2001-09

Information systems strategic planning for Kosovo Peace keeping force

Altinsoy, Nuh.

Monterey, California. Naval Postgraduate School

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

INFORMATION SYSTEMS STRATEGIC PLANNING FOR KOSOVO PEACE KEEPING FORCE

by

Nuh Altinsoy

September 2001

Principal Advisor:	William J. Haga
Associate Advisor:	John Osmundson

Approved for public release; distribution is unlimited

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.			
1. AGENCY USE ONLY *(Leave blank)*	**2. REPORT DATE** September 2001	**3. REPORT TYPE AND DATES COVERED** Master's Thesis	
4. TITLE AND SUBTITLE: Information Systems Strategic Planning for Kosovo Peace Keeping Force			**5. FUNDING NUMBERS**
6. AUTHOR (S): Nuh Altinsoy			
7. PERFORMING ORGANIZATION NAME (S) AND ADDRESS (ES) Naval Postgraduate School Monterey, CA 93943-5000			**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING / MONITORING AGENCY NAME (S) AND ADDRESS (ES) N/A			**10. SPONSORING / MONITORING AGENCY REPORT NUMBER**
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.			**12b. DISTRIBUTION CODE**

13. ABSTRACT ***(maximum 200 words)***

This thesis presents a model of a detailed information strategic planning for a military organization. The model includes the analysis and design of a network and a three-tier client server system. The network analysis focuses on the network traffic flow analysis of Ethernet and Token Ring models. Each candidate technology is simulated with Extend 4.0 separately. Average latency and waiting time in the queue are the simulation parameters. The selection of the candidate technology will play an important role in the implementation of the intranet for the organization.

The three-tier client/server system includes the design and implementation of a relational database, which is connected to the intranet. The database is created with Access 2000. The database connectivity from back-end to front-end is constructed by Active Server Pages (ASP), which enables the users to manipulate the database via their web browsers. The intranet pages are built with Microsoft Front Page 2000. This prototype will be a first and big step for this organization to initiate a transformation from paper-based environment to the paperless world.

14. SUBJECT TERMS Intranet, Network, Information Technology, Web-Database Connectivity and Information Strategic Planning			**15. NUMBER OF PAGES** 84
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UL

NSN 7540-01-280-5500 Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

THIS PAGE INTENTIONALLY LEFT BLANK

Approved for public release; distribution is unlimited

INFORMATION SYSTEMS STRATEGIC PLANNING FOR KOSOVO PEACE KEEPING FORCE

Nuh Altinsoy
1st Lieutenant, Turkish Army
B.S., Turkish Military Academy, 1996

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
September 2001

Author: _____
Nuh Altinsoy

Approved by: _____
William J. Haga, Principal Advisor

_____
John Osmundson, Associate Advisor

_____
Dan Boger, Chairman
Information Systems Academic Group

THIS PAGE INTENTIONALLY LEFT BLANK

ABSTRACT

This thesis presents a model of a detailed strategic information plan for a military organization. The model includes the analysis and design of a network and a three-tier client server system. The network analysis focuses on the network traffic flow using Ethernet and Token Ring models. Each candidate technology is simulated with Extend 4.0. Average latency and waiting time in the queue are the simulation parameters. The selection of the candidate technology will play an important role in the implementation of the intranet for the organization.

The three-tier client/server system includes the design and implementation of a relational database, which is connected to the intranet. The database is created with Access 2000. The database connectivity from back-end to front-end is constructed by Active Server Pages (ASP), which enables the users to manipulate the database via their web browsers. The intranet pages are built with Microsoft Front Page 2000. This prototype will permit this organization to initiate a transformation from paper-based environment to the paperless world.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

ACKNOWLEDGMENTS

I would like to thank Prof William James Haga who has spent a lot of time to help me get “the big picture” and not get lost in details with his good questions.

Also, I would like to thank Prof John Osmundson for his technical support and recommendations while developing the network model.

THIS PAGE INTENTIONALLY LEFT BLANK

I. INTRODUCTION

A. THE PROBLEM

The Kosovo Peace Keeping Force (KPKF) is a one year old rapid deployment brigade meant to handle any emergency (external /internal) presently in Kosovo as part of the Kosovo Force (KFOR). Although the KPKF looks like a standard army brigade, its structure and mission are different from normal brigades. A standard information system, which is used for the army brigades, does not exactly meet what the peacekeeping force needs. For this reason, there are five problems related to the current system, which is intended for use for the KPKF.

1-) Most brigades don't have an effective intranet system, either they have IBM Token Ring topology or they are working in a stand-alone mode. And of course, this situation negatively affects the information flow within the brigade.

2-) Brigades have different types of personnel record keeping systems and there is no interaction among them. Let alone brigade and above units, even within the brigade, there is no standard type of database system. This means that units still depend on paper and pencils while they are sending reports to each other and still the Brigadier General doesn't have real time access to his unit's personnel records. And this hinders effective decision-making.

3-) Providing security of personnel records appears to be vital. But most of the time, classified reports and secret personnel information are exchanged via insecure ways like telephone.

4-) KPKF is a peacekeeping force and has a high turnover rate. Every six months, all the personnel except some mission-critical ones have to come back to Orange Country and new ones have to be assigned. Because the computers within the unit are not efficiently networked, a lot of paper work is being duplicated in various units resulting in inefficiency.

5-) All the units participating KFOR (Kosovo Force) except KPKF have web sites and provide allies unclassified information like their missions, visions and structures.

In addition to these problems, commanding officers and IT personnel have different sets of solutions for this current situation. They don't speak the same language. Battalion and company leaders think that IT personnel are preaching from their ivory towers without understanding how it really works out there. And IT specialists view these officers as not being able to think out of the box.

B. THE SOLUTION

The author decided to make a detailed strategic information plan of the brigade in order to shed light on the mission, vision, objectives and priorities of KPKF and IT department. In some cases, unit directions and requirements don't drive information systems direction and computing architecture. So this plan will provide the common understanding between the technical people of IT department and commanding officers of sub units.

At the end of the planning timeframe, we will have:

- A well-documented information systems strategic plan
- A brigade and IT department situation that is understood by the entire unit
- A direction that is supported throughout KPKF (Cassidy, 1998)

In the last section of the plan, recommendation part, the author will specify the solutions to the current problems.

C. WHAT HAPPENS IF THE PROBLEM IS NOT SOLVED

The current system does not provide networked computer communications. All sub units have computers but they are used as stand-alone ones. For this reason, information is not accurate or up to date, and a lot of paper work is being duplicated in various units resulting in inefficient way of functioning. Manual personnel record keeping is ineffective. And this whole situation degrades the readiness of KPKF.

D. BACKGROUND

"The Lexus and The Olive tree were symbols of post-Cold war era: half of the world seemed to be emerging from the Cold war intent on building a better Lexus, dedicated to modernizing, streamlining and privatizing their economies in order to thrive in the system of globalization. And half of the world – sometimes half the same country, sometimes half the same person – was still caught up in the fight over who owns which olive tree" says Friedman. Although Friedman meant Israel-Palestine conflict when he said Olive tree, his description completely fits the Kosovo crisis which is occurring in the Balkans and which can be considered one of biggest shames of mankind in the twentieth century.

After the collapse of Yugoslavia, different ethnic groups within the country, who buried the hatchets temporarily, have started to fight again. After some time, ethnic tensions reached their highest point and it begun to claim the lives of many. One of the hot points within the country was the Kosovo region. Kosovo was facing a grave humanitarian crisis. Military and paramilitary forces from the Federal Republic of Yugoslavia (FRY) and the Kosovo Liberation Army (KLA) were fighting day and night. Destruction was everywhere, from family homes to schools and hospitals. There was little electricity or water. Roads were mined and bridges were destroyed. Radio and television stations were not broadcast. Ordinary life in Kosovo was stopped. Nearly one million people had fled Kosovo to seek refuge. (Kforonline, 1999)

All UN countries were very much concerned about this crisis and its consequences on international peace and security. For this reason, the UN decided to deploy international civil and security presences in Kosovo. A Special Representative of the UN controls the implementation of the civil presence, which deals with humanitarian relief, reconstruction, institution building and civil administration. And Kosovo Force (KFOR) is in charge of the security component of this peace operation. KFOR entered Kosovo on 12 June 1999 under a UN mandate, two days after the adoption of UN Security Council Resolution 1244(UNSCR 1244). (Kforonline, 1999)

Orange Country, as a NATO country, and as a strong and important US Ally in the Middle East, also decided to send a force to the region and Kosovo Peace Keeping Force (KPKF) was established.

II. INFORMATION STRATEGIC PLANNING

For any unit, information systems are expensive assets. If the unit invested the same amount of money in a building, each member of the officers in the executive branch would know the location, age, and purpose of the building. In this new era, many units spend more and more money on their information systems, yet officers may not know as much about their systems as they do about their building!

So, in other words, officers in the executive branches don't have a strong background in the IS field and don't exactly know what IS people are doing.

But still it is a reality that information systems assets are an important force multiplier of today's military forces.

For this reason, commanding officers should have a clear understanding of their information systems environment to manage their units effectively.

This plan is expected to bridge this gap by improving the communication between commanding and IT officers.

Each side will clearly state their missions, visions, objectives, strategies, and information needs. Also they will briefly talk about the current situations and what they plan to do for the future to enhance the readiness of the KPKF. As a result, each side will have a clear understanding of each other's jobs, and the expectations. Also it will establish the common ground between the technical people of IT department and the Commanders of the combat field, and serve as a template for the future missions.

A. HIGH LEVEL MILITARY DIRECTIONS

1. KPKF Mission

To handle any emergency situation effectively and efficiently

2. KPKF Vision

. A modern, integrated, result-oriented brigade characterized by quality leadership, communication and technology.

. An effective and flexible brigade-wide information technology environment, which is enabling rapid decision making to handle any situation

3. KPKF Values

Honesty, discipline, espirit-de-corps and camaraderie are the values of paramount importance for KPKF. Always to conduct themselves in an exemplary manner, and follow the law of the land

4. KPKF Goals

. Secure law and order in the area under our control at the earliest.

. Ensure demilitarization of the area under our control.

. Assist other friendly units of KFOR and also the UN mission in Kosovo (UNMIK) including core civil functions until they are transferred to UNMIK.

. Facilitate the deployment of other friendly brigades/units sent later on.

. Maximize effectiveness and efficiency by reengineering our Standard Operating Procedures (SOPs) in parallel with technology.

5. KPKF Objectives

. Implement connectivity with other friendly units and with the command.

6. KPKF Priorities

. Establish peace at the earliest in the area under our control.

. Establish internal and external connectivity at the earliest.

7. KPKF Structure

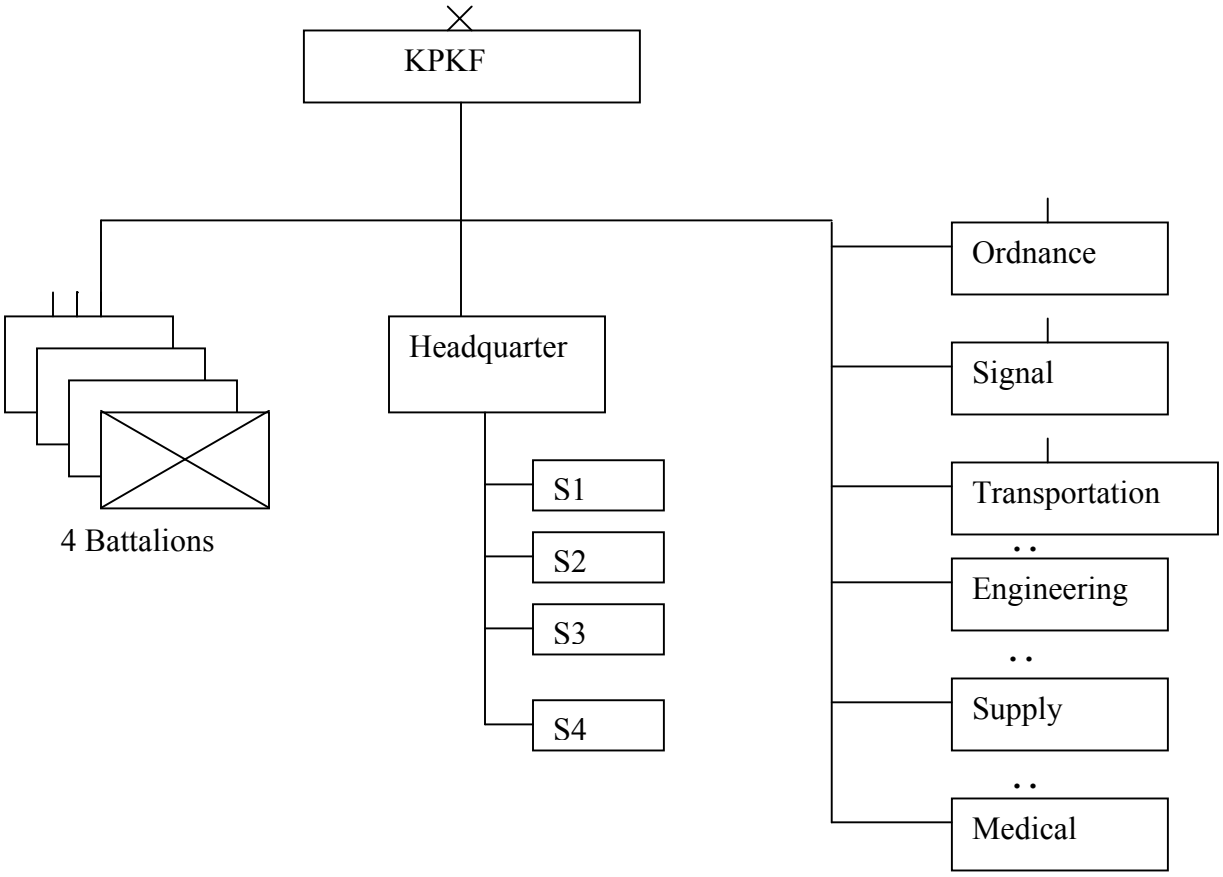


Figure 2.1 KPKF Structure[1]

[1] S1: Personnel Officer, S2: Intelligence Officer, S3: Operation and Training Officer, S4: Supply Officer

8. Requirements

a. Friendly Units Requirements

. Other units are using their intranet for the data interchange, so the KPKF intranet should have the capability to interoperate with them. As a result, an improved communication will be provided within the whole units.

. Provide logistic supports to other units when ordered.

. Establish a base with the other units for intelligence purposes.

b. Country Requirements

. Maintain communication and send weekly and monthly reports to the headquarters back in the country.

. Decrease the response time.

. Increase the usage of IT to reduce the manpower and redundancy.

. Increase the communication bandwidth and use of a variety of formats in communicating with various friendly countries.

c. Environmental Requirements

. The environment the brigade is acting in is unpredictable and volatile, so the KPKF should be ready for all situations.

. High mobility

. Quick response time

. Interaction with the local people and building up a good rapport with them

. Quick availability of local intelligence

. Communication and coordination with other friendly units

. Availability of personnel adapt to local language

. 24hour surveillance for the region that is under our responsibility

. Logistic support from the country

. Provide medical assistance when ordered

9. Operating Vision

The KPKF should be able to meet the requirements of the peacekeeping operation not only in the present but also, in the future, and so it should be able to exploit the advances in the technology to be successful in its operations. Fast and flexible systems would be used in the future to achieve quick response time. In the future, the adversary could be expected to be very technologically advanced and so the brigade should be able to meet the challenges.

B. DETAILED MILITARY DIRECTIONS

1. Information Needs

. Weekly and monthly Training Schedules

. Local intelligence (this is of paramount importance for the success of any operation the brigade undertakes)

. Information regarding the military personnel in the brigade (their background, experience, demographic and personal information) (to manage the functioning of the brigade efficiently)

. The training courses undertaken by various personnel

. The turnover rate of the personnel especially the critical personnel

. Inventory status

. Standard Operating Procedures (SOPs)

C. CURRENT IS SITUATION –INTERNAL

1. IS Environment

All the units have been provided with Intel Pentium III computers with MS Office suite but they are presently being used in stand-alone mode. No network connectivity has been provided. The communication between the various units is still being done by the time- tested method of couriers or via telephone. Daily, weekly and monthly reports are written on stand-alone computers and disseminated via floppy or zip disks, which takes a lot of time and resources. The top Officers believe the urgency of the networking because information exchange via telephone still exists as a big threat to the security of the information. A lot of paper work is being duplicated in various units resulting in inefficiency.

2. Organizational Structure

The KPKF has an IT department which has two officers trained in the field of Information Technology Management. Each officer is provided with five enlisted

personnel for assistance. The situation is ad-hoc presently and will be reviewed after some time.

3. Expenditures

Presently a lot of the budgeted money for the organization goes in doing routine work which could be saved by moving over to the client and server based technology and changing our work paradigm to facilitate establishment of a paperless office

4. Backlog

Since the brigade is relatively new, a backlog exists in institutionalizing various Standard Operating Procedures (SOPs) for various scenarios and for the proper functioning of the various units. All the units have already been computerized but a backlog still exists in the full computerization. So, the commander does not have full access to the computerized information and hence any requirement for information on any subject takes a long time to retrieve which results in more backlog in the normal day-to-day functioning of the units.

5. Other Locations

An Army Wide Area Network (AWAN) does exist but our brigade is not presently connected to it and hence, communication with other units is done by normal couriers or via telephone. Since, the brigade is rapid deployments brigade the connection to the WAN needs to be wireless based. Also, the networking protocol is mostly TCP/IP based hence our network needs to be compatible with it.

D. CURRENT IS SITUATION –EXTERNAL

The field of IT has been changing very rapidly. Network technologies like Ethernet and Client/Server architecture can be easily outsourced since they are widely

used in the commercial world. Also, it appears that in the future the wireless connectivity is going to be the norm and will be of paramount importance in a military scenario.

E. IS DIRECTION

1. IS Mission

To facilitate the availability of timely and accurate information needed to manage the day-to-day and strategic direction of the KPKF by the deployment of systems and tools. This information will assist the unit in achieving its objectives.

2. IS Vision

. Anyone can have access to any information, any time, and anywhere given the proper security constraints.

. Data is maintained in only one master place within the brigade.

. Integrated data, which is entered only once

. Implement systems, which will enhance end-user productivity.

