10.6 Computer System Configuration

In this section we examine the configuration of the computerized system.
We have analyzed the necessity of computerization regarding service-order system including subscriber line management, and billing system in the previous sections (10.4,10.5). However, it is more appropriate that they are distinguished between telephone-center system and billing-center system in examining computer system configuration and implementation of the system. Because some part of billing function (mainly calculation of bills) is done in a billing center and the other part (mainly collecting bills) is done in a telephone center.

Table 10.6-1 Examined System for IZmplementation

Examined system for implementation	System distinguished by Service	Main function
Telephone-center system	Service-order system	Service order
		Subscriber line management
	Billing system	Collecting bills
Billing System		Calculating bills

In addition, it is suggested that management information system (MIS) should be also examined and implemented.

As mentioned in the previous section, STE is striving to introduce computerized systems that contain billing and telephone-center systems.
Regarding to a telephone-center system and a billing-center system, the systems that STE is developing is practically almost the same as those we propose from the viewpoint of the objectives, the target, and the scale. We therefore decided to utilize the similar system configuration. Here we describe the system configuration after minor modifications. Besides, we also describe the system configuration of MIS.

10.6.1 Hardware Configuration

(1) Telephone-center Hardware Configuration

Terminals are available for each telephone center's contract section, technical section, construction section, exchange section, testing section, cable section, complaints section, and directory section. Besides, a chief of each telephone center uses one to manage the whole of work or service of the center. Moreover, another terminal is needed for a system administrator for system administration, operation, and maintenance. Cash registers similar to these terminals are available for cashiers and staff can treat cash for bills with them.

These terminals including cash registers must mutually communicate and thus are connected by a LAN (Local Area Network) and a file server. The customer information for each telephone center is utilized in a billing center, too. Accordingly, the file server in each telephone center is connected to a billing center by public network (X.25).

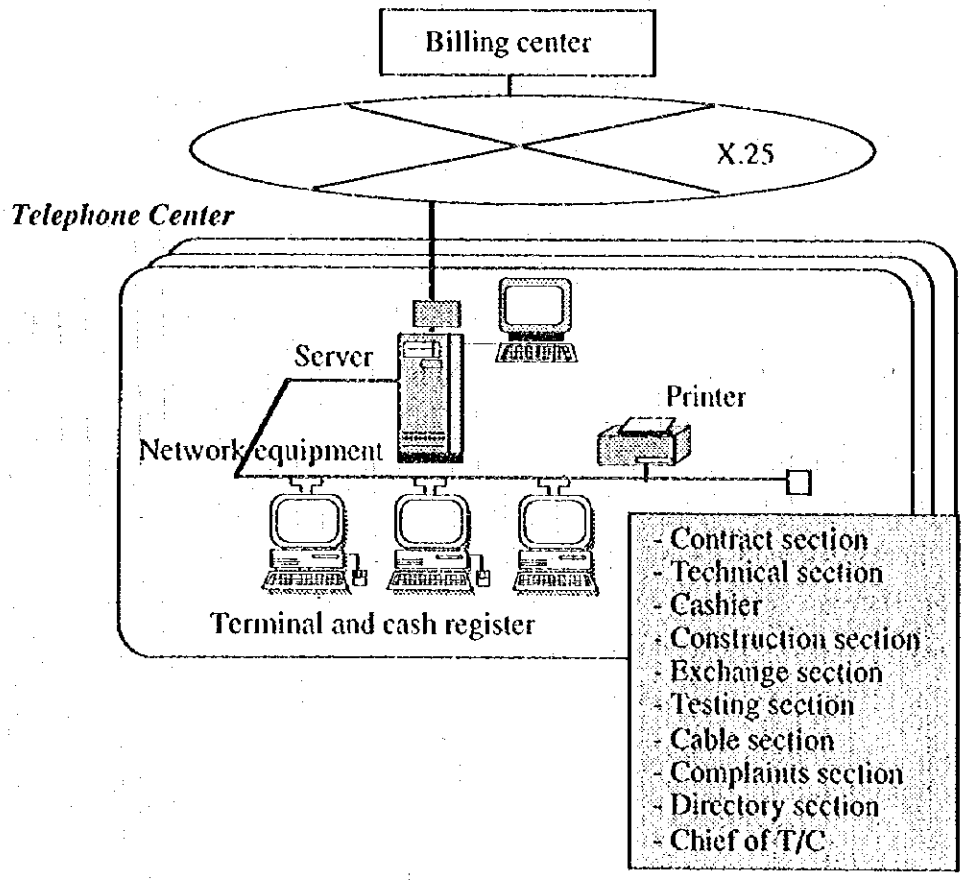


Figure 10.6.1-1 Computer Configuration Overview

A server, terminals and network equipment are necessary for each telephone center. Details of each device and an explanation are included below.

Table 10.6.1-1 Necessary Telephone-Center Equipment

Equipment		Explanation
Server	CPU, memory, I/O	For customer information management
	Storage (HD)	For storage of customer information
	Storage (Streamer)	For backup of file
Terminal	CPU, memory, I/O	For subscription process
	Storage	
Laser printer		For printout of forms
Cash register	CPU, memory, I/O	For bill-payment process
	Storage	
Printer		For printout of bills and receipts
Network equipment	Router	For LAN to LAN communication
	MODEM	For signal conversion to X.25
	Hub	For LAN controller
UPS		For power protection

A medium-class PC system is recommended as the server device. A low-class PC system is adequate for terminals. A small-scale network system (LAN) is requisite as network equipment. Strictly speaking, two types of terminals are necessary for a telephone center. One is a client terminal; the other is a cash register for cashier. In this study, however, it is assumed that a single type of terminal is employed for both of them.

Table 10.6.1-2 Machine Level of Each Device

Device	Level
Server	Medium-class PC system
Terminal	Low-class PC system
Cash register	Low-class PC system (the same with terminal)
Network equipment	Small-scale network system (LAN)

Detailed specifications for each device are included in S1-10-19 in the Supporting Report.
A telephone center's detailed hardware configuration is outlined in S1-10-20 in the Supporting Report.

The necessary quantity of terminals differs for each telephone center. Here we describe the calculation method.

(Quantity of terminals in contract section)

Formula A

$$\text{Quantity of terminals} = \frac{\text{Job-processing time} \times \text{Number of transactions}}{\text{Working hours} \times 60}$$

Average job processing time time : Necessary time on terminal to cope with one job in average (Minute)

Number of transactions : Number of customers who come to telephone center for telephone application

Working hours : Working hour per day (Hour)

Here we set as follows:

Job processing time = 15 minutes

Number of transactions = Depend on each center

Working hours = 6 hours

Therefore formula to calculate the quantity of terminals in contract section can be expressed as follows:

Formula B

$$\text{Quantity of terminals} = \frac{15 \times \text{Number of transactions of each center}}{6 \times 60}$$

In each of other seven sections excluding cashier, and for a chief of telephone center and a system administrator, one terminal should be installed. Therefore, total quantity of terminals for each telephone center is found by adding 7 to the result of formula B.

The necessary quantity of cash registers and hubs also vary according to the telephone center. Here we describe the calculation method.

(Quantity of cash registers)

In case of cash register, formula to calculate the quantity of cash registers can be expressed as follows:

Formula C

Quantity of cash registers = Round up (Number of subscribers / 10000)

(Quantity of hubs)

We suppose that we use 8 port hub.
When we use 2 hubs, one port is occupied by connection of the other hub.
Therefore formula to calculate the quantity of hubs can be expressed as follows:

Formula D

Quantity of hubs = Round up ([Number of devices connected to a LAN -1] / 7)

We decide the necessary quantity of devices as follow.

Table 10.6.1-3 Necessary Quantity of Devices for a Single Telephone Center

Device		Section	Quantity
Server	CPU Ethernet adapter Floppy drive Hard disk Streamer CD-ROM drive		1
Terminal	CPU Ethernet adapter Floppy drive Hard disk	Chief of T/C	1
		System admi.	1
		Contract	Depend on formula B
		Technical	1
		Construction	1
		Exchange	1
		Testing	1
		Cable	1
		Complaints	1
		Directory	1
Cash register	(Same with terminal)	cashier	Depend on formula C
Laser printer		each section	11
Printer	(Printing bills)	cashier	Depend on formula C
Router			1
MODEM			1
Hub			Depend on formula D
UPS			1

The quantity of devices for each telephone center is outlined in detail in S1-10-21 in the Supporting Report.

Here we describe the needed quantity of devices for all telephone centers (35) targeted computerization excluding 14 centers in Damascus City.

Table 10.6.1-4 Total Quantity of Devices for All Telephone Centers

Device	Quantity
Server	35
Terminal	394
Cash register	102
Laser printer	385
Printer	102
Router	35
MODEM	35
Hub	102
UPS	35

(2) Billing-center Hardware Configuration

In considering the configuration of billing-center system, we must decide the processing type (concentrated or distributed type). The distributed type is recommended for the following reasons:

- Damage caused by system shutdown or other trouble is less in case of distributed type than in case of concentrated type.
- Most of packaged software for billing application have the limit of the processing capability and it may be difficult to expand it.

Table 10.6.1-5 Comparison of Concentrated and Distributed Types

Type	Merits	Demerits
Concentrated type	- Concentrated management of customer information - To be able to reduce the number of technical staff for maintenance and operations	- Much manpower and machine power in one billing center - All of technical staff is necessary in one place. - Damage caused by system shutdown or other trouble is very large. - Possible difficulty of expanding the processing capability of billing application software
Distributed type	- To be able to reduce the load in one billing center - To be able to utilize the rural area staff - Less damage caused by system shutdown or other trouble - Free from the limit of processing capacity of billing application software	- Total technical staff must be increased. - Retrieval or management of all customers is difficult.

Distributed type is recommended (= plural billing centers).

Considering the present number of subscribers, increment of subscribers from now on, the location of big cities and so on, distributed billing system centers are installed as indicated below.

Table 10.6.1-6 Distributed Billing System Centers and the Divided Area for Each Center

1996-2000			2001-2010		
Center	Area (Provinces)	Expected number of subscribers in 2000	Center	Area (Provinces)	Expected number of subscribers in 2010
South (Damascus)	Damascus (City) Damascus (Rural) Quennetra Darra Sweda	808,000	South (Damascus)	Damascus (City) Damascus (Rural) Quennetra Darra Sweda	934,600
North (Aleppo)	Aleppo Homs Hama Idleb Der Alzor Alhasaka Rakkah Lattakia Tartous	1,046,200	North (Aleppo)	Aleppo Idleb	448,600
			Middle	Homs Hama	310,200
			Coast	Lattakia Tartous	263,800
			East	Der Alzor Alhasaka Rakkah	188,800

Implementation of Damascus billing center system has been done in the year of 1995, therefore this master plan does not include it and the target is implementation of the rest four billing center systems.

A server, terminals, and network equipment are necessary for each billing center; the same as in telephone centers. Details of each device and an explanation are outlined below.

Table 10.6.1-7 Necessary Billing Center Devices

Device		Explanation
Server	CPU, memory, I/O	For calculation of bill
	Storage (HD)	For storage of billing information
	Storage (Streamer)	For backup of file
MTU		For input of calls' information
Line Printer		For printing bills* and other report
Laser Printer		For printing forms For confirmation of input data
Terminal	CPU, memory, I/O	For data input
	Storage	(Photo counter, executive-form**, etc.)
Network equipment	Router	For LAN to LAN communication
	MODEM	For signal conversion to X.25
	Hub	For LAN controller
UPS		For power protection

Note* : For printing bills for subscribers coming to telephone centers in which a system is not installed

** : For input executive-forms of subscribers coming to telephone centers in which a system is not installed

A medium-class UNIX server system is recommended as a server. A low-class PC system is adequate for terminals. A small-scale network system (LAN) is required as network equipment. One or more high-speed line printers are essential because bills must be printed in a billing center for telephone centers in which a system is not installed.

Table 10.6.1-8 Machine Level of Each Device

Device	Level
Server	Medium-class PC system
Terminal	Low-class PC system
Printer	High-speed line printer
Network equipment	Small-scale network system (LAN)

Detailed specifications for each device are included in S1-10-22 in the Supporting Report.

The billing system requires high reliability, especially in the server that calculates and issues bill. If the server shuts down, damage could be severe. A duplex system is thus vital.
Aleppo billing system needs 32 terminals chiefly for data input of the photo counter, receipts and data of other services (telegrams, etc.).

Table 10.6.1-9 Necessary Quantity of Aleppo Billing Center Devices

Device		Quantity	Remarks
Billing computer	CPU X.25 adapter Ethernet adapter Floppy drive Hard disk Streamer CD-ROM drive	2	Duplex system
Line printer		2	
Laser printer		1	
Magnetic tape unit		2	
Terminal		32	
Hub		6	Depend on formula D
Router		1	
MODEM		1	
UPS		2	

During the Eighth Five Year Plan, the number of subscribers treated in Aleppo billing center is expected to increase, therefore hard disk should be added for enough capacity.

Detailed billing-center hardware configuration is outlined in S1-10-23 in the Supporting Report.

Other three billing center systems (Middle, Coast and East) need less devices, because:

- Each of the three centers covers relatively less subscribers; Middle covers about 288,000, Coast about 245,000, East about 175,000, in the year of 2005.

- It is expected that the amount of data input of photo counter becomes very small because analog exchanges are decreasing.

- Before implementation of these three centers, telephone-center systems will be implemented in major main centers. Therefore the amount of data input of executive form and receipt, and printing bills becomes small.

That is, necessary quantity of line printers and that of terminals for each of the three billing centers are fewer than those of Aleppo center.

Table 10.6.1-10 Necessary Quantity of Billing-center Devices
(For each of Middle, Coast and East Billing Centers)

Device		Quantity	Remarks
Billing computer	CPU X.25 adapter Ethernet adapter Floppy drive Hard disk Streamer CD-ROM drive	2	Duplex system
Line printer		1	
Laser printer		1	
Magnetic tape unit		2	
Terminal		4	
Hub		2	Depend on formula D
Router		1	
MODEM		1	
UPS		2	

(3) Management Information System (MIS)

A server of MIS is installed in headquarters of STE and it is connected to telephone center systems and billing center systems to gather customer information and billing information owned by them. Client terminals are installed in headquarters and each province connected by public network (X.25) so that directors can utilize them.
Details of each device and explanation are outlined below.

Table 10.6.1-11 Necessary MIS Devices

Device		Explanation
Server	CPU, memory, I/O	For gathering management information
	Storage (HD)	For storage of management information
	Storage (Streamer)	For backup of file
Line Printer		For printing reports
Terminal	CPU, memory, I/O	For analysis of management information
	Storage	For prepare managerial reports
Network equipment	Router	For LAN to LAN communication
	MODEM	For signal conversion to X.25
	Hub	For LAN controller
UPS		For power protection

A medium-class UNIX server system is recommended as a server. A low-class PC system is adequate for terminals. A small-scale network system (LAN) is required as network equipment in headquarters and a terminal of each province accesses the server through X.25.

Table 10.6.1-12 Machine Level of Each Device

Device	Level
Server	Medium-class PC system
Terminal	Low-class PC system
Network equipment	Small-scale network system (LAN)

Table 10.6.1-13 Total Quantity of Devices for MIS

Device		Quantity	Remarks
Server	CPU X.25 adapter Ethernet adapter Floppy drive Hard disk Streamer CD-ROM drive	1	installed in headquarters
Terminal		36	20 for headquarters 16 for provinces
Laser printer		37	for a server and each terminal
Hub		3	Depend on formula D
Router		1	for headquarters
MODEM		17	1 for headquarters 16 for provinces
UPS		1	

Detailed MIS hardware configuration is outlined in S1-10-24 in the Supporting Report.

10.6.2 Software configuration

(1) General

Necessary computer software includes an OS (operating system), network software, database software, and an application program. These kinds of software should be installed for each server and each terminal.
In addition, for programming or software maintenance, a server of billing center needs a compiler.

Table 10.6.2-1 Necessary Software Types

System / Software	Telephone-center		Billing-center		MIS		Remark
	Server	Terminal	Server	Terminal	Server	Terminal	
Operating system	●	●	●	●	●	●	Depend on hardware Much packaged software
Network software	●	●	●	●	●	●	For LAN communication Much packaged software
Database software	●	●	●		●	●	For database retrieval Much packaged software
Application software	●	●	●	●	●	●	Customization is necessary based on package software.
Compiler			●				For programming or software maintenance

Detailed specifications of the OS, network software, and database software are outlined in S1-10-25 in the Supporting Report.

(2) Overview of Application software of telephone-center and billing-center system

The application software will be comprised of the following subsystems.

- Service-order subsystem
- Subscribers-line-management subsystem
- Bill-collection subsystem
- Bill-calculation and issuance subsystem

The service-order and subscriber-line-management subsystems are used mainly by telephone centers. The bill-calculation and issuance subsystem is employed mainly by billing centers. The bill-collection subsystem is used in telephone centers and by billing centers.

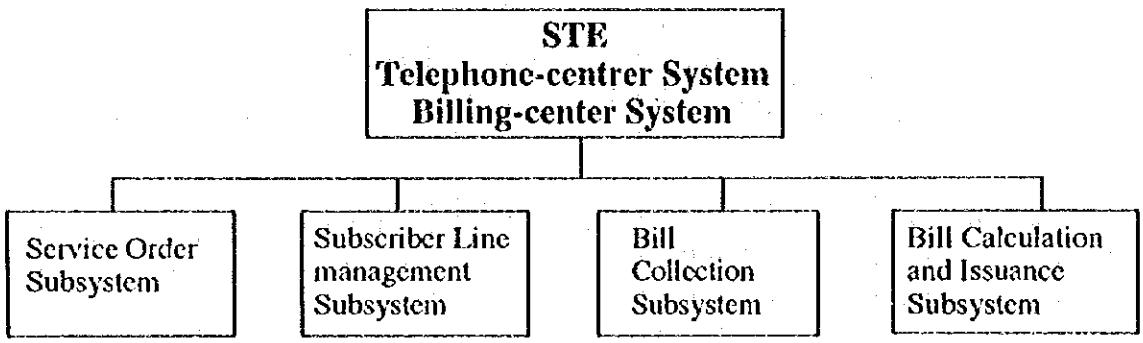


Figure 10.6.2-1 System Application Software Configuration

The system has two kinds of distributed database that can mutually communicate; telephone-center database and billing-center database. Customer information, subscriber information, bill information and subscriber-line information are managed in the telephone-center database. Conversely, customer information and accounting-history information, bill information, and service information are managed in billing-center database.

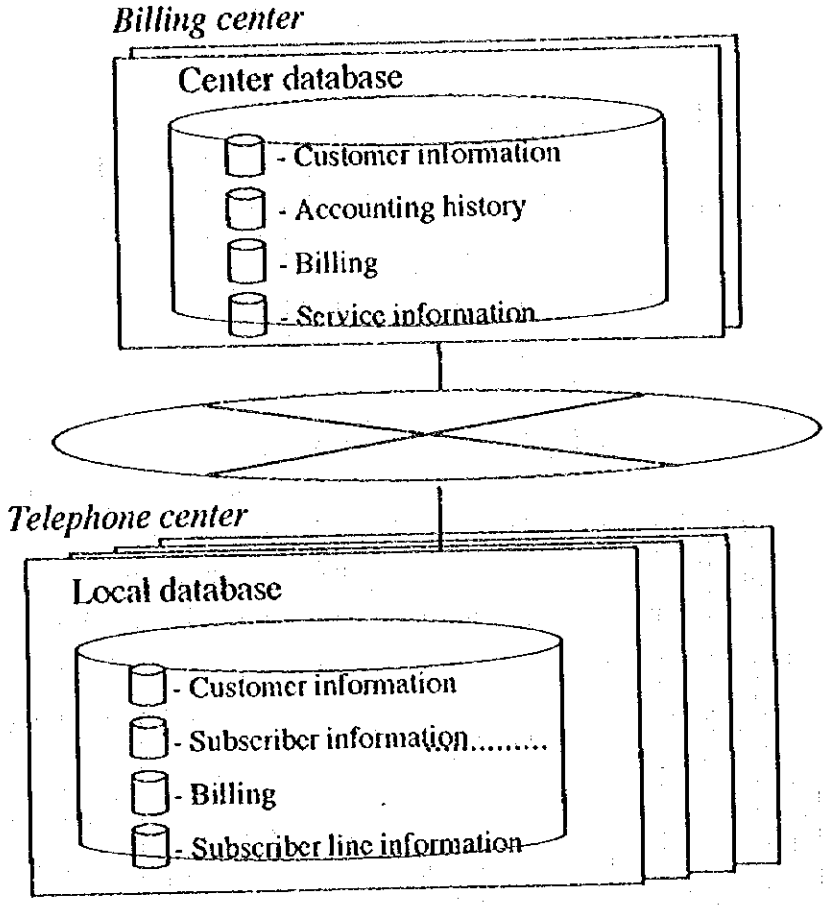


Figure 10.6.2-2 System Database Configuration

(3) Service-order subsystem

The service-order subsystem comprises application registration, installation processing, and subscriber-information-management functions.

The application-registration function conducts the processing concerning applications for telephone services—such as entering new application forms, issuing executive forms for installation, and issuing receipts for telephone applications.

The installation-processing function processes the connection of new lines—such as issuing execution-order forms for installation, and printing notices of installation to be sent to applicants indicating installation dates.

The subscriber-information-management function manages subscriber information, including update of the type and details of services associated with subscription, and the status of accounts.

