Roaming Service Quality and Interoperability: Keys for the Business Model

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ABSTRACT

Roaming in mobile telecommunications is defined as a customer's capacity to make and receive calls with the same number and equipment the customer has when traveling abroad by temporarily using another operator's network (visited network). Roaming is a service that brings together the interests of a wide range of players in the region: governments, manufacturers and suppliers, operators, marketers and users.

Over the past few years, roaming has grown as a result of globalization and the increased mobility of persons. Paradoxically, effective users are few and redundant, comprising a market segment that is price inelastic. After a decade in Latin America, the roaming service market constitutes an untapped business opportunity, with potential income earnings that the region's operators have left untouched. Its natural market is comprised of international travelers, although its use is restricted to VIP postpay customers who constitute a niche with substantial profit margins, but whose magnitude and impact on total results are not relevant for the overall returns of operators.

The above prevents a clear view of the importance of this market of services for the creation of competitive synergies in regional markets and the promotion of integration, competitiveness, and business activities in the Americas.

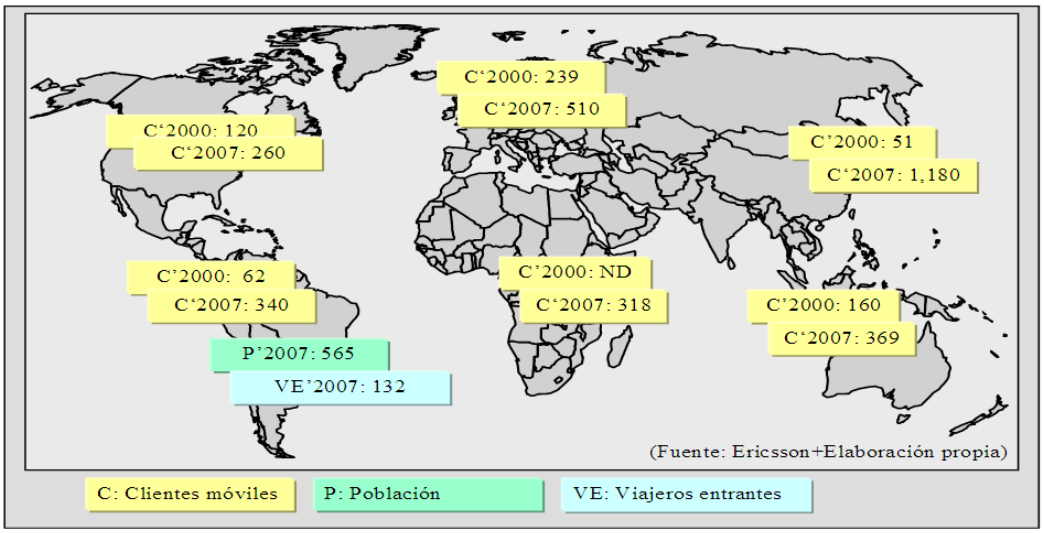
I. BUSINESS OPPORTUNITY

What we're talking about

International roaming is a service for all cell phone subscribers who need to communicate with the convenience provided by mobile telephony when they are traveling outside their country of residence. The phenomenon of globalization and rising world trade with new regional blocs and free trade agreements has led to an increase in the mobility of persons, triggering a spectacular rise in the number of potential roamers.

As indicated in Figure 1, the market of incoming travelers to Latin America is comprised of more than 130 million trips, accounting for 60% of the total population. Since in developing countries 100% own cell phones, it would be possible to assert that every international traveler could become a potential roamer.

Figura 1. Clientes móviles 2000-2007, viajeros y población 2007
En millones



How many we're talking about

To determine market size, below we are presenting an exercise on the *target* of roamers in a hypothetical country A[1] and for Latin America, with data estimated at 2007. Table 1 provides a breakdown of potential roamers and potential income; these estimates are based on a moderate income per minute of US$0.50 and a cost of US$0.20 per call.

Country A has an annual income earning potential of over US$32 million, with a net profit margin of US$24 million. On the basis of this preliminary example, it is estimated that the roaming service market in Latin America could amount to earnings of US$3 billion for international roaming.

