JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

SYRIAN TELECOMMUNICATIONS ESTABLISHMENT (STE)
THE SYRIAN ARAB REPUBLIC

THE STUDY
ON
NATIONAL TELECOMMUNICATIONS NETWORK
EXPANSION PLAN
IN
THE SYRIAN ARAB REPUBLIC

FINAL REPORT

MAIN REPORT

VOLUME 1 MASTER PLAN

AUGUST, 1996

NTT INTERNATIONAL CORPORATION
NTT DATA INSTITUTE OF MANAGEMENT CONSULTING

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PREFACE

In response to a request from the Government of Syrian Arab Republic, the Government of Japan decided to conduct a study on National Telecommunications Network Expansion Plan and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Syria a study team headed by Mr. Makoto Tanaka, NTT International Corporation, and composed of staff members of NTT International Cooperation and NTT Data Institute of Management Consulting, 4 times between March, 1995 and July, 1996.

The team held discussions with the officials concerned of the Government of Syria, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Syrian Arab Republic for their close cooperation extended to the team.

August, 1996

Kimio Fujita
President
Japan International Cooperation Agency

August 1996

Mr. Kimio FUJITA
President
Japan International Cooperation Agency

Letter of Transmittal

We are pleased to submit to you the Final Report on the Study on National Telecommunications Network Expansion Plan in the Syrian Arab Republic.

This study was conducted by NTT International Corporation in association with NTT Data Institute of Management Consulting under the contract with JICA, during the period of March 1995 to August 1996.

In conducting the study, we have formulated a Master Plan for the development of telecommunications network up to the year 2010 which mainly intend to meet the demand for telephone lines, to create a communications network that is both secure and reliable, to introduce new communication technologies and services and to increase the efficiency of operational and administrative functions by computerizing them.
After formulating the Master Plan, we have executed a feasibility study on the identified projects extracted from the Master Plan.
And with regard to each project during the first five-year period (1996-2000) which corresponds to the period of the Eighth National Five-Year Plan, we have prepared the Action Plan which includes "review of the facilities plan and costs" along the lines of demand perception of Syrian side and we have also prepared the Detailed Plan about projects to be fulfilled urgently.

Main reports on the study consist of three volumes. The Volume 1 as the Master Plan describes "Services provision strategy", "Demand forecast", "Fundamental technical plan", "Long-term facilities plan", Operations and maintenance", "Computerization", "Cost estimate', "Tariff plan", "Project evaluation" , "Recommendation" and others. The Feasibility Study results on the identified projects, mainly focusing on Damascus city, extracted from the Master Plan are described in the Volume 2.
The Volume 3 as the Action Plan includes "Review of the telecommunications part of the Eighth National Five-Year Plan", "Developing the Plan further in detail", "Examination of the feasibility of its implementation" and "Detailed Plan".

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, and other Authorities concerned of the Government of Japan. We would also like to express our gratitude to the officials concerned of the Syrian Telecommunications Establishment, other related agencies of the Syrian Arab Republic, the JICA Syria office, and the Embassy of Japan in Syria for their cooperation and assistance throughout our study.

Finally, we hope that this report will contribute to further development of telecommunications field in the Syrian Arab Republic.

Very truly yours,

Hideaki KAMITSUMA
President and CEO
NTT International Corporation

NATIONAL TELECOMMUNICATIONS NETWORK EXPANSION PLAN IN THE SYRIAN ARAB REPUBLIC (VOLUME 1: MASTER PLAN)

Study period: Mar. 1995 to Aug. 1996

Counterpart: Syrian Telecommunications Establishment

1. Background

In 1993 there were about 550,000 main telephone lines, which means the penetration rate was 4.11 per 100 inhabitants. This figure is far below the average 10.4 in the Middle Eastern countries, and this low density of telephones is one of the obstacles to economic and social developments in Syria. As many as 1.94 million applicants were still without telephone lines at the end of 1995 according to STE's data. The most important task is to eliminate the waiting lists.

2. Objectives

The Master Plan for the National Telecommunications Network Expansion Plan (target year : 2010) is intended not only to meet the demand for telephone lines but also to create a telecommunications network that is both secure and reliable, to introduce new kinds of communications technology and services, and to increase the efficiency of STE's operational and administrative functions by computerizing them. Thus, the Master Plan aims at contributing to social and economic developments throughout Syria.

3. Outline of the Plan

3.1 Concept

Present facilities are not sufficient to create a telecommunications infrastructure that will provide the capacity and variety of systems needed to meet tomorrow's social and economic needs. The Master Plan therefore sets the following targets:

(1) Increase network capacity to meet the demands of all applicants by the year 2000 and keep up with the growing demands thereafter.

(2) Introduce mobile telephone and paging service, and expand Syria's ISDN and PSDN, and introduce a data network exploiting B-ISDN, FR and ATM technology.

(3) Computerize the STE's operational and administrative functions.

Taking into account the status of the existing systems, the relative importance of each of the existing and new systems, the relative importance of each area, and the economic growth that will be driven by the new telecommunications environment, it has been decided that these targets should be reached in three five-year plans.

3.2 Contents of the facilities plan

Table 1 Telecommunications facilities plan for each five-year plan

	The 8th five year plan (1996-2000)	The 9th five year plan(2001-2005)	The 10th five year plan (2006- 2010)
1. Telephone Network (Line units)	855,339	376,300	146,600
2. Mobile Services (Subs.)			
Mobile Telephone	71,822	76,752	62,616
Paging services	17,278	46,084	37,530
3. Data Com. Services (Lines)	675	1,535	* -555
4. Network Management (Centers)	3	1	-
5. TMN (Systems)	-	1	1
6. Computer System (Terminals)	564	12	756

Note: * Because narrow-band lines transfer to broad-band lines.

4. Project Cost

The average annual investment cost for the proposed plan is about 73 million US. dollars. Because this is less than the estimated annual profit of STE (about 100 million US. dollars) during the plan's implementation, this is deemed "feasible investment size" as a long-term plan unless that profit changes from now on.

Table 2 Investment cost for each five-year plan (Unit: millions of US dollars)

	The 8th five year plan (1996-2000)	The 9th five year plan(2001-2005)	The 10th five year plan (2006- 2010)	Total
1. Telephone Network	583.3	178.6	121.4	883.3
2. Mobile Services	64.8	72.0	14.0	150.8
3. Data comm. Services	2.2	3.1	3.6	8.9
4. Network Management	3.0	10.0	-	13.0
5. TMN	-	15.0	5.0	20.0
6. Computer System	7.6	0.9	14.1	22.6
Total	660.9	279.6	158.1	1,098.6

Exchange rate (1995): 1US $=42 Syrian Pounds

5. Project Evaluation

This plan is deemed "practicable" from both the technical and financial points of view and also deemed "indispensable" in providing the infrastructure for socials and economic activities.

5.1 Financial Evaluation

According to financial analysis based on a cost-versus-profit analysis, the projects have an FIRR of 14.29 percent. In this analysis capital expenditure and operation & maintenance cost in each year are used as costs, and the profit in each year is a result of the capital expenditure. When the FIRR calculation includes the benefits of computerization, the projects have an FIRR of 16.21 percent.

5.2 Review of the STE's Eighth Five-Year Plan

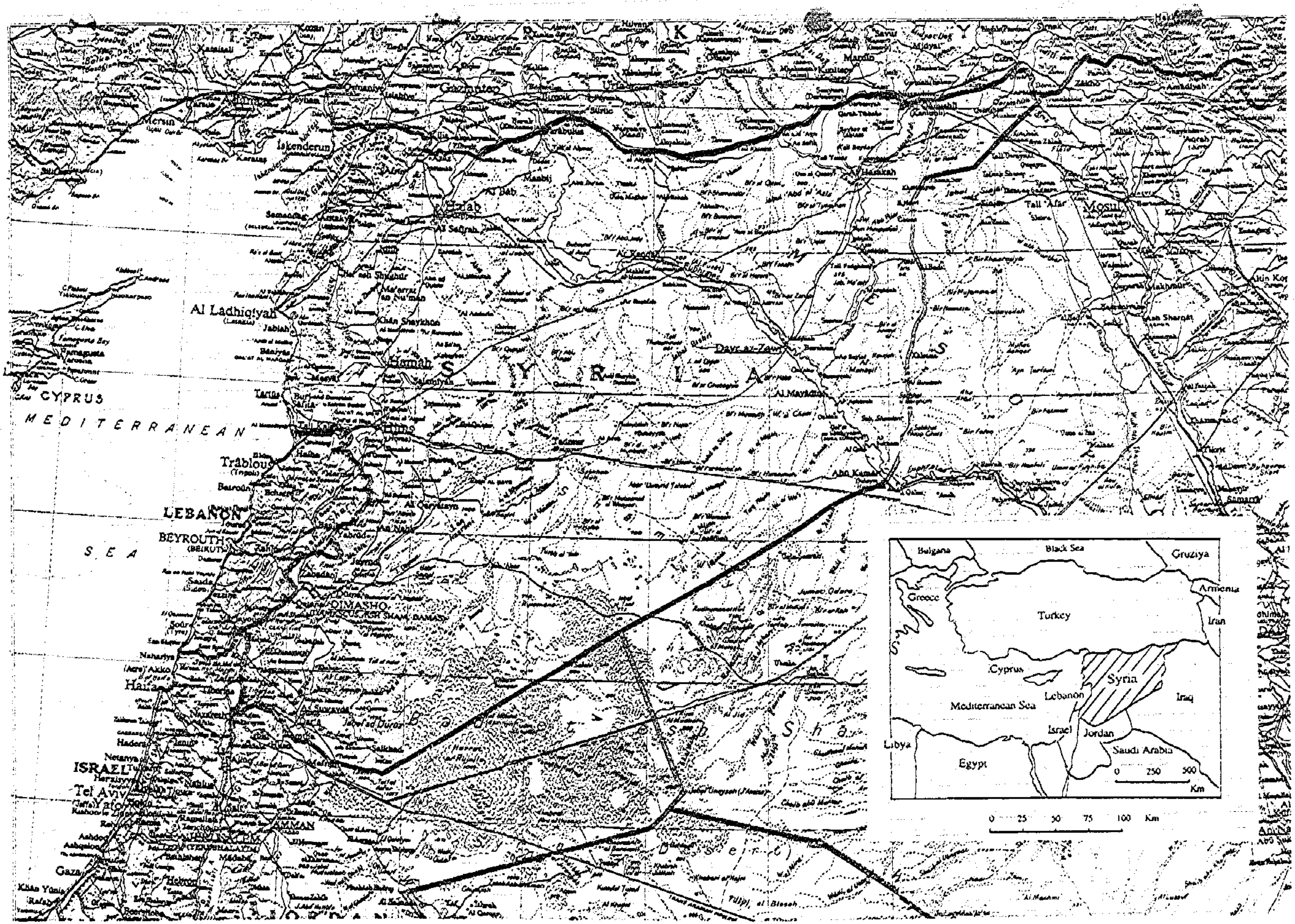
The Action Plan was prepared in order to review the Eighth National Five-Year Plan, which forecasts a greater demand than the Master Plan does. As a result of this review, it has been determined that the feasibility of implementing the Five-Year Plan can be enhanced by undertaking the following policies:

a. Periodical review of the demand and the facilities plans
b. Financing programs and prioritization of the projects.
c. Measures for dealing with the double number of new installations.
d. Strengthening of Project Management

6. Recommendation

(1) Review of organization and business management
(2) Authorization of the General Director
(3) Creation of cost consciousness
(4) Enhancement of incentives for employees
(5) Review and enhancement of outside plant works
(6) Arrangement of design and installation volumes on an annual basis
(7) Reservation of the radio frequency band for new mobile services

