Appendix A **FRAMEWORK SUMMARY**

Pervasiveness	
Level 0	*Non-existent:* The Internet does not exist in a viable form in this country. No computers with international IP connections are located within the country. There may be some Internet users in the country; however, they obtain a connection via an international telephone call to a foreign ISP.
Level 1	*Experimental:* The ratio of users per capita is on the order of magnitude of less than one in a thousand. There is limited availability, and use of the Internet is embryonic. Only one or a few computers are connected to the international IP network. The user community comprises principally networking technicians.
Level 2	*Established:* The ratio of Internet users per capita is on the order of magnitude of at least one in a thousand. The user community has been expanded beyond networking technicians.
Level 3	*Common:* The ratio of Internet users per capita is on the order of magnitude of at least one in a hundred. The infrastructure of supporting and related goods and services has become well-established, although is not necessarily extensive.
Level 4	*Pervasive:* The Internet is pervasive. The ratio of Internet users per capita is on the order of magnitude of at least one in ten. Internet access is available as a commodity service.

Geographic Dispersion	
Level 0	*Non-existent:* The Internet does not exist in a viable form in this country. No computers with international IP connections are located within the country.
Level 1	*Single Location:* Internet points-of-presence are confined to one major population center. There is an international IP link from only one city.
Level 2	*Moderately Dispersed:* Internet points-of-presence are located in at least half of the first-tier political subdivisions of the country. There is an international IP link from only one city.
Level 3	*Highly Dispersed:* Internet points-of-presence are located in at least three-quarters of the first-tier political subdivisions of the country. There are international IP links from two or more cities.
Level 4	*Nationwide:* Internet points-of-presence are located in all first-tier political sub-divisions of the country. Rural access is publicly and commonly available. There are international IP links from more than two cities.

Subsectors of the Social Structure			
Sector	Subsectors		
Academic	Primary and Secondary education	University education	
Commercial	Distribution Finance	Manufacturing Retail	Service
Health	Hospitals Clinics	Research Centers Physicians/Practitioners	
Public	Central government Regional and Local governments	Public companies Military	

Assessing Sectoral Absorption			
Sector	Rare	Moderate	Common
Academic-primary and secondary schools, universities	< 10% have leased-line Internet connectivity	10-90% have leased-line Internet connectivity	> 90% have leased-line Internet connectivity
Commercial-businesses with more than 100 employees	< 10% have Internet servers	10-90% have Internet servers	> 90% have Internet servers
Health-hospitals and clinics	< 10% have leased-line Internet connectivity	10-90% have leased-line Internet connectivity	> 90% have leased-line Internet connectivity
Public-top and second tier government entities	< 10% have Internet servers	10-90% have Internet servers	> 90% have Internet servers

Sectoral Absorption Rating		
Sectoral point total	Absorption dimension rating	
0	Level 0	Nonexistent
1-4	Level 1	Rare
5-7	Level 2	Moderate
8-9	Level 3	Common
10-12	Level 4	Widely used

Connectivity Infrastructure				
	Domestic Backbone	International Links	Internet Exchanges (IX)	Access Methods
Level 0	None	None	None	None
Level 1	< T-3	≤ 128 Mbps	None	Modem
Level 2	T-3 — OC-4	T-1 — T-3	1	Modem 64 Kbps leased lines
Level 3	OC-4 — 100 Gbps	T-3 — 10 Gbps	More than 1; Bilateral or Open	Modem > 64 Kbps leased lines
Level 4	≥ 100 Gbps	≥ 10 Gbps	Many; Both Bilateral and Open	< 90% modem > 64 Kbps leased lines

Organizational Infrastructure	
Level 0	*None:* The Internet is not present in this country.
Level 1	*Single:* A single ISP has a monopoly in the Internet service provision market. This ISP is generally owned or significantly controlled by the government.
Level 2	*Controlled:* There are only a few ISPs because the market is closely controlled through the maintenance of high barriers to entry. All ISPs connect to the international Internet through a monopoly telecommunications service provider. The provision of domestic infrastructure is also a monopoly.
Level 3	*Competitive:* The Internet market is competitive and there are many ISPs due to the existence of low barriers to market entry. The provision of international links is a monopoly, but the provision of domestic infrastructure is open to competition.
Level 4	*Robust:* There is a rich service provision infrastructure. There are many ISPs and low barriers to market entry. The provision of international links and domestic infrastructure are open to competition. There are collaborative organizations and arrangements such as public exchanges, industry associations, and emergency response teams.

Sophistication of Use	
Level 0	*None:* The Internet is not used, except by a very small fraction of the population that logs into foreign services.
Level 1	*Minimal:* The small user community struggles to employ the Internet in conventional, mainstream applications.
Level 2	*Conventional:* The user community changes established practices somewhat in response to or in order to accommodate the technology, but few established processes are changed dramatically. The Internet is used as a substitute or straight-forward enhancement for an existing process (e.g., e-mail vs. post). This is the first level at which we can say that the Internet has "taken hold" in a country.
Level 3	*Transforming:* The user community's use of the Internet results in new applications, or significant changes in existing processes and practices, although these innovations may not necessarily stretch the boundaries of the technology's capabilities.
Level 4	*Innovating:* The user community is discriminating and highly demanding. The user community is regularly applying, or seeking to apply the Internet in innovative ways that push the capabilities of the technology. The user community plays a significant role in driving the state-of-the-art and has a mutually beneficial and synergistic relationship with developers.