Table 10.6.2-2 Service-Order-System Functions

Subsystem	Function	Explanation
Service order subsystem	Application registration	Conducts the processing concerning applications for the telephone service.
	Installation processing	Executes the processing for the connection of new lines.
	Subscriber information management	Manages subscribers' information, including the type and details of services associated with their subscription, the status of their accounts, and so on.

(4) Subscriber-line-management subsystem

The purpose of this subsystem is to provide a computerized information system that groups all information concerning the elements of the telephone network--starting from the components of the exchanges, the distribution stands, the primary cables, the distribution cabinets, and the secondary cables---and ending with the distribution boxes, the aerial network, and the telephone-terminal set.

Table 10.6.2-3 Functions of the Subscriber-Line-Management Subsystem

Subsystem	Function	Explanation
Subscriber line management subsystem	Information update	Entry and update of the main / branch cable number, cabinet / box number, etc.
	Consulting	Find the nearest box and determine the subscriber's number.
	Listing	Listing the assigned / unassigned lines, defective lines, status of cabinet, etc.

(5) Bill-collection subsystem

This subsystem is used for telephone centers. The bill-collection subsystem provides the necessary functions for collecting bills and recording the paid amounts in the database, and automatically stamping the bill. Conversely, issuing lists of debtors, compiling warning statements, and listing line suspensions and reconnections are performed at the Billing Center.

Table 10.6.2-4 Bill-Collection Subsystem Functions

Subsystem	Function	Explanation
Bill collection subsystem (telephone center)	Bill management	Provides the necessary functions for collecting bills. - Collecting the bill and recording the paid data - Recording the paid amounts in the database - Issuing a list of uncollected bills at the end of the cycle
	Bill dispatch	The data related to collected and uncollected bills are transferred back to the billing center through the X.25 WAN.
	Bill printing	According to billing information for each subscriber calculated by billing center system (bill-calculation and issuance subsystem), bills are printed. The bill includes two coupons. One is given to the subscriber and the other is returned to the billing center after collecting the bills.
(Billing center)	Issue of debtors' table	Tables of debtors are issued and sent to the accounts department.
	Warning statements	Warning statement for debtor is made and sent to subscriber before suspending line.
	Line suspension and reconnection	A list of unpaid bills is made. Based on this list and incoming bill collection date, suspension or reconnection is executed.

(6) Bill-calculation and issuance subsystem

This subsystem provides the necessary operations for processing information related to billing calculation and issuance, including validating data, calculating bills, and formatting and printing bills.

Table 10.6.2-5 Bill-Calculation and Issuance Subsystem Functions

Subsystem	Function	Explanation
Bill calculation and issuance subsystem	Data entry	The information concerning subscribers' calls from different centers is entered. This information comes under several forms.
	Data validation	Data entry check is conducted. As a result of error checking steps, an error list is issued. The listed errors are corrected and the new values are reentered into the computer. For errors which cannot be centrally corrected, such as nonexistant numbers, the data are returned to the pertinent center.
	Bill calculation	Based on the entered counters, bill details are computed according to the set of rules specified by the exploitation directory and included in the tariffs database.
	Bill formatting and printing*	Bill information is properly extracted and formatted, then printed separately for each center. The bill includes two coupons. One is given to the subscriber and the other is returned to the billing center after collecting the bills.
	Data dispatch to telephone center	Transfer of bill data to the different telephone centers is performed through the X.25 WAN. The data received at each center are loaded in the local database. The bill data are used by the cash registers for the collection of bills.

Note*; Bill-collection subsystem (telephone-center system) has bill printing function, therefore bills for telephone centers in which systems are not installed are printed by billing center system.

(7) Management Information System (MIS)

MIS gathers customer information and billing information form telephone-center system and billing-center system and accumulates them as its database, so that directors can search necessary information by client terminals. These kinds of information include managerial information, for example:

- Number of subscribers of each telephone center
- Condition as to telephone utilization (amount of calls, amount of long distance call, etc.)
- Amount of bills and amount collected
- Condition of waiting lists

Directors can get latest data analyzed by a time series, by province or other means rapidly and they make use of them to make managerial decision.

Table 10.6.2-6 Service-Order-System Functions

System	Function	Explanation
Management information system (MIS)	Information gathering	Gather customer information and billing information from telephone-cener systems and billing-center systems
	Database update	Converting gathered information into appropriate data format as management information and accumulate as database
	Management supporting	Searching required information and analyzing it by sorting, calculation, comparison and so on
	Reporting	Preparing requested reports regarding management information and printing them

10.6.3 Other Equipment

(1) Other telephone-center equipment

Generally speaking, we have to consider an air-conditioner, access-control equipment when developing a computer system, and footprint requirement for computer installation.

Air conditioner

• The computer installed in a telephone center is not a specific computer, and thus does not require an air conditioner.

Access control

• Access control should be applied by a password system in both terminals and a server.

Footprint

• The computer installed in a telephone center is not so large, so we can set it on an ordinary desk. Accordingly, it is not necessary to prepare a large space.

(2) Other Billing-center equipment

Here also air-conditioner, access control, and footprint requirements are taken into consideration.

Air conditioner

• We utilize a relatively large computer that requires strict conditions in the Billing Center. Accordingly, we must prepare an air conditioner for the equipment room.

Access control

• Because a billing-center requires high security, entry/exit control by an ID-card system should be applied.

Footprint

• For billing center in Damascus, the new system requires 2 servers, 12 terminals, 2 line printers, and peripheral equipment. This configuration is similar to the existing configuration and the Quantity of terminals is greatly reduced. Considering that the physical scale of hardware is becoming smaller, the present equipment-room space is adequate for the new system.
• For each of other billing centers, footprint for the equipment above-mentioned will be needed.

(3) Other MIS equipment

The same requirement of three types of equipment are examined with telephone-center and billing-center system as follow.

Air conditioner

• An air-conditioner is not necessary for the MIS server because it is not so large.

Access control

• MIS requires high security because it has a great deal of important information related to STE management, therefore entry/exit control by an ID-card system should be applied.

Footprint

• For footprint for the server, a relatively large desk space is enough and it is needed in the headquarters of STE.

10.7 Functions and Process by Computerization

We describe here detailed functions owned by telephone-center system, billing-center system and management information system and process-flow realized by the computerization.

10.7.1 Service Order Subsystem

Service order subsystem consists of following three parts:

- Application registration
- Installation processing
- Subscriber information management

(1) Application registration

This part of the subsystem performs the required processing concerning the application for the telephone services. The main function associated to this part are:

- Entering new application forms and recording the database.
- Issuing automatically a notice for technical feasibility study by request form the contracting section.
- Issuing automatically an installation form for installation.
- Keeping a record of the feasibility and installation notice in the database.
- Updating the data concerning the application forms whenever changed.
- Entering payment information for telephone application.
- Issuing a receipt for telephone application.

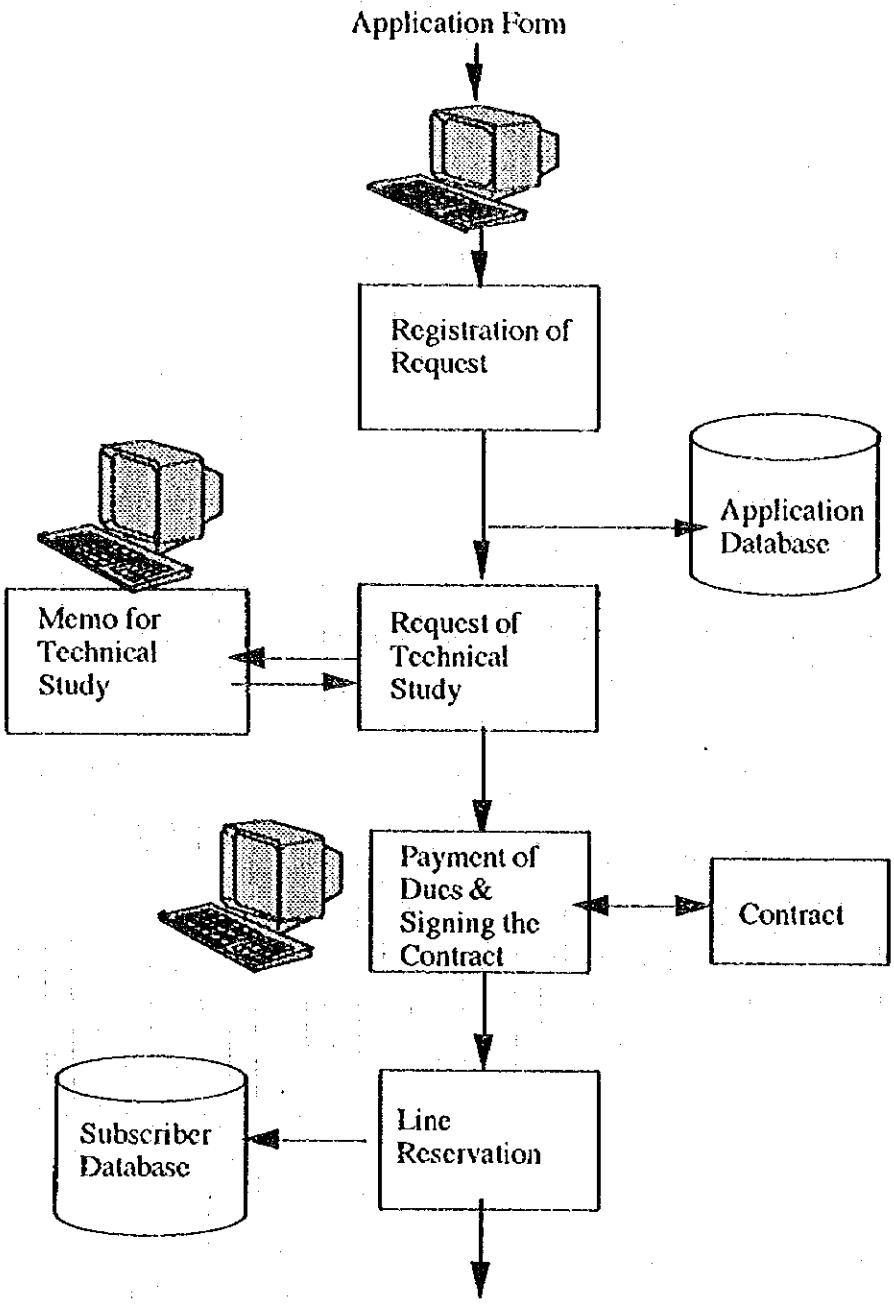


Figure 10.7.1-1 Process-flow of Application Registration Part in Service-order Subsystem

(2) Installation processing

This second part of the subsystem assumes the required processing for the connection of a new lines. The main functions are:

- Issuing the order of execution form for installation.
- Printing eventually a notice of installation to be sent to the applicant indicating the date of installation.
  - - Construction section
  - - Exchange section
  - - Testing section
- Sending executive form for billing center.

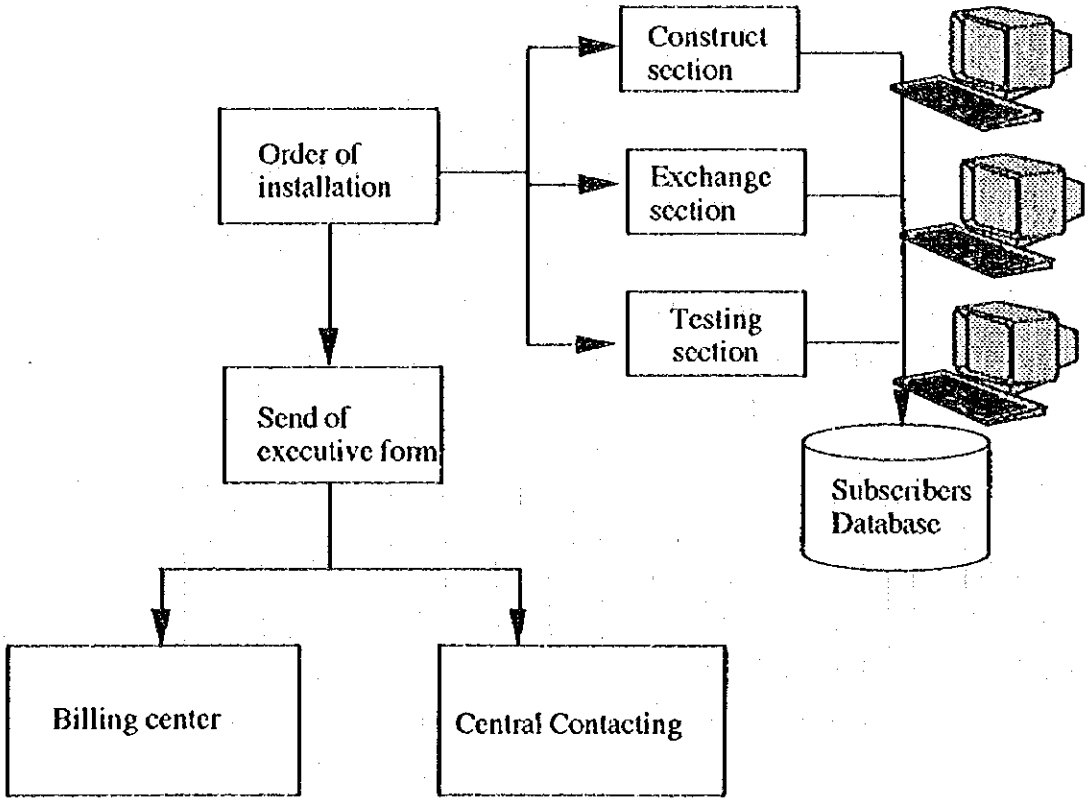


Figure 10.7.1-2 Process-flow of Installation Part in Service-order Subsystem

(3) Subscriber information management

This part is the management of the subscribers information, including the type and details of services associated with their subscription, the status of their accounts and the static related to them. The main operations are the followings:

1-Update of database

- Changing the subscription number, the type of tone and so on
- Changing the type of service, type of subscription
- Adding new type of equipment or services
- Preventing automatic national and international dialing
- Cutting and resuming the connection

2-Reporting

-Statistical reports concerning subscribers' information organized according to different criteria; type of services, type of equipment, average counter readings, automatic dialing, etc...

- Providing statistical reports and listings on requests such as:
  - number of application per month
  - number on application per type of service
  - number of application per area
  - etc...
- Printing the waiting lists according to the request priority and type of service.
- Providing statistical reports on the lines installed such as:
  - number of lines installed per day, per month and year, per type,
  - etc...

3-Inquiry

- Answering inquiries concerning subscription requests according to different criteria such as:
  - the name of the application
  - the date of application
  - type of requested services
  - etc...

10.7.2 Subscriber Line Management Subsystem

The purpose of this subsystem is to provide a computerized information system which groups all the information concerning the elements of the telephone network starting from the components of the exchanges, the distribution stands, the primary cables, the distribution cabinets, the secondary cables and ending by the distribution boxes, the aerial network and the telephone terminal set. The main operation provided the subsystem are:

1-Update of database

- Entry and update of distribution stands data
- Entry and update of primary network cables data
- Entry and update of distribution cabinets data
- Entry and update of the secondary network cables data
- Entry and update of distribution boxes data
- Entry and update of aerial lines data

2-Retrieval

- Consulting the database to find out the nearest distribution box to a given address
- Consulting the database to determine the most appropriate subscriber's number
- Consulting the database to determine the most appropriate vertical and horizontal stand's lines

3-Listing

- List of assigned lines
- List of defective lines
- List of unassigned lines
- List of primary cables, secondary cables
- List of the status of cabinets
- etc...

The line structure which is managed by the subscriber line management subsystem is indicated below.

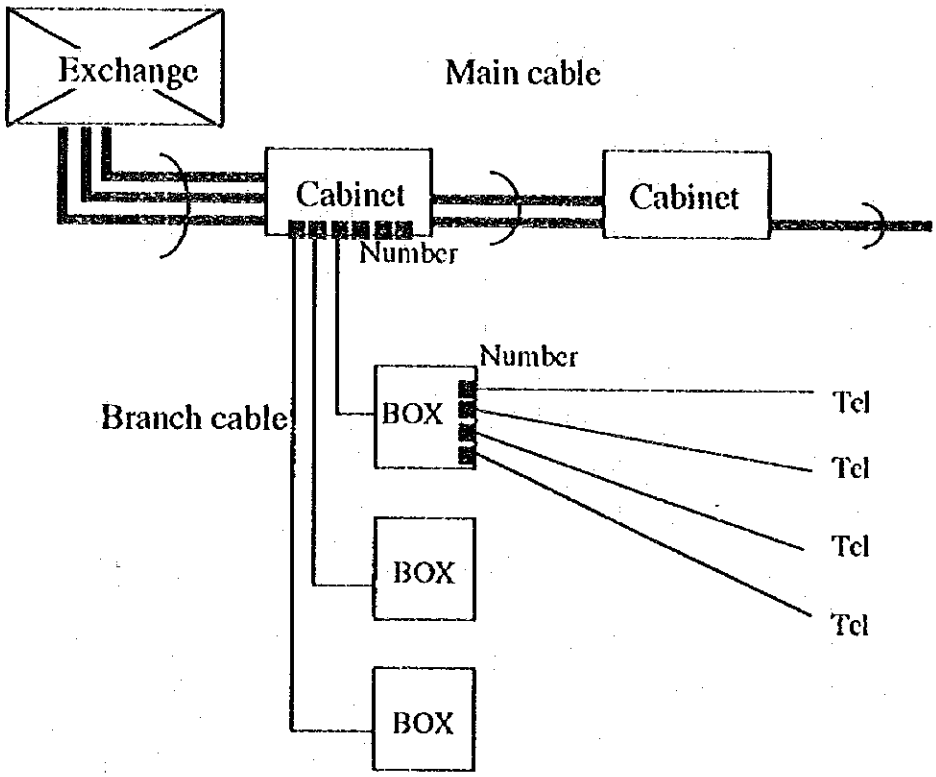


Figure 10.7.2-1 Line Structure Managed by the Subscriber Line Management Subsystem

10.7.3 Bill Collection Subsystem

This subsystem is consists of telephone center part and billing center part.
The bills collection subsystem in telephone center part provides the necessary functions for collecting the bills. These functions are described below.

- Retrieving and displaying the bills due relative to a specific number
- Collecting the bill and recording the paid amounts in the database
- Stamping automatically the bill
- Printing the daily journal
- Issuing a list of uncollected bills at the end of the cycle

The data related to collected and uncollected bills are transferred back to the billing-center computer through the X.25 WAN and processed later on.

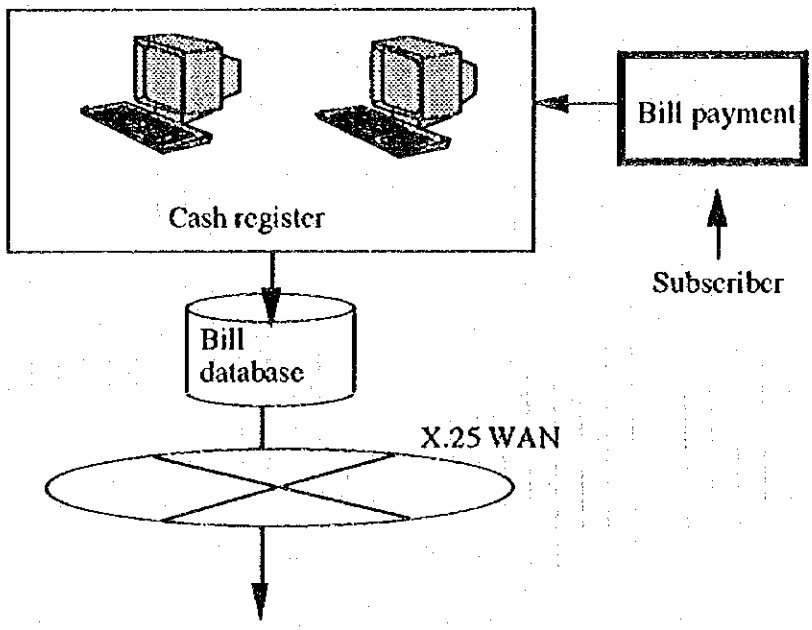


Figure 10.7.3-1 Process-flow of Bill Collection Subsystem (Telephone Center Part)

Function of bill collection subsystem in billing center part is as follows.

(1) Issue of tables of debtors

After collecting the bills, collection data at each center is transferred back to the central computer through the X.25 WAN. Bills collection data is processed and subscriber accounts are updated accordingly. Tables of debtors are then issued and sent to the accounts department.

(2) The subscriber accounts

A new subscriber account is created for each new subscription. Bills, payments, objections and settlements are recorded in this account. The data is kept on-line for a pre-defined a period of time. Then transferred to magnetic tapes and archived. However, debits and unpaid amounts remain on-line.

(3) Warning statements

The accounting software allows to issue automatically a warning statement for subscribers included in the debtor list. This statement is sent to subscribers before suspending the line.

(4) Lines suspension and re-connection

A list of the lines to be temporally due to unpaid bills is printed upon requests of the accounting department. This list is periodically revised and compared to incoming data concerning bill collection. Upon request, a list of lines to be re-connected is printed.

