Alternative Calling Procedures: Background and Trends

1.0 Introduction

At the World Radiocommunication Conference held in Geneva, Switzerland in January and February 2012, delegates from around the world began to debate the future of wireless communications, a discussion that ultimately will lead to additional spectrum allocations. But in establishing an agenda item for WRC-15 (suitably, Agenda Item 1.1) on "IMT, including broadband" they touched on a perhaps more profound question than they may have intended: What, in fact, does "broadband" really mean in the context of mobile services?

Some delegates thought it meant just "IMT" – ITU's trade name for 3G and 4G, operator-provided mobile services. Others argued that it should include the entire universe of mobile apps, no matter who delivered them. That could include even unlicensed wireless local area networks – basically, WiFi hotspots or their future technological descendants.

Just under the surface of that debate was a tension that has persisted in the international telecommunication environment for the past two decades: What constitutes "legitimate" telecommunications? Should policy-makers designate particular operators and technologies as the approved ones, and ban the rest? Or, should they take their cues from the market and legitimize new services that may arise to take advantage of business opportunities?

This is the basic philosophical question that underlies any discussion of what is termed *alternative calling mechanisms*. Indeed, the sub-text of the debate over broadband at this year's WRC included current trends that allow some consumers – those with smart phones and powerful-enough apps – to make international calls simply by accessing Internet-based calling services using a local (and often free) WiFi hotspot. These callers can simply disappear into the anonymous cloud of data carried by ISPs and Internet backbone operators, by-passing standard mechanisms for placing, terminating and charging calls, and also by-passing standard mechanisms for emergency calls and legal tracking and interception of calls. This may be desired by the caller, but what are the ultimate effects on other consumers and governments? Should regulators protect the integrity of their current regulations, or adapt them to incorporate the new capabilities that technology provides?

There is an old saying among those who have watched the Internet develop over the past two decades: "Information wants to be free." And that is true of the bits that increasingly make up voice traffic, as well. Or, at least, these bits want to cost less, if not be entirely free. (Note that the term "free" here is deliberately used in two senses: "zero cost" and "unburdened by regulatory or legal restrictions").

The tradition of wanting international telecommunications to be less costly goes back quite a few years – farther back, in fact, than the popularization of the Internet. We will not review ancient history, but we will outline events since the inception of global liberalization in the 1980s. Through several kinds of calling and routing procedures, dating back to that decade, consumers and operators have fought a kind of commercial insurgency against the established procedures of international settlements and termination rates. Some people have called this "arbitrage" and some have called it "illegal by-pass,"

but for something close to a generation, alternative calling procedures have been an increasingly unavoidable subtext to any conversation about international telecommunications.

This paper explores the legacy of that "underground" world of international call-back services, international re-file, and "leaky PBX" operations, as well as their more modern (and more accepted) descendants: Voice over IP (VoIP) and Internet telephony. All of these innovations represent the erosion of a circuit-switched, operator-based international calling system that stood like an edifice for so many decades but now seems to be increasingly undercut. This is a story of economic causes and socio-economic (and political) effects. The main protagonist is technological development in telecommunication markets, but the backdrop is clearly globalization and the liberalized international telecommunications regime introduced by the International Telecommunication Regulations (ITRs) in 1988 and reinforced by the WTO agreements regarding telecommunications services. What is unclear is whether alternative calling procedures represent innovation and change, or simply chaos and unsustainable business practices – and perhaps more importantly, who decides which is which?

2.0 Tricks of the trade: what is alternative calling?

Essentially, alternative calling procedures are those that route voice traffic outside standard international calling and charging mechanisms. Generally, these procedures can be divided into two classes:

- Operator routing procedures
- Consumer dialing or billing procedures

Before discussing these further, it should be noted that legal and regulatory frameworks view these various kinds of procedures differently in different countries. Generally, procedures that are viewed as harmless for incumbent networks – or which have been adopted by the licensed operators themselves – are more likely to be permitted and incorporated in regulated networks (i.e., "mainstreamed"). Those that tend to disrupt proper network functioning are generally banned in most countries. In a grey area are services or procedures that may help consumers, in terms of lower prices, but undercut the existing market structure that has been designed or licensed by regulators in a given country (Skype is no doubt the best-known example of a grey area service).

2.1 Operator Routing Procedures:

The principle of *least-cost routing* instructs operators to cut costs on international routes by employing economies of scale, newer technologies and routing patterns that take advantage of competition and – in some cases – arbitrage opportunities presented by greater liberalization on some routes. One example of a practice that arose in the 1990s is *international re-file of traffic*. Sometimes known as traffic *re-origination*, re-file is closely connected with the practice of hubbing traffic, which involves concentrating traffic from many different origination points, then routing it to a hub in a country with a relatively friendly regulatory structure (or very low settlement rates). This hub is then used as a transit point to re-route the calls to multiple third-country destinations.

Re-file occurs when the traffic is sent to a hub and then routed through a gateway that appears to re-originate the calls, so that they are not filed as "transit" traffic under international settlements, but

rather as originating calls. These calls are then routed on to their destinations as though they had originated in the hub country.

The economic benefit of this strategy is apparent in the difference in settlement or call-termination rates among different countries. Take, for example, a route between two countries (Country A and Country Z) with a termination rate of 10 cents per minute on an international call. Suppose that the termination rate between Country A and a third country (Country U) is just 3 cents a minute, and the rate from Country U to Country Z is just 4 cents a minute. By re-filing traffic through Country U, an operator can terminate calls from Country A to Country Z at a savings of 3 cents per minute (See figure 1).