Appendix B GLOSSARY

ADSL	Asynchronous Digital Subscriber Line—A DSL technology that allows the down-stream data to be transmitted at a much higher rate than the up-stream data. ADSL was developed for high speed Internet access and telecommuting applications, recognizing that the user typically downloads a far greater amount of data than is uploaded.
AED	Arab Emirates (UAE) Dirham
AGCC	Arab Gulf Cooperation Council
AID	Agency for Information for Development (Cuba)
AIN	Advanced Intelligent Network
AMD	American Micro Devices
AN	Access Network (PRC)
APC	Association for Progressive Communications—APC was founded in 1989 to coordinate the operation and development of networks devoted to peace, ecology, human rights, and other "progressive" causes. As of August 1995, the APC had eighteen member networks, serving over 31,000 activists, educators, nonprofit organizations, and non-governmental organizations in over 133 countries. APC also exchanges e-mail and selected conferences with 40 partner networks worldwide, many of which are expected to become full APC members in the future. In September 1995, APC was granted Consultative Status, Category 1, with the Economic and Social Council of the United Nations. This means that APC can have a permanent representative at the UN, and is entitled to submit written statements to the Council, to be granted hearings, and to propose agenda items for consideration by the Council and its subsidiary bodies.
APIA	Asia Pacific Internet Association
APNG	Asia Pacific Networking Group
APNIC	Asia-Pacific Network Information Center
ARPA	Advanced Research Projects Agency—Now called DARPA, the U.S. government agency that funded the ARPANET.[438]
ARPANET	A packet-switched network developed in the early 1970s. The "grandfather" of today's Internet. ARPANET was decommissioned in June 1990.[439]
ART	Arab Radio & Television Company (Saudi Arabia)
AS	Autonomous System (Number)—A sequential number assigned to each independently-managed network connected to the Internet.

[438] O. Jacobsen and D. Lynch, *A Glossary of Networking Terms*, RFC 1208 (March 1991).
[439] *ibid.*

ATM	Asynchronous Transfer Mode
AT&T	American Telephone and Telegraph—An American long-distance and international telecommunications carrier.
Backbone	The primary connectivity mechanism of a hierarchical distributed system. All systems that have connectivity to an intermediate system on the backbone are assured of connectivity to each other. This does not prevent systems from setting up private arrangements with each other to bypass the backbone for reasons of cost, performance, or security.[440]
Batelco	Bahrain Telecommunications Corporation—The monopoly telelcommunications services operator and only ISP, of which 60 percent of the stock is owned by the Bahraini government and 40 percent by Cable & Wireless (UK). There have been rumors that the government might sell off some of its holdings, but it will certainly retain a minimum level of ownership (10-25 percent) that will allow the government to continue to dominate certain aspects of Batelco's operations. Competition to Batelco has not been contemplated. Batelco maintains that there is no need for privatization of the company, since the government is not the sole shareholder. Batelco is the *.bh* national TLD manager.
BBS	Bulletin-Board System
BITNET	Because It's Time Network—An academic computer network based originally on IBM mainframe systems interconnected via leased 9600 bps lines using NJE protocols. BITNET has merged with CSNET, The Computer+Science Network (another academic computer network), to form CREN: The Corporation for Research and Educational Networking. See CSNET.[441]
BITS	Bahrain Information Technology Society
Bosnia	The Republic of Bosnia and Hercegovina
C^3I	Command, Control, Communications, and Intelligence
CAnet	China Academic Network (PRC)
CANF	Cuban American National Foundation
CAS	Chinese Academy of Sciences (PRC)
C-band	4-6 GHz frequency range for satellite communications
CCNIC	China Internet Network Information Center (PRC)
CDLR	Council for the Defense of Legitimate Rights—A dissident group, based in London, opposed to the current government of Saudi Arabia
CENIAI	*Centro Nacional de Intercambio Automatizado Industria y San Jose* (Center for Automated Exchange of Information) (Cuba)

