IMPLEMENTATION OF COMMUNICATION PROTOCOL FOR PARTIALLY DISTRIBUTED DATA BASE

A DISSERTATION

Submitted in partial fulfilment of the
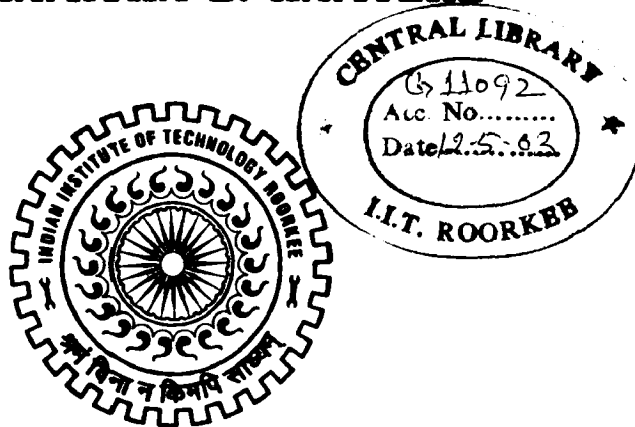*requirements for the award of the degree*
of

MASTER OF TECHNOLOGY

in

INFORMATION TECHNOLOGY

By

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CANDIDATE'S DECLARATION

I hereby declare that the work presented in this dissertation titled "IMPLEMENTATION OF COMMUNICATION PTOTOCOL FOR PARTIALLY DISTRIBUTED DATABASE", in partial fulfillment of the requirements for the award of the degree of **Master of Technology in Information Technology**, submitted in **IIT, Roorkee – ER&DCI Campus, Noida**, is an authentic record of my own work carried out during the period from August 2002 to February, 2003 under the guidance of **Mr. M.K. Bhattacharya**, Senior Project Manager, Electronics Research and Development Centre of India, Noida.

The matter embodied in this dissertation has not been submitted by me for award of any other degree of diploma

Date: 26-02-2003

Place: Noida

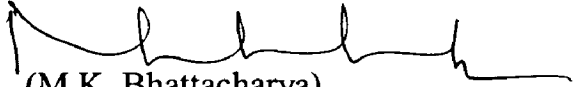(Ramteke Sanghamitra Balwant)

CERTIFICATE

This is to certify that the above statement made by the candidate is correct to the best of my knowledge and belief.

Date: 26-02-2003

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ACKNOWLEDGEMENT

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CONTENTS

ABSTRACT

The overall aim of this dissertation is to develop a database link between remote locations. This communication link is established by first connecting to remote machine by dial up networking, using remote access services and then using the very popular Internet protocol File Transfer Protocol for transferring files over the network. A user-friendly graphical interface is developed which will encompass transfer of files in a very effective manner.

I have developed the application using VB 6 as the front end and Oracle 8i as the back end. Remote Access Services are implemented on both the remote machines. File Transfer Protocol is implemented and configured on both the remote locations.

INTRODUCTION

1.1 Objective of the Dissertation

The information exchange between various departments of the client i.e. NSFDC is manual. Although some of the documents are generated on computer using packages like FoxPro, MS Excel etc., these packages are in-house developed and thus the data generated by these packages are not integrated at a location. If such development continues on stand alone PCs then since integration is not possible, redundancy in database and duplication in data entry, duplication of processing etc. will lead to error prone information flow. Further the incompatibility of soft media do not prompt transfer of said documents within the department's PC to PC.

It is therefore felt that there should be a software system available, which could cater for reducing the complexity of the functioning of the Organization. The main aim is establishment of a database link between Apex (Head Quarter) with each of its connected SCA's. A Protocol is a precise set of rules defining how computers communicate. Parts of a protocol are what additional information is needed to send the message. A communication protocol is desirable for data transfer in such diverse applications as remote job entry, file transfer, network mail system, graphics, remote program execution, and communication with block data terminals (such as printers, card, paper tape, and magnetic tape equipment, especially in context of terminal IMPs). Although it would be possible to include some or even all of the above applications in an all-inclusive file transfer protocol, a separation between data transfer and application functions may provide flexibility in implementation, and reduce complexity. Separating the data transfer function from the specific applications functions may also reduce proliferation of programs and protocols.

1.2 Scope of Work

The main aim is establishment of a database link between Apex (Head Quarters) with each of its connected SCA's (State Channelising Agencies). To establish communication between any two computers, there has to be a defined set of rules on how the communication is to proceed. Such rules are said to form a protocol. Particularly in this case, the communication protocol to be designed will be specific to NSFDC, so that it can be applied to establish link between Apex and SCA. In fact this link itself will be developed using the data available with respect to Apex and SCA .The communication protocol will be designed and implemented using the existing database of NSFDC. A new method for updating of database at headquarters will be designed to overcome the drawbacks of existing methods. In future this link can be generalized to any sort of data transfers involving some other database. A user-friendly graphical user interface is to be designed which any naïve user can use. An Application Programming Interface can be designed and implemented which can be attached to any sort of similar application.

1.3 Background

1.3.1 About ER&DCI

Electronics Research and Development Center Of India (ER&DCI) was established with the mandate to undertake and promote state-of-the-art Scientific Research and Development in Electronics and to design and develop Electronics Equipment and Systems for the growth of Electronics Industry. It has three Units, located, at Thiruvananthapuram, Kolkata and Noida, employing over 450 Trained Technical Professionals.

The functions of the units are coordinated and supervised by the governing council and executive committee. The units lay emphasis on translating the goal of Ministry of Information Technology (MIT), Government of India, to enhance the competitiveness of the Indian industry.

The main objectives of the organization are:

- To undertake Application-oriented Region-Specific Research, Design and Development and Engineering in a Mission-oriented and time-bound manner.

- To generate State-of-the-art, Producible, Marketable and field-Maintainable Products and systems.

- To promote accelerated growth of Electronics Industry in the region and to enhance self-reliance for Technologies, System Engineering, Industry Design, Pilot, and Production etc.

- To forge institutional linkages between Academia, R&D Institutions and Industries and to develop Commercial Technologies.

- To develop Human in hi-tech areas

1.3.2 About the Client: NSFDC

National Scheduled Castes Finance & Development Corporation (NSFDC) is a Government of India Undertaking functioning under the Ministry of Social Justice & Empowerment, Incorporated under Section 25 of the Companies Act, 1956. Objective of this Corporation is to provide loans to the Scheduled Castes community.

The basic objective of this Apex Corporation is to work towards the welfare of the Scheduled Castes of the country. The Apex Corporation carryout certain tasks, which would give rise to the upliftment of the Scheduled Castes who, are below the Double Poverty Line.

Various objectives to be pursued by the Apex Corporation are:

- To promote economic and development activities for Schedule Castes.

- To promote self-employment ventures for the benefit and rehabilitation of Schedule Castes.

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- To assist, through State Channelising Agencies, Schedule Castes, either individually or in-groups, by way of Grants, Subsidy, Loans or Advances for economically and financially viable income generating schemes and projects.

- To grant concessional finance to Schedule Castes in selected cases for persons belonging to Schedule Castes living below the double poverty line.

- To extend loans to students from the communities of Schedule Castes for pursuing professional or technical education.

- To promote training, quality control, technology up-gradation, etc. for the Schedule Castes.

- To assist in up-gradation of the technical and entrepreneurial skills of the Schedule Castes for proper and efficient management of production units.

1.4 Organization Of Dissertation

The brief introduction of the organization ER&DCI and the objectives of client NSFDC are described above. The module objective and scope of work is explained in the first chapter itself, just before this section. The next chapter consists of the explanation of concepts related to the thesis work done as well as the technical solutions available to solve then problem. Chapter three introduces NSFDC (National Schedule Caste, Finance and Development Corporation) and the theory related to it. Chapter Four brings out the analysis and designing involved in developing this system. Chapter Five puts up the results and discussions, which contains the description of the protocol implemented. Chapter Six is the Conclusion and Future Scope followed by References and Appendix A as the user manual.

LITERATURE SURVEY OF DATA TRANSFER

2.1 Distributed Databases Concept [1]

Oracle includes the Distributed option in all the Enterprise-level servers. This option allows you to set up database links from one database to any other on the same network. For example, the Accounting department may need to access data in other parts of the company, departments that each have their own databases. We can easily set up a one-way link from the Accounting database to the Engineering, Manufacturing, and Research and Development departments as shown in Figure 2.1

Accounting Database Server

Database Link (One Way)   Database Link (One Way)   Database Link (One Way)

Database Link Bidirectional   No Distributed Access (Default)

Engineering Database Server   Manufacturing Database Server   R & D Database Server
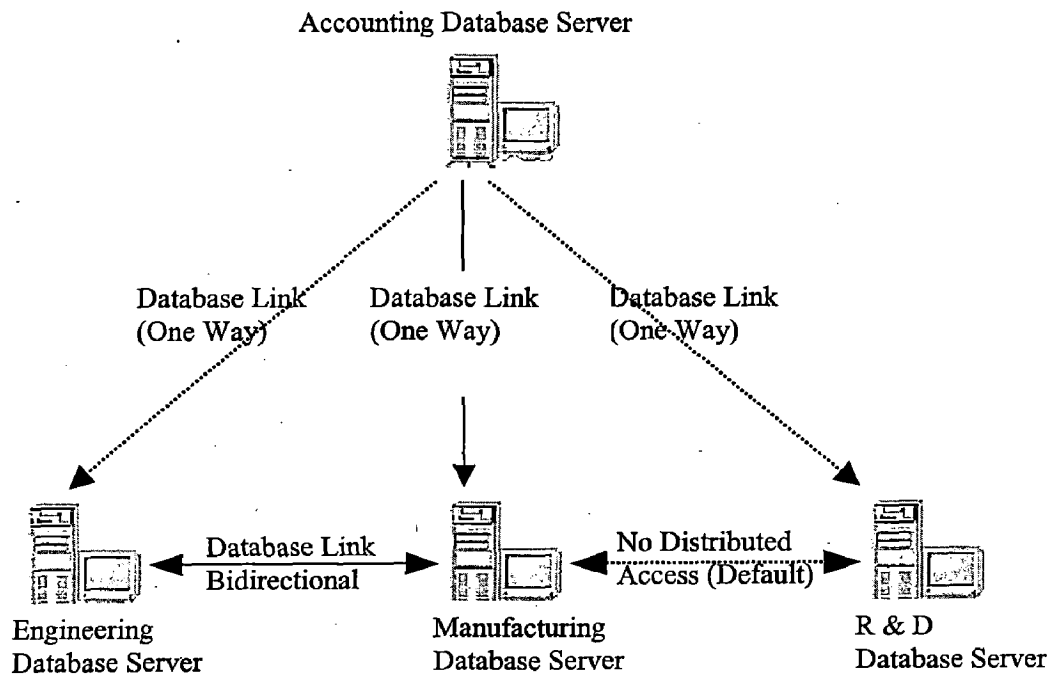
Figure 2.1: Database links in a distributed database

In this distributed situation, the users in the Accounting department can easily request data from any of the databases for which links have been set up. The technique is as simple as adding a table's location when doing your queries. You can even make the data link transparent with the use of synonyms. There are a variety of security measures

you can take to ensure that only those users who have the correct passwords can use the links.

The advantage of the distributed database is that a certain amount of separation (both physical and political) can be achieved for the data. If one database crashes, none of the others will be affected (though in this case, distributed queries cannot be executed). Oracle databases can also be accessed that are on different operating systems as long as they are on the same network. The versions of Oracle do not even have to be the same.

2.2 Client/Server Architecture Concept [1]

As the requirements are scaled up with more data and more users, a file-based approach simply reaches the point of being too slow to be useable. Depending on the volume of records and users and the speed of the network, this point may come earlier. We need a way to process the data on a very fast machine, we need to transfer over the network the smallest amount of information that will still do the job. In the case of the million-record search, we have to retrieve just the one value we need. The solution is client/server architecture.

As seen in Figure 2.2 that the client/server architecture consists of, as its name suggests, both clients and servers. The clients in this case, are the individual users, running applications like Visual Basic; the servers are powerful, often enterprise-level, pieces of equipment running an active Database Server.
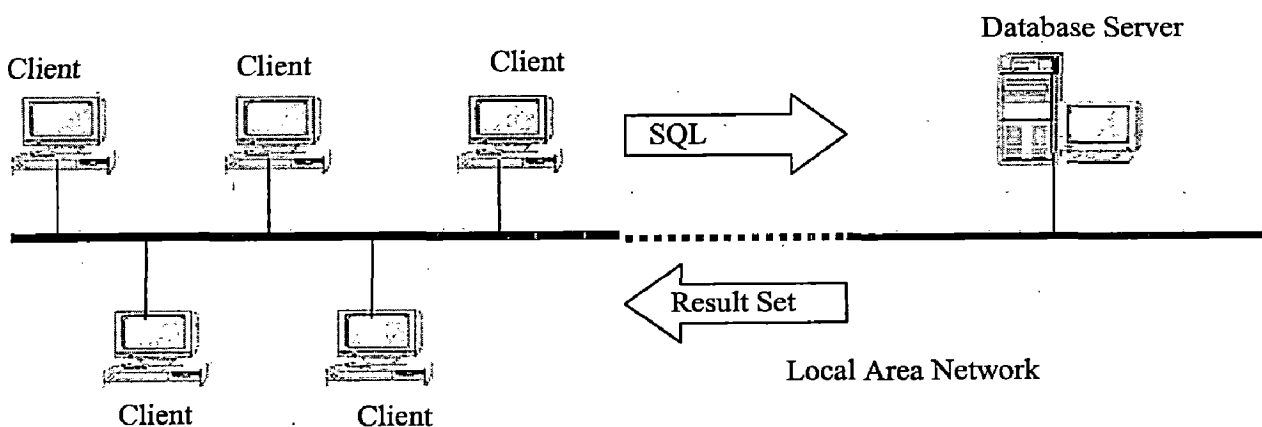
Figure 2.2: The client/server architecture

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Here client applications are written in Visual Basic and run on either Microsoft Windows 95 or NT Workstation. However, in reality, these client applications can be created in many different languages and on many different hardware platforms and operating systems. As for the server software, Oracle will be used exclusively, which can reside on nearly any hardware and operating system.

