

# Minutes Trading in The International Long-Distance Voice Market

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**Abstract** — This paper outlines trends reshaping the business of International Long Distance (ILD) voice minutes trading. Our analysis is centered on Arbinet's business model: an electronic market-place for trading ILD voice minutes. Arbinet, who adopted a minute-based termination model, claims to have switched about  $12 \times 10^9$  minutes in 2005 with 13% growth. Since 2003, other competitors, like Stealth's VPF (Voice Peering Fabric), entered the long distance voice market by introducing different flavors of VoIP (Voice over IP) peering. VPF, who adopted a flat pricing scheme, claims to have routed traffic for an equivalent  $18 \times 10^9$  minutes in 2005 with 750% annual growth. VPF installed its first switch in London late 2005, thus stepping into the ILD arena. The huge growth of flat peering exchanges does not necessarily imply that Arbinet has to give up its minute-based termination model in favor of flat or free peering arrangements. As a matter of fact, the way termination model will change in the future is far to be clear. Drivers that determine who will be fit to survive in this thinly profitable business are thus emphasized.

**Index Terms** — Business, communication system traffic, Internet, international trade, telephone, VoIP.

## I. INTRODUCTION

During the last 15 years, the annual volume growth of International Long Distance (ILD) voice traffic ranged between 13% and 15%, with a spike of 25% in year 2000 [1]. In the same period of time, the average price of international switched calls declined every year, with price erosion between 1999 and 2002 ranging from 15% to 24%.

As a result of these changing factors, the overall ILD business generated a revenue annual growth going from 15% down to -14%. As it can be clearly seen in Fig. 1 [2], the period between 2000 and 2002 was characterized by severely declining revenues, while between 2002 and 2004 the price decline slowed down to 7%, with a traffic growth around 15%, more than offsetting the price decline. Consequently, increasing worldwide revenues were observed both in 2003 and 2004.

Between 1997 and 2001, international VoIP traffic grew at more than 100% annually, while between 2004 and 2005 its growth went down to about 35%. Despite this reduced pace, VoIP traffic is increasing much faster than TDM-based telephone traffic, so that it is acquiring a steadily growing share of the ILD market.

Currently, VoIP is more and more adopted by incumbent and competitive operators as the technology of choice, to replace their legacy TDM-based voice networks, and by customers as the preferred means to make long distance calls at low

cost. At the same time, destinations of VoIP traffic are still mainly based on TDM.

Both in USA and Western Europe, the TDM replacement process is happening very slowly (or not happening at all): fixed operators have most of their customers still connected to a TDM network. These customers are able to place calls using VoIP over DSL-based broadband access, but they are still owning (and paying for) a traditional fixed telephone line, where they typically receive calls, however generated.

In addition, most VoIP-generated traffic is bound for developing countries in Latin America, Asia, Eastern Europe and Africa. This implies that, irrespective of the transport network, the vast majority of international traffic is terminated on the circuit-switched telephone network and that the traditional international termination-rate arbitrage remains a key driver.

Prior to global telecom deregulation, state-owned monopoly operators exchanged off-net calls and settled traffic imbalances with payments, based on bilateral agreements, called *bilaterals*. After the deregulation, the number of carriers increased to several thousands and the 'bilaterals' model was challenged by the concept of *competitive termination*, i.e. the possibility, for an operator in a country, to buy call termination from another (intermediate or destination) operator in another country in the competitive market.

The dramatic increase of mobile traffic (mobile traffic now accounts for 24% and 35% of outgoing and incoming international calls, respectively) has boosted the need for competitive termination [3]. It has been estimated that bilateral vs. com-

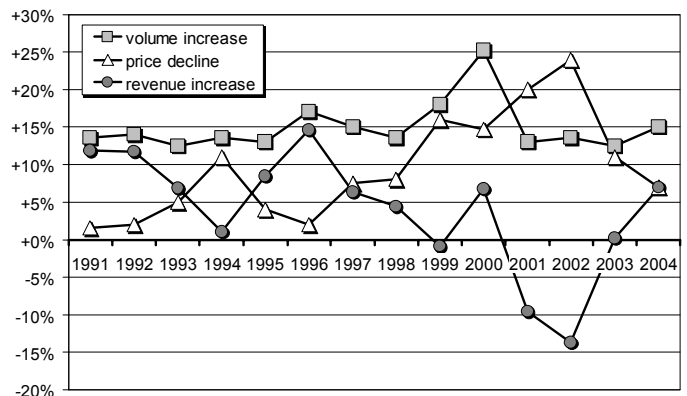


Fig. 1:  
Rate of price decline versus volume growth in the IDL voice market.

petitive market termination accounts for about 60% and 40%, respectively. The competitive market typically provides a lower unit price and a higher flexibility in terms of price-quality options.

