

CUBAN TELECOMMUNICATION INFRASTRUCTURE AND INVESTMENT

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The economic embargo has been the centerpiece of U.S. policy and strategy toward Cuba, but information and communications issues and measures have not been ignored. For example, after the embargo began, AT&T was allowed to maintain pre-embargo links through their existing undersea cable to Cuba. The power of information is also recognized in the Radio Broadcasting to Cuba Act of 1983, which established Radio Martí; Public Law 101-246 of 1990, on TV Martí; the Cuban Democracy Act of 1992, which called for improving telecommunications connections and information exchanges in order to increase the potential for change in Cuba; and the Cuban Liberty and Democratic Solidarity Act of 1996, which amends the Cuban Democracy Act in restricting communication investment.

Communication technology and policy have increased in importance in recent years because of rapid technical progress and massive global investment in telecommunication infrastructure. Emerging computer networks are one, important manifestation of the growing importance of communication. Networks can improve the economic productivity, education, health, democracy and human rights, and quality of life of a developing nation such as Cuba [16].

With this background in mind, we conducted a study of Cuban networks and related issues and policy implications [17]. As background for that study, we investigated Cuban telecommunication infrastructure, which is described in this paper. We found that Cuba's international links and capacity are suffi-

cient for today's demands, though more will be needed in the future, but that the internal Cuban infrastructure was poor and a bottleneck even today. The following sections discuss international and domestic telecommunication infrastructure and investment.

INTERNATIONAL TELEPHONE LINKS

Phone service between the U.S. and Cuba began in 1921 with AT&T's installing an undersea cable between Florida and Cuba. (The timeline in Figure 1 summarizes the history of U.S.-Cuba telephony.) After the embargo, AT&T was allowed to continue serving Cuba with the proviso that existing service continue, but new capacity not be added. AT&T deposited Cuban long-distance revenues in an escrow account. Calls from the U.S. were routed through an operator, and the FCC estimated that less than 1% of the 60 million annual call attempts were completed [6]. Cuban pressure and the rapid growth of Canadian companies providing call-back service in the U.S., led the State Department to issue guidelines calling for increased service in compliance with the 1992 Cuban Democracy Act [2], which allows an embargo exemption in support of "efficient and adequate telecommunication services between the United States and Cuba." Today we have direct dialing to Cuba and 953 authorized voice-grade (64 thousand bits per second, kbps) circuits. Of these 504 are in use. (See Table 1).

U.S. company WilTel has applied for permission to construct a 210 kilometer, 2.5 gigabit fiber optic cable that would have roughly 41 times today's combined authorized capacity. (John Williams, a founder

Figure 1. U.S.-Cuban Telecommunication Timeline

- April 1921:** Long distance service established through a submarine cable between Florida and Cuba.
- July 1950:** AT&T replaces original cable.
- August 1957:** Service enhanced by addition of over-the-horizon radio between Cuba and Florida.
- October 1966:** AT&T is exempted from the 1962 trade embargo for humanitarian reasons.
- April 1987:** Cable system fails, and service is diverted to radio relay towers.
- April 1989:** AT&T replaces failed cable system, but differences between Cuba and U.S. terms of agreement keep it inactive.
- July 1992:** The Cuban Democracy Act authorizes telecommunications facilities “in such quantities and of such quality as may be necessary to provide efficient and adequate telecommunications services between the United States and Cuba.”
- August 1992:** Hurricane Andrew incapacitates radio system in Florida City, and calls are routed through Italy.
- July 1993:** Cuban Government cuts calls from the United States from approximately 20,000 minutes/day to 20,000 minutes/month.
- July 22, 1993:** U.S. State Department issues guidelines for long-distance companies doing business with Cuba.
- July 27, 1993:** FCC issues notice of acceptance of applications for Cuban service (Report No. I-6831).
- March 1, 1994:** WilTel agrees to construct than undersea fiber cable.
- October 4, 1994:** The FCC authorizes five carriers to provide switched voice and leased private-line services to Cuba: WilTel, MCI, LDDS, Sprint, and IDB. (WilTel, IDB, and LDDS subsequently merged to form WorlCom) and AT&T service is improved. (Report No. CC-588, Memorandum of Opinion, Order, Authorization and Certification DA 94-1098.)
- December 9, 1994:** The FCC authorizes the resale of switched services to Cuba (Report No. I-7079).
- March 10, 1995:** A State Department letter states that they have no objection to Spring offering direct packet data service via Canada or to GTE’s Dominican Republic subsidiary CODETEL acting as a transit point for U.S.-Cuban telecommunications traffic.
- June 19, 1995:** An FCC letter authorizes AT&T Puerto Rico to temporarily operate 150 voice grade circuits pending approval of their permanent request.