3. IS Objectives

. Design systems for maximum availability (24-hour availability 7 days a week).

. Maintain information only once and have it available to everyone given proper security clearance. Information will be easily accessed, timely, and users will have the proper tools and training to be able to present the information in the desired format to support any decisions.

. Facilitate sharing of information throughout the unit.

. Handle information exchange throughout friendly units digitally.

. Leverage resources and solutions with friendly units.

. Utilize the power of the PC in our systems and projects

. Design systems to enhance end user productivity. This will result in less user training and will support cross-functional users.

4. IS Goals

. Have an Intranet for the Brigade.

. Provision for real time data transfer, allowing the Headquarter and Brigadier General to respond in a timely fashion to the Battalions and other sub units' needs and to make improved decisions.

. KFOR-wide system solutions, which enable us to function within the KFOR This means that we must be able to supply what friendly units want. So research what information we could we provide to the friendly units.

. An online bulletin board system to provide sub units with immediate access to brigades information, ability to place their weekly/monthly reports, training schedules, messages, notifications etc.

. Provision for a Brigade-wide email system.

. Provision for multilingual and multi-currency capabilities.

. Have a paperless environment, to significantly reduce costs and improve overall efficiency.

. The systems should be portable so it could be moved to other locations with minimum effort.

. Ensure secrecy, integrity, reliability and availability of our information architecture.

. Regular training of our workforce to shape them for the future

5. Proposed Computing Architecture

. Candidate Networking Technologies that can be used for the KPKF intranet will be discussed in more detail in Chapter III and IV.

. Systems will be developed with a three-tier client/server architecture, which is explained in Chapter V.

. Systems will employ graphical user interface design

. Connectivity with other KFOR networks will be in place

. Systems should provide multilingual support

. Systems will be deployed using relational database technology.

. For the current situation Microsoft Access 2000 is used, but the KPKF is planning to switch to SQL 7.0 server

Now each side knows the others' expectations and capabilities, so it is time to show the whole KPKF how the IT Department can solve these problems.

The solution set for the current situation will be discussed in more detail in the following chapters.

THIS PAGE INTENTIONALLY LEFT BLANK

III. MODEL ANALYSIS

A. THE SYSTEMS APPROACH TO ANALYSIS

A Network system is the set of components that work together and provide connectivity, communication and network services to users of a network. Generic components of a network system are users, applications, hosts and networks. (McCabe, 1998)

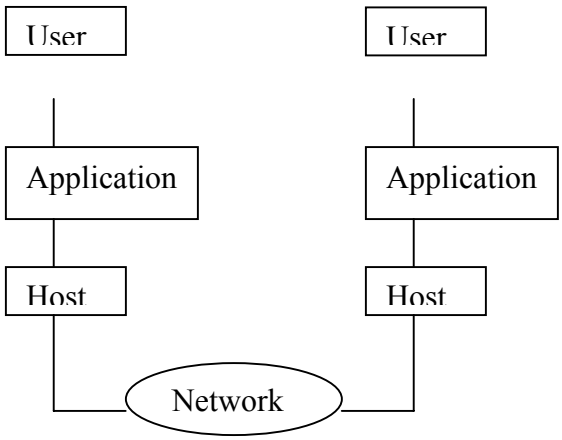


Figure 3-1. Generic Components of a System

Network designs have traditionally focused on providing connectivity between hosts. They did not consider users and applications. But now, we know that this traditional view is not complete. We must include the users and applications in the design.

B. REQUIREMENTS ANALYSIS

We begin the network analysis process with requirements analysis to understand our design environment. This consists of identifying, gathering and understanding system requirements and their characteristics. Requirements analysis is fundamental to the network design process but it is often ignored. Most of the time we have lean towards not gathering requirements, because it is difficult and time-consuming. But it is certain that requirements gathering and analysis is key to success. (McCabe, 1998)

1. User Requirements

From a user perspective, what does it take to get the job done? In general, the system should adapt to the user environment, provide quick and reliable information and offer quality service to the user. So we can summarize it as the following:

User Requirements	Description of Requirements
Location and # of users	57 users in each battalion, 35 users in each Supporting Unit and 23 users in the headquarters
Expected growth of in # of Users	
After 1 year	35 % increase
After 2 years	10 % increase
User Expectations	

Timeliness	All users expect less waiting time. This is critical during the engagements (If this happens to KPKF)
Interactivity	Allies expect remote access
Reliability	For database, reliability must be 100% during the application session.
Adaptability	Network must adapt to user additions, deletions, and changes. Also it must be compatible with any possible changes made in KFOR intranet.
Security	Each user must be provided with a username and password. Firewalls and intrusion detection systems are vital software for KPKF and must be included in the Intranet. PKI infrastructure has already been established by the KFOR and the KFOR plans to include the KPKF in the system.
Cost/funding	$2K/year

Table 3.1: User Requirements

2. Application Requirements

The application component interfaces with the user and host components. While we are evaluating the applications, we should focus on three types of applications: Mission-critical applications, controlled-rate applications and real-time applications.

Categorizing Applications	Mission-critical	Controlled-Rate	Real-Time
Database	1.23 Mb/s, 100%		
Telnet			10 Kb/s
Ftp		300 Kb/s	
WWW			200 Kb/s

Table 3.2: Application Requirements

3. Host Requirements

In the KPKF inventory, there are two types of hosts: generic-computing devices like desktop computers and servers (email server, ftp server).

Type of Host	Numbers and Locations
PC	48 computers in units and the headquarters
Database Server	1 in Headquarter
Ftp Server	1 in Headquarter
Email Server	1 in Headquarter

Table 3.3: Host Requirements

4. Network Requirements

Requirements for a network design must consider the characteristics of an existing network. But for the current situation we don't have any intranet.

C. FLOW ANALYSIS

1. Extend Modeling Software

We will make our flow analysis with Extend version 4.0. Using Extend, we can develop dynamic models of real-life processes in a variety of fields. With Extend, we get all the ease-of-use and capability we need to quickly model any system and process (Extend Manual, 1997):

- A full array of blocks, which permits us to build, models rapidly.
- Animation of the model
- Graphical interface, which shows the relationships in the system, we are modeling
- Blocks can be grouped together as a hierarchical block and this makes even complex systems easy to build.
- The ability to adjust settings while the simulation is running (Extend Manual, 1997)

With Extend one can change one part of a model, without having to write the whole model from scratch. Changing only one part is enough.

Generic library and Discrete Event library are the two main libraries, which come with Extend. These libraries allow us to construct models without typing equations. By modifying Extend blocks, we can build our own libraries. Normally, simulation is generally divided into two categories: continuous and discrete event. The Generic library is used for continuous simulations. In continuous simulations, value changes when time changes. The Discrete Event library is used for models that use queues, attributes and priorities. In our models, both Generic and Discrete event libraries were used. The models we used can be considered Discrete because the general simulation idea depends on queues, item-specific attributes and priorities.

2. Computing Environment

A PC was configured with a Pentium III 700 MHz processor, 256 MB RAM, 20 Gigabyte hard drive running Microsoft Windows 2000. There are five types of network traffic. Each generator for each computer generates all five types:

- Email with/without attachment
- FTP downloads/uploads
- WWW going out/in
- VTC application
- Network security

Network load is as stated below:

Level	Load
Headquarters	5.020 Kbps
Battalions	4.080 Kbps
Supporting Units	3.060 Kbps

Table 3.4: Network Load

3. KPKF Architecture

In The KPKF inventory, there are 48 computers, 5 of which are in the Brigade Headquarters. Each battalion has 7 computers and each supporting unit has 2-3 computers according to their size and mission. These numbers are expected to increase in the following years.

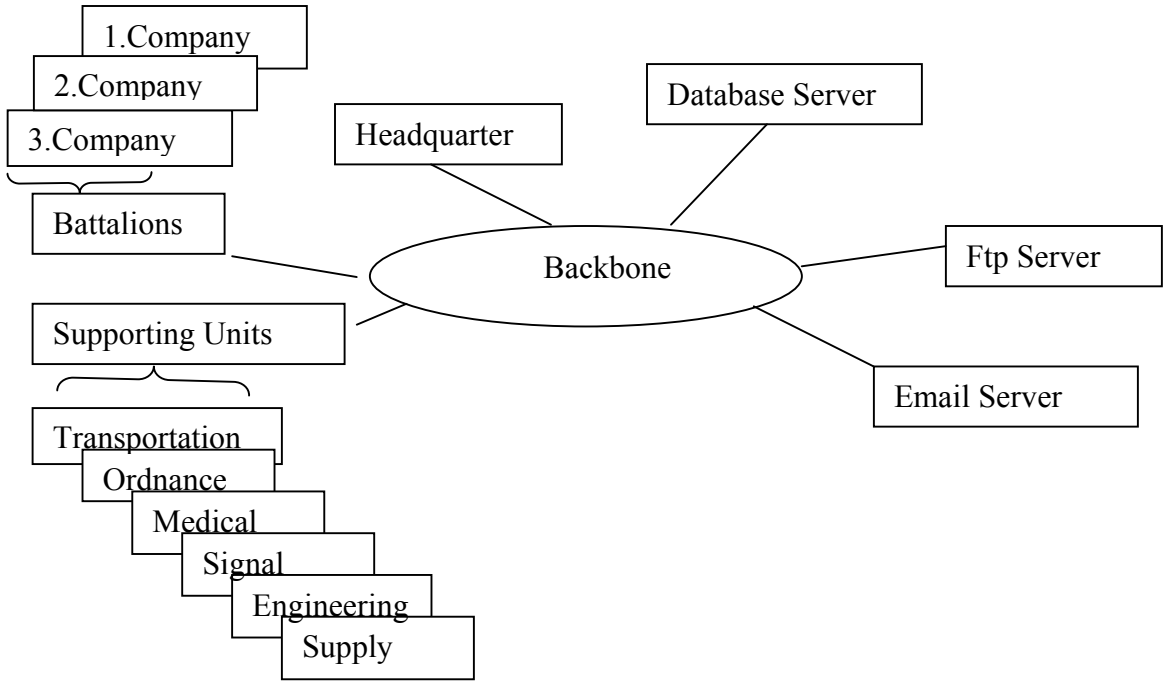


Figure 3.2:KPKF Architecture

4. LAN Topologies

This section describes the three topologies used most often with LANs.

a. Bus Topology

A network that uses a bus topology usually consists of a single, long cable to which computers attach. Any computer attached to a bus can send a signal down the cable and all computers receive the signal. Figure 3.3 illustrates the topology. Because all computers attached to the cable can sense an electrical signal, any computer can send data to any other. (Comer, 1999)

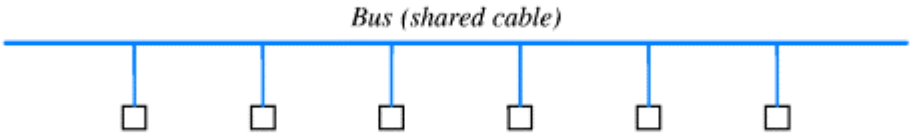


Figure 3.3: Bus Topology

b. Ring Topology

A network that uses a ring topology arranges for computers to be connected in a closed loop- a cable connects the first computer to a second computer, another cable connects the second cable to a third, and so on, until a cable connects the final computer back to the first. The name ring arises because one can imagine the computers and the cables connecting them in a circle as Figure 3.4 illustrates. (Comer, 1999)

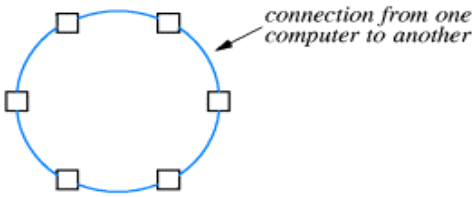


Figure 3.4: Ring Topology

c. Star Topology

A network uses a star topology if all computers attach to a central point. Figure 3.5 illustrates the concept. Because a star-shaped network resembles the spokes of a wheel, the center of a star network is often called a hub. A typical hub consists of an electronic device that accepts data from a sending computer and delivers it to the appropriate destination. (Comer, 1999)

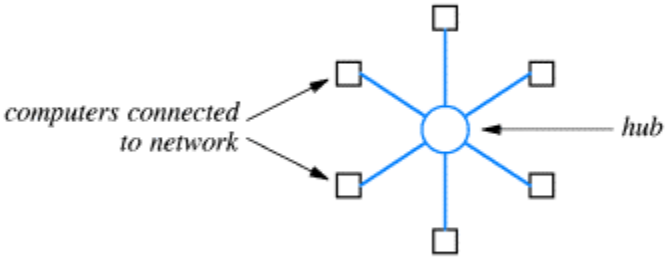


Figure 3.5: Star Topology

5. Network Protocols

The cutting-edge technologies that can be used for the simulation are briefly explained below.

a. Ethernet

Ethernet employs bus topology. The original Ethernet hardware operated at a bandwidth of 10 Megabits per second (Mbps). A later version known as a Fast Ethernet operates at 100 Mbps. The most recent version, which is known as Gigabit Ethernet operates at 1000 Mbps or 1Gigabit per second (Gbps). Ethernet uses Carrier Sense Multiple Access with Collision Detect (CSMA/CD). Each connected computer checks the network carrier to see whether it is occupied. This is called *Carrier Sense.* The idea of using this technique to determine when to transmit is called *Carrier Sense Multiple Access.* If two computers transmit the signal at the same time, a collision occurs. Whenever a collision is detected, the sending computer immediately stops transmitting and waits for the carrier to become idle again. This process is called CSMA/CD.

b. Token Ring

Most LANs that use a ring topology also use an access mechanism known as token passing, and the networks using this technology are known as token ring. A token ring operates as a single shared medium. Unlike an Ethernet, a token ring transmission does not rely on CSMA/CD. Instead, token ring mechanism coordinates the permission passed to each computer on its turn. The coordination uses a special message, token. One token exists on the ring at any time. To send data, a computer must wait for the token to arrive. Also, token ring networks use a priority system that permits high-priority computers to use the network more frequently.

c. Fiber Distributed Data Interface (FDDI)

A disadvantage of token ring networks arises from their susceptibility to failures. If one of the computers in the ring fails, the entire network fails. FDDI was designed to overcome such failures. FDDI uses an extra ring to accomplish this task. If one of the computers gets out of order, data flows around the second ring. This process is called counter rotating.

d. Asynchronous Transfer Mode (ATM)

Telephone companies have developed ATM technology. The basic element of an ATM network is an electronic switch to which several computers can connect. One or more interconnected switches form a central hub to which all computers attach. Unlike bus or ring topologies, a star topology only propagates data to the intended computer. (Comer, 1998). ATM is a technology that will enable carriers to capitalize on a number of revenue opportunities through multiple ATM classes of services. ATM will prove itself in the field of high-speed local-area network (LAN) interconnection; voice, video and future multimedia applications in business markets in the short term; and community and residential markets in the longer term. (Nortel Networks, 2001)

Following are some estimates for maximum throughput with TCP/IP. These numbers may vary depending on the type of OS that is being used. (McCabe, 1998)

Technology	Maximum Capacity	Minimum Throughput
Ethernet	10Mbps	3-7Mbps
	100Mbps	80-
Token Ring	4Mbps	4Mbps
	16Mbps	16Mbps
FDDI	100Mbps	80-
ATM: T3	45Mbps	34Mbps
OC-3c	155.52Mbps	120Mbps
OC-12c	622Mbps	Not yet available

Table 3.5: Capacity and Throughput

D. MODEL DEVELOPMENT

The focus of the model was to evaluate the flow of information through the KPKF. For this purpose, two of the technologies mentioned above are chosen to test and decide which one is more efficient and effective for future uses. These two technologies are Ethernet and Token Ring. In order to compare and contrast these two technologies from the flow analysis perspective, average latency will be taken into consideration:

1. Measure of Effectiveness – Average Latency

This measure shows the average time for all traffic to complete the movement through the model. Basically this shows how long a message originated from one node takes to go to the destined node. It also shows how long a message waits in the queues from the time it is first generated until being processed. For the Ethernet model, extra

waiting time due to **C**arrier **S**ense **M**ultiple **A**ccess / **C**ollision **D**etection is included in this measure.

Now, let us look at important parts of the simulation.

2. Message Generation

The Generator block generates each message with a one-minute interarrival time according to an exponential distribution. No block seed is used. After the generation, the Set Attribute block assigns the following attributes to items passing through: message size, destination, priority, which are generated by the Input Random Number block, and current time, which is generated by the System Variable block.

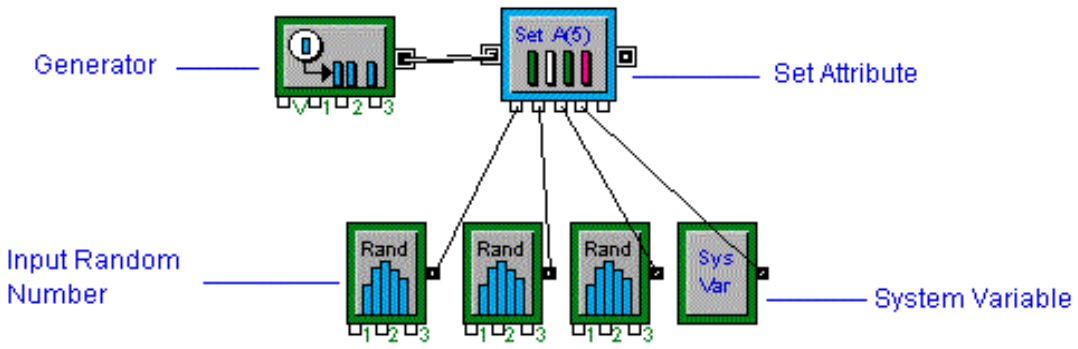


Figure 3.6 Message Generation

3. Determine Which One To Serve

After being generated, each message is queued by a FIFO (First In First Out) block. For the Ethernet Model, CSMA/CD is implemented in order to decide which computer will transmit next. For the CSMA/CD part, logic OR, NOT and AND blocks are used. The Logic OR block checks if any message is being served within the Activity Delay block and sends the result to Logic NOT. The Logic NOT block enables the

Activity Service block to get another message from the FIFO block that has messages waiting in the queue.