Table 1. Incoming roaming market potential in Latin America

In thousand (000)

	COUNTRY A	**Latin America**
Population	28,000	565,145
Cell phone subscribers	10,000	340,366
Incoming travelers from abroad	1,500	131,955
Outgoing travelers abroad	800 (e)	100,000 (e)
Potential for incoming roaming earnings		
Target: 30% incoming travelers	**500**	**43,985**
Outgoing roaming calls (30/roamer)[2]	15,000	1,319,550
Outgoing roaming minutes (60/roamer)	30,000	2,639,100
Incoming roaming minutes (30/roamer)	15,000	1,319,550
Income $ - total minutes (0.50/min)	**22,500**	**1,979,325**
Cost $ Operator visited (0.20$/call)	3,000	263,910
Potential annual margin	**19,500**	**1,655,415**
Potential for outgoing roaming earnings		
Target: 20% outgoing travelers	**160**	**20,000**
Outgoing roaming calls (20/roamer)	3,200	400,000
Outgoing roaming minutes (45/roamer)	7,200	900,000
Incoming roaming minutes (15/roamer)	2,400	300,000
Income $ - total minutes (1.00/min)	**9,600**	**1,200,000**
Cost $ Originating Operator (0.50/min)	4,800	600,000
Potential annual margin	**4,800**	**600,000**
Income $ total annual potential	**32,100**	**3,179,325**
Total potential annual margin	**24,300**	**2,255,415**

An untapped opportunity

Although the number of international travelers is rising, because of various factors the effective use of roaming has been confined to customers with high purchasing power, businessmen, executives, and government officials who make between three and eight trips abroad per year and whose use of roaming is paid for by the organizations they represent. Individual profitability is high, but as a segment it is not very important in terms of integrating the region and does not have any significant impact on the total profitability of operators, who fail to earn a high amount of potential income because they are not gambling on broadening the sector of users.

[1] *The hypothetical country A is a typical country that is representative of an average Latin American country.*

[2] *Average calls/roamer=30; outgoing calls/roamer=20; incoming calls/roamer=10; average minutes/call=3.*

In the first decade of the 21st century in Latin America, the CDMA technology prevailing in the United States is being steadily replaced by the GSM technology prevailing in Europe. One of the causes of this shift was the ease with which GSM is interconnecting networks and providing standardized roaming, but mobile telephony operators have not created the infrastructure to sustain service and many of their executive managers feel it is an added service that is not very attractive being imposed by headquarters and that benefits from very little attention and no investment.

In Latin America, there is the following paradox: a shift in technology along with a huge investment effort (GSM versus CDMA), but no advantage being taken of one of the main benefits of this shift, which is the availability of a highly standardized friendly roaming in GSM.

II. EMERGENCE OF ROAMING IN LATIN AMERICA

Prehistory of international roaming

Roaming service emerged in the nineties along with the growth of analog technology and TDMA. In South America, it appeared with bilateral agreements between operators, where each operator provided a local MIN[3] block so that the other operator could record the number in a second NAM,[4] and by fax the activation would be coordinated for a short period of time. This generated high risk, widespread subscription fraud, and the cloning of equipment.

Afterwards, as part of Bellsouth's globalization strategy, this company implemented a unifier gateway (PARC) that handled interconnection, billing, and fraud control services in the group of operators owned by Bellsouth USA. This roaming facilitated implementation and operation but did away with any chance of individual improvement or bargaining capacity with third parties, and in addition it held access to relevant commercial information about travelers.

During the privatization of telephone operators, Movilnet took the initiative whereby a traffic agreement was signed between cell phone operators, independent of the Bellsouth network; this in turn started up automatic roaming between the operators of Venezuela, Peru, Chile, Argentina, Uruguay, and Brazil and made it possible to organize the first roaming network for the region.

Infrastructure of international roaming

In the late nineties, automatic international roaming between operators of South America was implemented.