of WilTel’s parent company, was born in Cuba, and his family had business there until 1956.) While this is clearly excessive capacity today, video traffic and an evolved Internet in an environment of normal U.S.-Cuba relations could absorb that and more.

While motivated to some extent by current demand for calls (perhaps \$250 million per year [8]) between U.S. family members and Cuba, WilTel is clearly looking forward to post-embargo expansion. Haines [8] writes:

WilTel Technology Ventures president, Jerry Seller, feels Cuba could play a key role in the development of communications in the Caribbean, emerging as a “very interesting hub to tie in the United States.” Some U.S. analysts have gone further, suggesting that “Cuba could become a center for cable Communications between the U.S. and the Caribbean, later becoming the hub of a U.S./Caribbean/Central America/South America loop.”

The WilTel application was made to the Commerce Department, which referred it to the State Depart-

Table 1. Voice Channels from U.S. to Cuba (64 kbps)

Carrier	Link	Authorized by the FCC	In Use
AT&T	undersea cable	143	114
AT&T P.R.	Intelsat	150	150
MCI	Intelsat	150	120
Sprint	Intelsat	120	30
Worldcom	Intersputnik	390	90
	Intelsat Columbia		
Totals		953	504

Note: The Worldcom figure is the sum of the authorizations of WilTel (120), LDDS (150), and IDB (120), which were merged. Further compression can increase these figures. WilTel (Worldcom) also has permission for occasional use of 2 satellite video links via Intelsat.

Source: Troy Tanner, Attorney-Advisor, FCC, Report No. CC-588, Memorandum Opinion, Order, Authorization & Certification DA 94-1098, and a letter from the State Department to AT&T dated June 19, 1995.

ment for an opinion. A positive opinion was given in November, 1994, and the application is back at the Commerce Department [10]]. WilTel says the cable can be in operation a year after they receive approval [8], but in the current political climate they do not expect rapid approval [3]. Sprint also confirmed that they plan to offer leased, private-line service. Though they would not comment on price at this time, this would support full Internet connectivity if it could be afforded [18].

There is also a \$41 million joint venture between Cuba (51% ownership) and Italcable (49%) which provides long distance and international service through five portable earth stations in major tourist areas [8, 9]. I was unable to ascertain the capacity, but according to the Cuban Communications Ministry there are 1,109 total circuits. Italcable may account for the difference between this and the U.S. circuit count. Regardless, the majority of voice traffic is to the U.S.

While there is unused capacity for today's voice traffic, demand would increase dramatically if the trade embargo were revoked. Furthermore, today we have predominantly voice traffic, with little data transmis-

sion and fax services. A fiber cable would allow for video and other high-bandwidth data types and services. Still, for now, the internal Cuban infrastructure is a greater constraint on Cuban telecommunications than international connectivity.

INTERNAL TELECOMMUNICATION INFRASTRUCTURE

Cuban telecommunication infrastructure lags behind much of the world and the Caribbean region. Table 2 compares the number of main lines¹ in Cuba with larger Caribbean nations and with nations in various income groups and geographic regions. Cuba has fewer main telephone lines as a proportion of population and GDP than any Caribbean nation but Haiti, and is closer to the low-income nations than the lower-middle group in which it falls.

