

# **INTERNET PROTOCOL (IP) TELEPHONY - THE DEMISE OF TRADITIONAL REGULATORY PARADIGMS? – IMPLICATIONS FOR CARIBBEAN COUNTRIES.**

## **Abstract**

The Internet is an outgrowth of technological advancements in the telecommunications industry and in many ways threatens it, more precisely it has been said that the Internet threatens to turn existing regulatory paradigms on their heads. This paper will focus on the impact of IP Telephony on the Public Telecommunications Operator in relation to the International call market. I intend to examine the dominant paradigm in a broad way to see if this statement is sustainable. I hope to show that the accounting rate system on which this paradigm is premised is ill equipped to deal with international settlements in any event. It has become outdated and would have in an era of liberalisation collapsed for failing to take into account principles of economic efficiency. At the heart of the issue is the problem of pricing interconnection. An understanding of this will make clearer the weaknesses that paved the way for the exploitation of technological advances for economic gain. The pricing of interconnection is an economic problem but can economics fix the threat caused by the IP Telephony? It means that in implementing telecommunications reform Caribbean countries are

to be vigilant that issues created by IP telephony are not conflated with issues caused by a failure to adopt efficient pricing systems.

## **EXISTING MODEL**

The international call rate system is self-regulated in the sense that it is not subject to a governing regulator. The traditional model for the settlement of international telephone services by Public Telecommunications Operators (PTOs) has been based on “accounting rates” negotiated between each country pair. In this system the revenue is split on the basis of the difference between the traffic measured in minutes flowing between two or more countries that is originating and terminating. The originating PTO is entitled to one-half of the rates for that country pair plus any excess charged to its customers. This amount is shared between it and any local telephone company terminating the call where the international and local segments are separately owned. The amounts are paid on a net settlement basis so that the final payment represents compensation to the country terminating more minutes than it originates.

The settlement rate is an intermediate good and therefore an essential facility. It is an essential facility because International Communications Operators need it to terminate calls on each other’s network. It is the international telecommunication’s bottleneck equivalent to the local Public Switched Telephone Network (PSTN) it is a natural monopoly. The issue is made complex

because in the international call network both parties are monopolist and so there are two bottlenecks governed by two separate market structures with no regulatory oversight. This is a problem because it has never been the policy of a monopolist to encourage competition and so it has incentives to keep the price as high as possible in order to curtail entry or to put the competitor at a disadvantage vis-à-vis the end user. In the circumstances call rates based on this system are traditionally high.

Naturally this has called into question the efficacy of the system and in fact the system has come under attack and/or scrutiny by economists, regulatory bodies and multilateral organisations such as the World Trade Organisation. The

International Telecommunications Union in a report<sup>[1]</sup> stated as follows:

Recent technological developments, together with the beginnings of gateway arrangements allowing telephone calls to flow between the Internet and the PSTN, opens up a realistic possibility that the carriage of International telephone calls via the Internet (“Internet Telephony) will soon move from its original prototype or hobbyist status to be become a major “mode of operation” for carrying commercial traffic ....it is certainly happening outside of the *traditional* settlement systems. [italics mine]

Dr. Pekka Tarjanne, Secretary General of the International Telecommunications Union, had made a similar statement in 1996:

For developing countries, the bigger *threat* lies in the bypass of the accounting rate system by alternative networks such as voice over data networks (such as internet frame relay), international simple resale, private networks, or satellite bypass.<sup>[2]</sup> [italics mine]

The Federal Communications Commission of the United States of America issued the following statement: -

In the International realm, the Commission has stated that IP telephony serves the public interest by placing *significant* downward pressure on international settlement rates and consumer prices. In some instances, moreover, IP telephony providers have introduced an alternative calling option in foreign markets that otherwise would face little or no competition. We continue to believe that alternative calling mechanisms are an important pro-competitive force in international services market.<sup>[3]</sup>