Bellsouth's PARC network controlled the complete process of its affiliated operators, in its roaming relationship with the United States. At first, the entry of non-associated operators was restricted so that roaming with other markets of the region was not permitted. In the case of the other network, at first, it was a network of traffic between operators where the interconnection would take place through the gateway permitted between intermediate operators (for example, Chile permitted the transfer from Peru to Argentina and Uruguay). See Figure 2.

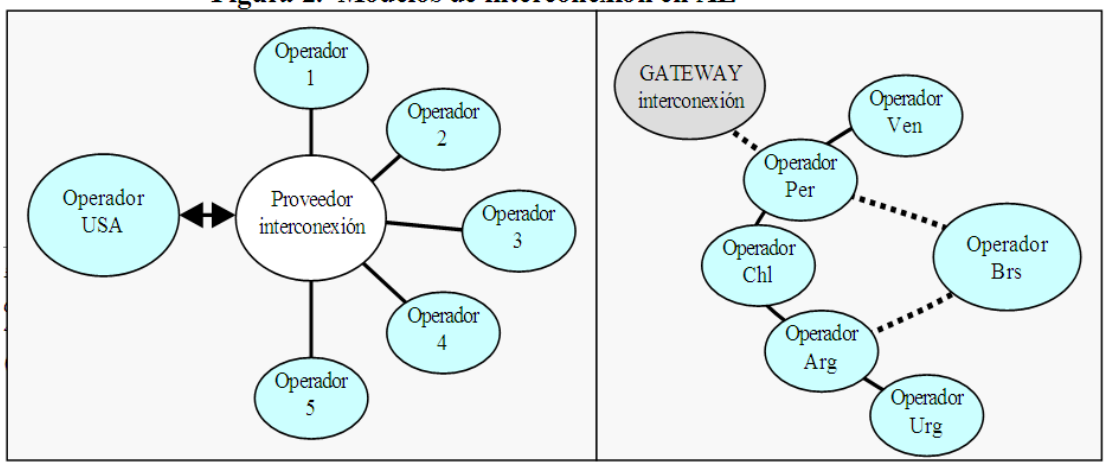
Billing would be done bilaterally using specific formats that were negotiated individually between roaming partners, and the problems of sending traffic information (CDRs of roamers), traffic and rate differences, and contra payments would involve an exhausting and insurmountable bargaining problem. Fraud was frequent and impossible to tackle because of how the contract was drafted, with both the originating operator and the visiting operator avoiding responsibility for improper traffic.

Customer service was conducted using local procedures set by the originating operator; it was costly for the roamer traveler and redundant controls were applied, inhibiting the use of service and focusing on VIP customers.

[3] *MIN is the mobile identification number; it is a ten-digit number assigned by the operator to a cell phone. It identifies the telephone and is used for billing purposes.*

[4] *NAM is the numeric assignment module; it corresponds to specific information about the telephone, which includes the ESN (electronic serial number) and MIN.*

Figura 2. Modelos de interconexión en AL



Roaming with the United States

Interest in expanding international roaming to encompass a larger share of the market in the region at that time was expressed from the very start of service. The operator that promoted roaming between the United States and Latin America was AT&T Wireless, even though the high quality of TDMA technology service prevented the high risk of fraud. Therefore, since 1991, in Europe, the political decision that was made to use one single common technological standard (GSM) for the European Union facilitated network integration and eliminated the possibility of proprietary and incompatible technologies.

With the discussions in the IFAST[5] group, a large share of the obstacles that were preventing the complete launching of roaming on AMPS-based technologies were overcome and resolved. Service was facilitated by outsourcing agreements with GTE-TSI (Syniverse) or Verisign, for signaling, billing, contra payments, and fraud control. With the emergence of CDMA technology appeared the almost insurmountable regulatory, technological, market, and strategic constraints that held back the adequate functioning of roaming.

The greatest lag came from Verizon Wireless (VW), the largest CDMA operator in the United States, which implemented a burdensome and repetitive negotiation process. When VW felt that technological constraints had been overcome and the risk of fraud minimized, it opened up roaming with Latin America. Unfortunately, this action coincided with CW's decision to migrate to GSM and the introduction of TIM-Italy in Latin America, which substantially affected this process.