Armando Coro, a telecommunications expert and University of Havana professor states that "The U. S. embargo has had a devastating effect on Cuba's telecommunications" [21]. The interruption of supplies of spare parts from Eastern Europe after the Soviet dissolution and a lack of hard currency has exacerbated the problems. Table 3 shows that Cuba has added some main lines since 1992, but that growth is much slower than in other developing nations or the world.

Enrique López, a principal of the AKL Group, a telecommunications consulting firm with wide experience in Cuba, reported that central office equipment dates back as far as the 1930s, and calls are very difficult to make. The poor infrastructure causes echo and disconnects and hinders both voice and fax calls [11]. Haines [8] estimates that 40% of the Cuban telephone systems was installed in the 1930s and 1940s. Professor Coro confirms this, and states that Cuban equipment comes from Alcatel and Thomson-CSF (France), Western Electric and GTE (U.S.), Northern Telecom and Mitel (Canada), and L. M. Ericsson (Scandinavia), East Germany, and Hungary [19, 21]. This mix, the embargo, and a lack of hard currency make interoperability and maintenance difficult.

1. *Main lines* are telephone lines connecting a customer's equipment (e. g., a phone or fax machine) to the public, switched (dial-up) telephone network.

Table 2. Caribbean and World Main Lines

Country	Population (millions)	1993 GDP (billion dollars)	Mains (thousands)	Mains/ million pop.	Mains/ million GDP
Cuba	11.0	12.9	350	31.8	27.2
Bahamas	0.3	3.1	76	282.2	24.6
Dominican Republic	7.7	7.3	474	63.3	65.0
Jamaica	2.4	3.8	251	103.1	65.9
Puerto Rico	3.7	35.8	1315	360.2	36.7
Haiti	7.0	2.6	45.0	6.4	17.3
Low income nations	3147.2	1276.0	46522	14.8	36.5
Lower middle	1110.6	1616.6	93190	83.9	57.6
Upper middle	508.4	2242.8	71893	141.4	32.1
High income	838.9	18850.2	435522	519.2	23.1
Africa	700.6	422.2	11497	16.4	27.2
Americas	795.0	8422.2	213495	279.1	25.3
Oceania	28.0	341.5	10811	386.5	31.7
World	5605.0	23985.6	647127	115.5	27.0

Source: Based on data in *World Telecommunication Development Report*, International Telecommunications Union (March 1994). The Cuban figures were supplied by the Cuban Ministry of Communications after publication, and vary slightly from the published version.

Table 3. Caribbean and World Main Lines: Change 1992-1994 (In percent)

Country	Population (millions)	1991 GDP (billion dollars)	Mains (thousands)	Mains/ million pop.	Mains/ million GDP
Cuba	1.89	-14.27	4.03	2.10	21.34
Bahamas	-10.0	-6.06	-4.15	6.5	2.03
Dominican Republic	0.00	0.00	0.00	0.00	0.00
Jamaica	-2.80	-2.56	49.02	53.31	52.94
Puerto Rico	1.39	59.11	29.52	27.75	-18.60
Haiti	3.53	0.00	0.00	-3.41	0.00
Low income nations	-2.18	28.22	80.36	84.39	40.67
Lower middle	40.62	39.04	67.27	18.95	20.31
Upper middle	-20.36	-0.24	-16.51	4.83	-16.31
High income	1.45	8.52	7.19	5.66	-1.22
Africa	2.38	1.81	14.10	11.44	12.07
Americas	2.91	13.65	10.36	7.23	-2.90
Oceania	2.45	-1.56	7.81	5.23	9.52
World	2.42	10.14	12.75	10.09	9.52

Source: *World Telecommunication Development Report*, International Telecommunications Union (March 1994). The Cuban figures were supplied by the Cuban Ministry of Communications after publication, and vary slightly from the published version.

There is a digital central office in Havana, identifiable by the "33" phone number prefix. These 33 numbers are available for dollars, and are used by phone company officials, foreign business people, diplomats, and so forth.² Cubans can theoretically have phones installed for an installation charge of 6.25 pesos, but in practice, they are not affordable by most. Those with 33 numbers can directly dial international calls, but others must request a call from an operator who places the call and calls them back when the connection is established. CIGBnet, and

presumably other computer networks, pay for their domestic lines in pesos, but CIGBnet Technical Director Carlos Armas fears that may change.