Unless otherwise stated, the following exchange rate prevailing in 1995 has been used: USD 1.00 = S.P 42.00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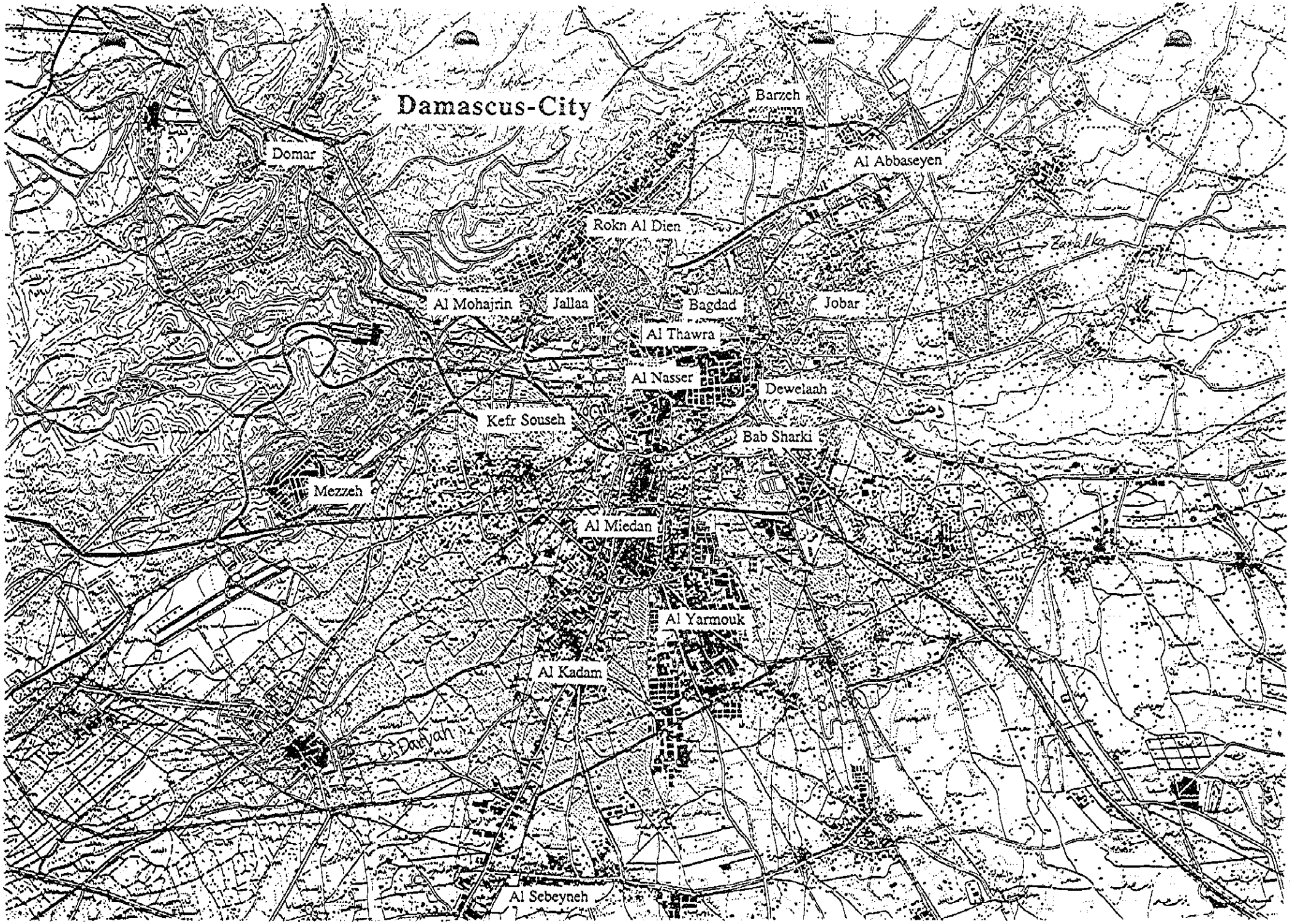
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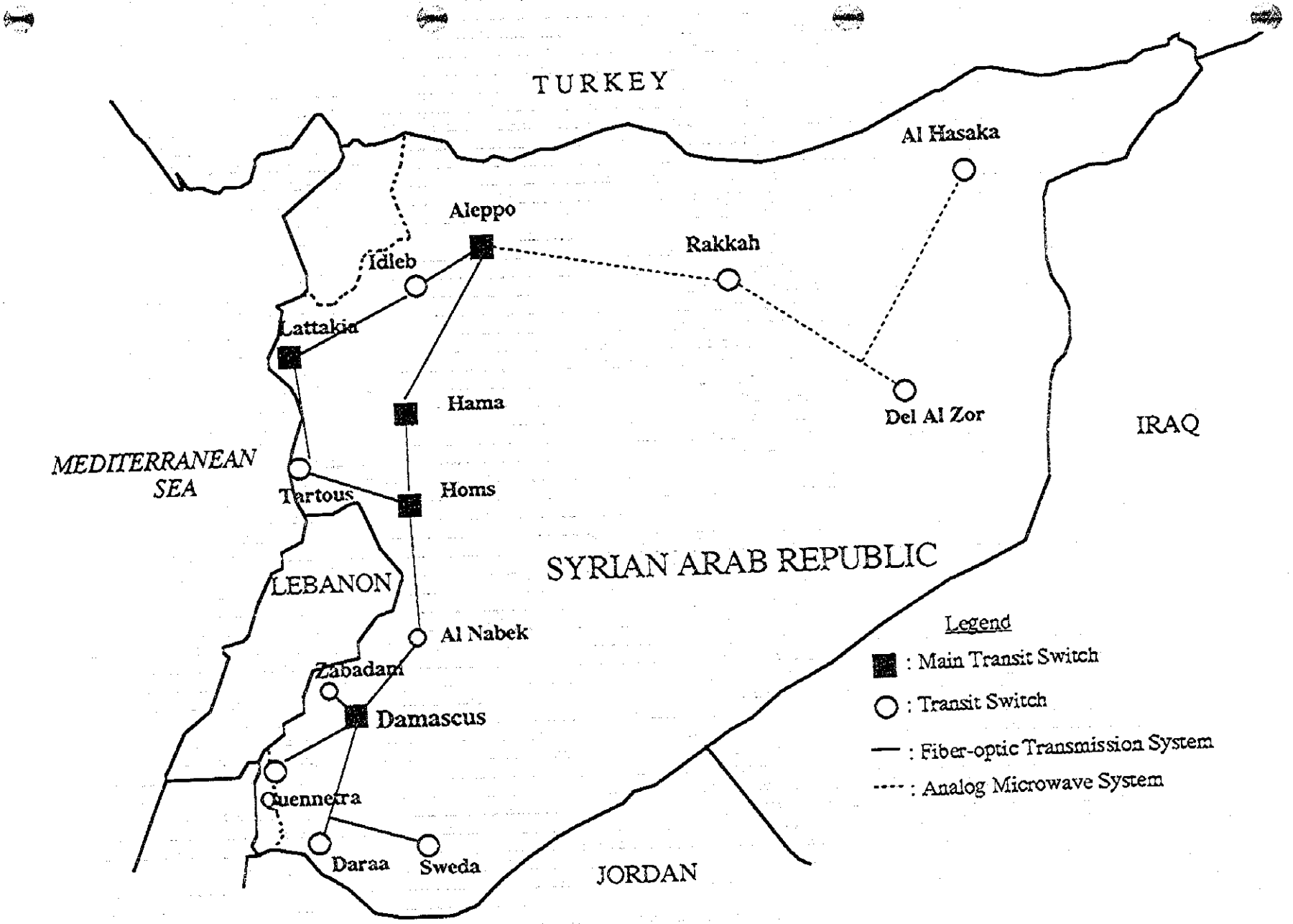

Route Map of STE National (Backbone) Telecommunication Network

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Abbreviation

ACC	:	Automatic Congestion Control
ADM	:	Add-Drop Multiplexer
B-ISDN	:	Broadband-ISDN
B.S	:	Base Station
BPR	:	Business-Process Reengineering
BSC	:	Base Station Controller
BTS	:	Base Transceiver Station
CAD	:	Computer Aided Design
CCC	:	Cross Connection Cabinet
CCITT	:	International Telegraph and Telephone Consultative Committee
CCS	:	Common Channel Signalling System
CENTREX	:	Centralized Extension System for Business Customers
CEPT	:	Conference of European Postal and Telecommunications Administration
CHILL	:	CCITT High Level Language
CNI	:	Centre National de l'Informatique
CSS	:	Customer Service System
DB	:	Data Base
DBP Telekom	:	Deutsche Bundespost Telekom
DCN	:	Data Communication Network
DECT	:	Digital European Cordless Telecommunication standard
DP	:	Distribution Point
DPX	:	a brand name of Bull's computer
DQ	:	Directory Inquiry
E 10 A/B	:	Digital Switching System of Alcatel
EMD	:	Edelmetall Motor Drehwähler Switch System of Siemens
ERMES	:	European Mobile Message services
ETSI	:	European Telecommunications Standards Institute
EWSD	:	Electronische Wähle System Digital (Digital Electronic Switching System) of Siemens
FEP	:	Front End Processor
FIRR	:	Financial Internal Rate of Return
FPLMTS	:	Future Public Land Mobile Telecommunication Systems
FR	:	Frame Relay
GDP	:	Gross Domestic Product
GSM	:	Global System for Mobile Communication

HD	:	Hard Disk
IDC	:	Insulation Displacement Connector
IGE	:	International Gateway Exchange
IN	:	Intelligent Network
INAP	:	Intelligent Network Application Part
INTS	:	International Transit Switch
ISC	:	International Switching Center
ISDN	:	Integrated Services Digital Network
ISUP	:	ISDN Service User Part
ITU	:	International Telecommunication Union
ITU-T	:	International Telecommunication Union - Telecommunication Standardization Sector
JICA	:	Japan International Cooperation Agency
LAN	:	Local Area Network
LE	:	Local Exchange
LL	:	Leased Lines
LT	:	Local Transit Exchange
LU	:	Line Units
MAF	:	Management Application Function
MBS	:	Managed Bandwidth Service
MDF	:	Main Distributing Frame
MFC	:	Multifrequency Code Signalling System
MFPB	:	Multifrequency Pushbutton
MIS	:	Management Information System
MSC	:	Mobile Service Switching Center
MT	:	Magnetic Tape
MTBF	:	MeanTime Between Failure
MTP	:	Message Transfer Part
MTU	:	Magnetic Tape Unit
MUX	:	Multiplexer
NE	:	Network Element
NEAX 61	:	Digital Switching System of NEC
NMC	:	Network Management Center
NTT	:	Nippon Telegraph and Telephone Corporation
O&M	:	Operation and Maintenance
OECD	:	Organization for Economic Cooperation and Development
OLTP	:	On-Line Transaction Processing
OMC	:	Operation and Maintenance Center
OSI	:	Open Systems Interconnection

OSP	:	Out Side Plant
PABX	:	Private Automatic Branch Exchange
PAD	:	Packet Assembler/Disassembler
PCI	:	Price Cap Index
PCM	:	Pulse Code Modulation
PDH	:	Plesiochronous Digital Hierarchy
POCSAG	:	Post Office Code Standardization Advisory Group
PSDN	:	Packet Switched Data Network
PSTN	:	Public Switched Telephone Network
PTT	:	Ministry of Posts, Telegraphs and Telephones
PUM	:	Personal User Mobility
PVC	:	Polyvinyl Chloride
QOS	:	Quality of Service
RBS	:	Radio Base Station
RCU	:	Remote Concentrated Unit
RDBMS	:	Relational Data Base Management System
RPI	:	Retail Price Index
RSU	:	Remote Switching Unit
RU	:	Remote Unit
SCCP	:	Signalling Connection Data Set
SCE	:	Service Creation Environment
SCF	:	Service Control Function
SCP	:	Service Control Points
SDH	:	Synchronous Digital Hierarchy
SIB	:	Service Independent Building Block
SIFS	:	Subscriber Information Filing System
SIS	:	Strategic Information System
SLMA	:	Subscriber Line Module Digital
SLU	:	Switching Line Unit
SMF	:	Service Management Function
SMS	:	Service Management System
SPC	:	Stored Program Control
SS7	:	Signalling System No.7
SSF	:	Service Switching Function
SSP	:	Service Switching Point
STD	:	Subscriber Trunk Dialing
STE	:	Syrian Telecommunications Establishment
STM	:	Synchronous Transport Module
STP	:	Signal Transfer Point

TC	:	Transmission Control
TDM	:	Time Division Multiplex
TE	:	Transit Exchange
TMN	:	Telecommunications Management Network
UPS	:	Uninterruptible Power System
UPT	:	Universal Personal Telecommunications
VPN	:	Virtual Private Network
WDM	:	Wave Division Multiplexing
WLL	:	Wireless Local Loop

CHAPTER 1 INTRODUCTION

The Government of Syrian Arab Republic (hereinafter referred to as "the Government of Syria") requested the Government of Japan to conduct the Study on the National Telecommunications Network Expansion Plan in the Syrian Republic (hereinafter referred to as "the Study"). Japan International Cooperation Agency (hereinafter referred to as "JICA"), which is the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, dispatched a Preparatory Study Team to Syrian Telecommunications Establishment (hereinafter referred to as "STE") in December, 1994.

JICA dispatched the JICA study team (hereinafter referred to as "the Team") in March, 1995 to formulate a Master Plan for the development of the telecommunications network in the Syrian Arab Republic up to the year 2010 (Phase 1) and to conduct a Feasibility Study for the identified project(s) based on the Master Plan (Phase 2).

In the course of the study for the Master Plan, it was necessary to draw up an Action Plan, specifically limited to the Eighth Five-Year period (1996 to 2000), in order to develop in detail, analyze and review the telecommunications part of the Eighth National Five-Year Plan, as prepared by the Government of Syria, and to improve its realization.

The main report has been divided into "VOLUME 1," the Master Plan, "VOLUME 2," the Feasibility Study, and "VOLUME 3," the Action Plan.

1.1 Background of the Study

As of 1993, the number of main telephone lines in Syria was approximately 550,000, and the penetration ratio of telephone lines was 4.11 per 100 inhabitants, which is considerably low when compared with the average penetration ratio of 10.4 for Middle Eastern countries. This lack of telephone lines is considered one of the main obstacles to the socio-economic development of the country.
In 1990, STE received funding from the State of Kuwait to implement a project to increase the number of lines by 700,000 by the year 1995.

This project, however, met only demands through 1985, and the number of waiting applicants for telephone services reached approximitely 1.94 million at the end of 1995 according to STE's data. STE has planned several development projects for the eighth five-year development plan (1996 to 2000) to meet telephone demand. STE has many urgent matters decided such as replacement of

the timeworn equipment and improvement of the current inefficient billing system which needs nine months to issue telephone bills. In order to solve these urgent matters, the Government of Syria has decided to implement a comprehensive long term communications development programs including introduction of computerized systems and of an efficient management structure.

Under these circumstances, the Government of Syria requested the Government of Japan to conduct a study for planning national telecommunication network expansion in the Syrian Arab Republic.

1.2 Objectives of the Study

The objectives of the study are to formulate a master plan for the development of the telecommunications network in the whole territory of the Syrian Arab Republic up to the year 2010 and to conduct a feasibility study for the identified project(s) based on the Master Plan.

CHAPTER 2 PRESENT STATE OF TELECOMMUNICATIONS IN SYRIA

2.1 Socioeconomic Conditions

2.1.1 Location and Geographic Features

(1) Geographical Situation

At the extreme west of Asia, on the shore of the Mediterranean Sea, Syria occupies a strategic position at the meeting point of three continents (Asia, Europe, and Africa) between latitude 32 and 37 degrees north and longitude 35 and 42 degrees east.

(2) Borders

Syria is bordered by Turkey to the north, Iraq to the east, Jordan and Palestine to the south, and Lebanon and the Mediterranean Sea to the west.

(3) Area

The total land area of Syria is 185,180 sq. km. The total length of its border is 2,274 km; the length of its coast on the Mediterranean Sea is 180 km.

(4) Climate

The climate of Syria is Mediterranean with some continental influence in the interior. On the coast, it is mild all year, but very humid, especially in summer. In the interior, it is mild in spring and autumn, hot in summer and cold in winter. Differences between day and night temperatures are minimal in the coastal area but vary in the interior. Average mean temperatures vary between 20 and 27 degrees celcius in spring and autumn, 1 and 5 degrees in winter, and 35 and 38 degrees in summer.

2.1.2 Demographics

(1) Population

The population of Syria is estimated to be about 13.8 million as of midyear 1994. As shown in Table 2.1.2-1, annual population growth was about 3.4% from 1975 to 1994. This rather high growth rate is due to the higher than average nutritional levels and the decline in mortality by two-thirds over the past two decades. The population under the age of 20 amounts to about 60% of the total population; about 50% of population is under the age of 15.