Traditionally, buying and selling international wholesale services were done at major industry events or operator-to-operator. Buyers purchased termination for calls to an entire country at one price (the so-called “country proper” price). Switches only needed to read the first digits of the called party number to know where to route an international call.

As the number of players expanded, the number of termination options increased consequently. For example, new carriers competing in the same geographical area differentiate their prices for terminating calls, typically below the country-proper price. Moreover, calls bound to mobile termination are typically billed at higher rate, varying from operator to operator.

Many operators wish to offer different rates depending on time of day. Today, routing mechanisms are more sophisticated: a higher and variable number of digits in the code string are evaluated, to take price-based routing decisions, allowing savings on outpayments to the called operator.

## II. TRADING VOICE MINUTES: THE ARBINET EXCHANGE

During the Nineties the idea of *voice exchange* was conceived, based on replacing the traditional one-to-one infrequent trading process of international voice traffic with a fast day-by-day practice, similar to the one used for trading in the financial markets. This voice exchange, modeled on the financial exchange concept, allows buyers and sellers to place their bids online: transactions are closed when prices match.

In order to make this exchange effective, routing features had to be integrated in the exchange, exempting buyers and sellers from the burden of managing the complexity of calling party codes. Moreover, integrated routing allows to assess the true economic value of a traded route by considering its Answer Seizure Ratio (ASR), i.e. the percentage of incoming calls that are actually answered through the seized connections. The voice exchange was also conceived to manage the settlement between buyers and sellers, underwriting the buyer’s credit risk and relieving the sellers of the possibility to incur in bad debts.

*Arbinet* [4] has materially developed this concept since 1996. It counts 399 members, dealing with an overall transaction volume of  $11.9 \times 10^9$  minutes<sup>1</sup> in 2005, i.e. 4.25% of the total worldwide ILD volume, with an annual growth of about 13%. Members include all ten largest international carriers of the world, tier 1 carriers, tier 2/3 carriers, resellers, VoIP carriers, calling card providers.

Arbinet acts as a hub for international competitive voice traffic trading, routing and settling, thus reducing the complexity of the many-to-many web of inflexible bilateral agreements with one flexible one-to-many relationship. In the legacy routing mechanisms, the originating and terminating carriers have direct relationship, with the country-proper rate of termination

paid by the originating to the terminating carrier. Conversely, Arbinet exchange matches the originating party (buyer) requests with the destination party (seller) offers, on an online trade market. This way, the optimal unitary cost per minute is automatically selected, based on the destination code.

Arbinet makes money out of the voice minute exchange business by charging a transaction fee. Income from buyers is balanced by outpayment for traffic termination to sellers. Net income is thus made of fee revenues.

Fee revenues are access fees (~80%), credit risk fees (~8%, i.e. 1% of trading revenues charged to sellers), membership fees (2% to 3%), other value added services (~10%). It must be pointed out that part of fee revenues (8%) is for credit risk, since Arbinet underwrites the risk that buyers do not pay termination fees, thus relieving the seller of bad debt risks [5].

So far, fee revenues have been 23.4 M\$ (2002), 34 M\$ (2003, +45%), 44.7 M\$ (2004, +31%), 48.8 M\$ (2005, +9%), with an EBITDA margin of 30% in 2005 against 37% in 2004.

In June 2005, the Arbinet share price abruptly fell (-50%), when the company announced a shift in the mix of traded geographic markets during first half of 2005. During this period, the mobile traffic minutes traded on Arbinet exchange increased, with mobile calls having duration often less than 3 minutes. The combination of the shift in traffic mix and increase in mobile minutes led to a decrease in the average number of minutes per call transacted, with minutes growth not keeping the pace with the growth in completed calls. In addition, two large buyers reduced their trading after Arbinet suspended their credit lines.