Some developing nations have been installing cellular systems as a substitute for decrepit landline systems. Cubacel is a joint venture partner with Iusacell (\$8 million investment [5, 8]), owner of the Mexico City cellular franchise. (Iusacell is a publicly-traded subsidiary of Industrias Unidas, S. A.) Calls are routed via satellite through Italy. Demand is low, and as of

2. The increase in main lines between 1992 and 1994 may be attributable in large part to this office.

Table 4. Cuban Telecommunications Indicators

	1992	1993	1994
Population (thousands)	10786	10856	10989
Havana population (thousands)	2142	2158	2175
Homes (thousands)	3031	3120	3147
Gross domestic product (million pesos)	15010	12777	12868
Main telephone lines	336945	349000	349471
Main telephone lines in Havana	153287	155100	156937
Main telephone lines in Havana (%)	45	44	45
Installed capacity (lines)	447340	455708	459168
Capacity used (%)	75	77	76
Lines to automated Central Office (CO) (%)	99	99	99
Lines to digital CO (%)	1	1	1
Residential lines (%)	63.0	63.5	64.8
Public telephones	10003	7508	5814
International circuits	262	442	1019
Telex subscribers	4728	4523	4337
Fax machines	392	na	na
Cellular subscribers	234	600	1152
Radio paging subscribers	632	734	859
Private leased lines	1006	na	na
X.25, 28 subscribers	na	na	266
Faults/year/100 lines	14.9	25.1	29.2
International calls (million minutes)	7.5	7.5	11.2
Residential installation (U.S. dollars)	\$100	\$100	\$100
Monthly residential charge (U.S. dollars)	\$6.25	\$6.25	\$6.25
Monthly commercial charge (U.S. dollars)	\$9.25	\$9.25	\$9.25
Charge per 3 minutes	none	none	none
Cellular installation (U.S. dollars)	\$120	\$120	\$120
Monthly cellular charge (U.S. dollars)	\$40	\$40	\$40
Cellular charge/3 minutes (U.S. dollars)	\$0.40	\$0.40	\$0.40
Full time employees	16900	17363	15696
Total revenue (million U.S. dollars)	221.5	241.4	283.8
Annual investment (million U.S. dollars)	26.7	na	na
TV sets (thousands)	1918	2061	na
Satellite antennae	na	na	260

Note: Figures reported in U.S. dollars assume an exchange rate of 1 U.S. dollar per peso, but this is unrealistic. Cuban residential service is paid in pesos, but lines to the digital office (33 prefix) and cellular fees are paid in dollars.

Source: Ministry of Communications, Havana, Cuba, provided by the International Telecommunications Union (September 1995).

1994 there were only 1,152 cellular subscribers in Cuba (Table 4). Cellular charges are also in dollars. Table 5 shows overall Cuban telecommunication in a global context.

The major hope for improving the Cuban telephone infrastructure rides on a joint venture between the Monterey, Mexico holding company Grupo Doms Internacional (Doms) and the Empresa de Telecomunicaciones de Cuba, S. A. (ETECSA). In June, 1993, Cuba decided to privatize telecommunication, and invited proposals for joint venture partners. Iusacell was selected first, but withdrew to concentrate resources for competition in Mexico when the

Telmex monopoly ends in 1997. (Dolan [5] speculates that there may also have been fear of interference by the Cuban bureaucracy.)

In June, 1994 Doms, through their subsidiary CITEL (Corporación Interamericana de Telecomunicaciones), agreed to purchase a 49% interest in the Cuban phone system for a reported \$1.5 billion [1]. ETECSA was separated from the Ministry of Telecommunications, and established as a private joint venture. The Ministry regulates the phone system and sets rates, so one can assume there are close ties between it and ETECSA.

