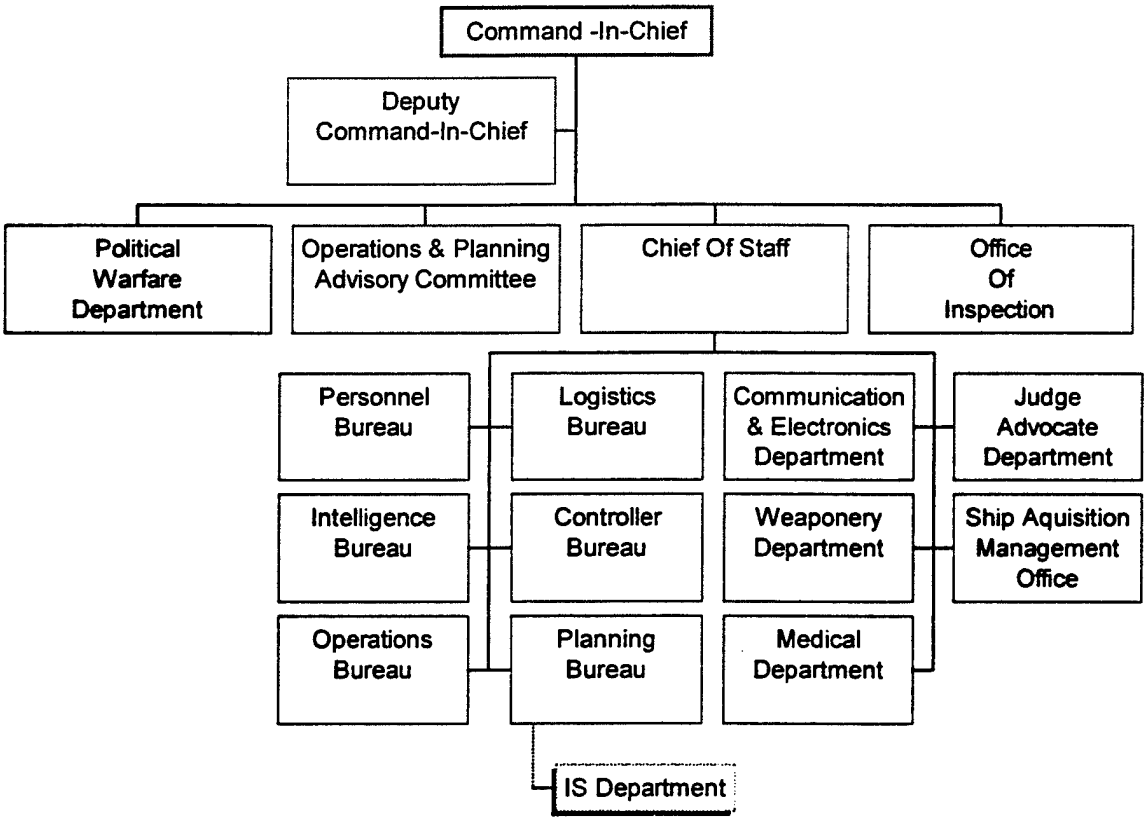

Figure 1. Organization Chart Of R.O.C. Navy Headquarters

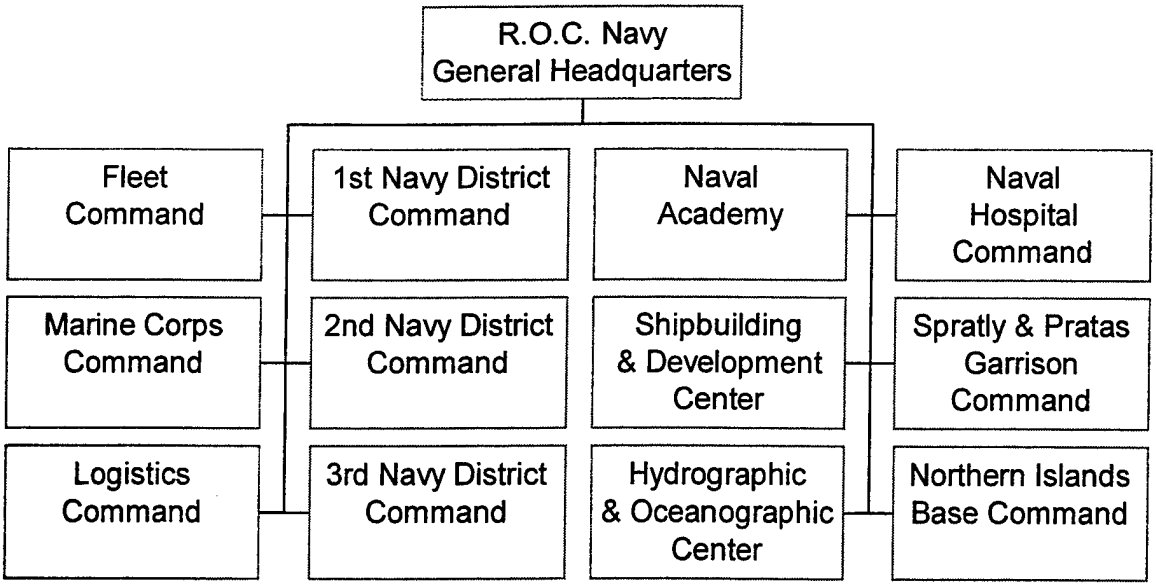

Figure 2. R.O.C. Navy Chain Of Command

application and current regulations of on-line policy. Every bureau has its own LAN and server. Most departments are limited to only the exchange of e-mail. Some Internet service is offered, but is totally separated from networks and access strictly controlled. A limited WAN has been set up to connect with important naval bases not on the LAN. EDI (Electronic Data Exchange) has been applied to deal with the logistic supply within the Fleet Command and logistic authority. The configuration of the computers are not identical, but all share resources.

B. CURRENT PROBLEMS AND ISSUES IN THE ROCNHQ

The objective of information technology at the ROCNHQ is to support and meet the Navy's mission responsibilities into the next century. The communication network will be one of the direct impact elements on the entire strategic plan. Due to the limited functions of the current network, most computers turn out to be only "word processor machines", without search directories or cross-platform functions, as such, the e-mail function cannot take advantage of the Just-in-time concept.

Limited access and slow speed of Chinese characters key-in also decrease the motivation of users to use this information system. As a result, the telephone is still the most popular communication tool; however, too many phones ringing make offices noisy and decrease efficiency and working quality.

These network infrastructures have already existed for more than ten years, and the Navy has continuously updated them, however the unique nature of each LAN, different software package requirements and rapidly changing technologies already have made the maintenance and control a very serious problem.

The connectivity and functionality problems confronting the ROCNHQ are neither new nor unique. These problems have been addressed and resolved in other government agencies and private industry through the use of intranet technology. Additionally, through the use of an intranet, these organization have been able to achieve other benefits such as increased productivity and efficiency as a result of redefined missions and roles.

