Evolution and Future Issues for an Academic Network in Palestine

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1. Summary

This paper gives details of the environment, process, outcomes and recommendations resulting from a study of the needs of the academic and related community in the Occupied Palestinian Territories. The steps in accomplishing this included searching the available literature , evaluation of local conditions by discussion with personnel at UNDP, visits to Palestinian universities and research institutions, and discussions with others involved in networking and communications in Palestine and the Middle East region. The study was sponsored by the United Nations Development Program – Program of Aid to the Palestinian People (UNDP-PAPP) and took place during September 1994. The objective of this study was to provide the Palestinian universities and research institutions with Internet connectivity. This would give them the capability to share resources between each other and to access resources outside Palestine. It would also provide a reliable and speedy route for electronic mail and for access to library catalogues both inside and outside Palestine. This network could be later extended to other Palestinian educational institutions and non-profit organization and possibly commercial companies.

2. Politico-Geographic Considerations

The Palestinian universities have expressed interest in the establishment of an Academic Network in Palestine with connections to the international Internet. This is perceived as of considerable potential benefit in increasing access by the universities to information resources. The Occupied Palestinian Territories (OPT) consists of the West Bank, including East Jerusalem, and the Gaza Strip. The West Bank and Gaza Strip are not connected at any point. At this stage it is not clear if any telephone or other connections between them will be in Palestinian control. At the stage of writing this report, responsibility for education in the West Bank and Gaza has been turned over to the Palestinian National Authority (PNA). However communications remain in Israeli hands. Moreover it is unclear whether the establishment of microwave transmitters by the PNA is permitted even in Gaza and Jericho. In addition, telephone communication in the West Bank and Gaza has ceased to be a monopoly of the Israeli telephone company (Basiq). Another company will also provide long distance service. This will affect any analysis of future costs. Basiq appears unwilling to invest in upgrading of lines in the West Bank and Gaza, as illustrated by Birzeit University's problems in obtaining lines. This means that, although costs of Basiq lines can be used in estimates, availability of those lines cannot be determined until a request is submitted for the connection. No substantive information is available on the alternative long distance provider or its pricing policies.

The UNDP East Jerusalem office is currently connected to the Israeli Academic Network by a 64 kbps digital leased line. This provides, in principle, acceptable performance for interactive applications. Tests show that, in practice, access to sites in the U.S. and to a lesser extent in Europe gives less than satisfactory performance at times, particularly for interactive applications. This would appear to be due to excessive latency in the connection leading to failure of typed

characters to appear for some seconds. This is probably due to saturation of the Israeli link to America and also possibly to a satellite link with high latency to America.

3 Comtext and Process of Study

3.1 General Context

Networking in the Occupied Palestinian Territories is still at an early stage. At the time of this visit only one university, Birzeit, had a LAN running over Ethernet, which was available for student use. Another, Bethlehem has a student LAN running over serial lines, Nablus has a DECnet Ethernet LAN for administrative use, and Al Quds and Hebron were in the process of establishing LANs for academic and administrative use respectively. It is clear that, in addition to the establishment of an inter-university network, there is also a need to train both users and technical support staff on uses of LANs and the Internet. A fuller discussion of the situation in each university was contained in a Trip Report submitted to UNDP.

3.2 Study Process and Observations

In order to evaluate local conditions and make recommendations, the following areas were identified as requiring attention:

1. *To liaise with the Palestinian Academic community on further* s*trengthening the establishment of a structure to sustain a workable Academic Network in Palestine.*
This was achieved by visiting the Palestinian universities to:
• discuss and receive input on the potential uses, benefits and problems (both normal and unique to the OPT) of establishing the network
• explain the steps required to do so • to request the appointment of a technical/administrative contact in the university
• seek input on or evaluate the situation with regard to telephone lines in the area of the university for the purpose of identifying special problems which might occur with test installations using Serial Line Internet Protocol (SLIP) [1] over ordinary telephone lines.
2. To *estimate the training needs in each of the institutions regarding the establishment and maintainance of an Academic Network.* To accomplish this it was necessary to identify the different levels of technology and expertise available in the various institutions, and the degree and nature of training both for network administrators at the sites and later ordinary users.
3. *To estimate the training needs in establishing local expertise.*. In addition to network expertise at the various institutions, greater expertise will be needed to establish and run the network as a whole. In the current situation in the OPT, where travel for Palestinians is regularly arbitrarily restricted, this expertise would need to be based close to the central hub and probably at that site. Such local experts could in addition to managing the Academic Network as a whole, act as a resource for assistance and training of the network administrators and users at the various institutions.
4. *To make a proposal outlining the steps needed to establish an* a*cademic Network.* This will be discussed in detail in an additional report. The primary requirements for establishing the physical network are to obtain :
• permission for UNDP Jerusalem to act as an Internet provider to the Palestinian Academic Community. This has been accomplished.
• permission for each university to connect to the Internet
• permission from the Israeli Ministry of Communications for each university to obtain a leased line to UNDP
• a leased line from each university to UNDP