Figure 1: Use of Hubbing and Re-file

Growth of re-file in the 1990s was accompanied by the advent of *international simple resale*, which liberalized the lease of international private line circuits in order to resell minutes to other carriers. Again, the economic value of this practice has been inherent in the pricing difference or discount that could be obtained through this kind of routing. To quote a paper published by the Organization for Economic Cooperation and Development from the 1990s, "Resale is an arbitrage operation and its profitability depends on the relative imbalances between prices and costs of services provided by [an operator]."[1]

Even more shadowy is the practice known as *leaky PBX*, which involves masking international calls as domestic or local ones through use of international private lines. A company can operate a PBX in one country to collect outbound calls, then route them over international circuits to a PBX in another country. The PBX in the destination country then "leaks" the calls onto the public switched telephone network, where they are terminated as domestic traffic (See Figure 2). Again, leaky PBX routing

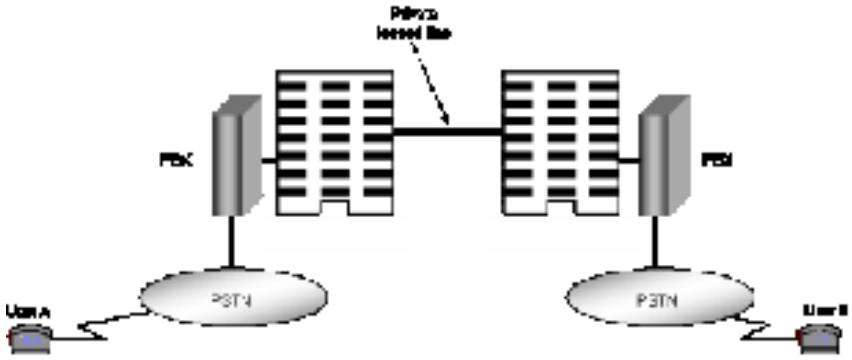
[1] OECD Discussion paper, Committee on Information, Computer and Communication Policy, "International Telecommunication: A Review of Issues and Developments," Paris, 1995, p. 8.

flourishes wherever there is a large delta between international termination rates and much lower local or domestic call-termination rates.

A more recent variation of the leaky PBX concept has been to apply it to the routing and termination of international mobile calls (or, in some places, the routing of domestic calls between competing operators). Known as "SIM boxing," this practice involves perpetrators who obtain multiple SIM cards for domestic networks. As incoming international mobile calls come in, gateway operators route them through "SIM boxes," which strip the incoming customer line identification and re-generate the calls as domestic ones using the local SIM cards. These calls are then terminated as domestic traffic, which in many countries entails a much lower call termination charge than an international call would. Meanwhile, the perpetrators record the calls as incoming international traffic, collecting the international call termination charges as profit. This practice can also be adapted to "trick" terminating operators into viewing the calls as on-net calls, when they are in fact inbound calls from another domestic or international operator, allowing the perpetrators to avoid paying interconnection charges associated with those calls.

Essentially, operators began in the 1990s to mask their routing techniques in ways that allowed them to avoid termination on international routes that were not cost-effective relative to other routes. In the process, they often entered a "grey market" that was not clearly illuminated by existing regulations or laws. Some of them, indeed, may still be seeking these loopholes for business reasons, even after they have been determined to be illegal or fraudulent by regulators.

Figure 2: Simple Diagram of a Leaky PBX Set-Up



2.2 Consumer Dialing or Billing Procedures

The other basic class of alternative calling procedures involves services that allow consumers to access dial tones in other countries or to reverse-bill calls – both of which allow them to take advantage of lower rates offered in third countries. These services, which encompass *international call-back* and *country-direct* services, are often marketed using pre-paid or post-paid calling cards. Rather than pay the full retail rate to originate a call in country A and have it terminated in country Z, the caller has access to a dial tone that lets him or her place a call from country U to country Z, or to bill the call back to an operator in his or her home country, at lower rates.

In its most basic form, international call-back allows a caller in Country A to dial an "access number"set up by the call-back provider in Country B. The signaling information from this call allows the service provider to "call back" or connect the circuit from its end of the international route. The caller in Country A then receives a dial-tone from Country B and can use that open circuit to make a call to anywhere in the world. The caller can thus take advantage of lower rates for calls that originate in Country B. This process completely by-passes the standard international direct dialing mechanism, essentially subverting the international settlements and call-termination regimes.

While call-back services are banned in many countries, country-direct services are usually legal because they involve simple reverse billing of calls, usually subject to bilateral settlement or call-termination agreements. Most often, a customer is issued a calling card (or an access number) that allows them to complete an international call, with the charges being billed back to the operator that issued the card. This allows operators to retain customer loyalty when their customers travel overseas, and they allow operators to provide discounts to retain that loyalty. But they usually provide less cost savings for the consumer compared with call-back services. Moreover, they require the card-issuing operators to form agreements (much like roaming agreements) with operators and regulators around the world to allow use of the cards in those countries.

These practices – particularly international call-back service – can be viewed as the consumer-level analogue of the routing practices described in the previous section. From a business standpoint, they are a clear attempt to draw market share away from the existing service providers in the retail international telecommunications market. Not surprisingly, those licensed service providers usually do not appreciate having their revenues drained away by operators in other countries over which they have no control. Similarly, regulators are stymied in attempts to protect their operators (as well as tax or fee receipts) from call-back or refile practices and operations that are based offshore.

The question of whether consumers benefit is more complicated. Certainly, if they live in liberalized markets with lower underlying call-termination or settlement rates, they are likely to see lower prices for retail calls. In addition, operators that take advantage of re-file practices can offer lower prices to consumers in their home countries as a way to compete against commercial rivals. And arguably, international call-back services do save consumers money. Finally, these practices have a general effect of undercutting inflated international settlement rates, potentially lowering international calling prices for everyone. At risk, however, are the revenue streams in developing countries that could be used to invest in better network infrastructure and improved services in those countries.

3.0 Alternative to what?

The key to understanding the development of these alternative calling mechanisms is to comprehend the power of *arbitrage*. Increasingly, telecommunications traffic is viewed as a commodity – in a digital world, a bit is just a bit, regardless of what information it represents. Viewed this way, the only real market advantage to be gained is by engineering the most cost-effective routing and the most competitive pricing. That advantage, in turn, will translate into more customers – that is, if retail rates are allowed to drop towards transmission and termination costs.