2.2.1 Advantages Of A Client/Server Architecture [1]

Most of the advantage client server architecture resides with the server and the capabilities it brings to the processing of data. With the presence of an existing networked desktop computer, it makes sense to do away with dumb terminals anyway. The modern PC has tremendous power to process data and display it in a variety of graphical ways that we have come to expect from desktop applications. The server no longer has to devote precious processor cycles for data formatting and report generation; instead, it merely ships the data to the client. The network potentially has to transmit less data.

2.3 Different Types Of Communication Protocols [2]

Modern networked computing environments and applications often require—or can benefit from the use of multiple communication substrates, transport mechanisms, and protocols, chosen according to where communication is directed, what is communicated, or when communication is performed. We propose techniques that allow multiple communication methods to be supported transparently in a single application, with either automatic or user-specified selection criteria guiding the methods used for communication between multiple computers.

We note that remote procedure call (RPC) or remote method consider interoperability at higher levels, e.g. framework interoperability While tools like SOAP can provide interoperability, the cost of their flexibility can be lower performance Can multi method communication packages be designed and built such that flexibility is provided for negotiating communication and beyond a certain breakeven point,

communication is done using a more efficient method. The connectivity between Apex and SCA can be provided by any of the following methods:

2.3.1 Data Network Solutions [3]

Some of the existing data networks are as follows.

- RAS (Remote Access Service),

- Dial Up Network,

- Internet, ATM, ISDN

- Frame Relay

- Private Line

- VPN

- VSAT

RAS is a windows software, which allows a user to gain access to a remote server by means of a modem. RAS allows its users to dial in to a Windows NT RAS Server and use the resource of its network as if directly connected.

The modem was a big breakthrough in computer communications. It allowed computers to communicate by converting their digital information into an analog signal to travel through the public phone network. Using a Dial up modem the user will hook onto the remote server. Once the connection is made the remote machine will be available in the user's Network Neighborhood as if it were on the same LAN, and similar to the LAN connection, user will be able to extract data (Files) or put some data into the remote server based on the permissions.

Frame Relay - Industry-standard, switched data-link layer protocol that handles multiple virtual circuits using HDLC encapsulation between connected devices. Frame Relay is more efficient than X.25, the protocol for which it is generally considered a replacement. By using a simplified framing with no error correction mechanisms over

high-quality digital facilities, Frame Relay can transmit data very rapidly, compared to other WAN protocols. Frame Relay uses Layer 2 identifiers (DLCIs) and Permanent Virtual Circuits (PVCs).

ISDN, which stands for Integrated Services Digital Network, is a system of digital phone connections, which has been available for over a decade. This system allows data to be transmitted simultaneously across the world using end-to-end digital connectivity. ISDN allows multiple digital channels to be operated simultaneously through the same regular phone wiring used for analog lines. ISDN allows multiple devices to share a single line. It is possible to combine many different digital data sources and have the information routed to the proper destination. Since the line is digital, it is easier to keep the noise and interference out while combining these signals

A Virtual private Network (VPN) is a private encapsulated network service that runs over a public network. VPNs evolved as a response to the high-cost of private leased lines and frame-relay, and utilization of VPNs is a way of creating secure network services without having to rely on third-party providers who charge monthly usage. Clients conducting business in remote, isolated locations need reliable data networks to monitor and control their assets. Transmitting this information to and from remote sites is possible with VSAT (very small aperture terminals) that operate where other communications options don't. VSAT satellite networks are an excellent choice for clients requiring any of the following:

- Remote, hard to reach locations

- Needs for very high reliability and data integrity

- Moderate data usage (3-15 Mb/site per month)

- Response time less than 2-3 seconds

- Low maintenance requirements

- Low cost/byte requirements

- Long haul communications

- Emergency back-up

- Quick installation

2.3.2 Other Issues in communication [2]

When a communication process in a distributed system does not receive any answer from its partner, it is unclear whether the network is down, whether it is congested or whether the communication partner has died. Hence there is a need for an instance that has global and up-to-date information on the status of all system components. There should be a guarantee that the transfer be completed within a specified time .A typical scenario can be a overnight run that must be finished when the user comes back to office the next morning.

Allocation and synchronization of network lines between specified entry nodes is another issue to be handled. In case of network break down, all open output streams are to be sent by email to the user or they are written to a file. Users should be able to rebind to interrupted sessions provided that the application is still running .No data should be lost in the mean time.

The Communication layer is designed to allow different types of processing for different types of queries but supporting a single communication protocol.

The communication layer may provide the following features:

- Provides reliable and hardware independent exchange of data.

- Allows to dynamically connect/disconnect to communication partners

- Checks the availability of communication partners

- Communication can be done also through remote procedure calls.

Setup and execution of multi site application has to be done which can run concurrently on several platforms. The term Multi site can be interpreted in 2 ways It can be just one application that runs on several machines without explicitly being

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programmed for that execution mode or it can comprise different modules each of them executing on a machine that is best suited for running that specific piece of code.

The graphical editor stores the graphical and textual data in an internal data representation. This data is bundled with the API access methods and sent as an object to the target systems. The internal data description can only be accessed and modified through the API. Modifications are possible because a description of the components graphical layout is kept as part of internal data representation.

An abstract data type establishes the link between the graphical and text based representation .It is also used to store descriptions on disk and to exchange them across networks. A common format should be needed for data on both the sides i.e. client as well as server. A temporary storage of data has to be done till positive acknowledgement is received. Communication Performance of such an application may be determined by the slowest link or by the average link speed

Connection-Oriented Services:

1.Connection Establishment

A single path between source and destination devices is determined.

2.Data Transfer

Data transmitted sequentially over the established path, packets arrive at the destination in the order sent.

3.Connection Termination

Terminate the connection between source and destination.

2.3.3 Various Communications Protocols [2]

The most important "traditional" TCP/IP services are as follows.

1. File Transfer Protocol

The file transfer protocol (FTP) allows a user on any computer to get files from another computer, or to send files to another computer. Security is handled by requiring the user to specify a user name and password for the other computer. Provisions are made for handling file transfer between machines with different character set, end of line conventions, etc. This is not quite the same thing as more recent "network file system" or "netbios" protocols, which will be described below. Rather, FTP is a utility that you run any time you want to access a file on another system. Can be used to copy the file to your own system. Users can then be worked with the local copy.

2. Remote login

The network terminal protocol (TELNET) allows a user to log in on any other computer on the network. You start a remote session by specifying a computer to connect to. From that time until you finish the session, anything you type is sent to the other computer. Note that you are really still talking to your own computer. But the telnet program effectively makes your computer invisible while it is running. Every character you type is sent directly to the other system. Generally, the connection to the remote computer behaves much like a dialup connection. That is, the remote system will ask you to log in and give a password, in whatever manner it would normally ask a user who had just dialed it up. When you log off of the other computer, the telnet program exits, and you will find yourself talking to your own computer. Microcomputer implementations of telnet generally include a terminal emulator for some common type of terminal.

3. Computer mail

This allows you to send messages to users on other computers. Originally, people tended to use only one or two specific computers. They would maintain "mail files" on those machines. The computer mail system is simply a way for you to add a message to another user's mail file. There are some problems with this in an environment where

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microcomputers are used. The most serious is that a micro is not well suited to receive computer mail. When you send mail, the mail software expects to be able to open a connection to the addressee's computer, in order to send the mail. If this is a microcomputer, it may be turned off, or it may be running an application other than the mail system. For this reason, mail is normally handled by a larger system, where it is practical to have a mail server running all the time. Microcomputer mail software then becomes a user interface that retrieves mail from the mail server.

2.3.3.1. Protocols other than TCP – UDP and ICMP [3]

TCP is responsible for breaking up messages into datagrams, and reassembling them properly. However in many applications, we have messages that will always fit in a single datagram. An example is name lookup. When a user attempts to make a connection to another system, he will generally specify the system by name, rather than Internet address. His system has to translate that name to an address before it can do anything. Generally, only a few systems have the database used to translate names to addresses. So the user's system will want to send a query to one of the systems that has the database. This query is going to be very short. It will certainly fit in one datagram. So will the answer. Thus it seems silly to use TCP. Of course TCP does more than just break things up into datagrams. It also makes sure that the data arrives, resending datagrams where necessary. But for a question that fits in a single datagram, we don't need all the complexity of TCP to do this. If we don't get an answer after a few seconds, we can just ask again. For applications like this, there are alternatives to TCP.

The most common alternative is UDP ("user datagram protocol"). UDP is designed for applications where you don't need to put sequences of datagrams together. It fits into the system much like TCP. There is a UDP header. The network software puts the UDP header on the front of your data, just as it would put a TCP header on the front of your data. Then UDP sends the data to IP, which adds the IP header, putting UDP's protocol number in the protocol field instead of TCP's protocol number. However UDP doesn't do as much as TCP does. It doesn't split data into multiple datagrams. It doesn't keep track of what it has sent so it can resend if necessary. About all that UDP provides is port numbers, so that several programs can use UDP at once. UDP port numbers are used

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just like TCP port numbers. There are well-known port numbers for servers that use UDP. Note that the UDP header is shorter than a TCP header. It still has source and destination port numbers, and a checksum, but that's about it. No sequence number, since it is not needed. UDP is used by the protocols that handle name lookups (see IEN 116, RFC 882, and RFC 883), and a number of similar protocols. UDP increases the speed of the transmission, but does not do the checking TCP does. UDP does have a port associated with it; IP alone does not allow this.

Another alternative protocol is ICMP ("Internet control message protocol"). ICMP is used for error messages, and other messages intended for the TCP/IP software itself, rather than any particular user program. For example, if you attempt to connect to a host, your system may get back an ICMP message saying "host unreachable". ICMP can also be used to find out some information about the network. See RFC 792 for details of ICMP. ICMP is similar to UDP, in that it handles messages that fit in one datagram. However it is even simpler than UDP. It doesn't even have port numbers in its header. Since all ICMP messages are interpreted by the network software itself, no port numbers are needed to say where an ICMP message is supposed to go.

2.4 File Transfer Protocol (FTP)

'File transfer protocol' [8] is the common procedure used for downloading and uploading files over the Internet. With FTP users can login to another Internet site and transfer (meaning, send or receive) files.

File Transfer Protocol (FTP), a standard Internet protocol, is the simplest way to exchange files between computers on the Internet. Like the Hypertext Transfer Protocol (HTTP), which transfers displayable Web pages and related files, and the Simple Mail Transfer Protocol (SMTP), which transfers e-mail, FTP is an application protocol that uses the Internet's TCP/IP protocols. FTP is commonly used to transfer Web page files from their creator to the computer that acts as their server for everyone on the Internet. It's also commonly used to download programs and other files to your computer from other servers.

As a user, FTP can be used with a simple command line interface (for example, from the Windows MS-DOS Prompt window) or with a commercial program that offers a graphical user interface. The Web browser can also make FTP requests to download programs selected from a Web page. Using FTP, files can be also updated (delete, rename, move, and copy) at a server. Users need to logon to an FTP server. However, publicly available files are easily accessed using anonymous FTP.

Basic FTP support is usually provided as part of a suite of programs that come with TCP/IP. However, any FTP client program with a graphical user interface usually must be downloaded from the company that makes it

The objectives of FTP are

1. To promote sharing of files (computer programs and/or data)

2. To encourage indirect or implicit (via programs) use of remote computers

3. To shield a user from variations in file storage systems among hosts

4. To transfer data reliably and efficiently.

FTP, though usable directly by a user at a terminal, is designed mainly for use by programs. FTP is a peer-to-peer protocol. FTP supports the ability to transfer files between dissimilar hosts because it uses a generic file structure that is operating-system independent.

2.5 Relationship between FTP and Telnet

The FTP uses the Telnet protocol on the control connection [8]. This can be achieved in two ways: first, the user-PI or the server-PI may implement the rules of the Telnet Protocol directly in their own procedures; or, second, the user-PI or the server-PI may make use of the existing Telnet module in the system. Ease of implementation, sharing code, and modular programming argue for the second approach. Efficiency and independence argue for the first approach. In practice, FTP relies on very little of the Telnet Protocol, so the first approach does not necessarily involve a large amount of code.

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2.6 Advantages of FTP

The Smarter way to transfer files

FTP enables users and organizations to move files between local and remote systems while enjoying the utmost in:

- **Security:** Protects your business critical and sensitive data with the highest commercially available data encryption level

- **Ease of use:** Makes sharing files fast and easy

- **Reliability:** Maximizes the rate of successful file transfers

- **Efficiency:** Allows transfers of more files to more destinations without adding to your workload

2.7 Usage of FTP [8]

FTP stands for File Transfer Protocol. FTP client software allows you to transfer files between your hard drive and a remote server. For instance, you could put your personal home page up on the Web by transferring files from your hard drive to a Web server, or you can download programs from your favorite shareware site.

Hypertext Transfer Protocol is how your browser transfers files from remote web servers to graphically display web content on your monitor. Although HTTP does a good job of downloading HTML files and the small bitmaps displayed within them, it was never designed to transfer large files. However, with FTP, you can download large files and resume transfer after interruptions, where you left off, saving time (read that "money") and aggravation (priceless).

FTP users find transferring files via e-mail attachments grossly inefficient or impractical when dealing with large documents. For uploading such files, FTP is the *only* open standard answer (e.g., for efficiently posting new HTML pages onto a Web site or sharing graphics-laden files).

CASE STUDY OF NSFDC

3.1 Basic Requirements [4]

On the basis of recommendations from National Task Force of Information Technology (IT), the use of computers within the organizations, industry houses, production units and business sector in general is expected to increase to the tune of 1 PC per group of 10 workers. The advancement of integrated networking enhancing such usage further for better production, management, information flow, data management etc., saving time of a technical person thus providing them with more productive time. Considering these objectives, officials of National Backward Classes Finance & Development Corporation (NSFDC) under Ministry of Social Justice & Empowerment approached ER&DCI for usage of IT tools on their instance. A team of experts from Electronics Research & Development Center of India, Noida (ER & DCI) visited NSFDC, and it was decided a preliminary Requirement Analysis Study would be carried out to elaborate the possibilities and feasibility of

- Establishment of network wherein existing PCs can be integrated

- Appropriate selection of Driver Server

- Selection of appropriate base software like Operating System, Database packages etc.