The organizational chart is very important for a traditional hierarchical organization to define subordinate and superior relationships, unfortunately the organizational chart is not well suited for getting the correct information to the people who need it.

> The greatest benefits that an intranet offers an organization and its users are described at chapter two. Within an intranet, users can dissolve the barriers of communication and use universal browsers to perform the following tasks:

Ward J., Griffith P. and Whitmore P., Strategic Planning for Information Systems, John Wiley, 1990.(Tittel and Stewart, 1997)

- View documents created on a variety of platforms.
- Create and revise document content.
- Participate in threaded discussions and news groups.
- View and interact with multimedia presentations.
- Gain seamless access to the Internet

- Interface with existing legacy data (non-HTML-based data) and applications.

Also because the ease of use, users will have more confidence and motivation to use it. It's an important step for an organization to process toward a paperless office. In the meantime, we have to consider intranet as not just a publicity driven trend. Its low implementation cost, ease of use, cross-platform independence, and its openness make this system the most dynamic and attractive network option available today.

A computer network is an integral part of the ROCN's infrastructure. The impact of an information system on the organization and management in the ROCN is dramatic. However, new technology can rarely by managed successfully using a "Bottom-Up" approach. The technologies evolving to support the ROCN are expected to upgrade its information application ability and help meet the goals of the ROC policy of networking the Island of Taiwan.

In order to reach the goal of office automation, sharing of resources and the integration of databases, an updated network has to be built. According to the users' past passive experience on current networks, some characteristics of this new solution should be considered, in order to stimulate the user's motivation. And intranet seems to be the answer. It provides many useful applications that including the following benefits: (also see Chapter. II)

- Ease of use.
- Improved productivity and efficiency
- Quick access to information.
- Cross-platform capability.
- Cost effectiveness.
- Reduced operating costs.