That, as it turns out, is a big "if" in many countries. As this section will explore, regulatory frameworks are often built upon the principle that retail pricing for international voice services is often kept

artificially high relative to actual costs – and relative to prices for domestic (including local) traffic. This disparity often occurs despite the fact that termination costs for international calls are not proportionally higher than the underlying costs for domestic traffic.

3.1 The Traditional Settlements System

Throughout the Twentieth Century, international telephony (and in earlier decades, international telegraphy) traffic was originated, transmitted and terminated through an orderly regime known as the international settlements system. Essentially, each country had a single international carrier, often (but not always) operated by the government of that country. This international "flag carrier" was usually the national posts, telephone and telegraph (or PTT) administration – often a branch of the communications ministry.

Often called the *International Accounting Rate* regime, the settlements system was (and still is) based on international bilateral agreements among the PTTs. Each international operator would record and track all of the minutes it received from, and terminated for, another operator/PTT. At the end of a finite period (one or more months) the two operators would exchange data on how many minutes they had terminated for each other. If the traffic was balanced on the route, all the minutes counterbalanced each other and no "settlement" payment was made. If, however, Country A sent appreciably more minutes to Country B than it terminated from Country B, country A's operator would be expected to make a settlement payment to compensate for the difference. These payments were denominated (per minute) in an agreed currency or in neutral *special drawing rights* (SDRs) that could be converted into currency later. The per-minute rate was known as the international accounting rate. This system is codified in Article 6 and Appendix 1 of the 1988 ITRs.

This was an agreeably elegant system, as long as the international telecommunications market remained a club of nationalized carriers that also were international cable system operators and members of international satellite consortia.[2] A snapshot of that market in about 1970 would have resembled such a club – just as such a snapshot would have in 1950 (absent the satellite consortia).

3.2 Decades of Change: Liberalization and Competition

The market, of course, did not remain constant. Beginning in the 1980s, and accelerating through the 1990s, wholesale change occurred through the introduction of competition in domestic markets and on international routes. Where before, a country would have a single operator making and enforcing settlements agreements with its single counterpart overseas, now each country began to have multiple operators, all competing with each other to make the best (i.e., least-cost) deal with operators from other countries. This was permitted by Article 9 of the 1988 ITRs. Long accustomed to an orderly universe, regulators now began to get busy preventing what they feared would be unfair business practices – attempts to corner the market on particular routes.

One potential issue was known as *whipsawing* – the idea that a large, monopolistic foreign operator could force a smaller, competitive carrier into agreeing to a non-advantageous accounting rate or termination terms. Lacking market power, the smaller operator would be forced to submit to the

[2] There were some exceptions to national ownership, such as in the United States, where the monopoly international carrier was AT&T, the "long distance" arm of the integrated Bell System.

dictates of the monopolist on the other end of the route. Similarly, any competitors would be forced to go along with those terms and rates or face being denied any return traffic from the monopolist. This would negate any positive effects of competition in the country that had liberalized international service, heightening the market power of the foreign operator. The flip side of this was the fear that one operator on a competitive route would make a secret, non-disclosed agreement or "special concession" to the monopolist that would not be known by, or available to, other competitors on the same route.

In the context of the ongoing international accounting rate system, national regulators struggled to contain and even understand the machinations of operators – new market entrants and old national flag carriers alike – to gain commercial advantage in newly competitive environments. And it was precisely at this time that alternative calling procedures exploded onto the scene.

3.3 Targets of Arbitrage

The liberalization of some international service markets in the 1990s began to establish arbitrage opportunities for operators. As competition began to develop, arbitrage was fueled by wholesale pricing differences, just as voice minutes of use (MOUs) became increasingly commoditized. This meant that operators could lower their underlying network costs by taking advantage of resale opportunities and routing traffic through the lowest-cost routes. This lowered their marginal MOU costs, allowing them to lower prices for retail minutes charged to consumers. And that translated into market share.

Market pressures began driving operators toward alternative calling mechanisms. Established operators took advantage of legal opportunities (e.g., country direct calling cards and reverse billing), and, wherever possible, such grey market mechanisms as re-file and international simple resale (ISR). ISR was increasingly legal in several jurisdictions, including the United States, which established a policy based on reciprocity. According to this policy, countries that liberalized their own international service markets found that their operators could compete in the US market, and routes to those countries were subjected to less rigorous scrutiny. In addition, the US Federal Communications Commission actively encouraged US operators to negotiate significantly lower international accounting rates. Operators in those countries that took the hint were likely to be the beneficiaries of much larger traffic flows coming from the United States. In essence, the US and other liberalized countries hung out their shingles as low-priced markets in which to set up international gateways for hubbing to third countries – in other words, ISR and re-file havens (all totally legal in those countries).

Meanwhile, newer or less established international operators set up call-back operations (often providing US dial tones). The net result was to drive down the international accounting rates on international routes and to make international voice calling more affordable for consumers. This trend, which worked to an average reduction of 15% per year for the period 1988-2009, was documented by the ITU[3].

Not surprisingly, many international operators saw the effect of rising competition as a threat – and so did their regulators. What liberalized-market operators viewed as big, fat, arbitrage opportunities to by-pass high international accounting rates, many governments saw as an insidious effort to undercut painstakingly constructed rate regimes that helped to support domestic infrastructure build-out programs.

[3] See http://www.itu.int/en/ITU-T/studygroups/com03/Pages/hs-acctrate.aspx

Often, international direct dialing was a service used in developing countries mainly (if not exclusively) by business elites. These elites (many of them deriving incomes from multi-national corporations or institutions) were thought to be more capable and willing to pay higher rates than were users of local, domestic services. The policy choice was one of using the higher-priced, elite international services to cross-subsidize the local services being marketed to farmers and shop-keepers. This was particularly seen as necessary for wireline telephony, which entailed large up-front and sunk infrastructure costs that could not be recovered at retail rates that farmers and shopkeepers could afford to pay.[4] In addition, international services were often seen as suitable targets for fees and taxes to supplement regulatory fees in domestic markets – further adding to the prices and costs for terminating calls in those countries.