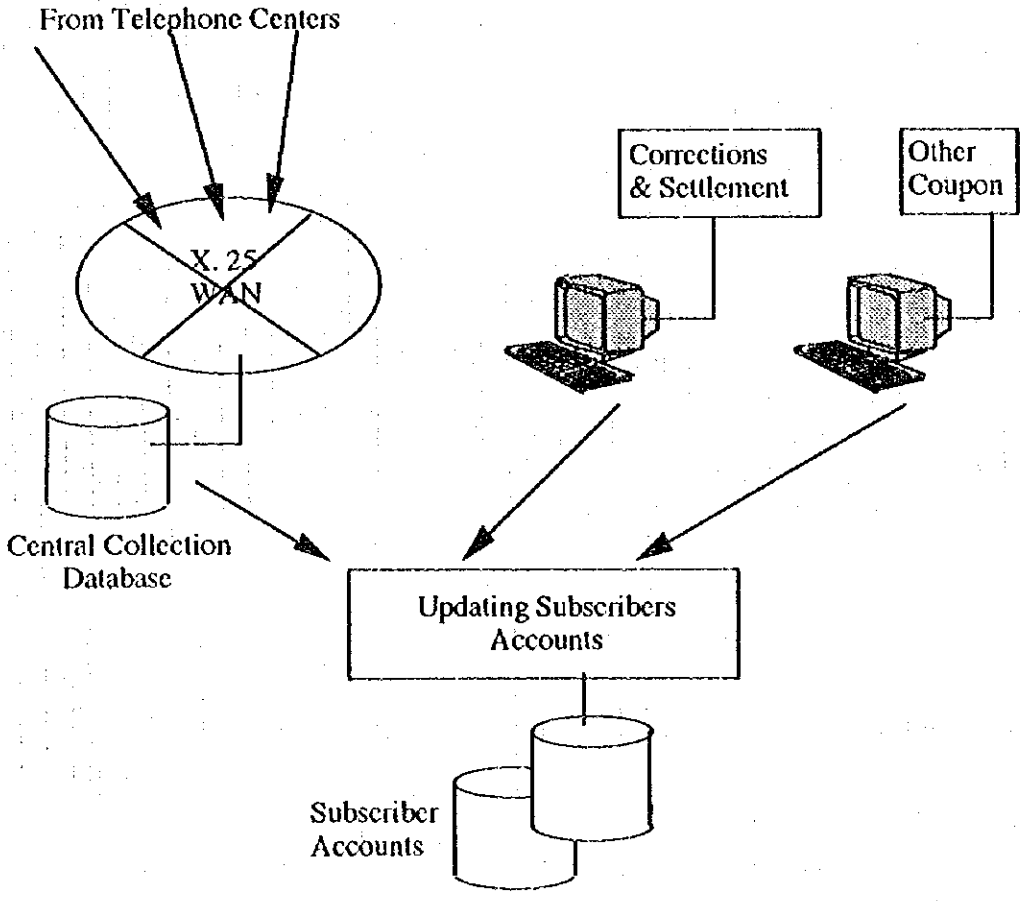


Figure 10.7.3-2 Process-flow of Bill Collection Subsystem (Billing Center Part)

10.7.4 Bill Calculation and Issuing Subsystem

The subsystem provides the necessary operation for processing the information related to billing calculation and issuing. Main functions of this subsystem is as follows.

(1) Data entry

The information concerning subscribers' calls is received from the different centers. This information comes under several forms namely:

- Exchange directly
- Paper coupons
- Counters photograph (local calls)
- Magnetic tapes
- Memos of execution (changing the number, transfer of line, etc.)

The data received from the different sources is unified in one format and stored in disk files. The billing software will use these files instead of the magnetic tapes.

(2) Data validation

The billing process begins with several stages of checking and processing according to the followings:

- Checking data entry from paper coupons : several types of errors are identified depending on the field entered incorrectly.
  - Date
  - The caller's number
  - Code of the called country
  - Called number
  - International
  - Checking the validity of the type of call
  - Compatibility between the starting time and the ending time of the call
  - Checking the validity of the tariff code

- Checking data entry from counters readings (copies, phone): checking the compatibility between entered telephone numbers.
  Entry error are also checked. If the difference between the new counter reading and the previous reading and previous reading is greater than subscriber's average rate, counter's reading is re-entered.

As a result to these two error checking steps, an error list is issued. The listed errors are corrected and the new values are entered again into the computer. Checking procedure is repeated until the error list become null.
For the errors which can not be centrally corrected, such as un-existing numbers, the data is returned back to the concerned center. (Calculating of bills)
Based on the entered counters, bills details are computed according to the set of rules specifies by the exploitation directory and included in the tariffs database. This directory includes the tariffs for each kind of communication services. Local and other types of taxes are also included automatically. Some of the bills can be transferred automatically on other bills if requested by the subscriber (grouping bills in one bill). The bills information is stored in the data base ready for formatting and printing.

(3) Formatting and printing of bills
When the computation is complete, bills information are extracted and formatted properly, the then printed for each center separately. The bill includes two coupons. One of them is given to the subscriber and the other one is returned back to the billing center after collecting the bills.

(4) Interfacing with the general accounting

The billing subsystem has a direct interface with the general accounting. The billing results will be reflected automatically in the accounts. Subscriber accounts are updated automatically as a result of billing.

(5) Transfer of bills data to telephone centers

The transfer of bills' data to the different telephone centers is performed through the X.25 WAN. The data received at each center is loaded in the local database. The bills' data are used by the cash registers for the collection of bills.

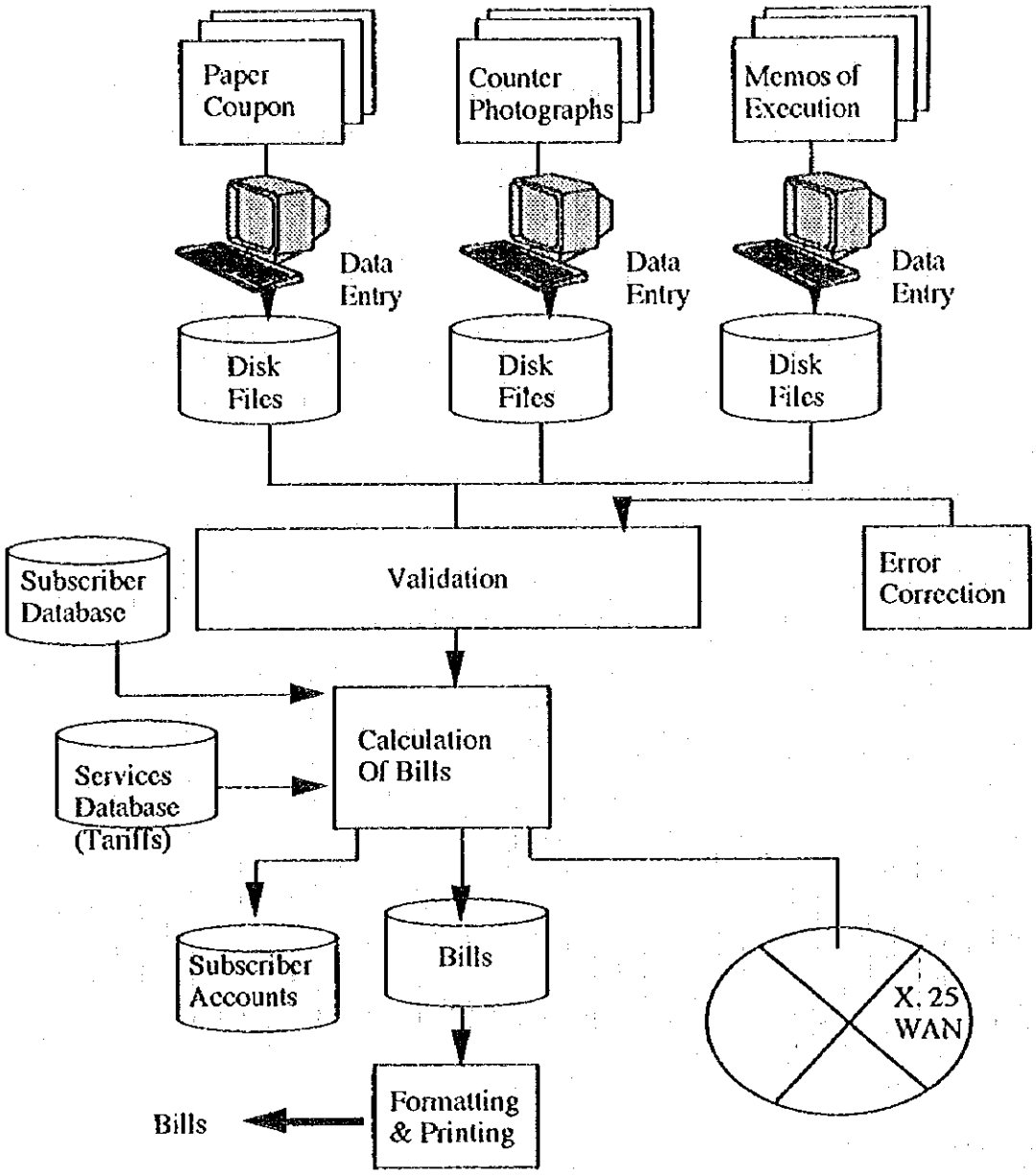


Figure 10.7.4-1 Process-flow of Bill Calculation and Issuing Subsystem

10.7.5 Management Information System (MIS)

(1) Uplating Management Information DB

Information concerning management information such as application, customers, subscribers, billing is send to Management Information System in headquarters via X.25 from billing centers and telephone centers once a month. After received, it is converted and Management Information Database is updated by it.

(2) Processing

Some periodical regular information reports are printed automatically, if users require.
However, users can get any kind of management information report at any time on their request.
- Users select one or more kinds of information they would like to know.
- Users input some parameters for example, period, area, telephone-centers, amount of payment to retrieve records from database.
- Users instruct the computer how to calculate, process or analyze the data.
- Users get the result on the screen. If they would like to get another, they can continue to instruct it what they require.

Examples of processed information are follows:

- Ranking telephone center by the number of new subscriber
- Ranking telephone centers by the rate of collecting bills
- Rate of collecting bills for some area
- Comparison sales of this month with that of last month

They can gain variable and the latest information and it supports them to make decision concerning management.

(3) Formatting and Printing

If they need, they input parameters about formatting and printing, and they get print-out.

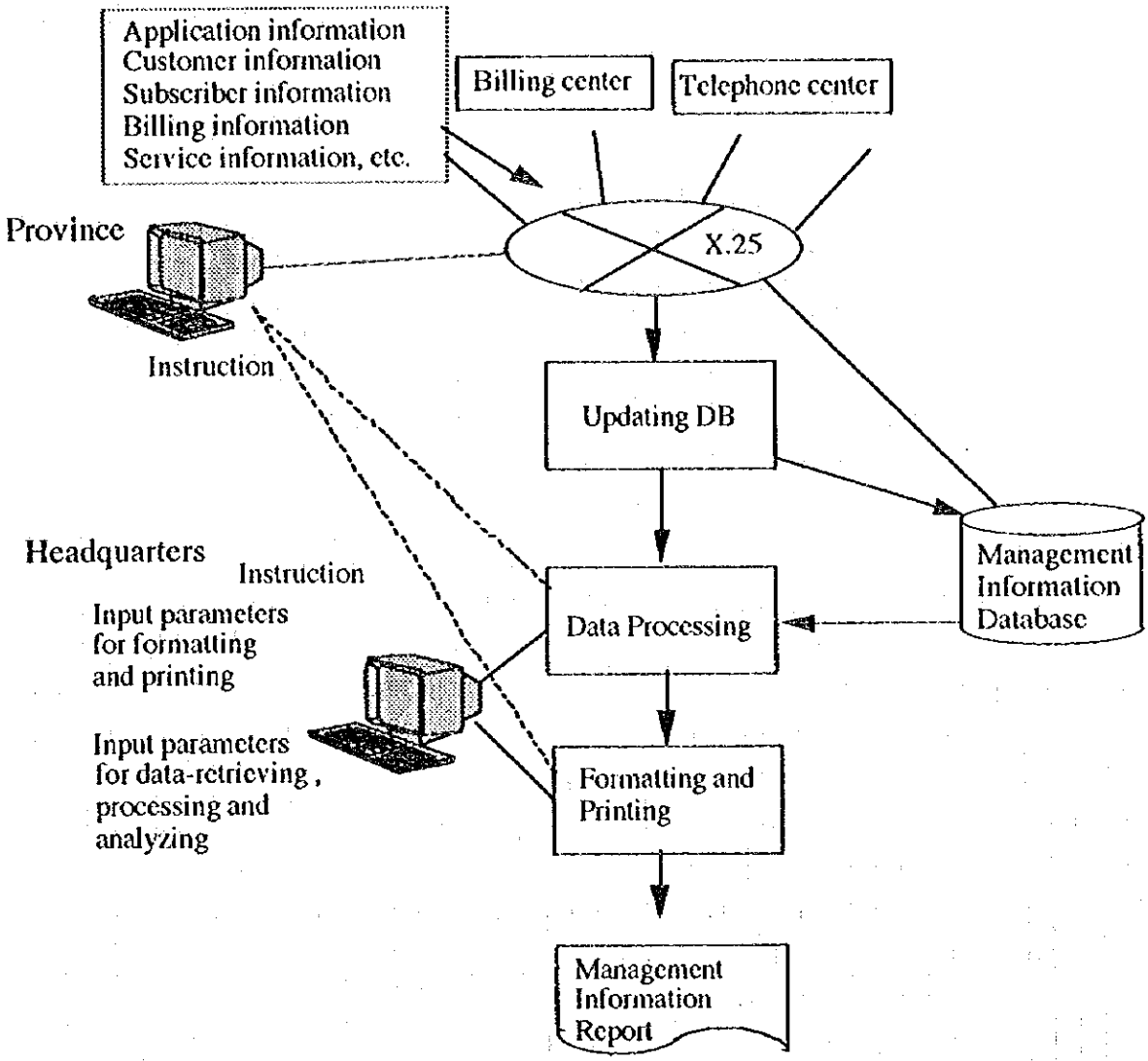


Figure 10.7.5-1 Process-flow of Management Information System

10.8 Implementation Plan

10.8.1 Plan for System Implementation

(1) The plan until 1995

As mentioned before, under the circumstance before implementing the computerized system by Bull in 1995, the computerization of service orders, subscribers-line management, and billing are urgent matters and should be implemented as soon as possible.
After the Bull system has begun operations in 1995, if it is successful enough, STE can temporarily cope with the overflow of billing up to the time, and the increase in new subscribers in 14 telephone centers in Damascus City.

(2) The plan during the Eighth Five-Year Plan (1996-2000)

Considering the expected number of subscribers, inasmuch as the Bull billing-center system in Damascus will have insufficient performance for all of Syria in 1996, another new billing system should be implemented for one of the distributed areas in the country within 1996. This is the most urgent implementation on and after 1996. For the location of another billing center, Aleppo is appropriate because it is the second biggest city and the main city in the northern districts.
After implementation of Aleppo billing center, billing processing is done by two billing center according to provinces as follows.

Table 10.8.1-1 Billing Centers and Divided Area for Each Center (1996-2000)

Billing center	Province
Damascus	Damascus (City), Damascus (Rural), Quennetra, Darra, Sweda
Aleppo	Aleppo, Homs, Hama, Idleb, Der Alzor, Alhasala, Rakkah, Lattakia, Tartous

In this case, as subscribers of Aleppo center are rapidly increasing and will reach to more than 1,000,000 subscribers in the year of 2000, capacity of storage will run short. Before 2000, hard disk of 4 GB or so should be added.

Moreover, the telephone-center system should be implemented in other telephone centers than 14 centers in Damascus within a few years to cope with increasing new subscribers. It is necessary to start to prepare for the order for implementation. Considering the necessary term needed for preparation, it is expected that in 1997 STE can begin implementation by some vendor.
Most of the implementation should be done in 1997 ideally. It will be difficult, however, to install the system in all target telephone centers (35) at once because it would need a great amount of equipment and many engineers or other personnel. Practically, the installation of systems would be done divided into several projects and in succession considering the number of subscribers, the network expansion investment, efficiency of installation, and so forth.
Here we propose that the installation for telephone centers in Damascus Rural, Quennetra, Darra, Sweda and Aleppo should be done in 1997, and that in Idleb, Tartous, Lattakia, Homs, Hama, Alhasaka, Der Alzor and Rakka in 1998.

As regards the management information system (MIS), because it is relatively small-scale and its application is not so complicated, it should be implemented in 1997.

(3) The plan during the 9th Five Year Plan (2001-2005)

The capacity and performance of the billing system in Aleppo is expected to become insufficient after 2000. In addition, it should be better that the risk of system shutdown and charge for billing process of computer and manpower are distributed more than 2 centers, Damascus and Aleppo. Therefore, during the 9th Five Year Plan, billing centers should be increased and finally STE will have 3 more billing centers, and billing process of STE is distributed into 5 by areas; North, Coast, Middle, East, and South.

Table 10.8.1-2 Billing Centers and Divided Area for Each Center (2001-2005)

Billing center	Province
South (Damascus)	Damascus (City), Damascus (Rural), Quennetra, Darra, Sweda
North (Aleppo)	Aleppo, Idleb
Middle	Homs, Hama
Coast	Lattakia, Tartous
East	Der Alzor, Alhasaka, Ralkkah

(4) The plan for during the 10th Five Year Plan (2005-2010)

By the year of 2005, a series of initial implementation of computer system will be completed and service operation in STE will be greatly improved. Considering the life-cycle of computerized system, however, the systems implemented before 2000 would be necessary to be replaced.
It would be difficult to replace all the system at once because it would need much manpower and equipment, so telephone-center systems and billing center systems should be replaced separately. Since the transaction will be still increasing in billing centers, its priority of replacement is higher than that of telephone-center systems. Telephone-center systems should be replaced after that and the management information system should be also replaced in the same way.

Concrete plan for initial implementation and replacement is shown in Table 10.6-3, 10.6-4.

Table 10.8.1-3 Plan for Initial Implementation and Replacement

System	Center	Year of initial implementation	Year of Replacement
Telephone-center	Damascus(City)	1995*	1997
system	Damascus(Rural), Aleppo, Darra, Sweda, Quennetra	1997	1997
	Homs, Hama, Idleb, Latakkia, Tartous, Alhasaka, Der alzor, Rakka	1998	1998
Billing-center	Damascus (South)	1995*	2006
system	Aleppo (North)	1996	2006
	Middle	2001	-
	Coast	2003	-
	East	2005	-
Management Information system	Headquarters in Damascus	1997	2007

Note *: Implemented by Bull before the Eighth Five-Year Plan

Table 10.8.1-4 Telephone-center System Target and Implementation Plan

Province	Telephone centers	Main telephone centers	The plan until 1995	Master Plan (1996-2010)			
			Computeri-zation by Bull	1997	1998	2007 (replace - ment)	2008 (replace - ment)
DAMASCUS (City Area)	14	14	14	0	0	14	0
DAMASCUS (Rural Area)	25	23	0	8	0	8	0
Aleppo	66	15	0	7	0	7	0
HOMS	41	15	0	0	3	0	3
HAMA	56	7	0	0	3	0	3
LATTAKIA	35	9	0	0	4	0	4
DARAA	38	11	0	1	0	1	0
SWEDA	24	4	0	1	0	1	0
TARTOUS	39	6	0	0	3	0	3
IDLEB	51	12	0	0	1	0	1
Der Alzor	40	3	0	0	1	0	1
ALHASAKA	29	6	0	0	2	0	2
QUENNETRA	9	1	0	0	0	0	0
RAKKAH	24	3	0	0	1	0	1
TOTAL	491	129	14	17	18	31	18

Supplement

It is ordinarily appropriate to make a plan for about five years for computerized system. The reasons for this:

- A management objective or plan is made for about five years, on which a computerization plan is based. Moreover, it is possible that the management, organization, financial situation, etc. could change considerably.

- Computer technology or trends cannot be predicted. The situation after five or more years will have changed dramatically.

- It is expected that circumstances in Syria, including the social infrastructure or economy, will have progressed remarkably by the beginning of 2000. Any computerized system and computerization plan will have to be appropriate for future society.

Therefore, this study's computerization plan for STE has been prepared chiefly looking forward to 2000. After that, examples of anticipated computerization are as follow.

- Computerization accompanying organizational reform, such as unification or closing of telephone centers, functional centralization such as centralization of maintenance and sales

- Computerization for new services accompanying social-infrastructural development
  - Paying bills via a bank
  - Service orders by telephone

10.8.2 Staffing Plan

To operate the implemented system more effectively, professional staff is needed for the computers in telephone centers and billing centers, except for personnel who have already accumulated managerial experience in telephone or billing centers. Needed for the computerized system are operators, maintenance personnel, and system engineers. The roles of each and necessary number for each system are listed below.

Table 10.8.2-1 Roles of Required Personnel and Necessary Number

Needed personnel	Location	Role	Necessary Number of staff members
Maintenance person	Telephone center	Maintenance of telephone-center system	One member for each four telephone-center system
Operator	Billing center	Operating and managing billing-center system	Three members for a billing-center
System engineer	Billing center	Developing the application program	Two members for a billing-center
	Headquarters	Maintenance of MIS Developing the application program	One member for the headquarters

According to the implementation plan mentioned above, the number of computer systems is increasing as follows.

Table 10.8.2-2 Number of Implemented Systems

Needed personnel / Year	Number of system centers		
	1996-2000	2001-2005	2006-2010
Telephone-center system	35	35	49
Billing-center system	1	4	5
Management information system	1	1	1

Consequently, the necessary number of staff members per year is indicated as follows.