Table 2.1.2-1 Midyear Population Estimated by Sex (thousands)

YEAR	MALES	FEMALES	TOTAL
1975	3,777	3,603	7,380
1976	3,904	3,723	7,627
1977	4,035	3,848	7,883
1978	4,170	3,978	8,148
1979	4,310	4,111	8,421
1980	4,455	4,249	8,704
1981	4,622	4,424	9,046
1982	4,749	4,549	9,298
1983	4,909	4,702	9,611
1984	5,074	4,860	9,934
1985	5,244	5,023	10,267
1986	5,420	5,192	10,612
1987	5,603	5,366	10,969
1988	5,793	5,545	11,338
1989	5,986	5,733	11,719
1990	6,189	5,927	12,116
1991	6,400	6,129	12,529
1992	6,620	6,338	12,958
1993	6,842	6,551	13,393
1994	7,071	6,773	13,844

(2) Administrative Divisions

Syria is administratively divided into 14 Mohafazas. Each Mohafaza is generally divided into Manatiks. Each Manatik is further divided into smaller administrative units called Nawahis. Each Nawahi covers a number of villages; a village is the smallest administrative unit. Administrative divisions are shown in Table 2.1.2-2.

Table 2.1.2-2 Number of Administrative Divisions at the End of 1993

Mohafaza	Manatikas	Nawahis	Villages	Population(000)*
Damascus (City)	-	-	-	1,552
Damascus (Rural)	8	27	191	1,451
Aleppo	7	31	1,469	2,856
Homs	5	17	447	1,301
Hama	4	16	500	1,116
Lattakia	3	17	442	834
Deir-El zor	2	11	124	599
Idleb	4	18	410	937
Hasakeh	3	11	1,677	1,030
Al-rakka	2	6	313	518
Al-Sweida	2	9	119	300
Dar'a	2	12	127	616
Tartous	4	22	474	689
Quneitra	1	4	161	45
TOTAL	47	201	6,454	13,800

*: as of midyear 1994

2.1.3 Economic Trends

(1) Economy

Syria is a middle-income developing country; its real growth in GDP in 1993 was 3.16%. Its economic base is diversified between agriculture, industry, and an expanding energy (oil) sector. The labor force is about 26% of the total population - it is relatively small due to the heavy concentration of population in the non-working age group (50% are under the age of 15).

Table 2.1.3-1 Economic Indicators

	1989	1990	1991	1992
GDP (million Syrian pounds)	208,900	268,300	316,200	371,000
GDP Per Capita (US$)	980	1,000	1,160	----
Real Growth in GDP (%)	-9.0	7.6	8.9	9.6
Export (million Syrian pounds)	33,740	47,282	38,504	34,720
Import (million Syrian pounds)	23,544	26,936	31,066	39,178

(2) Main Activities

Syria has traditionally been an agrarian country; in 1991 the contribution of agriculture to GDP was of the order of 31% and employed 22% of the total labor force. Only about 35% of the total land is cultivated, of which 15% (4.5% of total land) is irrigated, thus making agricultural production largely dependent on rainfall. A good rainy season can lead to GDP expansion, whereas drought conditions can lead to economic stagnation and even contraction.

Crude oil (petroleum) production is another major feature of the Syrian economy and is the most rapidly growing sector. Since the start of production in the early 1960's Syria has gone from a net importer of crude oil to a net exporter; oil is becoming the main earner of foreign currency. Natural gas production has also increased considerably. Exports of crude oil and natural gas in 1993 totaled about 21 billion Syrian pounds (= 1.9 billion US$), constituting 59.5% of total exports (=35 billion Syrian pounds).

The Syrian industrial sector is largely dominated by state-owned enterprises, in which the government has invested considerably. Industry revolves mainly around agricultural production, textiles and, recently, crude oil and natural gas production. Petroleum production account for 37.5% of total Syrian industry.

2.2 Telecommunications Sector

The STE is the sole responsible and authorized body for providing international and domestic telecommunications services in Syria. The STE is one of the government agencies under the control of the Ministry of Communications.

2.2.1 Outline of Organization Structure

The present organization of the STE is shown in Figure. 2.2.1-1.
There were a total of 14,524 staff members in 1993; the employees by category at the end of 1992 were distributed as follows:

Engineering	957
Technical Support	5,910
Customer Relations	5,275
Administration and Financial	980
Service	950
Total	14,072

2.2.2 Telecommunication Development Plan

STE has planned several development projects for the Eighth Five-Year development plan (1996 to 2000).

(1) Purpose

- To meet the waiting lists for the year of 1995
- To provide telephone service for the entire country (except for small villages)
- To achieve a penetration ratio of 14 telephone main line per 100 inhabitants
- To introduce ISDN service
- To commence mobile telephone service
- To expand data telecommunication network

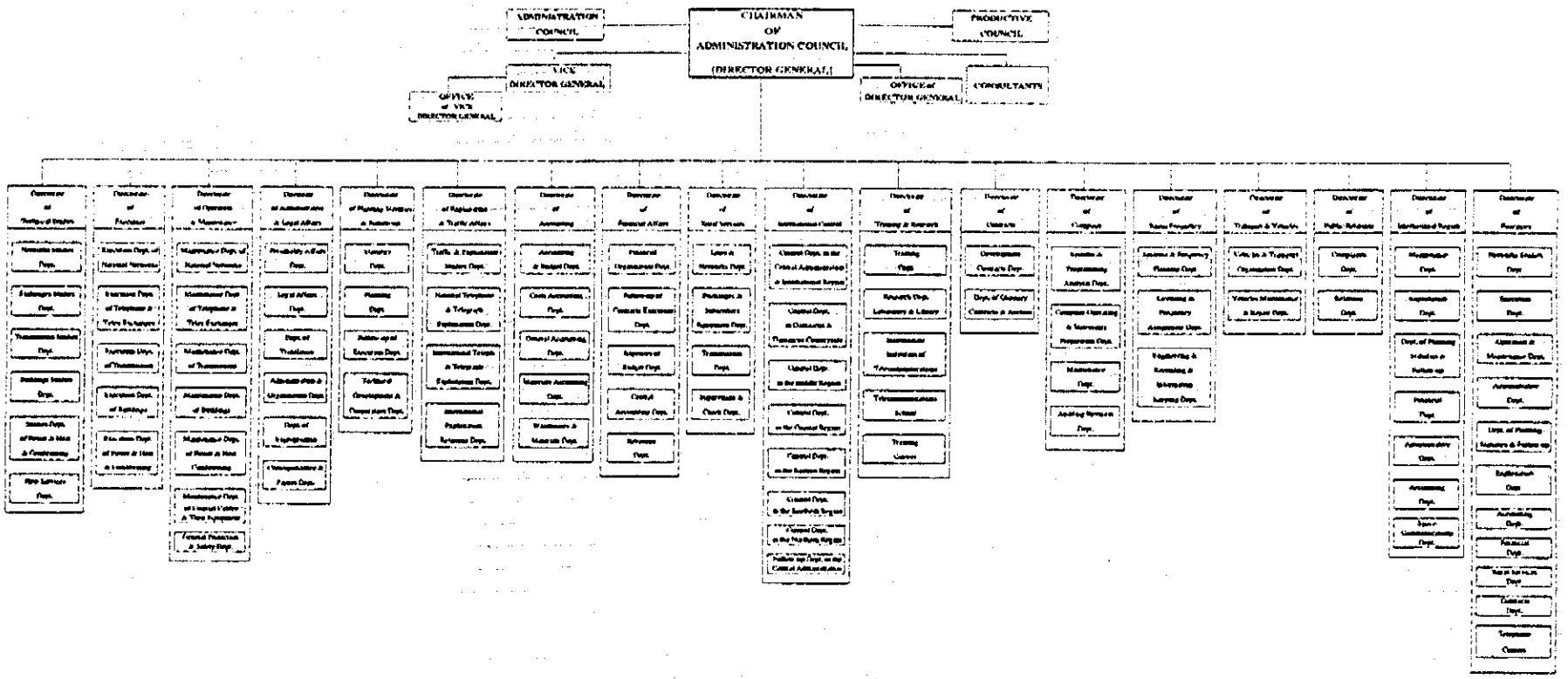

Figure 2.2.1-1 The Present Organization of the STE

(2) Size

Capacity of exchanges: 1,725,000 lines

- Replacement (manual to automatic): 50,000 lines
- Replacement (Electro-mechanical to digital): 87,000 lines

2.2.3 Financial Situation

2.2.3.1 Year-end Financial Results for the Past Five Years (1990-1994)

(1) Financial Results

Revenues and profits of the STE have increased quite rapidly over these five years, due to the continuous endeavors of the STE. The number of telephone subscribers in 1990 was 496,360; by 1994 it had increased to 688,500.

The basic reason for this rapid growth is the high rate of economic growth, mainly due to the increased petroleum production. The Kuwaiti Fund, which began in 1992, has also played an important role in this rapid growth of the STE.

However, the revenues and profits of the STE seem to be overestimated because the accounting system used is not in perfect accordance with international standard accounting systems, although it conforms to Syrian government accounting rules. It is thus necessary to reform the accounting system in order to meet international standards, that is, to introduce new management accounting. Especially important is to use actual revenues and profits rather than estimated sums as is done now mainly due to the about-one-year delay in collecting telephone fees. Revenues and profits for 1994, shown in Table 2.2.3.1-1, also include estimated sums.

Table 2.2.3.1-1 Financial Results (million Syrian pounds)

	1990	1991	1992	1993	1994
Revenues	2,545	2,832	3,170	4,291	6,493
Expenditures	1,264	1,206	1,444	1,718	2,737
Profits	1,281	1,626	1,724	2,573	3,756

(2) Revenues by Service

The main revenues of the STE have come from international calls, which account for close to half of total revenues. The high international revenues are due to the high cost of international calls. The current price of international call ranges from 7.8 to 266.7 times that for a long-distance call within Syria. The number of local calls in 1990 was 845 million and increased to 1,100 million in 1994. Long-distance calls in 1990 totaled 108 million minutes and 155 million minutes in 1994. International calls in 1990 totaled 21 million minutes and 35 million minutes in 1994.

Table 2.2.3.1-2 Revenues by Service (million Syrian pounds)

	1990	1991	1992	1993	1994
Local calls	338	364	537	600	660
Long-distance calls	189	192	266	276	372
International calls	1,150	1,204	1,320	1,723	2,923
Facsimile installation	—	—	—	8	16
Telexes	179	266	325	373	190
Telegraphes	97	74	81	85	97
Other telephone revenue	541	687	584	1,154	2,155
Other revenue	51	44	56	73	79
Total	2,545	2,832	3,170	4,291	6,493

Notes: According to the STE ANNUAL REPORT for 1992-1993, the revenue for each service in 1992 was as follows: local calls = 400 MSP, long-distance calls = 360 MSP, international calls = 1440 MSP

(3) Income Tax

The STE's income tax in 1994 amounted to 2,197 million Syrian pounds. It was calculated as follows:

a. Fix ratable value based on profits
For a profit of 3,756,275,492 SP, the ratable value was fixed at 3,756,207,517 SP.

b. Tax initial ratable value of one million SP by 10 - 40%
Average rate was 29.9%, so initial tax was 299,200 SP (tax 1).

c. Tax remaining ratable value by 45%
(3,756,207,517 - 1,000,000 SP) x 45% = 1,689,843,382 SP (tax 2).

d. Tax above tax by 30%
(1,689,843,382 + 299,200 SP) x 30% = 507,042,774 SP (tax 3).

e. Sum tax1, tax2, and tax3
299,200 + 1,689,843,382 SP + 507,042,774 = 2,197,185,357 SP (total tax).

2.2.3.2 Balance Sheet

The latest STE balance sheet is shown in Table 2.2.3.2-1. As mentioned before, several parts do not correspond to international accounting standards. The detailed data is in S1-2-1 of the Supporting Report.

Table 2.2.3.2-1 Balance Sheet (31/12/1994) (Syrian pounds)

ASSETS		DEMANDS	
Fixed Assets	8,627,698,898	**Actual Capital**	1,682,673,887
Land	40,504,384	Nominal Capital	2,540,000,000
Buildings & Establishment & Utilities	562,813,125	Unpaid Capital	-857,326,113
Equipment & Machines	7,715,493,804		
Transportation Means	217,290,187	**Reserves**	3,061,694,750
Office Furniture & Equipment	91,597,399	Legal Reserves	1,892,377,148
		Forward Surplus	1,169,317,601
Projects Under Execution	9,277,522,390	**Depreciation**	2,353,966,860
Buildings & Establishment			
Machines & Equipment	363,523,422		
Advance and Credits for Buying Assets	6,717,050,087	**Provisions**	2,211,730,081
	2,196,948,881	Tax Provisions & Other Fees	2,211,027,472
		Other Provisions	702,609
Goods In Storage	2,857,962,051		
		Long-Term Loans	9,375,927,339
Receivables		Local Loans	4,630,422,645
Subscribers	2,407,301,493	External Loans	336,893,694
Securities & Advances	2,342,185,447	Kuwaiti Loans	4,408,611,000
	65,116,046		

Assets		Demands	
Various Debt Accounts	2,804,788,273	**Creditors**	6,131,629,936
Due Appropriate &	2,344,090,403	Suppliers	5,365,561,503
Current Incomes		Promissory Notes	61,628
Accounts of Institutions	6,356,865	Various Creditors	764,975,806
Establishments		Various Credit Accounts	1,028,000
Currency of Establishments	7,391,005		
& Branches (Amount)			
Plans Account	446,950,000	**Various Credit Accounts**	1,921,381,794
(at Institutions)		Various Creditors	124,524,033
		Current & Appropriate Due	1,831,022
		Expenses	
Available Funds	763,731,542	Current & Appropriate	1,795,026,738
Cash in Hand	76,775,950	Received Incomes	
Current in Banks	686,738,253		
Permanent Advances	217,339		
Total	**26,739,004,648**	**Total**	**26,739,004,648**

2.2.3.3 Financial Plan

(1) Long-term Loans

The main components of the long-term loans are Local Loans (government loans) and the Kuwaiti Fund. The STE began borrowing from the Kuwaiti Fund in 1992. These funds have played an important role in the rapid growth of the STE since 1992. With the Local Loans, the Syrian government directly lends currency to the STE, but the other loans, including the Kuwaiti Fund, are allowances in kind. The borrowing results for 1994 are shown in Table 2.2.3.3-1.

Table 2.2.3.3-1 Borrowing Results for 1994 (Syrian pounds)

Local Loans	4,630,422,645.43
Kuwaiti Fund	4,408,610,999.64
World Bank Loans	87,247,038.74
French Loans	44,353,250.61
Loans of Arabic Kuwaiti Union	19,564,409.95
Arabic Saudi Bank Loans	16,955,460.43
German Loans	573,845.43

(2) Kuwaiti Fund

Repayment of interest for Kuwaiti Fund 401 and 404 began in 1992 (refer to Tables 2.2.3.3-3 and 2.2.3.3-4) at an annual interest rate of 3.5%.