[440] *ibid.*
[441] *ibid.*

CEPT	*Conference Europénne des Administrations des Postes et Télécommunications*
CERN	*Centre Européenne pour la Recherche Nucléarie* (European Laboratory for Particle Physics)
CERNET	China Education and Research Network (PRC)
CERT	Computer Emergency Response Team
ChinaGBN	Golden Bridge Network (PRC)
ChinaNET	The Internet network of the PRC Ministry of Posts and Telecommunications
CIC	China Internet Corporation (PRC)
CIDET	Center for Teleinformatic Research and Development (Cuba)
CIGB	Center for Genetic Engineering and Biotechnology (Cuba)
CITMA	Ministry for Science, Technology, and the Environment (Cuba)
CIX	Commercial Internet Exchange—Initially the agreement between PSI, UUnet, CERFnet, and US Sprint (Sprintlink) that lets the traffic of any member of one network flow without restriction over the networks of the other members. Any TCP/IP service provider may join the CIX and connect and send traffic to other CIX member networks.[442]
CNN	Cable News Network (USA)
CRnet	China Research Network (PRC)
CSC	Center for Scientific Computing—A Finnish national service center specializing in scientific computing and communications. CSC provides universities, research institutes and industry with modeling, computing and information services. The computing for Finnish weather forecasts is made by a Cray supercomputer administered by CSC. CSC's network support staff is responsible for administering FUNET network operations. <http://www.csc.fi/>
CSNET	Computer+Science Network—A large computer network, mostly in the U.S. but with international connections. CSNET sites include universities, research labs, and some commercial companies. Now merged with BITNET to form CREN.[443]
CSTNet	China Science and Technology Net (PRC)
CSU	Channel Service Unit
CWW	China Wide Web (PRC)
DARPA	Defense Advanced Research Projects Agency—The U.S. government agency that funded the ARPANET.[444]

[442] Cook Report, <http://www.users.on.net/tomk/library/ glossary.htm> (9 February 1998).
[443] RFC 1208.
[444] *ibid.*

DCI	Data Communication Company of Iran—The monopoly provider of non-voice communications services in Iran. The DCI operates a nationwide X.25 network, *Iranpac*, on the basis of which it is establishing public Internet services. Owned by the MPTT, this is the sister company of the TCI (*q.v.*).
DDN	Digital Data Network
DEC	Digital Equipment Corporation (USA)
DM	Deutsche Mark
DNS	Domain Name Server
DNS	Domain Name System—The distributed name/address mechanism used in the Internet.[445]
Domain	In the Internet, a part of a naming hierarchy. Syntactically, an Internet domain name consists of a sequence of names (labels) separated by periods (dots), e.g., "tundra.mpk.ca.us."[446]
DOS	Disk Operating System
DPA	Dayton Peace Agreement—The "General Framework Agreement for Peace in Bosnia and Herzegovina," initialed by the parties in Dayton, Ohio, on 21 November 1995 and signed in Paris on 14 December 1995.
DS-0	Digital Service, level 0 (zero)—64 Kbps; the standard for digitizing one voice conversion using pulse-code modulation.
DSU	Digital Service Unit
E-1	E-carrier—The European version of the T-carrier, operating at a basic rate of 2.048 Mbps. Comprises 30 DS-0 (64 Kbps) digital voice channels and control and framing channels.
EARN	European Academic Research Network (see TERENA)
EC	European Commission
EDI	Electronic Data Interchange
EMU	European Monetary Union
ERMES	European Radio Messaging System—A digital paging standard, compatible with the GSM digital cellular telephone system, with an effective over-the-air data rate of 3.75 Kbps using a 4PAM/FM modulation (3.125 Kbps transmitted data rate) with forward error correction. The standard is being up-graded to provide an effective data rate of 6.25 Kbps.
ETECSA	*Empresa de Telecomunicaciones de Cuba, S. A.*

[445] *ibid.*
[446] *ibid.*

Etisalat	Emirates Telecommunications Corporation—The monopoly telecommunications services provider and ISP in the UAE. Etisalat is the *.ae* national TLD manager.
ETLA	The Research Institute of the Finnish Economy—A private institute founded in 1946 to conduct research in the fields of economics, business and social policy designed to serve financial and economic-policy decision making. ETLA has two major activities: macro economic forecasting and project studies. <http://www.etla.fi/>
ETSI	European Telecommunications Standards Institute
EU	European Union
EUNet	European UNIX Network—A European IP backbone and Internet service provider.
FARNET	Federation of American Research Networks
FBIS	Foreign Broadcast Information Service
FDDI	Fiber Distributed Data Interface
Federation	The Muslim-Croat Federation of Bosnia-Hercegovina—The portion of the Republic of Bosnia and Hercegovina to be governed by a Muslim-Croat coalition under the provisions of the Dayton Accords.
FICIX	Finnish Commercial Internet Exchange—A consortium of Finnish Internet technology-based data communication providers designed to provide smooth and low-overhead interconnection and a cooperative forum for the operator's networks. FICIX interconnects the major domestic IP networks (Clinet, DataNet, EUnet, FUNET, GlobalOne, IBM Global Network, LanLink, Telia Finland) using 155 Mbps ATM technology. The FICIX exchange is neutral and policy-free interconnection point and each member network has defined its own policy for the traffic. <http://www.ficix.fi/>
FIM	Finnish Markka
FLAG	Fiber optic Link Around the Globe
FOG	Fiber Optic Gulf—A submarine fiber optic cable network connecting Bahrain, Kuwait, Oman, and the UAE. This system also connects the first three countries to the SEA-ME-WE systems via the UAE.
FQDN	Fully-Qualified Domain Name
FRG	Federal Republic of Germany
ftp	File Transfer Protocol—The Internet protocol (and program) used to transfer files between hosts.[447]
FUNET	Finnish University and Research Network—The Internet Service Provider for Finnish Universities, Government and research centers. FUNET-network services