The common thread through these three extracts is that IP Telephony is a “weapon against excessive settlement rates”<sup>[4]</sup> they support the view that IP Telephony brings with it the demise of this traditional paradigm. A fortiori it is a weapon against developing and, for the purpose of this paper, Caribbean countries. It is directed at forcing them to adopt and implement more cost-based and efficient systems for the delivery of telecommunications services. It is important to recognise that all three statements see the threat as a technological issue. But is it? The answer to this question is important. If it were treated as a technological issue then it would be easy to support arguments for banning IP telephony. If it is not, and is really a question of economics then any attempt to ban it would not augur well for the development of an efficient communications infrastructure, which means one that is based on cost. I argue that is a question of economics. For that reason regulatory caution is advised. It

is against this background that I propose to examine the technology and economics of IP Telephony and the accounting rate system.

### **Technological Issues**

Internet Protocol Telephony (IP Telephony) refers to the various methods by which communications services, such as voice, facsimile, and/or voice messaging operations are transmitted by means of packet switching over IP-based networks. IP telephony does not often use the public Internet at all. It uses its underlying structures that is, the Internet Protocol suite. Voice over Internet Protocol (VoIP) and Internet Telephony, are subsets of Internet Protocol Telephony although there are divergent views on this bifurcated classification, the resolution of which are not necessary for the purpose of this paper. Internet Protocol Telephony is made possible because of convergence in telecommunications. Convergence in telecommunications refers to the technological improvements, which enable users to transmit voice traffic over the Internet at no extra cost unlike in the public switched telephone network, which is circuit switched and costs are usage sensitive.

For users who have free, or fixed-price Internet access, Internet telephony software essentially provides free telephone calls anywhere in the world. This was first made possible in February of 1995 when Vocaltec, Inc introduced its Internet Phone Software<sup>[5]</sup>. This was limited in its application in that both users had to have access to the Internet at the same time and own a copy of the software. The

technology has since advanced to the point where software developers have created gateway servers capable of acting as an interface between the Internet and the PSTN. Eventually, the software came equipped with voice-process cards, which expanded Internet telephony from PC to PC, to enable users to communicate using standard telephones. Internet Protocol Telephony ‘rides’ on the Internet’s underlying technology Internet Protocol and is instrumental in blurring the distinction between data and voice. Internet telephony works by digitising the voice, which is then transmitted to a local gateway of an Internet telephony provider, which then compresses the ‘voice data’ into IP packets. The packets are then transported to the Internet for transmission through another gateway at the receiving end. At the receiving end the data is reconverted to voice – in this sense it operates like traditional voice telephony with telephone sets at both ends. It is this feature of IP Telephony, which is welcomed by some and of concern to others.

It is of concern, because it operates almost parallel to the Global Public Switched Telephone Network and its rate settlement system and bypasses it. Consumers welcome it because it is cheap. Industry players welcome its effect on the international call settlement system to the extent that it creates a *black market* for international calls. This is especially so in countries such as most developing countries where the incumbent has a monopoly on *voice*. In Jamaica West Indies

it was this effect that was in part responsible for the passing of the Telecommunications Act 2000 that set the stage for a liberalisation of the telecommunications market and releasing the *grip* of the monopoly provider Cable and Wireless Jamaica Limited. This model can be used as leverage in the rest of the Caribbean for negotiating favourable terms for telecom market liberalisation since if there is no regulating of IP telephony the incumbent telecom operator stands to lose out on millions in call revenues. Governments will also lose out on revenue in terms of a shortfall in taxes on the diminished revenues. The PTO faces a loss of revenue from international calling directly from collection charges and indirectly from the loss of settlement payments, a loss of subsidy for domestic service and governments in developing countries face the loss of revenue for the funding of their Universal Service fund.

But is this fallout out a function of technology or economics? We have seen how the technology makes this possible. The popular answer is that the existing regime is possible because IP Telephony is cheap but what is it that makes it so cheap? Is it inherently cheap? In order to fully appreciate the impact of IP Telephony of the Public Telephone Operators it is necessary to look at its offerings, which are summarised in the table below.