Because of the countless inconveniences of regional roaming and the conclusive B/C study on migration and updates, Cingular Wireless (AT&T Wireless) took the decision of migrating its technology to GSM, and this move was immediately imitated by the operators of the Telmex network (América Móvil) and operators of the Telefónica Group.

III. ROAMING DEVELOPMENT STRATEGY

Technological development strategy

The development of roaming has taken a different road in the Americas and Europe. The lines of action for growth and consolidation are differentiated by region, country and operator.

In the case of AMPS-based technologies (analog, TDMA, CDMA), their progress has been marked by freedom of choice, where it is felt that aggressive competition between standards and between providers within an identical technology shall lead to higher levels of technological progress. Although it was characterized by considerable initial acceleration, it then led to "proprietary" technologies, which were apparently compatible with technical singularities that prevented its customer operators from using different options within the technological standard. The absence of real competition, monopolistic control, tied supply, and the abundance of "patches" to achieve restricted and deficient interoperability have prevented service from growing.

At the beginning of Europe's cell telephony, the absence of standardization in technology and agreements forced European States to take the important political decision that led to the Global System for Mobile

[5] *Fred Gaechter, Ed Hall, David Crowe, Bernardo Martínez*

Communications (GSM). Over time this technology has become the world market's dominant one (accounting for more than 85% of all users) and the de facto standard for roaming services, because its global reach facilitates interconnection and roaming in voice calls, text messaging, and data communication possibility.

There is an appreciable competitive difference favoring GSM, because the decision to do away with free will in choosing a technology made it possible to boost other options, substantially reducing the costs of manufacturing equipment and terminals.

Business perspective of operators

The vision of roaming and the strategic guidelines applied by operators are highly diverse. U.S. and Mexican operators have spearheaded and sponsored efforts to implement standardized regional roaming with adequate quality. Their stance considers that roaming has a high potential for earning returns and their efforts are aimed at creating a profitable mass market. In the process of implementation, they stress service coverage for their travelers, give priority to growth rather than profit margins, and accept low returns albeit with a lower risk of fraud. All possibility of high improper traffic is avoided.

The operators of South America, in turn, have two positions with respect to roaming: a) they believe it is a value added to mobile service, b) they believe it is a business unit that is responsible for earning its own income. In the latter case, it is possible to deploy a commercial strategy with internal subsidies, charge relatively low rates, and run the risk of defective service. In the latter, a high return is required and the investments that are needed, direct operating costs, and a share of the proportionate costs and expenses must be covered. Both positions have led to the neglect of roaming, no investment to improve service, and the debatable expectation that the new GSM technology will enable a roaming operation that does not require administrative work and does not use up resources or incur costs where there would not be any risk of fraud or deficiency. Experience, however, teaches us that the efficient provision of roaming services is supported by an adequate and holistic adaptation of technology and processes on the part of key areas of results, inside the operators of the proprietary and visited networks.

There are optimistic estimates that point out that the roaming service market could account for 50% of the income of cell phone companies, especially in those countries that receive or are at the origin of greater mobility of persons, whether for tourism or business trips. This holds true for the European market, where the share of roaming can account for over 30% of EU operators with the largest traffic of travelers. In Latin America, however, the historical average points to shares that hardly reach 2% and, in the case of some operators, less than 0.5%. Although it is a less developed market with lower purchasing power, this information highlights the large growth potential for the region's roaming service market.

The absence of a standardized regulatory framework for roaming and the expansion of GSM have led to a growing regulatory vacuum, which is partially filled by agreements promoted by GSMA, which is the organization for the industry of GSM service manufacturers and providers. These agreements offset the lack of supranational agreements and, as a result of its recommendations, the GSMA sometimes takes decisions that would normally be the responsibility of the regulatory agencies of the region's countries.

Pricing and cost strategy

In Latin America, the rating strategy is aimed at covering service costs and adding a profit margin. The cost of roaming has two components: 1) a fixed component, which includes infrastructure costs, rental charges, and administrative management; and 2) a variable component to cover the traffic measured in terms calls or minutes.