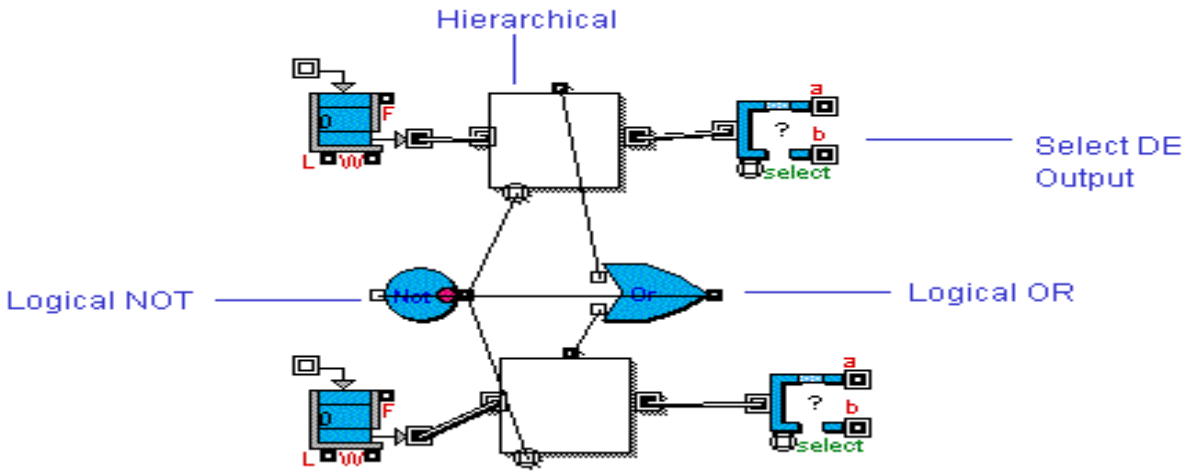


Figure 3.7: Service Sequence Determination for the Ethernet

The Logic AND block permits only one message at a time within the Activity Delay block. If there is more than one, it means a collision in the carrier and both messages must be retransmitted again.

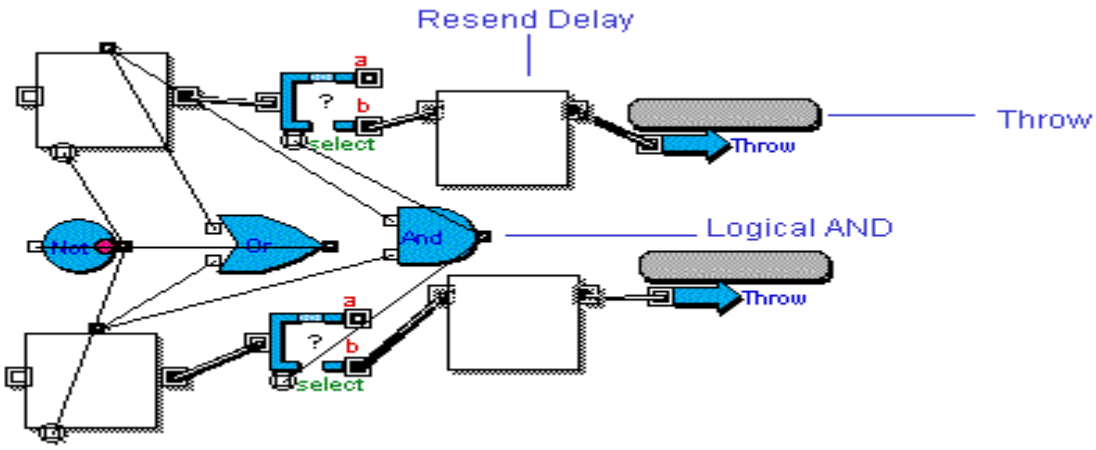


Figure 3.8: Collision Detection for the Ethernet

For the Token model, in order to decide which node will serve first, each message is provided with a priority attribute. Decision blocks check these attributes and permit the node with the higher priority to transmit first.

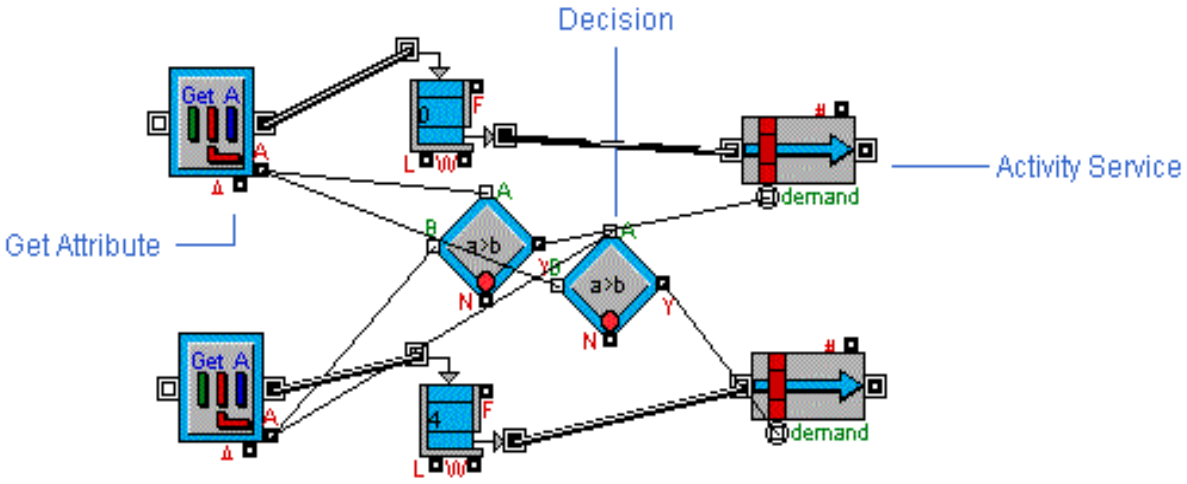


Figure 3.9: Service Sequence Determination for the Token Ring

4. Service and Resend Delay

Each message is delayed according to the message size over bandwidth. During this period, messages are kept within the Activity Delay block. So, the larger the message size, the longer the waiting time. To avoid multiple collisions in the Ethernet model, each computer chooses a delay at random after the first collision happens. So, after being delayed that random period, Catch and Throw blocks retransmit the message again.

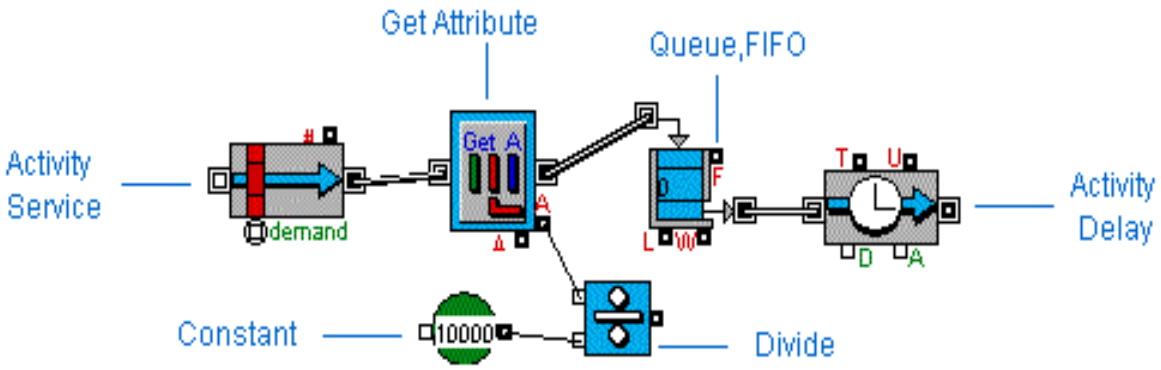


Figure 3.10: Service Delay

The complete Ethernet and Token Ring Models are in Appendix A and B

.

IV. FINDINGS

A. DESIGN GOALS

Prior to choosing the candidate technology for the intranet, design goals were established. Establishing design goals is part of understanding the roles of the network for the design. Common design goals are:

- Minimizing network deployment or operations cost.
- Maximizing the network performance characteristics.
- Maximizing the effectiveness of network flow (minimizing the latency and average waiting time for the service.)
- Ease of use and manageability.
- Adaptability to new and changing user needs.

Although each of these goals has to be studied in detail, the scope of this thesis focuses on the network flow. For this reason, candidate network technology will be selected by network flow results.

One thing that we have to keep in mind is that there may be trade-offs to each of these design goals. A design goal of minimizing cost can lead to a trade off network of flow.

B. MODEL RESULTS

The Ethernet and Token ring models, which were designed for the KPKF intranet, were tested five times. The simulation time for each run was 100 units, which took more than an hour. At the end of each run, average latency for each unit was noted. One sample from the results from both candidate technologies is demonstrated below. Details on the Ethernet and Token Ring Models are described in Appendix C.

KPKF Ethernet and Token Ring Models	**Average Latency**	
	Ethernet	**Token Ring**
Headquarter	0.2026	2.7843
1.Battalion	0.3538	4.9722
2.Battalion	1.2920	5.9225
3. Battalion	0.5147	5.5841
4. Battalion	2.5505	4.5895
Transportation	0.0003	0.4907
Ordnance	0.0003	0.2899
Signal	0.0357	0.4943
Engineering	0.0003	2.1051
Supply	0.0003	1.5650
Medical	0.0007	0.0729

Table 4.1: Model Results

After the performance comparison based on output from simulation runs, it can be seen that the overall average latency for the Ethernet is less than that for the Token Ring

model. Two reasons for this difference are the capacity and the technology difference between them. As the number of the computers within the unit increases, the difference between Ethernet and Token Ring increases. For example, the Medical Unit has two computers and the average latency for the Ethernet Model is 0.0007 and for the Token Ring Model is 0.0729. The third battalion has seven computers and the difference is 0.5147 versus 5.5841.

C. SELECTION OF THE CANDIDATE TECHNOLOGY

1. Network Flow

Based on the outcomes from Extend Simulations, Ethernet proves more efficient and effective from overall average latency and waiting time in the queue for the services perspective.

2. Upgrade

Another important factor that makes us choose Ethernet as the candidate technology is its ability to be upgraded, particularly from a capacity perspective. Most of the technologies have an evolutionary path that upgrades its capacities and capabilities. Ethernet can support 10 Mbps to 1000 Mbps. (McCabe, 1998)

So, based on these facts, the technology that will be used in KPKF intranet will be Ethernet.

THIS PAGE INTENTIONALLY LEFT BLANK

V. RECOMMENDED APPLICATION

As it is mentioned in Chapter I and II, KPKF requires a timely access to the information. In order to meet this need, the author developed a three-tier client/server system that enabled a user to enter, display, update, and delete data by a web browser. So, let us first look at the client/server architecture compared to a traditional peer-to-peer system and later examine the proposed application in more detail.

A. CLIENT/SERVER ARCHITECTURE

Networks require special software to control the flow of information between users. A Network Operating System, or NOS, is installed onto each PC that requires network access. The NOS monitors the exchange and flow of files, electronic mail, and other network information

Network Operating Systems are classified according to whether they are peer-to-peer or client-server NOSs. Peer-to-peer NOSs like Windows 95, Windows98 and Windows for Workgroups are best for home & small office use... they are great for sharing applications, data, printers, and other localized resources across a few PCs. Client-server NOSs like Windows NT, 2000, XP, Linux and NetWare are ideal for large-scale organizations that require fast network access for video, publishing, multimedia, spreadsheet, database, and accounting operations.

A peer-to-peer network allows two or more PCs to pool their resources together. Individual resources like disk drives, CD-ROM drive, and even printers are transformed into shared, collective resources that are accessible from every PC.

Unlike client-server networks, where network information is stored on a centralized file server PC and made available to tens, hundreds, or thousands of client PCs, the information stored across peer-to-peer networks is uniquely decentralized. Because peer-to-peer PCs have their own hard disk drives that are accessible by all computers, each PC acts as both a client (information requestor) and a server (information provider). (Freepctech, 2000)

Such a network is practical only for small workgroups of fewer than a dozen computers. (CNET Networks, 2001)

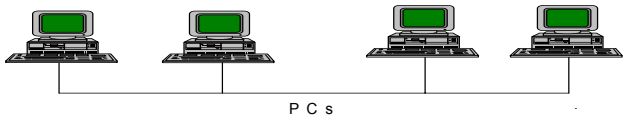


Figure 5.1: Peer-To-Peer Architecture, " From Orfali, 1999"

But as the number increases, the centralization of data becomes more vital. In a client-server environment like Windows NT, 2000 or Novell NetWare, files are stored on a centralized, high speed file server PC that is made available to client PCs. Network access speeds are usually faster than those found on peer-to-peer networks, which is reasonable given the vast numbers of clients that this architecture can support. Nearly all network services like printing and electronic mail are routed through the file server, which allows networking tasks to be tracked. Inefficient network segments can be reworked to make them faster, and users' activities can be closely monitored. Public data and applications are stored on the file server, where they are run from client PCs' locations, which makes upgrading software a simple task--network administrators can

simply upgrade the applications stored on the file server, rather than having to physically upgrade each client PC. ((Freepctech, 2000)

There is no hardware difference between servers and clients; the only distinction is software. For this reason, it would not be costly and time-consuming to switch to a client/server architecture.

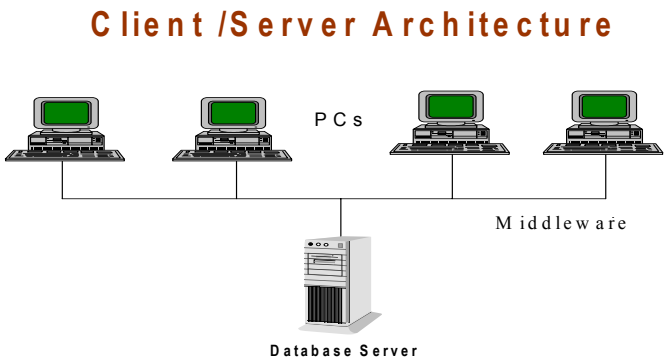


Figure 5.2: Client/Server Architecture "From Orfali, 1999"

One step ahead of the normal client/server (two-tier) architecture is three-tier architecture. It works like this: first tier is the database tier, it works on a server, listening for the data requests from authorized users and serving it back to them. Middle-tier is the software that is in the middle of client and server: transportation stacks like TCP/IP. The last one is the client tier, which requests a service like a web browser. (Vandersluis, 1999)

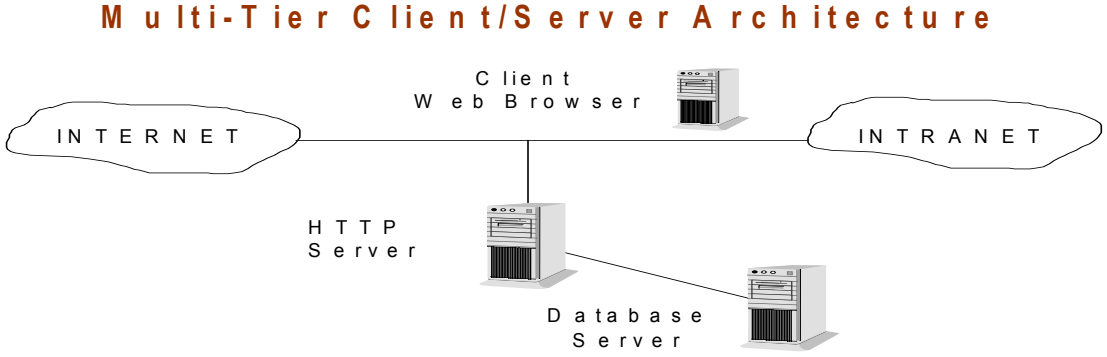


Figure 5.3: Multi-Tier Architecture "From Orfali, 1999"

B. PROPOSED KPKF APPLICATION

This new application will do routine work that was already done manually. It will help the KPKF to move to a paperless environment and save a lot of time and money. Users will be able to manipulate data from anywhere inside the KPKF firewall with a web browser.

All the pages were created by FrontPage2000 Web site creation and management tool. All user privileges are granted by NT (user accounts, file and directory permissions, share permissions, and group accounts) and Internet Information Server security (directory security, anonymous access and authentication control and Windows NT challenge/response) features.

The basic software sub-components that are and will be used at KPKF intranet are:

- Windows NT 4.0 as the network operating system.
- Internet Information Server 4.0 as the web server.

- Internet Explorer and Netscape as the web browsers
- SQL Server 7.0 and Access 2000 as database management systems (the initial KPKF personnel database is designed by Access 2000 and will be upgraded to SQL Server 7.0)
- Active Server Pages as the middleware for database connectivity and creating dynamic web pages.

Although for the current situation the web pages are published to World Wide Web server, it can be easily moved to our future KPKF Intranet server.

The sub-components of the application are described below

1. Home Page

The home page gives brief information about the functionality of the KPKF mission, the vision of the brigade, and provides contact numbers and email addresses, which can be used to reach the KPKF. It also has links to the "Overview" and the "Chain of Command" pages, which explains the deployment procedure and the structure of the KPKF. No ID or password is required for these pages; anybody can access them.

While designing the home page, the author paid attention to the web design criteria. Here are some of the important rules:

- There should be no vertical or horizontal scrolling.

- There should be no long sentences or instructions. Everything should be self-explanatory.

- Consistent, simple header and background color, and font size should be greater than 12(or readable –depending on the contrasting context)

- Links should change color after they have been clicked

- It should be easy to navigate.

- Consistent, simple header on every page.

- Clear visual hierarchy on each page (Lynch & Horton, 1999)

Figure 5.4: Home Page

2. Training Schedules

Before the development of the application, all monthly and weekly training schedules were written and stored in the Headquarters' computers. The battalions and supporting units were sending their floppy disks to the Headquarters weekly and getting a copy of the schedule. This was an awkward way of distributing documents, because, by itself, it took a lot of time and for the worst case which happened quite often, the document needed to be revised after the distribution, and the updated ones had to be redistributed to the units again, which made the time problem worse.

The new application was expected to solve this problem. An FTP port (1212) will be dedicated to the Training Schedules and Routine Weekly and Monthly Reports. G1[2] and G3[3] were in charge of uploading necessary information to the FTP site. They will be permitted to upload it only via a username and password. Battalion S1 and S3[4], and Supporting Unit Training Officers will be responsible for downloading these documents from the FTP site by using FTP client applications. They will also provide usernames and passwords to accomplish this task.

Each week's document will be saved in a separate directory.