• an IP address or addresses for each university
• an Internet domain for each university. This has been secured by Yaser Doleh in the case of most universities.
• the physical hardware (router and Unix machine) to allow connection to the leased line.

5. *To make a proposal on the systematic approach to administering the Academic Network.* This will also be dealt with in detail in another report. To facilitate the planning and setup of the network, technical/administrative contacts in each university have been identified. These can constitute an Ad-Hoc Technical Committee and be used for information on local conditions and input to the planning process. Actual meetings may however be difficult or impossible to accomplish due to the problems with travel in the OPT.

3.3 Networking Course

This was sponsored by the Continuing Education Department at Birzeit University. It took place at the beginning of the trip on August 8,10,11 and 12, with an additional optional day on August 13. This provided an opportunity to assess demand and capabilities among the potential user base. The course covered the history and structure of the Internet, Internet protocols and applications and a brief discussion on the configuration of machines for attachment to the Internet. It also involved on-line demonstration of Internet application such as gopher[2], Mosaic/WWW [3], news, traceroute [4], etc. The 27 attendees, from universities, research institutes, commercial companies, UNDP and UN-WRA, traveled from the Bethlehem and Jerusalem areas in addition to Birzeit. Travel restrictions made travel from Bethlehem difficult and probably excluded students from Hebron and Nablus. A number of the students had attended university in the U.S. or Europe and already had some familiarity with use of the Internet.

4 Current Environment

4.1 Environments and Interests of the Palestinian Universities

The visits to Palestinian Universities and Research Institutes took place over a period of weeks.

The first visits were to the universities in the Gaza Strip, Al Azhar and the Islamic University of Gaza. Prior to these visits we attempted to test the quality of the phone lines from the UNDP office in Gaza City to Jerusalem. It *was* clear that this was in general unacceptable since the local lines are noisy, acquisition of local dial tone can take as much as 5 minutes, and the number of trunk lines is inadequate so numerous redials are required. It proved impossible to make a connection and check data rates.

Al Azhar is a new university established 3 years ago. It has recently acquired a training center with 15 486 computers. It expects to be heavily involved in continuing education in addition to traditional programs. The president expressed interest and support for the academic networking project and appointed a technical contact.

At the Islamic University of Gaza the importance of continuing education was emphasized. The university had a network some time ago but this is no longer functional after the closures of recent years. Repair would be unreasonably expensive at this stage. The university has 10 PCs used for administrative purposes, 25 PCs and 10 486DX machines acquired with EC funds, and expects 50 Acer 486 which will be places in the library. A particular interest was expressed in a network as a means to access other Palestinian university libraries and on-line medical databases. The latter would be similar to the initiative to provide access to healthcare information contained in [11]. The lack of trained technical staff to maintain computer equipment was also perceived as a problem. It was suggested that the best route for international connectivity was via Egypt.

Next we visited the Applied Research Institute (Arij) in Bethlehem. Arij is involved in sponsored research in the area of geographical information for building, sewage and water resources. They explained their need to access geographical databases, particularly maps, at remote locations. The present method of using a 2400 baud modem was unrealistically slow. They expressed considerable interest in the networking project and a discussion of possible methods and costs took place. This visit also afforded an

opportunity to meet with Richard Bonugli and a colleague, who are involved in a USGS (U.S. Geological Survey) project to link national geographic centers in the region particularly for the purposes of earthquake prediction and water resource studies. A test of SLIP connectivity to UNDP at 2400 baud was successful if unusably slow.

Hebron University had a network for administrative purposes, which was now non-functional, but was in the process of restoration. The problems caused by the fact that the university had three campuses in Hebron separated by a few kilometers were emphasized. The extent to which local networking expertise was concentrated in one individual and the vulnerability in the event of the prolonged absence of that individual was apparent. A successful test of SLIP connectivity at 14.4 kbps was accomplished using the president's direct line.

