

**Achievement of Market-Friendly Initiatives and Results Program
(AMIR 2.0 Program)**

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*International Telecommunications Traffic Study for the
Telecommunications Regulatory Commission (TRC)
of Jordan*

Final Report

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I. EXECUTIVE SUMMARY

The Minister of Information and Communications Technology (MoICT) and the Telecommunications Regulatory Commission (TRC) are concerned about the quality of international telecommunications service between the United States and Jordan. As part of the AMIR project, Telecommunications Management Group, Inc. (TMG) conducted this study with the objectives of determining the root causes of the problems in international calling between Jordan and the United States and proposing solutions to improve the current situation. The study addressed technical, business and policy issues that impact international calling, including the following areas:

- Analysis of international telecommunications policy in the United States and Jordan;
- Analysis of the business aspects of international telecommunications in both countries and throughout the world, including pricing and competition;
- Analysis of the technical aspects of international telecommunications between the United States and Jordan; and
- Test calls between the United States and Jordan.

Mr. Juan Carlos Valls, Chief Executive Officer of TMG, conducted the field study of Jordan's international calling during November 24-28, 2002. While in Jordan, Mr. Valls met with executives and operational personnel at government agencies and telecommunications operators. Meetings were held with representatives from the Telecommunications Regulatory Commission (TRC), the MoICT, the Jordan Telecommunications Company (Jordan Telecom), the two cellular services operators (Fastlink and MobileCom), representatives of U.S. telecommunications companies and other players in the Jordanian telecommunications sector. Mr. Valls also contacted representatives of carriers of international telecommunications in the United States to determine how these companies carry traffic to Jordan. A list of the meetings and the contacts made can be obtained from TMG upon request.

The general findings of the analysis are that the primary causes for poor international telecommunications between the United States and Jordan are policy issues that have affected international telecommunications throughout the world. The liberalization of international telecommunications markets in the United States and Europe in the 1980s and 1990s has created intense competition in the industry. This has led carriers to seek alternative routes to carry international telecommunications traffic to reduce their costs and compete effectively. The most common practice used to accomplish this end is *least cost routing* (use of the most efficient and least expensive routes for international telephone traffic) and *alternative termination technologies*. Alternative termination technologies use voice transmission, compression equipment and data equipment to deliver international calls to domestic telecommunications networks through channels other than the official channel.

This practice appears to be pervasive in Jordan. Although the study was not able to pinpoint the exact location of such facilities, it is clear that they are being used to terminate international traffic into Jordan. This conclusion is reached both by the characteristics observed in calls terminated into Jordan and by unusual trends in international calls and minutes of use in recent years.

The proposed course of action to rectify the problem in Jordan is two-fold. First, oversee and, to the extent possible, sanction providers of unauthorized international telecommunications termination services. Second, use policy directives from the TRC to eliminate the business conditions that continue to favor the use of these alternative telecommunications services. Detailed recommendations are provided in the Recommendations section of this report.

II. STATEMENT OF THE PROBLEM

Recently, users of international telecommunications services have detected a significant deterioration in the quality of service for telephone calls between the United States and Jordan. This deterioration manifests itself in several ways. First, consumers are unable to complete international telephone calls and faxes from the United States to Jordan. Callers must make multiple attempts before a call is completed. When attempting to send a fax, users experience similar difficulties completing the fax call, and are faced with an additional challenge once the connection is established since the quality of transmission will often cause the connection to be interrupted before the fax is completed. Users must then attempt to re-establish the connection to finish transmitting the fax. Second, transmission quality problems exist in both voice and fax calls. Users frequently experience poor transmission characteristics such as low transmission power (faint), half duplex transmission (uni-directional transmission), echo and latency (delay). Overall, the situation creates user frustration. Officials in Jordan have determined that these problems are detrimental to social and commercial interests in Jordan, and generally hamper the country's development. In September 2002, the Minister of Information and Communications Technology sent a letter to the Chairman of the Federal Communications Commission requesting assistance from the U.S. agency, but as yet has not received a response.

III. STUDY METHODOLOGY

The study methodology undertaken by TMG and Mr. Valls was as follows:

- Identify possible causes of termination and quality problems for international traffic between the United States and Jordan
- Request information and data from the TRC, Jordan Telecom, and other players in the Jordanian telecommunications market to develop and support conclusions regarding the causes of the termination and quality problems
- Request information and data from U.S. sources to determine causes of termination and quality problems
- Perform field study (in Jordan) of international telecommunications systems, policies, business and technical issues that affect termination and quality
- Analyze all information and data to draw conclusions regarding termination and quality problems

- Propose corrective actions to improve termination and quality of international telecommunications traffic.

Before leaving for Jordan, TMG prepared a Work Plan and Request for Information (and data) from Jordanian and other sources, which served as a basis for the work undertaken in-country.

IV. ASSESSMENT OF THE JORDANIAN INTERNATIONAL TELECOMMUNICATIONS SITUATION

Although experience indicates that a problem exists in terminating international calls from the United States to Jordan, TMG's analysis of the Jordan Telecom international and transit networks indicates that its overall quality is good. International circuits to/from the United States are provided via satellite. These circuits appear to be well managed by a capable staff. Both international switching gateways into Jordan are modern and have sufficient capacity. The international switch is directly connected into every local switch. Although some capacity problems may exist in the transit network between the international and local switches during peak periods of unusual calling volume, TMG's opinion is that the network has sufficient capacity to ensure the successful completion of international calls during normal and even high volume days.

Jordan Telecom attributes the entire problem to bypass of the international network by alternative traffic providers. TMG's conversations with representatives from MCI (in Jordan) and Sprint (in the United States) confirm that these companies are routing only a small portion of their traffic over traditional (correspondent) channels that are priced at the accounting rate (US\$0.38) and paid at the settlement rate (US\$0.19 or JD 0.13). Most traffic is sent over alternative, least cost routes which are bought in the open telecommunications market. (Note: TMG's inquiries to international carriers for U.S. to Jordan market rates produced the following results: \$0.1150 to \$0.1220 for termination to fixed and \$0.1170 to \$0.1225 for termination to mobile). A high portion of this traffic is sent to Jordan via bypass routes, which do not guarantee quality. The economic incentive to operate these routes comes from the discrepancy between the settlement rate and cost of other possible termination points. The most popular termination points for bypassed traffic are:

- **Via Cellular Telephones:** companies lease facilities to gather international traffic to Jordan at a foreign location and land it in Jordan where they proceed to lease a large number of cellular lines. These cellular lines are then used to terminate traffic into the Jordanian fixed line network. Since mobile to fixed termination is priced at JD 0.025 peak and JD 0.02 off peak, a large incentive exists to use this routing.
- **Leased Local Private Lines:** companies gather the international traffic as indicated above, but land it through a leased local facility that provides them local termination. This case also provides a significant economic incentive, but is easier for Jordan Telecom to detect.

Aside from the evident loss of revenue to Jordan Telecom and the Government of Jordan, these lines tend to offer poor termination and quality of transmission (since the calls transit many points before reaching their final destination and since bypass operators do not work with the same quality of service standards as Jordan Telecom) and make certain calls, such as faxes, almost impossible to transmit.