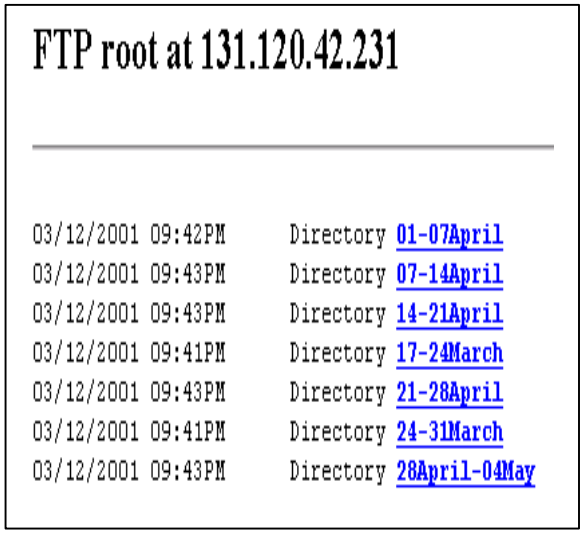


Figure 5.5: FTP site

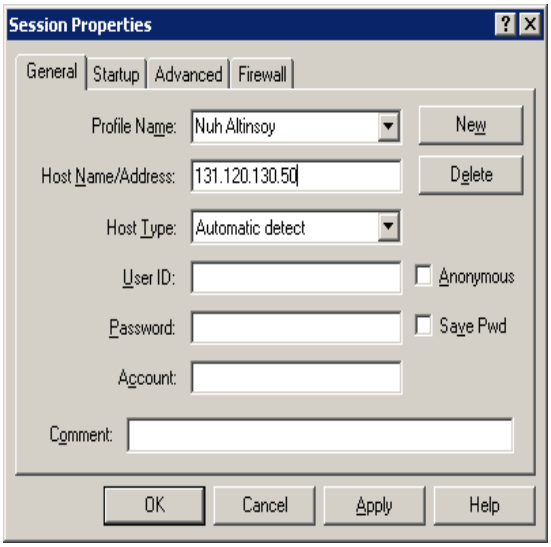


Figure 5.6: FTP Client

[2] The officer who is in charge of personnel records in the brigade level units.

[3] The officer who is in charge of operations and training in the brigade level units

[4] The officer who is in charge of operations and training in the battalion level units

An example email notification, which is sent from G1 to 1.Battalion Commander is shown below:

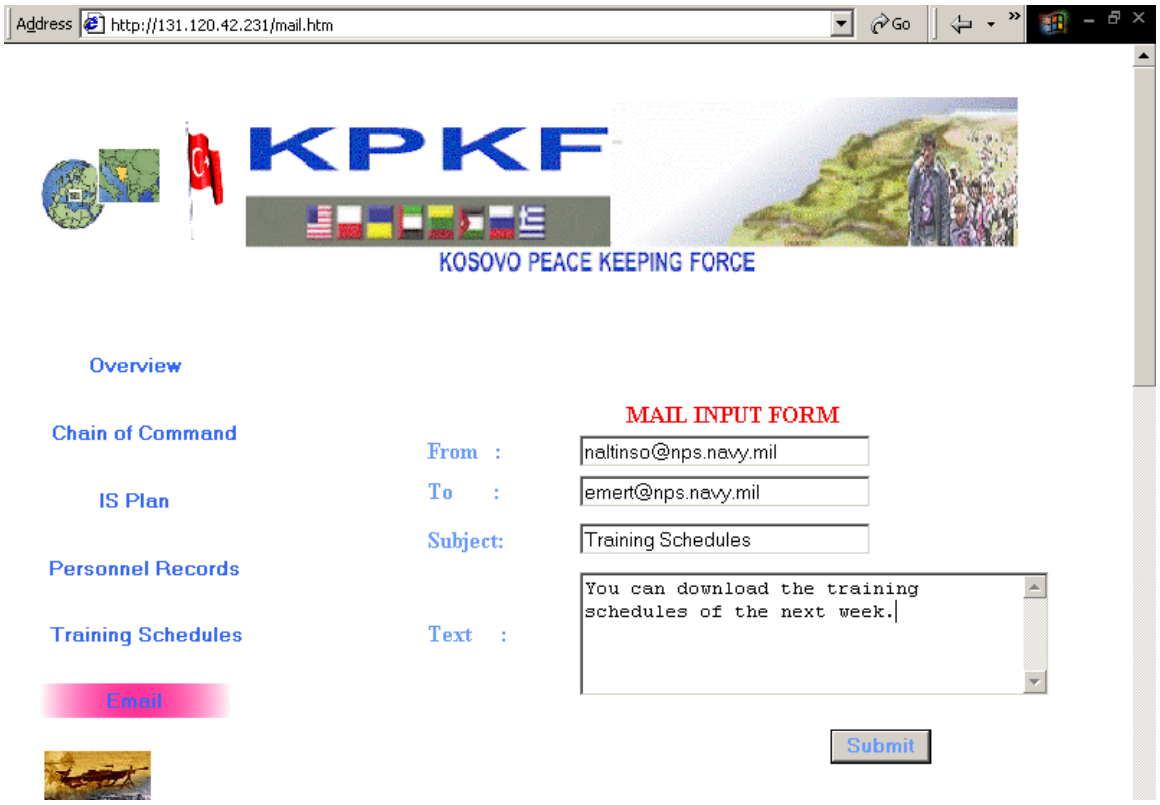


Figure 5.7 KPKF Email Systems

3. Personnel Records

As it was mentioned in Chapter I, the KPKF has a high turnover rate. Every six months, all the personnel except some mission-critical people have to come back to the Country and new personnel have to be assigned. Because the computers within the unit are not efficiently networked, a lot of paper work is being duplicated in various units resulting in inefficiency. Most of the time, people were complaining about filling the same type of information again and again.

The problem is solved by this new application, which stores all the personnel records in one Access Database, which is developed specifically for this purpose, and resides on the web server PC.

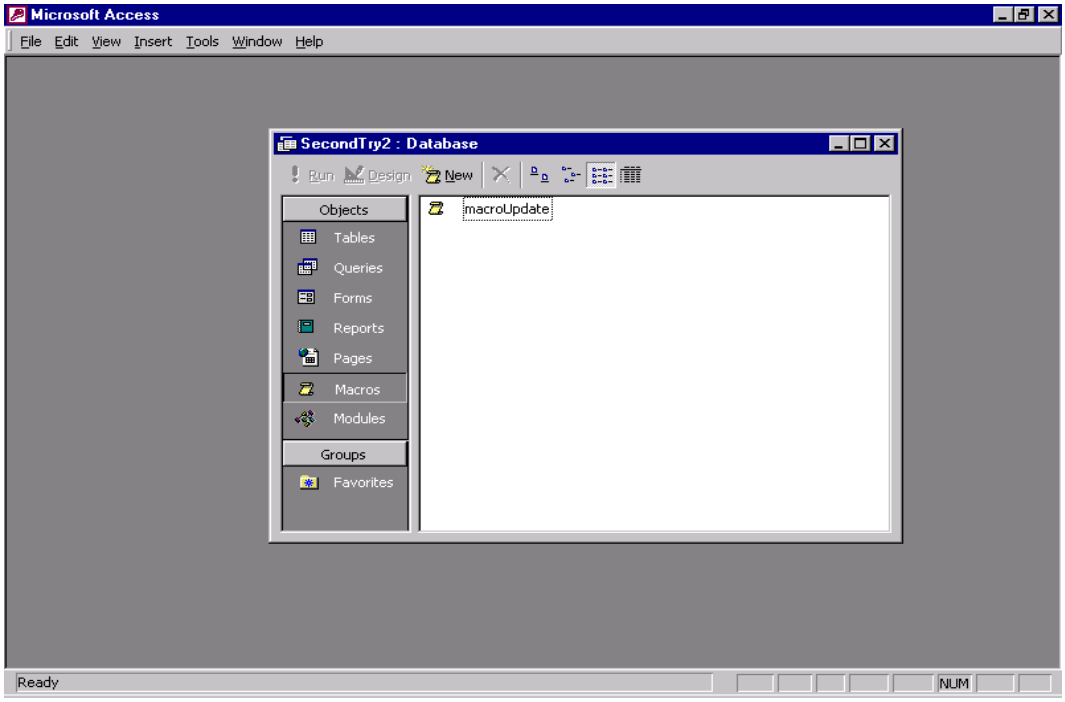


Figure 5.8: Access Database for Personnel Records

After creating the Access Database, which is shown above, it was connected to the FrontPage 2000 web pages. Active Server Pages (ASP) was used to provide this "database connection" as a middleware. FrontPage 2000 database pointers were used to connect the ASP to the Database Management Systems (DBMS).

Here is the web page that provides the options to the user for personnel records transactions.

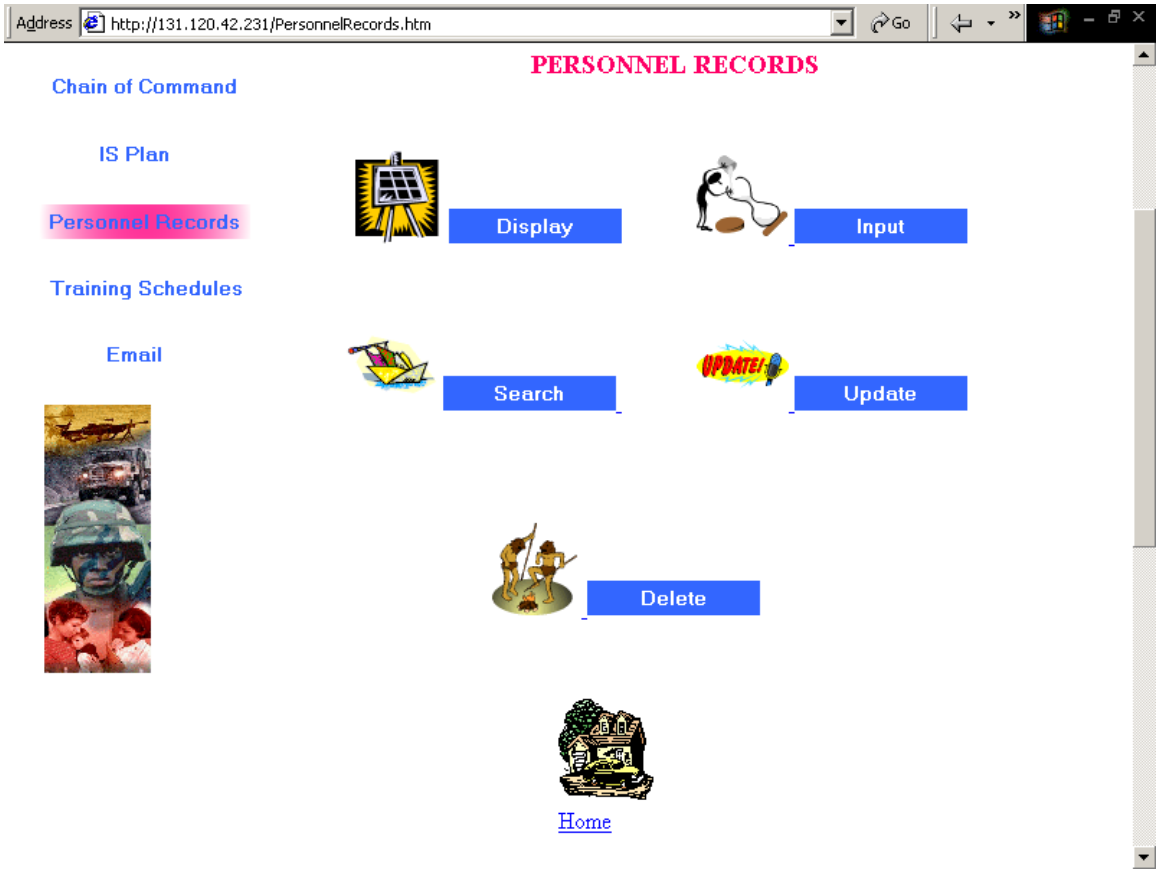


Figure 5.9: Personnel Records Page

a. Display and Search

Display and query functions will not require high-level clearance as do input, deletion and update. For this reason, display and query functions are permitted to Battalion, Company, and Supporting Unit leaders. For this purpose, each user was provided with a username and a password.

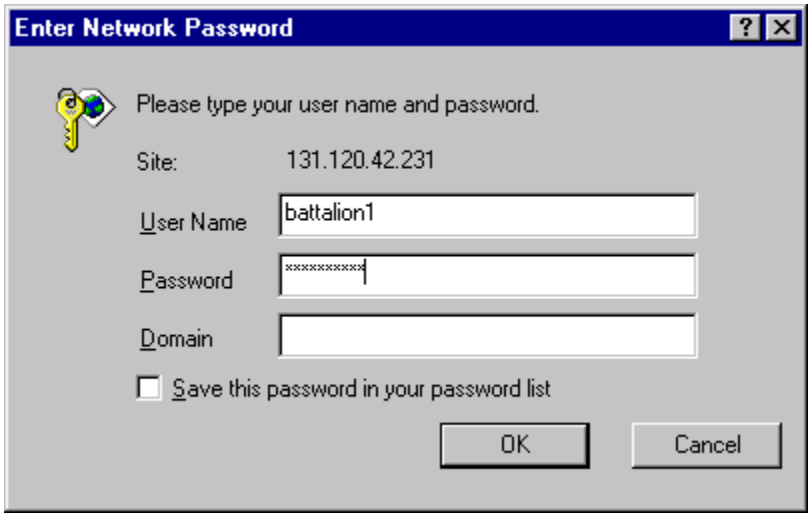


Figure 5.10: KPKF Username and Password

Each and every user who wants to access these records has to enter the proper username and password. Otherwise, they cannot access these files.

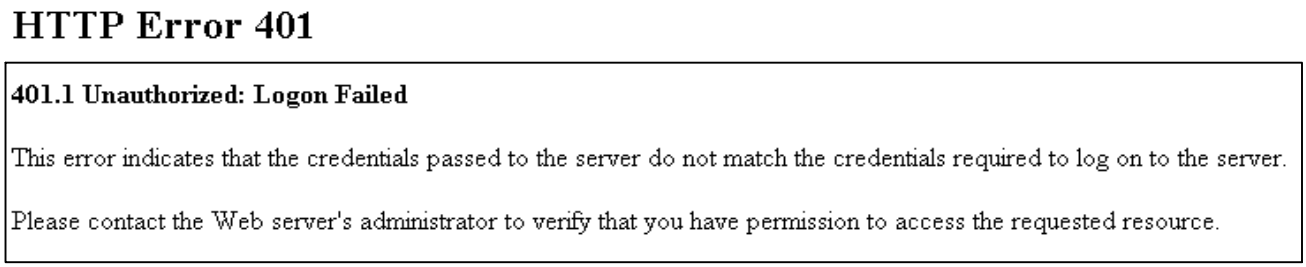


Figure 5.11: Failed Logon Attempt

After getting the access to the Display and Search you will see the pages that are posted below.

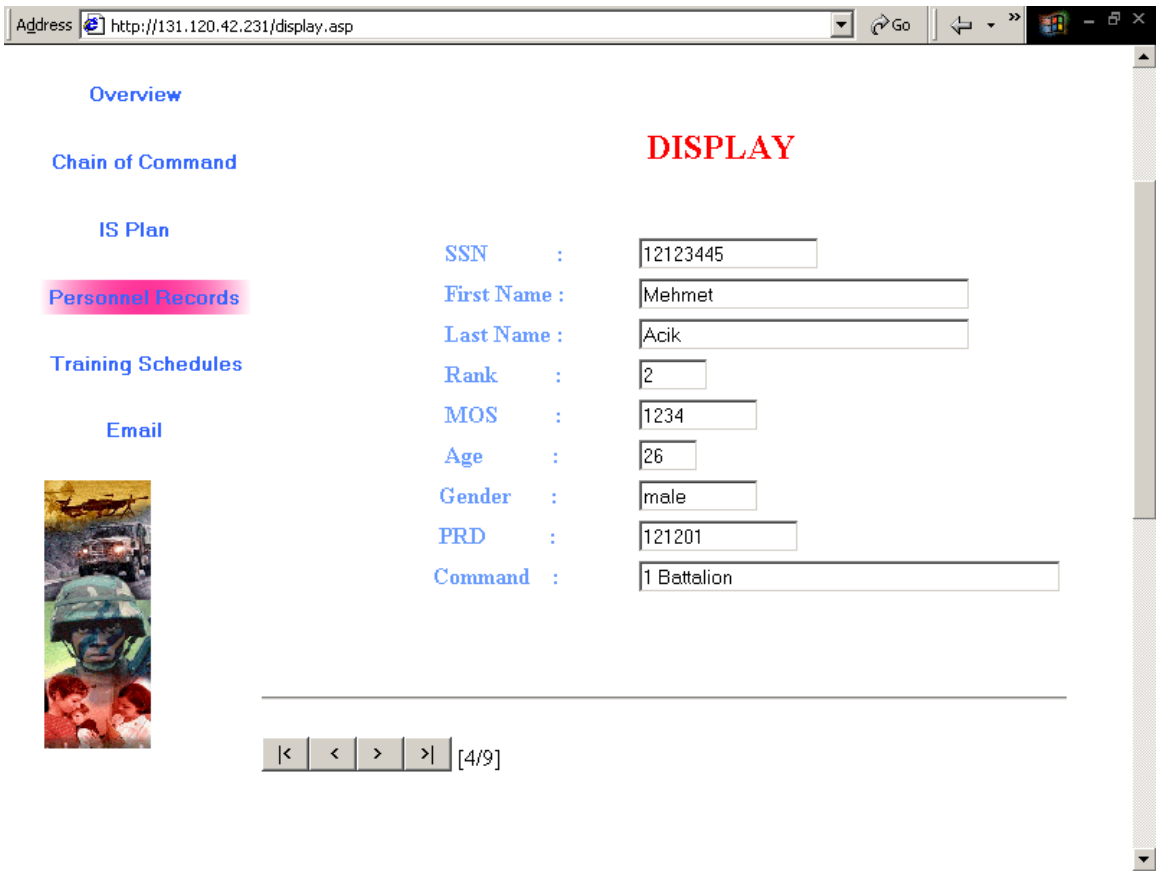


Figure 5.12: Display Page

Users can see both the total number of the records in the database and the sequence of the record that they are checking at that time. The records are sequenced with the order they were entered. First entered records get the lower sequence numbers. The user can navigate all the records one by one with this page.