Bethlehem University emphasized the importance a Internet link could play in institution building, in particular in the context of retaining faculty links with colleagues in Europe and America and access to libraries and other information resources. Network connections between the Palestinian universities could also alleviate to some extent the problems caused by the restrictions on travel for Palestinians in the West Bank and, even more so, between Gaza and the West Bank. The university has a 20 PC Novell network, running over serial lines, and about 40 others stand-alone PCs for student use. The problems with dial up connections due to lack of phone lines were outlined. These had prevented the establishment of inter-library loan links proposed previously. The need to build of local expertise to support the local network was also raised. This was made apparent by our attempt to connect to UNDP by modem which was unsuccessful due to failure to acquire an outside line.

At An-Najah University in Nablus, we discussed some of the previous attempts to connect universities in the region through efforts of the Arab Universities Association. Again access to resources particularly libraries was emphasized. An-Najah has a university network of 30 machines, using DECnet protocols over Ethernet, for registration, student records and transcripts. The main machine is currently a Vax but is due to be replaced by a DEC 3000/500 AXP Alpha also running VMS. There is a new laboratory of 15 486s on DECnet to be installed soon, and other laboratories of 386s for student use. The importance of trained staff for maintenance and the need for training for technical staff and faculty was emphasized.

At Birzeit University problems, which we were already aware of from the course, of telephone line quality and lack of lines were emphasized. Birzeit has recently ordered the installation of an exchange with 30 lines to Ramullah, at its expense, to try to improve the situation. The line quality of existing lines is substandard among other reasons due to interference from Israeli radio sources. Birzeit was interested in becoming linked to UNDP, using a leased data line, as soon as possible. It was also interested the investigation of alternative connection strategies such as microwave links. The university currently has a computer center, with Hewlett-Packard machines, an Novell based administrative network of 30 machines, a number of student labs and is in the process of connecting its buildings using fiber optic cable.

AI-Quds consists of 4 colleges with 4 separate campuses. It has recently received 65 PCs and is in the process of setting these up on Novell networks.

4.2 UNDP Internet Connection

UNDP, East Jerusalem currently has a CISCO Router which is connected to the the Israeli Internet. The main access point to the Internet is a Sparc Classic running Solaris 4.2. During our visit a number of network applications were installed on this machine (see Trip Report). In addition, to provide dial-in interactive access, a 386 PC was configured with FreeBSD and SLIP (Serial Line Internet Protocol) and a 9600 baud modem connected to it. This, was at the time, the only dial-in line at UNDP and has been extensively used for dial-in access to the Internet, confirming the predicted level of interest in Internet access. In addition, the 386 PC was configured to provide uucp connectivity for the Palestinian universities, research institutes and other higher education institutions. This acts as an interface between local e-mail at these

institutions and Internet mail, and provides a more cost effective and reliable connection than the previous direct dial-up from Ramullah to the U.S. UNDP has acquired an additional four telephone lines, one of which is reserved for UNDP use.

4.3 Domain Naming

A problem exists in allocating Internet Domain Names (DNS names) to sites in Palestine. There is no current national (two-letter) abbreviation for Palestine. Such abbreviations are assigned by the Internet authority, but are normally designated to be the two-letter country code assigned by the ISO. Such an ISO code does not currently exist. In order to obtain such a code it is necessary for the appropriate authority, normally the government, in the country to apply to the ISO. It is not envisaged that obtaining such a code will constitute a problem, since Palestine has tentatively been assigned an international country code for telephonic communications Two letter codes are assigned to be unique using an algorithm involving the country's official name. However, some of the more obvious two letter codes that might be used have already been assigned, such as pl for Poland, pa for Panama, and pt for Portugal. It is not certain what the two letter code will eventually be at this point. Pending an application by the Palestinian National Authority for such a two-letter code an interim, politically acceptable, solution was required. This was arrived at by registering the universities in the .edu domain and also registering a domain pi.org for Palestinian non-profit organizations. This was accomplished by Yaser Doleh in co-operation with local contacts at each institution. A list of the currently registered Palestinian universities follows:

Domain Name	**Institution**
birzeit.edu	Birzeit University
an-najah.edu	An-Najah University, Nablus
alquds.edu	AI-Quds University