The fixed cost is billed by call and is called the *interconnection charge*, the variable cost is billed by minute and is called the *airtime rate*. To the airtime rate is added a *markup* that is higher than the average of the other services in order to provide coverage for the risk of fraud. In addition, the value of international traffic is added, and it is passed on to the long-distance operator.

The components of the roaming rate are indicated in Table 2.

Table 2. Value of a call for the customer
Outgoing call:
Customer rate = (ci + ar*min + ldr*min) * (1+ taxes)
Where:
ci = interconnection charge
ar = airtime rate
Ldr = long distance rate, passed on to the LD operator
taxes = taxes required by law
Incoming call:
Inter-operator rate = (ci + ar*min) * (1+ taxes)
Where:
ci = interconnection charge
ar = airtime rate
taxes = taxes required by law

The new strategy to enhance the effective roaming market is aimed at reducing or eliminating some of the tariff components, which is feasible but comes up against the strategy of "*maximum profits, minimum traffic.*" Table 3 is a simulated example of how an operator bills a roaming partner.

The top individual margin determines implicitly that the operator shall focus on travelers who have a high capacity to pay and who receive a service with few options and a high price.

Table 3. Cost and value of an outgoing call for the roamer: Example of a 3-minute call			
Item	**Cost in US$**	**Rate in US$**	**Margin for OV**
Ci	0.10	0.00	-0.10
Ar	0.15	1.20	1.05
Ldr	0.30	4.50	4.20
US$/call	**0.55**	**5.70**	**5.15**
US$/minute	0.18	1.90	1.72
Tax		0.22	
US$/minute+tax		1.90	
US$/call+tax		**6.95**	
		Paid x roamer	

Traveling customer satisfaction

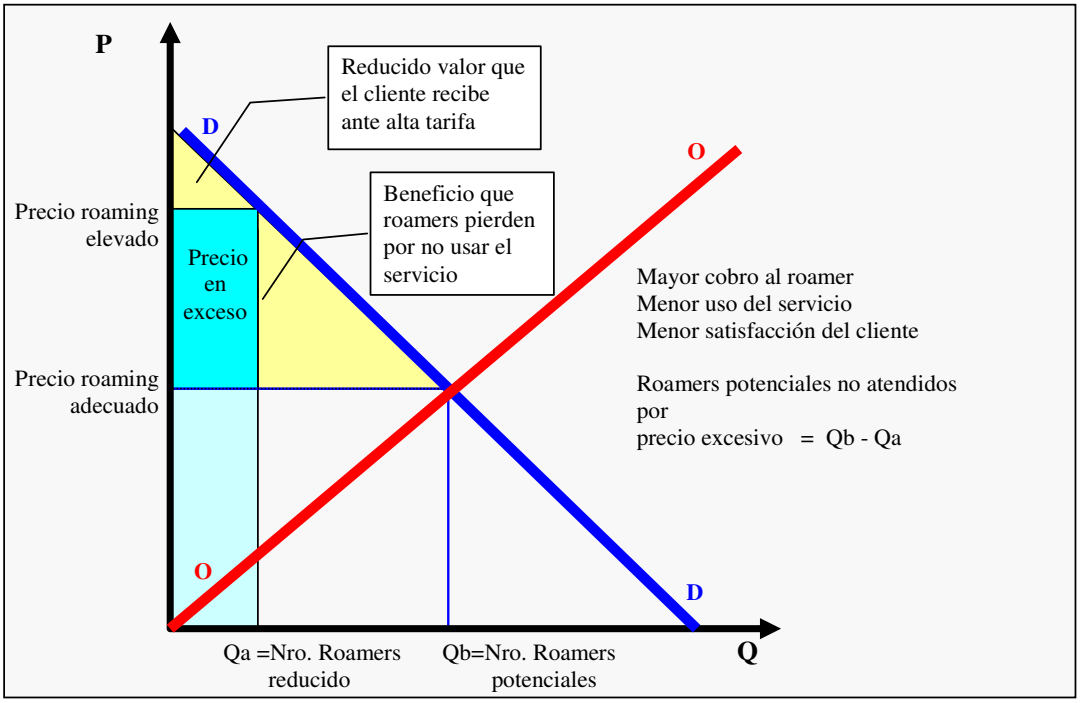
The customer of roaming services is an international traveler, whose importance as an attractive segment is being enhanced by the phenomenon of globalization and world trade. Paradoxically, service to this segment is being neglected, no postpay customer loyalty development mechanism has been drawn up, and the service it receives depends on the technical effectiveness of the visited operator's interconnection, without any participation of those responsible for customer loyalty development or the originating operator's effective interest. It is therefore a sluggish market niche that is price inelastic.