[447] *ibid.*

are provided by CSC's network support staff. The FUNET network relies primarily on Telecom Finland's ATM backbone. Connection speeds range from 10 to 34 Mbps with plans to upgrade to 155Mbps this year. Connections to the outside world go via the NORDUnet network of which FUNET is a member. The FUNET network is funded in part by membership fees, and in part by direct budgetary payment from the Ministry of Education. <http://www.funet.fi/>

Gbps	Gigabits per second—A transmission speed of billions (10^9) of bits per second.
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GET	Group for Electronics in Tourism (Cuba)
GII	Global Information Infrastructure
GIS	Geophysical Information System
GMT	Greenwich Mean Time
GPC	General People's Congress (Yemen)—The ruling political party in Yemen, formerly the ruling party of the Yemen Arab Republic (North Yemen).
GRCITP	General Research Center for IT Projects (PRC)
gTLD	Generic TLD—Such generic domains as *.com* (commercial), *.edu* (educational), *.gov* (government), *.int* (international organization), *.mil* (military), *.net* (network service), and *.org* (organization). Some countries substituted dinomes, e.g., *.ac* (academic), *.co* (company), and *.or* (organization).
GTO	General Telecommunications Organization (Oman)—The monopoly telecommunications services provider and ISP in Oman. The GTO is the *.om* national TLD manager.
HDSL	High bit-rate Digital Subscriber Line—A DSL technology that allows data transmissions at speeds of 64 Kbps up to T-1 (1.544 Mbps) or E-1 (2.048 Mbps) over copper wires.
HKISPA	Hong Kong Internet Service Provider Association
HPT	Croatian Post and Telecommunications—The state monopoly telecommunications company of Croatia, which also controls part of the Bosnian PSTN and offers Internet access in one Federation city.
HRT	Croatian Radio and Television—The official, state-run electronic media networks of Croatia, which also controls a significant number of radio and television transmission and relay stations in Bosnia.
HTC	Helsinki Telephone Company—Helsinki Telephone (also abbreviated HPY) is the largest local, private, telephone company in Finland and is the cornerstone of the Finnet Group. This group was formed in partnership with the other 45 local telephone companies of Finland. The company offers a full range of communication services to customers in the Finnish capital, Helsinki, and its

	adjoining areas. Through the Finnet Group the company can offer services anywhere in Finland and, through international alliances, even abroad. <http://www.hpy.fi/>
HTML	Hypertext Mark-up Language
HVO	Croatian Defense Council—An ethnic-Croat militia in Bosnia with responsibility for administering areas under Croat control prior to the establishment of the Federation.
IAB	Internet Activities Board—The technical body that oversees the development of the Internet suite of protocols (commonly referred to as "TCP/IP"). It has two task forces (the IRTF and the IETF), each charged with investigating a particular area.[448]
IANA	Internet Assigned Names Authority
IBM	International Business Machines
ICID	Central Institute for Digital Research (Cuba)
ICIMAF	Institute of Cybernetics, Mathematics, and Physics (Cuba)
ICMP	Internet Control Message Protocol—The protocol used to handle errors and control messages at the IP layer. ICMP is actually part of the IP protocol.[449]
IDICT	Institute for Scientific and Technological Information (Cuba)
IDP	Internally Displaced Person
IETF	Internet Engineering Task Force—One of the task forces of the IAB. The IETF is responsible for solving short-term engineering needs of the Internet. It has over 40 Working Groups.
IFOR	(DPA) Implementation Force
IHEP	Institute for High Energy Physics (PRC)
IMED	International Medical and Educational Data (Link)—An ISP in Bethesda, Maryland.
IN	Intelligent Network
IN	Interconnecting Network (PRC)
INC	Iraqi National Congress
Internet	The largest internet in the world consisting of large national backbone nets (such as MILNET, NSFnet, and CREN) and a myriad of regional and local campus networks all over the world. The Internet uses the Internet protocol suite. To be on the Internet you must have IP connectivity, i.e., be able to Telnet to—or ping—

[448] *ibid.*
[449] *ibid.*

	other systems. Networks with only e-mail connectivity are not actually classified as being on the Internet.[450]
IP	Internet Protocol—The network layer protocol for the Internet protocol suite.[451]
IPM	Institute for Studies in Theoretical Physics and Mathematics (Iran)—A leading academic institute in Tehran that established the first BITNET network and international link, followed by the first international IP link to the Internet. IPM is the *.ir* national TLD manager.
IPR	Intellectual Property Rights
IPv6	Internet Protocol version 6
IRNA	Islamic Republic News Agency—Iran's official news agency and wire service.
IRTF	Internet Research Task Force—One of the task forces of the IAB. The group responsible for research and development of the Internet protocol suite.[452]
ISDN	Integrated Services Digital Network
ISO	International Standards Organization
ISP	Internet Service Provider
ISPJAE	*Instituto Superior Politécnico "José Antonio Echeverría"* (Cuba)
ISTIC	Institute of Scientific and Technical Information of China (PRC)
IT	Information Technology
ITU	International Telecommunications Union
ITU-BDT	ITU Bureau for Telecommunications Development
ITU-T	ITU Telecommunications Standardization Sector
IX	Internet Exchange—A facility where two or more IP networks exchange traffic.
KAAU	King Abdulaziz University (Jeddah, Saudi Arabia)
KACST	King Abdulaziz City for Science and Technology (Riyadh, Saudi Arabia)—KACST is the *.sa* national TLD manager.
Kbps	Kilobits per second—A transmission speed of thousands (10^3) of bits per second.
KEMS	Kuwait Electronics Messaging Services
KFSHRC	King Faisal Specialist Hospital and Research Center (Riyadh, Saudi Arabia)
KFUPM	King Fahd University of Petroleum and Minerals (Dhahran, Saudi Arabia)
KSA	The Kingdom of Saudi Arabia
KSU	King Saud University (Riyadh, Saudi Arabia)