Table 1: Currently Registered Palestinian Organizations

4.3 Other Initiatives in Palestine

There exist two other initiatives which are related to the Academic Network, in that they could employ such an academic network as a medium for their accomplishment. The first is an initiative to provide copies of a unified library catalogue for all the Palestinian universities. The process currently proposed is for each institution to download their new additions to Birzeit using a modem. Birzeit then produces a unified catalogue which each institution can then upload by modem. Difficulties are currently being experienced due to the lack of availability and quality of the phone lines, lack of local staffing and the manual nature of the process. The Academic Network could be used to perform all the transfers involved or alternatively to provide on-line access to the actual catalogues at remote institutions. In this manner it is currently possible to access many of the library accession systems in universities around the world over the Internet.

The other initiative is PLANET, which is primarily an initiative to establish an electronic library in the form of on-line databases and data sets to host academic references, journals and research materials. Particular interest is in medical databases. A secondary aim is the establishment of a Palestinian academic network with connectivity to the Internet. This is clearly a necessary prerequisite to distributed access to such databases.

While in Palestine, we had an opportunity to attend the annual meeting of Baraka, a bulletin board and mail system for NGOs. Baraka has been operating for some time and the experiences gained there are of some value in assessing the use of dial in facilities to UNDP. A problem noted was that, since people tend to read and compose mail on-line, it is often difficult to get a modem connection. This is particularly for those who only wish to download and collect mail. This would also likely impact UNDP if it provides both SLIP and e-mail connectivity.

5 Palestinian Academic Network

5.1 Basic Configuration

The ultimate aim is to establish a Palestinian Academic Network running TCP/IP (Internet) protocols over dedicated high-speed (64 kbps) lines, with connectivity to the international Internet. The basic Palestinian Academic Network would consist of router-to-router connections over dedicated leased lines, similar to that between UNDP and the Israeli Academic Network. The recommended routers are Multiprotocol CISCO routers, since these have effectively become a standard on the Internet and are known to be reliable and capable of routing multiple protocols over the same leased line at acceptably high rates.

The initial configuration would call for the connection of each institution to the UNDP office in East Jerusalem in a star configuration. Minor savings could be achieved by connecting institutions together. However this would be at the expense of vulnerability of the outlying institutions to loss of connection in the event of failure or closure of any institution on the route to UNDP. Given the still volatile conditions in the OPT, this appears a more risky option. Further connectivity could be added later to provide redundancy.

Initially only standard Internet protocol (TCP/IP) packets would be routed. However the CISCO routers permit the evolution of the network to route other protocols locally or remotely if required. The existence of DECnet and Novell LANs may make this desirable. The UNDP router, which was configured by CISCO, currently uses the proprietary CISCO routing protocol. Consideration should be given to moving to a non-proprietary protocol at a later stage of evolution of the Palestinian Academic Network. The model of CISCO router appropriate will depend to some extent on the configuration of network at each institution. It is possible to use the routers to route on local LANs as opposed to using a bridge behind the router for this purpose. This may not be a desirable option unless required by the local environment, since it is desirable to keep the equipment used for connectivity to the Palestinian Academic Network separate from that used for local networking to prevent modifications of local configurations (particularly routing) from having an impact on the Palestinian Academic Network.

Assuming that this separation is maintained, each site would require a CISCO router (probably model 2501 or equivalent) with appropriate software, and at least one workstation running a variant of Unix. The Unix workstation would provide the main host for e-mail and interactive access using telnet, ftp, gopher [2], Mosaic [3] and other Internet applications. To bring the full benefits of the Internet to students and academic staff, it is necessary that the Internet connection be accessible from a LAN which is available to academic users. This can be a LAN consisting of PCs running DOS and Windows, Macintoshes or PCs, Macs or workstations running a variant of Unix. Internet access software, (such as telnet, ftp and mosaic), should be obtained for the machines on this LAN. It is desirable from the point of maintenance and support that some consistency be maintained in the choice of equipment and software across sites.

5.2 Leased Lines and Alternatives

Subject to availability the leased lines should be at 64 kbps. This should initially provide adequate bandwidth for interactive graphical applications, particularly information access systems such as Mosaic, and for reasonable size file transfers. In some cases, as indicated above, such lines may not be available. Tests indicate that even unconditioned telephone lines can sustain data rates of 14.4 kbps from sites in Hebron and Birzeit. This would seem to indicate that lines of acceptable quality will be available.

