The Communication Infrastructure and the Internet Services as a Base for a Regional Information Highway

by
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Abstract

This paper presents an overview about the heterogeneous data communication infrastructure and the existing Internet services in the different subregions: North Africa, central Arab and the gulf. It highlights a regional networking initiative called RAITnet, to link the IT professionals in the region together on top of the Internet as a transport facility. Several further issues and problems related to the Internet expansion and to regional networking activities are analyzed. It concludes with some future plans and recommendations to upgrade the data communication infrastructure and the Internet services in the region as a solid base for a Regional Information Highway.

1 Introduction

Regional information infrastructure is a part of the global information infrastructure. It has several building blocks; the heterogeneous data communication infrastructure, the infostructure in the different countries as well as other political, cultural, financial and technical issues [1]. The Internet, a network of networks, is considered as an appropriate transport facility to implement the regional networking as a core of the regional information highway. It is growing fast in various countries in the Arab region and its growth should be accelerated in all the other countries.

The technical obstacles are considered as a part of the barriers towards the growth of the Internet. Some countries like Egypt have overcome those obstacles and established successfully a structured Internet operational domain in the country. Nevertheless the Internet is still affected by other non-technical financial, political and cultural aspects [2].

An initiative has been taken by RITSEC (Regional Information Technology and Software Engineering Center) in Cairo to support the regional networking activities in the region starting December 1994. The first seminar was held in Cairo and another one will be held in Tunisia to push the cooperation in the area of communication and networking on a regional level.

2 The Data Communication Infrastructure in the Arab Region

2.1 Overview

The data communication infrastructure is considered the base for the regional networking and for the regional information highway. This section summarizes the infrastructure in the different countries, highlights its upgrade, plans and analyzes how suitable it is for the diffusion of the Internet in the different countries.

Public telecommunication services in the Arab region are provided by state agencies and are very heterogeneous. They differ from one country to the other. Arab states have an average of 4 main telephone lines per 100 inhabitants, which is almost 10 times less than the average in industrialized countries. On the other hand, over the last decade Egypt and Oman had among others the highest growth rates in the number of main telephone lines in the world. The telephone networks are around 95% automatic with 50% using digital switches and more than half of the countries have mobile phones.

We will divide the Arab Region in different subregions, which are more or less homogeneous in the nature of their data communication and networking infrastructure. A focus will be put on two to three countries which will be chosen as examples of each subregion.

The first subregion is North Africa and will be represented by Morocco and Tunisia, the second subregion is the central Arab subregion and will be represented by Syria and Egypt and the third subregion is the gulf area and will be represented by Kuwait and the United Arab Emirates.

2.2 The North African Subregion

The North African subregion contains several countries like Morocco, Tunisia, Algeria and Libya. A focus will be put on Morocco and Tunisia as they are more active in this domain.

Morocco provides its data communication services via public phone lines as well as leased lines connectivity from the PTT [3]. Optical fibre and digital lines are used for inter-exchange connectivity and are not used on the subscriber level.

The PTT provides its data communication services using an X.25 public data network with X.32 and PAD (X.28) access via telephone lines. This network is used as a base for the various value added services in the country such as videotex services. Some private sector activities from MCI provides email services via dial-up facilities on X.25. Morocco has registered the Internet .ma domain. More than 5 sites in academic and governmental agencies with more than 200 users are using email services. The services are running today with basic email services and are planned to be extended to include full interactive Internet services using a 64K leased connection to France. Al Akhawayn University is taking over the activities of introducing the Internet to the country with 64K lines to Fnet / EUnet using a set of class C addresses. It is planned to have other private and public Internet service providers soon.

Tunisia is also very active in communication and networking [4]. The PTT provides its data communication services using dial-up and leased lines. Tunipac, the X.25 data network of Tunisia provides its services via X.25 as well as PAD access (X.28).

The Internet service in Tunisia is well established within .tn domain since 1991/1992. The service is provided via an X.25 connection via Tunipac to France, while a 64K leased line connection is under installation. RNRT (Reseau National de la Recherche et de la Technologie) at IRSIT is the gateway of Tunisia to the Internet and provides the service to the academic (70%) as well as the governmental (different ministries) and the commercial sector (chambers of commerce). The center provides full Internet services with well established information access servers using gopher and World Wide Web. Other value added services include the videotex (Minitel service) with a lot of arabization efforts running.

Tunisia is ready to play a focal role in the area of communication and networking in the North African subregion due to the availability of reliable data communication infrastructure, well trained staff as well as well established value added network services.