C. INTRANET IMPLEMENTATION ISSUES FOR ROCNHQ

The most important part of network installation is planning. Since the networking technology is evolving so rapidly, building and managing a cost-effective, competitive and expandable intranet to support ROCNHQ is the author's focus. The first step to plan the successful implementation of an intranet is to obtain organization-wide support starting with upper management. A survey (see Appendix A) will help us to gather data about the current environment, personal attitudes and the users' computer abilities at the ROCNHQ.

A team has to be selected with representatives from different departments in the organization. It is important to have a diverse group of individuals with complementary skill sets and job functions.

Planning is an essential part of the intranet development process and is critical to the final success of an organizational intranet. To do so, we must define the goals, purpose, and objectives of the intranet. Before beginning the design, two conditions must be met. The first is an appropriate budget, available during the development time frame; The second is adequate personnel and expertise, available to support the operation and training plan.

1. Internal Organizational Strategic Plans and Setting Goal

The goal of effective management of this intranet deployment is to improve the overall productivity of the ROCNHQ.

An organization has its top level objectives and strategy. The manager should translate the organization strategy into network plan. The network plan has short and long term goals. Because networks technology is continually evolving, there cannot be a one-time investment that will keep an organization competitive. On the other hand, the leading edge technologies of networking are always combined with the risk of interoperability and integrity issues.

Short-term goals should focus on mission critical functionality to support organizational operations. The time frame for short-term plans is 2~3 years. The intranet's growth and its plans should match the organization's development and emerging network technologies.

Long term goals address organization integration, future growth, and improving quality of service. The time frame for longer-term plans can be 10~15 years. Long and short-term plans should be continually reviewed and adjusted over time.

2. Design Requirements

a. Define Requirement

Workflow process, document management, and work collaboration are areas of the communication structure. Workflow defines the series of steps, or processes, and the organization performs to complete a task. (Bermner, 1997) The data source for requirements comes mainly from network users. These requirements typically are the transmission bandwidth, response time, availability for resource accessing, service quality for different applications, reliability of networking management, and security features.

The requirements must be stated as clearly as possible and translate to quantitative figures. An example of quantitative requirement would be: The intranet operation reliability should be 99.9 percent; or a remote query with a ten seconds or less response time.

All the requirements should be prioritized into three levels, must have, desirable to have; and nice to have. (Fitzgerald, 1993) Implement these different ranks according to critical functions and budget restriction.

Constructing a pilot system is highly recommended before attempting an organization-wide intranet convergence of the existing IS. The pilot enables us to troubleshoot potential conversion difficulties, manually walk through the installation process, and evaluate the interaction of the existing data formats with new delivery mechanisms.

b. Organizational Structure and Functionality Design

Before we create a design for the intranet, we must redefine our organizational structure, which entails a good understanding of the communication channels within the organization. The power of an intranet is mainly due to its ability to distribute

information within an organization. If we limit this process, we will limit the effectiveness of the intranet. To the ROCN, the implementation of an intranet will be a major change for this traditional hierarchy organization. However, it's also a good start toward to a "learning organization". (Bernard, 1996)

Integrating a system that provides content management is an important part of an intranet plan. We can start building the intranet structure by grouping content into main topics and categories. Then, relate other information by department, function, project, or by a defined content. It is important that we involve more than one person in the task of grouping the topics. By using a team approach to information grouping, we will help keep the grouping users' friendly and ensure that they make sense to a wide audience. At this stage, to create grouping is much more important than to worry about each topic's exact organization. The following list can be a reference where it includes common categories we can use within the ROCN's intranet homepages:

- What's New
- Navy Information: history and contacts
- Navy Jobs
- Navy Web Sites Link
- Software and Tools library
- Telephone and E-mail Directory
- Help (technical assistance)
- Lesson Learned
- Search Engine
- Event Calendar
- Images Library

- On Line Survey

c. Technical Requirement

To establish an intranet, we need the following components:

- A Computer network for resource sharing.
- A network operating system that supports the TCP/IP protocol.
- A server computer that can run an Internet server.
- Server software that supports Hyperlink Text Transportation Protocol (HTTP) requests from browsers.
- Desktop client computers running network software capable of sending and receiving TCP/IP packet data.
- Browser software for various client computers.

Creating an internal web site, the basic system configuration consists of a server hardware platform/operating system and WWW server software. As a server platform, the rule of thumb is server hardware with sufficient memory and disk space to run Windows NT, Windows 95, and/or a Unix system platform. We also need to configure the hardware with LAN cards for TCP/IP connection over the network to the clients.