At the stage of writing this report, responsibility for education in the West Bank and Gaza has been turned over to the Palestinian National Authority (PNA). However communications remain in Israeli hands. Moreover it is unclear whether the establishment of microwave transmitters by the PNA is permitted even in Gaza and Jericho. It appears that certain frequencies in the microwave range may have been allocated for the television stations in Jericho and Gaza but no further frequencies appear to be allocated. This may be a complicated issue, which interacts with the presence of considerable microwave communications between the Israeli Defense Forces and the Israeli settlers in the OPT.

In addition, telephone communication in the West Bank and Gaza has ceased to be a monopoly of the Israeli telephone company (Basiq). Another company will also provide long distance service. This will effect any analysis of future costs. Basiq appears unwilling to invest in upgrading of lines in the West Bank and Gaza, as illustrated by Birzeit University's problems in obtaining lines. This means that, although costs of Basiq lines can be used in estimates, availability of those lines cannot be determined until a request is submitted for the connection.

Rough estimates (in NIS) of the costs for lines to the various cities with educational institutions is given below. The cost depends on the air distance. Note that the installation cost is the same irrespective of the data rate and is a one time additional cost of NIS 2281.50 . The costs include a modem supplied by Basiq and are exclusive of tax.

City	**Distance (km) to UNDP**	**Monthly 9.6 kbps**	**Monthly 64 kbps**
Bethlehem	10.8	513.02	628.52
Hebron	33.2	583.58	727.08
Nablus	46.8	626.42	786.92
Gaza	80.8	733.52	936.52
Ramullah	12.0	516.80	633.80

5.3 International Connectivity

The present leased line from UNDP to the Israeli Academic Network can provide initial connectivity to the international Internet for sites in the West Bank (including East Jerusalem). Despite the latency problems described above this would appear to be the only path which gives acceptable performance in the short term.

Connectivity for sites in Gaza is more problematical. It would seem the best option to connect these to the Egyptian Academic Network and hence to the international Internet. The link from the FRGU Computer Center in Cairo to Europe has recently been upgraded from a 9.6 kbps analogue line to a 64 kbps digital line. The local lines are still 9.6 kbps or less. Contacts with Nashwa Abdel-Baki, the Network Country Coordinator for Egypt indicated that Egypt would in principle be willing to connect Gaza through Cairo. There is a standard rate for phone lines from

Egypt to any Arab or African nation. One cannot at this stage estimate the data capacity of these lines but might expect that they would not be greater then the internal Egyptian lines which are analogue and support only 9.6 kbps. A formal request and proposal would be required to obtain costings for this route.

Alternatives in the longer term for connectivity for the West Bank would include a possible connection to Jordan or direct satellite links to Europe or America. A connection from UNDP Amman to UNDP East Jerusalem has been suggested by Richard Bonugli in his proposal for establishing JordanNet, a Jordanian Internet. This proposed a 9.6 kbps analog phone line to give JordanNet connectivity to the international Internet. An alternative proposed there is a 9.6 kbps satellite link to the U.S. A satellite link from Palestine to U.S. or Europe would be considerably more expensive then the present link and unless it had 64 kbps data transfer rate would be likely to provide less acceptable performance. Nevertheless sensitivity of information considerations as well as saturation of the Israeli link may make this the most acceptable long term solution.

5.4 Other Regional Developments

The general computing environment in the Middle East as of 1992 was described in [5]. The concentration in this report was more on the general information technology capabilities rather than on the availability of network connectivity. It gave snapshots of the status in Egypt, Iran, Jordan, and Syria. In the case of Egypt some of the issues and challenges in introducing the Internet are described in [6]. In the case of Jordan more information on the initiative to establish regional software centers is contained in [7].

A further meeting at UNDP outlined work on establishing a network linking national database centers in Jordan. This was an extension of the type of initiative described in [8]. This will initially run Internet protocols over existing phone lines, and thus be limited to 9.6kbps. Discussion of alternative network technologies such as microwave and satellite links also took place. Subsequently they drafted a technical proposal to provide Internet connectivity to seven Jordanian organizations and universities, with a hub at the National Information Center. One option for connecting to the Internet proposed was by a 9.6 kbps line from the UNDP office in Amman to the UNDP office in East Jerusalem. An alternative was a 9.6 kbps satellite link to the U.S. During a visit to Amman, we visited the Director of NIC. One of the major interests of NIC in the Jordanian networking project was for the purposes of linking government databases similar to that in [7]. This seems very similar in concept to the UNDP Sustainable Networking Initiative [9] and to suggestions for network connectivity for developing countries as described in [10]. We also confirmed, by a visit, that UNDP in Amman had no current initiatives in the area of networking, although one of their primary areas of interest now was technology transfer from developed countries. A recent information day (June 94), on Information Technologies Worldnet, held at the U.S. embassy seems to have generated considerable interest in the Internet.