Table 5. Cuban Telecommunications in a Global Context

Indicator	Cuba	Low Income	Lower Middle Income	Upper Middle Income	High Income	World Average
Basic Indicators						
Population (million, 1994)	11	3506	956	496	839	5606
Population density (per km ²)	96	86	23	22	25	41
GDP (billion U.S.\$, 1993)	13	1400	1535	2210	18850	23994
GDP per capita (US\$)	1331	433	1619	4555	22617	4360
Main telephone lines						
Lines (1984)	257	8947	43485	31619	304793	388844
Lines (1993)	349	47205	92590	70084	424141	634019
Compounded annual growth rate, CAGR (% change, 1984-94)	3.5	18.1	7.9	8.3	3.4	5.0
Lines/100 inhabitants (1984)	2.6	0.3	5.3	7.6	39.6	8.2
Lines/100 inhabitants (1993)	3.2	1.4	9.6	14.1	50.8	11.4
CAGR (% change, 1984-94)	2.5	15.9	6.2	6.4	2.5	3.3
Local telephone network						
Capacity used (% , 1992)	75.1	65.2	84.9	84.8	89.6	85.5
Automatic (% , 1992)	99.0	97.5	97.6	99.8	100.0	99.5
Digital (% , 1992)	1.0	75.0	29.7	55.3	67.4	61.6
Residential (% , 1992)	63.0	55.6	73.9	74.3	73.3	72.7
Faults/100 lines/year (1992)	14.9	170.6	50.0	33.3	10.1	23.8
Tele-accessibility						
Residential lines (thousands, 1992)	217	13315	62154	48320	276868	400657
Households (thousands, 1992)	3031	382798	174162	97332	277539	931831
Lines/100 households (thousands, 1992)	7.2	2.9	28.5	41.8	9829	37.5
Payphones (thousands, 1992)	10	317	676	1109	4479	6581
Payphones/1000 population (1994)	0.9	0.1	0.7	2.3	504	1.2
Urban concentration						
Population in capital (% , 1994)	19.8	4.7	11.6	16.8	7.8	8.2
Lines in capital (thousands, 1994)	157	4517	21673	18336	30150	74677
Lines in capital (% , 1992)	45.0	29.7	25.8	31.2	8.9	15.0
Capital teledensity (1994)	7.2	4.8	20.2	23.3	56.1	22.4
Rest of nation teledensity (1994)	2.2	0.6	7.6	10.4	48.4	11.2
National teledensity (1994)	3.2	0.8	9.0	12.5	49.0	12.1
Text communications						
Telex subscribers (thousands, 1988)	4.3	109.7	167.1	317.1	959.7	1553.5
Telex subscribers (thousands, 1992)	4.7	129.4	185.5	246.4	457.2	1018.6
Telex CAGR (% change, 1988-94)	2.3	4.2	2.7	-4.9	-16.9	-10.0
Fax machines (thousands, 1992)	0.4	284.5	512.5	1641	23439	25877
Data communications						
Leased circuits (thousands, 1992)	1.0	39.9	80.4	591.5	19540	20252
Mobile subscribers						
Cellular phones (thousands, 1992)	0.2	1756.2	1913.3	3339	42243	49252
Cellular as % of all phones (1994)	0.1	4.3	2.1	4.7	13.3	9.5
Radio paging (thousands, 1990)	0.6	481.0	39.9	516.1	18771	19808
Radio paging (thousands, 1992)	0.6	1742.5	1832.1	2750	44239	50564
Radio paging CAGR (% change, 1990-94)	6.5	38.0	160.3	51.9	23.9	26.4
International traffic						
Million minutes (1992)	5.3	1880	3558	4032	38402	47872
Minutes per capita (1994)	0.5	0.6	4.2	8.5	46.0	9.1
Minutes per line (1994)s	32.1	54.1	44.5	61.6	90.8	79.5
International circuits (thousands, 1992)	0.3	30.5	103.7	75.5	413.2	623.1
Telecommunications staff						
Staff (thousands, 1992)	16.9	1293	1327	511	2080	5212
Lines/employee (1992)	19.9	28.0	66.0	135.0	203.0	118.0

Table 5. Cuban Telecommunications in a Global Context (*continued*)