- Analyzing, formulating the structures for different applications to operate on the selected platform

- To establish linkage between NSFDC & it's State Channelising Agencies (SCA) so as to provide integration of the network cluster at NSFDC with each of its SCAs.

3.2 Scope of the Project

System study, design and development of application software for-

- Improved data communication between Apex Corporation and SCAs.

- Efficient management of sanction, disbursement and recovery of loan.

- Maintenance of unto date loan accounting record & data.

- Effective monitoring of sanctioned projects.

- Generation of reports, advice's, reminder etc.

a) The proposed application software will be for the Head Office of the Apex Corporation and its state channeling Agencies, situated in every state in India.

b) Implementation/installation of the application software at Head Office of Apex Corporation and at three selected SCAs of each Corporation including testing and debugging.

c) Training of personnel of Apex Corporation and SCAs in the operation and maintenance of the application software. The training will be conducted separately for each Apex Corporation and its SCAs.

d) Preparation of User Manual, Technical Manual for use at head office and at State Channeling Agencies.

3.3   System Study

3.3.1 Functional Structure [4]


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┌─────────────────────────────────────────────────┐
│      Ministry of Social Justice & Empowerment    │
└─────────────────────────────────────────────────┘
                        │
            ┌───────────────────────┐
            │         NSFDC          │   National HQ
            └───────────────────────┘
```

State Level Units

SCA   SCA   SCA   NGO   NGO   NGO

SHG   SHG   SHG   SHG

Beneficiary   Beneficiary   Beneficiary   Beneficiary   Beneficiary
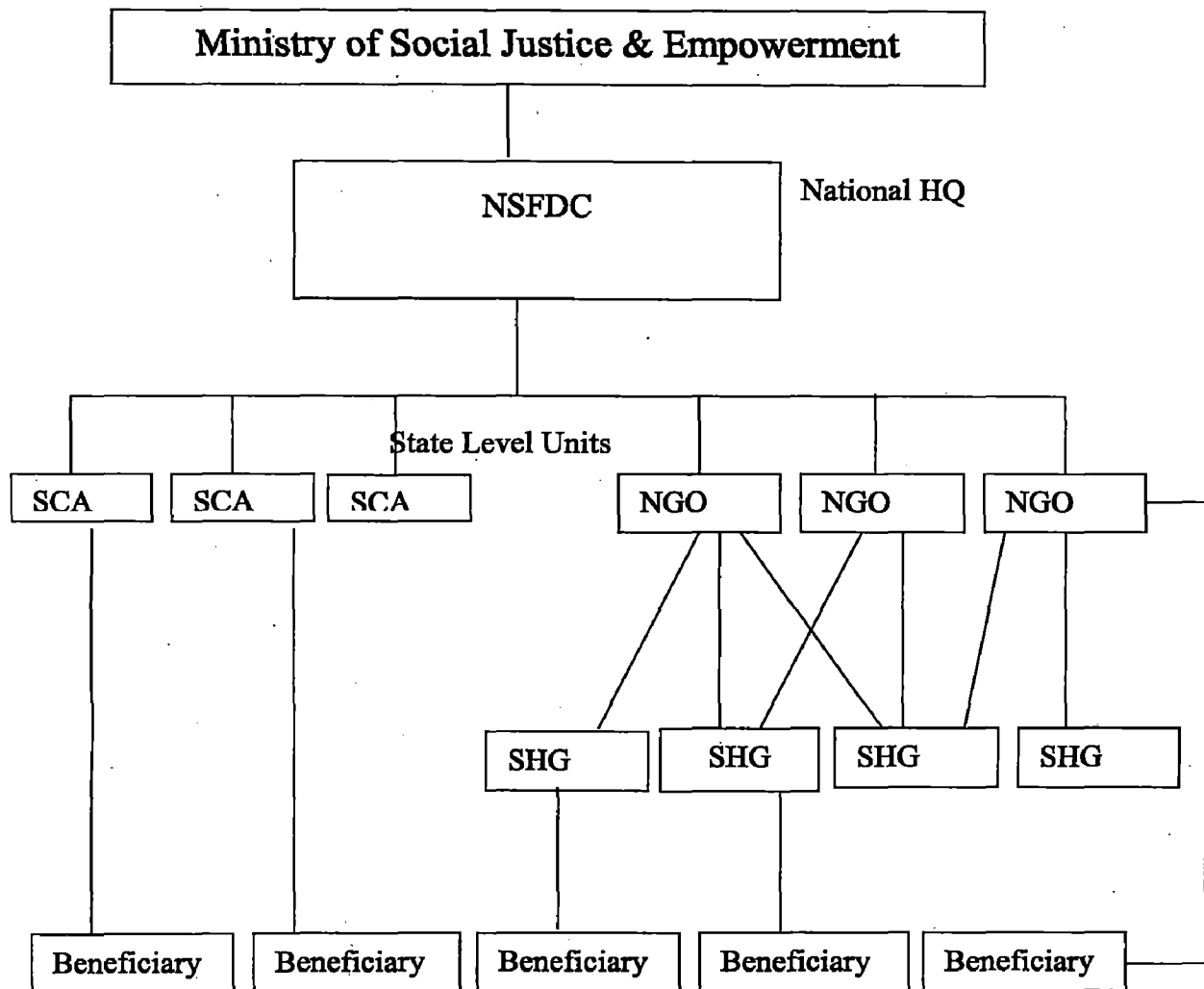
NSFDC: National Schedule Caste Finance and Development Corporation

SCA: State Channelising Agency

NGO: Non-governmental Organization

SHG: Self-Help Groups

Figure 3.1: NSFDC Structure

3.3.2 Departments And Their Functionality [4]

The Functionality of major departments that operate in NSFDC are as follows:

- SCA Projects

- SCA Finance

- NGO Projects

- NGO Finance

- Systems

3.3.2.1 SCA Projects

- Allocation of Budget (SCA-wise)

- Receipt of Proposals from SCAs

- Appraisal of proposals

- Sanctioning of proposals

- Drawing of Repayment Schedules

- Receipt of Utilisation Certificates

- Sending of Reminders, LOIs, etc., to SCAs

- Interaction with Finance dept. at various stages

- Receipt of Govt. Guarantee from States / SCAs

3.3.2.2 SCA Finance

- Financial Appraisal of proposals

- Disbursement to SCAs based on sanction

- Raising of Demand Notices

- Receipt of Repayments / Refunds

- Appropriation of Repayments / Refunds

- Interaction with projects dept. at various stages

3.3.2.3 NGO Projects

- Receipt of Proposals from NGOs

- Appraisal of proposals

- Sanctioning of proposals

- Drawing of Repayment Schedules

- Receipt of Utilisation Certificates

- Sending of Reminders, LOIs, etc., to NGOs

- Interaction with Finance dept. at various stages

3.3.2.4 NGO Finance

- Financial Appraisal of proposals

- Disbursement to NGOs based on sanction

- Raising of Demand Notices

- Receipt of Repayments / Refunds

- Appropriation of Repayments / Refunds

- Interaction with projects dept. at various stages

3.3.2.5 Systems

- Database Maintenance

- Generation of MIS Reports

- Overall maintenance of the System

3.4 Functional Requirement Definition [4]

The complete application will be developed module wise. Different modules to be developed are as follows:

- NSFDC Module

(National Schedule Caste Finance & Development Corporation)

- NHFDC Module

(National Handicapped Finance & Development Corporation)

- NMDFC Module

(National Minorities Development & Finance Corporation)

- NBCFDC Module

(National Backward Class Finance & Development Corporation)

- NSKFDC Module

(National Safai Karmachari Finance & Development Corporation)

The complete application will be one comprehensive system incorporating all these modules to enable common data sharing, query system and reporting system. Each of the application modules will have the following features

- Maintenance and updating of various master files

- Data entry and update

- Enquiries

- Linking of information as an integrated centralized system

- Query system and reporting system

- Various reports to be generated at different level

- Various reports to be generated over a period of time at different stage

- The Program will provide user restrictions for authenticated users.

The proposed integrated system would have the ability to rapidly process large quantity of data incorporating centralized server networked to a number of clients or users. The three basic functions required to be performed by the system are as follows.

- **Database services** to retain information e.g. Proposal Details, SCA/NGO details, Beneficiaries' details, U.C.s, BGGs, etc.

- **Application data processing** e.g. Drawing of Repayment Schedules, generation of Demand Notices, Recovery Adjustments, etc.

- **Presentation services** e.g. to report the progress of proposal, SCA wise/ NGO wise and Beneficiary wise Disbursements, Cumulative Utilisation, Cumulative Recovery, etc..

The system would be a real-time system, which would facilitate on-line processing of transactions and updating of the database. It would also be possible to generate reports from the database as in the desired formats so as to facilitate easy retrieval of latest information from the database at any point of time. Apart from these features, the system would specifically have certain features, which are of vital importance with respect to functioning of Loan Accounting & Management Information System.

Some expected features of the proposed system should be as under

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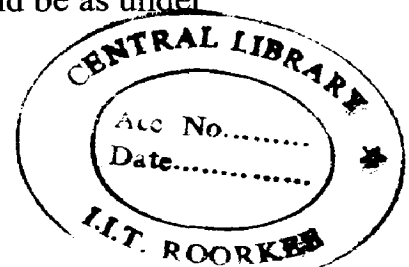
- The modules under the package for different units must be identical.

- The modules must have common formats for all the five units and respectively their state channelising agencies.

- The data would be generated and maintained by SCAs.

- Apex corporations would explore this distributed database and requisite information is sought for through dial-up links.

- The requisite information by Apex agency should be downloadable.

3.5 Proposed Integrated System [4]

From the preliminary requirement analysis at NSFDC, it has been observed that the objectives of NSFDC for MIS, is very clear, structured and properly formulated. Such a requirement can be implemented on a modular system in an integrated manner. These modules can be independently developed or can be developed as a part and parcel of a complex system. Integration of them will generate a complete unary system, which can effectively work as Integrated Loan Accounting System. Such integration is done based on Client / Server Architecture.

The various departments of NSFDC will be interconnected as shown in figure 3.2
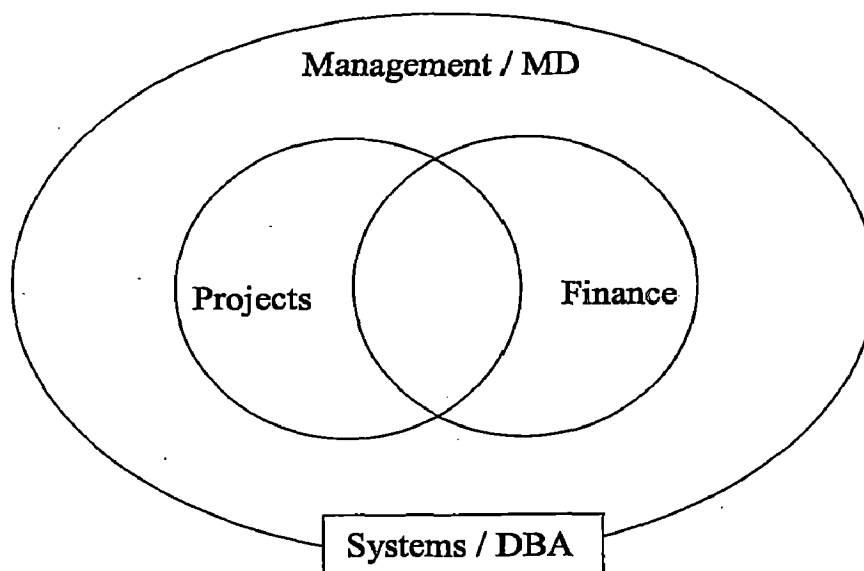
Figure 3.2 Communication links between various departments

The various departments of NSFDC will be inter-linked through LAN connections. Common data will be entered only once and will be available through all required departments. Each department will have certain users defined who can access the data relevant to them. Each user will have a password so that he or she can be uniquely identified by the system and the system will make visible only those data for which the user is authorized. This will maintain the integrity of data as well as remove duplication of data due to separate entries at individual departments.

SYSTEM ANALYSIS AND DESIGN

4.1 Approach Used for Solving the Problem [5]

The steps involved in developing a system by the linear sequential model are as shown in the figure 4.1
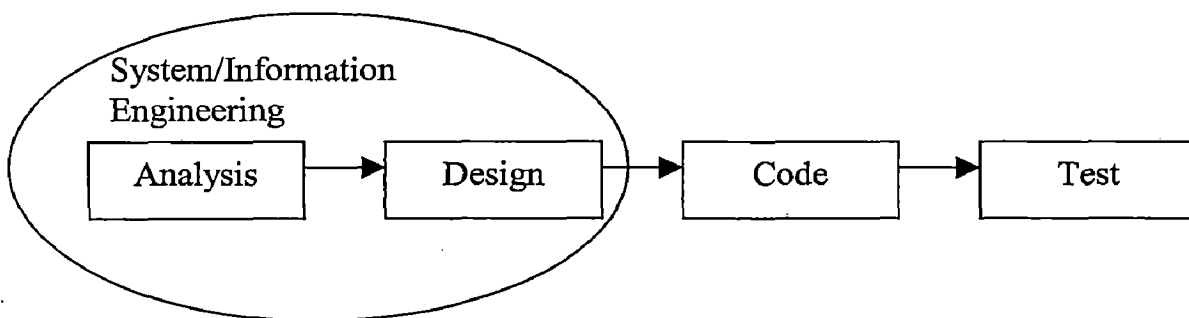
Figure 4.1 The Linear Sequential Model

Sometimes called the classic life cycle or the waterfall model [5], the linear sequential model suggests a systematic, sequential approach to software development that begins at system level and progresses through analysis, design, coding, testing, and support. Figure 4.1 illustrates the linear sequential model for software engineering. Modeled after a conventional engineering cycle, the linear sequential model encompasses the following activities:

System/Information Engineering and modeling- Because software is always part of a larger system (or business), work begins by establishing requirements for all system elements and then allocating some subset of these requirements to software. This system view is essential when software must interact with other elements such as hardware, people and databases. System engineering and analysis encompass requirements gathering at the system level with a small amount of top level design and analysis. Information Engineering encompasses requirements gathering at the strategic business level and at the business area level.

Software Requirements Analysis- The requirements gathering process is intensified and focused specifically on software. To understand the nature of the programs to be built, the software engineer ("analyst") must understand the information domain for the software as well as the required function, behavior, performance and interface. Requirements for both the system and the software are documented and reviewed with the customer.

Design- Software design is actually a multistep process that focuses on four distinct attributes of a program: data structure, software architecture, interface representations, and procedural (algorithmic) detail. The design process translates requirements into a representation of the software that can be assessed for quality before coding begins. Like requirements, the design is documented and becomes part of the software configuration.

Code Generation- The design must be translated into a machine-readable form. The code generation step performs this task. If design is performed in a detailed manner, code generation can be accomplished mechanistically.

Testing- Once code has been generated, program testing begins. The testing process focuses on the logical internals of the software, ensuring that all statements have been tested, and on the functional externals; that is, conducting tests to uncover errors and ensure that defined input will produce actual results that agree with required results.

Support- Software will undoubtedly undergo change after it is delivered to the customer (a possible exception is embedded software). Change will occur because errors have been encountered, because the software must be adapted to accommodate changes in its external environment (e.g., a change required because of a new operating system or peripheral device), or because the customer requires functional or performance enhancements. Software support/maintenance reapplies each of the preceding phases to an existing program rather than a new one.

4.2 System Design [4]

It is divided into following steps:

Data design: transformation of information created during analysis into data structure.

Architectural design: relationship among major structural elements of the program.

Interface design: describe how software communicates within itself, to system that interoperate within, and with humans who use it.

Procedural design: transforms structural elements of the program architecture into a procedural description of software components

4.2.1 Database Design

Table Name: FILE_INFORMATION

Name	Null	Type
QUERY		VARCHAR2 (2000)
FILENAME	NOT NULL	VARCHAR2 (12)
CREATION_DATE		DATE
SEND_DATE		DATE
SEND_FLAG		BOOLEAN

Table 4.1: Database Table FILE_INFORMATION

This table is particularly used to store information regarding files created for transfer between remote locations. As soon as the file reaches the remote location it will update the database of the remote location with the contents of the file.

Table Name: SCA_INFORMATION

Name	Null?	Type
LOCATION		VARCHAR2 (20)
PHONENO	NOT NULL	NUMBER (12)
COMPUTER_NAME		VARCHAR2 (20)
FTPSERVER_NAME		VARCHAR2 (10)
USER_NAME		VARCHAR2 (10)
PASSWORD		VARCHAR2 (10)

Table 4.2: Database Table SCA_INFORMATION

This table is particularly used to store information regarding different State Channelising Agencies that are involved in data transfer. For file transfer, information is needed on the client side about the ftp server name of the remote machine or a SCA. This table will contain the information needed to dial the remote machine and also transfer files by connecting through FTP.

Table Name: RECEIVEDFILE_INFORMATION

Name	Null?	Type
RECEIVING_DATE		DATE
RECEIVED_FROM	NOT NULL	VARCHAR2 (10)
PROCESSED		BOOLEAN

Table 4.3: Database Table RECEIVEDFILE_NFORMATION

This table is used to store information about the files that are received by means of data transfer. There should be some store where the information regarding transferred

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files is stored and retrieved when needed. The field Processed is a Boolean variable indicating whether the file is processed after receiving or not.

4.2.2 Architectural Design
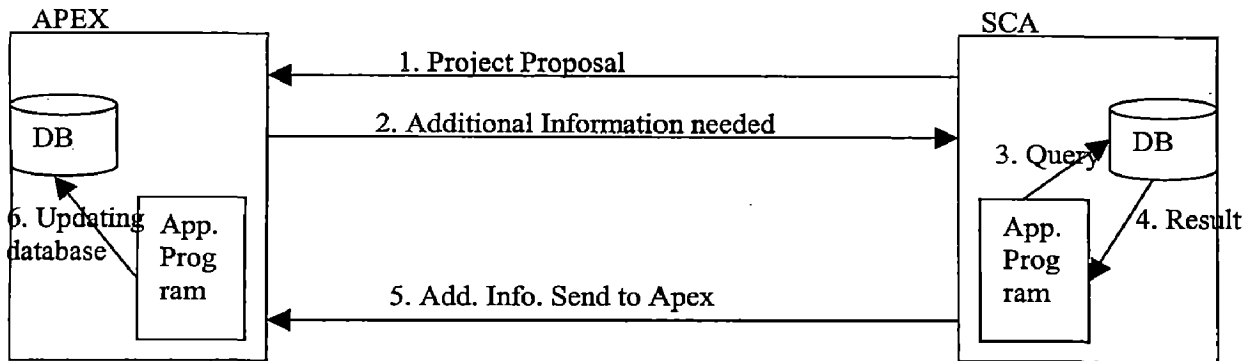
Figure 4.2 shows the architectural design.

Figure 4.2: Design of system

4.2.2.1 Connectivity between Apex & SCAs

The transfer will be a logical peer to peer type of transfer. The Apex Corporation will be connected to each of its SCAs through Dial Up Networking. This will provide a limited access to the Server placed at the SCA. A particular folder on the SCA Server will be shared for use by the Apex Corporation, the Apex Corporation will only be able to see Files that are made available by the SCA and put in the shared folder. However in case the Apex Corporation wants full access to the SCA Server the complete drive can be shared. The SCA will make available all data required by the Apex Corporation and place it in the shared folder in a file format readable by the user as well as the Software being developed. The software will then, on a Command by the user, convert the so accessed file into database format and store in the Apex Corporation Database. The network architecture of such a system is shown in the figure under the head Network Topology.

This connectivity will be provided using the RAS (Remote Access Service). RAS is a windows software, which allows a user to gain access to a remote server by means of

a modem. RAS allows its users to dial in to a Windows NT RAS Server and use the resource of its network as if directly connected.

Using a Dial up modem the user will hook onto the remote server. Once the connection is made the remote machine will be available in the user's Network Neighborhood as if it were on the same LAN, and similar to the LAN connection, user will be able to extract data (Files) or put some data into the remote server based on the permissions.

For configuring RAS we need a standard modem connected to both the client and the server. (Here the Server at the Apex Corporation will dial into the Server of the SCA as the Apex Corporation Server is the Client and the SCA server is the actual Server).

4.2.2.1.1 Goal/Objective of using Client/Server System

Objective of C/S system is to enable an application program running on the client machine anywhere on the network to request the server in a way which is transparent & independent of any software/OS running on these machines.

4.2.2.1.2 Necessity of Using C/S Computing

C/S System architecture involves running of any application on multiple client machines, which requires to be supported continuously by the server. Thus, whereas the client machine is providing presentation services, connectivity, interface and processing, while the server provides the Database Services, connectivity & processing to multiple users. In the environment, as the no. of users increases, the load on the server is also increased. Subsequently, the no. of servers can also be added to offset the increased load. Thus this system takes care of scalability.

Secondly, the network need not necessarily be of the same type. Various configuration of Network could be connected together. Thereafter the Data could be exchanged using API, RPC and SQL commands.

4.2.2.2 Network Topology

At NSFDC, for the physical transfer of information (like movement of papers) considerable amount of manpower time is wasted. Also there may not be direct interaction between any two officers. Hence it is proposed that the network like local area network spread all over the Apex Corporation need to be designed and deployed, which will connect all the computers and gets connected to a driver server for information transfer between concerned officers and departments.