During a visit to Cairo, we met with, the Network Country Coordinator for Egypt. She explained the current structure of the Egyptian Academic Network. The link from the FRCU Computer Center to Europe has recently been upgraded from a 9.6 kbps analogue line to a 64 kbps digital line. The local lines are still 9.6 kbps or less. She confirmed that Egypt would in principle be willing to connect Gaza through Cairo. There is a standard rate for phone lines from Egypt to any Arab or African nation. One cannot at this stage estimate the data capacity of these lines. A formal request and proposal would be required to obtain costings for this route.

6 Proposed Evolution

6.1 Training and Support

The success of any networking effort depends more on the availability of trained staff to manage the network and educate users than on the existence of the hardware. It became clear during the visit that there is a great need for training and familiarization with the Internet to go hand in hand with the actual establishment of the Academic Network. To that end, the UNDP has provided access to a number of individuals to the Internet through accounts on machines at UNDP. It is desirable that this access be increased and that individuals at each institution, particularly those, who might eventually take charge of networks there, become familiar with the Internet.

There is a definite need for more short courses for both users and potential systems staff on TCP/IP, the Internet, Unix systems administration, mail and uucp. These could be similar to the courses run by Birzeit University Continuing Education Department in Summer 94, but should contain more hands on experience of the Internet and its uses. This is more feasible now using the dial-in lines to UNDP. Due to the difficulty in travel from areas such as Gaza, Nablus and Hebron, it is desirable that courses be held in such outlying areas as well as Birzeit. Unfortunately unless at least dial-up access is available such courses are likely to be less useful.

The UNDP would initially act as a Network Management Center (NMC), which would act a central point of contact and expertise on matters relating to the Palestinian Academic Network and the Internet. This would require at least one technical staff member who would be capable of updating routing and other information, debugging network software and handling faults in routers, communications and networking equipment. Since UNDP would be directly on the Internet this person would have access to expertise via the Internet. Ultimately this center and staff would become a wholly Palestinian operation.

In addition, there is a need to develop and train staff at each institution capable of setting up and running LANs and an Internet connection. The NMC would be able to provide more technical advice when needed.

6.2 Mail

As an initial step to providing better communication between the Palestinian institutes of higher education and research institutes, UNDP has agreed to act as a provider for e-mail for these organizations. This will be accomplished initially by use of the uucp protocol over phone lines. Incoming mail from the Internet will arrive at UNDP and will be forwarded on using uucp. Outgoing mail from any institution would be transferred to UNDP and from there go out on the Internet connection.

To make this a reliable system, in the light of experience at Baraka and UNDP, it is necessary to dedicate a phone line for this purpose. It is suggested that the current 386 running FreeBSD provides adequate capacity for this purpose. The phone line attached to it would be used for this purpose. To ensure the success of this initiative each institution needs to provide a machine, modem and mail software capable of connecting to UNDP and someone whose designated responsibility it is to maintain the link. It is desirable that someone with expertise in configuring uucp on PCs running DOS and Unix as well as on workstations running Unix, travel to each site and assist in setting up the system. Training for the local person responsible is also essential to success.

6.3 Experience with the Internet

In order for people to acquire more expertise with the Internet and Internet applications, it is desirable that UNDP extend the present availability of dial-in access. It has become clear, that

due to travel restrictions on Palestinians, it is difficult for many who are interested to travel to UNDP or any other central point to acquire extensive experience.

At present the dial-in access is to the 386. This is excessively slow for interactive applications and is unlikely to bear up well under the increased load if more lines are added. It is suggested that the interactive dial-in connections be moved to a faster machine, preferably a 486 DX2-66 or equivalent, also running FreeBSD. The extra phone lines available (3) could be attached to this to give enhanced access. The lines should provide the option of running SLIP in order to permit full Internet access.