Table 10.8.2-3 Number of Staff Members for the Computer System

Needed personnel / Year	Number of staff members		
	2000	2005	2010
Maintenance person	9	9	13
Operator	3	12	15
System engineer (for billing center)	2	8	10
System engineer (for MIS)	1	1	1
Total	15	30	39

CHAPTER 11 COST ESTIMATION

11.1 Transmission

11.1.1 Methods of Cost Estimation

The following three methods are applied to each of the projects listed in section 7.1.6.

(1) SDH systems

It is relatively difficult to accurately estimate costs of SDH systems, because they are new, and extensive field data on cost factors are not available. Therefore, this study has applied the microscopic method. First, network configurations are roughly designed. Second, necessary equipment units are selected. Then costs of the units are totaled. Please notice that there may be some errors in this method, because costs of equipment units obtained from manufactures are not the ones which are offered during tender and may be expensive. On the other hand, the roughness of the designs leave out some necessary equipment units, thus balancing the estimation. Overhead costs are neglected, because they are masked by the errors. In spite of the disadvantages mentioned above, it can be said that the method applied here is the best at this moment.

(2) 34Mbit/s Microwave System

Cost per (1+1) system is calculated based on the cost data provided by the 50/A project. First, the total cost of subsystems 1 to 7, including cost of multiplexers, is calculated, then divided by the total number of 34Mbit/s multiplexers used in the subsystems. This result is a figure for one side of a 34Mbit/s microwave (1+1) system, so it is doubled and a 4.5% installation cost is added. The final figure is 365,211$ per (1+1) system.

(3) Cable Burying and Laying Cost

These costs are directly dependent on Labor costs in Syria, so cost data obtained from the STE has been applied. The costs are listed below.

(a) Burying cost (digging, laying, recovery, others) without optical fiber cable cost:
160,000 SP/ km

(b) PVC duct laying cost including costs of PVC duct materials and manholes (8 ducts) without fiber-optic cable cost:
1,200,000 SP/ km

(c) Cable laying cost in PVC duct:
15,000 SP/ km

(d) Cost for PVC ducts
130 SP/ m

For long distance sections, 10% of the section lengths are assumed to be in PVC ducts and the other 90% to be directly buried. In Junction Networks, all new cables are assumed to be in PVC ducts. The Syrian Pound (SP) to US dollar exchange rate is based on 42 pounds to the dollar.

11.1.2 Overview of Five Year Plan

The cost estimation methods explained in section 11.1.1 are applied to each of the projects listed in section 7.1.6. The final estimates are listed in the table below.

Table 11.1.2-1 Transmission Costs for 5-Year Plans

(US$)

	2000	2005	2010
Long Distance Networks	21,700,000	-	-
Junction Networks	6,000,000	5,100,000	5,600,000
Long Distance Local Sections	1,100,000	3,100,000	3,400,000
Local Sections	2,600,000	4,400,000	2,200,000
Sections on Manual Switches	8,800,000	8,800,000	-
TOTAL	40,200,000	21,400,000	11,200,000

11.2 Switching and Intelligent Network

11.2.1 Cost Structure in Syria

In the switching sector, the following cost components are to be considered

- Cost to be borne in foreign currency (US $)

  - Equipment cost,
  - Installation supervision cost

  Cost to be born in local currency (Syrian Pounds)

  - Planning cost,
  - General overhead cost (specification, contract negotiation, commissioning),
  - Installation cost,
  - Cost for buildings and land.

Due to the fact that the installation is fully being performed by local staff, all feasible possibilities to increase the locally added value portion seem to be exhausted.

Local assembly of switching system components (e.g. subscriber line cards) appears not feasible, since in accordance with our experience, a minimum of 150,000 - 180,000 cards per year are to be produced continuously in the long term, to keep a local factory profitable. As to be seen from the overview in section 7.2, in the year 2000, the amount of line units to be procured is estimated to drop significantly below this threshold and is predicted to remain there for a rather long time.

Furthermore, the increase in the locally added value due to assembly is estimated at a maximum of 20% of the present foreign currency portion, since the basic components (integrated circuits, capacitors, resistors, etc.) have still to be imported.

Note: A similar experience has already be made with the local assembly for the system E10.

11.2.2 System Cost Estimation

The contract 40 A was the last representative contract, which can be used to analyze the present cost for switching equipment in Syria. The newest contract on 125,000 line units comprises almost only remote units, which make use of already existing host switches, and is therefore not representative for overall costs in switching.

Subsequently, estimated costs are given per line (unit) for the different types of exchanges. In the foreign cost portion are included: (M)DF, power supply, batteries, diesel, air-conditioning, raised floor and installation supervision. The local currency portion contains: planning, project overhead, installation, testing, buildings and land.

The local currency portion is expressed in US $ based on an exchange rate of 42 Syrian Pounds per US $

Remote Units and Expansion of Existing Local Exchanges inside the Final Capacity

	US $	Syrian Pounds
Foreign currency portion	130	-
Local currency portion	40	1,680
Total per RU / LE line unit	170	-

New Local Exchanges and Expansion Beyond the Present Final Capacity

	US $	Syrian Pounds
Foreign currency portion	177	-
Local currency portion	43	1,810
Total per LE line unit	220	-

Long Distance (STD) Exchanges

	US $	Syrian Pounds
Foreign currency portion	178	-
Local currency portion	37	1,560
Total per STD line	215	-

International Exchanges (IGE)

	US $	Syrian Pounds
Foreign currency portion	355	-
Local currency portion	75	3,150
Total per IGE line	430	-

	US $
Service Control Point (SCP) Hardware	1,000,000
Service Control Point (SCP) Platform Software (Capability Set 1)	4,500,000
Service Management System (SMS) Hardware	1,000,000
Service Management System (SMS) Software (Capability Set 1)	4,500,000
Service Creation Environment (SCE)	1,000,000
Up-grade Hardware (9th Five Year Plan)	1,000,000
Up-grade to Capability Set 2 (9th Five Year Plan)	2,000,000
Total Intelligent Network Infrastructure	15,000,000

Note: The costs for the functions in the local exchanges, i.e. the Service Switching Point (SSP) function and the SS7 Intelligent Network Application Part (INAP), are assumed to be included in the line unit cost quoted above

11.2.3 Cost Trend Estimation

Since the start of market availability, the prices for digital switching equipment showed a very strong downward trend (80% price reduction in the last ten years). In general it is assumed, that in the future also a downward trend will exist. However, this trend will be much less strong than in the past. A price decrease is estimated at 1 - 2% per year.

For the local currency portion, an upward trend is estimated at approximate 6 - 8% per year due to increasing wages and inflation.

As a summary result we predict constant prices for switching equipment in the foreseeable future in conjunction with an increasing functionality (new subscriber features, Service Switching Point functionality, SS7 INAP, TMN (Q) interfaces, management intelligence, etc.)

11.2.4 Unit Cost Estimation

If a telecommunications network is expanded continuously in a balanced way, i.e. all components are provided in accordance with the demand and no over-provision is made in particular network parts (e.g. IGE or STD exchanges), simplified cost estimation is possible, based on unit cost.

Unit cost are obtained by calculating all system cost in portions into the basic unit, which is in the context of switching the subscriber line unit in the local exchange.

For Syria the following unit cost per subscriber line unit (switching cost only) is estimated:

	US $
Local Switching	177
Long Distance Switching Portion	20
International Switching Portion	13
Intelligent Network Infrastructure Portion	10
Planning, Project overhead, Installation, Testing, etc. (local portion)	60
Buildings (portion utilized for switching)	15
UNIT COST per Subscriber Line Unit	295

11.2.5 Five Year Plan Overview

In the following Table the investment cost for switching equipment are estimated based on the figure elaborated in the Facilities Plan (section 7.2) and on the cost estimations above.

For the calculation, system cost have been used in accordance with section 11.2.2 since due to the relatively large portions for older system replacement unit cost are not applicable. For the regular network expansion 50% as remote units and expansion in existing local exchanges inside the present final capacity, and 50% in new local exchanges and expansion beyond the present final capacity have been assumed.

(US$)

	2000	2005	2010
Regular Local Exchange Expansion	111,996,105	30,868,500	28,587,000
Replacement of EMD	48,620,000	-	-
Replacement of E10A/E10B	-	12,760,000	-
Replacement of NEAX61	-	22,000,000	-
Replacement of Manual Exchanges	13,200,000	13,200,000	-
Intelligent Network Infrastructure	12,000,000	3,000,000	-
Long Distance Exchange Expansion	1,827,500	328,950	683,700
International Exchange Expansion	-	-	-
TOTAL SWITCHING INVESTMENT	187,643,605	82,157,450	29,270,700

11.3 Subscriber Network

11.3.1 Unit Cost

In this section, cost estimates are given for the particular network components described in section 9.4 as a basis for the financial evaluations.

Wherever possible, the cost estimates are based on information gained within the scope of this study from Syria. In those cases where such information is lacking, world market prices are used.

Based on information obtained from STE counterparts, the average costs for the physical subscriber network are estimated as US$ 450 per Switching Line Unit (SLU). The breakdown is as follows:

Unit cost per Primary Cable Pair : 133.4 US$ (133.4 x 1.35 = 180 US$ per SLU)
Unit cost per Secondary Cable Pair : 153.8 US$ (153.8 x 1.35 x 1.3 = 270 US$ per SLU)

Note: This amount is applied independently of the chosen subscriber network technology.

As a reference, the average costs for wireless local loop are estimated as US$ 1,100 per subscriber access based on the world market price.

11.3.2 Five-Year Plans

As a final result, the necessary investment for the subscriber network for the particular five-year plans are shown in the following table.

(US$)

Year	2000	2005	2010
Primary Pairs	142,328,462	30,006,996	32,389,520
Secondary Pairs	213,151,420	44,951,126	48,557,736
Total	355,479,882	74,958,122	80,947,256

11.4 Mobile Services

11.4.1 Unit Cost of GSM

Based on current world market prices for the GSM system, the cost for a complete GSM network infrastructure, expressed as a cost per mobile telephone, is estimated at US$ 1,000.

It is expected that STE can achieve a minimum 20% saving due to the availability of the existing fixed network infrastructure; therefore the actual cost, expressed as the cost per Mobile Telephone, is estimated at US$ 800. Based on this "per mobile telephone" estimate, the cost of meeting the projected demand in the year 2005 of approximately 150,000 Mobile Telephones is estimated at just over US$113 Million.

For the particular components of the GSM system, the following unit prices are regarded as valid:

Ref.No.	Components	Price in US$
1	Base Transceiver Station(BTS)	200,000
2	BTS Expansion	260,000
3	Number of BTS Sites	0
4	Base Station Controller(BSC)	400,000
5	Mobile Switching Center(MSC)	3,500,000
6	MSC Expansion	1,000,000
7	OMC/NMC	1,000,000
8	Billing System	1,000,000
9	Microwave(BTS-BSC)	80,000
10	2Mbits/sec(BSC-MSC)	50,000
11	2Mbits/sec(MSC-MSC)	0
12	2Mbits/sec(MSC-PSTN)	0
13	BTS Site Infrastructure	50,000
14	BSC Site Infrastructure	100,000
15	MSC Site Infrastructure	350,000

11.4.2 GSM Five-Year Plans

Based on 1995 unit prices for GSM and the long-term GSM facility plan developed in Chapter 7, Section 7.4.4, a cost estimate of the total GSM infrastructure for each of the future five-year plans is provided in Table 11.4.2-1.

Table 11.4.2-1 Cost Estimates for Syrian GSM Infrastructure

Ref.No.	GSM Infrastructure to be provided in the five year periods:	Investments (US$) by Year:		
	Components	2000	2005	2010
1	Base Transceiver Station(BTS)	18,400,000	17,400,000	0
2	BTS Expansion	0	14,040,000	9,100,000
3	Number of BTS Sites	0	0	0
4	Base Station Controller(BSC)	4,000,000	4,000,000	0
5	Mobile Switching Center(MSC)	3,500,000	3,500,000	0
6	MSC Expansion	0	1,000,000	2,000,000
7	OMC/NMC	1,000,000	0	0
8	Billing System	1,000,000	0	0
9	Microwave(BTS-BSC)	7,360,000	6,960,000	0
10	2Mbits/sec(BSC-MSC)	2,200,000	2,450,000	1,050,000
11	2Mbits/sec(MSC-MSC)	0	0	0
12	2Mbits/sec(MSC-PSTN)	0	0	0
13	BTS Site Infrastructure	4,600,000	4,350,000	0
14	BSC Site Infrastructure	500,000	500,000	0
15	MSC Site Infrastructure	350,000	350,000	0
17	Design & installation Cost	4,291,000	5,455,000	1,215,000
18	Miscellaneous Set-Up Cost	6,000,000	0	0
		0	0	0
20	Total Cost	53,201,000	60,005,000	13,365,000

The following notes are provided to explain Table 11.4.2-1:

General Note 1: The information contained within this table has been calculated based on a demand forecast for more than 210,000 mobile subscribers by the year 2010. The calculations have been made without the benefit of a field survey and should therefore be understood as indicative of the scale of the infrastructure required. This table should not be used as the basis of a procurement specification. Detailed field surveys will be required as part of any network procurement process.

General Note 2: The amounts shown in the columns are the cumulative totals for each 5 year period: i.e. each column shows the total investment on infrastructure for the 5 year period up to the year indicated.

Note (Ref. No. 3): The number of BTS sites is estimated based on the assumption that there will be one BTS per site. Cost for sites are shown under item Ref. No. 13.

Note (Ref. No. 8): It is recommended that the Mobile Telephone Service should have a separate billing system from that of the fixed network, in line with the recommendation that the Mobile Telephone Service be managed with a "functionally separate management structure". In addition, there are known problems with the billing system for the fixed network that STE is in the process of sorting out. This is not the time to add an additional burden on the existing billing system.

Note (Ref. Nos. 10,11,12): It is assumed that BSC and MSC sites may be selected in order to optimize the use of the existing/planned transmission network facilities of STE's PSTN and therefore to minimize cost. An average figure of US$ 50,000 is used as an estimate of the cost per 2 Mbit/sec capacity between the BSC and the MSC. It is assumed that the MSC-MSC and MSC-PSTN transmission cost will be negligible, bearing in mind that the locations of the MSCs can be fully optimized with the design of the national transmission network.

Note (Ref. Nos. 13,14): It is assumed that STE's existing site infrastructure (buildings, towers, power, etc.) may be used to a significant extent, particularly in the start-up phase of the project, so that network construction time is minimized and cost savings can be achieved.

Note (Ref. No. 20): As recommended in Chapter 3, Section 3.4.1, expenditure should be foreseen in the first phase of the project for procurement of the services of an experienced external company to support the local management in the procurement and operation of the GSM network for a period of two years or longer, if necessary. Item 20 (total of 17 & 18) includes an estimate for this expenditure.

11.4.3 Unit Cost of Paging Services

Based on current world market prices for the Paging Services system, the cost for a complete Paging Services infrastructure, expressed as a cost per pager, is estimated at US$ 300.

It is expected that STE can achieve a minimum of 20% saving due to the availability of the existing fixed network infrastructure; therefore the actual cost, expressed as the cost per pager, is estimated

at US $240. Based on this "per pager" estimate, the cost of meeting the projected demand in the year 2010 of approximately 100,000 pagers, is estimated at US$ 24 Million.

For the particular components of the Paging Services system, the following unit prices are considered valid:

Ref.No.	Components	Price in US$
1	Base Station	130,000
2	Base Station Expansion	40,000
3	Number of B.S Sites	0
4	Paging Processor	2,000,000
5	Paging Processor Expansion	100,000
6	OMC/NMC	1,000,000
7	Billing System	1,000,000
8	Transmission Lines (B.S-Paging Processor)	0
9	2Mbit/s (PSTN-Paging Processor)	0
10	B.S Site Infrastructure	50,000
11	Paging Processor Site Infrastructure	350,000

11.4.4 Paging Services Five-Year Plans

Based on 1995 unit prices for Paging Services and the long-term Paging Services facility plan developed in Chapter 7 Section 7.4.5, a cost estimate of the total Paging Services infrastructure for each of the future five-year plans is provided in Table 11.4.4-1.

Table 11.4.4-1 Cost Estimates for Syrian Paging Services Infrastructure

Ref.No.	Paging Services Infrastructure to be provided in the five year periods:	Investments(US$)by Year:		
	Components	2000	2005	2010
1	Base Station	5,200,000	8,580,000	0
2	Base Station Expansion	0	440,000	440,000
3	Number of B.S Sites	0	0	0
4	Paging Processor	2,000,000	0	0
5	Paging Processor Expansion	0	100,000	100,000
6	OMC/NMC	1,000,000	0	0
7	Billing System	1,000,000	0	0
8	Transmission Lines (B.S-Paging Processor)	0	0	0
9	2Mbit/s (PSTN-Paging Processor)	0	0	0
10	B.S Site Infrastructure	1,000,000	1,750,000	0
11	Paging Processor Site Infrastructure	350,000	0	0
13	Design & Installation Cost	1,055,000	1,087,000	54,000
15	Total Cost	11,605,000	11,957,000	594,000

The following notes are provided to explain Table 11.4.4-1:

General Note 1: The information contained within this table has been calculated based on a demand forecast for more than 100,000 Paging Services subscribers by the year 2010. The calculations have been made without the benefit of a field survey and should therefore be understood as indicative of the scale of the infrastructure required. This table should not be used as the basis of a procurement specification. Detailed field surveys will be required as part of any network procurement process.

General Note 2: The amounts shown in the columns are the cumulative totals for each 5 year period: i.e., each column shows the total investment on infrastructure for the 5 year period up to the year indicated.

Note (Ref.No.3): The number of Base Station sites is estimated based on the assumption that , on average, there will be at least two Base Stations per site. Cost for sites are shown under item Ref.No.10.

Note (Ref. Nos.6,7): At present it is not certain whether the Paging Services should be managed with a functionally separate management structure from the fixed network. It is also assumed that there is one Billing system and one OMC/NMC for all mobile services. Further discussions will be required to decide on the management structure.

Note (Ref.Nos.8,9): It is assumed that Base Station and Paging Processor sites may be selected in order to optimize the use of the existing/planned transmission network facilities of STE's PSTN and therefore to minimize cost.
It is also assumed that the Base Station-Paging Processor and PSTN-Paging Processor Transmission line cost will be negligible, bearing in mind that the location of the Paging Processor can be fully optimized with the design of the national transmission network, and that conventional symmetrical cables are available for the lines between the Base Stations and the Paging Processor.

Note (Ref.No.10): It is assumed that STE's existing site infrastructure(buildings, towers, power,etc.) may be used to a significant extent, particularly in the start-up phase of the project, so that network construction time is minimized and cost savings can be achieved.

11.5 Packet Switched Data Network

Based on the PSDN facility plan contained in Chapter 7, Section 7.5, the cost estimates for the PSDN infrastructure are provided in Table 11.5-1. Cost estimates are based on the assumption that the existing PSDN will be used and upgraded according demand. However this has to be evaluated and confirmed in a feasibility study.

Table 11.5-1 Cost Estimate for PSDN

(Unit: US$)

Ref. No		2000	2005	2010
1	Delta* dedicated accesses (Qty)	180	-	-
2	Delta* dial-up accesses (Qty)	200**	500**	-
	Costs (US$)			
3	PSDN upgrade (switches, FEPs, MUX etc.)	400,000	180,000	-
4	Net Mgt Center upgrade	20,000	10,000	-
5	Site infrastructure	15,000	5,000	-
6	Auxiliary equipment (e.g. test facilities)	40,000	30,000	-
7	Miscellaneous	40,000	40,000	50,000
8	**Total Cost**	**515,000**	**265,000**	**50,000**

Notes:

- * Delta = increase during five-year period
- ** Delta figures minus access via ISDN interworking
- The cost are estimated on a five-year basis according to the five-year planning adopted for the development of the telecommunications infrastructure.

Related platforms (networks)

Table 11.5-2 Cost Estimation for PSDN-ISDN Interworking

Ref. No		2000	2005	2010
	Total Cost	**300,000**	**300,000**	**50,000**

Table 11.5-3 Cost Estimation for New Generation Networks (including MBS)

Ref. No		2000	2005	2010
1	Total Cost	1,400,000	2,500,000 *	3,500,000 *

Notes:

- Investments mainly in networks based on ATM technology. Because ATM supports any kind of communication, a clear distinction between services (voice, data, video etc.) is not any longer possible.

Table 11.5-4 Cost Estimation: Total

Ref. No		2000	2005	2010
	Total Cost	2,215,000	3,065,000	3,600,000

11.6 Network Management

11.6.1 Transmission Facilities Management

During the Eighth Five-Year Plan it is proposed (see Chapter 8.4) that Transmission Facilities Management Centers be installed at three locations :

- Damascus, covering the Damascus Metropolitan and Rural Areas
- Alleppo, covering the Alleppo Metropolitan and Rural Areas
- Damascus, covering the long distance transmission network.

The cost of providing Transmission Facilities Management at these three centers is estimated at US $ 1 million per center. This does not include the cost of providing the required intelligence in transmission nodes (network elements) which is assumed to be covered by the cost estimates for the transmission systems.

11.6.2 Traffic Management

During the Ninth Five-Year Plan it is proposed (see Chapter 8.4) that a National Traffic Management Center be installed at Damascus. Based on current World prices the cost of the National Traffic Management center is estimated at US $ 10 million.
This estimate excludes the cost of providing the functionality/intelligence in the Network Elements (exchanges) to interface with the NMC. The latter costs are assumed to be covered by the estimates for switching.