It is proposed that for this kind of network, Client/Server Technology be adopted. Such a topology is usually a Star topology. Star topology is preferred for its less number of hops, driver and standard minimum time consideration. Such a star topology is modifiable, extendable and is flexible so that modifications if any in future can directly be incorporated. It does not follow directly token ring but a logical ring which behaves like a ring so that network management could be done from a single location and that location need not to be physically fixed. That is, physical address of each client is transparent to the users. They are taken care by NMSP (Network Management Software Package). Such topology is also suitable for making the network as Intranet so that such Intranet can become a part and parcel of a bigger network. The topology is also suitable for physical formulations of object oriented technology. The seven-layer network protocol is followed by TCP/IP as shown in fig 4.3

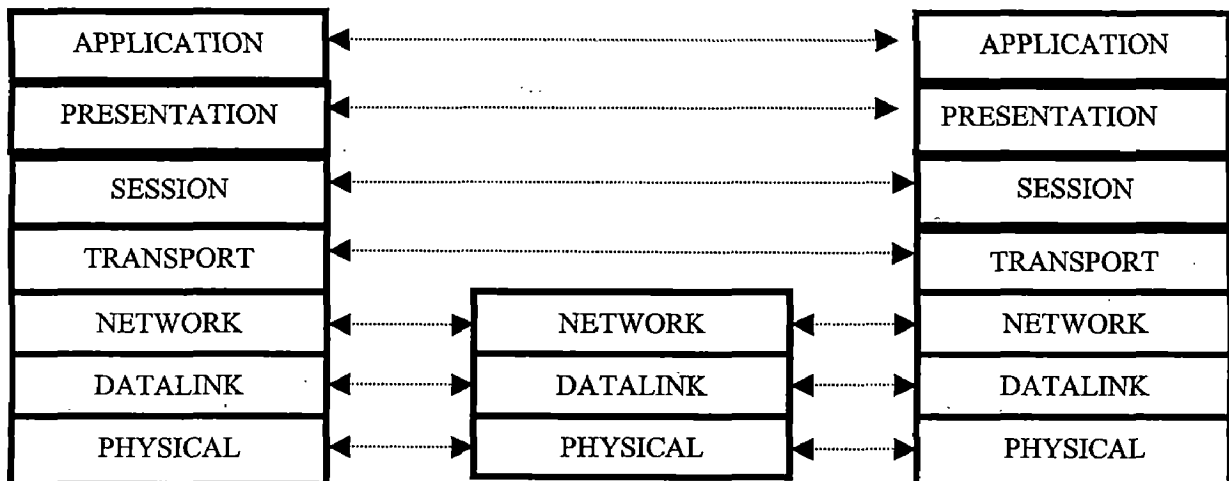| APPLICATION | ←···→ | APPLICATION |
PRESENTATION	←···→	PRESENTATION
SESSION	←···→	SESSION
TRANSPORT	←···→	TRANSPORT
NETWORK	←····→ NETWORK ←····→	NETWORK
DATALINK	←····→ DATALINK ←····→	DATALINK
PHYSICAL	←····→ PHYSICAL ←····→	PHYSICAL

Figure 4.3: Seven-Layer network Protocol

4.2.2.3 The Plan for Implementing the Project

The system envisages for Computerization of Sanction, Recovery and Loan Accounting System, which will have a centralized system, located at each Apex Corporation and distributed database at each SCA. SCA is the subordinate body of Apex. The performing functions of NSFDC to sanction and deliver loan for the purpose of setting up of income generation /self-employment activities are in the following areas:

- Agriculture & Allied

- Small Business/ Artisan & Traditional Trade occupation

- Services

- Transport

Various schemes/activities are financed under these sectors by NSFDC. The respective SCAs and NGOs explore the feasibility and all other factors [4]. In view of reducing paper work in routine operations fully computerized monitoring system for the organization for which data would keep coming from various sources and keeps updating the central system is to be designed, developed, implemented and officers are to be trained for handling the same. Once the information is confirmed and verified by Apex, it is updated on its database. The authentication is done manually by single user and just clicking of a button does updating on its database.

A network has to be formed involving Apex and SCA and the communication can be established through sockets. Socket allows a programmer to treat a network connection as a stream of bytes to read from and write to. In the socket model we have two hosts connected by a socket. The client and server are connected via a socket and communicate across this socket .In this model the server is the host accepting connections and the client initiates connection. File Transfer Protocol is used for data transfer between remote locations.

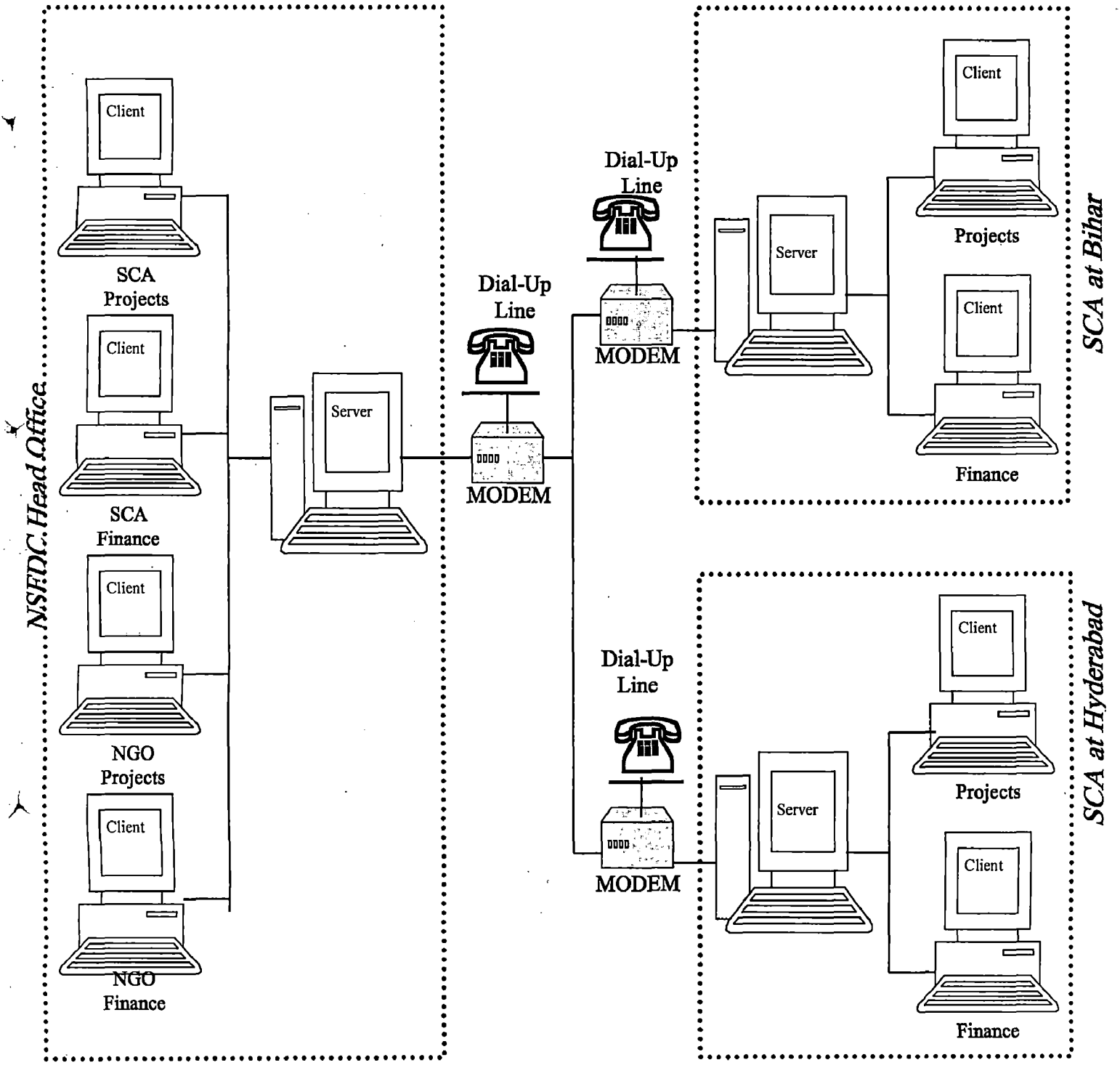The design of the network will be as shown in the figure 4.4 below.

Figure 4.4: Network Design

The Communication between client and server takes place in the steps below

Client: 1. Connects to remote machine

           2. Sends data

           3. Receives data

           4. Closes connection

Server: 1. Binds to a port

           2. Listens for incoming data

           3. Accepts connections to a bound port

4.2.3 Procedural Design

Data is transferred in three steps:

1. Data to be transferred to another location is selected through the Data Transfer Form at the sending site and a data transfer file is created.

2. The data transfer file is transferred via a dial-up connection to the receiving site.

3. The data transfer file is retrieved and the database is updated at the receiving site via the Data Updation Form.

4.2.3.1 Data Transfer Details

There is an In directory (for incoming data) and an Out directory (for outgoing data) at each location corresponding to each of all the other locations it shares a data transfer with. For example, Apex Head Quarters will have In and Out directories for all the SCA's connected to it. Similarly, History directories are maintained for archiving the data that is transferred between locations. During data transfer, data from all transactions affecting the database is combined and a text file is created in the Out directory corresponding to that location at the data-sending site. Then during data transfer procedure this text file is transferred via a dial-up connection to the in directory at the

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receiving end corresponding to the sending site location. The file is retrieved through an updation form and the data is updated at the receiving site. Once this procedure is over the text file is removed form the sending site's Out directory and an archive is created for that file in the History directory with the date of creation, contents and other relevant information. For example, if data is being transferred from Apex to SCA Mumbai, a text file is created in the Out directory (corresponding to SCA Mumbai) residing at Apex. This file (in which the relevant data has been appended) is then transferred through a dial-up connection to SCA Mumbai where it is stored in the In directory corresponding to Apex.

This file updates the database at SCA Mumbai after it is invoked through the Data Updation Form. Now the text file residing in the Out directory at Apex is deleted and an archive of that file is created in the history directory of Apex.

4.2.3.2 Data Transfer Technique

The steps are listed as an algorithm here:

1. Start.

2. Create location wise In/Out directories to store the incoming and outgoing data.

3. Select the particular data through execution of a particular query.

4. If success, then save the output to a specific file in a specific directory (date wise).

5. Select the Location, from drop-down list where data is going to be transferred.

6. Check the connection between current server and remote location.

7. If connection exists then send file to remote directory and wait for acknowledgement from remote location.

8. If Step-7 performed successfully then remove these files to another directory and if any failure then flash a message to user to try again later on.

9. After sending data file to remote location ask user to update his data by files that has been transferred to him.

10. If user answer is "No" then quit. Otherwise seek the pending files in incoming directory.

11. If found any file in incoming directory, then update data in the database by an application program residing on the client side.

12. Quit.

4.3 System Requirements

The proposed system when ready for installation would require certain hardware and Software for proper functioning; these have been listed below under separate heads for Hardware & Software. The development environment for the system is Visual Basic and Oracle.

At the time of installation it will be required that Oracle 8i be loaded on the Server as well as at least one client so that proper implementation and testing can be done. The Oracle database needs time to time tuning and maintenance. It is advisable to have at least one person trained so that he is proficient in Oracle Database Administration.

4.3.1 Hardware Requirements

NSFDC had gone for computerization and had already have few work stations/PCs for internal use and they are being used independently by respective users from various departments. These PCs are not integrated in a network. The network is expected to have a driver server who can spread information to all the clients. Existing PCs to be upgraded and integrated with the Server. In case, the requirement of number of clients increase, additional PC be added with specifications as shown in the table 4.1 below.

SL. No.	Product Description
1	**SERVER upto 50 Users:** P-IV 1.5 GHz / 845 Chip Set / 400 MHz FSB / 512 KB Cache / 512 MB SDRAM / 4 Memory Banks total Expandable to 4 GB / 2x36 GB wide Ultra3 10 K SCSI-3 U3 (1") Drive / Dual Channel Ultra3 SCSI Controller / 12/24 GB DAT Drive / 10/100 Ethernet Standard / 52 x CDROM / 7 Slots & 8 Bays / Enhanced 107 Key Board / Scroll Mouse / 15" Color Monitor
2	**NODES / DESKTOP:** P-IV 1.5 GHz / 845 Chip Set / 400 MHz FSB / 216 KB Cache / 128 MB SDRAM, 133 MHz / 20 GB HDD / Smart III Ultra ATA/100 (5400 rpm) / 3 PCI Slots, 1 AGP, 1 CNR Slot, 3 DIMM Slots & 6 Bays / Vidia Vanta 16 MB AGP 4x / Integrated Intel Pro 10 x 100 NIC / Integrated 16 bit AC97 Audio with Internal Speaker / 52 x CDROM / Enhanced 107 Key Board / Scroll Mouse / 15" Color Monitor