Web server software enables us to manage the internal WWW presence on the intranet. The right WWW server software solution will give us the functionality required to setup and manage home pages, develop WWW content based on HTML, perform text searches, and integrate with internal organization database or applications.

d. Forecast Demand

Forecasting demand is important because it determines the size and service provided by the intranet. The factors of developing a forecast include: number of network access lines, traffic, service, interest for the organization, and emerging new applications. From organization historical data we can find trends and potential new network service to be provided.

Combining the forecast demands, the requirements and the goals that have been developed in previous steps, the intranet functions and capabilities required can then be developed.

e. Evaluate and Select Products

The intranet products evaluation and selection is a complex process. There are hundreds of vendors and products and variation to choose from. Additionally the intranet technology is evolving and the intranet design will possibly be supported by multiple vendors.

To fulfill this step, the designer should coordinate with the technical group that specified the required capability or new products and conduct trials on new equipment. Products information collection maybe done through Internet survey, trade shows, and from key vendors. Selection is based on a comparison of cost and capability, yet there are other important considerations. For example, whether the components are in compliance with international standards, are the vendors independent, interoperability, compatibility with legacy devices, easy to use and manage, and an allowance for future growth. Intranet components are rarely supplied by one single vendor. The designer should ensure that each key technical area has more than two vendors for competitive pricing.

Hardware selection is a simpler problem than software selection because hardware is tangible and has a measurable function and purpose. Contrastly, software selection has to meet all the requirements to support networking, functionality application, and internetworking. Some advanced intranet capabilities have to be considered to increase the intranet's functionality. They are:

- Search engine tools that help users locate the information they need quickly and efficiently.
- Discussion-group software that fosters collaboration.
- Document-management tools that help users located documents, manage revisions, and notify document creators when the document requires an update.

- Workflow document tools that help users automate current process.
- Integrated tools that let users perform common tasks using a package of related software programs.

f. Economic Study

Economic studies support the proposal of evolving intranet as the best alternative. Normally, cost benefit analysis is performed through the system life cycle which starts with intranet planning, and continues to the stage of maintenance and management. The system life cost includes hardware, software, personnel and training.

Hardware lifetime is normally three to five years due to the technical obsolescence. One way to analyze cost and benefit is using net present value and pay-back period. (Garrison, 1993)

The possible benefits include cost reduction and intangible benefit. The analysis should perform an accurate job in translating cost and benefit into dollar value to provide for easier justification.

2. Management

a. People

Technology alone will not change the organization culture. Probably the most difficult area to manage on the intranet will be the people who use it. An intranet facilitates information sharing, but it does not guarantee it. Upper management's involvement in unleashing the intranet's full potential is critical and necessary.

Total quality management (TQM) provides a means of creating a system that promotes, supports and enables quality management in all aspect of an organization. TQM and the successful deployment of intranet will be a large-scale organizational change of the ROCN. Although change is not easy, people are more inclined to change their behavior when leaders have a clear sense of direction.

Ideally, the management should have a good understanding of what an intranet offers, as well as related costs and the time frame in which you expect to complete

the intranet. Take advantage from management skills that relate to quality-control techniques, process-management approaches, and communication patterns. Such as: (Bermner, 1997)

- Understanding of the organization document flow.
- Experience with the re-engineering process.
- Knowledge of quality-control techniques.
- Knowledge of the organization's informal flow of information.
- Experience with training and project coordination.
- Offering sufficient training programs.

If we want people to contribute content to the intranet, we have to train them how and why to share information with others. Often, people who deal with the technical aspects of intranet do not think comprehensive training on various aspects of the intranet is needed. So, conduct a survey to assess user training needs and wants, to train users how to develop HTML content are necessary to be evolved in the train program.

b. Content Management

Integrating a system that provides content management is an important part of the intranet plan. Some content-management tasks have to be included in the ROCNHQ's intranet plan:

- The ability to add new content.
- The ability to protect their content from changes by other users.
- The ability to update existing content.
- The process of the contents approve.
- The ability to control document revisions, especially for shared documents.

- The ability to provide an easy way for users to test their Web pages.
- An intranet style guide that provides guidelines for page layout, design elements, and HTML codes.

c. Security

Security is the means, process, and method for granting satisfactory access to a computer system while simultaneously preventing access by others.

Ward J., Griffith P. and Whitmore P., Strategic Planning for Information Systems, John Wiley, 1990.(Tittel and Stewart, 1997) Three technologies enable the secure storage and exchange of data on a network: authentication, access control, and encryption.