Indicator	Cuba	Low Income	Lower Middle Income	Upper Middle Income	High Income	World Average
Telecommunications revenue						
Total revenue (million U.S.\$, 1994)	284	14091	18895	42262	400388	475635
Revenue/capita (U.S. \$, 1994)	25.8	4.3	20.7	87.0	479.6	86.7
Revenue/line (U.S.\$, 1994)	812.1	304.0	233.0	620.0	946.0	764.0
Revenue/employee (thousand U.S.\$, 1994)	18.1	11.4	14.7	81.8	195.6	100.9
Telecommunications investment						
Investment (million U.S.\$, 1994)	27	11138	6621	17473	93449	128681
Investment/capita (U.S.\$, 1994)	3.5	3.6	7.3	36.0	112.7	24.2
Lines added (thousands, 1993-94)	0.5	14407	6772	4525	12170	37874
Investment as a % of revenue (1994)	0.1	0.8	0.4	0.4	0.3	0.3
Television						
Total sets (thousands, 1993)	2	371	175	116	500	1161
Sets/100 inhabitants (1994)	18.9	11.4	18.3	23.9	59.9	21.0
Sets CAGR (% change, 1984-94)	1.1	21.8	2.9	5.7	2.6	6.2

Source: Non-Cuban data from International Telecommunications Union, *World Telecommunication Development Report* (October 1995). Cuban data from Ministry of Communications, September 1995.

Billed as the first large scale privatization in Cuba since the revolution, the agreement was announced during a one-day trip to Cuba by then Mexican President Salinas, who also took the opportunity to speak against the U.S. embargo. (Subsequent to his presidency, Salinas spent two months in Cuba.) In April, 1995, Domos announced “completion” of the purchase, and the sale of 25% of their interest to STET International Netherlands, N. V., a wholly-owned subsidiary of the Italian State Telecommunication Company for \$291.2 million. ETECSA is jointly managed with 4 Cuban Vice Presidents, 3 Mexican, and one Italian. It will be interesting to see how the management of the operation and its relationship to the state evolves. Dolan [5] states that Domos is seeking further equity investment to reduce their share of ETECSA to 25%.

According to Domos spokesman Héctor Cuéllar [4], ETECSA has a concession for 25 years (the first 12 on an exclusive basis) with two possible 12-year extensions to provide basic national, domestic long distance, and international telecommunication services, data transmission, telex, public telephone, trunked radio communication, subscription TV, paging, and other value-added services (all but cellular telepho-

ny). The agreement “valued” ETECSA at \$1.442 billion, but promised investment “on the order of” \$1.5 billion, including cancellation of Cuban debt to Mexico of \$300 million.³ Domos says they will invest an additional \$700 million in the next 7 years for expansion and modernization of telecommunications, like the digitization of the network, refurbishing 200,000 existing lines, and expanding the network to a total of a million lines. The goal is to have 11 lines per 100 people (20 in Havana) in 7 years. Dolan [5] estimates that ETECSA already handles 20,000 international calls averaging 12 minutes daily.

The Domos plans sound optimistic, but I was unable to determine anything specific about their long and short term plans or actual improvements currently under way. I had many questions on the technology, money flow, and actual financial terms and commitments. When I asked, Cuéllar referred me to a contact at ETECSA, and I also contacted the Cuban Interest Section in Washington. Both invited me to submit follow-up questions (see Figure 2) via fax, but neither has answered despite several follow-up calls. One cannot infer from this that there are no concrete plans, but it is not encouraging. Moreover, *The Mexico Report* [20] recently characterized Domos as being

3. Domos refers to the debt swap as \$300 million, Haines [8] as \$200 million, and Dolan [5] as a \$200 million payment for debt with a face value of \$300 million.