[450] *ibid.*
[451] *ibid.*
[452] *ibid.*

Ku-Band	11-14 GHz frequency range for satellite communications
LAN	Local Area Network
MAE	Metropolitan Area Ethernet (USA)
MB	Mega-Bytes—Millions of bytes of data
MBMT	Ministry of Broadcast, Movies, and Television (PRC)
Mbps	Megabits per second—A transmission speed of millions (10^6) of bits per second.
MEI	Ministry of Electronics (PRC)
MILNET	Military Network—Originally part of the ARPANET, MILNET was partitioned in 1984 to make it possible for military installations to have reliable network service, while the ARPANET continued to be used for research.[453]
MINSAP	Ministry of Public Health (Cuba)
MKO	*Mojahedin-e Khalq* Organization—An Iranian opposition group headquartered in Iraq. The group espouses a combination of Marxist and Shi'ite Islamic philosophy and the separation of religious and government power.
MOFET	Ministry of Foreign Affairs (PRC)
MoU	Memorandum of Understanding
MPS	Ministry of Public Security (PRC)
MPT	Ministry of Posts and Telecommunications (PRC)
MPTT	Ministry of PTT (Iran)—Establishes policy relevant to telecommunications operations and industry and oversees its implementation in Iran. The MPTT has over 50,000 employees, making it the sixth largest ministry. It is the parent organization for the telephone operating companies, the most important of which is the Telecommunication Company of Iran, the country's 24 local operating companies in the provinces, and the Data Communications Company of Iran. The MPTT also owns the major telecommunications industrial and research and development enterprises.
Muslim	For the purposes of this report, a Bosnian adhering to the Islamic faith.
NAP	Network Access Point—On April 30, 1995, the architecture of the American Internet underwent a major change from a single dominant NSFnet backbone to a series of commercial provider owned and operated coast-to-coast national backbones. Under these conditions, the backbones had to have some means of exchanging data. Four Network Access Points (NAP) were designated to serve as data interchange points for backbone service providers. NSF's three primary NAPs are in the San Francisco Bay area, Chicago, and Pennsauken, NJ. Metropolitan Fiber

[453] *ibid.*

	Systems' MAE-East was designated by NSF as a secondary Washington, D.C., NAP.[454]
NASS	Network Analysis Support Services (Yemen)
NATO	North Atlantic Treaty Organization
NCC	Network Control Center—A division of RIPE that acts as the Regional Internet Registry for Europe and surrounding areas. As such, NCC provides support to approximately 1000 local Internet Registries, who provide funds for these services. <http://info.ripe.net/>
NCRI	Networking and Communications Research and Infrastructure—A division of the National Science Foundation.
NDTW	National Data Transmission Network (Cuba)
NGO	Non-Governmental Organization
NIC	Network Information Center
NII	National Information Infrastructure
NMT	Nordic Mobile Telephone—NMT-450 and NMT-900 are cellular air interface standards for mobile communications specified jointly by the telecommunications bodies of Denmark, Finland, Norway, and Sweden.
NOC	Network Operations Center
NORDUnet	Nordic University Network—NORDUnet A/S is a Danish-based limited liability company in charge of the communications network between all Nordic countries. It also provides network connections to other European countries and the USA, as well as to other parts of the Internet. Established for the organization of international network connections, its shareholders are the following research network organizations in the five Nordic countries: DENet Denmark, FUNET Finland, ISnet Iceland, SUNET Sweden, UNINETT Norway, or the corresponding ministries (e.g., Ministry of Education in Finland). <http://www.nordu.net/>
NRI	Neda Rayaneh Institute (Iran)—The first and still the largest commercial ISP in Iran, with a mirror Web site in the United States.
NRN	National Research Network—A term used to refer to the national research network organizations in the five Nordic countries: DENet Denmark, FUNET Finland, ISnet Iceland, SUNET Sweden, and UNINETT Norway.
NSF	National Science Foundation (USA)
NSFnet	NSF Network—A collection of local, regional, and mid-level networks in the U.S. tied together by a high-speed backbone. NSFnet provides scientists access to a number of supercomputers across the country.[455]

[454] Cook Report, *op. cit.*
[455] RFC 1208.