2.3 Central Arab Subregion

This subregion contains various countries like Egypt, Jordan, Palestine, Syria, Lebanon and Sudan. A focus will be put on Egypt and Syria and the available infrastructure and networking services will be highlighted.

Syria provides its data communication services via dial-up and X.25 access [5]. Syriapac, the PDN, is operational since late 1993 and provides its services via X.25, X.28 (PAD), dial-up and leased line connectivity. The PTT upgrades the existing infrastructure to inter-exchange optical fibre links, which gives a big push to the data communication projects.

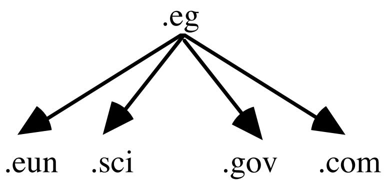
There are no Internet services available in Syria and the government recognized its need for that. The PDN (Syriapac) is the gateway of the country via X.25 protocol to other PDNs and value added service providers. There are successful connections with e.g. Egyptnet, the Egyptian Public Data Network. It has been successfully used to connect some institutions in Syria like HIAST to the Internet via RITSEC in Egypt. Further efforts have to be done to build upon these links in order to provide Syria with some Internet service using the tunneling or encapsulation (IP over X.25). The TCP/IP is available in Syria on the local and wide area level, but not as a part of the Internet.

Egypt is considered to have some major role in the central Arab subregion due to several reasons such as the availability of satisfactory data communication infrastructure, its central geographical location as well as the availability of well established full Internet services.

Egypt has a well established Internet domain serving the various sectors [6]. It has a satisfactory infrastructure provided by ARENTO, the Arab Republic of Egypt National Telecommunication Organization. ARENTO has established 3 million telephone lines as well as inter-exchange optical fibre links between the various exchanges in greater Cairo and Nile Delta, while other parts such as southern Egypt, will be covered soon. The digital data access is provided to the end user using digital multiplexors, the first digital public backbone network installation in Cairo, which has been established jointly between IDSC/RITSEC, the Supreme Council of Universities and ARENTO to provide a digital connectivity with at least 64kb/sec for the different Internet sites in Egypt.

The PDN, Egyptnet, is an X.25 based network covering Cairo, Alexandria and Suez with speeds up to 19.2k. It provides X.25 via leased lines as well as X.28 (PAD) access via dial-up and is connected to international PDNs e.g. Transpac using X.75 protocols. Its main problems are the limited geographical coverage as well as the limited speed on the network. Ongoing activities will raise the speed of the network and will cover new geographical areas in Nile Delta. Egypt's international data communication connectivity is well established via the optical SEMEWE-2 cable as well as via Intelsat and Arabsat services. The data communication services are quite reliable but suffer from prohibitive prices especially for the international data communication access. VSAT services to provide the data communication infrastructure in rural and remote areas are being introduced.

Concerning network value added services, the Internet is considered as a good representative for the value added services. It is operational since October 1993 and it has been preceded with a uucp service at Enstinet, an EARN/Bitnet service at EUN and the Tradenet service at IDSC/RITSEC. The Internet gateway to the E-bone in France and domain administration is with the Supreme Council of Universities and the structure covers the following subdomains:



Eun stands for the Egyptian Universities Networks and provides the services for the universities and schools, while .sci subdomain serves the scientific research institutes at the Academy of Scientific Research via Enstinet as well as for different other research centers like the National Telecommunication Institute. The governmental domain gets the service via IDSC (Cabinet Information and Decision Support Center) and the commercial domain via RITSEC.

The total number of Internet users is above 2000 with 70% of the users in the academic sectors, and the traffic growth rate has been 148% in Q4 1994, the fourth position in the world.

A commercialization process has been initiated to include the private value added service providers under the .com.eg domain.

Egypt has been among the leading countries in the region in the development of Gopher and WWW servers, but further efforts have to be put in that aspect.

The above indicats that Egypt can play a significant role in communication and networking in the central Arab region.

2.4 The Gulf Subregion

The gulf subregion has special characteristics due to the wealth of oil and natural resources in the majority of its countries. This has affected the telecommunication infrastructure in these countries significantly as it has helped in the establishment of a state-of-the-art telecommunication infrastructure in most countries. This fast development can be considered a base for a similar development in the area of information and value added services.

The United Arab Emirates has established via its public private shared PTT "Etisalat" the most up-to-date telecommunication infrastructure in the region. It has established about 600,000 telephone lines in the country. A full fledge fiber optic network covers the whole country including the offshore island, while future plans include introducing fibre in the subscriber loop and extending its services to the homes and offices. GSM service for mobile telephony has been recently launched as a fully digitized network [7].