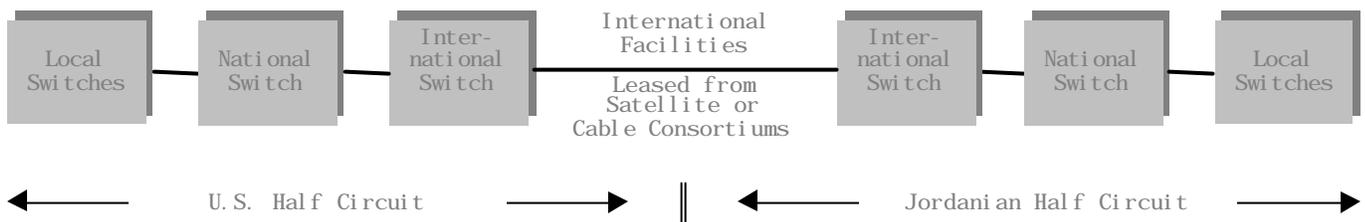
TMG must point out that bypass is not considered illegal nor is it discouraged by the United States or by European countries. Companies providing bypass termination points from North America and Europe operate legally. In many cases, the country where the terminating traffic lands condones the competition these companies create in local markets. In other cases, these companies rely on the ambiguity that exists in the definition of telecommunications service in most countries. Monopolies usually exist for voice service only. Other technologies, such as Voice over Internet Protocol (VoIP), fall under data communications licenses and pose a gray area (thus often referred to as “gray traffic”).

TMG’s conclusion is that termination and quality problems for international calls from the United States to Jordan are due to the pervasive operation of bypass telecommunications providers in the country. The problem stems from economic and policy issues, and not technical faults.

V. POSSIBLE CAUSES OF TERMINATION AND QUALITY PROBLEMS FOR INTERNATIONAL TRAFFIC BETWEEN THE UNITED STATES AND JORDAN

International telecommunications calls travel through the network components shown on the following diagram:

Diagram 1: International Calling Network



If a call fails or experiences quality problems, it will occur in one of the network components identified above.¹ In Table 1, TMG identifies the areas where international calls could be failing, or where quality problems could arise:

¹ A call can fail at the customer’s terminal, but this type of failure would not create the wholesale problems that are pervasive in the U.S.-Jordanian situation.

Table 1: Possible Network Failure Points

| Item No. | Definition of potential failure |
|----------|--|
| I. | Poor connectivity or transmission facilities at the U.S. end |
| II. | Poor transmission quality in the international facilities provided by the Intelsat satellite or the cable consortiums |
| III. | Technological or operational problems at the international earth station in Jordan |
| IV. | Problems in the facilities between the international earth station and the international switching points in Jordan |
| V. | Outdated or poorly managed international switching facilities in Jordan Telecom |
| VI. | Poor networking facilities from the international switch to the national and local network switches in Jordan – and on to the local subscriber |
| VII. | Alternative traffic entry points in Jordan with poor connectivity or quality |

TMG's field study, data gathering and analysis in Jordan and in the United States was focused on identifying which of the areas above are contributing to the termination and quality problems being experienced.

VI. INTERNATIONAL TELECOMMUNICATIONS SERVICES

To understand the international telecommunications problem in Jordan, it is important to review the status of the telecommunications sectors in both Jordan and the United States.

A. Telecommunications Sector in Jordan

Telecommunications in Jordan have progressed significantly in recent years. Telecommunications infrastructure and service offerings have expanded and improved mostly as a result of policy steps undertaken by the Government of Jordan. The Government enacted a new telecommunications law and modified it to provide new direction and organization to the telecommunications sector.

The most important results of the new law have been the privatization of the fixed telecommunications services provider, Jordan Telecom, and the introduction of competition into the cellular and value added services sector. France Telecom made a strategic investment in Jordan Telecom and is providing managerial oversight. France Telecom has an excellent reputation for quality telecommunications services and innovation. In the short time it has been involved in Jordan Telecom, it clearly has made a difference in the company's growth and quality. France Telecom has also strongly supported other new ventures such as MobileCom, which has experienced explosive growth in the GSM mobile telecommunications field. Jordan Telecom has many senior French staff that demonstrate France Telecom's strong commitment in Jordan.

Penetration rates for telecommunications services have increased significantly. In 2002, it is estimated that the penetration of main telephone lines is fourteen percent (14%). This percentage puts Jordan in the upper quadrant among countries with similar economic development. Jordan currently has about 750,000 main telephone

lines. The general availability of telecommunications to the Jordanian populace is also enhanced by the widespread development, subscription and use of GSM mobile telecommunications services. Most of the populated areas of the country have mobile services coverage. In 2001, cellular subscribers surpassed fixed mainline telecommunications subscribers. The estimated number of cellular subscribers as of 2002 is about 1.2 million, although not all these subscribers are truly active users of mobile services. All in all, the development is impressive, the availability of the service is geographically extensive, and the quality is generally rated as good. The duopoly that exists in the cellular arena (MobilCom and Fastlink) is due to expire at the beginning of 2004. It is expected that new licenses will be issued and new entrants may choose to compete in the Jordanian cellular telecommunications marketplace.

Jordan Telecom was granted a monopoly for international telecommunications until 2005, when the government of Jordan is expected to issue licenses for competitive international telecommunications services. Due to its monopoly situation, Jordan Telecom is attempting to safeguard international telecommunications traffic to the maximum extent possible. Jordan Telecom relies on the outdated system of international correspondent carrier relations to receive and send international telecommunications calls. This system has become obsolete worldwide due to the introduction of new, cheaper telecommunications technologies that have made telecommunications monopolies obsolete, and the introduction of competition that has ensued as a result.

Jordan Telecom maintains international correspondent carrier relations with three U.S. telecommunications carriers: AT&T, MCI/WorldCom and Sprint. These are the three largest international telecommunications carriers in the United States. These agreements state the general terms and conditions regarding facilities, pricing and traffic commitments between the parties. Although TMG requested to see copies of these agreements, Jordan Telecom deemed them to be proprietary and confidential, and did not provide them. The basic pricing conditions of the agreements, however, are a matter of public record in the United States and were obtained from FCC sources. Currently, Jordan has an accounting rate of US\$0.38 with each U.S. carrier. The settlement rate, which is half the accounting rate, is US\$0.19. Since the United States is a net exporter of telecommunications traffic (i.e. it sends more traffic than it receives), the settlement rate arrangements mean that U.S. carriers are net payers to Jordan Telecom for international telecommunications traffic. This net payment agreement is accounted for in the following manner:

Number of call minutes from USA to Jordan X Settlement Rate = Amount due to Jordan Telecom
Less
Number of call minutes from Jordan to USA X Settlement Rate = Amount due to USA Carriers
Equals
Amount paid to Jordan Telecom

The net payout situation that U.S. carriers have experienced has provided incentives for them to seek alternative, non-traditional channels to send their telecommunications traffic.

B. Telecommunications Sector in the United States

The United States has a competitive telecommunications marketplace in which providers of most telecommunications services are licensed by the Federal Communications Commission (FCC) and are allowed to operate freely without price, technological or operational regulation. The growth of the international telecommunications services market in the United States has been explosive. TeleGeography, a leading provider of statistics for the telecommunications industry, estimates that there were 461 international traffic carriers in the United States in 1996. This figure grew to a staggering 4,030 carriers by the year 2001.