Key explanations for the lack of service growth can be found in the **price-quality ratio,** where the traveler sees that service quality does not justify the high price paid for making and receiving calls abroad, which in turn leads to the **perception of lower value received compared to the high price paid** for the service. It can be asserted that roaming rates and costs do not strike an equitable balance and that the use of the service is burdensome for travelers who are not subsidized (see Figure 3).

A customer who is traveling does not benefit from the options that are offered locally so that he/she might feel "well served" if the service meets minimum communication expectations. Therefore, service satisfaction variables, by order of importance for the customer, are as follows:

1. **Access.** It is the probability of benefiting from service when one reaches a city of a foreign country and turns on one's device. Travelers trust they will be contacted by their office if the need to do so arises. The satisfaction comes from the technical capacity of operator interconnection, and dissatisfaction arises when various options are not available at the trip's location, with normally service being restricted to one single service possibility at a high rate that can only be paid by those travelers who are "price-insensitive" (those whose services are being covered by their company).
2. **Timeliness.** It refers to the trust coming from service continuity and little variability. That is, the service is available at the time it is needed and it shall not be removed or suspended for any reason. Satisfaction grows when calls that facilitate a roamer's business or personal activities are made and received. Dissatisfaction grows when service is intermittent, there are urban areas without service in the visited locality or service is suspended for administrative reasons.
3. **Speed.** This is the variable where the customer perceives personalized service. It refers to the speed of service delivery, whether for service activation, communication problems abroad or queries about coverage, rates, or billing. It is differentiated by type of customer: on the one hand, it is efficient and simple, by telephone or e-mail, for the VIP customer; on the other hand, it is slow, intricate and requires written request including payment guarantees for normal customers; and as for the prepay customer, no service at all is provided.
4. **Moment of truth.** It is the variable where the customer perceives the priority given by the company to the customer, either as a customer to be kept or as a user who is irrelevant in terms of service. In the former situation, the operator assigns trained human resources who frequently keep in touch with the customer or his/her immediate environment to keep his billing level and loyalty. In the latter situation, it is complicated and nonexistent, personal care is neglected, and processes are designed to eliminate or postpone the possibility of having the customers establish visual contact and receive direct responses to their concerns, along with the abundant use of ivr and web.

Figura 3. Análisis teórico de la relación precio-calidad en roaming



IV. QUALITY AND INFRASTRUCTURE OF ROAMING

Quality of roaming service

Service quality from the perspective of the customer[6] is identified on the basis of the expectations of the travelers who use it. Thus, the working premises that make it possible to outline the business opportunities in roaming are as follows:

- The most important cell phone product shall continue to be voice communication.
- Voice services shall continue to account for the highest volume of income (85%).
- Voice services are what determine customer satisfaction and business returns.
- Data services account for greater supply of services for more sophisticated customers, but their consolidation must be tied to profitable business models and adapted to the socio-economic reality of each country.

In roaming, international mobility of the cell phone number must include four types of usefulness: i) usefulness of location where the service *follows* the roamer: ii) usefulness of time, because the user is always connected to the required coverage; iii) usefulness of ease of use; and iv) usefulness of form with safe and ergonomic equipment. Service variables are: signal quality (power, continuity, coverage), additional voice services (voice mail, caller ID, transfers), additional data services (SMS, MMS, browser for data access), customer service, and loyalty.