4	MODEM – 56 KBPS (External)
5	**LAN Components:** Switch / HUB / IO Boxes / RJ Connectors / Cable / Any Other Necessary Components

Table 4.1 Hardware requirements

4.3.2 Software Requirements

Software requirements are as shown in table 4.2

	Operating System	Base Software	Tools
Server	Windows NT	Oracle 8i Visual Basic 6.0	Crystal Reports 8.0 MS – Office
Desktop	Windows 98		MS – Office

Table 4.2: Software Requirements

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RESULTS AND DISCUSSIONS

5.1 Results

A database link is developed between remote locations. The Head quarters (Apex Corporation) is connected efficiently to all its SCA's by dial up networking. A network is built up of the Apex as well as all its SCA's connected to it. At a time there can be communication between two locations through a dedicated dial up line. Efficient transfer of data files is possible through FTP. 'File transfer protocol' [8] is the common procedure used for downloading and uploading files over the Internet. The overall aim was to develop a network and connect all the remote locations over which the SCA's are spread out. When Internet Connectivity becomes a problem, we connect the remote locations through a telephone line. Whenever a machine has to transfer a file, it has to first connect to the remote location via telephone line through dialing with the help of Modem. Once two remote locations are connected, they will behave as if they are connected in a LAN. All the features of a LAN can be used once you are connected. Maintenance of file information is done while all the transfer activities are documented or saved for future reference.

The dial up networking is installed as well as the modems are installed on both the locations that are to be connected. Testing is done on two systems that are connected through telephone line. The machine is dialed as shown in figure A.5 in Appendix A. Once the two machines are connected, the files are transferred as shown in figure A.7 and A.8. Files can be get from a machine or sent to a machine. Both cases are tested and the output is verified as described in User manual.

5.2 Discussions-Analysing the Issues in Implementation of Protocol [6]

Following are some of the issues related to Implementation of Communication Protocol

1. Experience suggests that one of the most important factors in determining the performance of an implementation is the manner in which that implementation is modularized and integrated into the host operating system. For this reason, it is useful to discuss the question of how an implementation is structured at the same time that we consider how it will perform.

2. Efficiency Considerations: There are many aspects to efficiency. One aspect is sending data at minimum transmission cost, which is a critical aspect of common carrier communications, if not in local area network communications. Another aspect is sending data at a high rate, which may not be possible at all if the net is very slow, but which may be the one central design constraint when taking advantage of a local net with high raw bandwidth.

3. The final consideration is doing the above with minimum expenditure of computer resources. This last may be necessary to achieve high speed, but in the case of the slow net may be important only in that the resources used up, for example CPU cycles, are costly or otherwise needed. It is worth pointing out that these different goals often conflict; for example it is often possible to trade off efficient use of the computer against efficient use of the network. Thus, there may be no such thing as a successful general purpose Protocol implementation.

There is one obvious conclusion immediately suggested by even this simple analysis. Except in very special circumstances, when many packets are being processed at once, the cost of processing a packet is dominated by factors, such as CPU scheduling, which are independent of the packet size. This suggests two general rules that any implementation ought to obey. First, send data in large packets. Obviously, if processing time per packet is a constant, then throughput will be directly proportional to the packet size. Second, never send an unneeded packet. Unneeded packets use up just as many resources as a packet full of data, but perform no useful function.

The above analysis suggests that there are two main parts to the problem of achieving good protocol performance.

1. The first has to do with how the protocol implementation is integrated into the host operating system.

2. The second has to do with how the protocol package itself is organized internally.

CONCLUSION AND FUTURE SCOPE

6.1 Conclusion

"Enterprise-wide data distribution, global deployment for virtually any information environment. "

It will offer unique technology for two-way, read-write replication of databases and applications, supporting companies that need to manage data across multiple sites, geographies, or systems. This technology enables enterprises to effectively distribute business applications to remote offices and users, providing corporate-level quality of service to users at the edge of the enterprise. Local and remote users will access and manipulate shared data resources by relying heavily on network bandwidth to update the one or more central databases.

Data Transfer in this manner has the following advantages:

1. Reduction in time By 50%.

2. Validation Of Data.

3. Offline data Entry possible.

Today, growing numbers of power users, telecommuters, and corporate Internet managers are unleashing the protocol's potential by using FTP clients — file transfer software applications designed for users — to minimize time spent online. In fact, for anyone that even touches the Internet, "FTP client" should be spoken in the same breath as "e-mail" and "browser" when describing efficient desktop needs.

6.2 Future Enhancement

In future if the whole system is planned to be Internet based the same RAS feature can be enhanced to a Virtual Private Network (VPN). Microsoft's Virtual Private Networking technology uses the industry-supported Point-to-Point Tunneling Protocol (PPTP) to extend the use of RAS to the Internet. Instead of dialing directly into the RAS server using a telephone line, the remote RAS client dials a local Internet service provider and establishes an Internet link to the provider's PPTP RAS server. This virtual private network allows a remote user to securely access a central network over the non-secure Internet. As well as reduces the STD charges.

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50
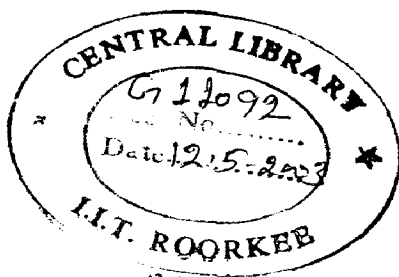
USER MANUAL

A.1 Graphical Interfaces and Implementation

The entry to the application is restricted to authorized persons who have permissions for data transfer between remote locations. This is done by a user login as well as a password that is known to restricted users only who are authorized, the snapshot of which is shown below.
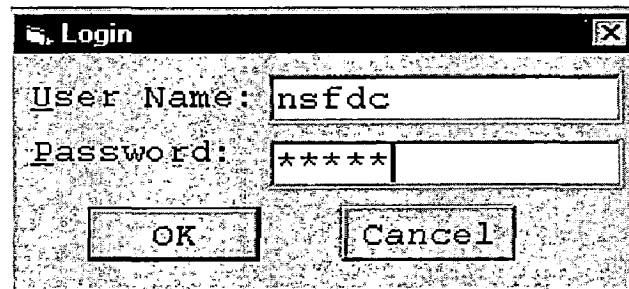

Figure A.1: Login Screen

As soon as the user name and password is entered, it is checked with the database table where user names and passwords are saved If the entered inputs match with those in the database, then the user enters the system. The snapshot is shown below. If the user name and password does not match ,then a user is again asked for inputs , but he/she is given trial for three times only to protect unauthorized access.
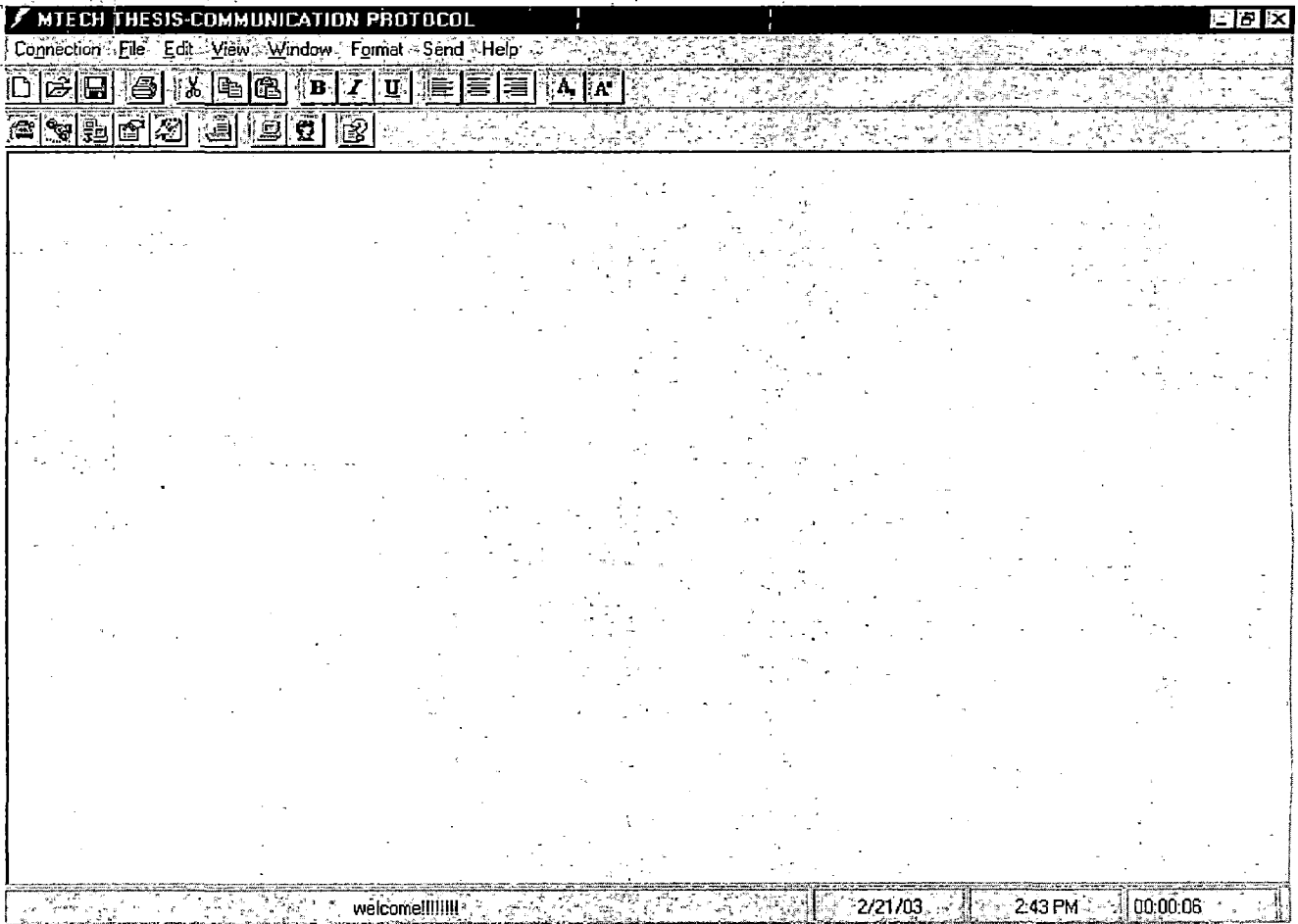
Figure A.2: Main Interface

The screen shown above shows the user interface for the application. It shows a menu which contains the items described below. The first item is Connection which contains the submenu as shown below.
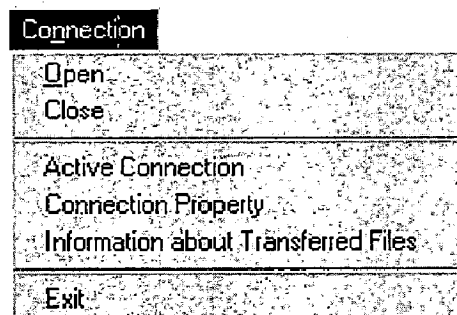

Figure A.3: Connection Sub menu

Connection- Open: when clicked will open up connection to the remote machine. This contains the information about the location, the corresponding phone number and computer name of the location to connect. To connect to the remote location, dial up

A-2

networking will be used and therefore telephone number of remote locations is required. This information is stored as a database table in the table SCA_INFORMATION.
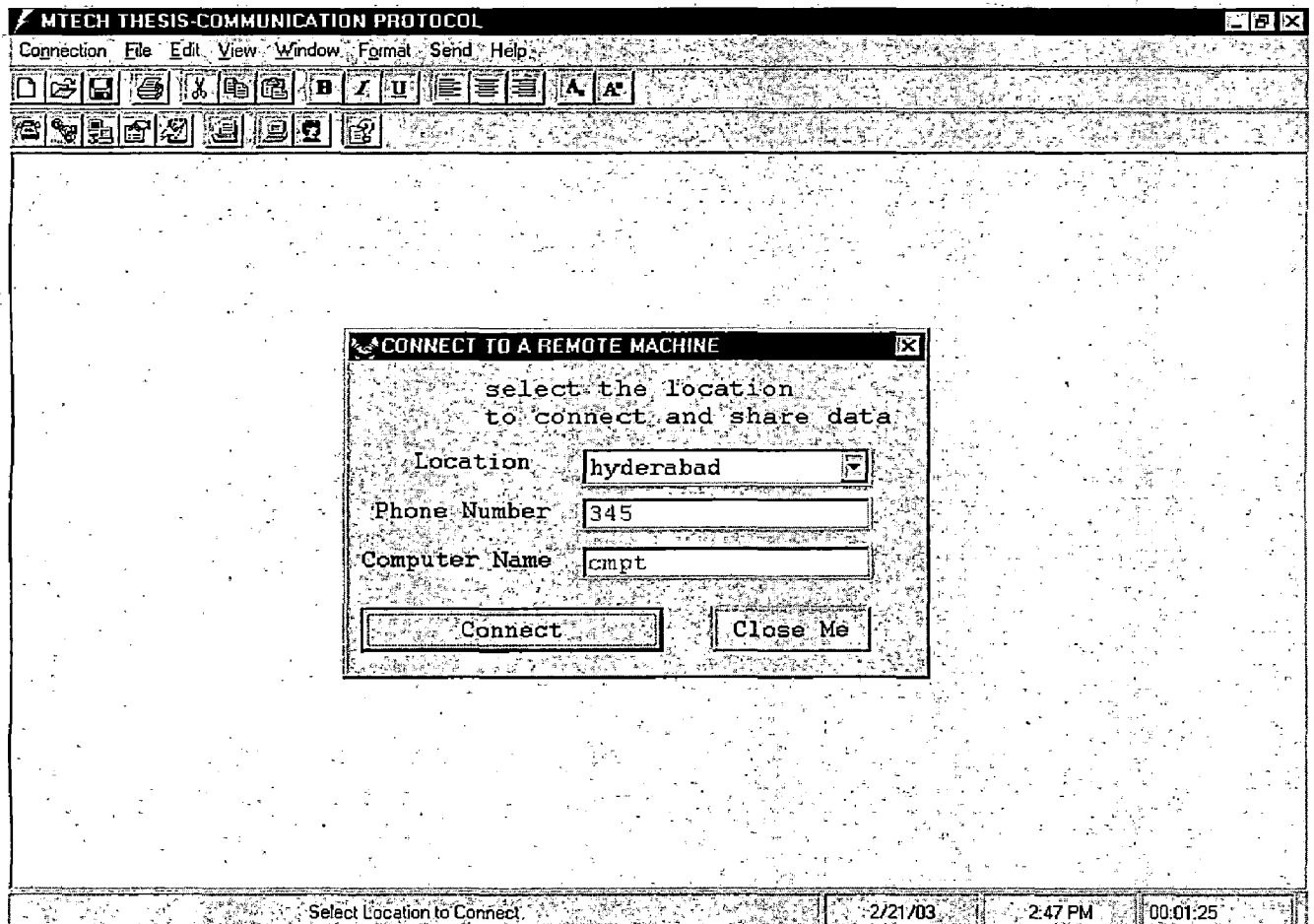

Figure A.4: Connecting through dial up