One of the most important results of competition has been a decrease in prices, especially in areas such as international telecommunications services. Traditionally, international telecommunications services pricing was correlated to international correspondent carrier agreements. The pricing clauses of these agreements were based mostly on non-cost based factors and business decisions of monopolistic telephone companies. With the advent of competition, market forces drove prices to costs, as predicted by classic economic theories. Because international transmission facilities and the international switching systems can carry large volumes of traffic and are relatively inexpensive to provide, the cost of international telecommunications calling is low. Therefore, since the real costs of international telecommunications traffic were very inexpensive, prices decreased quickly

The FCC has collaborated with U.S. telecommunications carriers to lower the costs of formal international telecommunications channels by establishing target levels for international accounting and settlement rates. Jordan Telecom has met the FCC's target accounting rate of US\$0.38. The FCC has maintained, however, that it does not favor the use of the international correspondent carrier agreement system and does not regulate international carriers' use of alternative technologies or channels to terminate calls. U.S. carriers are free to select any means or channel available in the market to terminate calls to foreign countries.

The result of these policies has been a very open and competitive marketplace for international calls, centered on large "Tele-Houses" such as 60 Hudson Street in New York City. These facilities are the home to multiple international carriers that trade traffic and look for the most efficient and least expensive routes.

C. Correspondent Carrier Relations and Agreements

Correspondent carrier relations are the traditional way in which international telephone companies have organized their business relationships. In the past, when telecommunications companies were monopolies, all international facilities traffic and prices were ruled by international correspondent traffic agreements. These agreements also specified the facilities required to carry international traffic. This system created a very organized market in which only a small number of players could participate. With competition in international telecommunications, however, correspondent carrier agreements started to become obsolete. International traffic was bought and sold at market rates from facilities based international telecommunications companies and resellers. The abundance of options made international telecommunications an efficient market. Consequently, rates (prices) fell. Buyers

seeking to send traffic to the major international routes had many options. For those routes with less demand, such as Jordan, the comparatively lower rates for other international destinations caused carriers to look for alternative transmission channels, often using non-traditional technologies and by-passing the official telecommunications channels.

The most salient pricing parameters for international correspondent carrier agreements are:

- The accounting rate is the full rate agreed to by the two correspondent carriers (in this case Jordan Telecom and each one of its U.S. counterparts individually) for the transport of international traffic. The current accounting rate between Jordan and the United States is US\$0.38.
- The settlement rate is one-half the accounting rate and is used to calculate the amounts due to the party that is the net receiver of international telecommunications traffic and, therefore, owed money. (See Table 2).

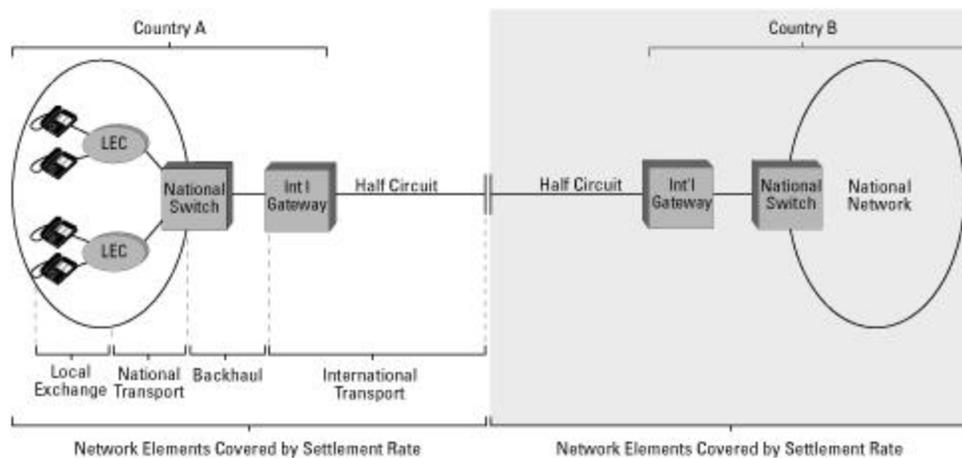
Table 2: Accounting and Settlement Rate Trends between the United States and Jordan

| Year | Accounting Rate | Settlement Rate |
|------|-----------------|-----------------|
| 1996 | \$1.50 | \$0.75 |
| 1997 | \$1.50 | \$0.75 |
| 1998 | \$1.35 | \$0.675 |
| 1999 | \$1.00 | \$0.50 |
| 2000 | \$.88 | \$0.44 |
| 2001 | \$.38 | \$0.19 |
| 2002 | \$.38 | \$0.19 |

D. International Telecommunications

Diagram 2 displays the network components of an international call. These components were always addressed in the Correspondent Carrier Agreement, as was the pricing of the call. In the past, the accounting rate was priced to cover the end-to-end costs of the call (although there was no empirical relation to the true cost of making the call). The settlement rate covered the half circuit price of the call, or in other words, each partner's (or carrier's) price.

Diagram 2: International Call Components



© 2001 TeleGeography, Inc.

Source: TeleGeography research

As telecommunications technologies became more affordable and easier to implement, competition increased in the market, as did alternative means of transmitting international messages. Changes in telecommunications policy around the world, but especially in the United States and Europe, catapulted this trend. Reliance on the old system of correspondent carrier relations began to erode. In the United States, a legal distinction was made between providers of local, fixed telecommunications services and providers of long distance and international telecommunications services as part of the settlement of an anti-trust suit. Suddenly, providers of long distance and international services had to pay to access the local fixed telecommunications services subscribers via “access charges,” which are termination fees to cover the costs of accessing the local telecommunications network. The concept of access charges took hold and has been implemented in most developed countries. With an access charge, an international or long distance services provider can develop their own facilities to haul the traffic between cities or countries, and interconnect their switches or points of presence (POPs) to the local fixed services providers by paying the fee. Every competitor in the international or long-distance telecommunications arena is treated equally, with access to the local fixed network via a non-discriminatory facility and price. Today, most developed countries have access charges that allow access to the local fixed telecommunications facilities. This is a structure that Jordan must implement as it moves to competition in long distance and international telecommunications in the near future.²

² Access charges should be cost based. Because the process of developing cost-based studies to set these fees is lengthy and complicated, the TRC should begin considering its policies, structures, and requirements for access charges soon to allow sufficient time to develop supporting materials before competition is introduced.

E. The Future of International Telecommunications in Jordan

Competition in international telecommunications in Jordan is scheduled to start in 2005. The TRC must take the appropriate steps to move to an openly competitive field in long-distance and international telecommunications. An important component of the competitive structure in 2005 will be access to the local network and access charges. TRC must begin working with Jordan Telecom in the near future to:

- Ensure that interconnection facilities are available to long distance and international telecommunications services providers.
- Set rates for interconnection to the local network in the form of access charges.