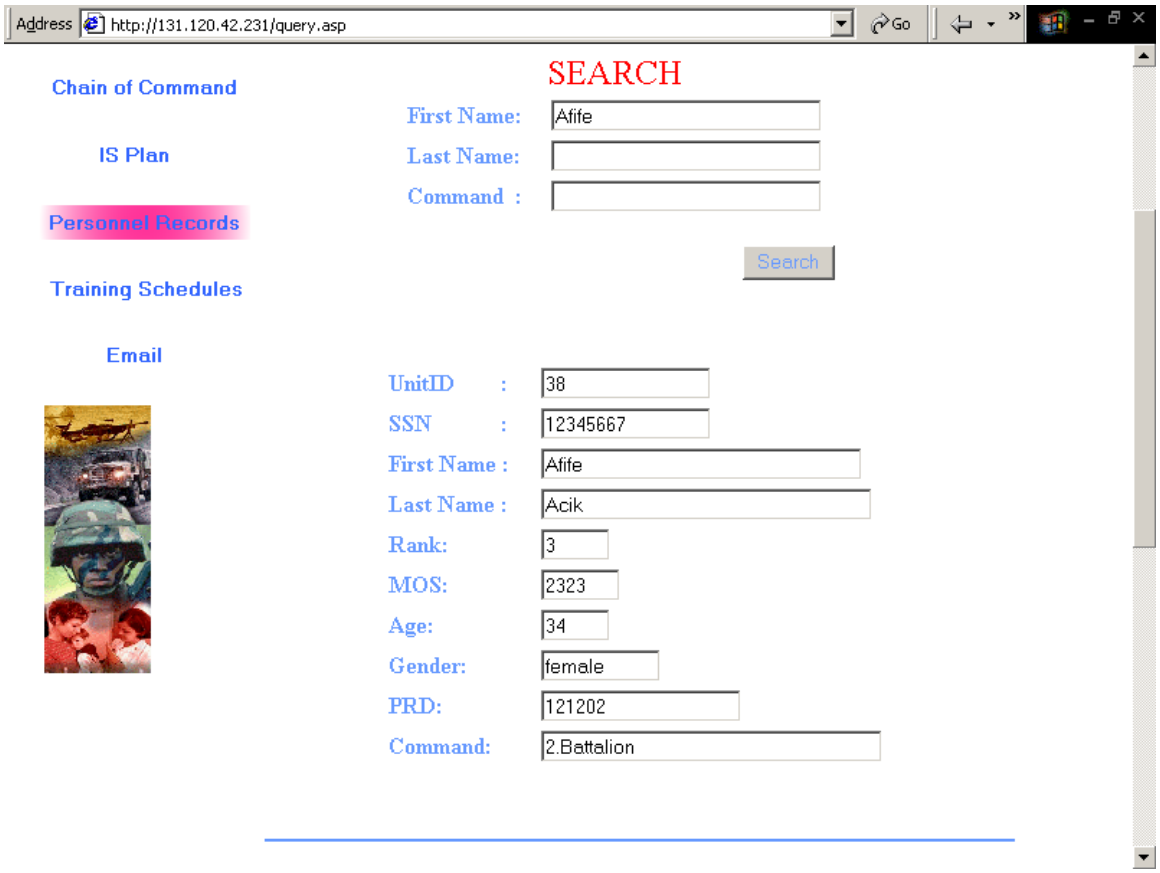


Figure 5.13: Search Page

The user can search either with the first, last or Command name. If there is more than one person that meets these search criteria, then all are listed.

b. Addition, Deletion and Update

Addition, deletion, and update were highly mission critical tasks, for this reason; only Brigadier General and G1 are permitted to do this task. It means that, the system validates only their usernames and passwords for these functions.

For the display, query and input function, the database wizard is enough to manipulate the ASP, but when it comes to the deletion and update, extra SQL[5] codes have to be written in addition to the wizard. The SQL commands that were used to accomplish these tasks are in the Appendix D:

The deletion and update processes are the same and work like this: First the user makes a search for the record he or she is looking for. Otherwise, it would be infeasible to check each record one by one in order to find the record that is intended to be updated/deleted.

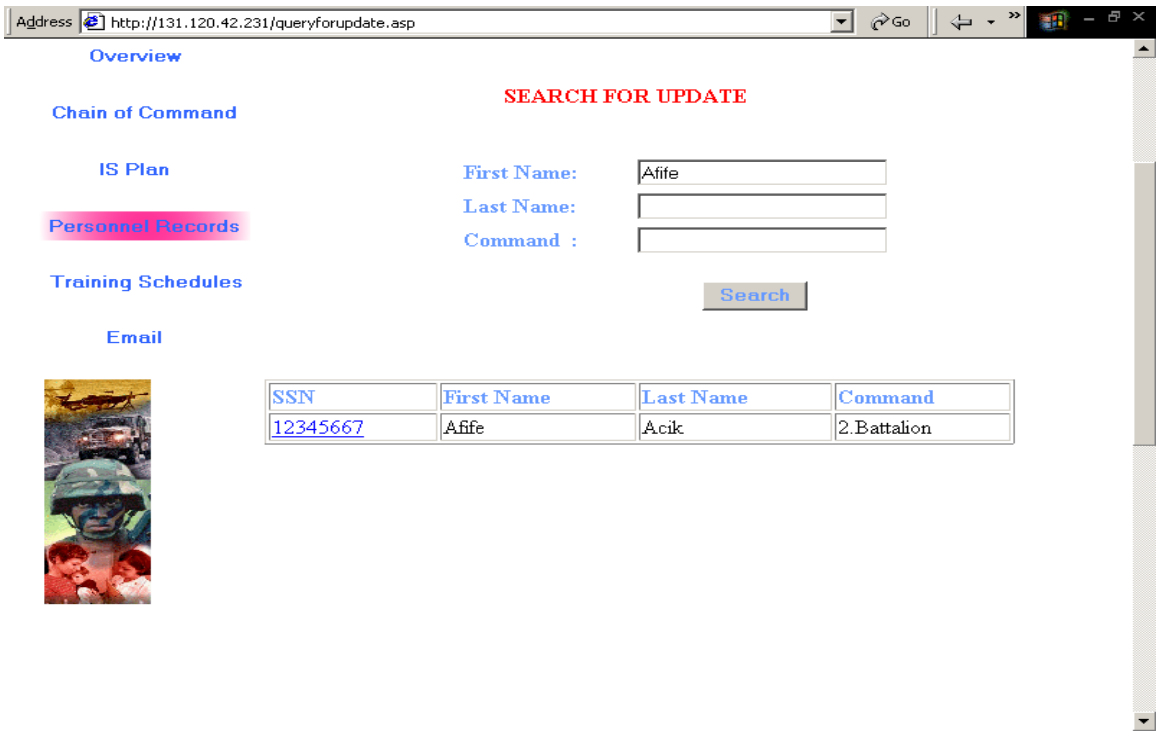


Figure 5.14: Search prior to Update/Delete

[5] Standard Query Language

Users can search the records either with the first, last or Command name. If there is more than one person that meets these search criteria, then all are listed. After scrolling down to the intended record, the user should click on the SSN[6] field (the key field in the database) of the record. Later, automatically the screen, which is shown below, prompts. After modifying the fields, by clicking on update/delete button, users can modify/delete the record.

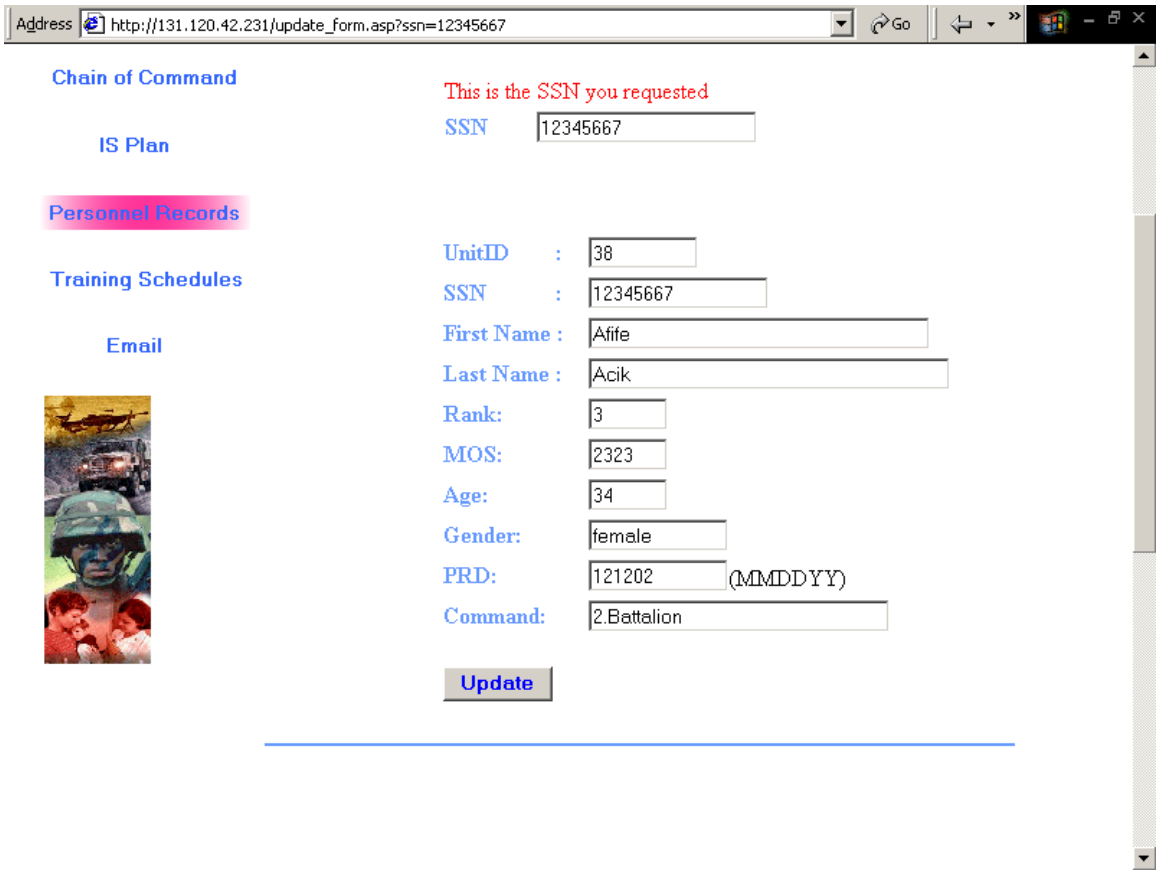


Figure5.15 Update Page

Lastly, a confirmation page notifies the user if the operation was successful.

6 Social Security Number

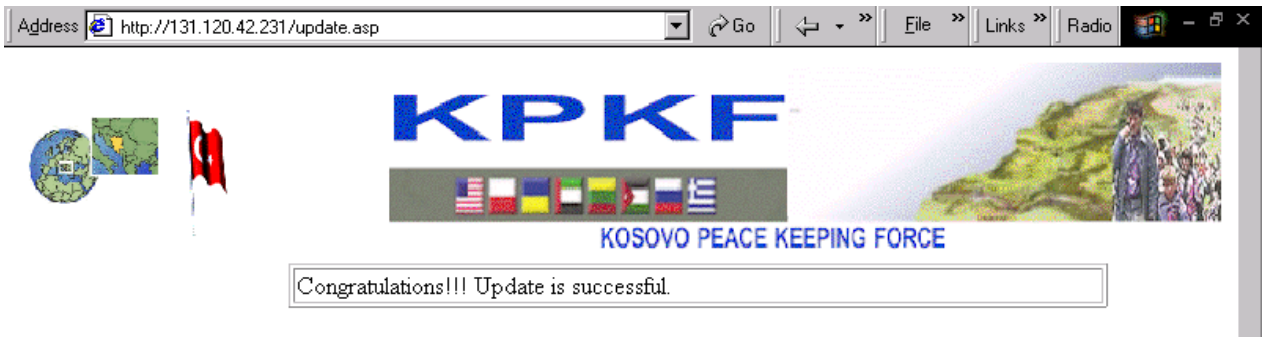


Figure 5.16 Confirmation Page

For the input function, the user is provided with a blank form:

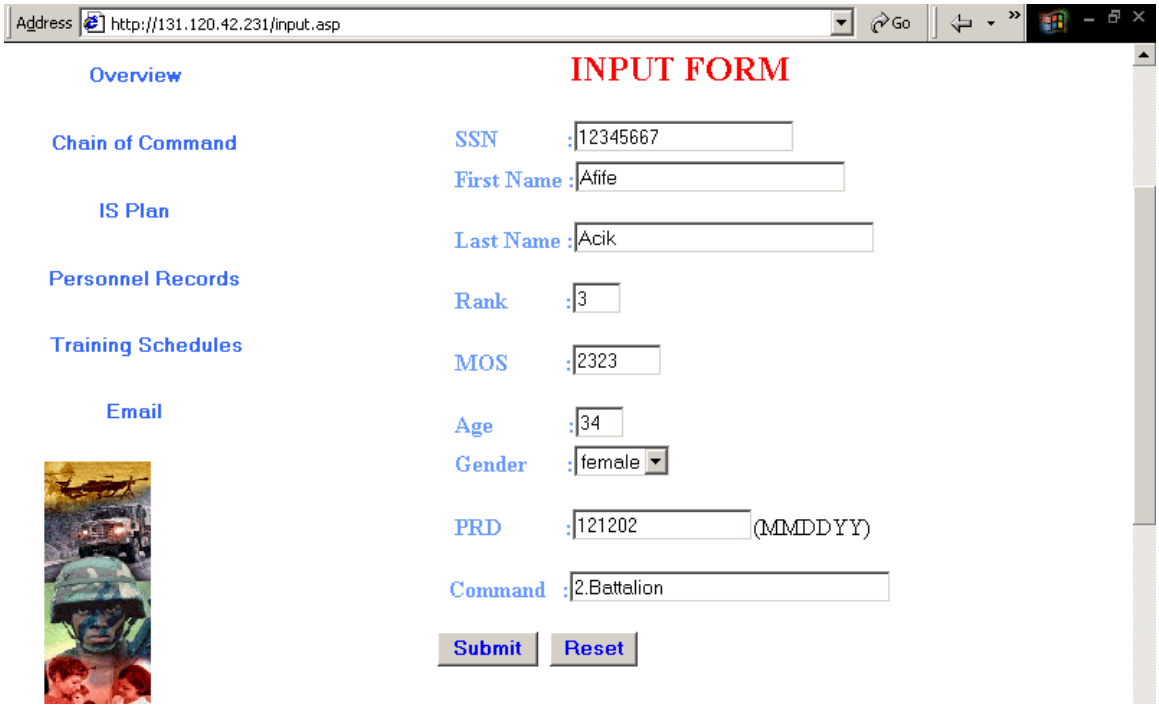


Figure5.17: Input Form

After filling out the form and clicking “Submit” button, the information is transferred directly to the database and the confirmation page prompts to the screen.

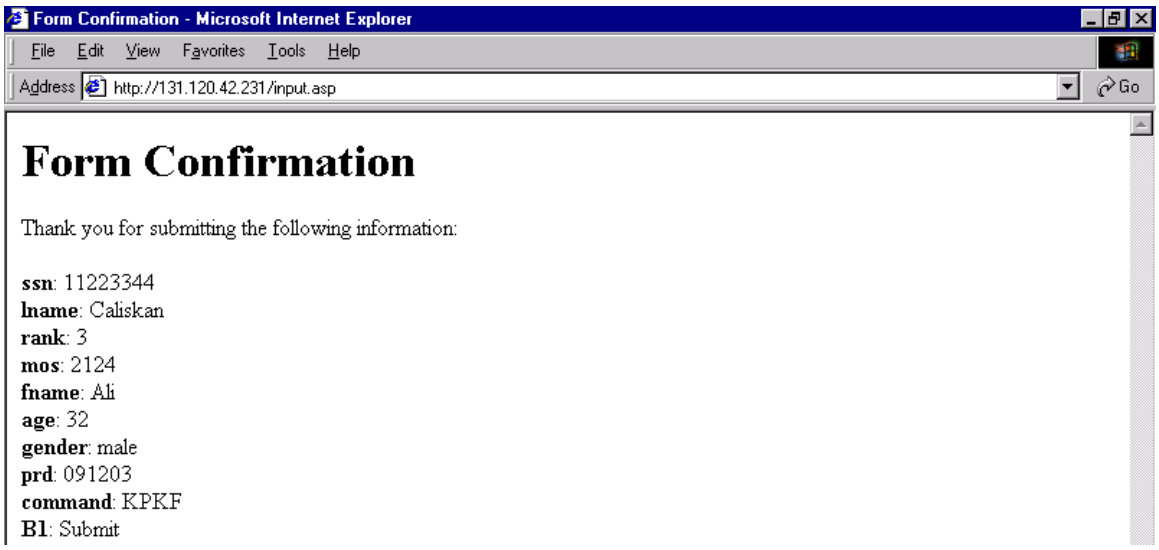


Figure5.18: Input Confirmation

While filling out the forms, even most experienced users can mistakenly enter improper information. In order to prevent this situation, each field was provided with an input mask. For example, if the user enters letter characters in the SSN field, s/he will not be permitted to do this.

Figure 5.19: A Sample Warning Prompt

Or if the user enters a value, which is out of range, in the rank field, then it will result in a similar type of prompt. (The top rank in the KPKF is Brigadier General, which is seven, so entering a value greater than seven does not make sense.)

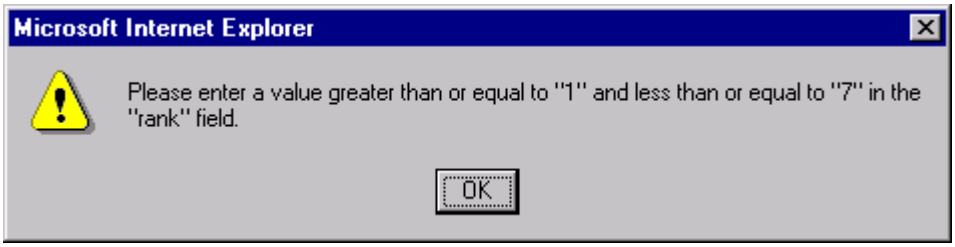


Figure5.20: A Sample Warning Prompt

4. Back-up

While users are dealing with personnel records, they can mistakenly delete some data that would be necessary for the future transactions. The solution to this problem is to back-up all the data in another database. For this purpose, another Access Database was created and extra SQL codes were written to have "Append" and "Delete Queries". A macro will run all these queries, which were programmed to make back up copies of all the data at the end of each week.