To come up with a judicious security plan, we have to think about the assets that we intend to make available via internal webs. This includes the data, documents, images, and network resources people will have access to. Then to review the vulnerability of each of these assets to the following hazards:

- Exposure of sensitive material to unauthorized personnel.
- Corruption or deletion of the asset.
- Illegitimate or inappropriate use of shared resources.

Once we have a sense of what we're protecting, we're ready to think about how to do it.

Securing any network is partly a matter of technology, partly of policy. To summarize, the low cost of an intranet should never be realized on the back of a lax security, especially for a military organization. Budget for network security of comparable quality, and maintain them with comparable discipline, good users training are the keys to make it works.

IV. POTENTIAL INTRANET APPLICATIONS AT ROCNHQ

A. BASIC INTRANET APPLICATION

A development project for the ROCNHQ network will be proposed in June 1998. The new developments enabled by intranet, new methods of collaboration, work sharing, instantaneous content updates, and simplicity of communication meet the Navy's need. This proposal may realize the concept of a paper-less (or, at least, paper-reduced) business environment for the ROCNHQ. This may be a significant contribution of intranet.

Web-based applications have the ability to improve internal communications. Making users more efficient and, as a consequence, more productive. There are several intranet applications which can be developed at an organization to improve information flow. Typical uses are:

1. Publishing Organization Documents

According to a Zona Research study (Zona Research Report Profiles, 1997), information publishing is the top application for intranet computing. "The most popular information on the intranet is created by employees, for employees." (Storm, 1995) With the click of a mouse, end-users can automatically post and share information on the organization network, rapidly creating an environment for employee collaboration that uses the most timely data. (Seymour, 1996) These documents can include newsletters, annual reports, maps, organization facilities, project information, and any document which is of value within the organization entity. This is one area where significant cost control can be achieved as well as much more efficient, timely and accurate communication across the entire organization.

2. Access to Searchable Directories

Rapid access to organization phone books and the like. This data can be mirrored at a Web site or, via Common Gateway Interface (CGI) scripts, the Web server can serve as a gateway to back-end, pre-existing or new applications. This means that information can be

made more widely available and in a simpler manner using the same standard access mechanisms.

3. Organization/Department/Individualpages

Within an organization each department has its own mission. Intranet technology provides the ideal medium to communicate current information to the department or individual. Search engines provide the means for people to find the group or individual who has the answers to the continuous questions which arise in the normal day-to-day course of doing business.

4. Simple Groupware Application

With Hyper Text Transport Protocol (HTML) forms support, sites can provide sign-up sheets, surveys and scheduling. As the intranet technologies continue to evolve, the press have been positioning the technologies as alternatives to major groupware applications to such a point that this type of rhetoric only serves to cause confusion as to the appropriateness of each area of technology. The intranet technology can be used to complement or as an alternative to such groupware products. It all becomes a matter of scale, cost, openness and preference. (JSB Computer Systems, 1997)

5. Transaction Application

These applications are two-way interactive exchanges such as requesting or providing information to an organizational database. With these applications, the user normally queries a database and in return receives a dynamically populated HTML page with the result of query. These applications normally require some programming.

These are the applications that empower users by enabling them to locate information on their own initiative. Transaction applications enhance productivity by removing the constraints that previously bound individuals to completing request forms or playing telephone-tag with the information source. Information can be retrieved by the user when desired and on demand when distributed using an intranet.

6. E-Mail

With the move to the use of intranet e-mail products with standard and simple methods for attachment of documents, sound, vision and other multimedia between individuals, e-mail is about to be pushed further forward as a simple, defacto communications method. Mail is essentially individual to individual, or individual to small group, communication. With the emergence of Web technology, there are now better and more appropriate tools for one-to many communication which historically is where mail systems have been over-burdened and over-burdening to the point of reducing their effectiveness.

7. Communication Applications

These applications are many-to-many, collaborative interaction that facilitate the direct exchange of information between members in a department, section, or workgroup. This exchange is the start of a thread that is available for others to review or add relevant information or comments. These application are especially effective for project teams that are dispersed throughout a large geographic area but who must still communicate and coordinate their efforts in achieving an assigned project.

Information is the future world currency. An advanced IT system is a must for the ROCN, not only in hardware and software, but also in the skills of people. In order to deliver information on demand - as and when needed, efficient and effective networks are the only solution. Intranet technologies provide the tools, standards and new approaches for meeting the problems of the modern organizations.