11.6.3 Five-Year Plans

As a final result the necessary investment for the Network Management Centers for the particular five-year plans are shown in the following table.

Year	2000	2005	2010
Transmission Management Centers	3,000,000 $	-	-
Traffic Management Centers	-	10,000,000 $	-
Total	3,000,000 $	10,000,000 $	-

11.7 Telecommunications Management Network

11.7.1 General

There are two aspects to consider in arriving at cost estimations for TMN.

The first is the cost of implementing TMN functionality, interfaces and communications capabilities in the different network elements and systems:

- Network Elements such as Switches, Transmission, Local Network, Common Channel Signalling Network, etc.
- Network Element Management and Network Management Systems
- Operating Systems for Service Management, Business Management

In general, it has to be assumed that the cost associated with implementing TMN in the above systems will be covered by the cost estimations for the specific systems and their associated supervisory and O&M requirements. It is not sensible to provide separate cost estimates for implementing TMN functionality since this would in most cases be duplicated in the cost estimates for the various network systems and operating systems that anyway will have to be provided.

The possible exception to this assumption is the cost associated with implementing a fully TMN "concept" compatible service provisioning system, which would in effect involve the requirement for additional Operating Systems.

Therefore an amount of the order of US$ 15 million should be foreseen as additional expenditure for TMN implementation during the Ninth Five-Year Plan and US$ 5 million during the Tenth five-year plan.

The second aspects to the cost of TMN is the cost of the Data Communications Network (DCN) infrastructure. The current assumption, based on the services strategy, is that the core of the DCN infrastructure will largely take the form of a packet switched data network that will also be used to support Packet Switched Data Network (PSDN) services. Cost estimates for the Data Communications Network are contained in Section 11.5.

11.7.2 Five-Year Plans

As a final result the necessary investment for the TMN for the particular five-year plans are shown in the following table:

Year	2000	2005	2010
Cost for TMN	-	15,000,000 $	5,000,000 $

11.8 Computerization

11.8.1 General

In estimating the cost for the STE computerization the preconditions are as follows.

- To procure hardware in Syria.
- To utilize and customize packaged software.
- To exclude construction costs for new buildings because it is possible all of the systems are installed in existing structures.
- To exclude communications expenses because the network facility is owned.

We calculate the necessary quantity of hardware and software described in Chapter 10 (10.6) for each Five Year Plan according to Development Plan (Chapter 10 (10.8)) and estimate the costs by using the quantity and the unit prices for hardware, software, and so on. However, actual costs would be lower than the estimated system costs shown below, because the prices of hardware, software, etc. depend on the relationship between customer and vendor in general; in other words, the prices are negotiable.

11.8.2 Telephone-center System

(1) Hardware

The cost during the Eighth Five Year Plan (1996-2000) is approximately $3.9 million (=162 million Syrian pounds).

Table 11.8.2-1 Cost of Telephone-center Hardware (1996-2000)

Device	Unit price($)	Quantity	Cost($)
Server	15,400	35	539,000
Terminal (inc. cash register)	4,290	496	2,127,840
Laser printer	1,860	385	716,100
Printer	1,860	102	189,720
Router	4,800	35	168,000
Hub	360	102	36,720
MODEM	350	35	12,250
UPS	1,980	35	69,300
Total			3,858,930

During the Ninth Five Year Plan (2001-2005) there is no cost because no telephone-center system is implemented.

All of the telephone-center systems implemented by 2000 including those in Damascus City implemented in 1995 are replaced during the Tenth Five Year Plan (2006-2010). Assuming that replacement cost for each telephone-center system is equal to the first implementation cost, it takes approximately $5.5 million (=229 million Syrian pounds) in total.

Table 11.8.2-2 Cost of Telephone-center Hardware (2006-2010)

Device	Unit price($)	Quantity	Cost($)
Server	15,400	49	754,600
Terminal (inc. cash register)	4,290	704	3,020,160
Laser printer	1,860	539	1,002,540
Printer	1,860	150	279,000
Router	4,800	49	235,200
Hub	360	144	51,840
MODEM	350	49	17,150
UPS	1,980	49	97,020
Total			5,457,510

(2) Software

The cost of application software is especially variable because it depends on number of subscribers, requested specification, performance, reliability and other conditions. Therefore, the

unit price for application software shown below is not definite.

The total cost during the Eighth Five Year Plan (1996-2000) is approximately $2.8 million (=116 million Syrian pounds).

Table 11.8.2-3 Cost of Telephone-center Software (1996-2000)

Kind of software		Unit price($)	Quantity	Cost($)
Operating system for server (inc. network software)	UNIX	3,354	35	117,390
Database software	RDBMS	10,935	35	382,725
Operating system for terminal	DOS, Windows (pre-installed in terminals)	360	0	0
Network software for terminal	(for DB manipulation)	Depend on number of terminals	496	19,050
Application software*	Packaged software customized for STE	2,240,000	1	2,240,000
Total				2,759,165

Note*: The price of application software is considered to include training price for users.

During the Ninth Five Year Plan (2001-2005) the cost is zero and during the Tenth Five Year Plan (2006-2010) the cost is approximately $3.0 million (=125 million Syrian pounds).

Table 11.8.2-4 Cost of Telephone-center Software (2006-2010)

Kind of software		Unit price($)	Quantity	Cost($)
Operating system for server (inc. network software)	UNIX	3,354	49	164,346
Database software	RDBMS	10,935	49	535,815
Operating system for terminal	DOS, Windows (pre-installed in terminals)	360	0	0
Network software for terminal	(for DB manipulation)	Depend on number of terminal	704	27,600
Application software	Packaged software customized for STE	2,240,000	1	2,240,000
Total				2,967,761

(3) Installation Cost

Beside hardware cost and software cost, we need to consider system installation cost. It is calculated according to this formula; Cost of hardware x 5% (including access control equipment, cables and other small devices).
The installation cost during the Eighth Five Year Plan (1996-2000) is approximately $193,000 (=8.1 million Syrian pounds) and during the Tenth Five Year Plan (2006-2010) approximately $273,000 (=11.5 million Syrian pounds).

Table 11.8.2-5 Installation Cost of Telephone-center System

Year	Hardware cost of telephone-center system($)	Installation cost($)
1996-2000	3,858,930	192,947
2001-2005	0	0
2006-2010	5,457,510	272,876

11.8.3 Billing-center System

(1) Hardware

During the Eighth Five Year Plan (1996-2000), Aleppo billing-center system should be implemented in addition to Damascus billing-center system implemented in 1995. Moreover, in accordance with the rapid increase of subscribers, hard disk should be added before the year of 2000. The total cost is approximately $403,000 (=16.9 million Syrian pounds).

Table 11.8.3-1 Cost of Billing-center Hardware (1996-2000)

Device	Unit price($)	Quantity	Cost($)
Billing computer (Server)	31,484	2	62,968
Hard disk (additional 4GB)*	5,600	1	5,600
Line printer	26,670	2	53,340
Laser printer	7,200	1	7,200
Magnetic tape unit	33,330	2	66,660
Terminal	4,290	32	137,280
Hub	360	6	2,160
Router	4,800	1	4,800
MODEM	350	1	350
UPS	31,100	2	62,200
Total			402,558

Note*: When the system is implemented initially the additional hard disk is not necessary, therefore the cost is $396,958 for the first implementation.

During the Ninth Five Year Plan (2001-2005), three billing-center systems are implemented; Middle, Coast and East. The cost is approximately $747,000 (=31.3 million Syrian pounds).

Table 11.8.3-2 Cost of Billing-center Hardware (2001-2005)

Device	Unit price($)	Quantity	Cost($)
Billing computer (Server)	31,484	6	188,904
Line printer	26,670	3	80,010
Laser printer	7,200	3	21,600
Magnetic tape unit	33,330	6	199,980
Terminal	4,290	12	51,480
Hub	360	6	2,160
Router	4,800	3	14,400
MODEM	350	3	1,050
UPS	31,100	6	186,600
Total			746,184

During the Tenth Five Year Plan (2006-2010), Damascus and Aleppo billing-center systems are replaced. Both of them have less devices especially terminals than the first implementation because telephone-center systems and the other billing-center systems will have their processing capacity and the charge on Damascus and Aleppo billing-center systems will have decreased. The cost is

approximately $532,000 (=22.3 million Syrian pounds).

Table 11.8.3-3 Cost of Billing-center Hardware (2006-2010)

Device	Unit price($)	Quantity	Cost($)
Billing computer (Server)	31,484	4	125,936
Line printer	26,670	2	53,340
Laser printer	7,200	2	14,400
Magnetic tape unit	33,330	4	133,320
Terminal	4,290	16	68,640
Hub	360	4	1,440
Router	4,800	2	9,600
MODEM	350	2	700
UPS	31,100	4	124,400
Total			531,776

(2) Software

During the Eighth Five Year Plan (2001-2005) the total cost is approximately $29,000 (=1.2 million Syrian pounds).

Table 11.8.3-4 Cost of Billing-center Software (1996-2000)

Kind of software		Unit price($)	Quantity	Cost($)
Operating system for server (Inc. network software)	UNIX	3,354	2	6,708
Database software	RDBMS	10,935	2	21,870
Operating system for terminal	DOS, Windows (pre-installed in terminals)	360	0	0
Compiler	C compiler	600	1	600
Application software*	Packaged software customized for STE billing	4,460,000	0	0
Total				29,178

Note*: The price of application software is considered to include training price for users.

During the Ninth Five Year Plan (2001-2005) the total cost is approximately $88,000 (=3.7

million Syrian pounds).

Table 11.8.3-5 Cost of Billing-center Software (2001-2005)

Kind of software		Unit price($)	Quantity	Cost($)
Operating system for server (Inc. network software)	UNIX	3,354	6	20,124
Database software	RDBMS	10,935	6	65,610
Operating system for terminal	DOS, Windows (pre-installed in terminals)	360	0	0
Compiler	C compiler	600	3	1,800
Application software	Packaged software customized for STE billing	4,460,000	0	0
Total				87,534

Damascus and Aleppo billing-center systems implemented by 2000 are replaced during the Tenth Five Year Plan (2006-2010). In case that replacement cost is assumed to be the same as the initial implementation cost, the total cost of billing-center software would be approximately $4.5 million (=190 million Syrian pounds).

Table 11.8.3-6 Cost of Billing-center Software (2006-2010)

Kind of software		Unit price($)	Quantity	Cost($)
Operating system for server (Inc. network software)	UNIX	3,354	4	13,416
Database software	RDBMS	10,935	4	43,740
Operating system for terminal	DOS, Windows (pre-installed in terminals)	360	0	0
Compiler	C compiler	600	2	1,200
Application software	Packaged software customized for STE billing	4,460,000	1	4,460,000
Total				4,518,356

(3) Other Cost

Regarding the billing-center system, air-conditioners are needed to keep appropriate temperature and humidity for computers. Costs of air-conditioner for each Five Year Plan are shown below.

Table 11.8.3-7 Cost of Air-conditioner for Billing-center System

Equipment	Unit price($)	Year	Quantity	Cost($)
Air-conditioner	2,000	1996-2000	2	4,000
		2001-2005	6	12,000
		2006-2010	4	8,000

And in the way as for the telephone-center system, system installation cost should be included in the cost of billing-center system; cost of hardware × 5% (including access control equipment, cables and other small devices).
The installation costs for each Five Year Plan are shown below.

Table 11.8.3-8 Installation Cost of Billing-center System

Year	Hardware cost for billing-center system($)	Installation cost($)
1996-2000	396,958*	19,848
2001-2005	746,184	37,309
2006-2010	531,775	26,589

Note*: The first implementation cost excluding additional hard disk

Total of other billing-center cost for each Five Year Plan are shown below.

Table 11.8.3-9 Total of Other Billing-center Cost

Year	Total of other billing-center cost($)
1996-2000	23,843
2001-2005	49,309
2006-2010	34,589

11.8.4 Management Information System (MIS)

(1) Hardware

During the Eighth Five Year Plan (1996-2000) the cost is approximately $252,000 (=10.6 million Syrian pounds).

Table 11.8.4-1 Cost of MIS Hardware (1996-2000)

Device	Unit price($)	Quantity	Cost($)
Server	15,400	1	15,400
Terminal	26,670	36	154,440
Laser printer	7,200	37	68,820
Hub	360	3	1,080
Router	4,800	1	4,800
MODEM	350	17	5,950
UPS	1,980	1	1,980
Total			252,470

During the Ninth Five Year Plan (2001-2005) there is no MIS implementation and there is no cost. MIS implemented by 2000 are replaced during the Tenth Five Year Plan (2006-2010). Assuming that replacement cost is equal to the first implementation cost, the total cost of MIS haraware would be approximately $252,000 (=10.6 million Syrian pounds).

Table 11.8.4-2 Cost of MIS Hardware (2006-2010)

Device	Unit price($)	Quantity	Cost($)
Server	15,400	1	15,400
Terminal	26,670	36	154,440
Laser printer	7,200	37	68,820
Hub	360	3	1,080
Router	4,800	1	4,800
MODEM	350	17	5,950
UPS	1,980	1	1,980
Total			252,470

(2) Software

During the Eighth Five Year Plan (1996-2000) the total cost is approximately $39,000 (=1.6 million Syrian pounds).

Table 11.8.4-3 Cost of MIS Software (1996-2000)

Kind of software		Unit price($)	Quantity	Cost($)
Operating system for server (inc. network software)	UNIX	3,354	1	3,354
Database software (Server)	RDBMS	10,935	1	10,935
Database software (Client)		930	2	1,860
Operating system for terminal	DOS, Windows	360	36	12,960
Application software		10,000	1	10,000
Total				39,109

Note: The price of application software is considered to include training price for users.

During the Ninth Five Year Plan (2001-2005) there is no cost because there is no implementation. Cost for replacement during the Tenth Five Year Plan (2006-2010) is approximately $39,000 (=1.6 million Syrian pounds).

Table 11.8.4-4 Cost of MIS Software (2006-2010)

Kind of software		Unit price($)	Quantity	Cost($)
Operating system for server (Inc. network software)	UNIX	3,354	1	3,354
Database software (Server)	RDBMS	10,935	1	10,935
Database software (Client)		930	2	1,860
Operating system for terminal	DOS, Windows	360	36	12,960
Application software		10,000	1	10,000
Total				39,109

(3) Installation Cost

System installation cost is calculated in the same as for the telephone-center system; Cost of hardware x 5% (including access control equipment, cables and other small devices).

The installation cost during the Eighth Five Year Plan (1996-2000) is approximately $13,000 (=530,000 Syrian pounds), during the Ninth Five Year Plan (2001-2005) there is no installation cost, and during the Tenth Five Year Plan (2006-2010) approximately $12,000 (=530,000 Syrian pounds).

Table 11.8.4-5 Installation Cost of MIS

Year	Total hardware cost of MIS ($)	Installation cost($)
1996-2000	252,470	12,624
2001-2005	0	0
2006-2010	252,470	12,624

11.8.5 Total Cost of Five Year Plans

As the result of estimation above (11.8.1 - 11.8.4), total cost for the computerization is about $22.5 million (=947 million Syrian pounds).

Table 11.8.5-1 Total Cost for the Computerization

System	Year	1996-2000	2001-2005	2006-2010	Total
Telephone-center System	Hardware	3,858,930	0	5,457,510	9,316,440
	Software	2,759,165	0	2,967,761	5,726,926
	Others	192,947	0	272,876	465,823
	Subtotal	**6,811,042**	**0**	**8,698,147**	**15,509,189**
Billing-center System	Hardware	402,558	746,184	531,776	1,680,518
	Software	29,178	87,534	4,518,356	4,635,068
	Others	23,848	49,309	34,589	107,746
	Subtotal	**455,584**	**883,027**	**5,084,721**	**6,423,332**
Management Information System	Hardware	252,470	0	252,470	504,940
	Software	39,109	0	39,109	78,218
	Others	12,624	0	12,624	25,248
	Subtotal	**304,203**	**0**	**304,203**	**608,406**
Total Cost for Computerization		**7,570,829**	**883,027**	**14,087,071**	**22,540,927**

(US$)

11.9 Summary

The total investment cost for long term plan is listed in Table 11.9-1.

Table 11.9-1 Total Cost Estimation Summary for Long Term Plan

(Unit: Million US dollars)

Year / Facility / System	1996 - 2000	2001 - 2005	2006 - 2010	Total
Switching System	187.6	82.2	29.3	299.1
Subscriber Network	355.5	75.0	80.9	511.4
Transmission System	40.2	21.4	11.2	72.8
Mobile Services	64.8	72.0	14.0	150.8
Data Communication Services	2.2	3.1	3.6	8.9
Network Management	3.0	10.0	0.0	13.0
Telecom Management Network (TMN)	0.0	15.0	5.0	20.0
Computerization	7.6	0.9	14.1	22.6
TOTAL	660.9	279.6	158.1	1098.6

CHAPTER 12 PROJECT EVALUATION

12.1 Purpose

In this chapter the project's financial viability and potential profitability are evaluated and financial analysis has conducted just for reference.
In the Feasibility Study, the Project, mainly on Damascus City, will be evaluated not only from financial point of view but also from economic point of view.
Refer to the chapter 10.5 on computerization for evaluation of business process improvements, including reduced personnel expenses, offered by computerizing operations.

12.2 Procedure

Financial analysis of the project is based on a cost versus profit analysis using an internal rate of return. Since most of the STE's revenue and expenditure are settled in US dollars, all the revenues and costs concerning the project were calculated in US dollars. The project was evaluated using the following methods:

(1) Estimation of capital expenditure and operating expenditures (cash outflow)
(2) Estimating operating revenue (cash inflow)
(3) Creation of cash flow table and calculation of financial internal rate of return (FIRR) .

12.3 Premises and Assumptions

The first step is to identify the premises and assumptions for the project. Realistic and simple assumptions make evaluation more reliable and accurate. The basic premises and assumptions of this evaluation are described in the following sections.

(1) The Duration of the Project's Revenues

The duration of the project revenues is longer than the duration of the project's investments. Though the project duration is until 2010, the duration of revenues was calculated until 2020. The reasons of it are as follows;

a) The lives of facilities are mainly 10 years and 20 years (e.g. EMD switches), so it is reasonable to settle the duration of revenues as 10 years after the end of investments.

b) From the worldwide points of view, it is general to settle the duration of revenues as about 10 years after the end of investments.

(2) Salvage Value

The salvage value for facilities having longer service lives than the duration of the project is entered as a negative cost at the end of the project. The salvage value of the equipment that has reached the end of its service life is considered nil.

(3) Inflation

The effects of inflation were not considered. Although price changes affect both project costs and revenues, prices that increase at the same rate at home and abroad mean they maintain the same levels.

(4) Revenues and Costs Estimation

The present tariff rate (1995) was used to estimate the revenues in the project.

12.4 Estimation of the Project Revenues

The project revenues consist of telephone installation fees, basic yearly charges, local call charges, long distance call charges, international call charges, facsimile installation fees, telex charges, telegraph charges and others.

(1) Revenue per main line from 1992 to 1994

The number of main lines, revenues and revenue per main line from 1992 to 1994 according to STE statistics are shown in Table 12.4-1. OECD countries' revenue per main line are shown in Table 12.4-2.

Table 12.4-1 Revenue per Main Line (1992 - 1994)

Year	Number of Main Lines	Revenues (US$)	Revenue per Main Line (US$)	Increment (US$)
1994	688,500	154,600,000	224.5	38.7
1993	550,000	102,200,000	185.8	38.7
1992	513,000	75,480,000	147.1	-

Table 12.4-2 OECD Countries' Revenue Per Mainline (1992)

(US$)

Australia	1,088	Japan	947
Austria	942	Luxembourg	1,122
Belgium	754	Netherlands	807
Canada	847	New Zealand	877
Denmark	860	Norway	1,076
Finland	718	Portugal	684
France	770	Spain	845
Germany	976	Sweden	1,021
Greece	352	Switzerland	1,383
Iceland	736	Turkey	263
Ireland	1,243	United Kingdom	1,012
Italy	852	United States	1,114
OECD average			965
Syria			147

Source: Communications Outlook 1995 (OECD)

(2) The Estimate of the Project Revenues

We estimated the annual project revenue as shown in Table 12.4-3, by forecasting the number of mainline, the revenue per main line, and traffic distribution.

Table 12.4-3 The Estimate of the Project Revenue

Year	Annual Increment	Number of Main Line	Revenue (US$)
1995			
1996	204,000	204,000	49,798,000
1997	205,000	409,000	95,820,500
1998	205,000	614,000	141,843,000
1999	205,000	819,000	187,865,500
2000	205,000	1,024,000	273,516,800
2001	27,000	1,051,000	286,623,200
2002	28,000	1,079,000	293,992,800
2003	28,000	1,107,000	301,362,400
2004	29,000	1,136,000	308,995,200
2005	29,000	1,165,000	316,628,000
2006	30,000	1,195,000	319,024,000
2007	30,000	1,225,000	326,920,000
2008	30,000	1,255,000	334,816,000
2009	31,000	1,286,000	342,975,200
2010	31,000	1,317,000	351,134,400

12.5 The Estimate of the Project Costs

In general, the project costs consist of investment costs, which include construction and procurement costs, consulting fees etc., operation and maintenance costs, working capital and taxes.