As it can be noticed, Arbinet business is very sensitive to call duration, traffic mix (mobile vs. fixed), geographic destination of traffic and financial reliability of members, showing the downside of a business model on termination arbitrage.

Originally, Arbinet used to offer anonymous trading only, until many members started requiring non-anonymous termination for segments of their voice traffic. Launched in 2005, a new service was added by Arbinet, giving members a direct connection to fixed and mobile networks, so that buyers may purchase routes from known network operators.

Members are interconnected to the backbone shown in Fig. 2 in one or more points through standard E1 ports and signaling protocols. Buyers needing to send voice traffic to a specific destination use a specific “bid” form where price limit, ASR, type of route and order start/end dates are specified.

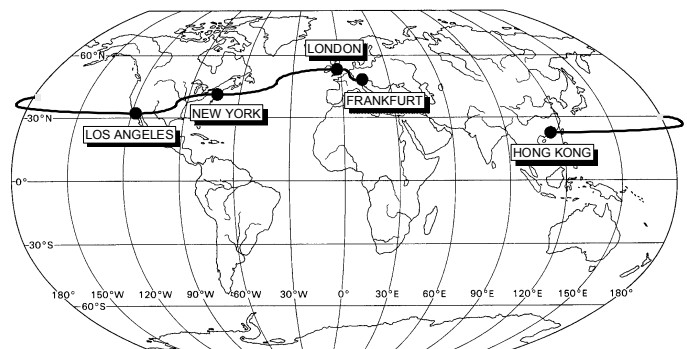


Fig. 2: Arbinet voice backbone.

<sup>1</sup> Stealth recently stated [6] that when Arbinet claims to have had  $11.9 \times 10^9$  minutes, they are counting “in and out (i.e. twice). So they are actually doing 6 billion minutes.”

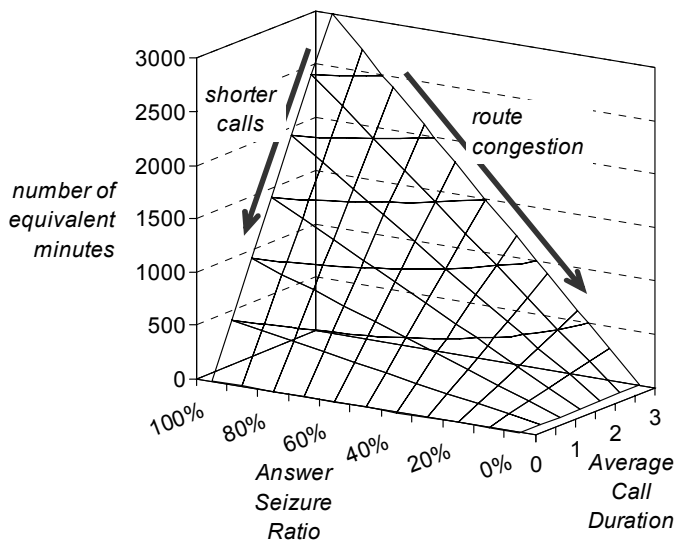


Fig. 3: Number of equivalent minutes on a route for 1000 call attempts.

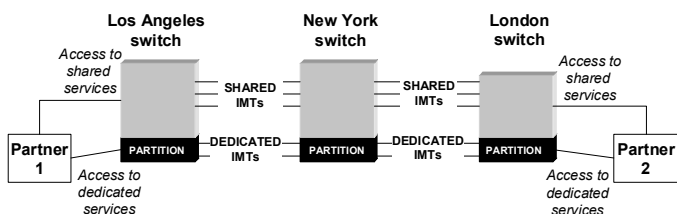


Fig. 4: Global switch partitioning.

Sellers, on the other hand, offer their termination capacity towards a destination using a specific “ask” form, where price limit and ASR are specified.