Alternative calling procedures flourished, essentially, because international calling rates (including underlying settlement fees, taxes, regulatory fees, etc.) on many routes were artificially high – and kept that way for policy reasons. Alternative calling mechanisms became simply the modes in which business flowed downhill, away from higher costs and higher rates, and toward grey markets and off-the-books operators. Those operators that did not – or could not – engage in routing and marketing innovations simply watched that business flow through their fingers and out to sea.

For their part, operators in liberalized countries felt they were being forced to pay inflated rates to terminate calls in many countries. Their customers in the developed economies originated far more calls – often by orders of magnitude – than did consumers in developing countries. This gradient only got larger over time as retail prices dropped in developed markets and remained high in the developing countries. Put simply, international calling became more affordable in liberalized markets, so people made more calls. Where it stayed expensive, there were fewer calls being originated.

So, traffic on these routes tended to be woefully imbalanced, resulting in consistently large settlement payment transfers from developed economies to developing ones. Indeed, the ITU estimated that between 1993 and 1998, the net flow of settlement payments from developed countries to developing ones amounted to something like $40 billion.[5] Meanwhile, the operators in developed countries were facing increasing retail and wholesale competition from each other and from the call-back operations. By the mid-1990s, they were telling their regulators they could no longer sustain tremendously large and lop-sided settlement transfers to operators on the non-competitive ends of international routes. From their perspective, the international accounting rates had become unsustainable and international settlement payments were for chumps. They had every economic incentive to engage in what developing country governments viewed as “by-pass.”

4.0 The Rise of the Internet

By the end of the 1990s, of course, there was another, much faster growing alternative avenue for routing traffic and, eventually, for placing calls: the Internet. That growth was enabled by Article 9 of the 1988 ITRs. The use of packet-switched transmission via Internet Protocol (IP) is not the same thing

[4] Rate cross-subsidization is not confined to developing countries, of course. Rather, it has been a longtime feature of most telecommunications markets – particularly ones in which the “natural monopoly” principle dictated a unitary market for a single infrastructure provider and where the cost of providing universal coverage is far higher for low-density rural areas than it is for dense urban centers.

[5] Data from ITU-T website at http://www.itu.int/ITU-T/studygroups/com03/accounting-rate/index.html#1, downloaded 15 March 2012.

as “Internet telephony.” A far greater use of IP is, of course, the routing of data – which remains more common than what we now call Voice over IP (VoIP). With the rise of the World Wide Web (as it originally was known), Internet data traffic began to grow rapidly, a trend that continued to accelerate into the new century, despite the recession of the early 2000s in the global information and communications technology (ICT) market.

4.1 Least-Cost Routing

From early on, operators began to use IP to transmit voice traffic over backbone networks and undersea cables. Using a gateway switch, they could receive circuit-switched MOUs from the PSTN and translate them into packets for least-cost routing, often using international private lines or leased circuits. The traffic could then be converted, through a gateway on the other end of the route, back to circuit-switched calls and terminated as normal voice traffic. This traffic did not necessarily mean any kind of grey market was occurring. It just meant that the international trunking section of a call could be done more cheaply via IP long-haul infrastructure.

IP routing did mean, however, that voice traffic could “disappear” into date streams and be routed through leaky PBXs and onto the PSTN, masking its origination and by-passing the international accounting rates regime. At least initially, voice packets were difficult to detect when they were masked as data, particularly if they were routed through the “dirty Internet.”
Routing voice traffic over the Internet (as opposed to a dedicated international private-line facility) usually took a toll, however, in terms of quality (due to the fact that individual packets travel through the IP network at differing speed). “Internet telephony” was often an exercise in frustration, complete with dropped calls, voice distortion and overall horrendous sound quality. Standard voice traffic continued to have a vast advantage over IP telephony purely because of its better quality and wider accessibility.

4.2 VoIP

That began to change in the 2000s as increases in bandwidth minimized the time delays in the transmission of IP packets. Voice over IP transmission emerged, eventually, as a viable service to rival standard, circuit-switched international direct dialing. Companies such as Skype (internationally) and Vonage (in the domestic US market), were able to offer a pure IP conduit as a medium to carry traffic, without the need to route and convert traffic via gateways to circuit-switched minutes. In the process, they began to market customer premises equipment that could attach to a computer or modem, allowing computer-to-computer IP calling, or even converting calls to and from IP at the desktop, allowing the use of standard telephone handsets.

Again, here was a way to originate and terminate calls outside of the standard accounting rate system. Technically, at least, VoIP represented another alternative calling mechanism. Meanwhile, the voice quality steadily improved, making it VoIP a service that, for the first time, could rival circuit-switched telephony in terms of quality, even with packets routed over the “dirty Internet.” In contrast with international call-back, VoIP was not always seen as a threat to the PSTN. Perhaps learning from the experience of the previous decade, operators and governments in some countries embraced VoIP, seeing it as a technology that could not simply be stuffed back into the bottle.

This did not mean that regulatory frameworks were prepared for VoIP as a mass market service. Questions arose, for example, regarding emergency calls ("911" in the USA) and legal interception. Some jurisdictions took the view that all voice services had to meet the same regulatory requirements, while others felt that regulatory requirements could be relaxed, to some extent, to favor new technologies. So VoIP was not always required to conform to existing regulatory requirements that had been promulgated for circuit-switched telephony.

As a result of alternative calling (considered broadly), what had been an established market in 1990, dominated by longstanding PTT operators, had become by 2005 a complex "network of networks" that blurred the previously distinct lines between telephony and data services, between the Internet and the PSTN, and between "official" and unofficial, grey-market service offerings. From the end user's point of view, it became easier and cheaper, in many settings, to make international calls. But the regulatory world did not take the changes as well. In fact, in many ways, the regulatory response was fractured, if not atomized, from one country to the next.