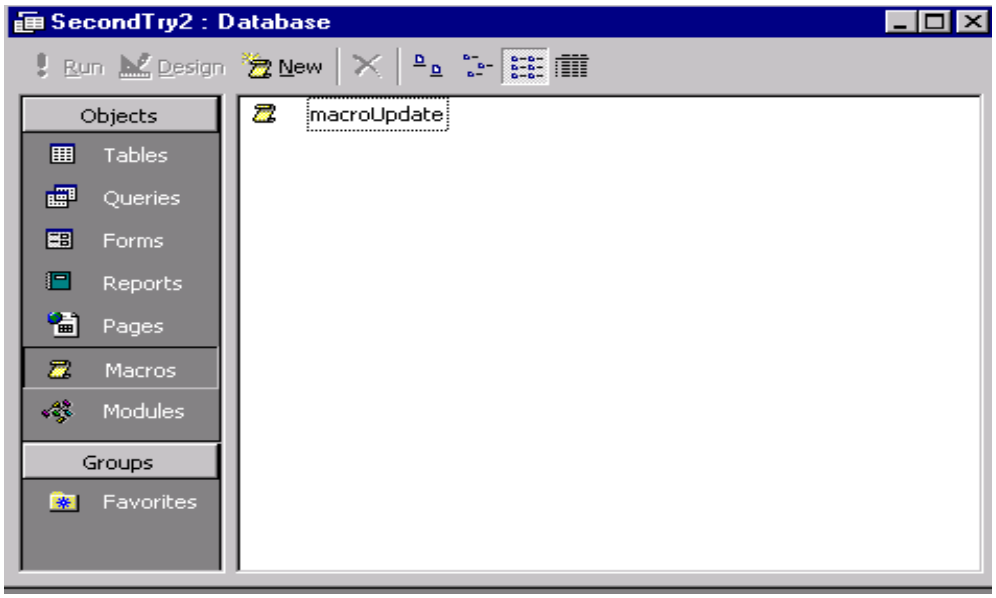


Figure5.21: Back up Macro

After running the back up macro, the user will see a back up warning.

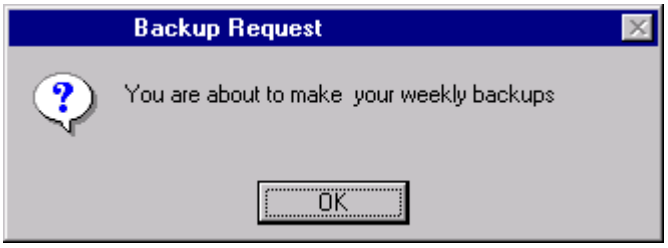


Figure5.22 Back up warning

Later, the macro will automatically run the append and delete queries.

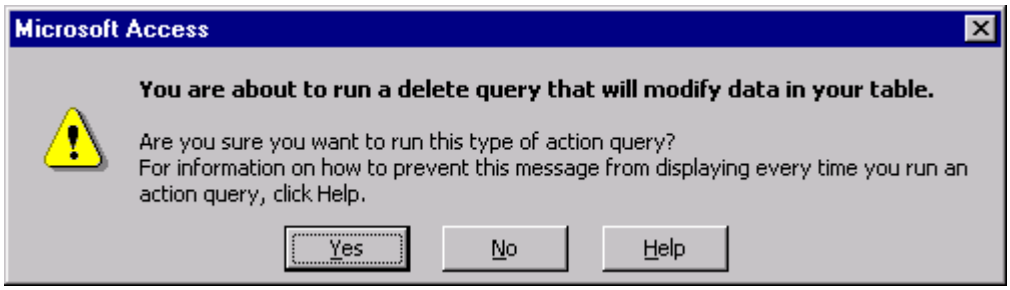


Figure5.23 Delete query

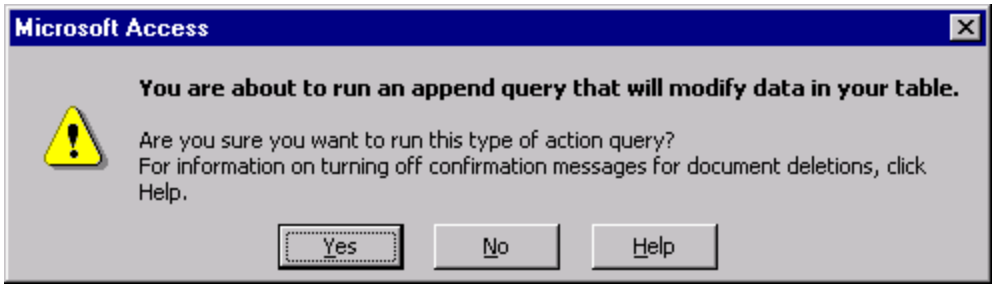


Figure5.24 Append query

And finally back up conformation prompt will show up.

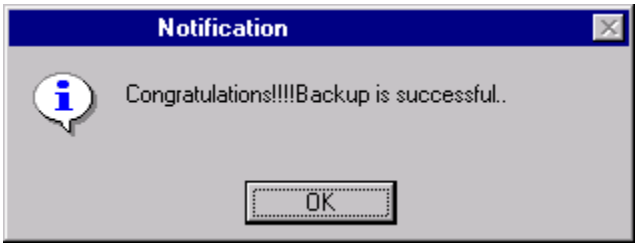


Figure5.25 Back up Confirmation

THIS PAGE INTENTIONALLY LEFT BLANK

VI. CONCLUSIONS & RECOMMENDATIONS

A. CONCLUSIONS

While the scientists were evaluating the war capabilities of two countries, they were just comparing and contrasting the numbers of warships, warplanes, armored vehicles, or rifles in the past. But the context has changed; computer and information technology became the major player in the combat field. Now, military leaders are talking and thinking about network attacks, virus programs and hacking tools as well as air attacks. This new situation changes the structure of the combat units. Computers have become the key element of each and every unit's inventory and the Information Technology (IT) department has become an indispensable part of the organizational structure. Meanwhile, unexpected problems arose such as computer-illiterate military leaders or excluding IT people from the decision process.

To better understand what this thesis tried to accomplish, a reader must put himself/herself in the shoes of an IT professional who is sent to a new region with a newly deployed unit and tries to build an enabling IT infrastructure for that unit. This thesis made a detailed plan to correlate the IT and military goals in the Kosovo Peace Keeping Force (KPKF), in order to make the most of the IT assets. Military missions, vision, strategies, and goals are stated clearly. In addition to this, specifically IT Departments' strategies and goals are defined. Later, the current IS situation is assessed and in the last part, Recommendations, it is proposed to have an intranet and a client/server database system for keeping the routine reports like training schedules, training procedures or personnel records.

As the use of web-based applications has increased in the organizations, the average latency and waiting time in the queue of the messages have started to become an important issue, because the application download takes a long time. KPKF, which was trying to keep up with the improving web-based organizational technology, took this into consideration during the intranet technology selection. For this reason, KPKF intranet analysis completely focused on the flow analysis, which comprised average latency and waiting time in the queue made by Extend Simulation Tool. As the candidate technologies, Token Ring and Ethernet were assessed. Based on the output gotten from the simulation results, Ethernet proved more efficient and effective. Another factor that made KPKF choose Ethernet as the proposed technology is its ability to be upgraded, particularly from capacity perspective. It can support 10 Mbps to 1000 Mbps. The selection of the candidate technology will play an important role in the implementation of the intranet for the organization

The three-tier client/server system, which is built on the top of this intranet system, includes the design and implementation of a relational database. The database is created with Access 2000. The database connectivity from back-end to front-end is constructed by Active Server Pages (ASP), which enables the users to manipulate the database via their web browsers. The intranet pages are built with Microsoft Front Page 2000. This client/server architecture will promote the data sharing and provide the timely access to the information in the KPKF. This prototype will be a first and big step for the KPKF to initiate a transformation from paper-based environment to the paperless world.

Conclusively, this plan is expected to enhance the readiness of the KPKF and serve as a template for the future missions.

B. RECOMMENDATIONS TO TURKISH ARMED FORCES

After the establishment of this IT infrastructure, the main emphasis should be on the maintenance of this new system. Without good follow-on maintenance, even a perfect establishment does not make sense. Following are some of the important issues that should be focused on.

1. IS Staff Training

IS people should keep up with the most up to date technologies. For example, for the current situation, Windows NT and Internet Information Server 4.0 are used as a network application and a web server. In the following years, KPKF can switch to Windows 2000 or XP and Internet Information Server 5.0 and IS people should have enough technical information for this type of transition.

2. KPKF Personnel Training

The first part of the training process consists of teaching the users how to use applications. For example each and every unit is expected to download their training schedules by FTP client application, for this reason every user should have a high command over using this application. Or, units are expected to get personnel records from the Web, so everybody has to know how to search with this new application to get the necessary information.

The second part involves improving user awareness of security. Teaching users to employ strong password, informing users of security threats, and warning users against leaving application sessions unattended are some of the major methods that will enhance the security.

C. FUTURE SEARCH

1. Security Mechanisms

There are several security mechanisms available today and many more on the horizon. However, not all mechanisms are appropriate for every environment. Each security mechanism should be evaluated for the environment that it is being applied to. Some of the security mechanisms that can be used within the KPKF architecture are physical security, packet filters, application wrappers and gateways, encryption and firewalls.

2. Evaluation of Other Technologies

For the current situation, Ethernet and Token Ring are evaluated as the candidate technologies. But there are also other promising technologies like ATM that can be simulated and applied to the KPKF environment.

3. Including KPKF in Wide Army Network

A Wide Area Network is being established for all the Army units back in the country. As mentioned in chapter II, KPKF has to send monthly reports to the Army Headquarter, but most of the time, security becomes an important issue. In order to facilitate the communication and bridge the security gap, KPKF should be included in Wide Army Network (WAN).

LIST OF REFERENCES

Extend User's Manual, version 4, Imagine That, Inc., 1997

Lynch Patrick J, Sarah Horton, *Basic Design Principles for Creating Web Sites*, Yale Univ Pr, 1999

Orfali Robert, Dan Harkey, Jeri Edwards, *Client/Server Survival Guide*, Third Edition, Wiley, John & Sons, Incorporated, 1998

McCabe, James, *Practical Computer Network Analysis and Design*, Morgan Kaufmann, 1998

Comer, Douglas E., *Computer Networks and Internets*, Second Edition, Prentice Hall, 1999

Gdanski, Gregory T., *Applying Asynchronous Transfer Mode to the Marine Corps Base Level Information Infrastructure*, Master's Thesis, Naval Postgraduate School, June1999

Cassidy, Anita, *A Practical Guide to Information Systems Strategic Planning*, St. Luice, 1998

KFOR Online. [Online] Available http://www.kforonline.com/kfor/default.htm, April 11,2001.

Friedman, Thomas L., *The Lexus and The Olive Tree*, Anchor Books, 2000.

Ambler, Scott W., Larry L. Constantine, *The Unified Process Inception Phase*, CMP Books, 2000

Vandersluis, Chris, *Third-Tier Ready to End the Rule of Client-Server*, Computing Canada, 1999

Peer-to-Peer Network. [Online] Available http:// www.cnet.com/Resources/Info/ Glossary/ Terms/peer.html

Peer-to-Peer vs. Client/Server Networks. [Online] Available http: //www.freepctech.com /pc/002/networks007.shtml, 2000

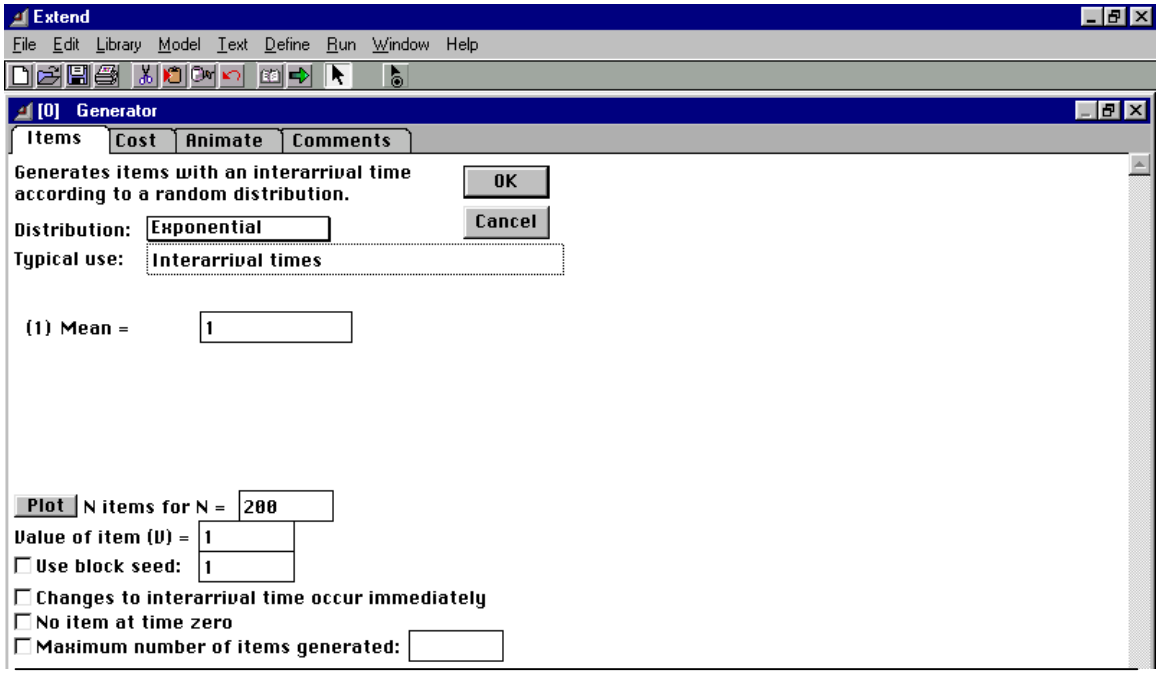
THIS PAGE INTENTIONALLY LEFT BLANK

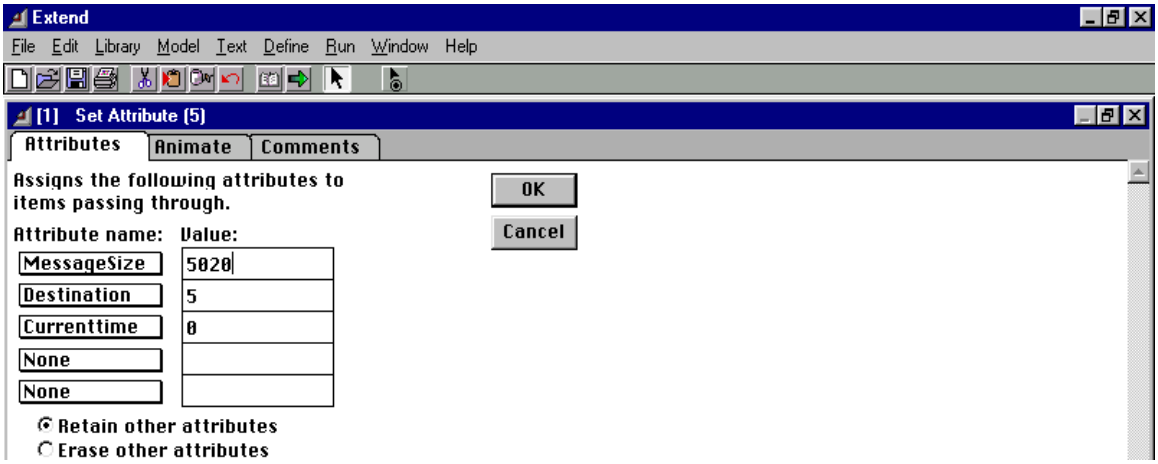
APPENDIX A: ETHERNET MODEL

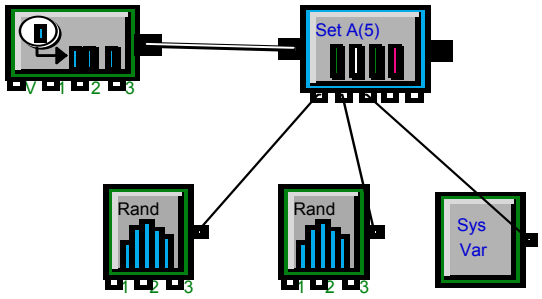
The actual Ethernet model consists of eleven high level parts. Each part represents one unit in the KPKF. The model is too large to fit in a couple of pages, for this reason this appendix will not show the whole architecture, but only shed lights on the basic building steps of it. In order to get the whole model, you can visit the KPKF web site (http://131.120.42.231). The author uploaded the simulation program under "IS Plan" section. So, you can download it with anonymous username and password.

MESSAGE GENERATION & SETTING ATTRIBUTES

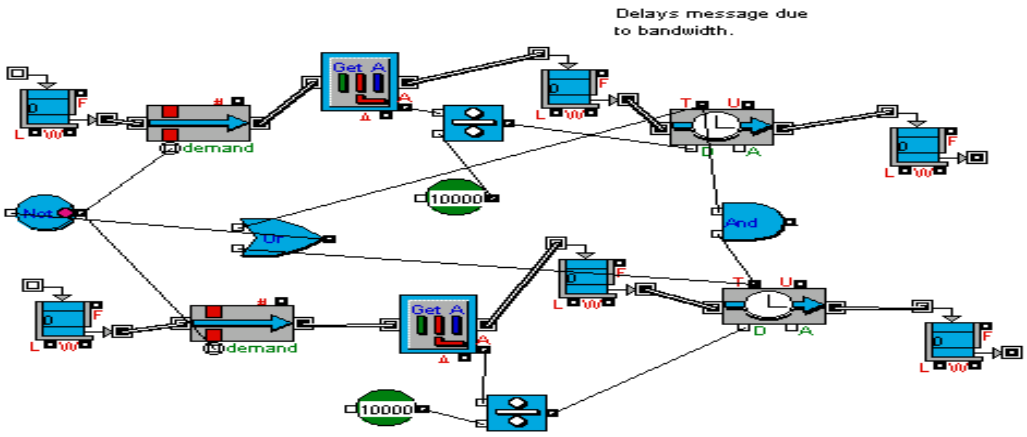
The message generation that is used for Ethernet Model is shown below. After each message is generated, following attributes are assigned to it: message size, destination, and current time.