Buyers can decide to prioritize routing (by destination) based on least cost (“price first”) or highest quality (“quality first”). For measuring the quality of an offered termination route, Arbinet introduced a quality index indicating the number of equivalent minutes a buyer could expect from 1000 call attempts, based on verified data for the sell route, i.e.

$$ASR \times ACD \times 1,000$$

where ACD is the Average Call Duration (Fig. 3).

This indicator gives the actual route quality in terms of routable minutes (i.e. revenue) per call attempt. As an example, two sell routes, with both 48% ASR but 0.9 and 1.4 minutes ACD respectively, provide 432 minutes and 672 minutes per call attempt. ACD varies depending on the type of originating and destination operators (fixed or mobile), as well as based on the geographical destination of traffic.

Matched orders become route plans periodically every few hours. Route plans are automatically loaded into switches, thus making the web real-time trading system concretely effective.

### III. OUTSOURCING VOICE NETWORK AND OPERATIONS

Global partitioning of switches allows Arbinet to allocate capacity for creating dedicated overlay networks between two or more partners [7]. Customers have only to manage the commercial relationships with connected partners and to establish routing policies. The pricing model is usage-based, so

that all competitors’ fees are combined into one simple per minute cost tied to customer traffic volume.

This business model basically provides Arbinet with the capability to outsource voice network infrastructure and operations, giving partners the opportunity to make use of dedicated network resources without incurring in the burden of capital and operational costs to set up and operate their own networks.

### IV. VOIP PEERING IN THE ILD COMPETITIVE MARKET

While start-up providers of VoIP services are creating an end-user expectation of voice calls for free, or at low flat rates, a new breed of peering VoIP exchanges is emerging, which allow service providers to remove middle players along the voice call termination, bypassing voice minutes-based bilateral agreements.

With VoIP calls, there is an expectation that traditional interconnect agreements can be avoided. Just as ISPs can go to IP peering exchanges to find the lowest price for delivering their data traffic around the world, VoIP carriers have the choice of VoIP peering exchanges [8]. As larger LECs convert their customers to VoIP, it is most likely that these carriers will take payment for voice termination over their upgraded networks [9]. At the same time, start-up VoIP service providers push for adoption of a “sender-keep-all” model, with no settlement between originating and destination/transit operators.

Arbinet, who defines itself as “strong believer in payments for services rendered” introduced a new commercial VoIP peering service allowing VoIP service providers receiving a per-minute termination fee for all successful calls from Arbinet’s VoIP and TDM members to their VoIP customers. The service allows sending traffic directly to the destination VoIP customer by exchanging of signaling information between Arbinet and the service provider. In addition to this, Arbinet launched (October 2004) a service in which the principle of global partitioning is applied to VoIP resources like softswitch, gateways and session border controllers, to allow outsourcing a dedicated VoIP network to a virtual operator (Fig. 4).

Since 2003, several competitors have entered the long distance market and started competing against Arbinet and all incumbents in the ILD market.

For example, *Stealth’s Voice Peering Fabric (VPF)* [10] was launched in late 2003. Stealth has installed the VPF across the US and in London, with plans to reach Asia. The VPF is a distributed Layer-2 Ethernet network with the purpose of exchanging VoIP traffic, routing packets rather than switching minutes and charging flat fee per port with no transaction charges.

VPF claims to have switched voice traffic for an equivalent  $2.5 \times 10^9$  minutes in 2004 and  $18 \times 10^9$  minutes in 2005, growing more than 750% in the last year and largely prevailing over Arbinet, at least in terms of traffic volume. While this shows how fierce is the competition that Arbinet had to face in 2005, substantial differences between the two business models exist.

Firstly, Stealth mainly plays in the US domestic long distance market, entering the international arena only recently, while Arbinet acts more like an international hub. In terms of business model, Stealth is leaving the interconnected carriers

to make their own commercial agreements, while Arbinet plays the man-in-the-middle role, allowing anonymous trading between buyers and sellers.

From this point of view, Arbinet native business models looks more attractive for TDM-based providers willing to completely outsource the burden of negotiations, settlements and credit risk at international level, while being less interested in knowing counterpart's credentials in the clear for quality assurance purposes. Arbinet recently introduced a service allowing sellers to offer their routes in the clear so that buyers can purchase high-quality branded routes from known network operators.