The next sections of this paper will explore the effects of alternative calling procedures – both for consumers and governments -- in today's international telecommunication environment.

5.0 The Response to Alternative Calling

At times, this paper has referred to the development of alternative calling mechanisms in the past tense, and indeed, even many policy analysts in developed economies appear to believe that the era of call-back service, re-filing and other practices ended with the new century. Yet a quick Google search will easily turn up websites advertising call-back offerings, many of them adapted for mobile phone calling and triggered through texting or logging onto a website account. Indeed, high rates for international mobile roaming appear to have given arbitrage a new lease on life. Commonly available, easily downloaded smart phone apps allow users to make international calls using WiFi hotspots anywhere in the world. Why have alternative calling mechanisms persisted, despite efforts to close off arbitrage opportunities? What effects have they really had over the years?

5.1 Government Reactions to Alternative Calling

In keeping with the varied pace and approach to liberalization throughout the past two decades, there has been no single approach to regulating alternative calling practices. Not only have different types of mechanisms and services been addressed separately, some governments have taken almost diametrically opposite tacks in responding to these marketplace changes.

A case in point is the varying treatment given by different governments to international call-back operations, on the one hand, and VoIP, on the other. Early reaction to call-back was (and still is) almost wholly negative. As of 2 May 2005, 114 countries and territories had informed the ITU that both incoming and outgoing call-back practices were prohibited in their jurisdictions. The list literally extended from Afghanistan to Zimbabwe.[6] There were, however, 35 countries that had allowed call-back services. These were predominantly in North America, Europe and the Asia-Pacific region, but the group also included El Salvador, Guatemala, St. Vincent and the Grenadines and Tajikistan.

[6] See ITU website, http://www.itu.int/ITU-T/special-projects/callback/index.html, downloaded 15 March 2012.

By contrast, data reported to the ITU for 2004-2009 indicated an almost mirror image with regard to VoIP liberalization. At the end of that period, 92 countries allowed VoIP while only 49 banned it outright; the remainder either had no regulatory framework for VoIP or allowed it only in a wholesale or restricted form. [7] Moreover, the number of countries "legalizing" VoIP doubled over the period, from 46 in 2004 to 92 five years later.

To help understand the different regulatory reactions to call-back and VoIP, it is important to parse what they have in common, and where they differ. The biggest commonality between these alternative calling mechanisms is their basic effect: they remove minutes of use from the standard accounting system between two countries, while offering lower-cost services to consumers. The impact on incumbent operators is to reduce the number of inbound, circuit-switched minutes of use (MOUs). This potentially lowers the revenues of established international service providers, as well as any potential government tax or fee revenue. To that extent, both call-back and VoIP services can be considered alternative calling. And yet, VoIP is increasingly coming in out of the cold, to be recognized and regulated alongside circuit-switched telephony. Call-back is not achieving the same level of redemption. Why?

Some factors that may be influencing divergent treatment of these mechanisms include:

- *Timing* – Call-back services came on the market much earlier than did VoIP, encountering a much greater backlash against what was, at the time, a more monolithic traditional accounting rate system.
- *Broadband technology* – Call-back originated as an arbitrage based on signaling technology, making it appear much more like a "subterfuge" of the logical process of originating a call. By contrast, VoIP grew out of the growth of the Internet, making it inescapably intertwined with many countries' efforts to promote broadband networks through lighter regulation. In non-technical terms, call-back service is a small advertisement in the back of a magazine; VoIP is a *killer app* – there could not be a much greater gap in panache between two different technologies being driven by the same market demand.
- *Network effects* – Some forms of call-back are recognized as a source of potential harm to the network infrastructures in other countries. Some forms of call-back involve continuous signaling bombardment of the network to achieve a more real-time connection (rather than waiting for an actual "call back" from the third country). The potential for tying up international circuits is perceived as harmful, particularly on "thin" routes to developing countries, where international network capacity remains a vital issue.

In a larger context, then, VoIP can be characterized as an augmentation to telecommunications technology. If it is made legal, existing network operators can incorporate it into their own suite of services, lowering their costs and bringing in new customers. Call-back, on the other hand, appears entirely dilutive of market share and potentially damaging to the PSTN. No existing operator would participate in a scheme that effectively subtracts revenues while tying up international circuits, all without providing any incentive to build broadband network infrastructure. Put succinctly, VoIP can be seen as transcending arbitrage -- as a building block of future broadband services. Call-back has a much greater "image problem."

[7] See Biggs, Philippa, "Voice over Internet Protocol: Enemy or Ally," Discussion Paper presented to the Global Symposium for Regulators, ITU, 2009, p. 4.

That said, operators at this juncture do have methods of detecting or "sniffing" VoIP traffic, using a sophisticated filtering technology known as *deep packet inspection (DPI)*.[8] There is some evidence that governments may engage in DPI to detect VoIP where it is illegal. Moreover, operators themselves may be using DPI to detect or degrade VoIP traffic, along with peer-to-peer (P2P) transmissions.[9] According to a statement by the Body of European Regulators of Electronic Communications (BEREC), reporting preliminary findings of a review of traffic management practices:

"The most frequently reported traffic management practices are the blocking and/or throttling of peer-to-peer (P2P) traffic, on both fixed and mobile networks, and the blocking of Voice over IP (VoIP) traffic (mostly on mobile networks, usually based on specific contract terms). When blocking/throttling is implemented in the network, it is typically done through deep packet inspection (DPI)."[10]

This puts the issue squarely into the discussion of *network neutrality* in many developed economies. That is, should operators be allowed or trusted to engage in traffic management techniques that may degrade the service offerings of their commercial rivals? Or, conversely, should regulators prevent operators from managing their traffic in a way that allows optimal use of their own networks? VoIP is at the heart of this ongoing debate over open access to data networks.