(1) Investment Costs

Investment costs examined and estimated in this report include the prices for facilities, equipment, land and buildings, vehicles, construction and installation fees, and consulting fees. Investment costs for the project are shown in Table 12.5-1

Table 12.5-1 Investment Costs

(US$)

Year	Switching	PSDN	TMN	Trans-mission	Subscriber Network	Mobile System	Traffic Manage-ment	Computer	Total
1996 to 2000	187,643,605	2,215,000	0	40,200,000	355,479,882	64,806,000	3,000,000	7,570,829	660,915,316
2001 to 2005	82,157,450	3,065,000	15,000,000	21,400,000	74,958,122	71,962,000	10,000,000	883,027	279,425,599
2006 to 2010	29,270,700	3,600,000	5,000,000	11,200,000	80,947,256	13,959,000	0	14,087,071	158,064,027

(2) Operation and Maintenance Costs

Expenses for the operation and maintenance of telecommunications networks consist of personnel costs, administration costs, and repair costs.

Table 12.5-2 Cost per Main Line (1992 - 1994)

Year	Number of Main Lines	Expenses (US$)	Cost per Main Line (US$)	Increment (US$)
1994	688,500	65,640,000	95.34	32.83
1993	550,000	34,380,000	62.51	6.55
1992	513,000	28,710,000	55.96	-

Table 12.5-3 Operation and Maintenance Costs in 1994

Payment to International operator	Personnel	Utilities	Others	Total
22,330,000	27,050,000	3,190,000	13,070,000	65,640,000

Generally speaking, "cost per main line" tends to decrease as telecommunication technology improves; however, in the case of Syria, "cost per main line" went up between 1992 and 1994.

12.6 Working Capital

Working capital can be recovered within a short time through business activities. The capital includes current deposits as cash on hand, and accounts receivable as funds necessary until call charges are collected. Although working capital is calculated as an annual expense, it should be recovered during the final year of the project.

12.7 Taxes

The STE pays about 58.5% of annual profits to government as a tax obligation. Because the STE is a government organization (public corporation), the FIRR should be calculated on the basis of pre-tax revenue.

12.8 Results of Financial Analysis

The FIRR is the discount rate that makes the total present value of investment costs equal to the total present value of annual profit.
Table 12.8-1 shows a tentative revenue and expenditure statement. The project will have the **14.29%** tentative internal rate of return. In case that the project includes the benefits of the Computerized System (Refer to S1-12-1), the tentative internal rate of return will be **16.21%**.

Table 12.8-1 Tentative Cash Flow Table

Year	Number of Subscribers	Total Revenue [A]	Investment	Operation & Maintenance Cost	Working Capital	Total Expense [B]	Net Inflow [A] - [B]
1996	204,000	49,798,000	132,183,063	19,449,360	14,939,400	166,571,823	-116,773,823
1997	409,000	95,820,500	132,183,063	38,994,060	28,746,150	199,923,273	-104,102,773
1998	614,000	141,843,000	132,183,063	58,538,760	42,552,900	233,274,723	-91,431,723
1999	819,000	187,865,500	132,183,063	78,083,460	46,966,375	257,232,898	-69,367,398
2000	1,024,000	273,516,800	132,183,063	97,628,160	68,379,200	298,190,423	-24,673,623
2001	1,051,000	286,623,200	55,885,120	100,202,340	71,655,800	227,743,260	58,879,940
2002	1,079,000	293,992,800	55,885,120	102,871,860	73,498,200	232,255,180	61,737,620
2003	1,107,000	301,362,400	55,885,120	105,541,380	75,340,600	236,767,100	64,595,300
2004	1,136,000	308,995,200	55,885,120	108,306,240	77,248,800	241,440,160	67,555,040
2005	1,165,000	316,628,000	55,885,120	111,071,100	79,157,000	246,113,220	70,514,780
2006	1,195,000	319,024,000	31,612,805	113,931,300	79,756,000	225,300,105	93,723,895
2007	1,225,000	326,920,000	31,612,805	116,791,500	81,730,000	230,134,305	96,785,695
2008	1,255,000	334,816,000	31,612,805	119,651,700	83,704,000	234,968,505	99,847,495
2009	1,286,000	342,975,200	31,612,805	122,607,240	85,743,800	239,963,845	103,011,355
2010	1,317,000	351,134,400	31,612,805	125,562,780	87,783,600	244,959,185	106,175,215
2011	1,317,000	351,134,400	0	125,562,780	87,783,600	213,346,380	137,788,020
2012	1,317,000	351,134,400	0	125,562,780	87,783,600	213,346,380	137,788,020
2013	1,317,000	351,134,400	0	125,562,780	87,783,600	213,346,380	137,788,020
2014	1,317,000	351,134,400	0	125,562,780	87,783,600	213,346,380	137,788,020
2015	1,317,000	351,134,400	0	125,562,780	87,783,600	213,346,380	137,788,020
2016	1,317,000	351,134,400	0	125,562,780	87,783,600	213,346,380	137,788,020
2017	1,317,000	351,134,400	0	125,562,780	87,783,600	213,346,380	137,788,020
2018	1,317,000	351,134,400	0	125,562,780	87,783,600	213,346,380	137,788,020
2019	1,317,000	351,134,400	0	125,562,780	87,783,600	213,346,380	137,788,020
2020	1,317,000	351,134,400	0	125,562,780	87,783,600	213,346,380	137,788,020

FIRR = 14.29% (Tentative)

CHAPTER 13 TARIFF PLAN

13.1 Introduction

The content of the study is in accordance with the respective terms of references and consists therefore of:

- a brief analysis of the current telecommunication tariffs in Syria;
- establishment of theoretic base of telecom policy and tariffs by total cost sharing,
- an outline of the analytical basis and development of the computer-based tariff model;
- structure of expense at present stage and their mutual coverage of costs between services,
- simulation of tariff system and structure to be coordinated with financial program,
- a comparison of an incentive tariff systems especially the price cap regulation,
- a discussion of the universal service obligation in Syria.

This study on tariffs for telecommunication services in Syria was carried out at Syria during the tariff expert's 7 weeks stay in Damascus and later in Germany.

The report presents a detailed study on all telephone tariffs of STE. The collected data are referring to the current "Tariff Telecommunication System" issued by the Board of Directors, under number (231) from 4/9/1994 and which was confirmed by a decision of the Telecommunication Minister, under number (513) from 8/9/1994.

Telegraph and telex are considered as obsolete and declining techniques of telecommunications and therefore their tariffs are not subject of any active price policy. Telex having been largely superseded by the facsimile service. It should be avoided to commit any price irritations of the customer in these market segments. The result would be a more accelerated decrease of demand of these services. On the other hand due to the determined time schedule of the tariff study embedded into the entire master plan there have been some shortcomings of available cost data. Therefore it was not possible to make tariffs for both of STEs' pilot projects the X.25 data network and ISDN.

Core subject of this study is the PSTN. The optimization of the current tariffs is driven by the intention to finance STE's future network modernization and expansion from that incomings. It should be pointed out that all given tariff recommendations are serving the target to improve the overall shortcomings and lack of telecommunication means of the Syrian people.

Telecommunications tariffs like other prices, serve a variety of corporate and macro-economic functions. They give indications for appropriate investment decisions and create revenues on past

investments. Telecommunication tariffs can be used to stimulate the development of certain services and to meet social needs such as the development of telecommunications in rural areas.

13.1.1 Methodological Approach

The efficient provision and use of telecommunication services requires that tariffs reflect both the relative costs of different services within the sector and the cost of telecommunications relative to other means of communication. The marginal cost has therefore been assessed as the basis for charging local, long distance national and international telephone services. Tariffs set using the marginal cost pricing rule generally reflect the efficient use of telecommunication resources because it is profitable for telecommunication providers to increase the output (i.e. calls) until the additional revenue per call covers the additional (i.e. marginal) cost per call.

It has to be pointed out that this tariff study is the first step towards determining cost, profit and welfare oriented tariffs in the Syrian Arab Republic. Due to the absence of reliable and valid data concerning detailed cost structures it is recommended to continue and update the given analysis in future. In future it is suggested to build up an own tariff department (see recommendation tariff department).
Additionally to the a.m. cost oriented tariff optimization, this study provides a comparison of the current Syrian tariffs with international tariffs. The results are so called benchmarks that can be used for drawing up further reflections and conclusions for tariff setting.

13.1.2 General Remarks

13.1.2.1 Structure of the New Tariff

The following general remarks and assumptions should be made:

- all PSTN-tariffs are regulated by the Telecommunications Minister of Syria,
- the tariff level and structure which will be developed in the course of this study are based on an estimated traffic flow derived from the existing traffic flow of STE,
- cost figures are adapted from the calculated costs of the proposed new network,

- the study covers especially the telephone tariff adjustments for the next years 1996 and 1997 (experiencing the demand reaction afterwards the network expansion, the tariffs should be adjusted and steered closely to the market.).

- telegraph and telex are obsolete techniques of communication. On short term there will be a complete substitution by other telecommunication means e.g. facsimile and, data transmission, changes on tariffs of the services will accelerate the end of their market niche, therefore these services are not analyzed in this study,

- assuming that all charges are linked to the US Dollar and there is no inflation on the US Dollar. All calculations have been made on the basis of US Dollars at an exchange rate of US Dollar 1 = Syrian Pound 42 (exchange rate Commercial Bank of Syria from 01.06.95).

13.1.2.2 Introduction of a Single Customer Tariff System

Considering the intended long term expansion of the Syrian telephone network the share of business users will substantially decrease in future. Actually the annual rental (subscription fee) for business users is twice of the residential users (800 : 400 SP), but due to international comparisons both are quite low. In case of the recommended increase of the annual rental tariff, many business users will try to avoid the then even much higher business tariff by presenting themselves as residential users. Regarding the additional administrative costs necessary to avoid this frauding of business customers it seems to be reasonable to deal only with one kind of customers.

13.1.2.3 New Subdivision of Long Distance National Zones

At the moment, traffic is charged according to one local zone, seven long distance zones and seven international zones. For technical, economic and especially marketing reasons, one local zone , a long distance national zone 1 (up to 80 km), a long distance national zone 2 (81 km up to 160 km) and a long distance national zone 3 have been assumed. The former subdivision of zone 0 - zone 6 makes no sense from the point of transmission cost. As the cost analysis will show there are no decisive differences between 50, 100, and 400 km transmission. Due to the important progress in the field of fiber optics the cost of long distance transmission have decreased significantly at the last years. Thus it is suggested to change the

- existing zone 0 and 1 to New Long Distance Zone 1 (up to 80 km),

- existing zone 2 and 3 to New Long Distance Zone 2 (81 km up to 160 km),
- existing zone 4, 5 and 6 to New Long Distance Zone 3 (more than 160 km).

For international calls the already existing seven zones should still remain, but according to the negotiated accounting rate system the subdivision of the classes should adjusted to the amount of the distinct settlement rates.

13.1.2.4 Peak and Off-Peak Pricing Tools

Costs per call depend on the time of day the call is made. During office opening hours the demand from business customers is much higher than at other times. Peak period traffic, which causes the capacity costs of the network, is therefore in the time frame of office opening hours. If higher tariffs are charged during the peak period,(especially for residential customers) low value traffic will be shifted to off-peak periods. Thus the necessary investment for the peak hour will be reduced and revenues will be increased by decreasing network congestion during the peak period.

Peak load pricing can therefore increase the efficiency of the network considerably. Considering the actual very limited capacity of the telephone network in Syria's main cities, it is recommended to introduce also peak pricing in the local tariff. In general the important issues for the viability of off-peak pricing are:

- the potential savings in cost,
- the ability to shift load.

In theory it would be optimal to have a different tariff for each hour of the day in order to have a totally equal distribution of traffic, thus arriving at the cost-minimal supply of service. In practice, however, tariff differentiation is limited by measurement and implementation costs on the one hand, and by the customers' acceptance on the other. Therefore it is recommended not to have more than two different tariffs per day.

It is assumed that the peak period for long distance national calls should remain as it is between 07:00 and 22:00 and that higher tariffs should be charged during this period. Additionally this peak period should be valid for local calls.

The different off-peak discounts for international calls should be canceled. With respect to the cost structures determined by the height of the accounting rates it seems not to be useful to have international tariff rates off-peak. The part of the settlement rate in comparison to total cost of a one-minute international outgoing call ranges from 48 % up to 85 %. A further reason lies in the influence of the time differences in the terminating country, which determine the origin of the traffic substantially much more than the tariff itself.

13.1.2.5 Duration of Local Calls

Due to the scarce constraint of the network capacity nowadays, the existence of local call units of 6 minutes limits this bottleneck even much more. Due to the absence of any economical incentives for the users, long time conversations are blocking the low capacities at the business hours. Therefore it is recommended to reduce the local call unit in the peak hours from 6 minutes to 2 minutes. This will create much more high value traffic in the network (e.g. international business calls from/ to the Bab Sharki and Bab Touma business areas etc.). Regarding social reasons on the other hand, this adjustment could be re-balanced with cheaper local off-peak tariffs and holding the 6 minutes-units for the off-peak time.

13.1.2.6 Free Call Units

Actually local calls are included as part of the subscription up to a quarterly limit of 175 calls (equal 350 minutes/ 5.83 hours per month !) for the subscribers who are connected to an exchange type EWSD. Subscribers connected to other exchanges have 175 free local calls per quarter without any limitation of time. These free units are exceeding the total local traffic per subscriber in some other countries. Regarding the free units and spoken in economic terms, local calls are practically a "free good" in Syria.

Internationally free call units serve the purpose to balance errors or other operational and maintenance failures. In order to increase the profitability of STE it is recommended to decrease the free call units to a level of 30 free local call units quarterly.

13.2 Analysis of Present Tariff System

A summary of the current tariff structure for PSTN and other telecommunication services is given in Table 13.2-1. A detailed presentation of all Syria's' present telecommunication tariffs has already been included in the Chapter 2. Actually the tariff system in Syria seems to be very complicated and in-transparent for the customers.

Table 13.2-1 Current Tariff Structure STE PSTN

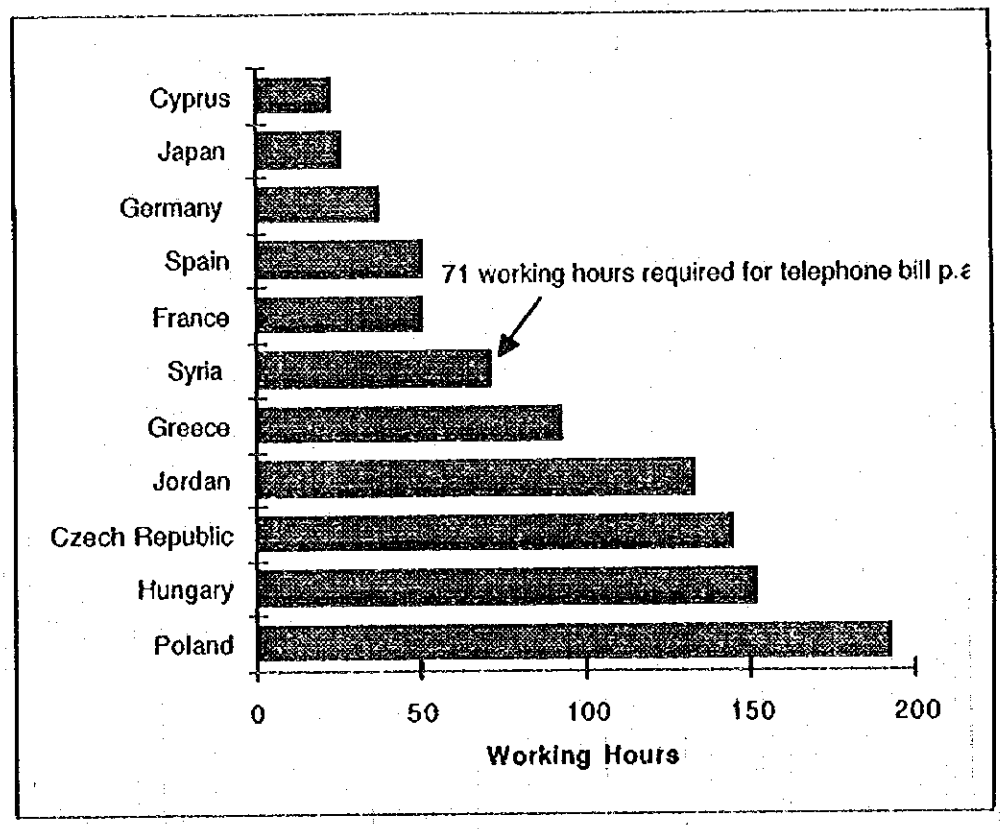
STE (PSTN)	US $
Installation charge (Normal Access, Waiting List)	95.24
Installation charge (Priority Direct Access)	1,785.71
Annual rent (Subscription Fee) Residential Customer	9.52
Annual rent (Subscription Fee) Business Customer	19.05
Local Calls per 6 minutes (EWSD) (or unlimited!)	0.014
Long Distance National Zone 0 up to 25 km /min.	0.018
Long Distance National Zone 1 up to 50 km /min.	0.030
Long Distance National Zone 2 up to 100 km /min.	0.036
Long Distance National Zone 3 up to 200 km /min.	0.054
Long Distance National Zone 4 up to 300 km /min.	0.071
Long Distance National Zone 5 up to 400 km /min.	0.089
Long Distance National Zone 6 more than 400 km /min.	0.107
International Zone 1 /min.(Jordan, Lebanon)	0.833
International Zone 2 /min.(Cyprus, Greece, Turkey)	1.190
International Zone 3 /min.(S. Arabia, Kuwait etc.)	1.548
International Zone 4 /min.(Europe)	2.381
International Zone 5 /min.(Japan, Australia, Far East)	2.738
International Zone 6 /min.(USA, South America)	2.976
International Zone 7 /min.(Rest of the world)	4.762

(Source: STE, Dept. of Exploitation and Traffic 1995, 1 US$ = 42 S. P.)

For long distance national calls and international calls there is an off-peak discount of 50% due to a differentiated time frame.

To find out how expensive telephone really is for the people in a country it is necessary to define what local money can buy. S1-13-1 in the Supporting Report gives a local price basket of daily goods in Syria. Getting a general understanding of the telephone price level in Syria, Figure 13.2-

1 defines a telephone basket of the sum of yearly charges and the requirement of working hours to pay for it. It is assumed that the average income of a Syrian worker is 4500 S.P. per month and the average working time is 162 hours per month. The telephone basket assumes that the installation fee is distributed over 10 years, residential subscription rate, charges for 700 local calls and 200 long distance calls (3 min.) up to 100 km (daytime-rate and nighttime-rate mixed). No international calls are considered in the basket.



(Source: Siemens, national telephone tariffs 1993, own estimates)

Figure 13.2-1 Working Hours required for the Sum of Telephone Charges

Some in the figure not mentioned countries as China P.R. with 944 working hours or Sri Lanka with 651 working hours have a much more expensive price level for basic telephone service. When internationally compared, the local and national telephone charges of STE are very low. Therefore the present tariff system in Syria should be improved.

The following survey of graphs shows comparisons of international tariff structures (also called benchmarks) in relation to the current STE's tariffs. The goal of such comparisons is to develop some understanding and general commitment of how high tariffs should be. This process could be understood as bench marking.

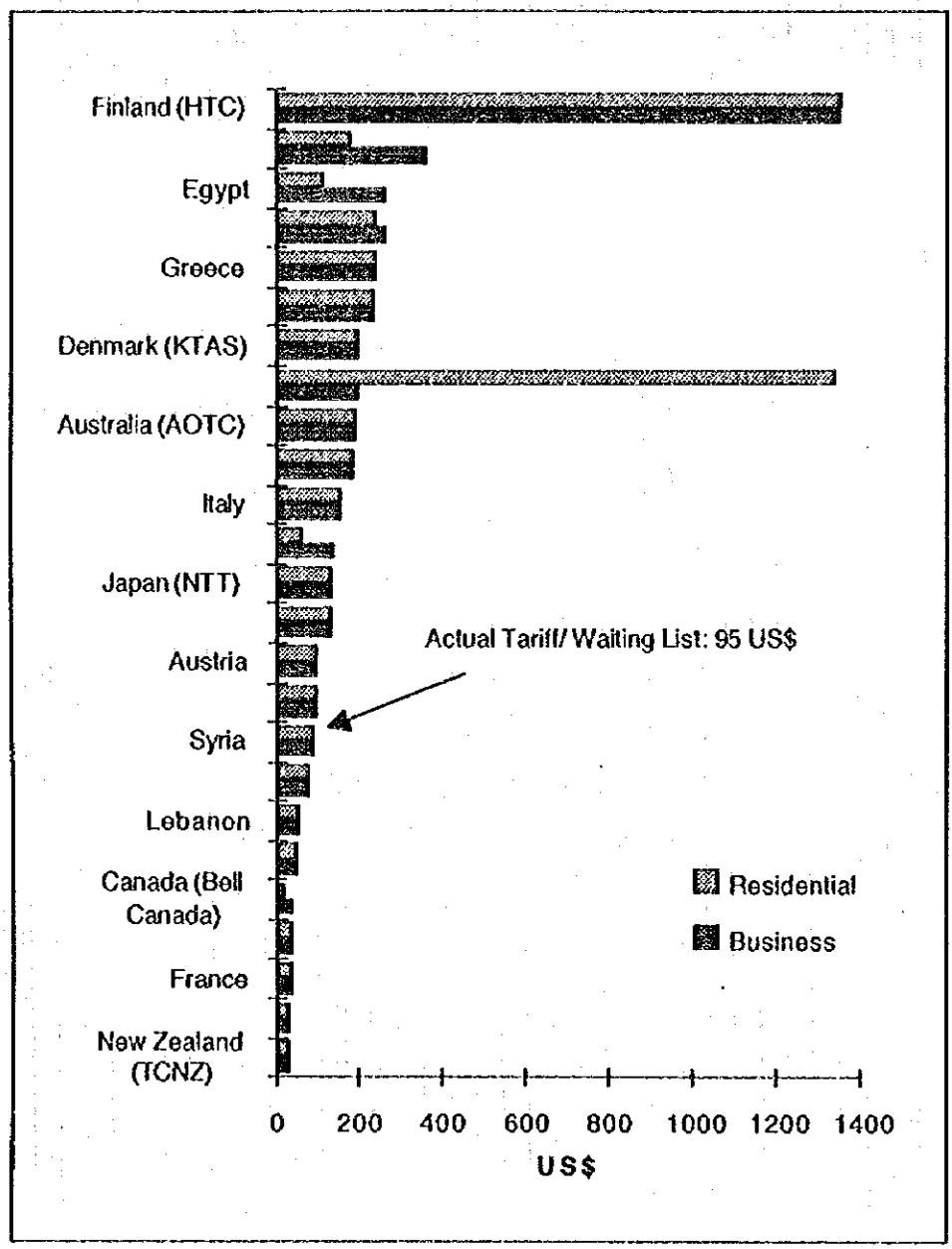


Figure 13.2-2 Installation Charges

The installation charges for a normal access to the telephone are not expensive in Syria compared internationally.