VII. FIELD STUDY AND ANALYSIS OF EXISTING SITUATION

TMG's analysis and conclusions about Jordan Telecom's international network, its configuration, its ability to handle traffic volumes and its quality is based on meetings with Jordan Telecom's executive and technical teams. The following Jordan Telecom employees met with Mr. Valls and provided commentaries, documents and other information used in this study:

- Mr. Peter Mattei – Chief Executive Officer
- Mr. Olivier Faure – Chief Sales and Marketing Officer
- Eng. Omar Rashdan – Sales Department Manager
- Eng. Munther Borgan – Regulatory Affairs Department Manager
- Eng. Yussef Karasanah – International and National Switching and Signaling
- Eng. Abdullah Sammour – Technical Support Manager – Switching and Signaling
- Eng. Walid Ali – Marketing and Regulatory Affairs Manager
- Mr. Roland Meire – Fraud Detection Manager
- Eng. Shahe Dabbas – International Earth Station Manager

A. International Telecommunications between the United States and Jordan Telecom

Jordan Telecom maintains the monopoly for international telecommunications services between Jordan and the world. To date, all international telecommunications between Jordan and the United States are transmitted via the Intelsat international satellite system using International Data Records (IDR) service on Satellite 905@335.5°E. Jordan Telecom has a landing point at Aqaba for the FLAG – *Fiber Loop Around the Globe* – fiber optic cable system, but it does not use it currently for international switched traffic.

B. International Earth Station and International Facilities

Jordan Telecom maintains an Intelsat standard earth station in Amman. TMG met with Mr. Shaher Dabbas, Manager of the International Earth Station, who is responsible for international traffic. This meeting yielded the following information.

Jordan Telecom manages a modern earth station with digital technology that meets Intelsat's technical requirements. All indications based on conversations with Jordan Telecom's technical personnel and review of data are that the Intelsat satellite circuits are managed with very high standards and are fully compliant with Intelsat's requirements.

Intelsat, the international satellite consortium, prides itself with providing high quality service. In 2001, Intelsat claims to have had an average availability on its satellites of 99.9993%, which means that its systems are almost always operational. Intelsat provides the satellite connectivity and complements it with a worldwide ground-based network of Teleports, fiber and Internet points of presence at strategic exchange points. To guarantee the best quality of service possible, Intelsat requires that the earth stations of participating companies, such as Jordan Telecom, meet a certain level of technical and operational capability before connecting with its system.

Mr. Dabbas assured TMG that Jordan Telecom has contracted and committed the proper bandwidth to manage traffic between the Jordan and the United States. The company tracks performance on its circuits and meets the recommended BER 10^{-8} standard month to month.

Jordan has dedicated international facilities with each of the three U.S. international correspondent carriers. All U.S. carriers use the Intelsat satellite system to lease and configure circuits. The specifics of the circuits are as follows:

AT&T circuits

1 MB Intelsat International Data Record with 4:1 Compression is configured into 60 circuits between the United States and Jordan

Sprint circuits

2 MB of Time Division Multiple Access (TDMA) with 4:1 Compression is used to configure 120 circuits between the United States and Jordan. Intelsat Specifications, Pulse Code Modulation (PCM) and Speech interconnection are used and quality is good.

MCI/WorldCom circuits

2 MB with 4:1 compression (Mitsubishi compression equipment) is configured into 120 channels between the United States and Jordan, which are highly utilized.

Our conclusion is that the international earth station is properly configured and properly managed. The personnel operating the station exhibit high levels of technical education and understanding. Jordan Telecom should consider moving international circuits to the FLAG fiber optic cable to gain the cost and quality efficiencies inherent in fiber optic networks. Nevertheless, the current arrangement with Intelsat is standard throughout the world and should provide for high quality international telecommunications services.

C. International Switching and Connectivity to the National Network

Jordan Telecom's network is well designed. Based on the observations TMG was capable of making in the brief time allotted for the study, the network also appears to be well maintained by a capable operational staff.

TMG's met with Eng. Yussef Karasanah of the International and National Switching group. Mr. Karasanah stated that Jordan Telecom uses ITU (International Telecommunication Union) standards to engineer and manage its switching network, and that ITU requirements are met. Mr. Karasanah discussed Jordan Telecom's procedures and standards for the international and national switching network; however, no specific standards reports or specific engineering documents were provided.

Jordan Telecom operates two international switches, labeled NISC1 and NISC2. Both of these switches are modern Siemens EWSD international switches. The two international switches in the Jordan Telecom network are directly connected to the local switches that serve residential and business subscribers, as shown in the diagram. Both international switches are also connected to regional switches in a meshed network arrangement, which in turn are directly connected to the local switches. Overflow routes are used for all international circuits. This redundancy should provide sufficient routing alternatives to assure that congestion at the network level is low.

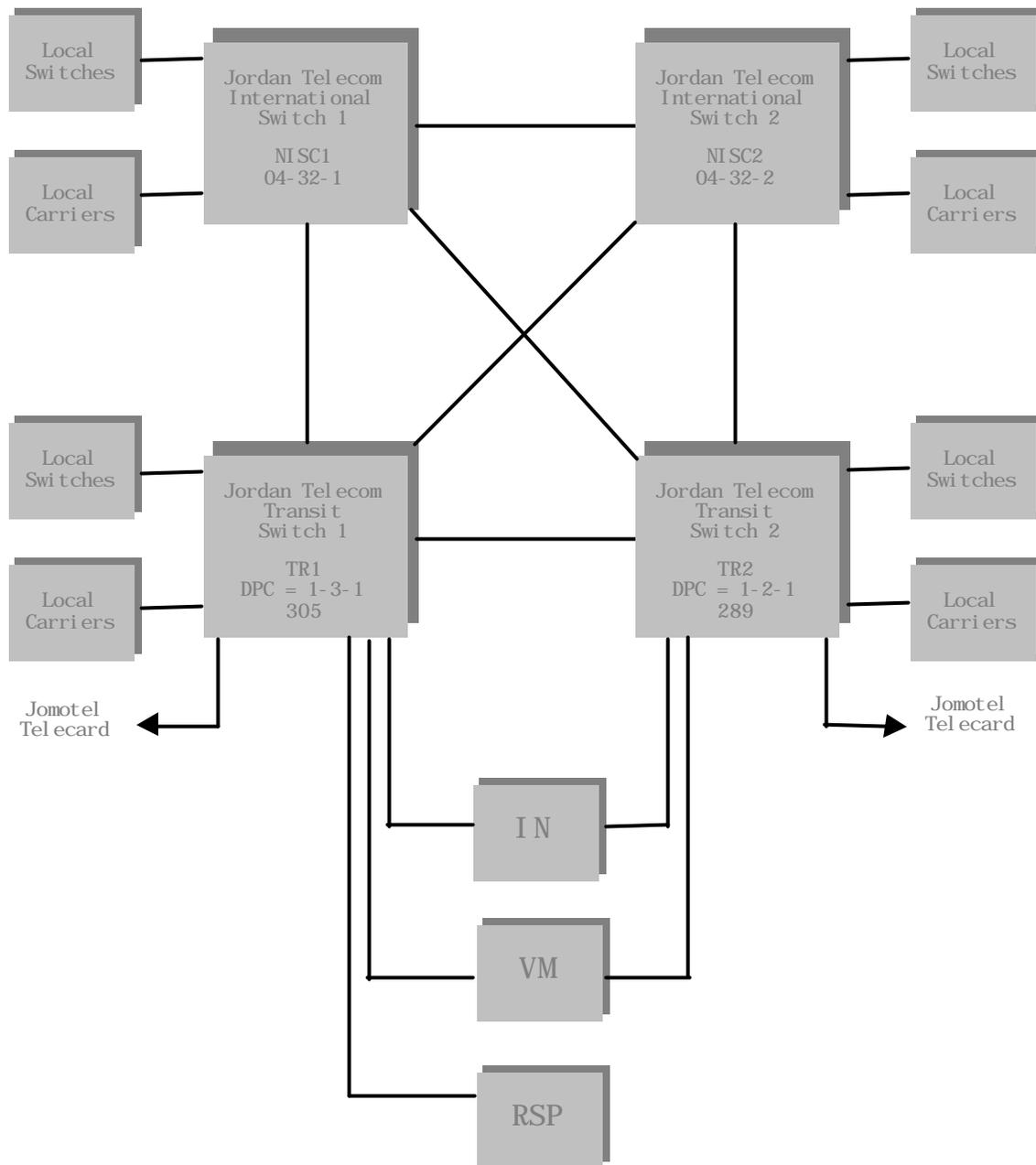
Additional information was provided about the switching network, as follows:

- Facilities used are modern – Pulse Code Modulation (PCM) and fiber optic cable are used between all switches.
- The signaling network is in the process of being upgraded – signaling is not CCIT 7 meshed network, but will be modernized by the middle of 2003.
- Compression equipment is used on international circuits –its highest level of use is 80% on peak hours.
- Numbering problems exist in the network – the numbering scheme is not used correctly (this concern was also expressed by the TRC).

Testing on the international switch is done on a monthly basis. The basic test performed is to establish paths with several countries and perform a series of tests with strict measurements. Jordan Telecom will also perform spot tests from time to time to ensure that high quality is maintained. Tests from the switch out to the subscriber and from the subscriber to the network are also performed periodically.

Diagram 3 shows Jordan Telecom's international network along with its connectivity to the national network.

Diagram 3: Jordan Telecom's International and National Switching Network



Jordan Telecom does not have a Network Operations Center (NOC), which impacts on the professionalism of its network management. Procedures are followed to correct a network trouble, as follows:

1. Trouble is reported.
2. A trouble ticket is opened (but no NOC exists).
3. Troubles from other countries are followed until both parties are satisfied regarding the cause of the trouble.
4. End to end tests are performed with international carriers (including all three U.S. carriers); changes in routing are effectuated if trouble is detected.

TMG did not receive information from Jordan Telecom about the number of facilities connecting each of the switches within network;³ therefore, TMG cannot determine definitively if the facilities connecting the international switches to the national network are all properly sized to handle the traffic between switches. Notwithstanding, the availability of multiple routing possibilities provided by the existing network configuration (international to local, international to regional to local) makes it unlikely that termination and quality problems for international calls are occurring beyond the international switches in the national network. Messrs. Muwaffaq Abu Agola and Mr. Yousef Al-Hunite of the TRC voiced the opinion that circuits from the international switch to the national network are well provisioned, as is connectivity to the local subscriber. TMG met with outside consultants, mobile telephony providers and other players in the telecommunications arena, all of which expressed the same opinion regarding the capacity and quality of Jordan Telecom's network. All of this reinforced TMG's observations that Jordan Telecom's staff is highly capable, and has engineered and provisioned the network to meet traffic requirements.

VIII. ALTERNATIVE TERMINATION OF INTERNATIONAL TELECOMMUNICATIONS CALLS

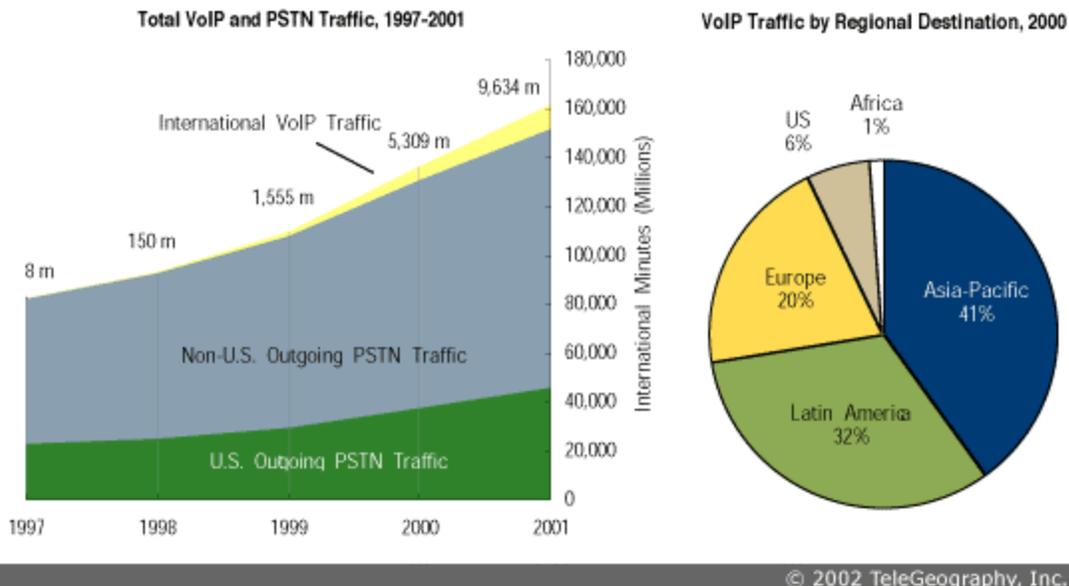
Jordan Telecom claims that the main, if not the sole, source of termination and quality problems for international calls from the United States is the use of alternative termination facilities. This traffic does not use the facilities between Jordan Telecom and its U.S. correspondent carriers. Instead, it uses other facilities, usually Internet Protocol (IP) based, for the international haul and it enters the Jordan Telecom network through unauthorized means. These include the mobile telecommunications network and private line connections. This traffic is labeled as "bypass," "gray" or "pirated" traffic. Jordan Telecom simply refers to it as fraud. The result, however, is always the same: loss of revenues for Jordan Telecom. The company intends to protect its monopoly for international telecommunications services, which ends in 2005.

For decades, international phone calls were a big source of high-margin revenue for telephone operators worldwide. The introduction of modern technologies, additional facilities and competition in telecommunications markets, along with the introduction of the Internet have resulted in classically competitive markets where prices of international telephone calls are driven closer to their cost. Initially, bypass of international traffic was due primarily to low technology arrangements such as call back, least cost routing and refiling of calls from one country to another.⁴ This led to reduced call costs for carriers and subscribers, and they became highly popular arrangements. Today, the greatest pressures on international settlements come from Internet Protocol services, which are likely to become the transmission standard for international calling in the future. Switched bypass, however, is still very common, and is most probably still being used to bypass the traditional network in Jordan. Diagram 4 shows the growth of VoIP traffic.

³ Jordan Telecom deemed this information to be proprietary.

⁴ Refiling is most prevalent between countries with highly disparate settlement rates or with regional "sender keep all" arrangements. Jordan participates in a "sender keeps all" arrangement with its neighbors and is the victim of refiling to this day.

Diagram 4: International VoIP and PSTN Traffic Summary



Note: Voice-over-IP (VoIP) traffic includes all cross-border voice calls carried on IP networks but terminated on public switched telephone networks; PC-to-PC communications and private network traffic are excluded. PSTN traffic includes circuit-switched voice and fax traffic carried on traditional international facilities as well as international simple resale (ISR) facilities. Figures for 2001 are estimated.

The TeleGeography⁵ diagrams (Diagrams 5.a-5.d) below show the development of call transmission schemes that have led to bypass of traditional international calling channels.