B. POTENTIAL APPLICATIONS AT ROCNHQ

1. Event Calendar

Distributing memos and notifications are a waste of time and paper. With the intranet, it will provide people who work at ROCNHQ with an online archive of the daily schedule. When schedules are changed, an e-mail notification can be forward to all related individuals or unions. This process will eliminate the need for broadcasting, notification,

distribution, and lead to reduce paper cost. The activities on the Web-based calendar can be updated immediately. It is also convenient for different bureaus to pick up the appropriate dates when hosting the activities.

2. Leave Request Form

End users can submit leave requests on line. Manager can approve the request, deny the request or ask for additional information from the applicant. This automated procedure will reduce the cycle time. Also paper-related costs will be reduced for printing, sorting, storage and searching for Leave request forms. This application will not only reduced paper cost, but also permit the staff members to utilize their time in a more productive manner.

By the same principle, many standard request forms can be transformed from printed paper documents to online Web forms. This application has not only saved the money in paper and garbage expense, but timely submission of forms and accuracy of the information has improved as well. A user can access any form related to his job, project, or problem from a single location on the intranet. It also need to be designed to ensures that each form is immediately routed to the proper divisions or people, plus the auditing system will be able to more effectively control, audit, and track the flow of information to and from people.

3. Project Collaboration

Tight coordination is demanded on research and weapon acquisition project teams. Team members can use the intranet to access a wealth of project development information, debate topics in dedicated "discussion areas", and share experiences and project results with their colleagues. In the meanwhile, this application also can streamline internal processes such as project management overhead and let project leaders focus more on technical problems than on administrative issues.

At ROCNHQ, the collaboration via the Web will bring the Planning Bureau, Weaponry Department and the Navy Ship Acquisition Management Office working more closely.

4. Hot Line

When someone has a question for which he can't find an answer from the internal Web, he can submit a hotline request to the appropriate bureau. All hotline e-mail would be received by an assigned staff and then routed to the appropriate office. This question be responded to within 24 hours. The staff in charge will e-mail the answer back to the requester and copy the appropriate staff. On the other hand, if the question is generally applicable, it will be archived on the intranet Web site for others to browse.

This application should be developed to allow requests to be submitted by authorized users from any workstation or terminal. The request fulfillment process will be e-mail driven. Through the Web-based e-mail, attachments can be more diverse, and will help describe the problem more clearly. The hotline administrator is inserted into the process in order to ensure that the 24 hour "turnaround" requirement is met. At the end of each week, the hotline administrator summarizes the system responsiveness. The self-service routing of the request and automatic tracking functions should be included.

This hotline application can benefit ROCN by reducing cycle times, improving administrative responsiveness, reducing call volume, improving cooperation among staffs and departments.

5. Staff/Employee Handbook

New staff and employees need a way to find information on procedures, organization, and benefits as soon as they come onboard.

This application will offer the following information: operating procedures, training manuals, required submission forms, qualification requirement, related Navy policies, leave regulation, benefit and responsibility. This will allow new staff personnel and employees to browse the information they need or want to know, through the hypertext links.

The profound payoff will be reduced printing and distribution costs. It also can simplifies the training process for new members and lessens the burden placed on experienced employees while training is performed.

As new technical specifications, updated materials, and related articles are written, these are added to the database of internal information. Members at ROCNHQ will be encouraged to keep abreast of the materials contained in the database to improve their work. ROCN will benefit greatly from this work quality improvement.

6. Phone Book and E-mail Directory

This application will become a living document that is not obsolete the day it is printed. This directory will include all people, offices and other public information deemed necessary. It will have updated information, and an e-mail directory portion in Hypertext format. Utilizing a search engine, employees can easily find the right person, click on the individual's name, and automatically generate the "mail to" header information of a message to the person.

Besides the basic personal information, data has to be arranged by organizational structures to give users an understanding of the arrangement of the other units.

7. Chief Navy Officer's (CNO's) Corner

One way to introduce the intranet to the ROCN is by starting at the top. This application will give the CNO the ability to communicate his ideas, vision, and future to all the members at ROCN. The CNO's corner could provide members with the tools to help create a more open and honest organization culture.

Vice versa, we can use a CNO's homepage as a model for setting up departmental and individual homepages.

C. SUMMARY

Integration of Naval resources is a crucial issue. Future ROCN intranet applications should include all Naval bases and facilities to ensure the effective and efficient use of limited resources.