The data communication infrastructure is based on the up-to-date transmission facilities in the country. The networks started with classical X.25 networks with dedicated and PAD (X.28) access via dial-up with various speeds from 50bps-64kbps.

A frame relay service has been recently launched and provides a LAN-to-LAN connectivity for corporate customers with various speeds from 64K-2MB with bandwidth on demand functionality.

The ISDN service is also available as a primary rate interface and basic rate interface for videoconferencing and other value added services.

The PTT offers a number of value added services which include fax on demand facilities, electronic mail (3000 mail boxes) using standard and proprietary mail systems.

The value added services at the information centers need further attention. The Internet domain has been registered and is not yet operational in the country, and the information and value added services need further development.

In Kuwait the PTT is publicly owned but some services are provided by the private sector. Using a state of the art telecommunication transmission facilities with optical fibre and digital connectivity all services are provided by the public PTT except a cellular mobile phone and paging system which are provided by a semi governmental company. The VSAT service as well as the electronic messaging system are also provided by local companies [8].

Kuwait public data network uses X.25 protocol and provides its customers with local and international services.

Various applications include access to the international databases, various information retrieval services as well as telex and fax per email services. Store and forward email system based on the international standards are also available. Other value added services include the ODS (On-line Data Services) with banking and directory services are supported by local providers. Kuwait has also an operational Internet domain .kw with operational nodes at the University and other private companies. The Internet provides email and full Internet services to the academic, governmental and commercial community in Kuwait. Additional efforts will be put in the area of information servers such as gopher and WWW servers to enrich the Internet in the region with the necessary information wealth.

3 Regional Networking

There had been several initiatives for regional networking in the Arab Region which has not been that fruitful. Various technical obstacles had contributed to that, such as the lack of public data networks, incompatible transport facilities and proprietary protocols as well as heterogeneous applications such as various bilingual database management systems. The lack of standards for arabization and networking had caused the establishment of scattered proprietary networks in different disciplines like science, trade and agriculture.

However the establishment of operational Internet domains in some countries of the region is changing the picture of regional networking significantly. The Internet has significant technical advantages as a base for regional networking due to the following [2]:

- It is a homogeneous transport facility on multivendor platform with TCP/IP protocol. Large investments, which have been done before in the developing countries, are going to be protected and no other large investments are needed.

- It provides a full suite of protocols for transport as well as for application services. The various applications are standard on different platforms.

- It provides simple access mechanisms with dial-up, X.25 and leased line access with different link speeds and access protocols (asynchronous, synchronous, ...).

- The Internet has standard search and navigation tools in different areas.

- It contains a wealth of information in various disciplines e.g. Information Technology, Environment, Commerce, ...

Due to the above mentioned reasons, the Internet has been considered as the most suitable transport facility for regional networking.

An initiative called RAITnet, the Regional Arab Information Technology Network has been launched in Cairo in December 1994 to bring the IT professionals in the region together. Its main objectives can be summarized as follows:

- To support the acceleration of the software industry in the Arab region

- To maximize the utilization of the technical resources available for the software industry in the member countries.

- To help exchange experience among professionals in Information Technology.

- To follow the state-of-the-art international developments in the software related fields.

It's main beneficiaries are the IT professionals in the governmental and non-governmental agencies. The main services include for the first time in the region an email list, regional gopher and WWW servers as well as regional forum services (discussion groups) in the area of information technology.

Fig.1 summarizes the structure and access mechanisms of RAITnet.

RAITnet is gaining more users and can be considered a step forward towards regional networking. However this is only an individual step, which needs to be followed by other structured steps. To achieve strong regional networking in different areas more efforts have to be exerted in this direction. There is a need to strengthen the Internet services in the region qualitatively and quantitatively. This is related to different issues and problems which will be summarized in the following section.

4 Problems and Issues of the Internet in the Region

This section gives an overview about the various problems which have been faced and the issues related to the expansion of the Internet services in the region. The issues and problems can be classified as:

- Financial

- Political

- Cultural

- Technical

A focus will be set on the technical and cultural issues.