Another major difference is that Stealth's VPF is natively IP-based, while Arbinet is natively TDM-based and has started providing soft-switch-based VoIP services since October 2004 only. VPF is then benefiting mainly from the global erosion of TDM voice by VoIP, while Arbinet performance (only +13%) reflects the organic growth of traditional voice (mainly due to mobile) plus a share of the global VoIP growth (VoIP accounted for 27% of the total Arbinet traffic during 2005).

One of the major reasons usually claimed for introducing VoIP is the high flexibility in configuring end-to-end routes compared to TDM solutions, due to the possibility of centralizing routing intelligence in soft-switches. Arbinet is able to refresh its routing tables every four hours though, claiming also to have a scalable operations model. Hence, while VoIP can be regarded as a facilitator for new peering exchanges, the Arbinet case demonstrated the possibility to successfully implement voice exchanges using legacy TDM technology only.

Finally, VPF business model is based on a flat port fee, while Arbinet is sticking to the traditional minute-based settlement model also for VoIP termination.

*Infiniroute* [11], founded in second quarter of 2004, handles TDM-to-VoIP protocol conversion and routes VoIP calls over the public Internet, using its carrier-grade routing engine. It has PoPs in London, Madrid, New York and Hong Kong, and connects with some of the largest Internet backbone carriers for route diversity. Carriers make their own commercial arrangements, while *Infiniroute* charges a flat fee per port.

*Xconnect* [12] was launched in March 2005 to interconnect VoIP-over-broadband providers. *Xconnect* carries out peering at Layer 4. It offers ENUM look-up and interoperability services, to ensure that VoIP providers with different interpretations of the SIP stack, or VoIP providers using other protocols such as H323, can interconnect. It also provides security services and supports both settlement (without underwriting risk) and settlement-free minutes trading. *Xconnect* currently peers across the public Internet, but has plans to move towards a Layer 2 interconnection model.

*Interoute's Arena* softswitch-based peering platform [13] was launched in second quarter of 2005, aside its VoIP switch partitioning service *Virtual Voice Network*. *Interoute* saw a market opportunity to launch a new offering on its softswitch platform, basically outsourcing VoIP operations. *Interoute* claims that its advantages are that carriers have the flexibility to make their own commercial arrangements, giving them more control over the quality of the termination. *Arena* has

been now launched in seven countries, including Hong Kong, Singapore, USA and Europe.

## V. WHERE IS ILD VOICE MARKET GOING?

The ILD market is undergoing a process of profound transformation. Several new players are facing the challenge to gain traffic and revenue shares in a business that, since 2003, has been growing again (although still thinly profitable). The ILD market used to be traditionally dominated by incumbent players with TDM-based technologies, adopting a consolidated country-based settlement model. This is all bound to change and the transformation can be regarded from several viewpoints.

On one hand, the ever-growing usage of VoIP by broadband end-users is clearly indicating the need for replacing TDM-based architectures with VoIP, also for the long distance interconnection market. On the other, it is becoming more and more evident that different ILD players interpret the concept of VoIP peering in different ways.

More specifically, interconnection can take place at any layer of the OSI stack: at layer 2, 4 or even 7 (typically for accessing SIP-based Intelligent Network applications). The higher the protocol layer, the higher is the intrinsic "value" in providing the peering, thus creating different definitions of business model and, more importantly, different revenues.

Thus, on one hand, comparing Arbinet and Stealth's VPF traffic volumes is significant for understanding where the market is going, since both are managing voice traffic. On the other hand, these companies are actually doing two different things: the former switches voice traffic (plus other valuable tasks) internationally, the latter routes packets on an IP infrastructure carrying voice mainly for US domestic market. As VPF is being extended internationally, the two companies will more and more compete in the ILD market.

Another important differentiation between VoIP peering providers is the way voice is carried over IP, either over the Internet or over operator-owned IP networks, thus introducing differentiations in terms of expected quality and cost and allowing international ISP's to enter the VoIP peering game.

The business model adopted by ILD providers is also different depending on the role the provider wants to play in the commercial relationship between the interconnected operators. Some, like Arbinet, want to stay in the middle, acting as clearing-houses in a trading environment, thus acquiring control of the way traffic is routed and priced internationally.