Table 1: Retail Phone-to-Phone Voice Services

Selected examples of different marketing approaches

<p><b>Discount International Services via Access Numbers</b></p>	<p>Like other alternative or “dial around” long distance and international services, Phone-to-Phone Internet telephony and VoIP services require the user to dial a local access number to get a “second dial tone.” After dialing the gateway server of an IPTSP, the user inputs an access code and then the destination phone number. Examples include Czech Telecom’s “Xcall” service<sup>[i]</sup> and CLEAR’s “CLEAR 0505” service.<sup>[ii]</sup> Panasonic offers an “Internet phone” with a button by which the user can “select” (speed-dial) an IPTSP instead of his or her regular long distance or international provider.</p>
<p><b>Preselected Long Distance and International – Mobile</b></p>	<p>The most common implementation of Internet Telephony and VoIP as a preselected route for outgoing long distance and international calls is on mobile networks. Indeed, a good deal of pioneering use of IP Telephony technology was done by mobile operators, such as the Czech operator Radiomobil (See Box 4.2), which routes its international calls through a Global One gateway to its partner Deutsche Telekom’s global VoIP network. (See the ITU-commissioned case study, “Colombia: IP Telephony and the Internet”<sup>[iii]</sup> for a detailed examination of the use of IP Telephony by mobile operators in that country).</p>
<p><b>Calling Cards</b></p>	<p>In practice, most retail Phone-to-Phone Internet Telephony and VoIP services are marketed through pre-paid calling cards. Just as in the above scenario, the user dials the local PSTN access number of an IPTSP, is prompted to enter an account code, and then gains a second dial tone to dial the desired telephone number. Services of this type are offered by independent IPTSPs<sup>[iv]</sup> all over the world, often without any indication to the user that the service is provided with Internet Telephony or VoIP.</p>
<p><b>Freephone Access</b></p>	<p>Specialized services such as ITXC’s “Borderless800”<sup>[v]</sup> give callers around the world access to toll-free (freephone) numbers in the US, which would otherwise be unavailable to them.</p>

Source: ITU.

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The common denominator in these four offerings is the absence of the intermediate good – interconnection. As stated before interconnection is a natural monopoly. The natural result of this is that prices are not cost-based but based on the existence of a dominant bargaining power. The ability to set the price rests solely with the person who owns the intermediate good. In the absence of the intermediate good the price would necessarily fall and this is what consumers

want, lower prices.

The intermediate good is further threatened by the development of a wholesale market for IP telephony. Backbone operators sell the routing facilities to other providers as illustrated in the table 2 below.

The call termination in table 2 is important, as it is an illustration of how countries lose out on settlement rates for terminating calls.

Table 2: Wholesale Phone-to-Phone Voice Services

*Internet Telephony and VoIP services for the PTO and IPTSP*

<b>Least-cost-routing</b>	Just as many telecommunication carriers employ IP Telephony in their backbone networks, several operators sell IP capacity (often combined with termination services) as a least-cost routing solution for international calls. <sup>[vi]</sup> Given the increasing prevalence of this type of transmission, many callers are probably already making IP Telephony calls without knowing it. Pulver.com's "Minutes Exchange" <sup>[vii]</sup> acts as a "market maker" between parties originating and terminating IP minutes.
<b>Call Termination</b>	Hundreds of small companies, many related to established ISPs, offer international call termination in almost every country in the world (including many where IP Telephony is prohibited). Some of these firms are full-service clearinghouses and offer billing services as well. <sup>[viii]</sup> The barriers to entry are low and so are the prices. See, for instance, the list of termination rates around the world available on the IPxStream Website, <sup>[ix]</sup> or that of Arbinet-TheXchange, where the prices quoted are often below the settlement rates which would otherwise apply. <sup>[x]</sup> Just about anywhere the Internet reaches, IP Telephony minutes are being terminated on the PSTN.

Source: ITU.