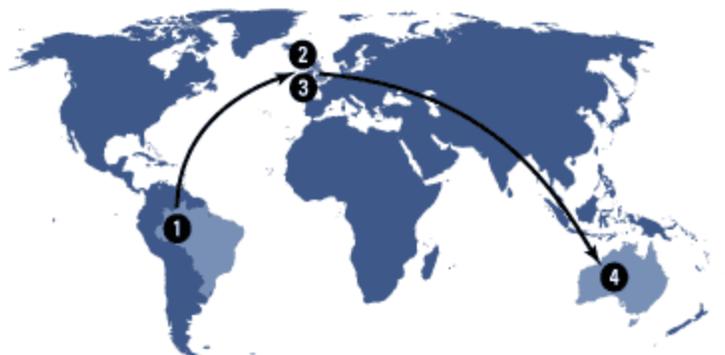
Diagram 5.a: Standard Public Switched Call



1. Customer dials international number.
2. Call is sent over the Public Switched Telephone Network (PSTN) by originating carrier, which pays settlement charge to terminating carrier in destination country.
3. Call is delivered to its final destination by terminating carrier.

⁵ TeleGeography, Inc., www.telegeography.com.

Diagram 5.b: Refile



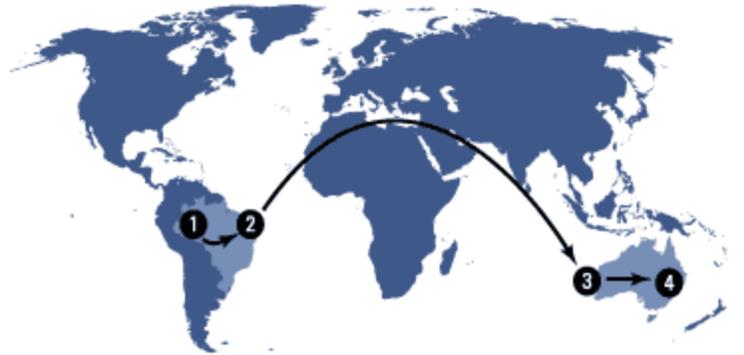
1. Customer dials international number
2. Originating Carrier sends call to hub country via PSTN or over international private line, known as International Simple Resale (ISR).
3. Refile carrier re-originate call over PSTN.
4. Call is delivered to final destination via refile carrier, which pays settlement charge to terminating carrier.

Diagram 5.c: Switched Bypass



1. Customer dials international number.
2. Call is routed over international private line to switch in destination country but outside network incumbent telco (e.g., to closed user group or mobile operator).
3. Call is re-routed to incumbent telco's network and completed as a local call on PSTN. No international settlements are paid by the originating carrier.

Diagram 5.d: VoIP Bypass



1. Customer dials international number. Call is routed over PSTN to gateway computer.
2. Call is converted from analog voice to Internet Protocol (IP) format and sent over the Internet to a gateway in terminating country.
3. Call is converted back to analog format.
4. Call is completed as a local call on PSTN. No international settlements are paid by the originating carrier.

Jordan Telecom claims to lose over \$15 million dollars a year from bypass of the international network. TMG estimates that this figure is realistic. Jordan Telecom has gone to great lengths to eliminate bypass traffic. The company has a team dedicated to rooting out this traffic by constantly analyzing termination. When bypass traffic is detected, all means available to the company are used to curtail it. These include cutting lines and using the court system to punish abusers.

Mr. Roland Meire (Fraud Detection Manager) made a presentation to TMG regarding fraudulent international traffic flows to Jordan. Jordan Telecom had identified a change in Answer Seizure Ratios (ASRs) in traffic from France, Italy and the United States. It initiated a review of International Quality of Service (QOS) on these channels in 2001. Jordan Telecom also established a collaborative effort with the TRC to create a detection mechanism for fraudulent international traffic. The parties jointly initiated tests with customers. Based on these efforts, Jordan Telecom claims that Telecom Italia recaptured traffic on legal routes and QOS from Italy has improved.

In June and July 2002, Jordan Telecom closed over 400 mobile lines that were suspected of carrying bypass traffic. These were for both Fastlink and MobileCom customers. Jordan Telecom is redoubling its efforts to curtail bypass and detection processes for fraudulent traffic include:

- A committee established with the TRC specifically for this purpose;
- Special traffic studies;
- Tracking traffic and revenue; and
- Tracking cut lines.

Jordan Telecom claims that the mechanisms currently being used to bypass its international network are:

- VoIP;
- VSAT termination using private lines or private telephones;
- Call back services;
- International pre-paid calling cards;
- Border effect traffic from Israel and other neighbors (refile).

Jordan Telecom pays particular attention to traffic from the 077 and 079 numbering schemes (mobile).

As for its IP network, all traffic comes through a global Internet partner. Ninety percent (90%) goes through a single gateway. Jordan Telecom cannot supervise traffic among operators.

U.S. carriers use two routes to send traffic to Jordan: through traditional routes and through termination bought in the open market. Prices vary for these services. Calls over traditional routes are transmitted via satellite (Intelsat) to Jordan, land at Jordan Telecom's earth station and flow into the network. Bypass calls can take one of multiple routes. They are transmitted to a Tele-House facility (60 Hudson Street, New York City, or another similar facility), possibly to a VSAT, or maybe to Europe then to a VSAT, or maybe to Europe and then to FLAG on a leased circuit, from there to a company in Jordan that has leased lines or leased mobile lines, and then to the end subscriber. The probability of not terminating the call or call degradation is high.

The inability to terminate faxes would suggest a high volume of illegal traffic is entering Jordan by non-cellular routes. The equipment typically used for these routes is PC-based, with Dialogic or equivalent plug-in cards that support either T1 or E1 interfaces (24 or 30 circuits, depending on local signaling standards). Dialogic uses separate hardware for voice and fax traffic, and the cost of fax hardware is significantly higher than voice hardware. Operators of bypass networks typically provision their equipment to support only voice traffic, since cost of the hardware is less expensive. Also, fax calls are typically only one minute in duration, so the financial incentive is to support voice traffic rather than fax traffic. It is simply not as lucrative to support fax traffic as it is to concentrate on voice.

Aside from hardware considerations, poor fax transmission can be caused by compression levels that do not meet international standards. A compression ratio of 4:1 (16 bit compression) is the standard for carrier-grade traffic. This level of compression provides for very high quality on voice traffic, and also easily supports fax transmission.

Bypass operators typically use compression levels of 8:1 (8 bit compression) to 13:1 (4.7 bit compression). These compression levels result in a serious degradation of voice quality—a condition noted by TMG in making test calls to Jordan. These higher compression ratios also make fax transmission almost impossible, which is another condition noted by TMG.

IX. TMG'S ANALYSIS OF INTERNATIONAL TELECOMMUNICATIONS INTO JORDAN

A. Technical Aspects

With Jordan Telecom:

Jordan Telecom showed TMG how, on multiple occasions, international incoming calls from the United States do not display an international incoming number. Conversely, these calls display a local number, a cellular number or an "unidentified caller" designation. This study was not empirical, but established bypass as a probable cause of the international termination and quality problems.