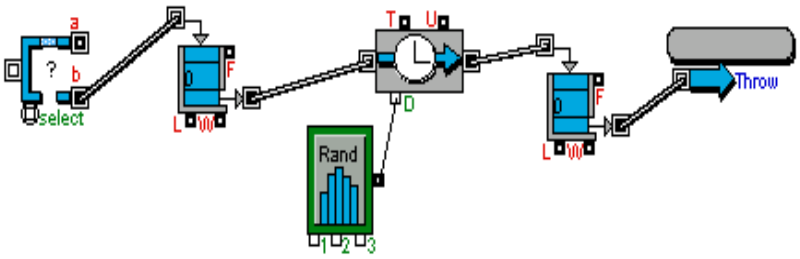




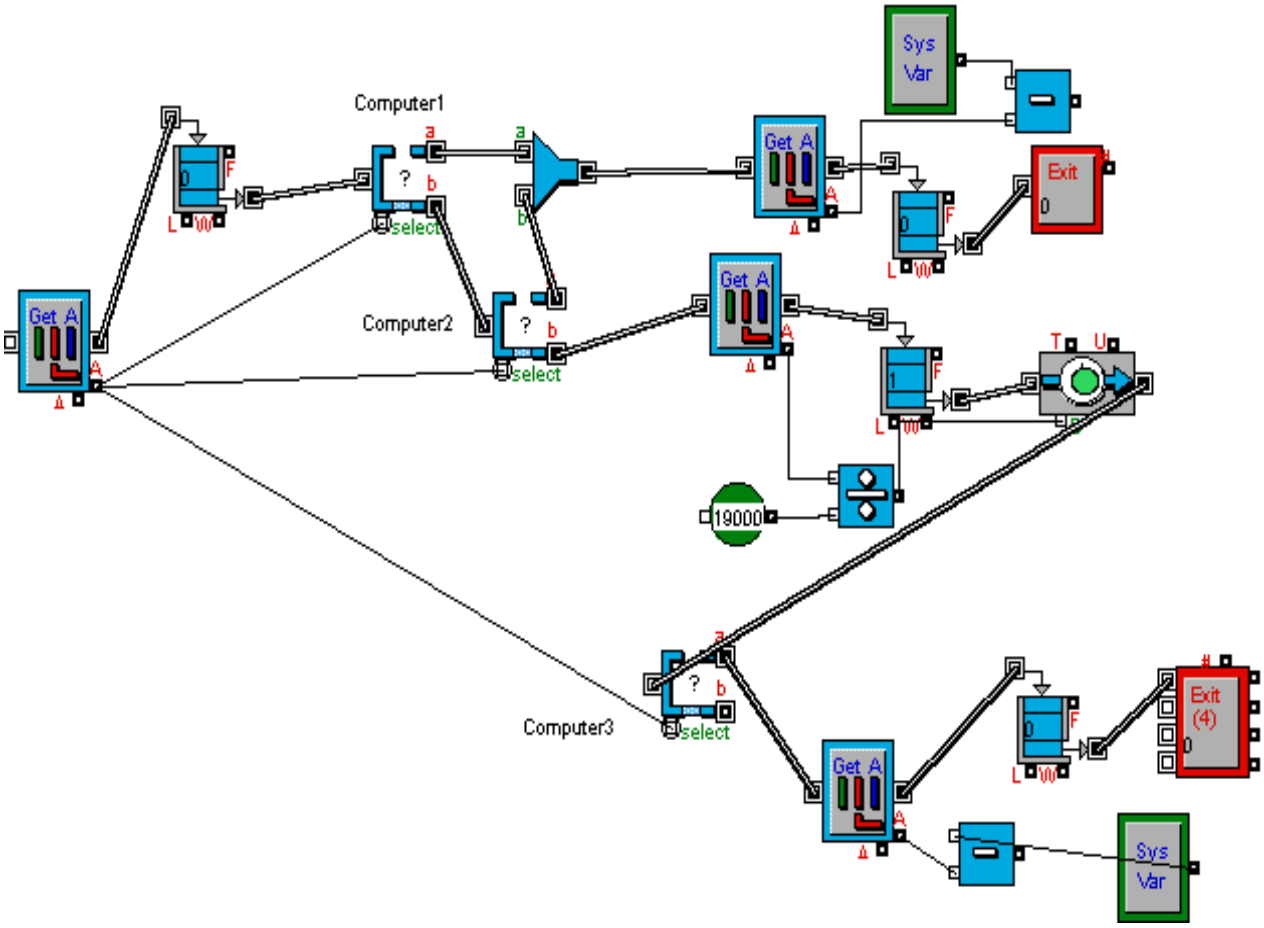
CSMA/CD & MESSAGE DELAY



RESEND DELAY



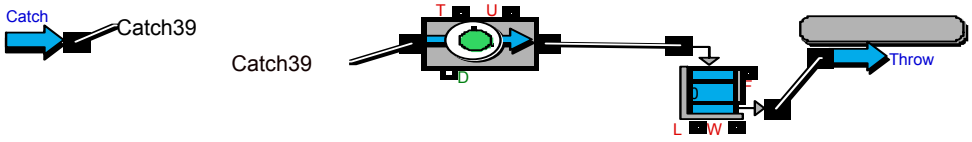
GETTING ATTRIBUTES & NODE SELECTION



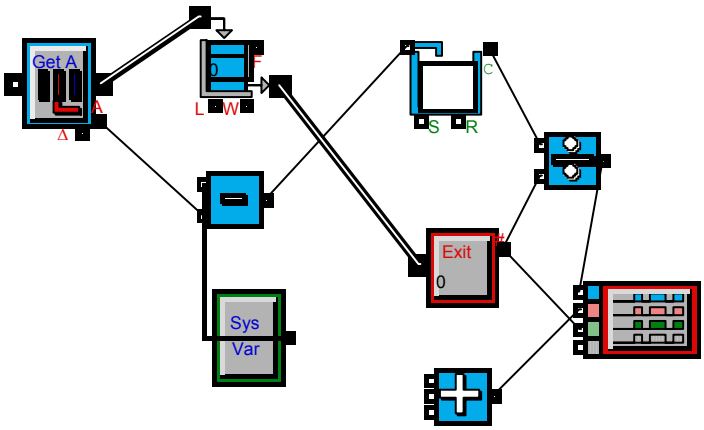
CATCH AND THROW

Messages that have undergone collisions are delayed by an amount equal to random delay time and re-transmitted again

After being delayed messages that have undergone collisions are sent back to their origins for retransmittal

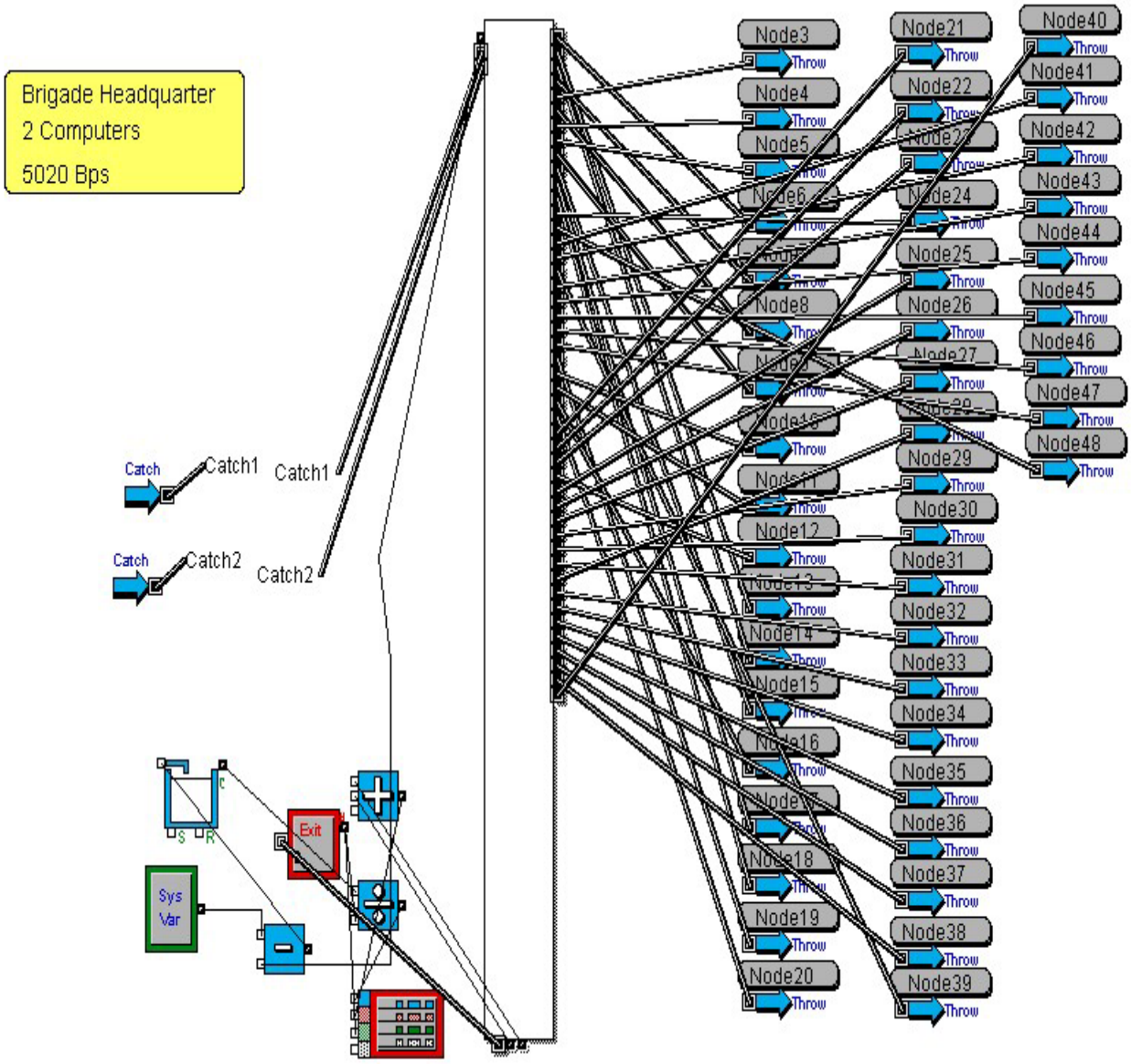


MEASURING LATENCY, AVERAGE WAITING TIME IN THE QUEUE AND TOTAL MESSAGES

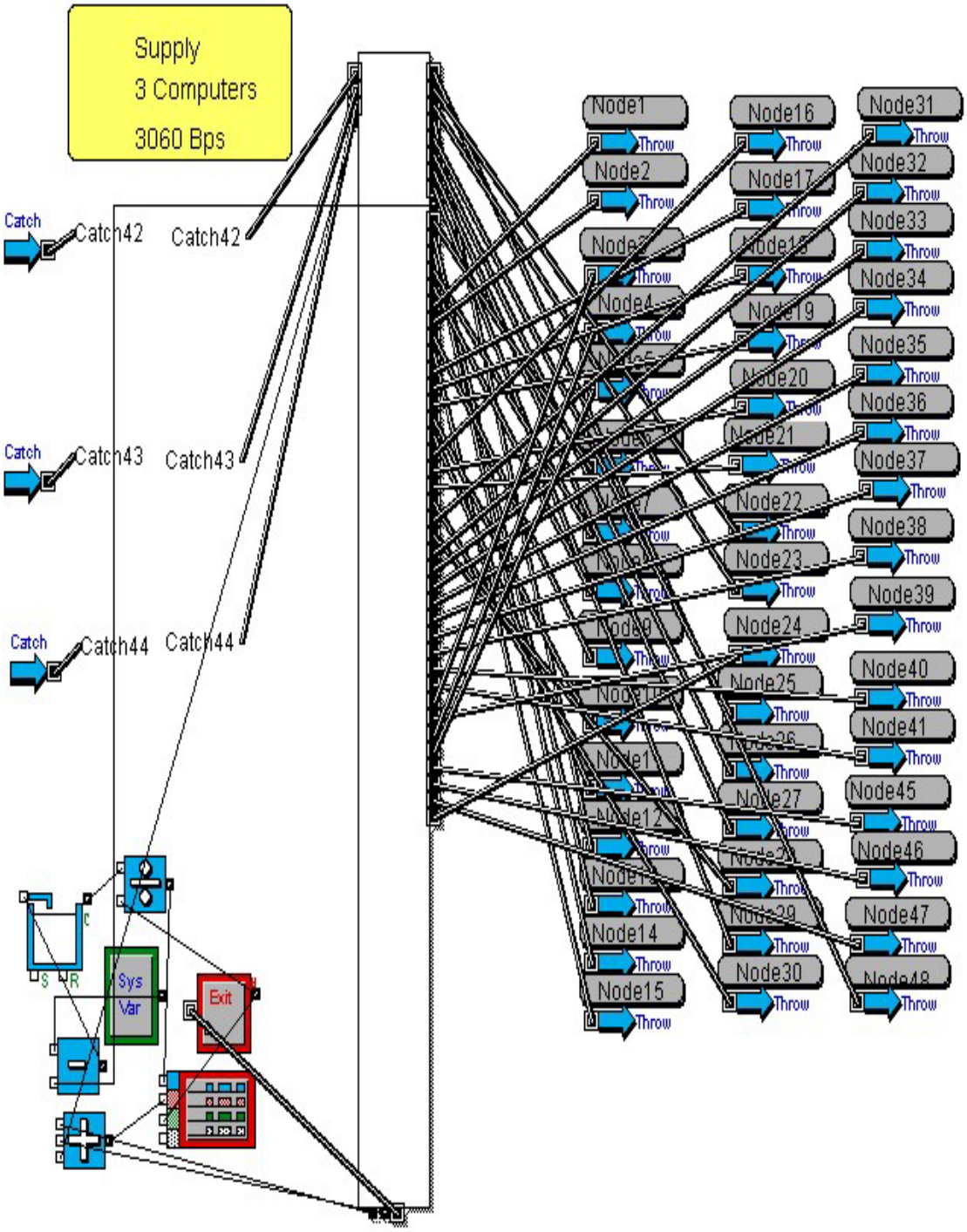


COMPLETE 2 NODES EXAMPLE:

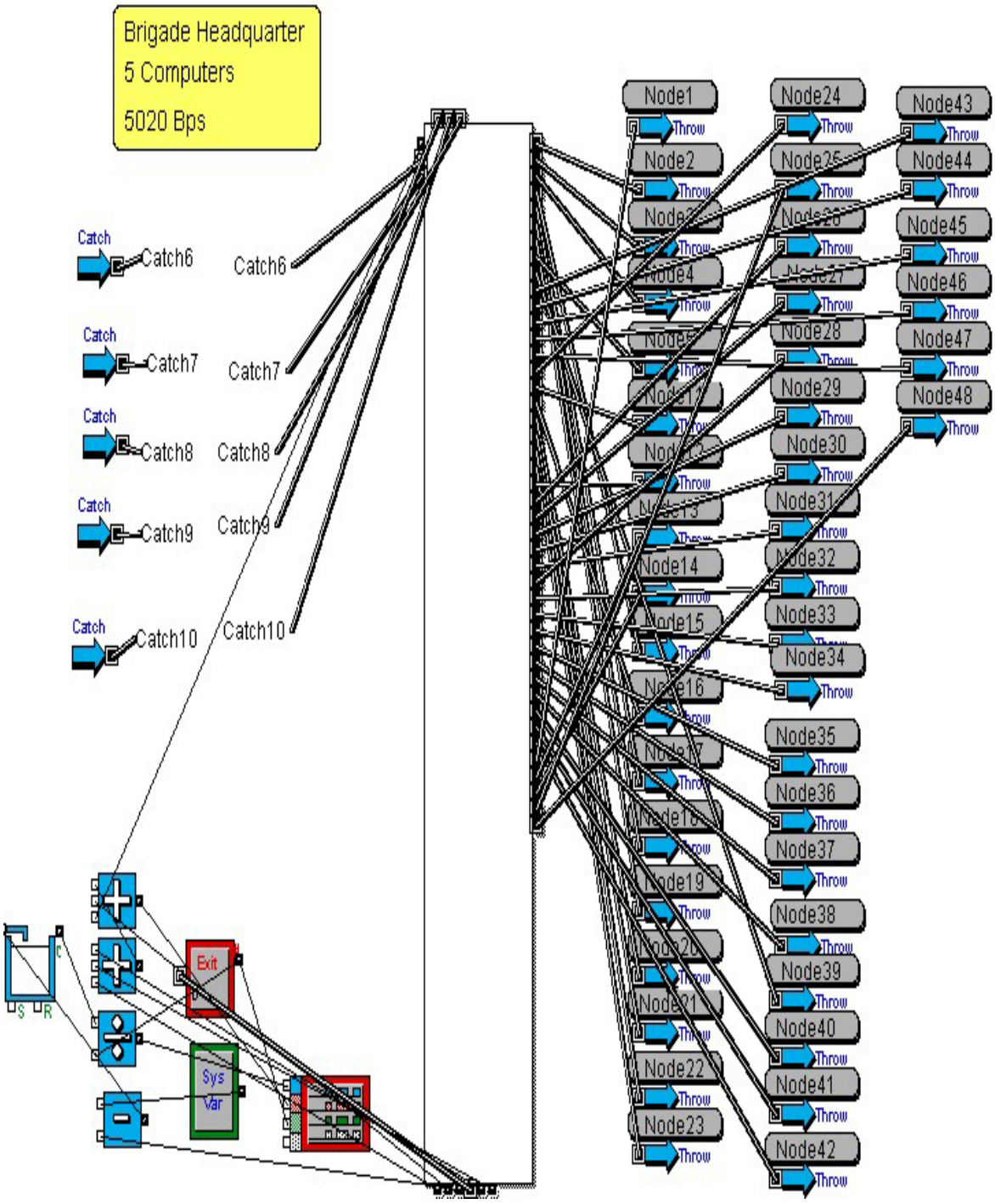
There are totally 48 computers in the KPKF. Each node represents one computer, which is sending the messages. Each catch block shows one computer, which is receiving the messages. For example, in the Brigade Headquarters, there are two computers, and for that reason it is represented by two catch blocks.