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IP telephony has been banned in some countries and encouraged in others. For those that have banned it that has not prevented the termination of calls on their

PSTN and the corresponding loss of revenue. The United States has encouraged it and has also recommended that a hands off approach be taken as to attempt to regulate it would remove the threat that it poses to foreign monopolies that hold international settlement rates so high in so many countries”.[6] The intermediate good is clearly a factor in high call rates. This is supported by an examination of the impact of its absence from IP telephony calls with the corresponding reduction in prices. But what is wrong with the intermediate good such that its absence could have such a significant impact on price? What is the economics of the intermediate good?

### **The Economics of the Intermediate Good.**

The accounting rate system that governed the price of the intermediate good was premised on certain key assumptions: -

1. That traffic between the country pairs would remain equal;
2. That prices would be symmetrical and;
3. Inflation and exchange rates would remain stable

The advent of liberalisation and in particular The World Trade Organisation’s Basic Agreement on Trade in Telecommunications Services, which came into effect on the 5<sup>th</sup> day of February 1998[7] shattered these assumptions.

Liberalisation emphasised the development of competition and with that came the lowering of costs and prices in the countries that adopted the ‘efficiency’

strategies. This meant that in cases where liberalisation was not adopted the bottleneck remained intact so there was a one-sided lowering of costs. With the lowering of costs and hence prices came the increase in the number of calls that originate in 'cost-sensitive' countries and given that the system is traffic sensitive in favour of the country terminating the calls the 'efficient' countries found that they were paying out settlement cheques without a corresponding return. In addition to that private networks, call-back operators, resellers and IP telephony were affecting the 'balance' of the accounting rate system. Bear in mind however, that IP telephony deprived both sides of collection charges and settlement payments. IP telephony reduced the number of calls in minutes that terminated on the local switch via the international switch and therefore reduced settlement payments. What could account for these distortions even in the face of the ban on IP telephony in some cases?

The low costs caused low rates generally and together with call back, resale and private networks increased call volume and with that came an increase in the settlement payable to foreign countries. The existing model while challenged by IP telephony was more threatened by its own price structure - it was not cost based, prices remain high and were arbitrarily set by these monopolists. Any form of competitive entry will threaten a system that is not based on cost, even if that entrant is an inefficient provider. IP is an example of this; the quality while it

has improved is still not what one is accustomed to in using the traditional telephone. Nevertheless, it continues to improve. One form of IP telephony that continues to threaten the existing system at least in Jamaica West Indies is effected by the use of the YapJack device. It is an end-user device and is currently making a significant inroad into the incumbent's international call revenue. The sellers of this device, the incumbent and the regulator are headed for Court and it remains to be seen how this will eventually play out. The use of devices such as the yapjack however, are an important tool in forcing down prices and forcing incumbents to adopt more cost based pricing for the benefit of consumers. How will other Caribbean countries treat with issues relating to IP telephony? It may not be so bad and careful analysis and examination must be undertaken before banning its use. The restrictions are very often ineffective and involve social and administrative costs. Who will bear these costs? Is it that the incumbent telephone provider must adopt more cost-based pricing? These are some considerations in deciding on the way forward in this era of liberalisation. Consumers and entrepreneurs must recognise that while lower prices are good the government has a duty to balance the interests of the incumbents. They have much to lose having regard to their substantial investments in infrastructure prior to liberalisation. The government must of necessity adopt a transitional approach to the IP telephony issue.

IP telephony is here to stay it is set to improve. Governments, in addressing the issue of IP telephony must recognise that while it has had some impact the imbalance would have occurred without it. This is important in making a decision to allow or to ban IP telephony. IP telephony makes it clear that PTO's need to adopt cost-based pricing. A ban on any device or system that forces incumbents to efficiency must be taken only after a careful analysis of all the factors. The problem with the accounting rate system shows that a ban on IP telephony will not solve the problem of high prices and inefficient delivery of services. The accounting system is internally destructive because it is not cost-based. The focus must therefore be on devising an alternative paradigm to solve the pricing of this intermediate good. This raises a further issue. When one is found where does IP Telephony fit or can it? Can those paradigms withstand the *threat* of IP telephony can it be regulated under any of them or is it ungovernable? These are additional issues to be considered by Caribbean countries in the face of these challenges.