Figure 2. Questions Regarding Grupo Domos' Investment Plan

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Will competition be allowed after their 12-year exclusive arrangement expires? 2. You state you will invest \$700 million over the next 7 years, but did not provide details on how it would be used, for example: <ul style="list-style-type: none"> • What percentage will be in Havana as opposed to other cities? • Which cities will be connected with fiber? • What percentage of Havana will be connected with fiber and digital switches? • Has anything been done so far? • What is the timetable for the expenditure over the next 7 years? | <ol style="list-style-type: none"> 3. Has there been any joint planning with CENIAI or other Cuban Internet organizations? 4. Has there been planning with key industries like tourism or biotechnology? 5. Are there plans for services such as ISDN, frame relay, or ATM? 6. Is there an overall communication infrastructure plan? <p>Note: These questions were posed to representatives of ETECSA in Havana and the Cuban Interest Section in Washington, who were asked that their answers be faxed. Answers were not received.</p> |
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“in default on a \$350 million payment due Cuba for the purchase of that country’s phone company.”

I made informal contact with an ETECSA employee who does not wish to be identified. He said there were plans for some renovation with digital switches in Havana, and that \$3 million had been allocated for a 64kbps X.25 network.⁴ The choice of X.25 instead of frame relay was the result of a lack of technical expertise. He also stated that generally nothing had changed within the company. There is still a lack of funds for investment in modern technical infrastructure, and no competitive approach. Top management is not market oriented. They are conservative, and trying to maintain the current voice infrastructure, rather than starting over from scratch in the data communication business with a market orientation. He also mentioned reports of a plan for a national satellite network in support of tourism, though he had no details. This would be designed for telephony, not data.

At a Havana networking conference in May, 1996, it was announced that the X.25 network would have a

2 million bits per second (mbps) data rate in Havana (connecting each Ministry), and that Domos would be building fast microwave links to four provinces. This is a bit more than my anonymous reporter indicated, but substantially the same.

Pérez-López [13] argues that while investments are important to Cuba, they may be of less than face value for a number of reasons. Several of these—multi-year disbursement, contingency of the investment upon future events, use of existing assets (in Mexico and Cuba) rather than fresh investment, payment for management of existing facilities rather than new construction, debt for equity swapping (\$200-\$300 million in this case), supplier credits rather than equity investments, and business delays—might apply in the case of this joint venture.

An additional cloud hangs over the Domos investment. ETECSA has inherited assets of the nationalized Cuban Telephone Company, an ITT subsidiary, and ITT has an outstanding claim for \$131 million against the Cuban Government [13]. Domos received a warning from the U. S. shortly after the

4. X.25 is a 20-year old data transmission protocol which is well established, but generally less efficient for computer networks than the newer frame relay protocol (though X.25 is a more rational choice in a nation with poor infrastructure than one with modern infrastructure because it contains an error correction mechanism.)

passing of the Cuban Liberty and Democratic Solidarity Act, and this may give them second thoughts and further hamper their effort to raise capital or find other equity investors.

To summarize, the internal Cuban telephone infrastructure is obsolete and deteriorating. While investment has been promised, the details—questions such as those raised in Figure 2—are not specified, and Domos appears to be having difficulty making good on their promises. For some time, voice and data communication within Cuba will continue to be poor, and there may be opportunity for further investment.

CONCLUSION

We have seen that Cuba's international telecommunication infrastructure is in better condition and better able to meet current and future demand than their internal infrastructure. The U. S. has been a major investor in international connectivity, and plans more as the political situation allows.

Demand for telecommunication is rising in spite of the economic effects of changes in relations with Eastern Europe and the former Soviet Union and the embargo. Key industries which generate hard currency, for example tourism and biotechnology, require communication, and their requirements are being slowly funded. Four Cuban networks have international Internet connectivity. They grew substantially during 1992-95, are significant by Caribbean standards [14, 15], and are working to connect their networks internally creating a Cuban "intranet," which will eventually be permanently connected to the Internet (current links are dial-up only). A committee "regulating the policy on global information net-

works"⁵ has been formed, and an Internet plan formulated [12].