6.4 Towards Full Connectivity

In order to progress towards full connectivity of an Academic Network a number of steps are required in addition to the acquisition of the routers and machines.

- UNDP needs to acquire a license to act as an Internet provider
- Each institution must get an Internet address or group of addresses. These must currently be in the series allocated to Israel, since initial connectivity is through Israel. To facilitate this process UNDP has acquired a group of addresses for allocation to the Palestinian universities and research institutes.
- Each institution must apply for a license for a leased line to UNDP to the Israeli Ministry of Communications.
- On getting permission each institution must apply to Basiq for the leased line.
- When the leased line is installed the router and machine must be configured.

In addition a Palestinian domain should eventually be created. To do this requires:

- Ultimately a Palestinian domain must be registered. This must be done by a competent authority. Many of the obvious English language choices are unavailable, since they have been already allocated (pi and pa are ?? and Panama, for example).
- The institutions already registered should be reregistered in the Palestinian domain

7 Administrative Structures

7.1 Normal Practices

Most national or regional academic networks have one or more representative committees which are responsible for overall policy, and technical policy and administration of the network. The committee or committees usually consist of one member nominated by each participating institute, together possibly with a representative of the government education or science agency (which is usually the funder of such a network). In the case where there is only one committee this usually consists of senior members from Computing Services at each institution. In addition, there may be representatives of network working groups (or technical subcommittees) and of the regional or national group of university librarians. The latter recognizes the significant role of the network in linking library accession systems.

The network management committees (NMC) usually employ a Network Coordinator who has day to day responsibility for the functioning of the network. Technical running of the network may be entrusted to a Network Operations Center (NOC) which consists of the Network Coordinator and technical staff or the overall running of the network may be subcontraced to a univeristy computing center or other institution. Besides the technical administration of the network, the NOC is also often responsible for the administration of the national Internet namespace.

7.2 Recommendations

It is recommended that the administrative structure of the Palestinian Academic Internet (PALnet) consist of two committees representing the participating institutions. As an interim measure to ensure input in the creation of PALnet it is suggested that the Univeristies be requested to nominate representatives to ad-hoc versions of these committees as soon as possible.

One committee, the ad-hoc Technical Committee (AHTC), should consist of one representative of each institution, together with a representative of the UNDP. The committee should elect its own chairman for a term of 2 years. The chairman would be responsible for calling meetings of the committee. The representatives should be able to consider and resolve technical matters relating to networking. The primary responsibility of the AHTC would be to consider the technical needs of the networks and its proposed evolution, and to propose a budget and expenditures based on these needs. The AHTC should establish Working Groups, either as standing sub-committees or as temporary working groups, to consider technical issues. These Working Groups can invite volunteers to assist in their work.

The other committee, the ad-hoc Administrative Committee (AHAC), should consist of one representative of each institution, together with a representative each of the Palestinian National Authority Education Council, the UNDP as interim funding agency, and the univeristy libraries. The committee should elect its own chairman for a term of 2 years. The chairman would be responsible for calling meetings of the committee at least twice a year. The primary responsibility of the committee would be in matters requiring financial outlay. It would, in particular, review the budget proposed by the technical committee in the context of user demands and other financial pressures on the participating institutions.

The AHTC and AHAC together would be responsible for the hiring of a Network Coordinator. The Network Coordinator will be responsible for the day to day functioning of the network, troubleshooting, and advice to network staff at the participating institutions. In particular, the Network Coordinator should be responsible for routing at all routers on the network, and for the administration of Internet numbers and domain names. The Network Coordinator would head the Network Operations Center (NOG). Initially the NOG should be situated at the UNDP office in East Jerusalem. At the end of an interim period of 2 to 3 years the AHTC and AHAC should consider whether they should subcontract for further NOC services to one of the universities of other institutions or whether they should establish a seperate NOC with technical staff of its own. Given the prevailing conditions in the OPT the latter option would seem the more desirable.

Over the same period the AHTC and AHAC should consider the establishment of an organization to act as a controlling body for the network. This would involve incorporating an organization with responsibility for Academic Networking and appointing officers, particularly a Chairman, Secretary and Treasurer. The AHAC and AHTC together would act as governing body or board of trustees of this organization. The officers would be appointed by the AHTC and AHAC together, and would be responsible for the monetary management of the resources of the network organization. It is suggested that the Chairman, Secretary and Treasurer be elected from among the members of the AHTC and AHAC.

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