Underwriting the credit risk is an additional source of revenue, particularly appreciated in times of low financial stability and scarce level of trust for unknown operators in foreign countries. Others are leaving interconnected operators making their own one-to-one arrangements in the clear, hence leaving carriers the chance to directly control price and quality.

Leveraging their international switching capabilities, some voice exchanges like Arbinet and *Interoute* outsource voice infrastructures and operations, by providing partners with dedicated network resources and relieving them of capital and operational costs for setting up and operate their own networks.

Clearly, the most important issue is the position taken by the ILD players with regard to the termination model, i.e. minute-based settlement vs. flat or free peering arrangements. Minute-based settlement in an open trading environment has proved to be successful for Arbinet (at least so far), also due to the need of incumbent and competitive national players to preserve their solid revenues coming from voice termination while VoIP transformation is taking place.

In addition, it must be also reminded that, while a large part of originating traffic is being now transferred to VoIP due to broadband access, at the same time most part of calls are still bound to terminate onto TDM networks, due to the slow pace of network evolution by traditional players. So, on one hand, getting rid of the termination settlement is not practically feasible and, on the other, Arbinet is better placed to play in this heterogeneous environment, since Stealth is purely IP-based.

It is important to remark that the principle to make one operator pay for the amount of resources used in the network of another operator (i.e. the time resources are used) still stands, since routing VoIP minutes has a non-null cost [14]. The idea that in a VoIP network the cost of switching one minute is less than the one in a TDM network is widely accepted (although not always verified). The idea that this cost equals zero just "because it is IP" (as someone seems to infer) is clearly a popular misunderstanding.

Therefore, the issue is not whether usage of resources should be accounted for, or not, in the relationship between originating and terminating operators: it is more a matter of how and when this usage should be paid for. If, between two operators, the 'value' of traffic in one direction is equal on the average to the 'value' of the traffic in opposite direction, deciding to go for a free peering arrangement does not impact the profits of the two operators (while clearly impacts their revenues). If the 'value' of exchanged traffic is instead unbalanced, some sort of payment must be done, either flat, against some sort of usage forecast, semi-flat based on usage thresholds or entirely usage-based.

Then, the question actually is whether this termination 'value' is linked to:

- a) the marginal cost for terminating the (voice over) IP traffic onto the destination VoIP network;
- b) the retail revenue associated to additional value-added services carried transparently within the VoIP call (low-cost or free);
- c) the traditional minute-based termination tariff.

For the time being, case c) is dominating the whole voice market. New emerging carriers push for case a), although this is even less profitable than case c), hoping to be able to upsell services (i.e., case b)) in the near future, once they acquired large shares of the voice market. In the meanwhile, huge shares of the voice market are changing hands with fast declining prices.

When calls will be more and more terminated on VoIP endpoints, then the minute-based settlement model based on TDM tariffs will be replaced by a new one, where the 'value' of terminating calls will depend on retail VoIP economics (revenues and costs).

Whether this mechanism will be minute-based or flat it is not understood yet. If a minute-based approach will be dominating also for VoIP, Arbinet will be able to play its role just like it is doing now. Otherwise, it will have to gradually shift to the new paradigm.

## VI. CONCLUSIONS

In this paper, we outlined trends reshaping the business of ILD voice minutes trading. Analysis was focused on Arbinet's peculiar business model: an electronic market-place for anonymous trading of ILD voice minutes. Arbinet reported to have had 4.25% (growing 13%) of the ILD market in 2005. Nonetheless, since 2003, other competitors (e.g. Stealth's VPF), entered the ILD arena by introducing different flavors of VoIP (Voice over IP) peering. VPF claims impressive annual growth rate in terms of traffic volume (+750%).

In our analysis, we concluded that this does not necessarily mean that Arbinet has to give up its minute-based termination model in favor of flat or free peering arrangements. In particular, we highlighted the evolution of Arbinet's business and we pointed out that the large majority of VoIP calls are still terminated onto TDM networks, while how call termination model will change in the future is far to be clear. We emphasized critical issues and drivers that will determine who will be fit to survive in this thinly profitable business.

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