Repayment of the original principal of Kuwaiti Funds 401 and 404 has not started yet. A semiannual repayment of Kuwaiti Fund 401's original principal is planned to begin in January 1998 and to end in July 2013. The semiannual payment will be 1,150,000 - 1,200,000 Kuwaiti Dinars. The semiannual repayment of Kuwaiti Fund 404 is planned to begin in 1997 and to end in 2013. The semiannual payment will be 435,000 - 455,000 Kuwaiti Dinars.

The repayment plan for the original principal of Kuwaiti Funds 401 and 404 is shown in Table 2.2.3.3-2, and the repayment of interest of Kuwaiti Funds 401 and 404 is shown in Tables 2.2.3.3-3 and 2.2.3.3-4.

Table 2.2.3.3-2 Repayment Plan for Original Principal of Kuwaiti Funds 401 and 404

Kuwaiti Fund 401		Kuwaiti Fund 401	
Date of Payment	Kuwaiti Dinars	Date of Payment	Kuwaiti Dinars
15/1/1998	1,150,000	15/10/1997	435,000
15/7/1998	1,150,000	15/4/1998	435,000
15/1/1999	1,150,000	15/10/1998	435,000
15/7/1999	1,150,000	15/4/1999	435,000
15/1/2000	1,150,000	15/10/1999	435,000
15/7/2000	1,150,000	15/4/2000	435,000
15/1/2001	1,150,000	15/10/2000	435,000
15/7/2001	1,150,000	15/4/2001	435,000
15/1/2002	1,150,000	15/10/2001	435,000
15/7/2002	1,150,000	15/4/2002	435,000
15/1/2003	1,150,000	15/10/2002	435,000
15/7/2003	1,150,000	15/4/2003	435,000
15/1/2004	1,150,000	15/10/2003	435,000
15/7/2004	1,150,000	15/4/2004	435,000
15/1/2005	1,150,000	15/10/2004	435,000
15/7/2005	1,150,000	15/4/2005	435,000
15/1/2006	1,150,000	15/10/2005	435,000
15/7/2006	1,150,000	15/4/2006	435,000
15/1/2007	1,150,000	15/10/2006	435,000
15/7/2007	1,150,000	15/4/2007	435,000
15/1/2008	1,150,000	15/10/2007	435,000
15/7/2008	1,150,000	15/4/2008	435,000
15/1/2009	1,150,000	15/10/2008	435,000
15/7/2009	1,150,000	15/4/2009	435,000
15/1/2010	1,150,000	15/10/2009	435,000
15/7/2010	1,150,000	15/4/2010	435,000
15/1/2011	1,150,000	15/10/2010	435,000
15/7/2011	1,200,000	15/4/2011	435,000
15/1/2012	1,200,000	15/10/2011	455,000
15/7/2012	1,200,000	15/4/2012	455,000
15/1/2013	1,200,000	15/10/2012	455,000
15/7/2013	1,200,000	15/4/2013	455,000
Total	37,000,000	Total	14,000,000

Table 2.2.3.3-3 Repayment of Kuwaiti Fund 401 Interest

Period	Kuwaiti Dinars	Exchange Rate	Syrian Pounds
7/1992-1/1993	159,703	38.5	6,149,373
5/1993-1/1994	679,293	36.8	25,013,443
7/1994-1/1995	987,440	38.8	37,355,659

Table 2.2.3.3-4 Repayment of Kuwaiti Fund 404 Interest

Period	Kuwaiti Dinars	Exchange Rate	Syrian Pounds
6/1992	23,920	36.6	878,155
4/1993-10/1993	162,707	36.7	5,966,101
7/1994-1/1995	298,873	37.5	11,212,755

(3) Local Loans

The yearly interest rate on Local Loans (Government Loans) is 9%, which is higher than that for the Kuwaiti Fund (3.5%). However, the STE can obtain currency directly only through Local Loans, and the repayment plan is less rigid. Repayments of Local Loans, including original principal and interest, have not started yet.

The borrowing results are shown in Table 2.2.3.3-5.

Table 2.2.3.3-5 Borrowing Results for Local Loans (Syrian pounds)

Year	Original Principal	Interest
1981	604,664,172	124,301,959
1982	126,179,336	73,083,768
1983	64,747,503	89,855,554
1984	-	100,243,357
1985	-	112,010,013
1986	-	120,872,287
1987	-	132,153,479
1988	-	144,892,394
1989	-	158,010,586
1990	-	172,757,950
1991	-	287,548,751
1992	-	207,843,559
1993	1,054,000,000	240,928,576
1994	550,000	366,329,394
TOTAL	2,399,591,011	2,230,831,634

2.2.3.4 Assets

The depreciation of asset is calculated not by a fixed-rate method but by an equal-annual-payment method. The depreciation periods and the fixed amounts of assets are shown in Table 2.2.3.4-1. The annual depreciation is shown in S1-2-2 in the Supporting Report.

Table 2.2.3.4-1 Depreciation Periods and Fixed Amounts of Assets

Assets		Depreciation Period (Years)	Straight-Line Rate (%)
Switch	EWSD	16	6.25
	EMD	10	10
Satellite	Intelsat	10	10
	Arabsat	10	10
	Intersputonic	10	10
Cable	Within City	16	6.25
	Between Cities	20	5
Terminal	Telephone	5	20
	Telex	10	10
	Telegraph	5	20
Building		40	2.5
Furniture		10	10
Office Machine		5	20

2.2.3.5 Service-Level Indicator

The service-level of the STE is shown in Table 2.2.3.5-1. The number of subscribers of automatic switching has increased rapidly, while the number of subscribers of manual and semi-automatic switching has decreased. Overall, the total number of telephone subscribers has increased. The capacity of exchanges has increased more rapidly than the number of subscribers, because introducing exchange systems is easier than completing the last mile. The number of telex subscribers has remained steady since 1992, although telex utilization has decreased due to the increasing utilization of facsimile.

Table 2.2.3.5-1 STE Service Levels

	1990	1992	1993	1994
Number of Telephone Main Subscribers	496,360	513,000	550,000	688,500
Automatic Service *	376,646	401,000	435,000	610,000
Manual & Semiautomatic Service	119,714	112,000	115,000	78,500
Capacity of Main Telephone Exchanges	516,000	531,000	738,500	1,205,000
Capacity of Automatic Exchanges	389,000	416,000	613,000	1,116,000
Capacity of Automatic & Semiautomatic Exchanges	127,000	115,000	125,000	89,000
Number of Local Calls (millions)	845	895	1,000	1,100
Number of National Calls (million minutes)	108	111	115	155
Number of International Calls (million minutes)	21	22	34	35
Number of Telex Subscribers	3,401	3,650	3,725	3,765
Number of Telex Letters (million minutes)	2,375	2,893	2,681	2,525
Number of Workers in STE	13,796	14,072	15,670	16,655

* The subscribers are not automatic.

2.2.4 Tariff System

The primary objective of the next section is to analyze the present tariff structure of telecommunications services offered by the Syrian Telecommunication Establishment (STE).

The data presented are from the current "Tariff Telecommunication System" issued by the STE Board of Directors, under number (231) on 4/9/1994; they were confirmed by the Syrian Telecommunication Minister, under number (513) on 8/9/1994.
The descriptions given refer to voice line telephony (PSTN) service, unless stated otherwise.

2.2.4.1 Billing

Billing of customers is done on a quarterly basis (every three months). A subscriber receives itemized bills for national and international calls if the total amount of the bills exceeds 1000 SP (Syrian pounds). Each subscriber is allowed up to 175 free local-call units per quarter.

There is a delay in sending the bills to subscribers (9 -12 months). After a public announcement that the latest quarterly bill has been issued, subscribers have to pay their bills in cash at the local service center within one month.
A grace period of 15 days is usually given before a subscriber is disconnected. A disconnected subscriber has three months to pay 100 SP for reconnection. After the three months, the subscription is canceled.

2.2.4.2 Installation Fee

There are currently about 1.1 million applicants on the waiting list for installation, with the earliest applications from 1981. The waiting list for the years 1981 to 1995 will be handled based on the applicant subscription forms. The installation fee for a regular applicant who applied in 1980 was 4000 SP. For those who submitted applications during 1981 to 1995, it is possible to get a subscriber line for a fee of 37,500 SP. Customer who did not apply in those years can still get a subscriber line, but for a charge of 75,000 SP.
The charge for a second line (an exceptional line) is 100,000 SP.

2.2.4.3 Subscription Fee

The annual subscription fee is paid in advance during the first quarter. The charge for residential users is 400 SP and for business users 800 SP.

2.2.4.4 Local Calls

Local calls are included as part of the subscription fee, up to a quarterly limit of 175 calls (or 350 minutes per month), for subscribers who are connected to an EWSD exchanges. Subscribers connected to other types of exchanges also receive 175 free local calls per quarter, but without any limitation on time.

Calls in excess of these limits are charged 0.6 SP per six minutes if the subscriber is connected to an EWSD exchange. After six minutes, the second billing unit starts. Subscribers connected to other types of exchanges are charged 0.6 SP per local call without any time limitation.

Economically speaking, these free units for local calls are practically a "free good". Local calling areas are based on the 14 administrative districts (Mohafazats).

2.2.4.5 National Calls

Calls to outside a local-exchange area are long-distance calls and are charged according to stepped distance bands. The bands and charges per minute are as follows:

Zone 0	uo to 25 km	0.75 SP/min.
Zone 1	26 - 50 km	1.25 SP/min.
Zone 2	51 - 100 km	1.50 SP/min.
Zone 3	101 - 200 km	2.25 SP/min.
Zone 4	201 - 300 km	3.00 SP/min.
Zone 5	301 - 400 km	3.75 SP/min.
Zone 6	more than 401 km	4.50 SP/min.

The distance is defined as a straight line between both points. There is an off-peak discount of 50% between 22:00 and 7:00. This tariff became effective on 01.07.1994, it is not clear whether it considers the seven national zones accurately at time.

International Comparison of National Call Charges

Comparing the charges for national calls with those for other countries is difficult because the configuration of the distance bands is different. Also, while two step tariffs apply almost everywhere, the balance between fixed and usage tariffs differs. Making this comparison is important because although the ability to pay differs from country to country, equipment costs do not vary to the same degree. The costs for a three-minute call are compared with those for a small selection of other countries in Table 2.2.4.5-1. It can be generally said that all of the Syrian distance-band charges are extremely cheap by international standards.

Table 2.2.4.5 - 1 Costs for a 3-minute National Call (in US$)

Charge Band	Syria	Indonesia	Gennany	Spain	Turkey
Local	0.01	0.04	0.14	0.03	0.09
Up to 25 km	0.02	–	0.14	0.69	0.12
26 - 50 km	0.03	1.09	0.42	0.69	0.63
51-100 km	0.04	1.09	0.72	0.69	1.02
101-400 km	0.09	1.45	1.20	1.23	1.68
More than 401 km	0.11	2.17	1.20	1.23	1.68

(Exchange Rate 1US$ = 42 SP)

2.2.4.6 International Calls

Since 1982 there have been four increases in the international-call charges, each between 42 and 74 %. The current rates took effect on 1.4.1991.
The rates are based on country zones, as defined below.

Zone 1 = Jordan, Lebanon

Zone 2 = Cyprus, Greece, Turkey

Zone 3 = Alger, Bahrain, Djibouti, Egypt, Kuwait, Libya, Morocco, Mauritania, Oman, Qatar, Saudi Araba, Somali, Sudan, Tunisia, UAE, Yemen

Zone 4 = Albania, Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, Germany, Gibraltar, Hungary, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Malta, Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Swiss, UK, CIS, Vatican, Yugoslavia

Zone 5 = Afghanistan, Australia, Bangladesh, India, Indonesia, Iran, Japan, Malaysia, Nepal, Pakistan, Philippines, Taiwan, Thailand

Zone 6 = Antigua, Bahamas, Barbados, Canada, Cuba, Dominican Republic, Grenada, Guadeloupe, Haiti, Jamaica, Martinique, Panama, Tahiti, Trinidad/Tobago, USA, Virgin Islands, Mexico, Central America, South America, USSR

Zone 7 = Rest of the world.

The rates by zone are as follows:

Zone:	SP per minute
Zone 1	35
Zone 2	50
Zone 3	65
Zone 4	100
Zone 5	115
Zone 6	125
Zone 7	200

There is a discount of 50% on all calls based on the following Syrian local-time schedule:

- Far East Countries 14:00 - 19:00
- Europe, Africa, Arab Countries and Near East Countries 1:00 - 6:00
  * (22:00 - 03:00)
- North America and South America 3:00 - 8:00
  * (01:00 - 06:00)

Note: * ( ) means local-time schedule amended on 1st of April, 1996.

2.2.4.7 Other Charges

International collect calls are possible through international direct dialing (IDD) or operator-assisted dialing from and to the following countries:
Canada, Greece, Italy, Spain, UK, France, Switzerland, Czech Republic, USA and Romania (only to Syria).
The additional charge for these "home country direct" calls is included in the local call units.
Calling cards services are available from AT&T (no. 0808) and Sprint International (0888) or (0887 Arabic operator) to limited areas.

2.2.4.8 Facsimile

Facsimile service became available in Syria in mid-1994. The number of registered fax subscribers was around 4000 in April 1994. The estimated actual number including non-registered fax machines is two to four times higher. The use of fax on telephone networks is regarded as a distinct service that bears a special installation charge, a deposit, and a subscription fee. The use of a fax machine needs to be registered with the STE and if non-approved use is detected, the line is disconnected.

Installation charge	25,000 SP * (10,000 SP)
(for companies under Law Nr. 10)	500 US$ * (200 US$)
Deposit	10,000 SP
Subscription Fee	+10% of the subscriber's national and international call fee

Note : * ( ) means tariff amended on 1st of April, 1996

A temporary fax subscription limited to six months is also available.
The charge for sending a fax is the same as for a normal telephone call since there is no mechanism for charging differently.

2.2.4.9 Telegraph

While the STE also provides telegraph service, the reduced cost of communication services will lead to a large decrease in telegraph usage. The national telegraph tariffs are as follows:

- Ordinary telegram per word	1.50 SP
- Urgent telegram per word	3.00 SP
- Ordinary local telegram per word	0.75 SP
- Urgent local telegram per word	1.00 SP

The minimum charge per telegram is 10 words.