5.2 The ITU Membership's Reaction to Alternative Calling

The ITU's Telecommunication Standardization Sector has addressed the questions posed by alternative calling mechanisms in two ways: directly and indirectly. Reflecting the reactions of its member governments, the ITU has on its books several documents directly dealing with alternative calling:

- ITU-T Recommendation D.201 – This recommendation on "General Principles Regarding Call-Back Practices" was approved on 13 December 2002. It defines call-back as "an alternative calling procedure where the call is initiated in the country of the caller, but call set-up and billing data collection take place in the network of a country other than the home country network of the caller." The recommendation calls on ITU-T to continue to update the list of administrations that prohibit and allow the practice. ITU-T Group 3 decided, however, at its 12-16 September 2005 meeting, to discontinue the collection and publication of this information.[11] Moreover, it calls on governments that allow call-back to restrict its provision into countries where it is banned. Governments of countries in the latter group should take "all reasonable measures" to stop call-back practices within their territories.

- ITU-T Resolution 29 – First enacted by the World Telecommunications Standardization Assembly (WTSA) in Geneva in 1996, Res. 29 was updated in Montreal in 2000 and then again in Florianopolis, France, at WTSA 2004. It notes that call-back procedures are legal in some countries but illegal in others. It also establishes that some call-back practices – "constant

[8] DPI is used for other purposes, including by intelligence or security agencies to screen data traffic, and by ISPs for traffic management (i.e., to prioritize delivery of packets for applications that may be more sensitive to disruption or "jitter" – such as VoIP).

[9] See "Euro Watchdog: Telcos ARE Strangling VoIP and P2P Traffic," posted 16 March 2012 and downloaded 27 March 2012, at http://www.theregister.co.uk/2012/03/16/eu_regulator_reports_on_euro_operators_traffic_management_policies/

[10] BEREC press release, 9 March 2012, downloaded at http://erg.eu.int/whatsnew/index_en.htm

[11] See http://www.itu.int/ITU-T/special-projects/callback/index.html

calling (or bombarding or polling) and answer suppression" – may harm the PSTN. All regulators and governments are urged to take reasonable measures, within national legal frameworks, to "suspend" any such harmful methods or practices.

- ITU-D Resolution 22 (Istanbul, 2002) – This document requested that governments allowing alternative calling procedures respect the decisions and regulations of other administrations that did not permit them.

- ITU Plenipotentiary Resolution 21 (Marrakesh, 2002) – This document urged administrations to implement ITU-T recommendations designed to limit negative effects of alternative calling procedures on developing countries. It also urged countries to respect other countries' prohibitions on alternative calling – a principle reflected in ITU-D Res. 22, as well.

In addition to the attempt to set principles directly, the ITU has also responded to the international traffic conditions that essentially set the stage for arbitrage – the imbalance between costs and prices in international calling (particularly the inflated international accounting rates). As early as 1991 (three years after the last revision of the ITRs), ITU-T Study Group 3 began to review the international accounting rate system. In ITU-T Recommendation D.140, SG3 articulated the principle that international accounting rates should be "cost-orientated," meaning that they should reflect the underlying costs of terminating calls in each country.[12]

Still, the ITU found that during the early to mid-1990s, the accounting rates fell only marginally. Between 1992 and 1996, the annual decline in accounting rates was just 4 per cent.[13] That rate picked up speed only after 1996 (12 per cent annually) and then 1998 (more than 20 per cent, per year). By this time, the ITU had taken further action, joined by some administrations – particularly the United States. At the close of 1998, SG3 approved a revision to ITU-T Recommendation D.150 that promoted three different ways of paying for international call termination:

(1) The *termination charge procedure* – allowing operators to set a single charge for call-termination;
(2) The *settlement rate procedure* – allowing operators to negotiate cost-oriented (and therefore potentially asymmetric) rates according to the route; and
(3) Any *commercial arrangement* – allowing operators to work out any call-termination agreement they could through bilateral negotiations.

In effect, this was a recognition that the hegemony of the standard international accounting regime was over. In part, the ITU was taking the lead to guide the development of more cost-based rates. But it was also responding to market reality – a reality in which the ITU acknowledged that as much as half of all international traffic was running outside of the international accounting rates system by the end of the decade.[14]

5.3 The Assault on High Accounting Rates

[12] See ITU-T summary at http://www.itu.int/ITU-T/studygroups/com03/accounting-rate/index.html#1
[13] Ibid.
[14] Ibid.

At least one country, the United States, was unwilling to wait for the ITU's reforms of the accounting rate system to take hold gradually. One of the first countries to authorize wide-open competition on international service routes, the US had early on implemented what it called an International Settlements Policy or "ISP" to govern how multiple American operators would deal with monopoly foreign operators. The ISP tried to avoid whipsawing by requiring all US carriers to agree to the same accounting rate. US carriers also were empowered to receive US-inbound traffic from foreign carriers in the same proportion as the outbound traffic they generated. This would help avoid a situation in which foreign monopoly operators might steer traffic toward a particular US counterpart that offered preferential treatment. And US operators were placed under a "no special concessions" rule that barred any off-the-books exclusive arrangement with a foreign operator that would preclude competition.

This engineering of the international service market may have helped foster the development of a competitive international service market in the US, but the resulting competition did little to take the air out of the foreign administrations' accounting rates. Suffering from a net outflow of settlement payments, US operators sought help from the Federal Communications Commission (FCC), which in 1997 authored a brand new policy to force down international settlement rates. Called the "Benchmarks Policy," the FCC's rules set per-minute rates (i.e., benchmarks) essentially as price ceilings for US operators to negotiate with foreign counterparts.[15] US operators were instructed not to pay settlement rates above these price caps. To sugar-coat the pill, the FCC set the original benchmarks above what it deemed to be the true call-termination costs, and it established classes of routes based on national "income" level – a rough nod to the principle that developing countries might have higher call-termination costs (based on fewer network economies of scale and high sunk costs) than did developed countries.The initial benchmark rates ranged from USD 0.15 per minute for "upper-income" countries to USD 0.23 per minute for lower-income ones.