The Connect button shown when clicked will dial the telephone number of the remote location and connect to the remote location as shown below in the screen shot figure A.5
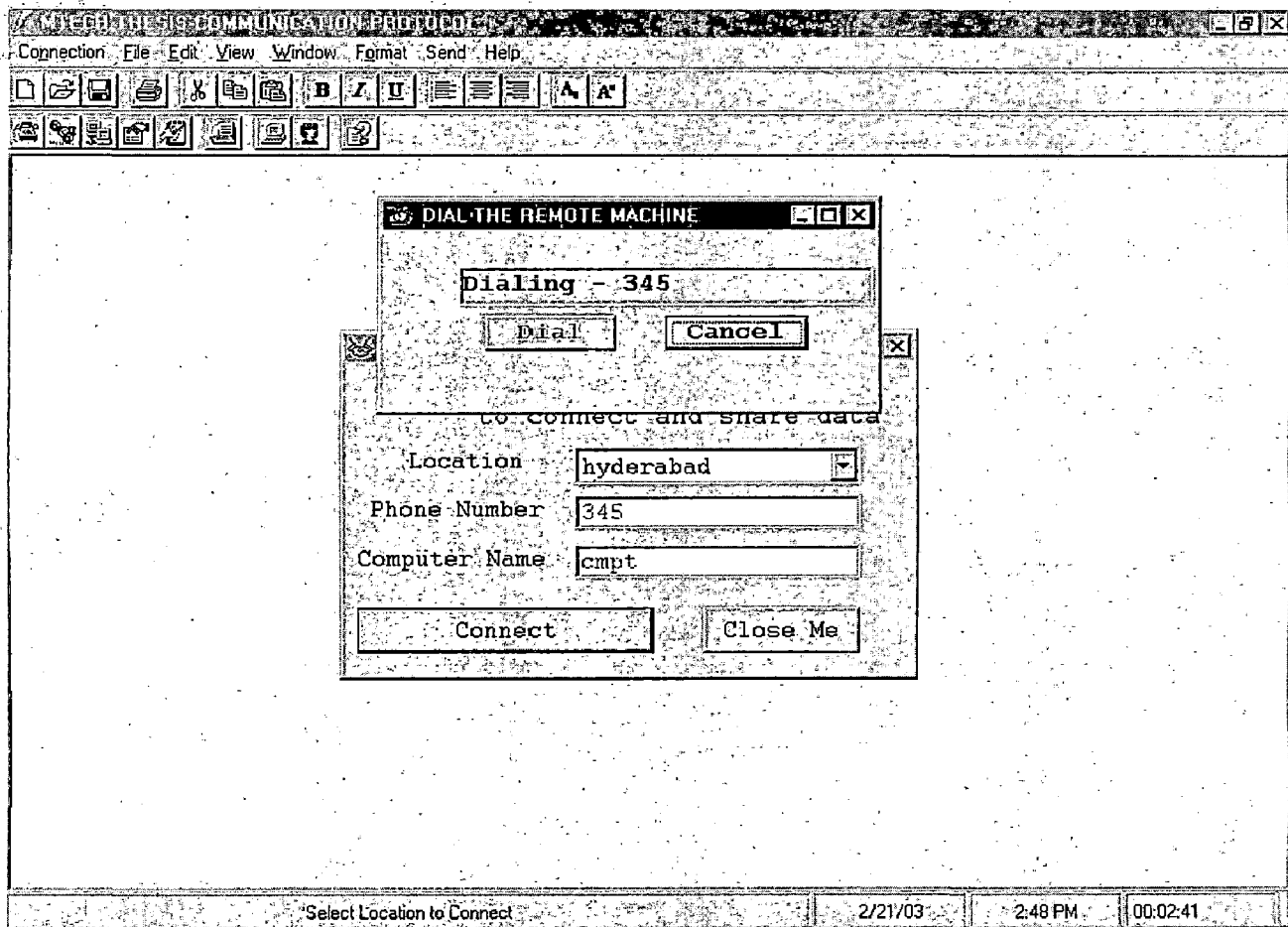
Figure A.5: Dialing to Remote Machine

Once you are connected, there can be data transfer between the connected locations. Files can be transferred from the local location to the remote location and vice-versa.

Connection-Close menu button will close the dial up connection to the remote location.

Connection-Active Connection menu button when clicked will give the information about the active connection to remote location through dial up line to the user.

Connection-Connection Property menu button will display information about the connected modem as well as the properties related to the existing connection to the remote location through dial up line.

Connection-Information about Transferred Files menu button when clicked will display information about the files transferred or to be transferred in future. It shows the file

names in a list box. A file name when clicked will display the corresponding query with the date of creation of that particular file and whether it is sent or not. Y indicates that it is already sent while N indicates that it is not sent. If the sent flag indicates that the file is already sent then data of sending is also displayed for that corresponding file. Files can also be viewed according to their status, i.e all files can be viewed at once or only files to be sent can be viewed by selecting corresponding option from the checkboxes shown at the top. The snapshot of this is shown below in figure A.6.
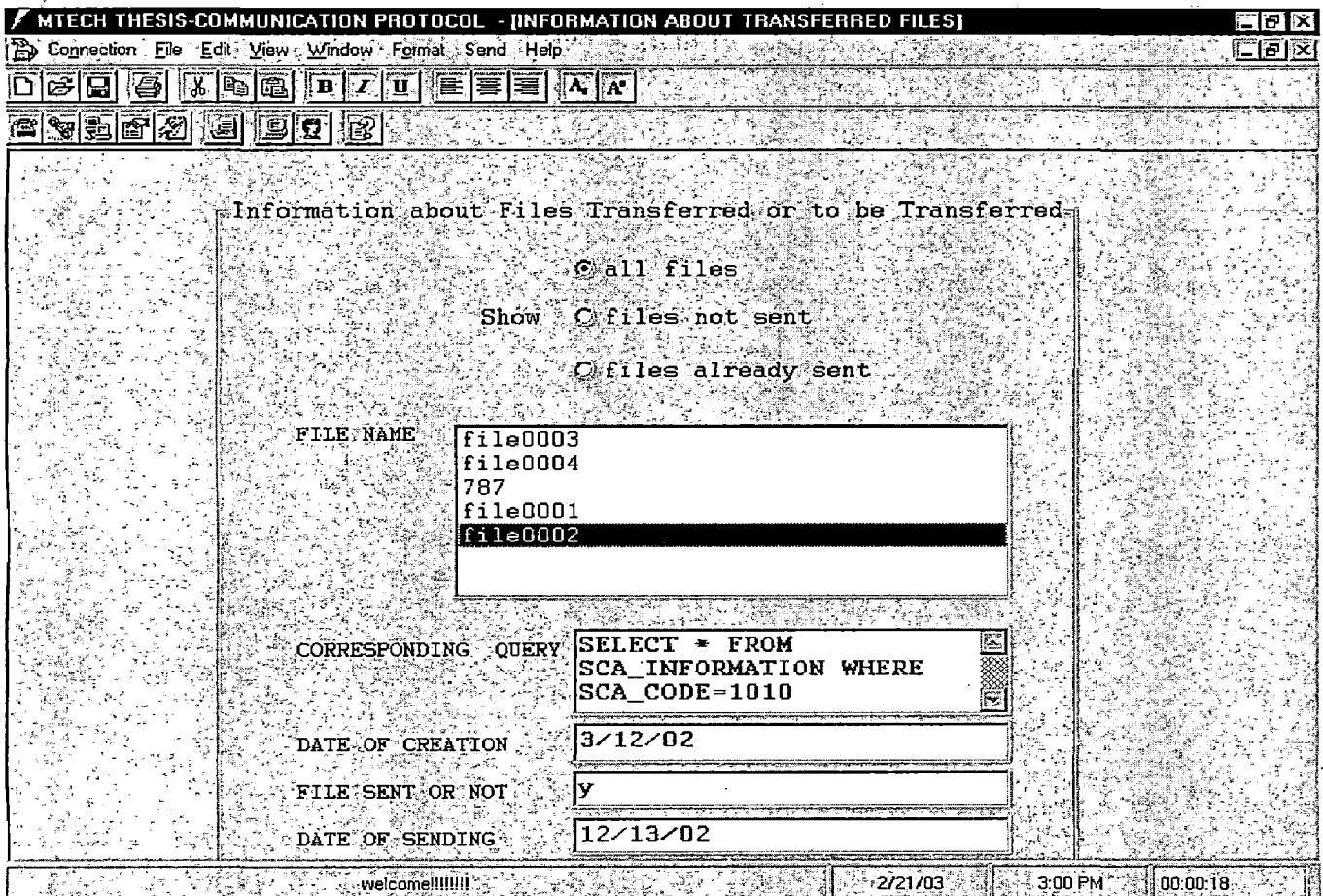

Figure A.6: Information About transferred files

Connection-Exit will close the active connections and exit from the application of data transfer.

An item on the main menu is SEND which has two items in its submenu, i.e Send using FTP and Send using Netbeui.

Send – Using FTP when clicked will first check for any connection to any remote location. If any such connection exists through dial up line then it will connect to the FTP

server of that particular location. The information about the location, telephone number and computer name is stored in database. In addition to this, the FTP Server name, the user name and password for successful file transfer is also stored in the same database table. There are two tabs, one for getting file from the remote location and other for sending file to the remote location.

For getting file to the local location from the remote location, the snapshot is shown below.
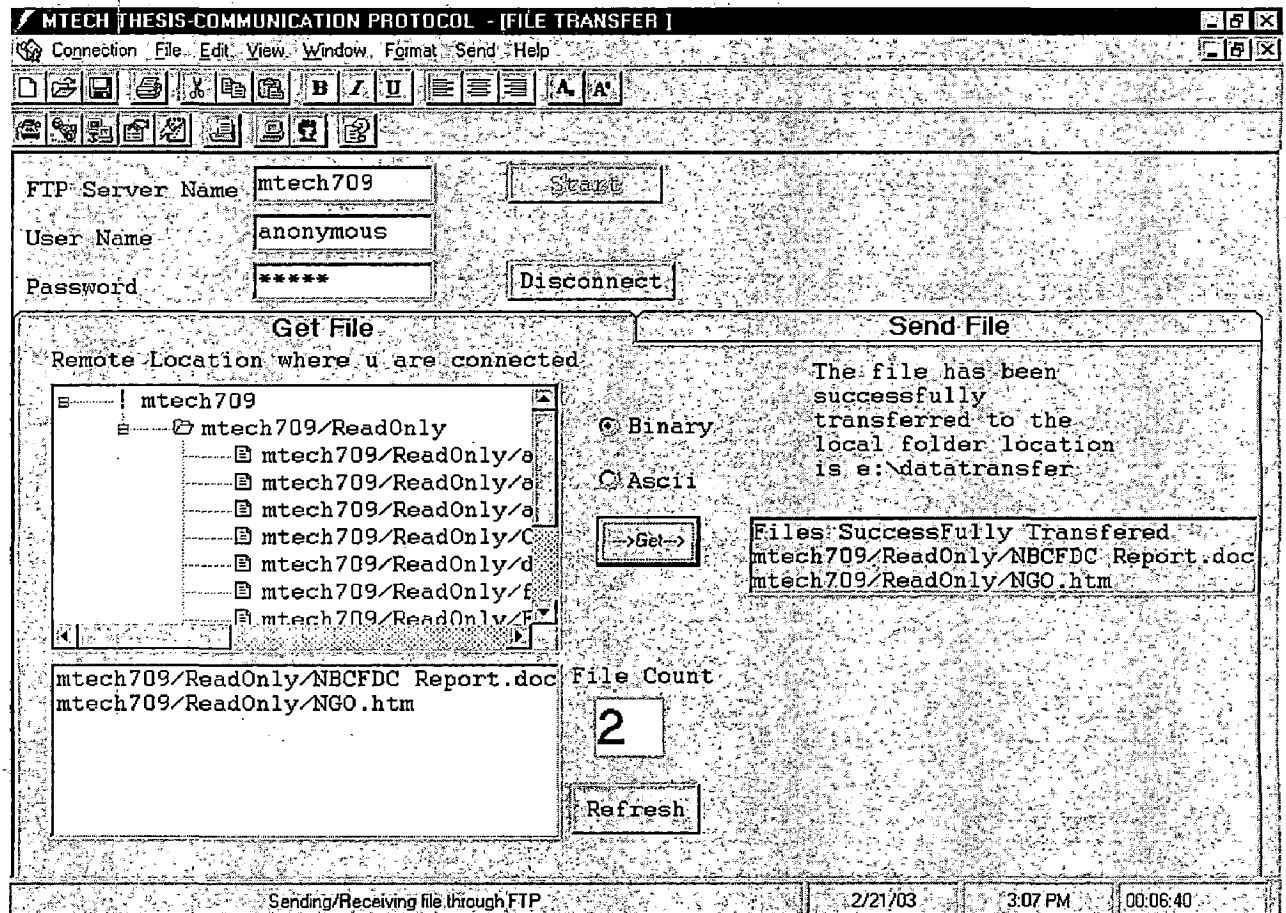

Figure A.7: FTP- Get File from remote location

The above snapshot is of the application performing file transfer from remote location where you are connected to the local location. A particular folder for getting the transferred files is fixed and permissions are set for it. The directory structure of the remote location is shown as a tree structure with the files available for transfer. Once clicked on a file name, it appears in the list box and the file count is incremented. When the Get button is clicked, the files in the list box are transferred to the local folder

location. The names of the transferred files and the address of local location is displayed for convenience of user. Once a file is transferred, the database is updated with this information, the flag is set to Y for the corresponding file. If not already connected, this will ask user to first connect and then only transfer files.
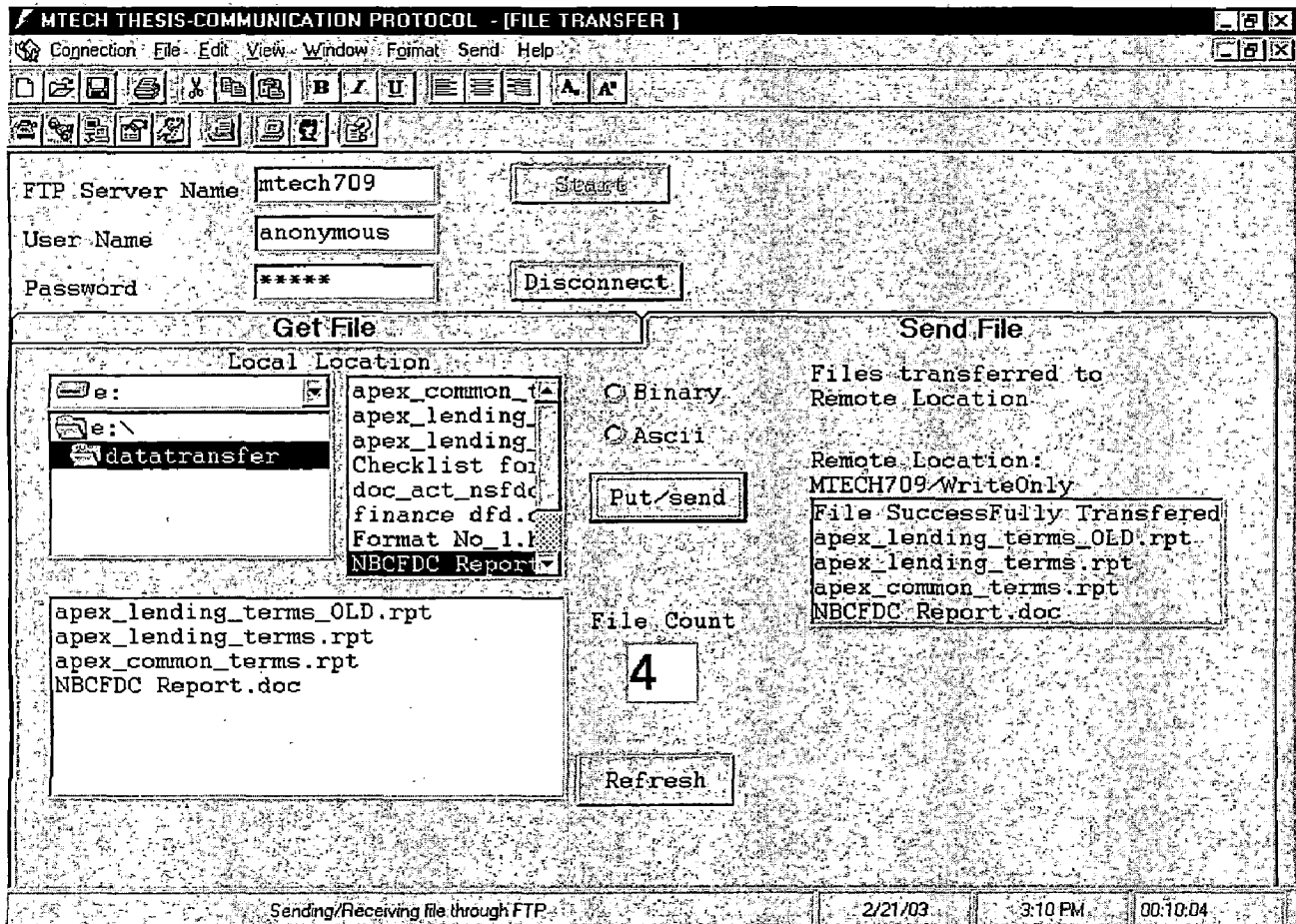

Figure A.8: FTP- Send File to remote location

The above snapshot is of the application performing file transfer from local location to the remote location where you are connected by a dial up line. A particular folder for getting the transferred files is fixed and permissions are set for it at the remote location. The directory structure of the local location is shown as a tree structure with the files available for transfer. Once clicked on a file name, it appears in the list box and the file count is incremented. When the Put/Send button is clicked, the files in the list box are transferred to the remote location. The names of the transferred files and the address of remote location where these files are stored is displayed for convenience of user. The database is updated with this information. The receivedfile_information table contains the

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information about the files received as a result of file transfer with the date of receiving. Also if that particular file is processed at the receiver side then the processed flag is set.

There are times when a user needs to transfer files created by user himself at run time. Therefore the main menu also provides a full facility of a RTF editor. Files can be created at run time by using this editor.

File Menu:

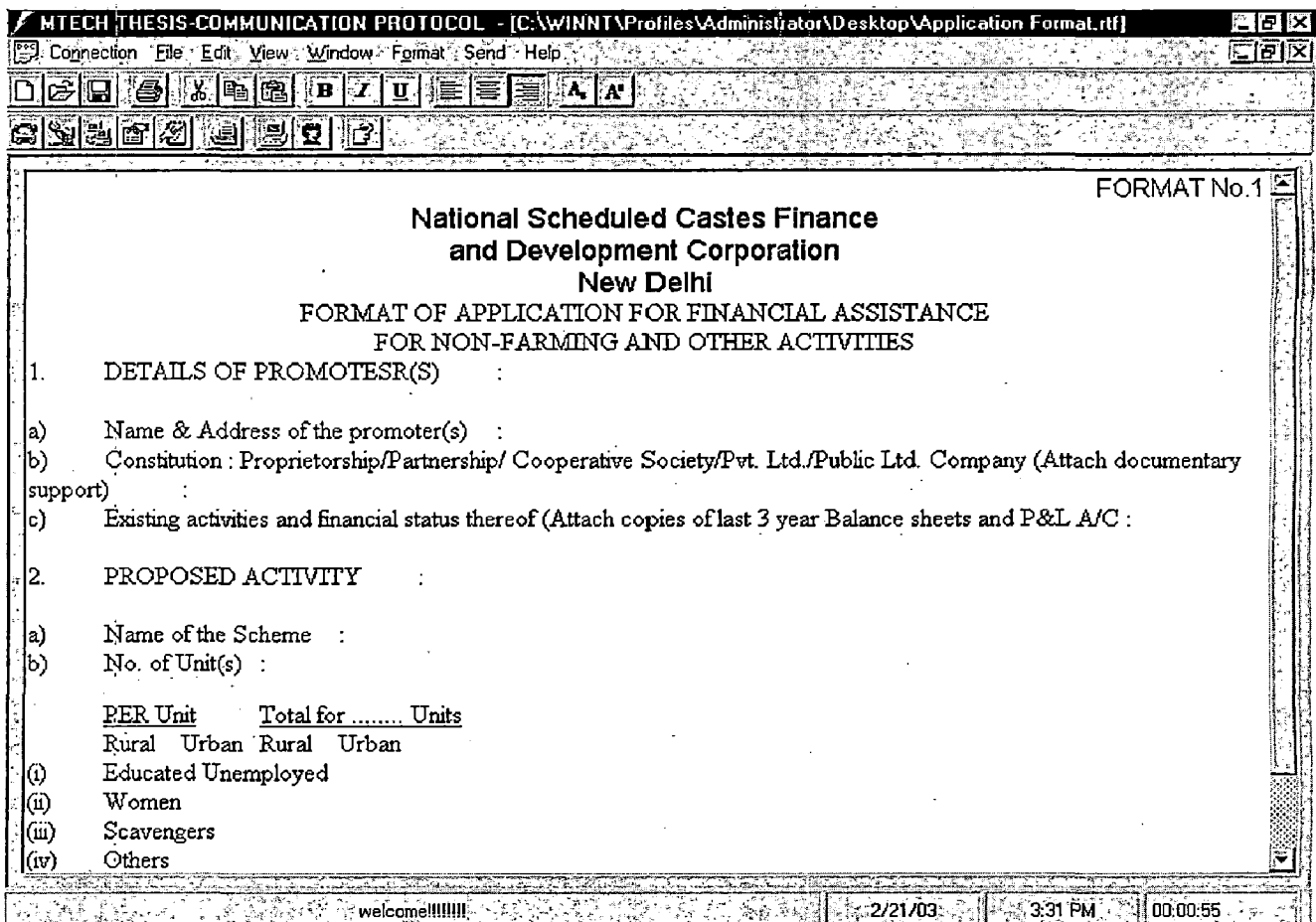File-New menu item when clicked opens up a new text document for use by the user.

Figure A.9: File Editor Window

Shown above is the snapshot of the editor document.

File-Open menu item when clicked opens up an existing text file for any further modifications to an existing file.

File-Close menu item when clicked will close the active document which is open.

File-Close All menu item will close all the open windows of the editor.

File-Save menu item when clicked will save the file.

File-Save As menu item when clicked will save the file with some other file name.

File-Print menu item when clicked will print the file to the local printer.

File-Information menu item when clicked will give information about the existing files and their properties. The snap shot of which is shown below

The names of files with the location of the folder where they are saved, their attributes and the date and time of creation and modification are displayed.
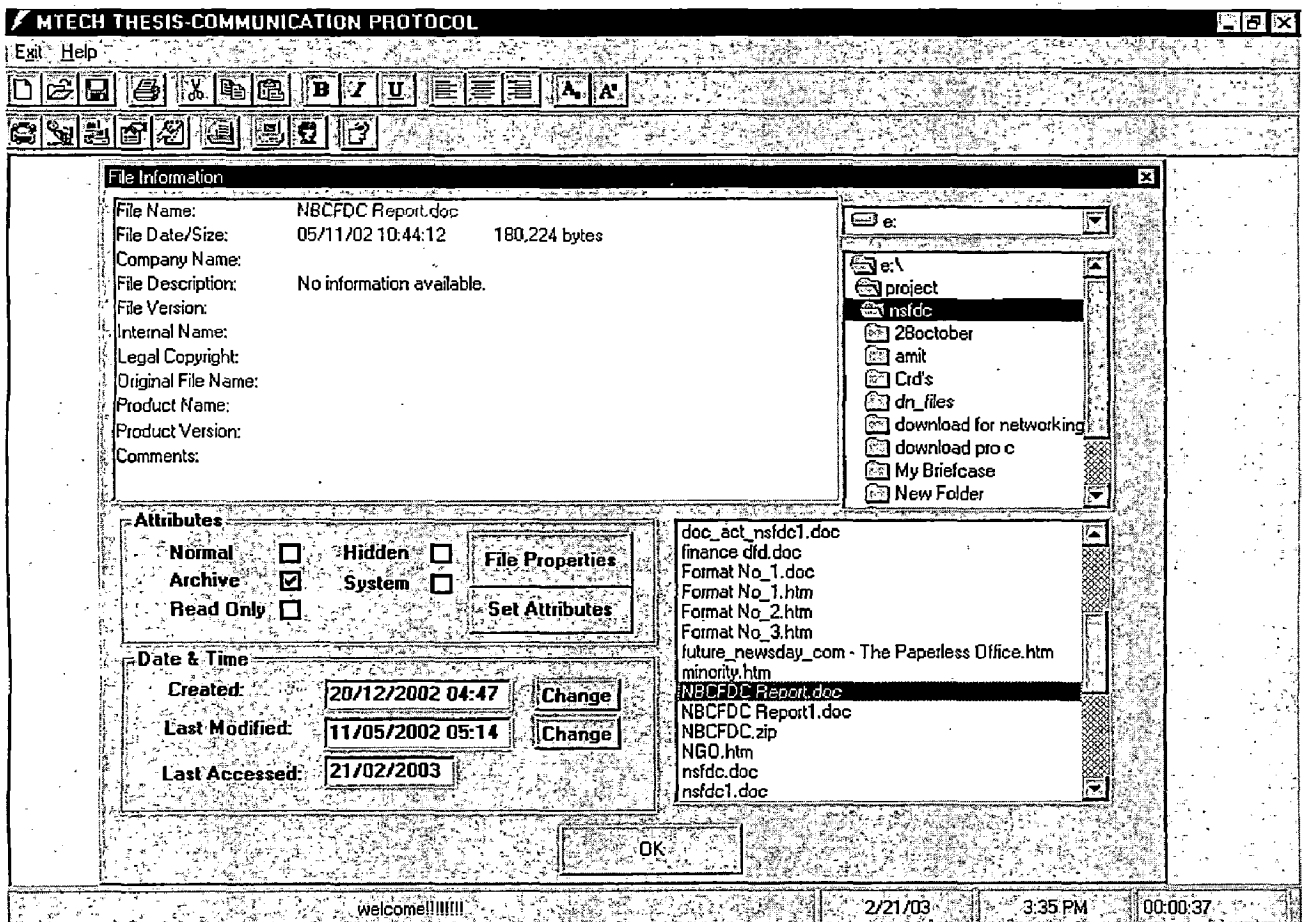

Figure A.10: File Information with attributes

Edit Menu:

Edit-Cut menu item when clicked will cut the selected portion from the text document.

Edit-Copy menu item when clicked will copy the selected portion from the text document.

Edit-Paste menu item when clicked will paste the copied portion to the text document.

Edit-Clear menu item when clicked will clear the contents of the document.

Edit-Select All menu item when clicked will select all contents in the text document.

Edit-Find menu item when clicked will open up a screen to find/search a specific word or words in the document.

Edit-Find Next menu item when clicked will find the next word in the search.

Edit-Replace menu item when clicked will open up a screen to replace a particular word by another word in the document.

View Menu:

View-Connection Toolbar menu item when checked will display the connection toolbar otherwise hide it.

View-File Toolbar menu item when checked will display the File toolbar otherwise hide it.

View-Status Bar menu item when checked will display the status bar otherwise hide it.

Window Menu:

Window-Cascade will cascade the opened windows.

Window-Tile Vertical will tile open windows vertically.

Window-Tile Horizontal will tile windows horizontally.

Format Menu:

Format-Font menu item when clicked will open up a dialog box for formatting text with font, font style, size, font color and many more.

Format-Bold menu item when clicked will change the selected text to bold.

Format-Italic menu item when clicked will change the selected text to italic.

Format-Underline menu item when clicked will underline the selected text

Format-Subscript menu item when clicked will change the selected text to subscript.

Format-Superscript menu item when clicked will change the selected text to superscript.

Format-Alignment menu item when clicked will open up a submenu containing the following items- Left for left alignment, Right for right alignment, Center for Center alignment and Justify for justification of the selected text in the document.
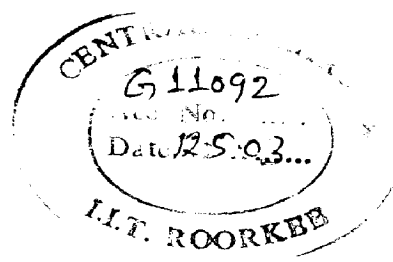
Help Menu:

Help-Manual menu item when clicked will open up the user manual for information regarding the application.

Help-About menu item has two sub menus system and Developer Info.

Help-About-System menu item will display information about the system.

Help-About-Developer menu item will display information about the developer.

INSTALLATION AND CONFIGURING SERVICES

B.1 Installing Dial-Up Networking and Remote Access Service