The charges for international telegraph services are divided into eight zones. The tariff per word ranges from 6 to 38 SP.

2.2.4.10 Telex

In 1994 the number of telex subscribers was 3765. As with telegraph service, the number of subscribers and the traffic load are assumed to decrease in the future. The current tariffs are as follows:

Installation fees:	
- within the telex-exchange circuit limits (4 km)	5000 SP
- for 500 m exceeding the telex-exchange circuit limits	900 SP
- for each 500 m between 2 - 5 km	1800 SP
- for each 500 m above 5 km	2400 SP
Annual subscription fee	2500 SP
Subscription deposit	5000 SP
Teleprinter deposit (leased teleprinter provided by STE)	5000 SP
Teleprinter lease charge (monthly, for temporary subscr.)	2500 SP
(A temporary subscription for three months maximum is available.)	

The national telex service charge is 3.00 SP per minute to anywhere in Syria The charges for international telex service are divided into nine zones. The tariff per minute ranges from 22 to 142 SP.

2.2.4.11 Packet-Switched-Data Network (PSDN)

A pilot service for packet-switched data has been available since 1994. The number of subscribers was thought to be around 50 in May 1995. The tariffs are as follows:

Installation fees:

-a) Dedicated leased line	75,000 SP
* (Asynchronus X.28)	* (8,000 SP)
* (Syncronus X.25)	* (20,000 SP)
-b) Using public telephone	12,000 SP
	* (3,000 SP)
-c) Additional fee for using exchange conjunction cables	25,000 SP
	* (5,000 SP)

Monthly subscription fees:

-a) 1200 - 4800 bit/s:	
via dedicated leased line	1,500 SP
	* (500 SP)
via public telephone/telex network	500 SP
	* (300 SP)
-b) 9600 bit/s	3,000 SP
	* (700 SP)

Data transmission tariffs:

-a) National tariff:

per minute	5 SP
	* (2 SP)
per kilo segment	5 SP

-b) International tariffs:

with Arab countries per minute	10 SP
	* (3 SP)
with Arab countries per kilo segment	300 SP
	* (100 SP)

with European countries per minute	15 SP
	* (5 SP)
with European countries per kilo sec.	400 SP
	* (150 SP)
with the rest of the world per minute	20 SP
	* (8 SP)
with the rest of the world per kilo sec.	700 SP
	* (300 SP)
* (with America per minute)	* (7 SP)
* (with America per kilo sec.)	* (250 SP)

Note : * ( ) means tariff amended on 1st of April, 1996

2.2.4.12 Leased Lines

The STE also offers 9.6-Kbit/s leased lines. The number of leased lines was approximately 200 in May 1995. There is no installation charge. The monthly charges without tax are as follows:

- Leased line not exceeding 20 Km	4,850 SP
- From 20 to 50 Km	9,800 SP
- From 50 to 100 Km	17,800 SP
- From 100 to 150 Km	27,750 SP
- From 150 to 200 Km	37,700 SP
- From 200 to 250 Km	47,650 SP
- From 250 to 300 Km	57,600 SP
- From 300 to 350 Km	67,600 SP
- From 350 to 450 Km	82,500 SP
- From 450 to 600 Km	107,400 SP

Additionally, there are daily leased lines tariffs ranging from 320 to 7160 SP and hourly leased lines tariffs ranging from 70 to 1490 SP.

2.2.4.13 New Telephone Network Services

Subscribers connected to an EWSD exchange have access to the following new telephone services. Most of the charges are on an annual-rate base. The tariff is different for residential and business users.

Service	Residential	Business
1) Abbreviated Dialing	300 SP	600 SP
2) Wake-up Service	240 SP	480 SP
3) Follow-me Service	1,200 SP	2,400 SP
4) Call-waiting Service	400 SP	800 SP
5) Meter Observation	50 SP	100 SP
6) Hot Line	1,200 SP	2,400 SP
7) Don't Disturb Service	1,200 SP	2,400 SP
8) Service Restriction		
- according to subscriber demand/establishment	500 SP	--
- according to subscriber demand/apparatus	600 SP	1,200 SP
9) Three-party conference	1,200 SP	2,400 SP
10) Private automatic branch exchange (PABX)		
- Branch exchange sequentially linked	--	1,200 SP
- Branch exchange linked with digital and analog circuits	--	1,800 SP (per circuit)

2.3 Present Telecommunications Services and Equipment

2.3.1 Telecommunications Services

2.3.1.1 Telephone Services

(1) Basic Telephone Service

As of the end of 1994, the number of main telephone lines in service was approximately 688,500, of which 588,500, or 85.5 %, were connected to automatic telephone exchanges.

Of the total main lines connected to automatic telephone exchanges, about 350,000, or a little more than 50%, were connected to digital exchanges. Available information suggests that 10% of all connected subscribers are business subscribers.

Local, long-distance and international access is available to all subscribers connected to automatic telephone exchanges. Customers can also have their outgoing service restricted to national and/or local calls only.

All subscribers connected to automatic exchanges can access emergency services according to their region, as shown in Table 2.3.1.1-1.

Table 2.3.1.1-1 Access to Emergency Services

Region	Police	Fire	Ambulance
Damascus	112, 115, 116, 117	113	110, 118, 119
Homs	112, 115, 116, 117	113	110, 118, 119
Hama	112, 115, 116, 117	113	110, 118, 119
Aleppo	112, 115, 116, 117	113	110, 118, 119
Idleb	112, 115, 116, 117	113	110, 118, 119
Lattakia	112, 115, 116, 117	113	110, 118, 119
Tartous	112, 115, 116, 117	113	110, 118, 119
Al-Rakka	112, 115, 116, 117	113	110, 118, 119
Deir-El-Zor	112, 115, 116, 117	113	110, 118, 119
Al-Hasakeh	112, 115, 116, 117	113	110, 118, 119
Daara	112, 115, 116, 117	113	110, 118, 119
Al-Sweida	112, 115, 116, 117	113	110, 118, 119
Quneitra	112, 115, 116, 117	113	110, 118, 119

In addition, the STE provides emergency telephone service on several of the principal highways in Syria.

(2) Telephone Features for Subscribers Connected to EWSD Exchanges

Several telephone features, activated using simple MFPB (multifrequency pushbutton) procedures, are currently available to subscribers connected to EWSD exchanges. The STE has only recently announced these features and at this stage the number of customers is not thought to be significant. The list of features currently being offered by the STE is given in Table 2.3.1.1-2

Table 2.3.1.1-2 STE Feature Offerings (EWSD Exchanges)

Feature	Brief Description
Abbreviated Dialing	Use 1/2 digit to dial up to 100 pre-stored telephone numbers.
Call Diversion:	Forwarding, to another number, of all incoming calls:
-Call Forwarding Unconditional	- independent of the condition of the incoming line;
-Call Forwarding on Busy	- only when the incoming line is busy;
-Call Forwarding on No Reply	- only when no answer for a predetermined period.
Alarm Clock Call (one call)	User sets a time within 24 hours to receive ringing on his line.
Alarm Clock Call (daily)	User sets time to receive ringing on his line, daily for a period.
Call Waiting (with Hold)	Call attempt to an engaged line causes special tone on that line.
Hot Line (Immediate)	Immediate call attempt to a fixed destination, on "lift-off"
Hot Line (Delayed)	Call to a fixed destination, if dialing does not start within a few seconds.
Malicious Call Trace	A-Number identification for all calls to a User's line.
Three-Party Conference	To establish, and join, two simultaneous calls from one line.
Meter Observation	Recording of charge units per call, for a limited period.
Service Restriction (By STE)	Prevent outgoing calls to all or certain destinations. (Fixed)
Service Restriction (By Subs)	Prevent outgoing calls to all or certain destinations, (User activated).
Do Not Disturb	Diversion of all incoming calls to a network announcement.

Local EWSD exchanges are equipped with sufficient memory capacity to allow 5 - 10% penetration levels for these features, depending on the feature.

Features that are mentioned in the Feature List for the current version of the EWSD software for Syria (V4.6W) but which do not as yet appear to be offered to customers include:

- Priority Subscriber, which, during conditions of network congestion, provides the user with a better grade of service than normal subscribers.

- Conference Call (3 - 8 participants)

- Subscriber Premises Call-Charge Meter. In addition to the feature application in the software version, the switching system must be equipped with line cards for 12- or 16-KHz pulse metering for this service to be provided. However, these special line cards are now only provided in sufficient quantities to allow for the connection of public payphones.

- Preferential Class of Service (in catastrophic situations, service could be restricted on a class-of-service basis)

(3) Telephone Services for Business Customers

The main telephone services offered specifically to business customers are shown in Table 2.3.1.1-3.

Table 2.3.1.1-3 Telephone Services for Business Customers

Service	Description	Remarks
Line Hunting	Automatic selection of a free line from a customer's line group for incoming calls.	PABX connection
Direct-Dialing-In	Automatic access to PABX extension lines for incoming calls.	Pilot service only

(4) Detailed Billing/Charging Information

The STE provides a detailed itemized bill for all long-distance and international calls. Subscriber premise meters are not used in the STE network and there are currently no plans to offer this service. (A special line card in the local exchange that can generate and transmit 12- or 16-KHz pulses down the subscriber's line would be needed in addition to the subscriber premises meter.)

(5) Operator Services (excluding local manual exchanges)

Modern operator assistance facilities are provided using the EWSD system. There are a total of 25 Operator Centers consisting of :

- 1 International Operator Center, Damascus

- 5 main national Operator Centers
- 19 smaller Operator Centers.

The equipped capacities of the operator centers are as given in Table 2.3.1.1-4.

Table 2.3.1.1-4 Operator Capacities in the Syrian Network

Location	Number of Operator Positions	EWSD Exchange
Damascus	62	ISC (Damascus)
Aleppo	Not specified	ISC (Aleppo) *
Damascus	59	Damascus Transit
Aleppo	60	Aleppo Transit
Homs	45	Homs Transit
Hama	35	Hama Transit
Lattakia	37	Lattakia Transit
Nabek	11	Nabek
Shaykh Miskeen	10	Shaykh Miskeen
Al-Sweida	16	Al-Sweida
Idleb	17	Idleb
Dar'a	13	Dar'a
Quneitra	7	Quneitra
Tadmur (Palmyra)	7	Tadmur (Palmyra)
Tall Kalakh	7	Tall Kalakh
Tartous	13	Tartous
Safita	13	Safita
Baniyas	16	Baniyas
Manbij	7	Manbij
Hazaz (or Haz)	7	Hazaz (or Haz)
Arak	13	Arak
Deir-El-Zor	13	Deir-El-Zor
Abu Kamal	7	Abu Kamal
Maydan	7	Maydan
Al-Hasakeh	13	Al-Hasakeh
Al-Kamishli	16	Al-Kamishli
TOTAL	511	

* planned

A second International Operator center, associated with the planned installation of a second International Switching Center in Aleppo, is planned to begin operation in 1996.

(6) Directory Inquiries

Only a very limited Directory Inquiry (DQ) service is available in Syria. The service is not computerized and the situation is not helped by the fact that updated Telephone Directories have not been published for some time. There are two DQ positions in Damascus and one position in each of the main cities.

This situation will be improved for Damascus when the new customer services system is installed. This system will contain a database for customers that may be used for DQ.

The STE plans to purchase stand-alone PCs on which the DQ database can be run from the customer service system. Ten PC positions are planned for Damascus.

(7) Public Payphone Services

Table 2.3.1.1-5 shows the public payphone facilities provided in Syria.

Table 2.3.1.1-5 Public Payphone Services in Syria (approximate)

Location	Number of Coin-Operated Payphones	Number of Card-Operated Payphones
Damascus	230	94
Damascus (Province)	55	15
Homs	80	20
Hama	60	13
Idleb	40	10
Aleppo	130	48
Tartous	40	10
Lattakia	85	28
Deir-El-Zor	60	12
Al-Rakka	40	10
Al-Hasakeh	70	20
Dar'a	55	10
Al-Sweida	55	10
TOTAL	1000	300

In addition, a small quantity of older-type coin-operated payphones may still be in service; however, their number is not thought to exceed 200 units.

The total number of public call cabinets, including coin payphones, card payphones and telephone instruments for operator-assisted calls, is about 2500.

Coin-operated payphones provide local-call service only. Card-operated payphones provide local, long-distance and international access. The cards used are essentially debit cards and are provided in a range of values 100, 200, 500, 1000 and 1500 units, with each unit being equivalent to 1 SP. Cards are sold at discount prices (e.g., the 1000-unit card costs 900 SP). The card phones have proved to be very popular, so much so that the STE has sold out its current stocks of the lower value cards.

There are no credit-card payphones in operation in Syria.

(8) Information Services/Value-Added Services

This is not by any means a well developed sector in Syria. The STE provides a "Speaking Clock" service that can be accessed by using the shortened dialing code "151". The numbering plan indicates that further information services have been considered, such as weather, cinema, and hotel information. However, none of these services is currently available.

2.3.1.2 Nonvoice Services and Facilities

(1) Telex Service

Telex service has been offered in Syria for many years. The current telex network, supplied by Siemens, has a capacity for 5000 subscribers connected at two telex exchanges and a number of telex concentrators, as detailed in Table 2.3.1.2-1. There are about 4,000 subscribers.

Table 2.3.1.2-1 Telex Service & Facilities

Telex Switch/ Concentrator	Capacity (Telex Lines)	Comment
Damascus	2300	Also International Gateway
Dar'a	100	Concentrator
Al-Sweida	100	Concentrator
Homs	300	Concentrator
Lattakia	300	Concentrator
Tartous	200	Concentrator
Hama	200	Concentrator
Deir-El-Zor	100	Concentrator
Al-Hasakeh	75	Concentrator
Al-Kamishli	75	Concentrator
Aleppo	1100	--
Idleb	100	Concentrator
Al-Rakka	50	Concentrator
TOTAL	5000	--

Demand and traffic has fallen with the recent arrival of improved national and international telephone and facsimile services.

(2) Packet-Switched Data Network

A small-scale packet-switched network, supplied by Gandalf of Canada, was installed in Syria during 93/94. The network consists of three packet-switched nodes, two co-located in Damascus and one in Aleppo. The packet-switched network is connected internationally via the SPRINT carrier and the Cairo International Packet-Switched Network node using X.75.