Needless to say, most other countries responded negatively to what they saw as a unilateral attempt by one country's national regulatory authority to dictate price caps on international settlement rates. Nevertheless, the FCC claimed in 2011 that its Benchmarks Policy had worked – at least from its perspective. From a net settlements outflow of $5.6 billion in 1997, the annual outflow had declined some 36 per cent, down to $3.6 billion, in 2009.[16] This occurred over a period when U.S. – billed MOUs increased by 250 per cent, the FCC said. Those MOUs jumped from 22.8 billion minutes in 1997 to 72.9 billion minutes 12 years later.[17]

Clearly, by the end of the first decade of this century, a large whammy had been put on the arbitrage target that the formerly monolithic international accounting rate system had presented. The arbitrage began with alternative calling mechanisms such as call-back in the 1990s and continued with Internet-based routing and consumer services in the 2000s. The liberalizing countries, led by the US, intervened in the market, not only to legalize the alternative calling procedures, but also (in some cases) to directly deflate high accounting rates. And the ITU sought to moderate the rapid decline in settlements by protecting operators from the worst abuses of alternative calling, while setting expectations and guidelines for implementing "cost-orientated" rates. So if the arbitrage opportunity is gone (or at least reduced), why do we still need alternative calling mechanisms?

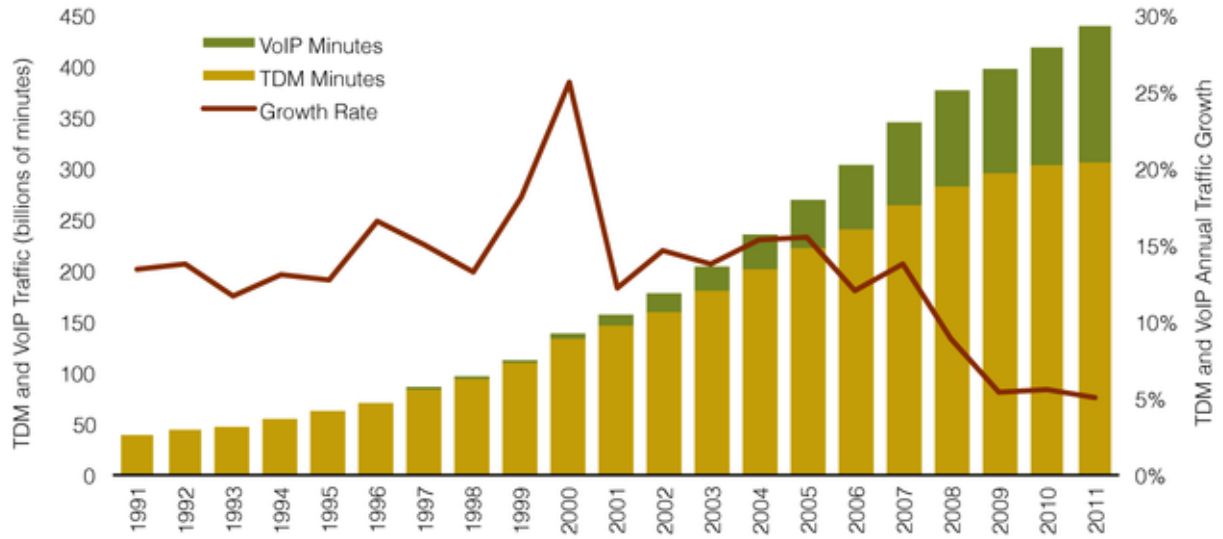
[15] See Federal Communications Commission, "In the Matter of International Settlements Policy Reform," notice of proposed rulemaking in IB Docket No. 11-80, (FCC 11-75), rel. May 13, 2011, paragraph 4.
[16] Ibid., paragraph 5.
[17] Ibid.

6.0 Present-Day Effects of Alternative Calling

The advent of alternative calling mechanisms has not caused the volume of international traffic to shrink, although the rate of continued growth has slowed from a peak of more than 25 per cent annually in 2000 (just before the "dot-com" recession of that year) to about 5 percent in 2011. The growth rate is clearly sensitive to the overall global economy: the rate was nearly 15 per cent in 2007, the last full year before the most recent global recession (See Figure 3). Furthermore, not surprisingly, TeleGeography reports that VoIP traffic is growing more rapidly than direct international dialing, but that both together totaled almost 450 billion minutes of use (MOUs) in 2011. In 1991, at the very dawn of alternative calling mechanisms (of all kinds), that figure stood at just under 50 billion MOUs.

If this is the case, it becomes hard to argue that alternative calling has had a major negative impact on the international telecommunication service market, at least in terms of traffic volumes.

Figure 3: Growth in International MOUs, 1991-2011



SOURCE: TeleGeography

The issue of whether alternative calling has had a major impact on developing countries or infrastructure development is harder to parse. In a 2003 study, Syracuse University researcher Martha Garcia-Murillo carried out a statistical analysis of the impact of "Internet telephony" (i.e., VoIP) on the deployment of telecommunications infrastructure.[18] Among the factors the study noted was that operators and regulators have felt threatened by the potential loss of revenues and loss of control over their markets, respectively. But whether the effects were too slight to register, or whether they had been managed effectively, the study concluded that "for developing countries, the results of this analysis show that at least two technologies, call-back and Internet telephony, have not had negative impact on infrastructure. This shows that the effect that these technologies may have on the existing

[18] Garcia-Murillo, Martha, Ph.D., "Assessing the Impact of Internet Telephony on the Deployment of Telecommunication Infrastructure," paper presented to NET Institute Conference at Stern/NYU, New York, December 12, 2003, available at http://www.netinst.org/2003_conference.htm

carriers is, if anything, gradual."[19] Citing the benefits of the Internet, moreover, the study noted that the emergence of Internet cafes had allowed individuals without previous access to land lines or mobile phones to make international calls "at prices 30% to 50% cheaper" than prevailing international service rates.[20]