By TMG:

TMG performed an informal analysis of calling from the United States to Jordan over the course of several days. When dialing into Jordan, TMG typically experienced at least 20 seconds of Post Dial Delay (PDD), and usually more. On many occasions, local Jordanian dial tone was received after the PDD, followed by analog equipment at the far end out-pulsing the local number. This indicates the terminating equipment is located in a site that has **local** or **mobile** dial lines, rather than trunk lines. Cellular operators use CCIT7, which would result in little post dial delay even on a bypass route. PDD should be in the 4-5 second range even on an international call. Even if the PDD is normal for traffic under the cellular scenario, the behavior should be that of trunk lines (no voice path established until out-pulsing is complete) rather than local dial lines (voice path completed upon seizure). This suggests that Jordan Telecom should not downplay the impact of non-cellular bypass routes.

B. Economic Aspects

The economics favoring bypass routes are eminently clear. The major U.S. carriers (e.g., Verizon and BellSouth) are paying from US\$0.1150 to US\$0.1220 for fixed and US\$0.1170 to US\$0.1225 for mobile traffic per minute. Additionally, international calls in the competitive market are priced in 6-second intervals, making the cost even cheaper. These prices are much lower than the official settlement rate (previously shown to be US\$0.19), creating ample incentive to bypass.

TMG estimates the cost of terminating a call to Jordan via VoIP to be as follows:

| | |
|---|------------------------------|
| Termination using mobile or other means | US\$ 0.025 per minute |
| Cost of international space segment | US\$ 0.02 per minute |
| Cost of local private line segment | US\$ 0.02 per minute |
| Equipment required to terminate | US\$ 0.01 per minute |
| Monthly subscriptions (cellular phones) | <u>US\$ 0.01 per minute</u> |
| Total cost is about | US\$ 0.085 per minute |

Since current market pricing ranges from US\$0.115 to \$0.1225, profits are anywhere from US\$0.03 to US\$0.0375 a minute. Considering that this profit must be split among many parties (and that traffic volumes from the United States to Jordan are relatively low), pressure from Jordan Telecom and the TRC may go a long way to discouraging bypass traffic into Jordan in the future.

Additionally, U.S. carriers will weigh the cost, both economic and in customer perception, of call termination as measured by the ASRs. These carriers have a choice of buying Jordan bound traffic in the United States for a very reduced price or sending it over the legal route for the settlement rate. Over the legal route the ASR is 70%, but over the bypass route the ASR will be much lower – probably 30% to 40%. Weighing the termination issues, U.S. carriers will find a price at which it starts to make sense to send the traffic to Jordan Telecom again. This will be the point at which the two solutions begin to approach each other economically.

C. Statistical Aspects

Using official data provided by Jordan Telecom, TMG calculated that incoming international traffic from the United States to Jordan is growing at a meager one percent (1%) per year. The Federal Communications Commission actually shows a decrease in traffic from the United States to Jordan in its official statistics. (See Table 3 below). These statistics are counterintuitive because international traffic has been growing around the globe for well over 10 years. The FCC's decreasing traffic statistics are one additional piece of data pointing to bypass of traffic into the Jordanian telecommunications network.

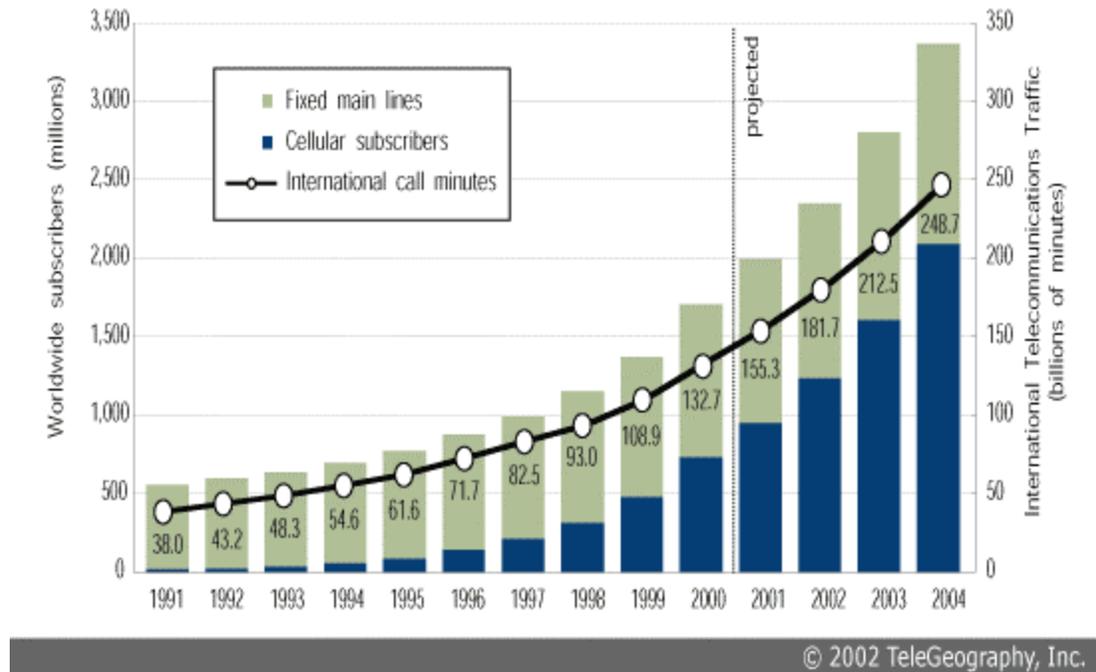
**Table 3: FCC International Traffic Data Reports for
Jordan
1998-2000**

| Description | | Item | 2000 | 1999 | 1998 |
|--|--------------------------------------|--------------------------------|---------------------|---------------------|---------------------|
| Traffic Billed in the United States | | Number of Messages | 5,151,108 | 9,759,864 | 7,403,933 |
| | | Number of Minutes | 35,171,768 | 47,344,846 | 50,775,328 |
| | | U.S. Carriers Revenues | \$27,240,033 | \$33,460,999 | \$39,864,236 |
| | | Payout to Foreign Carriers | \$16,378,330 | \$23,351,783 | \$31,725,608 |
| | | Retained Revenues | \$10,861,703 | \$10,109,216 | \$8,138,628 |
| Traffic Billed in Foreign Countries | Originating or Terminating in the US | Number of Messages | 2,054,122 | 1,635,334 | 1,837,033 |
| | | Number of Minutes | 9,415,407 | 6,938,770 | 6,767,786 |
| | Transiting the US | Receipts from Foreign Carriers | \$4,440,032 | \$4,530,703 | \$4,820,449 |
| | | Receipts from Foreign Carriers | \$9,806,146 | \$1,113,233 | \$1,327,311 |
| | | Payout to Foreign Carriers | \$8,141,677 | \$531,594 | \$561,338 |
| | | Retained Revenues | \$1,664,469 | \$581,639 | \$765,973 |
| Total U.S. Carriers Retained Revenues | | | \$16,966,204 | \$15,221,558 | \$13,725,050 |

Source: Federal Communications Commission, International Telecommunications Data reports for 1998, 1999, and 2000.

Another piece of information supporting international traffic growth is provided by TeleGeography in the diagram below, which indicates that fifteen percent (15%) growth has been the standard for the past few years and is expected to continue.

Diagram 6: International Traffic and Main Line Growth



Note: Data include outbound international traffic on public networks only. Projections assume 15% traffic growth, 5% main line growth, and 30% mobile subscriber growth annually.