Packet assembler/disassembler (PAD) capabilities are installed at seven locations throughout Syria, as shown in Table 2.3.1.2-2. The packet-switched service is operated on a pilot basis at the moment. Access to the PSDN is via dedicated circuits (X.25) or by using dial-up via the PSTN (X.28). The list of PSDN customers which are connected or are in the process of being connected to the pilot service is given in S1-2-3 in the Supporting Report.

Table 2.3.1.2-2 PSDN in Syria

Location	No. of Packet Switches	No. of PADs
Damascus	2 (Co-located)	3
Aleppo	1	2
Lattakia	0	1
Homs	0	1
Deir-el-Zor	0	1
Dar'a	0	1
Al-Sweida	0	1

2.3.1.3 Leased-Line Services

A small number of analog leased lines are provided to government bodies and to other organizations, such as companies involved in the oil industry. The total number is of the order of 200. This figure does not include leased lines for dedicated access to the PSDN.

No information on the standards used for leased lines is available.

It is understood that there are special arrangements involving the provision of digital private circuits for individual clients. However, there is currently no broad-based STE service offering private digital circuits. The STE's policy with regard to the future provision of private circuits in general and private digital circuits in particular, is not clear.

2.3.1.4 Pilot ISDN

Five local exchanges are equipped with ISDN termination: two local exchanges in Damascus and one local exchange each in Lattakia, Aleppo and Homs.

All 450 terminations are ISDN-basic accesses. The equipped capacities are as shown in Table 2.3.1.4-1.

Table 2.3.1.4-1 Equipped ISDN Capacity

Exchange	No. of Basic Accesses
Damascus G3	150
Damascus B 1	100
Lattakia D1	50
Aleppo B2	100
Homs D1	50

It is understood that the installed ISDN conforms to ITU-T and ETSI standards, but no statements or documentary evidence of conformance of the interfaces to specific ETSI standards is available. It is understood that the 'U' interface is implemented in accordance with the German national standard (no European standard for the U interface exists).

2.3.2 Telecommunications Systems and Equipment

2.3.2.1 Transmission

The STE has the following transmission systems, the details of which are given in the Supporting Report.

- Analog and digital coaxial systems (see S1-2-4)
- Analog and digital microwave systems (see S1-2-5)
- Digital optical-fiber systems (see S1-2-6)
- Digital symmetrical-cable PCM systems (see S1-2-7).
- Analog VHF and UHF radio systems & open-wire carrier systems (see S1-2-8)
- Earth stations (see S1-2-9)

(1) Digital transmission systems

In the early 1990s, the STE's main transmission systems were analog microwave systems and analog coaxial systems. Last year the STE digitized its network on a large scale under three projects.

a. 50/A contract project
-140-Mbit/s optical-fiber systems as backbone networks for areas north and west of Damascus.
34-Mbit/s optical-fiber systems as backbone networks for areas south of Damascus.
-34-Mbit/s microwave systems as spur networks in northeast Syria.

b. 3/A, 40/A contract projects
-140-Mbit/s optical-fiber systems as inner-city networks (junction networks) for big cities

S1-2-10 in the Supporting Report summarizes all digital transmission systems in Syria, except digital coaxial systems, symmetrical-cable PCM systems and digital international systems.

All circuits in the 50/A contract project are listed in S1-2-11 in the Supporting Report. They are the most important backbone circuits in Syria.

The STE is now planning expansion projects for the 50/A, 40/A, and 3/A networks at a cost of about 25% of the original projects to be executed by the end of 1995 (40/A, 3/A) and by the first quarter of 1996 (50/A). It is also planning digitization projects for the rural regions of Damascus,

Quenitra, Daraa, Seida, Homs, Hama, Tartous, Lattakia, Idleb, Aleppo, Rakka, Deir Elzor, and Hasakeh to be executed by the end of 1997.

(2) SDH Transmission Systems

The STE has already introduced a SDH system for Damascus (TV center) - Muara Sydnaya (earth station) STM-4 (1+1) system.

The introduction of SDH for the Syria (Tartous) - Cyprus (Pentaskhinos) submarine optical-fiber cable project is being considered.

In the expansion plan for the 50/A project described in (1), the STE is considering introducing SDH (STM-4) for Damascus, Homs, Hama, Aleppo, Tartous, and Lattakia to replace the existing 140-Mbit/s equipment. (The replaced 140-Mbit/s equipment would be transferred to the south to replace 34-Mbit/s optical systems.)

NOTE: The Syrian cesium master clock is installed at Nasser (Damascus international exchange).

2.3.2.2 Switching Equipment

This section reviews the existing PSTN/ISDN switching equipment, both in terms of quantity (capacity) and in terms of quality (characteristics, capabilities, and features of the installed switching systems).

(1) Switching Capacities

The following subsections discuss the provided capacity of the PSTN/ISDN switching equipment as of May 1995. In addition, projects beyond May 1995 (i.e., projects under implementation, contracted projects, projects in the contract negotiation phase, and projects where detailed planning has been finalized) are also included to the extent information could be obtained.

However, it should be stressed, that the figures in this subsection refer strictly to capacity provided and capacity planned to be provided in the forseeable future, and neither to demand nor to utilized capacity, which are covered in other sections in this report.

a. International Switching

One International Switching Center (ISC) is operational in Damascus. Contract negotiations for a second one in Aleppo are currently underway. More detailed information may be obtained from the following table:

SYSTEM	FUNCTION	PLACE	CODE	CAPACITY (lines)		INSTALLATION
				(inter.)	(national)	Year
EWSD	ISC	Damascus	DAIT	5,000	5,000	1993
EWSD	ISC	Aleppo	ALIT	3,000	3,360	1996 (planned)

Considering that as of end of April 1995 a total of only 1,793 international lines were operational in the Damascus ISC, it might be argued that the installed capacity there is sufficient for the medium-term future, and that the Aleppo ISC might not be justified as early as 1996. Considering the importance of sufficient and reliable international telecommunications for the national economy, a single ISC in Damascus cannot provide the required reliability, especially if disasters and calamities (such as earthquakes, fire, and intrusions), which can disable an exchange for a long time, are taken into account. Therefore, the second ISC in Aleppo is fully justified, and the provision should even be speeded up.

The second ISC in Aleppo will provide the additionally required reliability only if the connection

of international circuits to both ISCs is balanced and if they both have physically independent access to international transmission facilities.

b. Long-Distance Switching

The long-distance network consists of a fully intermeshed top level of transit exchanges (TEs), and a partly provided underlying level of combined transit-/local exchanges (TE/LEs).

In the top level (network level 4), the following exchanges are operational:

SYSTEM	FUNCTION	PLACE	CODE	LEVEL	CAPACITY (Trunk lines)	INSTALLATION YEAR
EWSD	TE	Damascus	DAST	4	20,939	1993
EWSD	TE	Aleppo	ALST	4	12,267	1993
EWSD	TE	Hama	HAST	4	4,480	1993
EWSD	TE	Homs	HOST	4	9,720	1993
EWSD	TE	Lattakia	LAST	4	7,320	1993

In the partly provided underlying level (network level 3), the following exchanges are operational:

SYSTEM	FUNCTION	PLACE	CODE	LEVEL	CAPACITY (Trunk lines)	INSTALLATION YEAR
EWSD	TE/LE	Daraa	DRB1	3	3,630	1994
EWSD	TE/LE	Sweda	SWB1	3	3,760	1994
EWSD	TE/LE	Safita	SAB1	3	2,280	1994
EWSD	TE/LE	Tartous	TAB1	3	3,780	1994
EWSD	TE/LE	Idleb	IDB1	3	2,310	1994
EWSD	TE/LE	Rakka	RAB1	3	2,670	1994
EWSD	TE/LE	Deir El-zor	DEA1	3	3,600	1994
EWSD	TE/LE	Al Hassakeh	AHB1	3	2,730	1994

c. Local Switching

Presently (May 1995), a total local-switching capacity of approximately 1.5 million line units (LUs) is provided in the PSTNs/ISDNs by means of five automatic switching systems and a non-neglectable number of manual switch boards. In particular, there are:

SYSTEM	LINE UNITS	PERIOD OF INSTALLATION
EWSD	1,005 000	since 1993
E 10 B	29,000	1985 - 1992
NEAX 61	100,000	1982
E 10 A	29,000	1979 - 1982
EMD	221,000	1967 - 1986
Total Automatic LUs	1,384,000	1967 - 1995
Total Manual LUs	119,000	1947 - 1995
Total LUs (May 1995)	1,503,000	1947 - 1995

Note: 2,500 line units from the E 10 A and E 10 B systems are being relocated in 1995; another 1,000 line units of E 10 B will be relocated in 1996.

The following expansion projects are ongoing (contracted, under negotiation, or planned):

SYSTEM	PROJECT	LINE UNITS	INSTALLATION PLANNED
EWSD	Small rural exchanges	125,000	1996 -1997
not yet decided	Small rural exchanges	125,000	1997 and beyond
TOTAL ONGOING		250,000	1996 and beyond

d. Integrated Services Digital Network (ISDN)

ISDN has been introduced on a pilot basis at selected places in STE's network. Only basic accesses (BRA) have been provided. The basic accesses are integrated into normal local digital exchanges, which also serve analog subscribers. Altogether, 450 basic accesses are presently provided.

The following local exchanges provide basic accesses:

PLACE	CODE	CAPACITY (analog)	(BRA)	INSTALLATION YEAR
Damascus	DAB1	30,000	100	1993
Damascus	DAG3	10,000	150	1994
Aleppo	ALB2	20,000	100	1994
Homs	HOD1	20,000	50	1994
Lattakia	LAD1	28,000	50	1994

e. Intelligent Network (IN)

Intelligent network (IN) functions and components (such as the service switching function/points, the service control function/points, and the service management function/system have not yet been integrated into the network. Concrete plans for IN were not identified.

f. Operation and Maintenance Systems / Centers

There are operation and maintenance systems, located in operation and maintenance centers (OMC), only for the E 10 A, E 10 B, and EWSD switching systems. Systematic connection of all exchanges to OMCs is envisaged only for the EWSD exchanges and is nearly completed. The following OMCs exist:

SYSTEM	PLACE	CODE	LUs SERVED	INSTALLATION YEAR
E 10 A/B	Damascus	--	25,500	1981
EWSD	Damascus	DAOM	426,000	1993
EWSD	Aleppo	ALOM	176,000	1994
EWSD	Deir El-zor	DEOM	102,000	1994
EWSD	Homs	HOOM	165,000	1994
EWSD	Lattakia	LAOM	136,000	1995

The role of the OMCs for the EWSD exchanges concentrates on maintenance (i.e., fault clearing) support. The major operations tasks in terms of frequency and time consumption (i.e., putting new subscribers into service and making changes to existing subscribers) are still being performed locally in the exchanges, not in the OMCs.

g. Switching Systems

This subsection gives a brief description of the inherent characteristics of the automatic switching systems used in Syria and their potential for up-grading to cope with new technical developments, such as Signalling System No. 7 (SS7), Integrated Services Digital Network (ISDN), intelligent networks (INs), and telecommunications management networks (TMNs).

There are four different switching system families operational in Syria:

EWSD
NEAX 61
E 10 A and E 10 B
EMD

The EWSD was supplied by SIEMENS AG, Munich, Germany. Its basic characteristics are as follows:

Type of system	advanced digital-switching system;
Subscriber stage	digital;-
A/D conversion	per subscriber line;
Concentration factor	2:1 for subscriber lines and 1:1 for digital trunks;-
Switching network	digital, structure: T-S-S-S-T;-
Control	distributed with co-ordination processor; SPC
System software	mainly CHILL, parts in assembler
Alternate routing	standard feature
Detailed charging data	standard feature
Local-call charging	multi-unit charging: standard feature

- Remote units

The RSU remote unit has not been implemented. The RCU local unit is operational in Syria and the small shelter RCU is available.

The common-channel signalling characteristics of the EWSD are as follows:

SS7 capability:	MTP and ISUP operational in Syria, other UPs/APs available;
Integrated STP capability:	operational in Syria.

The advanced capabilities are as follows:

ISDN	operational in Syria;
IN (SSP capability)	available;
IN (INAP)	under development, most likely already in beta-test.

The support system interfaces include:

O&M system interface	proprietary, Q3 interface under beta-test in Germany
Billing center interface	tape and direct interface possible
Customer-care system	implemented (e.g., for TELECOM ASIA, Bangkok)
TMN (Q3) interface	under development, beta-testing in progress.

A successor system is not required; the system concept is suitable for future development.

The NEAX 61was supplied by NIPPON ELECTRIC CORPORATION, Tokyo, Japan. Its basic characteristics are as follows:

Type of system	first-generation digital-switching system
Subscriber stage	analog
A/D conversion	per subscriber stage group
Concentration factor	2:1 to 8:1 for subscriber lines and 1:1 for digital trunks
Switching network	digital, structure: T-S-S-T
Control	multi-processor system; SPC
System software	no information obtainable
Alternate routing	standard feature
Detailed charging data	standard feature
Local-call charging	multi-unit charging: standard feature

- Remote units

The RSU remote unit has not been implemented. The RCU local unit is operational in Syria and the small shelter RCU has no information obtainable;

The common-channel signalling characteristics of the EWSD are as follows:

SS7 capability:	up-grading economically not feasible;
Integrated STP capability:	up-grading economically not feasible;

- Advanced capabilities

ISDN:	up-grading economically not feasible;
IN (SSP capability):	up-grading economically not feasible;
IN (INAP)	up-grading economically not feasible;

- Support system interfaces

O&M system interface:	proprietary;
Billing center interface:	tape and direct interface possible;
Customer-care system:	no information available;
TMN (Q3) interface:	further development of system no longer sustained;

- Successor System: NEAX 61 E.

The E 10 A and E 10 B was supplied by CIT ALCATEL SA, Paris, France. Its basic characteristics are as follows:

Type of system	first-generation digital-switching system
Subscriber stage	analog
A/D conversion	per subscriber stage
Concentration factor	8:1 for subscriber lines and 1:1 for digital trunks
Switching network	digital with marking; structure: no information obtainable
Control	distributed with multi-registers; SPC
System software	no information obtainable
Alternate routing	standard feature
Detailed charging data	E 10 A: local charging only; E 10 B: standard feature
Local call charging	multi-unit charging; standard feature

- Remote units

The RSU remote unit has no information obtainable. The RCU local unit is operational in Syria and the small shelter RCU has no information obtainable.