> The intranet will play an important role in the future of network computing. However, " the distinction between an empty vessel and a useful intranet component depends entirely upon adding organization or task-specific information to the basic capabilities of some kind of networked application."

Ward J., Griffith P. and Whitmore P., Strategic Planning for Information Systems, John Wiley, 1990.(Tittel and Stewart, 1997) All the values of the intranet applications are in their content. The overall purpose of these applications are to enable limited resources, both informational and human, to be used more efficiently. So, to computerize basic capabilities; such as a powerful search engine and how the data is organized, is the first step of a successful application implementation. Using the intranet to automate repetitive tasks and simplify complex tasks will lead ROCNHQ toward a more efficient organization.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

Intranets represent a new model for internal information management, distribution and collaborative computing, and offer a simplistic but powerful implementation of client/server computing.

Development and implementation of organizational intranets encompass an enormously wide array of technologies. They require careful planning, organization, and forethought. There are three primary requirements for an intranet: efficient individual and group information management-i.e. access, collaborative authoring, and distribution; cost-effective document management; and administrative control. It is crucial for an intranet deployment to have a good planning, implementation, and employee training. It will present not only technical challenges, but also organizational challenges.

The concept of the intranet will make the theoretical concepts of a learning organization a reality. Groups that have been geographically separated in the past can finally share a common communication slate. Team members will learn how to depend on each other when faced with difficult tasks. An employee's homepage will become the ultimate garden for growing the seeds of collaboration and knowledge sharing within the organization.

Intranet will flatten the hierarchical structure of the organization, enabling others to participate in the decision making process. It should be designed to support the organizational overall strategy. For ROCNHQ, the intranet is a solution to meet the short-term requirement, as well as support the long-term strategy.

The push of new technology will be greater than in the past. More unforeseen developments will surface. The relative strength of the military to the civilian market has shifted dramatically over the last ten to fifteen years, with civilian industry increasingly driving the new technological developments. We will increasingly lack the opportunity to

incorporate the best developing technologies into our development process. As more advances occur outside of military purview, we will be forced to rapidly inject new advances that we discover only when they are released to the public. This will reduce the planning cycle time that we have to prepare to support these advanced off- the-shelf capabilities, to far less than have been required for major information technology upgrade. As new developments occur, we will need to adopt them. The advantage of an intranet and the Internet are so compelling that we will surely wish to exploit them across the entire spectrum of conflict.

To implement an intranet, the ROCNHQ should prepare in advance for its impacts, such as the changing work environment, training and education issues at all levels, and partial re-engineering of the structure and job process.

B. RECOMMENDATIONS

1. Planning Ahead

An intranet implementation task team should be formed to manage the development and implementation efforts. This team should develop a realistic, achievable timeline for this implementation. It is important that this team work with representatives from different departments.

Some issues have to be considered, such as training programs; design requirements, content management, and maintenance. In order for this technology to be embraced by the masses, two or three of the first applications developed should have an immediate and lasting impact on the users of ROCNHQ.

The growth of the intranet also has to be thoroughly planned and managed in order to meet the future expansion.

2. Maximize User Convenience

The danger with dividing the information into categories is that the information may end up with too many layers, so that it becomes tedious for the users to select category after

category of information. The best, and only way to settle this issue is with rigorous usability testing.

Searching is the best way to guarantee that users will locate exactly what they need quickly and easily. A powerful search engine is necessary to maximize users' convince.

3. Security Issues

The network security must be considered and its importance must be balanced with that of network performance. ROCN cannot afford the loss or corruption of valuable data, or a system failure. Education and training will help users to better understand and to comply with network security policies and the continued success of the network will be assured.

4. Highest Level's Support

Leadership must embrace intranet technology at the highest levels in the ROCN. The information system department at ROCN is a relatively small office, without highest level's of support it will be difficult to push through such an ambitious plan. Meanwhile, information technology concept must be emphasized at ROCN. It is still stereo typical for some high ranking officers to place more emphasis on weapon procurement than the information technology infrastructures and application. As recent conflicts have shown, information is a vital commodity. Without information and communication even the largest forces cannot be effective.

APPENDIX A. SURVEY

R.O.C.N.HQ Information System Development Survey

Survey Purpose : to improve current Information system and evaluate the effectiveness of office automation. Please take a few moments from your busy schedule to tell us how you feel about headquarters' current information system. Our goal is to evaluate the acceptability and satisfaction of the current system. Your complete and candid assessment is vital to this project and is greatly appreciated.