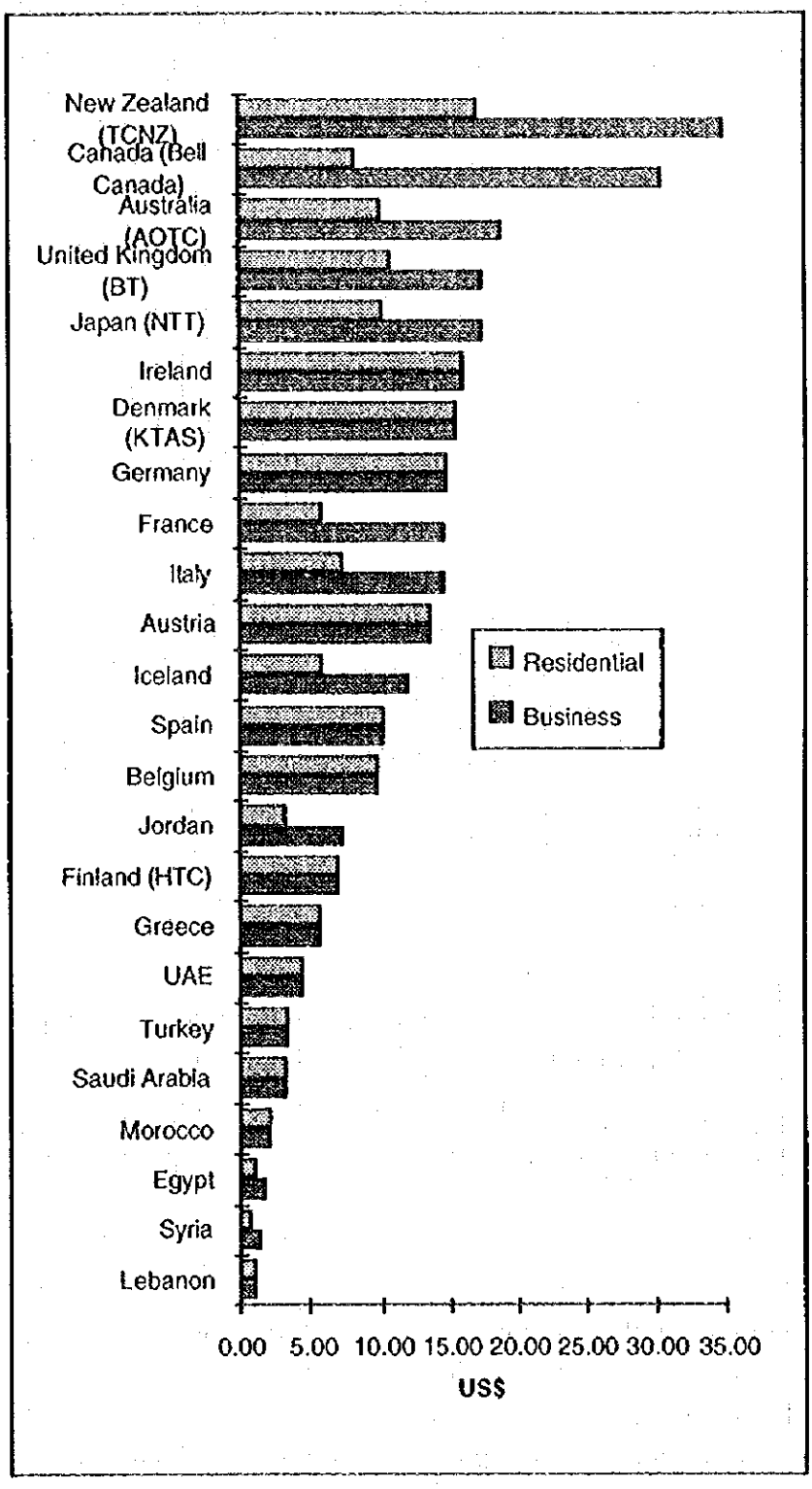


Figure 13.2-3 Monthly Rent/ Subscription Fee

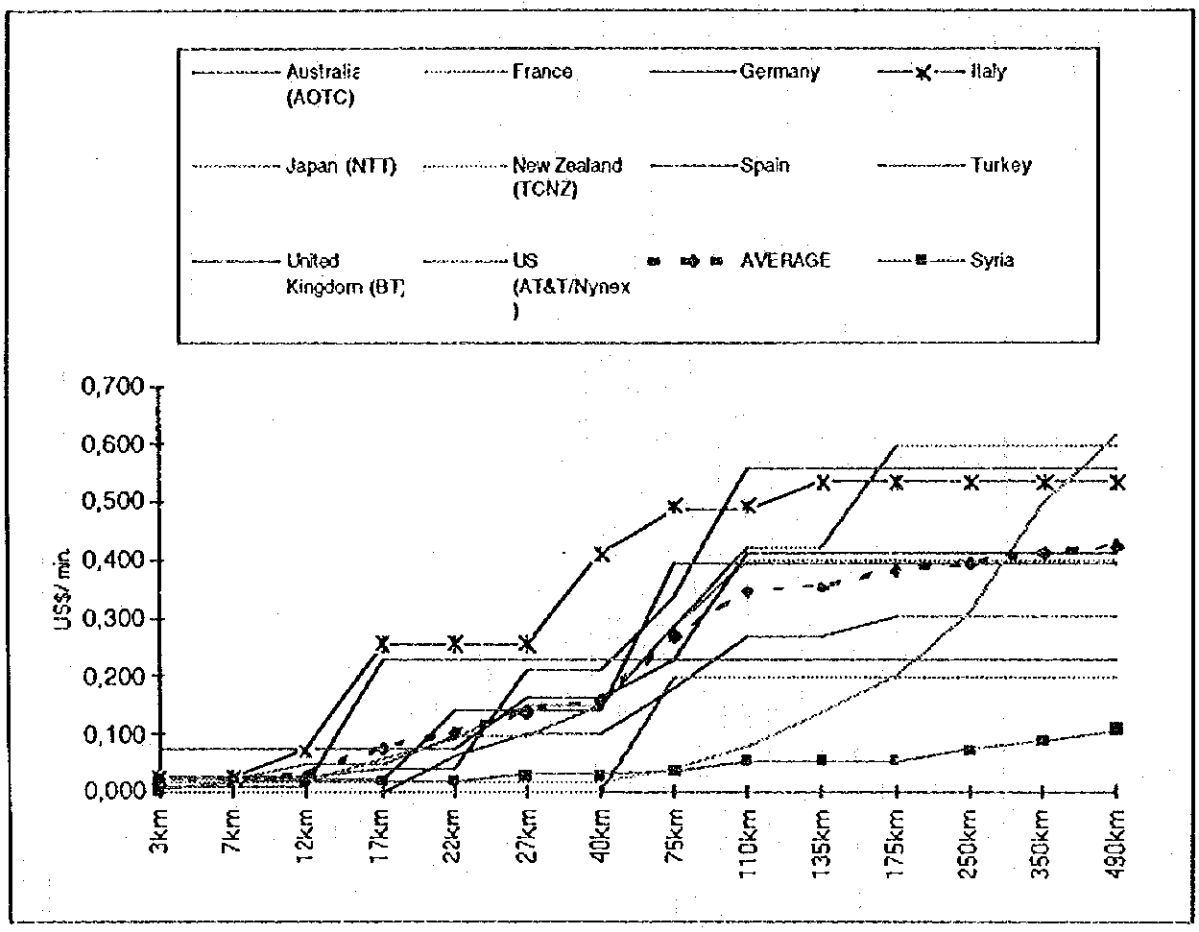


Figure 13.2-4 Local/ Long Distance Tariffs

The figure shows that STE's has the lowest long distance tariff level. Analyzing the curves of the other operators three tariffs have been applied for distances ranging from 3 Km to 490 Km. This is understandable from the point of the most important cost element of long distance calls - the transmission cost. There are important economies of scope and scale in that field.

Making the comparison with other countries is difficult because the configuration of distance bands is different and while two or three step tariffs apply almost everywhere, the balance between fixed and usage tariffs differs. Making the comparison is relevant because although the ability to pay differs from country to country, the equipment cost does not to the same degree. It can be generally said that all distance bands in Syria are extremely cheap compared by international standards. The tariffs of a three minute call are compared in the following Table 13.2-2.

Table 13.2-2 Cost of a 3 minute National Call in US$

Charge Band	Syria	Indonesia	Germany	Spain	Turkey
Local	**0.01**	0.04	0.14	0.03	0.09
0 - 25	**0.02**		0.14	0.69	0.12
26 - 50	**0.03**	1.09	0.42	0.69	0.63
51-100	**0.04**	1.09	0.72	0.69	1.02
101-400	**0.09**	1.45	1.20	1.23	1.68
401-800	**0.11**	2.17	1.20	1.23	1.68

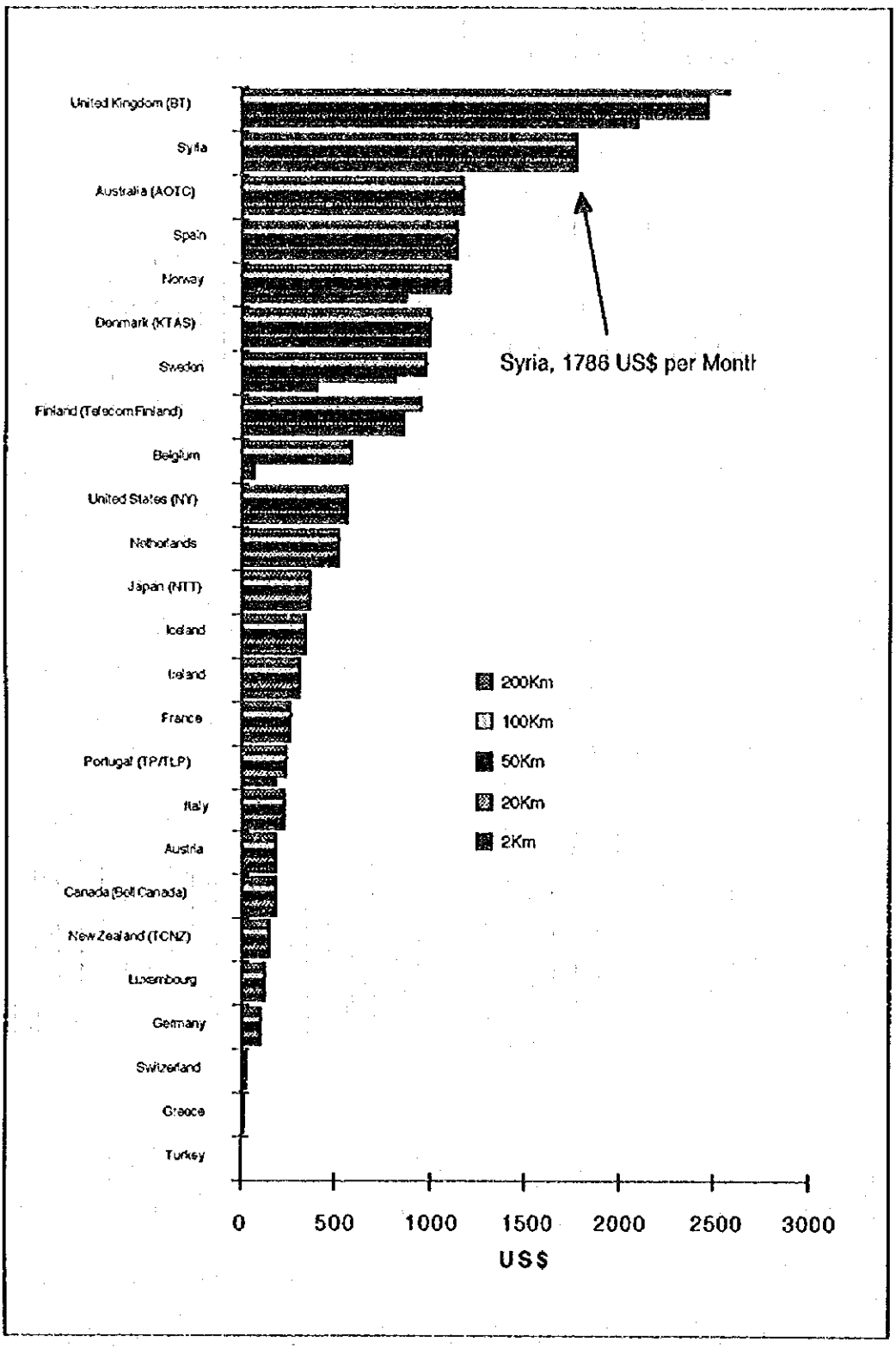


Figure 13.2-5 Installation Charges for 9.6 Kbits Leased Lines by Distance

Regarding the different international tariff level for leased lines, STE's installation charges seems to be to high.

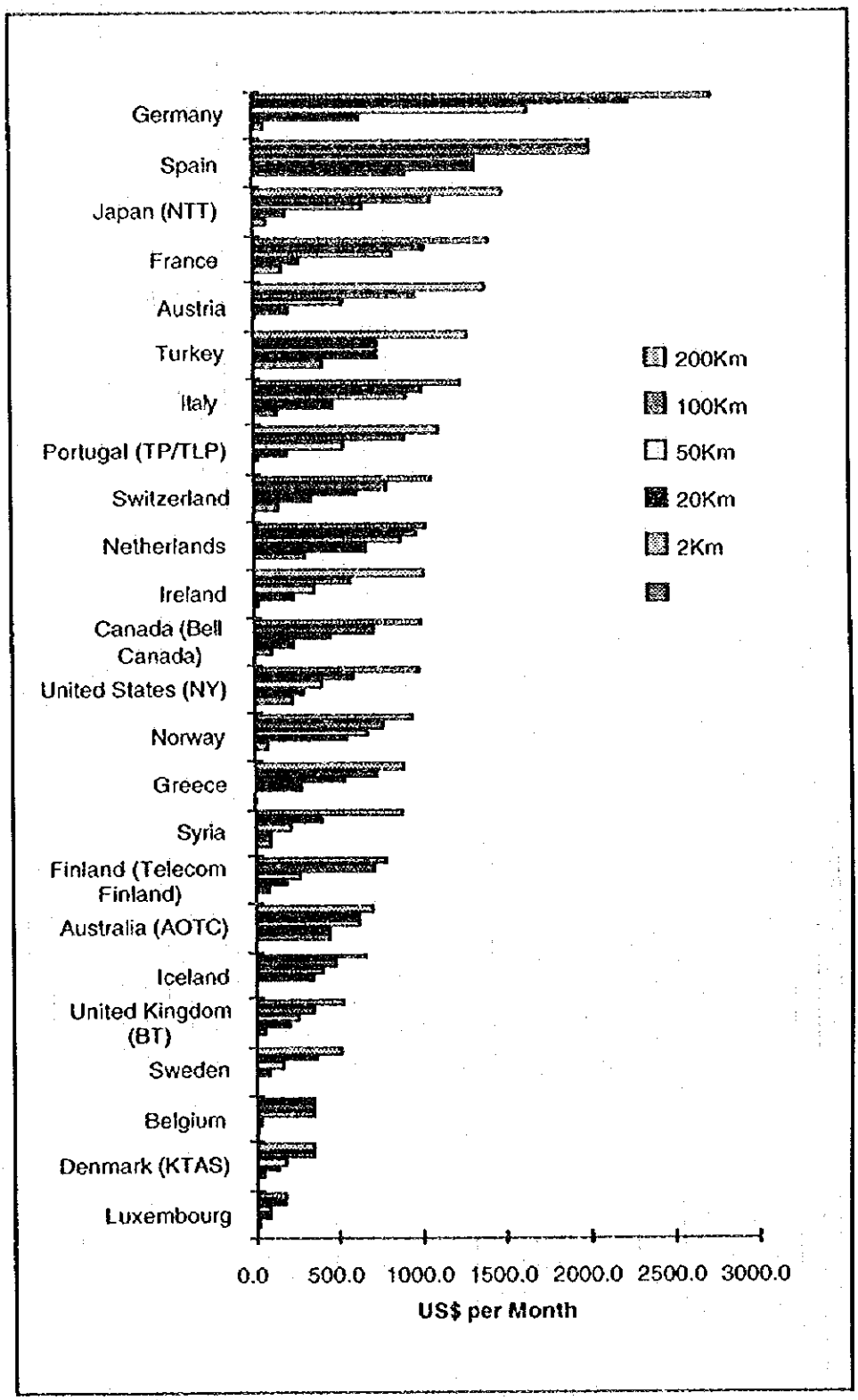


Figure 13.2-6 Rental Charges for 9.6 kbit Leased Lines by Distance per Month

STE's rental charges for 9.6 kbit leased lines are in line with the international tariff level.

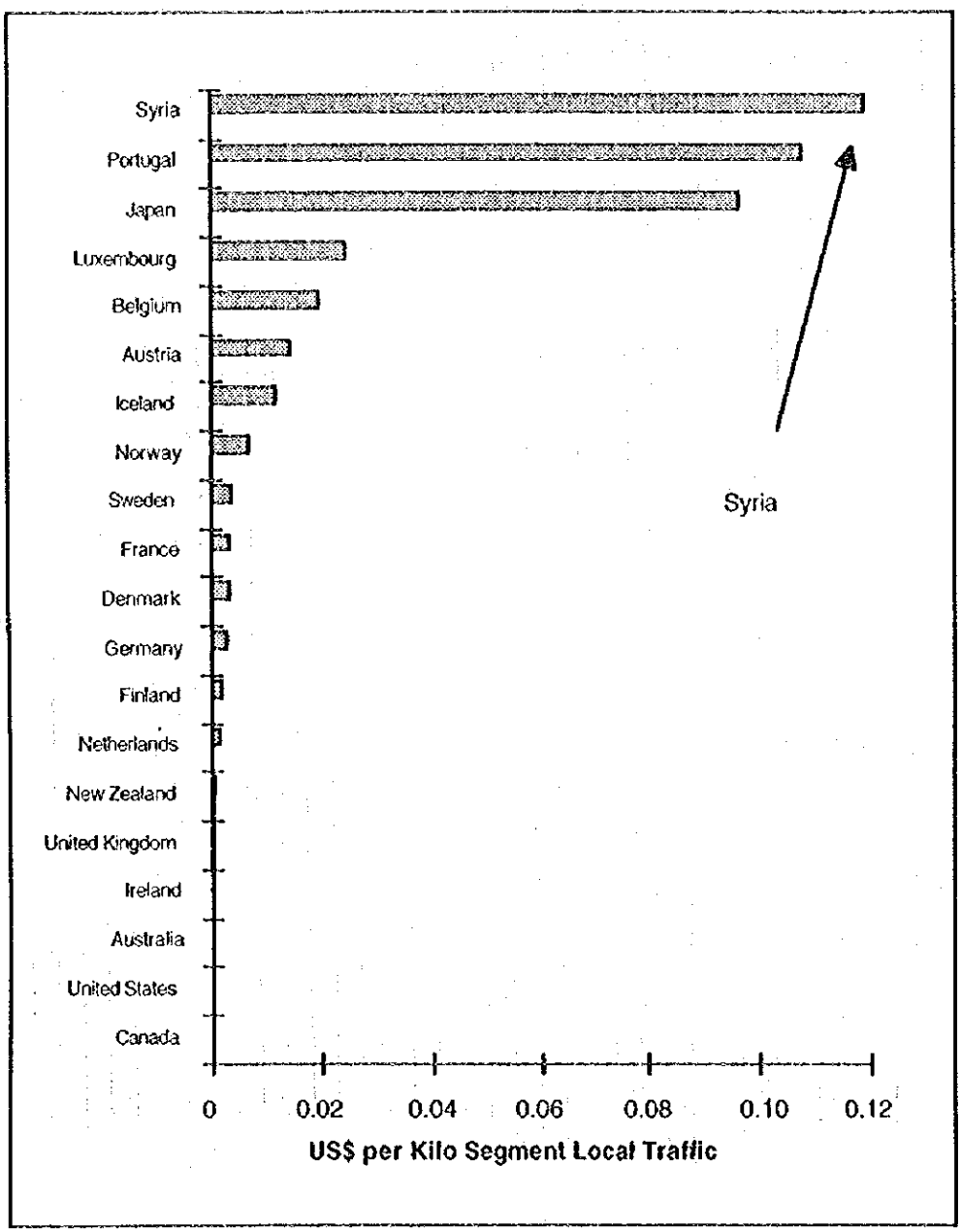


Figure 13.2.-7 Charges per Kilo Segment of Data for Local Transmission on the PSDN

Obviously STE's tariff of the pilot X.25 project is very high compared internationally.