The common-channel signalling characteristics of the EWSD are as follows:

SS7 capability:	possible for E 10 B, but up-grading economically not feasible;
Integrated STP capability:	not implemented;

- Advanced capabilities

ISDN:	up-grading economically not feasible;
IN (SSP capability):	up-grading economically not feasible;
IN (INAP):	up-grading economically not feasible;

- Support system interfaces

O&M system interface:	proprietary, operational in Syria;
Billing center interface:	no information obtainable;
Customer-care system:	no information obtainable;
TMN (Q3) interface:	no information obtainable;

- Successor System: ALCATEL 1000 E 10

The EMD 55v(m) was supplied by SIEMENS AG, Munich, Germany. Its basic characteristics are as follows:

Type of system	analog two-wire step-by-step switching system
Subscriber stage	analog
A/D conversion	none; for junction lines and trunks by means of external equipment
Concentration factor	engineerable for subscriber lines and 1:1 for incoming junctions
Switching network	analog selector stages, partly with electrical marking
Control	distributed hardware control, relay technology
System software	none
Alternate routing	technically not possible
Detailed charging data	technically not possible without external equipment
Local call charging	multi-unit charging; up-grading economically not feasible

- Remote units

The RSU remote unit has not been implemented. The RCU local unit is operational in Syria and the small shelter RCU is available, external equipment with special interface.

The common-channel signalling characteristics of the EWSD are as follows:

SS7 capability: technically not feasible;
Integrated STP capability: technically not feasible;

- Advanced capabilities

ISDN: not possible;
IN (SSP capability): not possible;
IN (INAP): not possible;

- Support system interfaces

O&M system interface: technically not feasible;
Billing center interface: technically not feasible;
Customer-care system: technically not feasible;
TMN (Q3) interface: technically not feasible;

- Successor System: EWSD.

2.3.2.3 Power Supply and Air Conditioning for Switching

The power supply and air conditioning equipment for STE's switching systems is procured together with the switches on a per project basis.

Consequently, the following subsections concentrate on the general situation of the public power supply, on STE's engineering standards, and on how these fit together.

(1) Public Power Supply

The public power supply is under the responsibility of the Ministry of Electricity and is executed through the Public Establishment for Electricity (PEE), which is a fully government-owned utility, responsible for electricity generation and distribution.

(2) Voltage and Area Coverage

The nominal voltage provided to residential end users is 220 volts at 50 Hz. Industrial users (and government establishments, such as the STE) can also be connected directly by means of high-tension lines. In this case, the transformers are provided by the Public Establishment for Electricity.

Public power supply is provided throughout the country. In fact, there are no automatic exchanges that are not connected to the public power supply and exclusively dependent on their own generators.

The power distribution network is a meshed network. All power stations are interconnected with other power stations; none supply only isolated islands.

The capacity of the operational power stations does not fully satisfy the demand at certain times of some days. This shortcoming has been overcome by systematically scheduling power cut-offs in certain areas. Major projects to up-grade the installed power generation capacity are underway. A remarkable improvement is already being felt (at least in Damascus) since new power generation stations became operational at the end of 1994 and at the beginning of 1995.

(3) Reliability of Public Power Supply

From a general point of view, the reliability of the public power supply does not yet fully meet the usual standards in more industrialized countries. Part of this has most likely been caused by the

shortfalls in the installed power generation capacity described above. Furthermore, the distribution network itself has not been re-engineered to meet the increasing demand and the increasing power generation capacity; it has also been described as not being maintained as it should be.

As already mentioned, a general improvement in the situation was observed in 1995. However, it is much to early to rely on this improvement. A much longer observation time will be needed before any change in STE's engineering standards can be considered.

A record of the running times of the back-up generators for selected exchanges across Syria during the period from the 1st of January till the 31st of March 1995 is shown in the following table. The running times also include the test running times, which account for approximately 30 minutes per month.

AREA	EXCHANGE	GENERATOR RUNNING TIME (hours)
Damascus	Barze	4
	Tall	17
	Kesweh	25
Homs	Alwaar	50
	Tal Kalakh	32
	Palmyra	47
Aleppo	Hamadanieh	6
	Maliry	70
	Sfereh	35
Deir Al Elzor	Deir El-zor	15
	Mayadin	70
	Abo Kamal	125
Daraa	Daraa	18
	Jasem	60
	Bussra	78
Lattakia	LattakiaD	90

	Al Heffe	205
	Kurdaha	60

(4) Present Engineering Standards

The basic planning principle of the STE is to provide at each exchange site a public power supply, a battery, and a stationary back-up power generator.

The detailed engineering standards for these three components are described in the following sections.

Given the characteristics of the public power supply, this planning principle appears to be justified so long as no sustained reliability improvements in the public power supply are achieved.

(5) Voltage for Switching Equipment

The nominal voltage feed to the switching equipment is -48 volts with the plus pole grounded. An overview including the operating range for each exchange type is given in the table below.

SYSTEM	NOMINAL VOLTAGE (Volts)	OPERATING RANGE (Volts)
EWSD	- 48	- 44 to -54
NEAX 61	- 48	- 46 to -56
E 10 A	- 48	- 44 to -56
E 10 B	- 48	- 44 to -56
EMD	- 48	- 45 to -54

(6) Grounding

Grounding is provided by means of the usual building earth bar, to which all equipment to be grounded in the exchange building is connected, and an appropriate grounder.

The maximum allowance for the grounding resistance is as follows:

EXCHANGE SIZE	Ohms
< 5,000 LUs	10
5, 000 - 10,000 LUs	5
> 10,000 LUs	1

NOTE: Especially in the more dry desert-like areas of Syria, grounding often faces serious resistance problems.

Sample tests of grounding resistance have shown how the resistance varies.

EXCHANGE	GROUNDING RESISTANCE (Ohms)
Aleppo B2	4.0
Aleppo D2	2.1
Homs D1	2.4
Damascus O	5.0

The O&M Department for switching reported the following remarkable samples:

EXCHANGE	GROUNDING RESISTANCE (Ohms)
Damascus L1	100
Kerdaha	117
Sweda B1	at MDF 11,000

(7) Transformers

The transformers are provided, owned, and maintained by the Public Establishment for Electricity. They are dimensioned for the planned final demand in the respective building. The STE has to bear the full provisioning cost.

Up-grading of the transformers is not a major problem and can normally be done inside half a year after notice is given to PEE. Again the STE has to bear all costs.

(8) Rectifiers

The rectifiers are provided with the exchanges and are engineered for the planned initial capacity of the respective exchange. In addition, one stand-by (back-up) rectifier is always provided (n+1 principle).

(9) Batteries

The batteries are provided with the exchanges and are engineered for the planned initial capacity of the respective exchange. Battery capacity is provided as follows:

Exchange type	Battery capacity (hours)
EMD	10
E 10 A	10
E 10 B	10
NEAX 61	10
EWSD	4

(10) Emergency Power Generators

Stationary emergency back-up diesel power generators are provided for each switch based on the final planned capacity of the switch, of the associated air conditioning equipment, and of the emergency lighting for the switching room and the associated rooms.

The back-up diesel power generators start automatically when the public power supply goes down, and are automatically controlled dependent on the load.

NOTE: At some locations (e.g., the NEAX 61 Exchange on Baghdad Street), the originally provided emergency back-up diesel power generators have been provisionally replaced by ones without automatic start up capability and with manual control. Such substitutions are acceptable only for a shortwhile.

(11) Air Conditioning Equipment

Air conditioning equipment is provided for the digital exchanges (EWSD, NEAX 61, E 10 A, and E 10 B) together with the switching system; it is dimensioned for the planned initial capacity of the switch.

2.3.2.4 Outside Plant

The existing subscriber network in Syria is a flexible network. Figure 6.12.12-1 illustrates the principle structure of this network. The primary network is located between the main distribution frames (MDFs) and the cross-connection cabinets (CCCs). A terminal joint (pothead) located in the cable vault room is the transition point between the installation inside the exchange and the outside cable network. Tie cables (300 pairs each) are the link between the terminal joint and the MDF. A secondary cable connects the CCC with the distribution point (DP).

Primary cables are usually installed unarmored in duct systems. In areas with low density or for connecting of subscribers directly (without passing through the CCC), the primary cables are directly buried if no duct system is available.

The secondary cables in the cities are usually armored and directly buried. In rural areas there are both directly buried cables and aerial cables.

A service line links the DP to the subscriber premises. Both drop wires and separate wires are used as service lines.

It is in the responsibility of the Syrian Telecommunications Establishment (STE) to provide the complete OSP installation from the MDF to the subscriber's terminal equipment (e.g., telephone).

The wireless local loop is not used by the STE.

(1) Main Distribution Frame

In the digital exchanges, the MDFs are provided together with the switching equipment. Insulation displacement connector (IDC) technology is used in the terminal blocks. The MDF is located above the cable vault room.
In the analog exchanges, soldering tags are used to connect the terminal blocks to the tie cables between blocks and to the jumper wires to the vertical terminal blocks (switching). On some of these MDF terminal blocks, the jumper wires have been found wrapped at the tags without being soldered, which can lead to corrosion. Arrestors for lightning protection are installed at the MDF.

Some of the analog exchanges have been extended with new digital switching equipment, so that both old and new MDF types, as described above, can be found.

Primary pairs of several subscribers originally terminated at analog exchanges are being relocated

to new digital exchanges by junction cables in buildings containing both types of switches and also between buildings.

(2) Cross-Connection Cabinets

The older CCCs were manufactured in Germany and were constructed of metallic material (sheet steel); the newer ones are fabricated in Bulgaria, and their cases are fabricated using reinforced plastic material according to STE technical specifications. However, newer types of CCCs with metallic housing have been found during site surveys.

The terminal blocks use soldering tags to connect with the primary and secondary cables on the backside and nickeled brass screws to connect with the jumper wires. Ground clips are fixed at the bottom of the terminal blocks to provide connection for the metallic sheath of the outer cables. Heat shrinkable sleeves are used to seal the terminal block entries after the primary and secondary cables are connected. Terminal blocks with prefabricated tail cables are not used by the STE.

Problems have been reported with the construction of the terminal blocks:

(a) the base material has a tendency to crack if torsion force is applied during the screw-on process.

(b) Except in one case, the surrounding surfaces were found to have been restored properly and the CCC firmly attached to the base. In one case, however, the test clips and a reel of jumper wire were missing. All of the cable entry holes were correctly sealed by the use of heat shrinkable sleeves, and the spare ducts were covered by rubber caps.

(c) The terminal block frame was fitted by securing bolts. Outside stenciling and the labeling inside the CCC (door and terminal blocks) were missing. The STE technical specification requires a "metallic sheath clip inside the housing of the cable terminal block in order to provide an electrical earthing of the aluminum sheath of the lead-in cable". However, nothing is mentioned regarding the grounding of the CCC housing or metallic parts, like the terminal block frame.

The CCCs have the following capacities:

Table 2.3.2.4-1 Capacities of CCCs

Capacity	Primary Pairs	Secondary Pairs
600	250	350
900	400	500
1200	550	650

The terminal blocks have capacities of 50, 100, or 150 pairs.

(3) Distribution Point (DP)

The distribution points (DPs) are mounted overhead vertically on walls and wooden poles. According to the STE technical specifications, the DPs are to be made of robust reinforced plastic materials.

Some of the inspected DPs were found without terminal blocks or covers, therefore exposing them to humidity, which sooner or later results in corrosion of the connections.
Outside stenciling was not applied, and their housings were not grounded.

The DPs have capacities of 10, 20, 30 or 50 pairs. Their housing does not require grounding.

(4) Telephone Plug Socket

A unique type of plug socket for different purposes is in use; insets for telephone, TV (coaxial type), and electrical power cables can be inserted into the same plug socket. The installations, however, should not be mixed. However, cases were observed where two types of insets were installed in the same socket.

(5) Telecommunication Cables

The cables installed in duct systems are made of sheathed polyethylene (PE) , insulated, or a jelly-filled type. The older lead-sheathed, paper-insulated, and air-pressurized type of cables still in use in some exchange service areas are gradually being replaced by the STE.

The directly buried cables are sheathed PE, insulated PE, jelly-filled PE, or armored PE. These types of cables are protected with galvanized steel tape wrapped in layers, the number of layers depending on the size of the cable.

The aerial cables installed on poles are sheathed PE, insulated PE, non-jelly-filled PE, or self-supporting.

All of the primary and secondary cables now being installed underground in the exchange service areas are the jelly-filled type. The conductors in the cable are twisted pairs, stranded in subunits for forming units.

The tie cables installed for leading the primary cable pairs to the MDF are sheathed PVC, insulated PE, or the air-core type. Their capacity is either 300 pairs or 600 pairs with wire diameters of 0.5 mm.

The capacities of the duct cables are in 50, 100, 150, 300, 600, 900, 1,200, or 1,800 pairs, with wire diameters of 0.4, 0.5, 0.6, or 0.9 mm. The direcly buried cables have 10, 20, 30, 50, 75, 100, 150, 200, or 300 pairs with wire diameters of 0.4, 0.5, 0.6, or 0.9 mm.

The capacities of the aerial cables are 5, 10, 15, 20, 25, 50, 75, 100, 150, or 200 pairs with wire diameters of 0.4, 0.5, 0.6, or 0.9 mm.

(6) Duct System

The civil construction work is completely handled locally. However, road rebuilding after installation of access holes and ducts has been found lacking: road surfaces have subsided along duct routes and access hole covers have cracked due to a heavy traffic and the use of insufficiently strong material.

a. Manholes

Two types of manholes have been specified by the STE: those for use in roadways and driveways and those for use in sidewalks. Tables 2.3.2.4-2 shows the standardized types of manholes used by the STE.

Table 2.3.2.4-2 Types of manholes

Application	Roadways/Driveways				Sidewalks				
Type	T1	T2	T3	T5	T1	T2	T3	T5	C2
No. of Ducts	6-12	13-20	21-30	21-40	6-12	13-20	21-30	21-30	Spec. for CCC
No. of covers	2	2	2	2	2	2	2	2	1
Cable bearer	4	6	6	6	4	6	6	4	2
Length (cm)									
Out	470	570	670	620	470	570	670	520	220
In	390	500	590	550	400	500	600	450	180
Width (cm)									
Out	240	250	270	540	240	250	270	320	210
In	160	180	170	430	170	180	200	250	170
Depth (cm)									
Out	257	257	257	260	257	257	257	257	232
In	200	200	200	200	200	200	200	200	192
Directions	2	2	2	3	2	2	2	3	2

b. Duct (Pipe)

Three types of pipes (asbestos pipes, PVC pipes, and steel pipes) exist in the study area. The PVC pipes are mainly used for duct routes being installed in the exchange service areas, while the steel pipes are applied to special sections, such as bridge attachment, sand road crossings. Although asbestos pipes exist in the old duct routes, they are no longer applied to duct routes.