The suggestion here is that IP telephony and accounting rate reform may not be so linked as initially perceived. The accounting rate system must be fixed the question is how?

Several approaches have been suggested such as facilities based interconnection agreements, progressive reduction of accounting rates to the point at which they are so low that countries are willing to move to 'senders-keep-all' and a system of

call termination charges<sup>[8]</sup>. However, the scope of this paper does not allow me to examine all those various approaches, which have been critiqued by economists and found wanting and in any event in April of 2001 the ITU after joint consultation with the various interests recommended that the settlement rates should be reduced to a cost based level with appropriate safeguards for Universal Service<sup>[9]</sup>. The focus of this paper is therefore to concentrate on those proposals that give some insight on the usefulness of costs-based models as the most appropriate solution to economic inefficiency and the pricing of the intermediate good.

In the local call access market the suggested approach has been the Efficient Component Pricing Rule simply put it stipulates that the pricing of interconnection where the monopolist and the entrant produces the same good is the average costs plus the market share lost to the entrant. It has been suggested that whereas this model is workable because of the cost component it falls short to the extent that there is no opportunity costs for the provisioning of the intermediate good in the international call market<sup>[10]</sup>.

Economists have suggested that the better approach is to find out what the optimal best price that can achieve efficiency? In a first best world, a necessary condition for optimality would be that entrants internalize the bottle neck's marginal costs<sup>[11]</sup> so that the access price would be cost based. The first best price

therefore is where price equals marginal costs. This kind of costing however, would deprive the PTO of a profit and so it has been suggested that in the circumstances that the PTO is to be allowed to balance its budget by offering a menu of tariffs so that some goods can be priced above marginal costs. This menu of tariffs would in turn comply with economic principles of elasticities of demand, complementarities and substitutability so that prices could vary for on and off peak volume and or pricing of inelastic goods higher than those with elastic demand.

It is suggested that this approach is workable because the lion's share of the costs do not vary with the volume of traffic on either side<sup>[12]</sup> as it does under the existing paradigm. The problem with this approach though, is this. In determining price, what is the inelastic good in this inelastic 'market'<sup>[13]</sup> what is its complement or substitute? Is it IP Telephony? In this model where does IP telephony fit? Is it a complement or a substitute? Is it voice or is it data? Is it a computer or is it a telephone? To regulate requires a classification what is its class?

To suggest a model is to suggest a governing regulator but the Internet is the antithesis of the traditional utility. The Internet is a *multi-purpose multi-point* digital interactive continuously evolving worldwide telecommunications

network. The traditional paradigm for utility regulation rests on the regulation of a *well-defined* set of services offered by a *well-identified* operator (or small group of operators) in a *well-circumscribed* geographical area.<sup>[15]</sup> It is difficult to find a perfect fit in large part because of the differences in architecture of the two systems, the PSTN's centralized design and the Internet's open and distributed architecture.<sup>[16]</sup>

The global switched telephone network is to date unregulated it may be that this is because it transcends boundaries in much the same way that the Internet does.

In the final analysis to subject IP telephony to regulation without research would be to stifle innovation or on the other hand cause confusion with all the changing classifications and understate the impact of convergence. The traditional media distinctions have been blurred – broadcasting and information technology are examples some of media that have merged with telecommunications applications and the Internet and which are regulated by different bodies and rules. What is the dominant paradigm? The economics literature does not provide a systematic analysis of these important questions..<sup>[17]</sup>

For this reason the advice to regulators is that caution is a necessary virtue in the face of conflicting issues and tensions on the difficult path of liberalisation compounded by the fact that incumbent rights are entrenched.

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[1] Chairman's Report of the Seventh Regulatory Colloquium, The Changing Role of Government in the era of Telecom Deregulation: Transforming Economic Relationships in International Telecommunications, (3-5 December 1997, Geneva) p. 83.