The existing tariff structure has the following disadvantages:

- access and annual rent charges do not cover access cost,
- access costs are subsidized by international charges (especially accounting rates payments for incoming calls from foreign operators,
- there is no direct incentive for the operator to connect new subscribers to its network,
- attraction of customers with very low usage leading to no rationalization of demand.

To overcome these weaknesses a cost-based tariff structure will be developed.

13.3 Development of the Analytical Basis of the Tariff Model

13.3.1 Assumptions on Demand and Traffic

13.3.1.1 Demand and Traffic Measurement

The estimates of demand and the traffic analysis from Chapter 4 and 5 are used as inputs for the demand side of the model. The assumptions derived from these input parameter are given completely in S1-13-2 in the Supporting Report. The main basic assumptions are:

- existing subscriber base end of 1994: 685,000
- new demand of main lines in 1996: 55,000
- new demand of main lines in 1997: 58,000

The number of main lines built from STE in this year 1995 is not known and therefore will be neglected in this calculation. For economic reasons a long term tariff setting exceeding the time after 1998 will have no valid background regarding today's' cost and demand forecast. Based upon local research the data and assumptions for the traffic are as follows:

- average traffic volume per main line 0.08632 Erlang,
- outgoing traffic 50% = 6,522.29 min. /main line/ year in 1996/97.

The detailed analysis of the traffic leading to the main traffic and demand assumption of the later used tariff model are shown in the first input data spread sheet in the S1-13-2 in the Supporting

Report. The following three tables show the distribution of the outgoing traffic in and from Syria for the year 1994:

Table 13.3.1.1-1 Structure of Outgoing Traffic 1994

Traffic Distribution 1994	in Million Min.	in %
Local call minutes (average call duration 3 min.)	3600	94.21%
National long distance minutes	167.5	4.38%
International minutes	53.8	1.41%
TOTAL	**3,821.3**	**100%**

(Source: according to STE Statistics 1995)

Table 13.3.1.1-2 Outgoing Minutes Long Distance Traffic 1994

Governorates	Outgoing Minutes Long Distance Nat'l. 1994	in %
Damascus	36,753,398	21.94%
Rural Damascus	28,323,776	16.91%
Homs	16,156,404	9.64%
Hama	5,650,788	3.37%
Aleppo	37,406,468	22.33%
Idleb	8,644,560	5.16%
Tartous	10,886,328	6.50%
Lattakia	11,900,658	7.10%
Al-Rakka	3,056,692	1.82%
Deir-ez-Zor	1,630,645	0.97%
Al-Hasakeh	5,584,598	3.33%
Dar'a	183,632	0.11%
Al-Sweida	1,142,200	0.68%
Quneitra	225,460	0.13%
TOTAL:	**167,545,607**	**100%**

(Source: STE Planning Dept./ JICA Study Team 1995)

Table 13.3.1.1-3 Structure of International Outgoing Traffic 1994

Split of International Minutes 1994:	Total Min.	in %
Outgoing + Transit:		
International minutes zone 1	7,283,768	13.52%
International minutes zone 2	2,816,096	5.23%
International minutes zone 3	21,910,405	40.66%
International minutes zone 4	10,395,011	19.29%
International minutes zone 5	820,014	1.52%
International minutes zone 6	10,038,863	18.63%
International minutes zone 7	624,272	1.16%
TOTAL	**53,888,429**	**100%**

(Source: Dept. of Exploitation and Traffic 1995)

Decisive is the demand for the Arab neighboring countries in zone 3 (Saudi Arabia, Kuwait) and zone 1 (Lebanon and Jordan).The graph shows the distribution of international outgoing (incl. transit traffic).

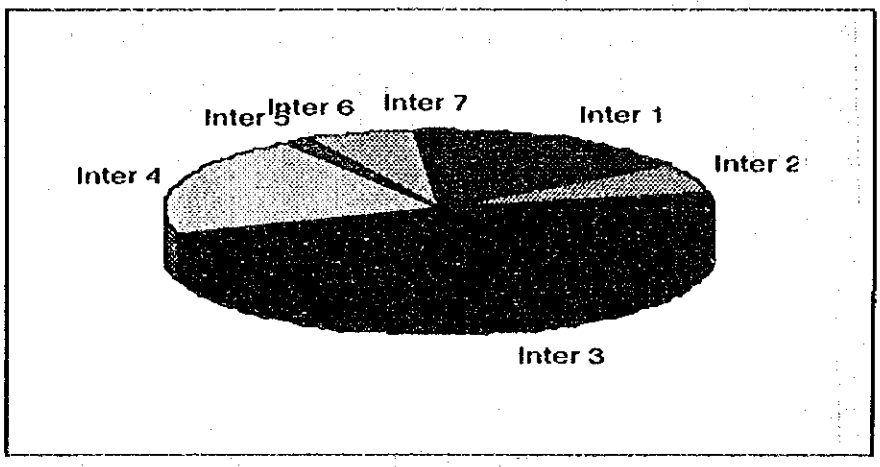


Figure 13.3.1.1-1 Distribution of International Outgoing Traffic

The international traffic is constantly and rapidly growing since 1993. But the incoming traffic is nearly twice of the outgoing plus transit traffic. The data derived from the first quarter 1995 leads to estimates for 1995 of 100.7 million incoming minutes and "only" 59.5 million outgoing minutes.

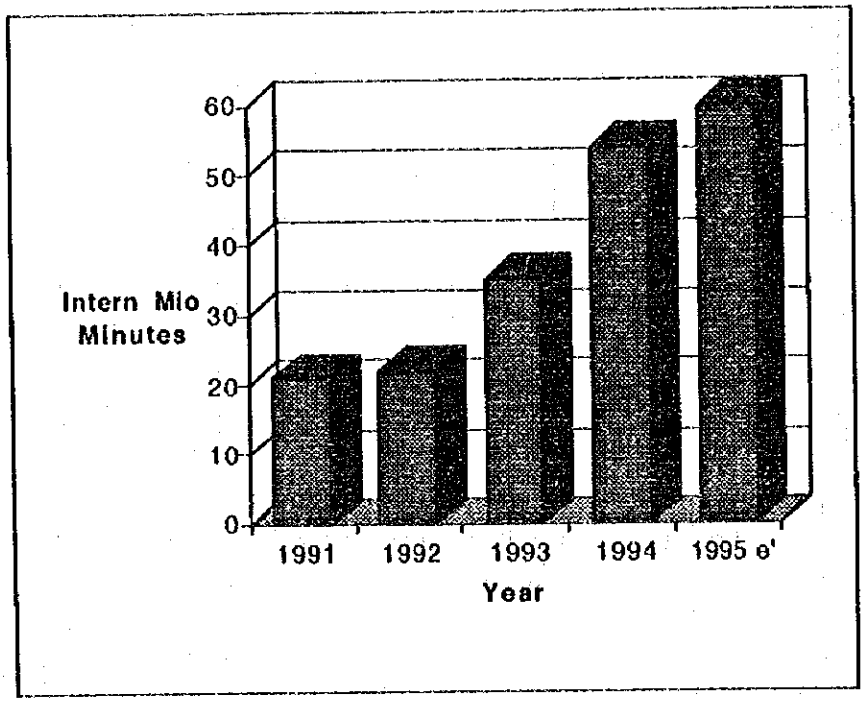


Figure 13.3.1.1-2 Growth of International Outgoing Traffic

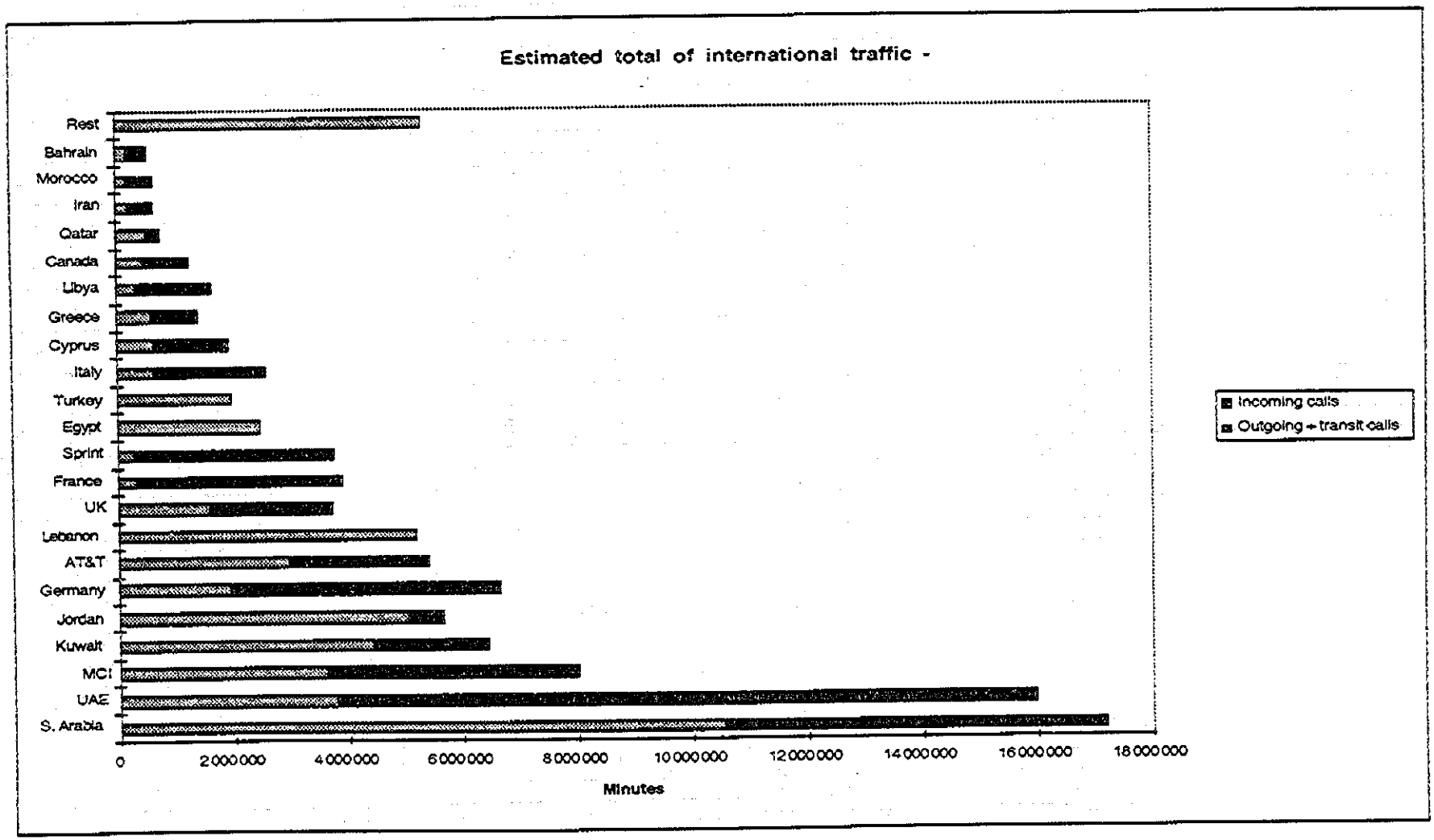
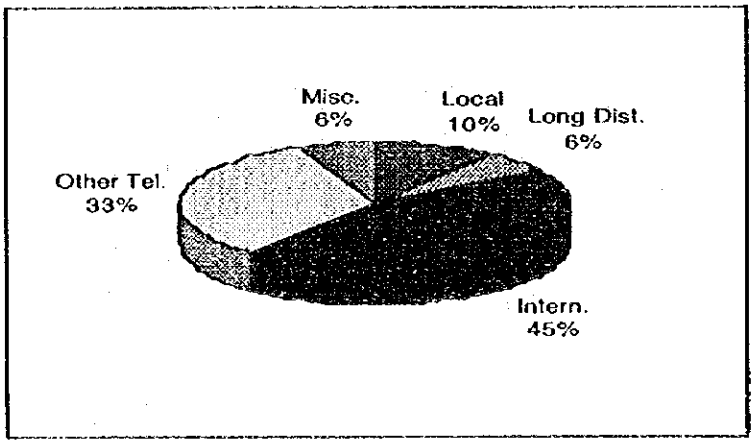


Figure 13.3.1.1-3 Structure of International Traffic 1995 estimated

Figure 13.3.1.1-3 shows the surplus of the positive traffic balance of STE. Great importance has the international telephone traffic for the financial situation of STE. Most of the revenue are generated from international incoming calls.



(Source: STE Dept. of Accounting)

Figure 13.3.1.1-4 Structure of STE's Revenues in 1994 e' (estimated)

13.3.2 Inputs on Cost

The investment cost as an input for cost oriented tariffs are taken from the technical plan. Investments are depreciated according to the specific periods. Interest on the investment, operation and maintenance costs have also been included.

Unfortunately there are no suitable and achievements oriented cost figures available from the STE's accounting department. Therefore the tariff study will use a project approach with own cost estimates as inputs for the tariff model. The used cost figures have been discussed intensively with STE counterparts and stand in line with international experienced prices and costs of 1995. Switching, transmission and outside plant are stated as so called net investment. The cost inputs as follows:

- switching cost per main line: 300 US$
- transmission cost per main line: 70 US$
- outside plant cost per main line: 450 US$
- administration: 30 US$

- total cost per new main line 1995 - 1998: **850 US$**

The switching cost including the MDF, power supply, battery, diesel, air conditioner, raised floor and installation supervision.

Cost of network management per main line ca. 10 US$ as well as overheads incl. planning, installation and buildings of ca. 25 % of the a.m. net investment are also included in the figures.

- operation and maintenance (O&M) 10 % of a.m. Net Investment

To calculate tariffs it was necessary to do a further breakdown of the cost data. The cost blocks were separated into costs concerning network access and costs concerning traffic. The overhead cost were allocated to the cost origins of switching, transmission and outside plant. The breakdown of total costs is shown in Figure 13.3.2-1.

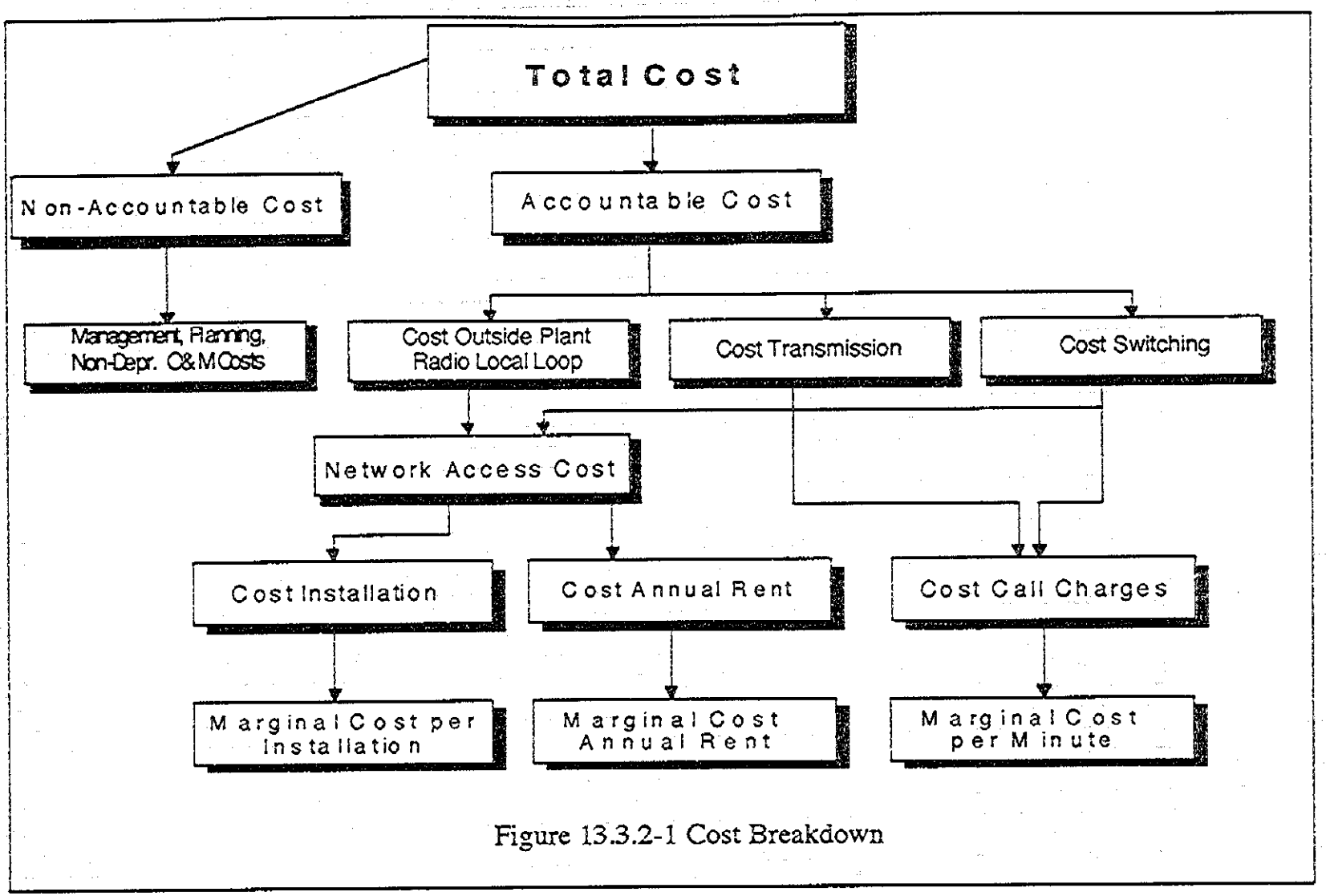


Figure 13.3.2-1 Cost Breakdown

The network access costs comprise the total outside plant costs (incl. radio local loops) and 33.33 percent of switching costs. Then the relevant operation and maintenance costs as well as a interest of 22 percent are added. The calculation of the interest is derived from the devaluation of the Syrian currency (Syrian Pound) in 1994 of 18 % (Source: German Trade Letter, Bfai-Länder report, February 1995) and an added bond rate (e.g. state bonds Germany 1995) of 4 %.

The traffic costs include the expenditure on transmission equipment and 66.66 percent of the switching costs. The transmission as well as the switching costs are allocated to the different services by weighting factors. The transmission equipment is necessary for national and international telephony. Therefore marginal transmission costs are computed only for:

- new long distance national zones 1 - 3,
- international traffic zones 1 - 7.

To obtain marginal transmission costs for each service the relevant operation and maintenance costs and a interest of 22 percent were added. These cost were distributed according to the assumed number of microwave stations per zone.

- long distance zone 1: 12.5%,
- long distance zone 2: 25%,
- long distance zone 3: 37.5%,
- international zones: 25% (to international gateways Damascus/("Aleppo").

Apart from these costs the following negotiated settlement rates for international traffic were added to obtain the total marginal costs for these services:

- international zone 1: US$/ 0.39 min.,
- international zone 2: US$/ 0.69 min.,
- international zone 3: US$/ 0.79 min.,
- international zone 4: US$/ 1.18 min.,
- international zone 5: US$/ 1.38 min.,
- international zone 6: US$/ 1.77 min.,
- international zone 7: US$/ 2.37 min.

Actually there are some irregularities found in these settlements of the a.m. international zones. For example the countries of Cyprus, Greece and Turkey they are all included in the international zone 2 but their settlement rates are ranging from 0.75 Gold franc to 1.75 Gold franc (1 US$ = 2.5374 Gold franc). It is recommended to build up international zones with nearly equal settlement rates for the included countries.

66.66 percent of the total switching costs were allocated to local, long distance and international traffic according to the weighted amount of traffic within each zone. The weights correspond to the assumed number of switches passed by specific traffic:

- local: 1 exchange,
- long distance zone 1: 2 exchanges,
- long distance zone 2: 2 exchanges,
- long distance zone 3: 3 exchanges,
- international: 2 exchanges.

To obtain marginal switching costs for each service the relevant operation and maintenance costs and an return of 22 percent were added.

In S1-13-4 in the Supporting Report the detailed procedure for the calculation of the marginal costs is shown. Table 13.3.2 -1 summarizes the marginal costs of the different services. They will be used to calculate the new tariffs for the master plan in the next paragraph.

Table 13.3.2-1 Marginal Costs of STE's Network

Marginal Costs (in US$)	1996
Common Marginal Network Access Cost (Installation)	82.50
Common Marginal Network Access Cost (Annual Rent)	17.60
Marginal Costs Local Calls (Minute)	0.0051
Marginal Costs Long Distance Calls Zone 1 (Minute)	0.024
Marginal Costs Long Distance Calls Zone 2	0.051
Marginal Costs Long Distance Calls Zone 3	0.136
Marginal Costs International Zone 1 (Minute)	0.611
Marginal Costs International Zone 2	0.911
Marginal Costs International Zone 3	1.011
Marginal Costs International Zone 4	1.401
Marginal Costs International Zone 5	1.601
Marginal Costs International Zone 6	1.991
Marginal Costs International Zone 7	2.591