4.1 Technical Issues

The technical issues will be highlighted in the following section:

4.1.1 Infrastructure Upgrade

From the above mentioned overview about the data communication infrastructure in the region it may be concluded that, although the infrastructure is very heterogeneous on the transmission and interconnectivity level, it is still suitable to start stronger networking and even information highways on top of it in the different countries. There is a need, such as in the case of Egypt and Syria that the digital data communication facilities should cover a wider range of their territories. Additional serviceslike fractional and digital access up to E-1 and even E-3 should be provided in the future. The PTTs in the different countries are expected to come up with a comprehensive plan for data communication infrastructure upgrade, furthermore this plan should be worked out in cooperation with value added network service providers to determine

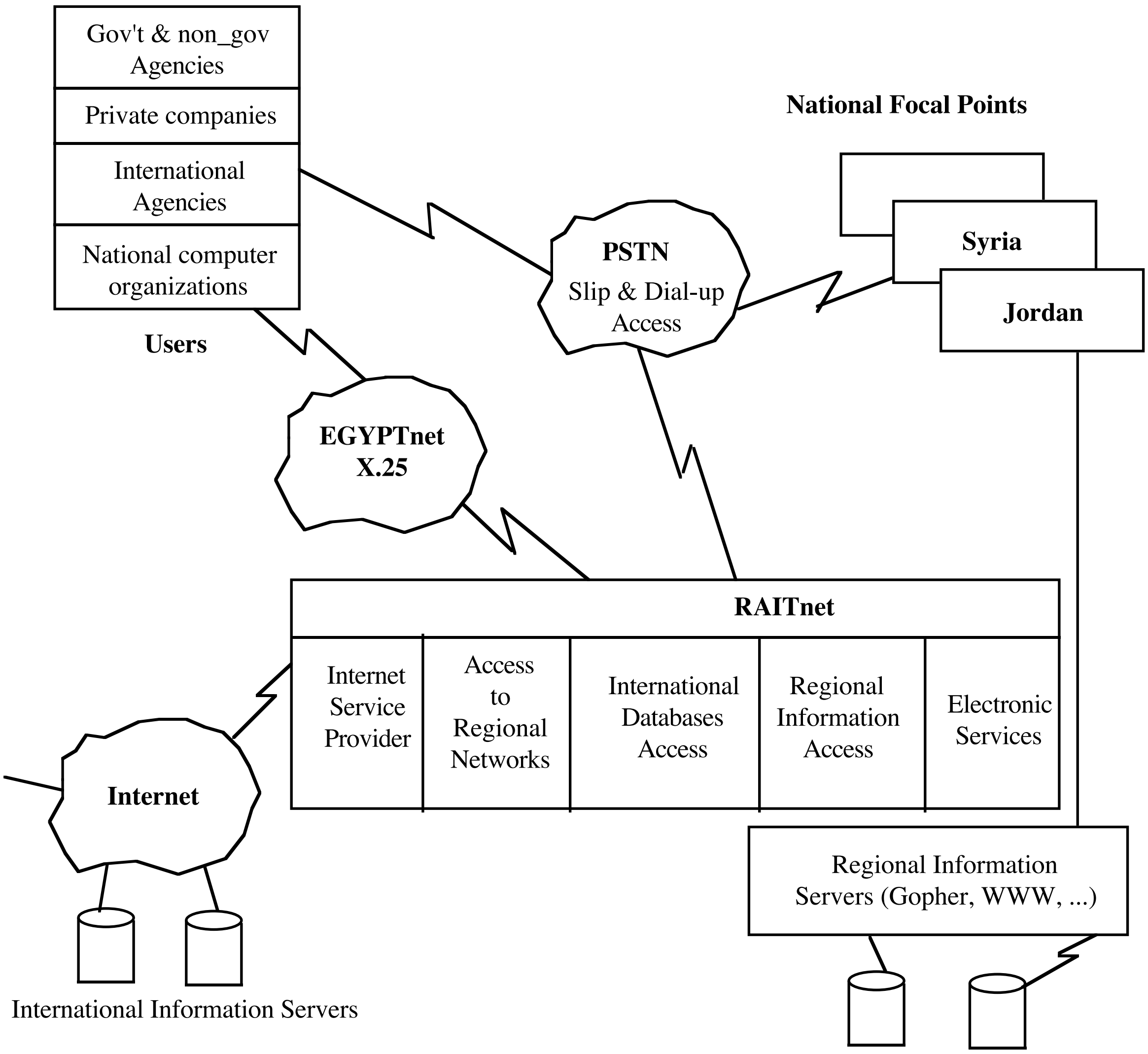


Fig.1 RAITnet Structure

their needs and requirements. A switched data network with frame relay and ATM upgradability should be installed and established in the different countries.

4.1.2 Network Security

Network security is considered one of the main technical issues for the diffusion of the Internet and for other regional activities in the region. A compromise is needed between being open as the Internet is and maintaining a certain level of network security. The network security requirements start at the transport level and include the different applications. The user and the system administrator in the region should be confident in the security services and mechanisms provided by the Internet. A threat model with different threats should be worked out and the various security services to protect the networking environment should be outlined. The various security mechanisms and techniques should then be identified to be applied for different sectors.