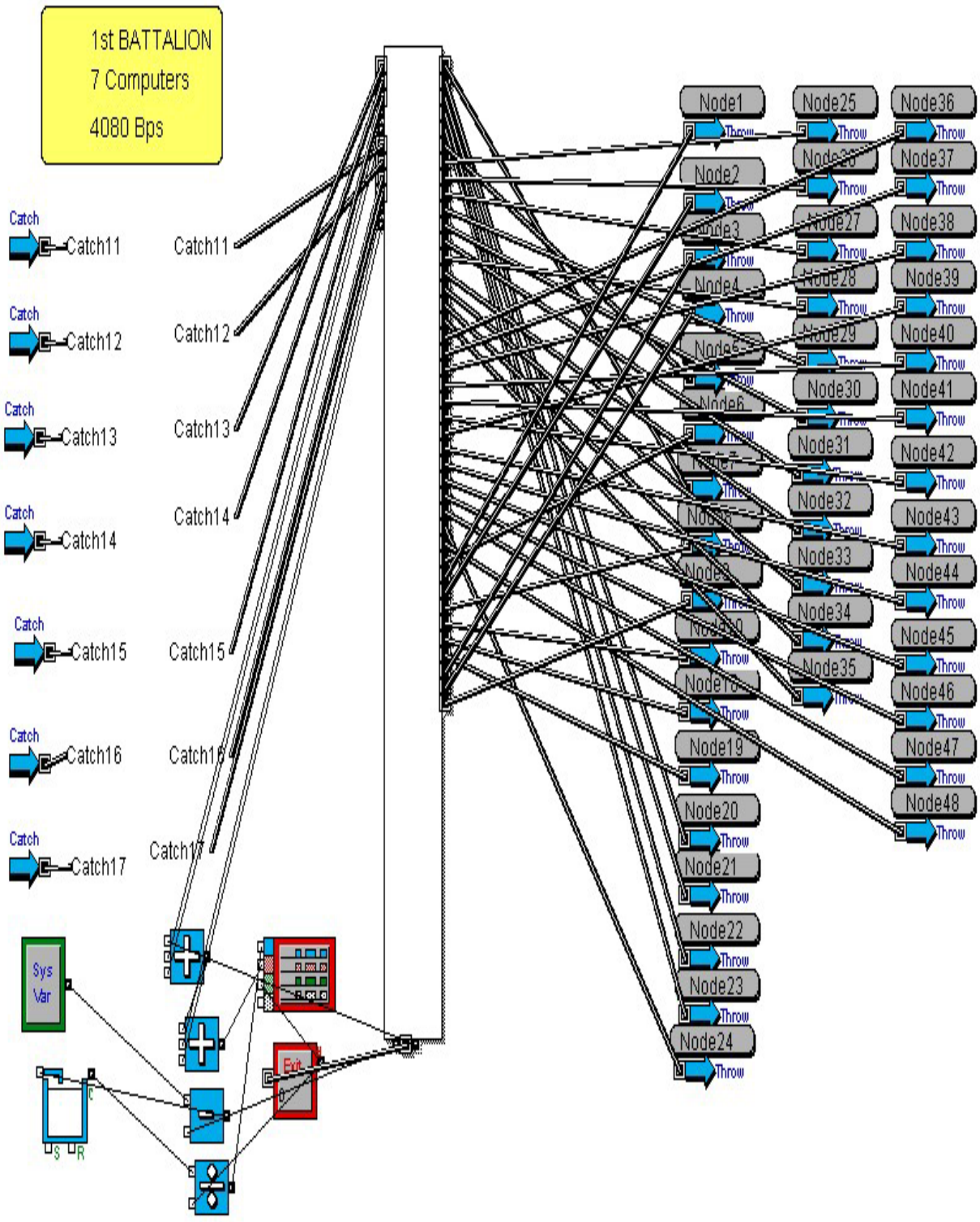
COMPLETE 3 NODES EXAMPLE:



COMPLETE 5 NODES EXAMPLE:



COMPLETE 7 NODES EXAMPLE:



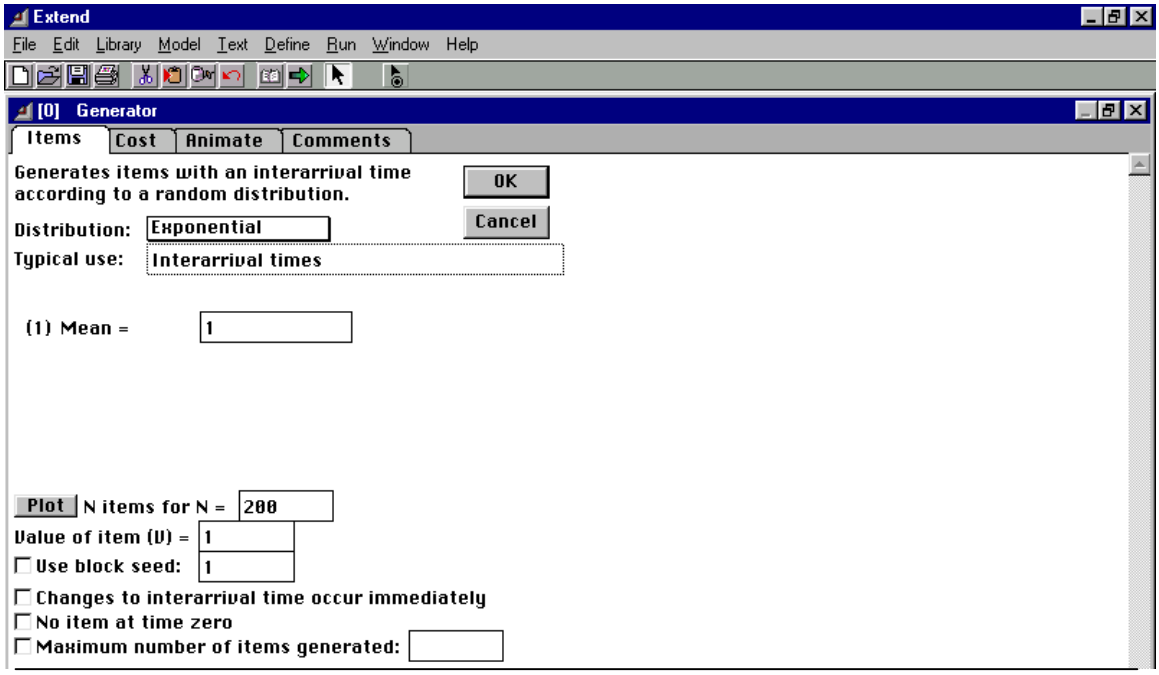
THIS PAGE INTENTIONALLY LEFT BLANK

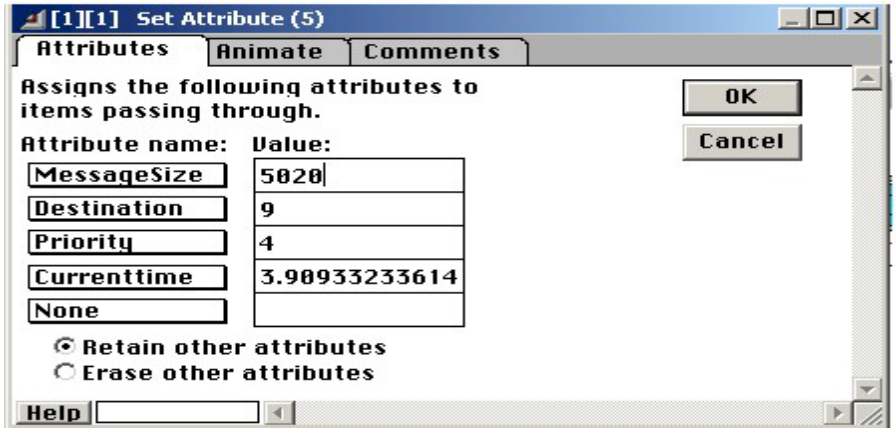
APPENDIX B: TOKEN RING MODEL

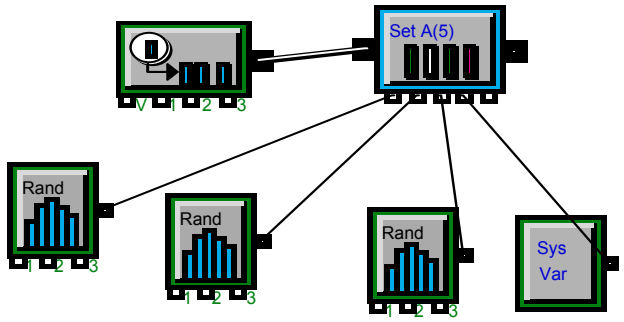
The actual Token Ring model consists of eleven high level parts. Each part represents one unit in the KPKF. The model is too large to fit in a couple of pages, for this reason this appendix will not show the whole architecture, but only shed lights on the basic building steps of it. In order to get the whole model, you can visit the KPKF web site (http://131.120.42.231). The author uploaded the simulation program under "IS Plan" section. So, you can download it with anonymous username and password.

MESSAGE GENERATION & SETTING ATTRIBUTES

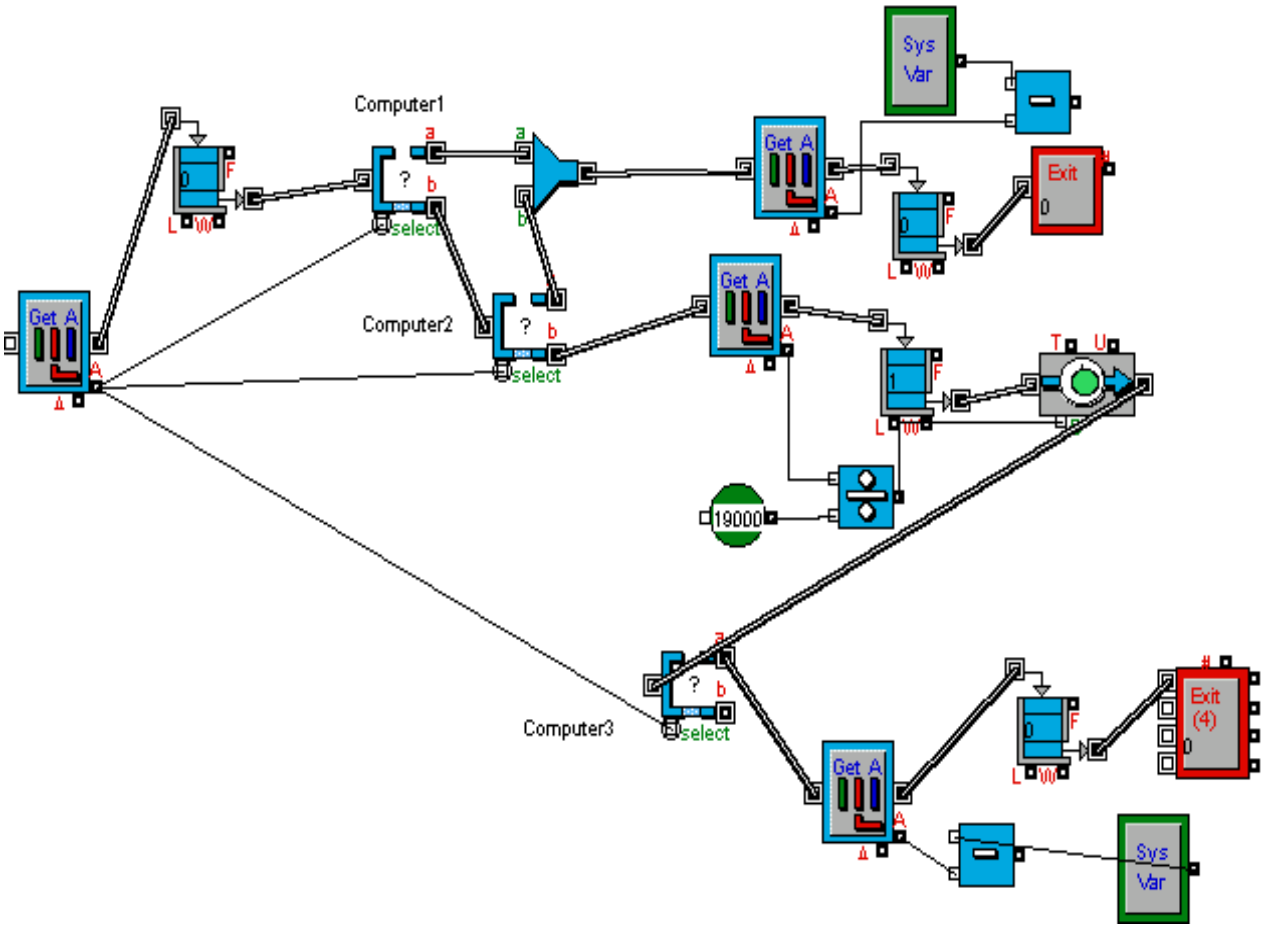
The message generation that is used for Token Ring Model is shown below. After each message is generated, following attributes are assigned to it: message size, destination, current time and priority.



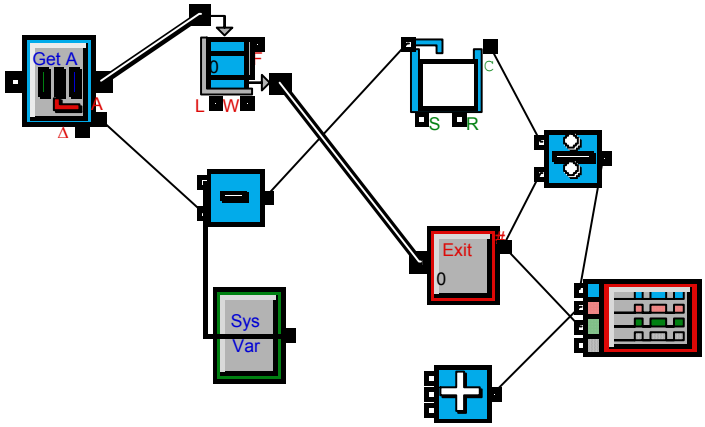




GETTING ATTRIBUTES & NODE SELECTION



MEASURING LATENCY, AVERAGE WAITING TIME IN THE QUEUE AND TOTAL MESSAGES



APPENDIX C: TEST RESULTS

This appendix includes the remainder of the runs. The first run can be seen in Chapter IV

Average Latency:

KPKF Intranet Test Results	**Ethernet**				**Token Ring 2**			
	1. Run	2.Run	3.Run	4.Run	1.Run	2.Run	3.Run	4.Run
Headquarter	0.9055	0.7073	0.1450	0.1994	2.1321	5.2951	3.8235	3.819
1.Battalion	1.7185	0.4606	1.5501	0.7040	4.3985	5.7144	4.8941	5.5074
2.Battalion	0.9678	1.7698	0.5401	1.0204	4.8248	4.3369	5.7752	5.1873
3.Battalion	1.2277	0.2686	0.9036	0.7319	4.8738	4.3097	5.7199	5.0712
4.Battalion	1.6717	1.7248	1.7855	2.4692	4.3964	5.7211	5.5360	4.5729
Transportation	0.0003	0.0003	0.0003	0.0003	0.0804	0.5428	0.0003	0.6243
Ordnance	0.0003	0.0003	0.0003	0.0003	0.1138	0.0367	0.3191	0.1973
Signal	0.6098	0.0003	0.0251	0.0149	1.0750	0.9874	1.5088	2.2208
Engineering	0.0006	0.0003	0.0003	0.0003	1.7887	1.4248	1.4148	1.0678
Supply	0.0032	0.0003	0.0003	0.0003	1.8016	1.8174	2.0244	1.9619
Medical	0.0005	0.0005	0.0005	0.0006	0.2111	0.5048	0.1905	0.2741

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D: SQL CODES

This appendix shows the SQL codes that are used in the creation of Active Server Pages (ASP) for the update and deletion functions.

. For the Deletion:

DELETE Distinct from KPKF where SSN =’::SSN::’ AND FirstName:='::FirstName::' AND LastName='::LastName::' AND Rank=’::Rank::’ AND Mos=’::Mos::’ AND Age=’::Age::’ AND Gender=’::Gender::’ AND PRD=’::PRD::’ AND Command=’::Command::’

. For the Update:

UPDATE KPKF SET *SSN =’::SSN::’ AND FirstName='::FirstName::' AND LastName='::LastName::' AND Rank=’::Rank::’ AND Mos=’::Mos::’ AND Age=’::Age::’ AND Gender=’::Gender::’ AND PRD=’::PRD::’ AND Command=’::Command::’*

WHERE SSN =*’::SSN::’*

THIS PAGE INTENTIONALLY LEFT BLANK

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center
   Fort Belvoir, Virginia 22060-6218

2. Dudley Knox Library
   Naval Postgraduate School
   Monterey, California

3. Prof. George Conner
   Naval Postgraduate School
   Monterey, CA 93943
   gconner@nps.navy.mil

4. Prof. William J. Haga (Code SM/HG)
   Naval Postgraduate School
   Monterey, CA 93943
   wjhaga@mbay.net

5. Prof John Osmundson (Code CC/OS)
   Naval Postgraduate School
   Monterey, CA 93943
   josmunds@nps.navy.mil

6. Nuh Altinsoy
   Buyuk Bolcek Mah No: 40
   AKSARAY, TURKEY 68100
   altinsoynuh@yahoo.com

7. Kara Harp Okulu Kutuphanesi
   Bakanliklar ANKARA, TURKEY
   avaroglu@kho.edu.tr

8. Orta Dogu Teknik Universitesi
   Balgat ANKARA, TURKEY
   lib-hot-line@metu.edu.tr

9. Harp Akademileri Komutanligi
   4. Levent ISTANBUL, TURKEY
   ktp@harpak.tsk.mil.tr

10. Bilkent UNIVERSITY
    Balgat ANKARA, TURKEY
    library@bilkent.edu.tr

11. Genel Kurmay Baskanligi Bilgi Sistem Destek Dairesi Baskanligi
Plan ve Proje Yonetim Subesi
Bakanliklar ANKARA, TURKEY
sengezer@tsk.mil.tr

12. Gazi Universitesi
Endustriyel Sanatlar Egitim Fakultesi
Besevler ANKARA TURKEY
atogay@gazi.edu.tr