We can expect gradual investment in Cuban telecommunication. In spite of the political risks, Castro sees that modern communication and computer networks are necessary for the economy. (This "dictator's dilemma" is being faced in many nations.)⁶

U. S. companies have invested in international telecommunication links. It was arguable that U.S. investment in internal telecommunication infrastructure was allowed under the terms of the Cuban Democracy Act, since that is where the major communication bottleneck is, and communication was to be encouraged. (Encouraging political communication without strengthening the economy and internal security is the "democrat's dilemma.") However, the Cuban Liberty and Democratic Solidarity Act seems to have closed that option. It allows the "delivery of telecommunication signals to Cuba," but amends the Cuban Democracy Act with a prohibition of investment in "the domestic telecommunications network within Cuba."⁷

If the investment by Domos materializes, ETECSA will make significant equipment purchases. They may also find new equity partners who will supply equipment and service. In addition to basic communication equipment, networking equipment like routers will be needed, and could possibly be supplied by U.S. firms. At the very least, we should allow direct investment in the equipment needed to support the services we offer. For example, Alan Garatt, an MCI spokesman, reported that problems with Cuban infrastructure caused difficulty and a four month delay in establishing their current service [7].

5. This was taken from *Granma* according to a Reuters release on June 20, 1996.

6. The policy implications of improved networks and telecommunications are complex and mixed. See [16], for a discussion of the likely impact of improved telecommunication and computer networks on free and fair elections, civil liberties and human rights, movement toward a free market economy, Cuban living standards, Cuba-U.S. trade, finding new forms of management and state/enterprise relationships, protection of the environment and conservation of natural resources, and access to Cuban scientific information.

7. This sounds like it refers to the telephone network, and routers and other computer networking equipment could conceivably be treated differently—the line between computing and communication equipment barely exists—however, this is an unlikely interpretation.

REFERENCES

1. Bardacke, Ted, "Mexicans to Buy 49% of Cuban Phone System," *Washington Post* (June 14, 1994).
2. Beird, Richard C., letter from Beird, Senior Deputy U. S. Coordinator, Bureau of International Communications and Information Policy, U. S. Department of State to FCC Chairman Reed Hundt, October 3, 1994.
3. Broyles, Gil, interview, July, 1996.
4. Cuéllar, Héctor, telephone and fax interview.
5. Dolan, Kerry A., "Their Man in Havana," *Forbes* (September 11, 1995), pp 60-68.
6. FCC, Common Carrier Action, Report No. CC-588, October 5, 1994.
7. Garatt, Alan, telephone interview, August, 1995.
8. Haines, Lila, "Cuba's Telecommunications Market," *Columbia Journal of World Business*, 30:1 (Spring, 1995), pp 50-57.
9. International Technology Associates, "Market Trends," *Latin American Telecom Report*, vol. 3, no. 1 (January 1, 1994).
10. Lockman, Laura, State Department Desk Officer, telephone interview, August, 1995.
11. López, Enrique, telephone interview, August, 1995.
12. Martínez, Jesús, "Profile of the Cuban Scientific Network Project," email document received, February, 1995.
13. Pérez-López, Jorge F., "A Critical Look at Cuba's Foreign Investment Program," Meeting of the Latin American Studies Association, Washington, D. C., September 28-30, 1995.
14. Press, L. and Snyder, J., "A Look at Cuban Networks," *Matrix News* 2(6), Matrix Information and Directory Services, Austin (June 1992).
15. Press, L., and Armas, C., "Cuban Network Update," *OnTheInternet* (January/February 1996). Pp. 46-49.
16. Press, L., "The Role of Computer Networks in Development," *Communications of the ACM*, Vol. 39, No. 2 (February 1996), pp 23-30.
17. Press, L., *Cuban Telecommunications, Computer Networking, and U. S. Policy Implications*, DRR-1330-OSD. Santa Monica, CA: RAND Corporation, February 1996.
18. Savageau, John, R., email interview, October 1995.
19. Scaefelen, Steve, "A Different Kind of Revolution," *In Perspective* (Summer 1994).
20. *The Mexico Report*, Vol. 5, No. 10 (June 3, 1996), <http://l-r-i.com/mexrpt.html>, info@l-r-i.com, (202) 363-8168.
21. Wallace, David, "Rebuilding Cuba's Network," *Telephone Communication*, Vol 98, No 20 (October 15, 1994), p. 28.