****

1. Which bureau you are working for?

[ ] G-1 [ ] G-2 [ ] G-3 [ ] G-4 [ ] G-5 [ ] G-6 [ ] Acquisition Office
[ ] Political Warfare Dept. [ ] Others.

2. How many years you have been worked in the N.H.Q?

[ ] Less than 1 year [ ] 2~3 years [ ] 3~5 years [ ] more than 5 years

3. My occupation status :

[ ] Civilian [ ] E1 ~ E5 [ ] E6 ~E9 [ ] O1 ~ O3 [ ] O4 ~ O6

4. Using computer is required for my job : [ ] Yes [ ] No

5. I use computer on a daily basis : [ ] Yes [ ] No

6. I feel comfortable using computer :

[ ] Strongly agree [ ] Agree [ ] No opinion [ ] Disagree [ ] Strongly disagree

7. My office currently uses a computer network information system : [ ] Yes [ ] No

8. I am proficient in keyin Chinese characters :

[ ] Strongly agree [ ] Agree [ ] No opinion [ ] Disagree [ ] Strongly disagree

9. Intra headquarter communication is an important part of my job :

[ ] Strongly agree [ ] Agree [ ] No opinion [ ] Disagree [ ] Strongly disagree

10. I feel comfortable using E-mail :

[ ] Strongly agree [ ] Agree [ ] No opinion [ ] Disagree [ ] Strongly disagree

11. E-mail is enough to meet my need :

[ ] Strongly agree [ ] Agree [ ] No opinion [ ] Disagree [ ] Strongly disagree

12. I have heard " INTERNET" before : [ ] Yes [ ] No

13. I have used " INTERNET" : [ ] Yes [ ] No

14. The most important key factor to my job is :

[ ] Real Time [ ] Exact Data [ ] File Information [ ]

15. A computer network information system would improve work efficiency :

[ ] Strongly agree [ ] Agree [ ] No opinion [ ] Disagree [ ] Strongly disagree

16. I feel office automation would affect work atmosphere :

[ ] Strongly agree [ ] Agree [ ] No opinion [ ] Disagree [ ] Strongly disagree

17. I feel the information system can help my job doing better :

[ ] Strongly agree [ ] Agree [ ] No opinion [ ] Disagree [ ] Strongly disagree

18. I feel he richer communication will help my job be done better :

[ ] Strongly agree [ ] Agree [ ] No opinion [ ] Disagree [ ] Strongly disagree

19. I feel recycling office paper is important :

[ ] Strongly agree [ ] Agree [ ] No opinion [ ] Disagree [ ] Strongly disagree

20. I feel current information system can meet my requirement :

[ ] Strongly agree [ ] Agree [ ] No opinion [ ] Disagree [ ] Strongly disagree

21. My overall opinion of the current information system is :

[ ] Very Poor [ ] Poor [ ] No Opinion [ ] Good [ ] Very Good

22. Please list some application software you feel comfortable to use :

1) **2)** **3)**

23. My additional comments are :

********** *THANK YOU* **********

APPENDIX B. GLOSSARY OF TERMS

Authentication
Certifying identity, "you are who you say you are."

CGI (Common Gateway Interface)
An interface standard that allows Web servers to run external application.

Firewall
A hardware or software barrier between a private network and the public Internet or other networks.

FTP (File Transfer Protocol)
An Internet based protocol that allows a user on one computer to transfer files to and from another computer.

Groupware
Applications such as Lotus Notes that allow users to share information and work together.

HTML (HyperText Markup Language)
The document formatting language that underlies most World Wide Web pages. It can be used to format text and link to images, audio, video, and other programs such as Java and CGI applications.

HTTP (HyperText Transport Protocol)
The Internet based protocol that negotiates the delivery of WWW documents and applications.

HyperText
Text that is highlighted and represents a link to another resource. That resource could reside on the same computer, or one on the other side of the world. Hypertext allows real-time, non-linear access to network resources.

Intranet
An organizational network that uses World Wide Web technology and standards.

Java
An object-oriented language developed by Sun Microsystems. Java is used to write platform-independent applications that can be distributed over the World Wide Web.

TCP/IP (Transmission Control Protocol/Internet Protocol)

The collection of transport and application protocols used to communicate on the Internet and other networks.

URL (Uniform Resource Locator)
A string of characters that identifies the location of an Internet resource.

Web Server
A HyperText Transport Protocol (HTTP) server that provides Internet resources. The HTTP server has the ability to serve up text, inline images, sounds, and video, and may also be used as an FTP file server.

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