NTG	New Technologies Group—A Bosnian software company that maintains a server in Texas via FTP from Sarajevo.
OECD	Organization for Economic Development and Cooperation (UN)
OHR	Office of the High Representative (for implementation of the DPA)
OIC	Organization of the Islamic Conference
OICIS-NET	OIC Information Systems Network
OSCE	Organization for Security and Cooperation in Europe
OSI	Open Society Institute (Soros Foundation)
PAAET	Public Authority for Applied Education and Training (Kuwait)
PAD	Packet Assembler-Disassembler
PC	Personal Computer
PGP	Pretty Good Privacy
Ping	Packet Internet Groper—A program used to test reachability of destinations by sending them an ICMP echo request and waiting for a reply. The term is used as a verb: "Ping host X to see if it is up!"[456]
PKK	Kurdistan Workers' Party
PLA	People's Liberation Army (PRC)
POP	Point-of-Presence—A node of an Internet service provider containing a DSU-CSU, terminal server, and router, and sometimes one or more hosts, but no network information center or network operations center.[457]
POS	Point-Of-Sale
PPP	Point-to-Point Protocol—The successor to SLIP, PPP provides router-to-router and host-to-network connections over both synchronous and asynchronous circuits.[458]
PRC	People's Republic of China
PSTN	Public Switched Telephone Network—The public telephone system, also referred to as POTS—"Plain Ordinary Telephone Service"
PTA	Parents-Teachers Association
PTC	Public Telecommunications Corporation (Yemen)—The monopoly domestic telecommunications services provider in Yemen.
PTT	Post, Telegraph, and Telephone (or Post*s*, Telegraph*s*, and Telephone*s*)
PUK	Patriotic Union of Kurdistan

[456] *ibid.*
[457] Cook Report, *op. cit.*
[458] RFC 1208.

QR	Qatari Riyal
Q-Tel	Qatar Public Telecommunications Corporation—The monopoly telecommunications services provider and ISP in Qatar. Q-Tel is the *.qa* national TLD manager.
RADIUS	Remote Authentication Dial-In User Server—A user authorization protocol invented in 1992 by Livingston Enterprises Inc. that performs account management functions for dial-up subscribers.
RAID	Redundant Array of Inexpensive Disks
RDC	Regional Documentation Center—Baghdad-based library and database manager for the Arab Gulf Cooperation Council
RENACYT	National Network for Science and Technology (Cuba)
RFC	Request for Comments—The document series, begun in 1969, that describes the Internet suite of protocols and related experiments. Not all (in fact very few) RFCs describe Internet standards, but all Internet standards are written up as RFCs.[459]
RITSEC	Regional Information Technology Systems Engineering Center (Cairo, Egypt)
RIPE	*Réseaux IP Europeens* (IP Registry Europe)—The Internet registry for Europe, Africa, and the Middle East. The registry and database are maintained at the RIPE Network Control Center (NCC) in Amsterdam (www.ripe.net/db/index.html).
RO	Omani Riyals
RS	Republika Srpska
RSVP	Resource Reservation Protocol
SAIC	Science Applications International Corporation
SCADA	Supervisory Communications and Data Acquisition
SCIRI	Supreme Council for the Islamic Revolution in Iraq
SCS	Saudi Computer Society
SDH	Synchronous Digital Hierarchy—ITU-T optical interface standard for 51.84 Mbps to 13.22 Gbps digital transmission over optical fiber.
SDLC	Synchronous Data Link Control—An IBM bit-oriented data communications protocol used in the Systems Network Architecture (SNA).
SDN	Sustainable Development Network
SEC	State Education Commission (PRC)
SEA-ME-WE	South East Asia-Middle East-Western Europe—Submarine communications cable systems. SEA-ME-WE 1 is an analog network based on coaxial metallic cable, while SEA-ME-WE 2 and 3 are digital networks based on fiber optic cables. The UAE and Saudi Arabia have direct connection to the latter two systems.

[459] *ibid.*

SETC	State Economic and Trade Commission (PRC)
SFOR	Stabilization Force—NATO-led military coalition to stop the war in Bosnia.
SGI	Silicon Graphics Inc.
SIME	Ministry of Mechanical and Electrical Industries (Cuba)
SLIP	Serial Line IP—An Internet protocol used to run IP over serial lines such as telephone circuits or RS-232 cables interconnecting two systems. SLIP is now being replaced by PPP.[460]
SNA	Systems Network Architecture—An IBM proprietary network architecture using IBM's Synchronous Data Link Control (SDLC) protocol.
SPC	State Planning Commission (PRC)
Srpska	The Republika Srpska—The portion of the Republic of Bosnia and Hercegovina to be governed by ethnic Serbs under the provisions of the Dayton Accords.
SS7	ITU-T Signaling System Number 7
SSTC	State Science and Technology Commission
S&T	Science and Technology
STC	Saudi Telecommunications Company—The monopoly telecommunications services provider in Saudi Arabia.
STD	Subscriber Trunk Dialing—Direct-dialed domestic long distance
STET	*Società Finanziaria Telefonica p.a.* (Italy)
T-1	T-carrier—The North American basic digital transmission rate of 1.544 Mbps. Comprises 24 DS-0 (64 Kbps) digital voice channels plus control and framing channels.
TAE	Trans-Asia-Europe—The "Silk Road" fiber optic network connecting Shanghai, PRC, with Frankfurt-am-Main, FRG.
TCI	Telecommunication Company of Iran—A wholly-owned operating company of the MPTT with responsibility for planning, installation, and operation of telecommunications nationwide. It is the long distance (toll) carrier, and oversees and coordinates the operations of the provincial operating companies. Headquartered in Tehran, TCI maintains ten regional offices. It is part owner of the MPTT's two principal industrial enterprises, the Iran Telecommunication Manufacturing Company and Iran Telecommunication Industries, and also operates the Iran Telecommunication Research Center.
TCP	Transmission Control Protocol—The major transport protocol in the Internet suite of protocols providing reliable, connection-oriented, full-duplex streams. Uses IP for delivery.[461]