[2] ITU-Telecommunications Standardisation Sector, (Study Group 3) (Geneva: November 11-15, 1996), page 6.

[3] Federal-State Joint Board on Universal Service, *Universal Service Report, CC Docket 96-45, para 93*

[4] Dissenting Statement of Commissioner Harold Furchgott-Roth, *FCC Universal Service Report, CC Docket 96-45*

[5] [www.iec.org/online/tutorials/int\\_topic01.html](http://www.iec.org/online/tutorials/int_topic01.html)

[6] <[http://www.fcc.gov/Speeches/Furchgott\\_Roth/Statements/sthfr817.html](http://www.fcc.gov/Speeches/Furchgott_Roth/Statements/sthfr817.html)>

[7] Numerous countries signed the WTO agreement but were tardy in effecting its recommendations for the liberalisation of the Telecommunications market.

[8] James Alleman and Barbara Sorce Ibid page 4

[9] *ibid* page 4

[10] James Alleman and Barbara Sorce: International Settlements : Time for a Change

[11] Laffont and Tirole page 101.

[12] James Alleman and Barbara Sorce: International Settlements : Time for a Change page 10.

[13] I say 'inelastic market' because the international call market has always been said to have inelastic demands.

[14] <http://www.stern.nyu.edu/networks>

[15] Laffont and Tirole: Competition in Telecommunications at 272

[16] [http://stills.nap.edu/html/coming\\_of\\_age/ch4.html](http://stills.nap.edu/html/coming_of_age/ch4.html)

[17] *ibid* 272

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[i] <http://www.telecom.cz/set.php3>.

[ii] [http://www.clear.co.nz/about/media-releases/release.ptml?FROM=index.ptml&ID=11&row\\_start=6](http://www.clear.co.nz/about/media-releases/release.ptml?FROM=index.ptml&ID=11&row_start=6).

[iii] <http://www.itu.int/osg/sec/spu/ni/iptel/countries/colombia/index.html>.

[iv] Examples include: DeltaThree.com (based in New York, NY, USA), [http://deltathree.com/unified\\_signup/signup\\_calling\\_cards.asp](http://deltathree.com/unified_signup/signup_calling_cards.asp); Incomtel (based in Moscow, Russia), <http://www.incomtel.ru/>; and Pan EC Technology Corp. (based in Taipei, Taiwan ROC), <http://www.pan-ec.com.tw/>.

[v] <http://www.itxc.com/borderless800.html>.

[vi] Least-cost-routing services offered by discount service providers often use a hybrid mix of different technologies on different routes, according to what is cheapest, where, and when. A press release relating to CLEAR New Zealand's "CLEAR 0505" retail discount calling service describes the method also used by wholesale least-cost-routing operators: "Ordinary voice calls are transmitted via ATM (asynchronous transfer mode) to a switch in Los Angeles, which then directs the call on the cheapest available route to its eventual destination, where it is converted back into an ordinary voice call. The cheapest available route might mean sending the call using voice-over-IP, voice-over-ATM or traditional calls." ([http://www.clear.co.nz/about/media-releases/release.ptml?FROM=index.ptml&ID=11&row\\_start=6](http://www.clear.co.nz/about/media-releases/release.ptml?FROM=index.ptml&ID=11&row_start=6)).

[vii] <http://www.min-x.com/>.

[viii] See, for example, Concert Global Clearinghouse, <http://www.concert.com/clearinghouse/>; Telia Clearinghouse Services, <http://clearinghouse.telia.com/>; NTT Communications Clearinghouse Service, <http://clearinghouse.ntt.com/>; iBasis, Inc., <http://www.ibasis.net>; GRIC Communications, Inc., <http://www.gric.com/>; and ITXC, <http://www.itxc.com>. A complete list of IPTSPs and clearinghouses is hosted by IPxStream at <http://www.iptelephony.org/GIP/providers/index.html#settle>.

[ix] <http://www.iptelephony.org/GIP/popshop/tshop/index.html>.

[x] <http://www.arbinet.com/>.

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