This article describes how to install and configure Windows NT 4.0 Dial- Up Networking (DUN) and the Remote Access Service (RAS)[7] client for a connection to a Windows NT or third-party RAS Server. Can be applicable to Microsoft Windows NT Server 4.0 and Microsoft Windows NT Workstation 4.0.

To install DUN and RAS on your Windows NT 4.0-based computer, follow these steps:

1.Click Start, point to Programs, point to Accessories, and then click Dial-Up Networking.

2.Click Install. When you are prompted, type the location of the Windows NT 4.0 installation files.

NOTE: If you are not prompted to install Dial-Up Networking, DUN and RAS have already been installed. Skip to the "Configuring Dial-Up Networking" section in this article.

1. If you have not installed a RAS-capable device, the Remote Access Setup program prompts you to invoke the Modem installer. Click Yes and follow the instructions to install a modem.   In the list of RAS-capable devices, click the modem you just installed, and then click OK.

2. Click Configure, click Dial Out Only, and then click OK.

3. Click Network, click the check boxes of the protocols to use for your connection to select them, and then click OK.

NOTE: The protocols that are currently installed are selected by default. If you choose a protocol that is not currently installed, you must install that protocol using the Network tool in Control Panel.

4. Click Continue, and then click Restart to restart your computer and finish the installation.

B.2 Configuring Dial-Up Networking

To configure DUN to make a connection to a Windows NT or third-party RAS server [7], follow these steps:

1. Click Start, point to Programs, point to Accessories, and then click Dial-Up Networking.

2. By default, there are no entries in the phone book. Click OK to add a new entry. If you are reinstalling DUN, there may be existing phone book entries. To create a new entry, click New.

3. Type a name for the phone book entry to identify your connection, and then click Next.

4. Click any of the check boxes that apply for this connection to select them, and then click Next. If you are unsure whether any of these check boxes apply, see the RAS server administrator.

5. Type the phone number for the RAS server, click Next, and then click Finish.

6. Click Dial to connect.

B.3 Installing Modem[7]

If your modem is not on the Windows NT 4.0 Hardware Compatibility List (HCL) or is not detected by Windows NT, use one of the following procedures to install it:

- Obtain from the modem manufacturer an .inf file designed for Windows NT 4.0. Follow the manufacturer's instructions for installing the modem in Windows NT 4.0. Contact the modem manufacturer for assistance with this procedure.

- If your modem has an .inf file for Windows 95, you may be able to use that file under Windows NT. When you are adding the modem through Control Panel, Modems, check the box labeled, "Don't detect my modem; I will select it from a list." Choose the "Have Disk" option and insert the disk containing the Windows 95 .inf file. Please be aware that not all Windows 95 .inf files will work correctly in Windows NT 4.0.

- Install your modem as a standard modem using the following steps:

    1. In Control Panel, double-click Modems. The Install New Modem Wizard starts automatically if you have not installed a modem before. If the wizard

does not start automatically, you have installed a modem previously and you should click Add to start the wizard.

2. Check the box labeled "Don't detect my modem; I will select it from a list," and then click Next.

3. In the Manufacturers box, click Standard Modem Types. In the Models box, click a model that corresponds to the speed of your modem, and then follow the instructions in the Install New Modem Wizard.

B.3.1 Verify COM Port(s)

Verify that Windows NT recognizes your COM port(s)[7] by double-clicking the Ports icon in Control Panel to see if the COM port that the modem is connected to is listed. If it is, Windows NT recognizes the COM port.

If the COM port is not recognized in the Control Panel Ports applet, there is most likely a hardware problem or a configuration problem. Use the following steps to troubleshoot the problem.

B.3.1.1 External Modems [7]

1. If the COM port is on the motherboard or is provided by a serial card, make sure the port is not disabled in the BIOS (also called the CMOS) setup of the computer. Refer to the documentation for your computer to obtain information about configuring options in the BIOS setup.

2. Make sure there are no other adapters or devices that are configured for the same Base I/O Address or IRQ as the COM port to which the modem is attached.

3. Verify that the serial port is not defective. If the modem and any other serial devices fail on the COM port but work on other COM ports, and you have verified the two steps above, the serial port may be defective.

4. Verify the serial cable is not defective by using a new standard serial cable.

B.3.1.2 Internal Modems

1. If the COM port is defined by an internal modem [7], make sure the jumpers on the modem are configured properly. Internal modems will almost always have a jumper on the adapter that configures the modem as a particular COM port. There may or may not be jumpers that allow you to set the Base I/O Address and IRQ to be used by the modem as well.

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2. If the modem is configured for a COM port number that is assigned to a COM port on the motherboard or a serial card (physical port), you must either set the modem to use a different COM port, or use the BIOS setup to disable the COM port with the same number as the internal modem. For example, if both the internal modem and the physical COM port are set to COM1, you must either set the internal modem to a different, unused COM port, or the physical COM1 port must be disabled in the BIOS setup.

3. Make sure there are no other adapters or devices that are configured for the same Base I/O Address or IRQ as the internal modem. Usually COM3, using an IRQ (or interrupt) of 5, is a good choice for an internal modem. However, if you have a sound card, you may need to choose a different IRQ than 5 since many sound cards use that interrupt.

4. In the Ports component of Control Panel, verify that the IRQ settings and the I/O addresses are correct. Check the System log with the Event Viewer for I/O or IRQ conflict errors.

When possible, use standard settings for COM ports, which are as follows:

SERIAL 1   COM1: I/O Address = 3F8h   IRQ = 4

SERIAL 2   COM2: I/O Address = 2F8h   IRQ = 3

SERIAL 3   COM3: I/O Address = 3E8h,   IRQ = 4

SERIAL 4   COM4: I/O Address = 2E8h,   IRQ = 3

5. You do NOT need to add a new port in the Control Panel Ports applet to add support for an internal modem. NTDETECT will detect the internal modem and the COM port it is configured to use. If a duplicate port was added using the Add button in the Control Panel Ports applet, use the Delete button to remove the duplicate port.

6. Verify that the internal modem is not defective. Also, it is often a good idea to check with the vendor of your modem to see if there is a flash upgrade available for your modem.

B.4 Testing Through Ping Utility

Ping [7] is a low-level utility designed to test basic connectivity between any two end nodes on an IP network. If a ping to an end node is successful, it indicates that all of the IP network devices between the end node and the pinging station are properly configured to carry IP traffic.

Ping operates by sending Internet Control Message Protocol (ICMP) packets to a destination node. When the network and all its elements are properly configured, the destination node receives these ICMP packets and sends out a response packet for each one it receives. The Connection is good if the node that originated the ping receives the responses within a predefined period of time. To run ping, open the command prompt window and type :

Ping target_ip_address

The output from the ping may vary, depending on the type of operating system you are using. If the ping is successful, you will receive one of the two following responses:

Target_ip_address is alive

Or

Pinging target_ip_addtress with 32 bytes of data :

Reply from target_ip_address : bytes=32 time= 52ms TTL= 128

Reply from target_ip_address : bytes=32 time= 46ms TTL= 128

Reply from target_ip_address : bytes=32 time= 45ms TTL= 128

Reply from target_ip_address : bytes=32 time= 45ms TTL= 128