4.1.3 Arabization

The language barrier will be mentioned in the cultural issues and is bound with some technical obstacles in the arabization of the interfaces of the Internet applications. Different initiatives for developing application interfaces for various natural languages are running world wide. The arabization does not have a widely acceptable code to be used across the region and across the different applications, which makes the development of bilingual (Arabic/Latin) standard Internet applications more difficult. First trials has been done at RITSEC for the arabization of the Simple Mail Transport Protocol (SMTP) using one of the known arabization codes. But still strong initiatives are needed to provide a comprehensive arabized interface for the various Internet applications.

Further attention should be given to establish a stronger intercountry data communication services in the region. More usage of the SEMEWE-2 optical fibre cable and satellite data communication channels should be done.

4.2 Cultural Issues

The following summarize some cultural problems and issues related to the Internet growth in the region.

4.2.1 Language Barrier

The language barrier is considered one of the problems facing the spread of the Internet in the region on a large scale. The usage of Latin characters is common in the Arab region but the real penetration of the Internet to schools and individuals is bound with being able to handle the Internet applications in Arabic. This issue has been highlighted also in the technical issues and problems.

4.2.2 Open Environment

Another cultural issue is that the Internet is a very open environment, where the users should be completely open to the rest of the world. This point is combined with some resistance in some countries due to the fact of being overwhelmed with new inputs and contributions from different foreign cultures all over the world. The digestion and processing of new ideas and new inputs from other cultures need longer time periods in some societies in the region. It is a compromise between cultural preservation and being a part of the new trends in the world.

The financial issues and problems include the prohibitive prices of PTT in the region for international data communication facilities. This problem should be considered in the context of the deregulation of some services in the PTT's such as the various data communication services.

5 Plans and Future Needs

The following section presents the plans and future needs for the establishment of well structured Internet services as a base of an information highway in the region.

- The national Internet structure should include the subdomains to provide the services to the academic, governmental and commercial community. A necessary mechanism and formula for the cooperation between the various service providers in the different sectors within a comprehensive financial, political and technical framework should be formulated. This should also include the development of an Acceptable Use Policy (AUP) for the value added network services in each country.

- Coordinate with various PTTs to upgrade the national data communication infrastructure and facilities in the country. The Internet, with its multimedia service, is an appropriate guideline for user needs and requirements. This upgrade starts at introducing new telephone lines in new areas as well as in the overpopulated areas to run terminal emulation, SLIP and PPP (point-to-point protocol). Further steps can include introducing the VSAT technology for rural and remote areas.

  New services as the LAN emulation services can be provided by the upgrade of the existing X.25 PDNs to frame relay based service with speeds up to E-1. Future plans for comprehensive ATM services should be considered early enough and the necessary data transmission infrastructure up to E-3 should be deployed.

- Coordinate with the national PTT's and the international data communication carriers to develop a new tariff structure for higher speed intercountry connectivity. These facilities will strengthen the exchange of information between the different countries and will push the regional networking activities strongly. It will help to create network clusters in the various subregions and can thus optimize the use of the expensive international links.

- Intensify efforts in some regional specific problems such as the arabization of the Internet applications and services using some known and defacto standard Arabic codes. This will require a close cooperation between several Arab countries, as well as learning from other natural language working groups.

- Accelerate the development of the Information servers on the Internet (e.g. gopher and WWW servers) covering areas of interest to the region (e.g. Tourism, Culture, ...). This will integrate the networking society in the region as a part of the global networking society, and will contribute to the wealth of the information services in the region. It will also link the immigrants with their home countries and make them contribute to the socio-economic development of the country. It will reduce the negative effects of the brain drain, from which the developing countries are suffering.

- Professional development is one of the areas which needs significant attention in communication and networking in the region. It includes the professional development on various levels such as the technical support in wide area connectivity, network planning and management, network software and application development. Further training is needed in Internet

Navigation and the development of information servers on the Internet.

6 Conclusion

The conclusion of this paper can be summarized as follows:

- There exists a heterogeneous but appropriate data communication infrastructure in the region. Further upgrade in a cooperation between the PTT and other value added networks service providers is needed.

- The Internet should be used as the transport facility and the core of the regional networks and the regional information highways in this phase.

- Successful individual networking activities exist e.g. RAITnet but further work should be done.

- Focus should be put on professional development, as well as on how to promote the development of information servers and services.

- Further technical problems should be focused on such as arabization and network security.

From the above mentioned points it is clear that the data communication infrastructure and the Internet services can be used as a base for the Regional Information Highway.

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