The distance between manholes in a straight line ranges between 100 and 250 m, while the distance between manholes in a curved line is less than 100 m. According to the information obtained from the STE, the average distance between manholes is approximately 140 m in the city area of Damascus, and the clearance between the ground surface and the top of pipes installed underground is 60 cm or more, except for special sections.

A duct system under construction in the Damascus N2 exchange area (DAN2) has been inspected. Three PVC pipes were laid correctly appr. 30 cm apart at a depth of 1 m. However, a spacer was not used, so the spacing may not be maintained. The PVC pipes were embedded in sand and covered with the excavated earth.

(7) Surveillance Systems

There are two different systems in use for monitoring the OSP network. In analog exchanges, old lead-sheathed cables can be found, which are pressurized with an air compressor. A control panel shows the status of each connected cable. If the pressure in a cable falls below a certain threshold, a clock is supposed to give an acoustic alarm signal in the exchange.

In digital exchanges, a computerized system performs electrical tests of the dedicated telephone lines. Routine tests for various subscriber lines can be initiated by the operator. In case of a customer complaint, a single line can be tested as well.

2.3.3 Operations and Maintenance

2.3.3.1 Transmission

(1) Organization

Under the Directorate of Operation and Maintenance, three departments are responsible for transmission O&M:

a. The Maintenance Dept. of Networks is responsible for maintaining the symmetrical links and optical-fiber cable links inside cities, the national networks, which use optical-fiber cables, and the subscriber cables

b. The Maintenance Dept. of Microwave Transmission is responsible for maintaining microwave and satellite facilities and equipment.

c. The Maintenance Dept. of Coaxial Cables Transmission Systems is responsible for maintaining coaxial-cable transmission systems

There are 14 regional directorates and one international area directorate to handle the O&M matters for each region, to make periodic reports to the maintenance departments, and to receive directions, when necessary. They are the Damascus, Damascus Rural, Homs, Hama, Idleb, Aleppo, Lattakia, Tarouts, Rakka, Deir Ezzor, Hassakeh, Daraa, Sweda, Quneitra, and International area regions.

(2) Shift Rotation

At each site where transmission equipment is installed, there is a maintenance staff that works 24 hours a day, 365 days a year. The general shift rotation system is as follows.

8:00 - 14:00	5, 6,or 7 technicians/engineers, including manager
14:00 - 20:00	2 technicians/engineers (minimum)
20:00 - 8:00	2 technicians (minimum)

Sites are generally attended by a maintenance staff, except for those in uninhabited areas, such as T4, which are not staffed. For the 34-Mbit/s microwave sites of the 50/A project, only the main stations are attended.

Maintenance staff are sometimes (not always) divided into specific transmission areas, such as microwave, optical fiber, and coaxial, even if they are in the same room. At sites with transmission equipment in separated rooms, each room usually has its own staff.

Customer complaints are handled by the local stations; the staff working on a problem communicates with other stations as necessary. If a problem cannot be handled by the shift on duty between 14:00 and 20:00, engineers are dispatched to provide assistance. Between 20:00 and 8:00, unsolvable problems are held until the next morning. However, for major problems, such as cable failure, the station chief will be called in no matter what the time.

(3) Centralized Supervisory Systems

Centralized supervisory systems have been introduced for the 140-Mbit/s optical -iber systems of the 50/A project as follows.

master station: Damascus STD
slave stations: Tartous, Talkalalh, Homs, Alnabek, Quteifeh,
Int. Airport, Keswh (Damascus X), Sanamein, Cheikh Meskeen, Daraa, Sweda

master station: Aleppo STD
slave stations: Banyas, Lattakia, Gisr Eshoughour, Edleb, Hama,Tartous

The 34-Mbit/s digital microwave network of the 50/A project has centralized supervisory systems for each area of the following master stations.

master stations: Homs, Aleppo, Tartous, Lattakia, Edleb, Kamishly

The 140-Mbit/s optical-fiber systems for the local networks of the 40/A project have centralized supervisory systems as follows for each area.

master stations: Damascus STD, Lattakia TR, Aleppo STD, Tartous STD, Hama TR,
Homs A, Idleb A, Deir Ezzor, Rakka A

The 34-Mbit/s optical systems of the 50/A project have no centralized supervisory systems, and are only locally observed.

Since these centralized supervisory systems above have only recently been introduced, and since the STE also has other systems which must be observed locally, the maintenance work for

transmission is still mainly based on local observation, except for the unmanned stations in the 34-Mbit/s microwave systems.

2.3.3.2 Switching

(1) Operations

The day-to-day tasks of general service provisioning include setting up of new trunks and junction lines and modifying routes; those for particular subscribers include setting up of new subscribers, and changing service specifications for existing subscribers.

Switching Operations are performed locally at each switch. The larger exchanges are manned between 8:00 and 20:00 hours on normal working days (Saturday to Thursday). The O&M staff travel to the smaller exchanges on demand.

(2) Maintenance

The switching maintenance tasks include everything required to sustain services (such as hardware and software fault localization and clearing).

Maintenance for the NEAX 61 and EMD systems is performed on-site. Preventive maintenance of the EMD exchanges (i.e., overhauling of selectors and relay sets) is performed at the regular intervals.

Maintenance for the E 10 A and E 10 B systems in Damascus is supported by a dedicated OMC. Maintenance for the EWSD systems is handled by five regional OMCs and supported by three technical assistance levels (TAC1 - 3) that are called in when help is needed.

TAC1 is represented by the five regional OMCs.
TAC2 is represented by the supplier in Syria.
TAC3 is represented by the supplier in Germany.

Supervision of the unattended EWSD exchanges is performed by the responsible regional OMC. Outside normal working hours this applies to the other EWSD exchanges as well.

(3) Spare Parts and Circuit-Board Repair

The EMD systems use an electro-mechanical motor selector; repairs are handled on-site. Spare parts are provided by the supplier and held at stock by the STE.

Spare parts for the E 10 A, E 10 B, and EWSD systems are kept at each OMC. For the NEAX 61 systems, spare parts are kept partly at the repair center and partly in the exchanges.

For the EWSD, NEAX 61, E 10 A, and E 10 B systems, repair centers have been established in Damascus for repair of the most commonly used circuit boards. Those board types, that cannot be repaired there are send back to the supplier.

NOTE: The EWSD repair center currently has a workload of approximately 85% to 90% of total capacity due to SLMA boards with damaged hybrids caused by loads on subscriber lines (see sec. 4.6.5). Considering that only a minor portion of the newly installed subscriber-line units are actually connected, it is obvious that the EWSD repair center will soon be heavily overloaded, if the original problem is not taken care of in a timely manner.

2.3.3.3 Subscriber Cable Network

Operation and maintenance of subscriber lines includes provisioning and subscriber-line installation. Both tasks are allocated to the STE.

(1) Subscriber Connection

A new subscriber is connected to the network by

- connecting jumper wires in the MDF,
- connecting jumper wires in the CCC,
- installating a service line between the DP and the subscriber's premises,
- installating an in-house wire, and
- installating a telephone plug socket and the terminal equipment.

(2) Fault Repair

Fault repair is initiated in two ways;

- the surveillance system indicates a cable failure.
- a customer complains about a fault in the telephone line.

The following test instruments are used by STE:

- Echo Meter
- Bridge Megger Testing Set
- Insulation Resistance/Continuity Meter
- Cable Testing Set

Faults are cleared as follows:

- the complaint-receiving section receives a fault report
- the subscriber-line testing section checks the faulty line between the switching equipment and the MDF in the exchange, and if the fault is not found in the tested section,
- the service-line section is notified by the complaint-receiving section and the staff of this section inspects the service line between the DP and the subscriber terminal equipment, and if the fault is not found in this tested section,
- the cable-maintenance section is notified and the staff of this section searches for a fault in the primary and secondary cable sections.

If the fault is in the primary or secondary cable sections, a major effort is required to repair the fault.

The time required to repair cable faults depends on their origin and extent.

Repair work in a service line can usually be completed within two days, while restoration of defects in the primary or the secondary cable lines take one week on average.

2.3.3.4 Network Management

There is no centralized network management center or system in Syria. Furthermore, there are no formalized network management procedures.

However, the installed digital switching and transmission systems are equipped with some network management capabilities and these, together with established working contacts between the operational staff responsible for the transmission and switching systems, constitute the current working network management system.

The principal individual digital systems are as follows.

(1) EWSD Exchanges

The EWSD exchanges are all connected to one of the five centralized operation and maintenance centers: Damascus, Aleppo, Homs, Der-ez-Zor, and Lattakia. It is intended that the OMC in Damascus will act as the main OMC to which the other OMCs will be connected, but this has not yet been fully implemented. This arrangement, when fully operational, will be able to manage a total of 124 EWSD exchanges. The OMC in Damascus will, in addition to acting as the controlling OMC for the other 4 OMCs, directly control 55 of the 124 EWSD exchanges.

The EWSD OMCs are most likely to be the first centers to become aware of problems in the network.

(2) Urban Fiber Networks (PDH Transmission)

The existing PDH transmission system uses a 3-Mbit/s overhead channel in the 140-Mbit/s transmission systems for system supervision, alarm, remote monitoring, and diagnosis. The system is physically installed in the transmission bays and the required jumpering for connection to the individual systems in the 2/34/140-Mbit/s transmission multiplex hierarchy was performed by STE staff. The supervision modules may be installed at the terminal and repeater stations.

A facility for connecting a PC to the supervision modules and software is available from the supplier; it can process the alarm/status data transmitted on the overhead channel from the remote supervision units. However, it has not yet been implemented, so the status/alarm information for remote sites is determined by using status inquiry and alarm panels in the rack-mounted supervision modules.

(3) Long-Distance Transmission

A more sophisticated transmission network management system is in operation for the long-distance 140-Mbit/s PDH transmission systems using fiber. The technical specifications for this system have been made available by the STE and they will be assessed in the next phase of the study.

It should be noted that not all long-distance digital transmission systems are connected to this transmission network management system, in particular the 36 (34 +2)-Mbit/s optical line systems used on certain low-capacity transmission routes.

CHAPTER 3 SERVICES PROVISION STRATEGY

3.1 Trends in Telecommunications

3.1.1 World Trends in Telecommunications Services

Several market forces are at work in influencing trends in telecommunications services. Primary forces are

- technological advances
- liberalization in the telecommunications industry, and
- the growing demands and needs of users, reflecting such other forces as the

- changing nature of work,
- growing competitiveness in business, and
- changing way of living.

The following are some examples to help demonstrate how these forces are influencing trends in telecommunications services.

Technology advances have made the large-scale deployment of optical-fiber transmission systems economically feasible. This means that transmission bandwidth on terrestrial optical-fiber systems is now plentiful. The inherent inertia of the switched network infrastructure, however, results in a time lag in implementing the services that can exploit this bandwidth. In the meantime, specialized high-capacity networks, such as those intended to provide switched multimegabit services for business applications, have emerged.

CENTREX and Virtual Private Network services were developed to attract business telephone traffic (especially long-distance traffic lost to private networks or competing service providers) back onto the public switched network .

"Public Voice Mail" was developed by 'local' telephone companies in the US to increase call completion rates and therefore call revenue.

Service features like "Direct-Dialing-In" and "Private Voice Mail" have evolved out of the need for business users to cut overhead for operator and secretarial staff.

The needs of residential customers are also changing. The aging population of most developed countries has led to increased research spending on products for this category of user, particularly

with regard to the ergonomics and acoustic performance of the basic telephone set. This user category is viewed as a potential market for video telephones.

To put the analysis for the next fifteen years into context, it is useful to look back at some of the highlights of the past fifteen years concerning developments in telecommunications services and networks. Table 3.1.1-1 details some of these highlights.

Table 3.1.1-1 Developments in Telecommunications since 1980

1980	1985	1990	1995
Facsimile Group III is practically unknown outside of CCITT(now ITU-T) standards committees.	Network digitalization is in full swing	ISDN deployment according to internationally agreed standards started	Electronic Mail, On-Line Information Services, and Interactive Services such as Home Banking are well established
The first digital switching and transmission systems are just starting to be deployed	X25 packet-switching networks are operational in several countries.	Facsimile Group III speeds increase dramatically with the improvement in the quality of the public networks	ISDN has found many new applications for sophisticated business users. Penetration levels are modest.
Geostationary satellites are meeting the growing demand for international circuits	Facsimile Group III has already started on a rapid growth curve	The market for Mobile Telephone services expands rapidly	Many new services and service features for business users are widely available : freephone, virtual private networking, switched high-speed data services, etc.
ISDN is being discussed in CEPT and CCITT study groups	The first intercontinental fiber-optic cables are being deployed	Several large-scale broadband field trials are underway	High-speed modems improve data communications on the PSTN. Video telephones (proprietary) for use on the PSTN become available.

Developments over recent years are expected to bring about further dramatic changes in the years ahead. The main charges will be the following.

Integration of Computing and Telecommunications

The most obvious example of this development is the integration of telecommunication functions onto standard personal computers to support facsimile, file transfer, screen sharing, desk-top conferencing, and multimedia services. A less visible but nevertheless significant development is the integration that is also happening at the corporate network level (i.e., between the PABX and the host computer) to enable improvements in business performance and customer relations. This integration will prove to be an important attraction for current ISDN offerings upon which many of the computer-telephony applications depend.

High-Speed Data Communications

New 'pre-B-ISDN (Broadband integrated services digital networks), high-speed data communications networks are being constructed to meet the growing demand for linking Local-area networks (LANs), linking LANs to host computers, and so on. Two main technologies are under development : one uses frame relay techniques, and the other a cell-switching technique that is expected to migrate to the ATM.

Personal User Mobility (PUM)

Separate developments in different service sectors and the combined effect of these developments are expected to greatly enhance the possibilities for PUM: (1) in the mobile telephone sector, the development of universal standards (and/or the use of hybrid interfaces in handsets) for the air interface to connect in the home, the public land mobile telephone service, and ultimately the telephone service via satellite; (2) in the fixed and mobile telephone networks, the introduction of Intelligent-Network-supported services such as Personal Number services and Universal Personal Telecommunications.

Integration of Telecommunications, Broadcasting and Interactive Entertainment Services

The development of full Broadband ISDN services has been triggered in a number of countries by regulatory changes that will enable television cable companies to enter the telecommunications market and local telephone companies to enter the market for broadcast television and interactive video home entertainment.