On the other hand, reports from some operators appeared to indicate that VOIP was taking a toll. For example, FINTEL, the monopoly provider of telecommunication services to and from Fiji, reported a decline in revenues from USD 43.13 million in 2000 to USD 26.03 million in 2004 – a decline it attributed to erosion from VoIP.[21] The Nigerian operator Nitel, estimated in 2004 that, before it reduced the price of international calls that year, some 90 per cent of international calls were being carried through non-settlement means.[22] In Nepal, a "crackdown" in VoIP "by-pass" (illegal in that country), reportedly led to an increase in the number of standard IDD minutes recorded at international gateways in 2011. Nepal Telecom reported that minutes increased from 28-40 million MOUs per month up to more than 50 million MOUs. Other operators reported similar increases. The operators calculated that they had been losing more than USD 6 million in revenues every month.[23]

VoIP aside, some developing countries have, also cited problems with outright fraudulent use of SIM cards and Calling Line Information (CLI). Ghana, for example, has reported significant problems with SIM boxing and has taken action to try to choke off the flow of illicit SIM cards into the hands of what it views to be perpetrators of fraud. On 3 March 2012, operators deactivated more than 1.5 million unregistered SIM cards in response to a government initiative to crack down on SIM boxing, which the National Communications Authority (NCA) said was costing the government an average of USD 5.8 million in taxes per month in 2009. That year, the government enacted the Electronic Communication Amendment Act , which set the international call termination charge in Ghana at USD 0.19 cents, of which 0.06 cents was due to the government as a tax for national development. Critics alleged that the rate was too high relative to domestic rates and when compared to termination rates in other countries. Nevertheless, NCA made it clear that operators would be forced to pay the USD 0.06 tax on any minutes terminated through unregistered or invalid SIM cards.[24]

Indeed, as this paper suggested on its first page, the next chapter of alternative calling is likely to be written in the broadband mobile market segment. Existing retail rates for international mobile roaming may well present the best opportunity for arbitrage in this century. A report done by Plum Consulting for Telekom Austria, published in October 2011, noted the current drive by the European Commission to

[19] Ibid, p. 31.
[20] Ibid., p. 3.
[21] See Biggs, p. 9.

[22] Biggs, Phillipa, "The Status of Voice over Internet Protocol (VoIP) Worldwide, 2006," International Telecommunication Union, *The Future of Voice* New Initiatives Program, January 2007, p. 13.
[23] Shrestha, Ramesh, "Police Crackdown on VoIP Rings: Telcos' Incoming International Calls Surge," The Kathmandu Post, 8 August 2011, downloaded from http://www.ekantipur.com/the-kathmandu-post/2011/08/07/money/police-crackdown--on-voip-rings-telcos-incoming-intl-calls-surge/224941.html on 23 March 2012.
[24] "Telcos To Be Held Responsible for SIM Box Fraud," Ghanaweb.com, 16 March 2012, downloaded from http://www.ghanaweb.com/GhanaHomePage/NewsArchive/artikel.php?ID=232866&comment=0#com on 23 March 2012.

get a handle on both wholesale and retail roaming rates.[25] Plum found that the biggest problem with non-cost-based rates could be found in the retail voice roaming market, because consumers rarely considered that segment when buying domestic mobile service packages. Meanwhile, it added, "customers have a much wider range of options to choose from for data roaming services than for voice roaming." [26] Plum pointed to data indicating that data roaming prices had declined rapidly from the end of 2007 through the end of 2010.

In addition, an OECD report that year cited no fewer than 10 (legal) substitutes for mobile roaming:[27]

1. Global or Regional SIM cards, allowing seamless use in multiple countries
2. Purchasing a local SIM card
3. Buying a dual SIM Card handset and accompanying services
4. VoIP/data substitutes, using either a mobile or WiFi network
5. Hotel telephones, pay phones or calling shops
6. International calling cards (an old favorite)
7. Using SMS (texting)
8. Satellite phones
9. Landline VoIP
10. Email

Or, one can simply carry multiple phones with different SIM cards, one for each country that he or she normally visits or enters for business reasons. Of course, there are advantages and disadvantages to all of these options – including having to stuff your briefcase with multiple mobile phones. But the clear message is that whenever the market detects an artificially inflated price, it identifies an arbitrage opportunity. Even if the alternatives are imperfect, consumers and operators will have incentives to use them, as long as they are accessible and less expensive – and sometimes even if they are not clearly legal. International mobile roaming rates may be – along with persistently high direct international dialing rates in many markets -- a "red flag" for alternative calling mechanisms.

7.0 Conclusion

In the end, national regulators will have to make the policy determination of whether alternative calling mechanisms' benefits outweigh their risks. Does the benefit of allowing more consumers to make international calls at lower rates outweigh the potential erosion of operators' revenues? Should VoIP providers be required to contribute to universal access and universal service programs? Is it better to ban call-back services or work to eliminate the arbitrage opportunity that makes them marketable – or both?

There is a need for additional research to be done on the economic effects of alternative calling, weighing the direct benefits to each consumer from downward pressure on prices against the potential negative impacts on operators and investment. More quantification is need for both sets of effects, and this data would help regulators to determine how to proceed, particularly since there remains much in

[25] David Black and David Lewin, "The Future of European Roaming: More Competition of More Regulation?" Plum Consulting for Telekom Austria Group, October 2011.
[26] Ibid.
[27] Diaz-Pines, Agustin, "International Mobile Roaming Services: Analysis and Policy Recommendations," OECD Digital Economy Papers, No. 168, OECD Publishing, 2010.

the way of grey area between outright fraud (e.g., SIM boxes), on the one hand, and the advent of newer, more efficient technologies (e.g., VoIP), on the other. Economic analysis should be careful to make distinctions between different types of alternative calling, using the litmus test of whether a given mechanism harms the public switched telephone network, or effectively expands its reach.

Keeping in mind the old adage, "Information wants to be free," the essential question really boils down to this: How can we reduce barriers to new technology and promote consumer welfare, while protecting the foundation of revenues and resources that operators and governments need to bring the benefits of information and communications technologies to all citizens.