[460] *ibid.*

TeleYemen	Yemen International Telecommunications Company—The monopoly international telecommunications services provider and ISP in Yemen. TeleYemen is the *.ye* national TLD manager.
Telnet	The virtual terminal protocol in the Internet suite of protocols. Allows users of one host to log into a remote host and interact as normal terminal users of that host.[462]
TEP	Telecommunications Expansion Project (Saudi Arabia)
TERENA	Trans-European Research and Educational Networking Association—A network using BITNET technology connecting universities and research labs in Europe. (formerly EARN)
TLD	Top-Level Domain
UAE	United Arab Emirates
UK	United Kingdom
UN	United Nations
UNDP	UN Development Program
UNESCO	UN Educational, Scientific, and Cultural Organization
UNHCR	UN High Commissioner for Refugees
URL	Uniform Resource Locator
U.S.	United States
USA	United States of America
USAID	United States Agency for International Development
USBR	United States Bureau of Reclamation
USIA	United States Information Agency
USIS	United States Information Service
USSR	Union of Soviet Socialist Republics
UST	University of Science and Technology (Yemen)
UTIC	University TeleInformatic Center—University of Sarajevo's Internet center
UUCP	UNIX-to-UNIX Copy Program—A protocol used for communication between consenting UNIX systems.[463]
VAS	Value Added Services
VHF	Very High Frequency
VLSI	Very Large-Scale Integration

[461] *ibid.*
[462] *ibid.*
[463] *ibid.*

VSAT	Very Small Aperture Terminal
xDSL	Digital Subscriber Line—The generic designation for a transmission technology that digitally multiplexes data channels over a single pair of copper wires.
WiLL	Wireless Local Loop (*also* WLL)
WIPO	World Intellectual Property Organization
WLL	Wireless Local Loop (*also* WiLL)
WTO	World Trade Organization
WWW	Worldwide Web
YCC	Youth Computer Club (Cuba)
YR	Yemeni Rial
ZTN	ZaMir Transnational Network (Balkan Region)

Appendix C COMPUTER NETWORKING BACKGROUND

This appendix provides networking technology background and introduces terms needed to put Cuban networks in context. “Computer network” is a very broad term, describing anything from two computers temporarily connected with a dial-up phone call to the core of the Internet in which millions of computers are connected 24-hours per day using high speed, dedicated communication links. Networks in developing nations typically begin with something like the former, and move in stages toward the latter. Let us begin with the goal, the Internet, and work back to lesser forms of connectivity.

THE CORE OF THE INTERNET

The core of the “Internet” consists of roughly 22 million “host” computers in 186 nations that are connected 24-hours per day using dedicated communication links. The links between the hosts may be cables strung by the user organization, private lines leased from a telephone company, a satellite link, or a terrestrial wireless link. The speeds of these links vary widely depending on the technology used. Slow Internet links are typically 56,000 bits per second, high-speed links are typically 600 million bits per second, and commitments are now being made to next-generation links that will run at ten billion bits per second.

These links may be local or run between locations. For example, the computers within a building or campus may be linked together using cables you string, forming a local-area network (LAN). Your LAN might in turn be connected to the Internet (a WAN, or wide-area network) using a line leased from the telephone company. This is indeed a common progression. As such, the Internet is actually a network of interconnected networks. Developing nations go through an analogous progression.

Information typically moves between networked computers in small blocks called “packets.” If a packet fails to arrive or arrives with an error, it can be resent. The conventions used in assembling packets and checking to see they arrived at their destination in order and without error are referred to as a “communication protocol,” and the protocol used on the Internet is called “TCP/IP” which stands for Transmission Control Protocol/Internet Protocol. People often shorten this, referring to an “IP network.”

Lets take a break and summarize what we have so far. The core of the Internet consists of 22 million computers that are connected 24 hours a day, using the IP protocol for communication, by relatively fast, reliable links. By contrast, the computers on a network in a developing nation may only connect for short times during the day over slow, unreliable telephone lines, and use other protocols than IP.