The economic impact of this is significant. U.S. traffic terminating in Jordan using official channels has grown at only 1% per year over the past 5 years (with some negative years) whereas U.S.-bound traffic originating in Jordan has grown by over 15% per year over the same period. By looking at the trends in the growth of international telecommunications traffic to Jordan, TMG would expect to see over 70 million minutes arriving in the Jordan Telecom network a year from the United States, however, approximately 35 million minutes are projected to terminate through the correspondent channels in 2002. The revenue loss per year is estimated to be US\$6.5 million (at the settlement rate of US\$0.19).

An interesting observation on the correspondent rate charts from the FCC for 2000 is that the receipt ratio per minute of correspondent traffic is significantly higher for Jordan than for most other Middle East countries. For example, Kuwait received just \$1,338,360 in foreign receipts on 6,601,015 minutes of traffic (average \$0.202 per minute). The exception to this is Lebanon, where the ratio is fairly close to Jordan's (\$2,770,925 on 6,586,631 minutes, for an average of \$0.420 per minute). Given the ASRs for Lebanon are much higher than for Jordan, this suggests that Lebanon takes a much more aggressive approach to locating and shutting down bypass operations. Another indicator is message units. Lebanon's total minutes versus number of messages rate is much better than Jordan's: 5.6468 minutes per message in Lebanon vs. 4.5830 minutes per message for Jordan. This supports TMG's own anecdotal

information for Jordan on dropped calls, calls terminated early because of poor quality, etc., and also supports the ASR information TMG has been able to gather.

X. CONCLUSIONS OF THE STUDY

TMG concludes that the bulk of the problem with the termination and quality of calls from the United States to Jordan lies in the pervasive operation of bypass telecommunications providers in the country. The problem of terminating international calls to Jordan is a telecommunications economics and policy problem, and not a technical one.

Jordan Telecom's insistence and reliance on the outdated accounting rate and settlement systems for managing international call pricing provides significant economic incentive to operate bypass routes into the country. Bypass is a fact of life in the telecommunications industry. Steps can be taken to combat it, but it is ultimately a losing battle. Legally, Jordan Telecom has a right to defend the monopoly it holds for international telecommunications services and there is true economic value for the company in this structure. However, Jordan Telecom and the TRC should begin to work together, even at this early stage, to address the root structural and economic causes of this problem. New economic postures and regulatory policies for international telecommunications would pave the way for a smooth transition to competition in 2005 for Jordan Telecom and new entrants.

TMG's overview of Jordan Telecom's international network, and its connectivity to the national network, did not identify grave causes for failures. On the contrary, Jordan Telecom's network appears to be well designed, engineered, provisioned and managed. TMG's very cursory contact with the network and its operation pointed to some areas where network and operational improvements can be made (see Section XI on recommendations). Certainly some quality problems can and do exist in Jordan Telecom's network, but not to the extent that they would cause the pervasive and persistent problems that have been encountered when making international calls from the United States to Jordan. Conversely, bypass providers often provide poor termination and quality of transmission. Many of the characteristics observed in international calls to Jordan are compatible with the use of bypass technologies and carriers.

XI. RECOMMENDED ACTION PLAN FOR JORDAN TELECOM AND THE TRC

TMG's recommendations are as follows:

- Jordan Telecom must be vigilant about bypass traffic to curtail this traffic to the extent possible. This is a continuous activity and must be carried out until competition is introduced in the market in 2005 (when competition should have the effect of driving long distance rates to competitive levels). TMG recommends that the TRC fully support Jordan Telecom in these efforts.

- Jordan Telecom should not downplay the role of non-cellular bypass routes into the country. Some of the characteristics exhibited by calls that are failing indicate termination attempts via landline connections. Jordan Telecom appears singularly focused on cellular termination. It should broaden its fraud detection program to all possible areas of bypass. One possible way to expand fraud detection is for the TRC to require that the caller identification be displayed on international calls. This, coupled with a public awareness campaign, should quickly lead to identification of non-cellular bypass operators, since these operators are using local lines. The differences in trunk and local line signaling systems prevents bypass operators from displaying numbers other than those already established in the local domestic network switch.
- The TRC should encourage Jordan Telecom to accept lower accounting and settlement rates for international traffic to Jordan. This will have the effect of driving more traffic back to its international network and should result in an increase in the company's revenues. Jordan Telecom should be encouraged to use cost-based tariff methods that will allow them to moderate rates to confront competition effectively in 2005 by having a cost-based termination rate to Jordan.

If the above actions are taken and prove successful, the resulting increase in international traffic over Jordan Telecom's network will increase revenues. Additional traffic may result, however, in new quality problems. Nevertheless, the company appears to have the expertise and resources to address any problems that may arise. Jordan Telecom must continuously monitor traffic and grow circuits to meet the increased demand.

From an operational standpoint, TMG recommends that Jordan Telecom:

- Establish a Network Operations Center (NOC) to have the tools to address network operations issues more fluidly.
- Revisit its numbering plan and develop a program to address numbering plan problems.

TMG recommends that the TRC become fully engaged in Jordan Telecom's effort to root out bypass routes by taking a firm stand on the issue. TRC should work with Jordan Telecom to implement policy and economic changes that will drive international traffic back to the company's routes. With the appropriate policies, consumers would benefit from lower cost, higher quality services and the rights of telecommunications license holders could be upheld.

While Mr. Valls was in Jordan, he prepared a statement for the TRC on this matter, which is included as Annex I.

ANNEX I

STATEMENT FROM THE TELECOMMUNICATIONS REGULATORY COMMISSION - JORDAN

The Telecommunications Regulatory Commission of Jordan has undertaken a technical and business analysis of the current difficulties in transmitting international voice calls from the United States to Jordan. The Regulatory Commission and the telecommunications operators have received numerous complaints regarding both the inability to consistently complete international calls to Jordan and the poor quality of these calls.

The conclusion of our analysis is that the preponderance of the problem lies in the pervasive operation of bypass telecommunications providers in the country. These operators take advantage of low cost technologies and alternative connectivity points into Jordan to provide termination of international calls. The result disadvantages the telecommunications sector in Jordan by diverting revenues from the licensed providers of international telecommunications into the country. It also results in very poor quality of termination and transmission into the country, which detracts businesses and individuals attempting to deal with Jordan.

The Telecommunications Regulatory Commission strongly supports the activity of licensed telecommunications operators to identify and eliminate the bypass of international telecommunications calling. Providers of alternative telecommunications channels are operating either illegally or through erroneous interpretations of the telecommunications law and the telecommunications licensing regime. The Telecommunications Regulatory Commission will not tolerate this activity. Any illegal use of telecommunications facilities to terminate international traffic into Jordan will be strongly pursued by the Telecommunications Regulator.

Notwithstanding, the Telecommunications Regulator will also encourage that all licensed operators in Jordan implement policies to create economic disincentives for illegal international operators to provide service to Jordan. The Commission's objective is to always assure that the Jordanian public receives the best possible telecommunications service at fair prices.

The Telecommunications Regulatory Commission proposes to implement a working group with the main operators in Jordan to identify, police and eliminate the termination of illegal telecommunications traffic into Jordan. The Commission will work to impose the full force the telecommunications law and regulations to assure that international telecommunications quality is restored at reasonable and fair prices.