THE REST OF THE INTERNET

Note that to this point I have spoken of the “core” of the Internet, but many users are not connected to the Internet 24 hours a day. They dial a computer that is on the Internet, establish a temporary connection, and hang up when they finish. During the time the connection is up, they are on the Internet. The protocols used for this sort of connection are called SLIP (serial line IP) or PPP (point-to-point protocol), and they are compatible with IP. PPP is more versatile, and

therefore more common. These connections are typically made over voice telephone lines, which are relatively slow, so transferring pictures, sounds, and video may take prohibitively long.

There is another common way of temporarily using the Internet. You make a dial-up connection to a computer that is on the Internet, and use your personal computer as a terminal connected to that computer. The computer you connect to is typically shared by many users at once, and it, not your computer is on the Internet. This is called having a "shell account." A shell accounts limits what you can do. You can retrieve information and send and receive e-mail, but you cannot provide information to others. You are also limited to text and numeric data, no pictures, sound, or video. (There are variations on the shell-account theme that we will not pursue here.)

There are also some users who are behind "firewalls" for security purposes. This means their computers are on the Internet, and, while they can send and receive e-mail and run client software, they cannot be seen by computers outside the firewall, so they cannot provide information.

There is one more important distinction among computers connected to the Internet (or any network)—they may be "clients" or "servers" or both. A user runs client software to do a job or find some information on the Internet. For example, to find and retrieve information on the World Wide Web, you would use client software like Mosaic or Netscape. On the other hand, the computer that provides the information you are retrieving is the server, and is running server software. As the name implies, the server provides a service to the network, and you need compatible client software to use the service.

Note that the client-server distinction is based on the software running on a host. Since many operating systems like Unix or Windows allow several programs to be active at once, a computer can be both a client and a server at the same time. Furthermore, a user may run several clients—a Web client, e-mail, Gopher, ftp, and so forth. By the same token, a computer may run several server programs.

This completes our description of the Internet. While the core hosts are connected continuously, some users dial in for temporary sessions. Some dial-up users are directly on the Internet during their sessions, others work through surrogate shell accounts on shared systems. There are also clients and servers. The former are typically on the desk of a user who seeks information, while the latter may be in a closet or on the system administrator's desk, and they provide information or other services. If you are using a shell account, the client software you use is running on the computer you connect to, not your own computer.

NETWORKS IN DEVELOPING NATIONS

Networks in developing nations begin very simply, and evolve toward Internet connectivity. For example, when I visited Cuba's Tino Network headquarters in 1992, the network consisted of a single, i80386-based PC running the Unix operating system. The computer had one modem, which meant that one user at a time could dial up and log in to read and leave e-mail. This was more similar to what we would call a small "bulletin board" system in the United States than what we call a "network."

Cuban international traffic was exchanged every few days. A phone call would be placed from Canada to a computer at CENIAI in Havana, the messages that had accumulated since the last

call were exchanged, and the phone connection hung up. This is an example of "store-and-forward" messaging in which e-mail and data files are exchanged in batches.

Two store-and-forward protocols are common in developing nations, Fido and UUCP (Unix-to-Unix Copy Protocol). UUCP is most common, and is used by all the Cuban networks. While it was devised for information transfer between computers using the Unix operating system, it has also been implemented for computers using DOS, Windows, and other operating systems.

UUCP is also used internally within Cuba and other developing nations. All of the major Cuban networks exchange messages using UUCP, so a user on, say, Tino Network can exchange e-mail with a CIGBnet user. Furthermore, a network, say CIGBnet, exchanges traffic with its client networks using UUCP.

It should also be noted that so-called "X.25" networks can be used instead of the voice telephone system for transfer of UUCP data. These are older networks established for connection of terminals to host computers, and they are expensive, but faster and more reliable than telephone connections in developing nations.

A store-and-forward network can transfer messages, but cannot be used for interactive applications. For example, users on UUCP or Fido networks cannot search for information on Web or Gopher servers. They are restricted to e-mail.[464] The same goes for people with accounts on different networks like Bitnet. They can exchange e-mail with Internet users, but cannot run interactive applications.

As such, developing nations generally begin with a Fido or UUCP network, and also begin experiments with local IP networking. For example, CIGBnet and CENIAI have IP networks running on their LANs. That means users in their buildings who are connected to the LAN can run interactive client-server software. It also means technicians are gaining experience for the time when full IP connectivity is available.

To summarize, developing nations typically start with a domestic UUCP network, connecting a few universities or research institutes. Often several such networks will begin, and they will exchange traffic with each other. The next step is for one or more of them to establish an international UUCP link to a computer that is on the core Internet. From that moment forward, users in the developing nation can exchange e-mail with colleagues throughout the world.

At the same time, technicians in the developing nation may be experimenting with IP-based LANs and, if the telephone infrastructure permits, IP connections between institutions or dial-up IP. (This is generally confined to large cities because of limited telephone infrastructure.) The final step is the leasing of a dedicated international link to an Internet computer. At that point IP access and interactive applications become possible. Users in the developing nation can reach global servers and people and they can be reached as well. Cuba recently took this last step.

[464] While this sounds like a severe limitation, e-mail is still the most important networking application, and the opening of simple e-mail connectivity is a boon to a developing nation. It is also possible to retrieve information from servers using properly formatted e-mail messages, but this is tedious, error-prone, and time-consuming.