Strictly speaking, the basic level of service that the roamer wishes to have is an activated service that has the capability of making and receiving voice calls and being able to receive data traffic on the basis of needs (messaging, mail, contents).

Technological migration to GSM has apparently aggravated neglect of service for traveling customers and led to low service quality. As a result of the deterioration of roaming's administrative functioning, it is likely that satisfaction has declined and that the potentially untapped market has grown.

The administrative structure of roaming

International roaming is managed with a multidimensional architecture, which is beyond the classical structures of matrix coordination.

- In terms of ***operations***, roaming is organized as non-hierarchical unit that use the process approach to coordinate roaming activity points managed by specialized areas.
- In terms of ***tactics***, roaming is handled as a process of negotiation and decision making sustained by the stream of information on use (traffic) and financial information (contra payments, charges, and payments), which strike a balance between service traffic and greater returns with the risk of undue use and losses stemming from service that cannot be billed.
- In terms of ***strategy***, the design of product, development, and operation is considered, including the service chain, the identification of operational, administrative, financial, or legal restrictions and bottlenecks, and the mechanisms that balance investment and operating costs.

Roaming activity points are located in functional management and pertain to a portion of the normal activities of these areas. The roaming area coordinates and matches local resources with the resources of other operators and providers, for the signaling, the STP-gateway, controlling high usage, use and exchange of tariff-setting records (CDRS), and billing between operators. It is also in charge of designing and implementing the projects involving service provision such as the signaling network, Signaling Transfer Point, authorized Reception Point, billing and centralized contra payments, ARP-clearinghouse, traffic control.

Technological migration to GSM has generated two types of actions among operators. On the one hand, there is a greater allocation of resources and consolidation of the roaming area in operators that prioritize the international mobility of their customers. On the other hand, reduction of the area can be observed, as well as the mimetization of its attributions within the normal tasks of its functional areas, in the understanding that the new technology entails already established standards, simple operationality, without ups and downs and without any risks.

[6] *Every measuring of QoS roaming is part of the technical measurement of quality. There is as yet no quality standard for roaming service that takes into account customer needs, expectations, and perceptions.*

Service interoperability infrastructure

The creation of infrastructure for the functioning of roaming is based on various principles:

- It is a service operator activity, and therefore service operators shall provide it and promote it if their return is positive.
- Roaming is independent of the spectrum assignment, and therefore it is not subject to the framework of regulators.
- Operators are connected through intermediary providers that perform the function of interconnecting and translating different technical options to make them compatible.
- In roaming, there is enough technical know-how to permit interconnectivity of operators and interoperability between various technological versions and between various technologies. Roaming is possible between a GSM operator and a CDMA operator through an intermediary (PARC, MACH SYNIVERSE) that will make the adjustments and translations required by the service.
- The critical topic affecting interoperability of roaming is the terminal's technological compatibility, which must be capable of being connected to the visited network and sustaining the air interface of the visited operator.[7]
- In the near future, roaming interoperability shall refer to the compatibility between 2G and 3G technologies and future evolutions.

At the process level, roaming is structured into three differentiated segments:

a) The administrative segment includes the website, customer service, billing and the control of improper traffic. Development, agreements, inter-operator and interfunctional coordination, retail billing (customer) are handled by its own administration and account for administrative expenses.

b) The technical segment includes international interconnection, MSC, HLR, VLR, SMSC, MMC, LCF, clearinghouse, IOT. It makes its own investment (switch) accounting for costs and depreciation or it is outsourced (interconnection and international signaling, clearinghouse, sending and receiving CDRs and exchange format, IOT, anti-fraud) under the modality of fixed payment expenses or by traffic volume.

c) The terminal or handset includes interoperability, multiband, and multifunctionality. They are acquired and transferred for customer usufruct, as sale, rental or donation. For practical purposes, it is not considered either as an expense or a cost.

The administrative and technical-operational coordination points implement and supervise a part, in the roaming process sequence (see Figure 4).

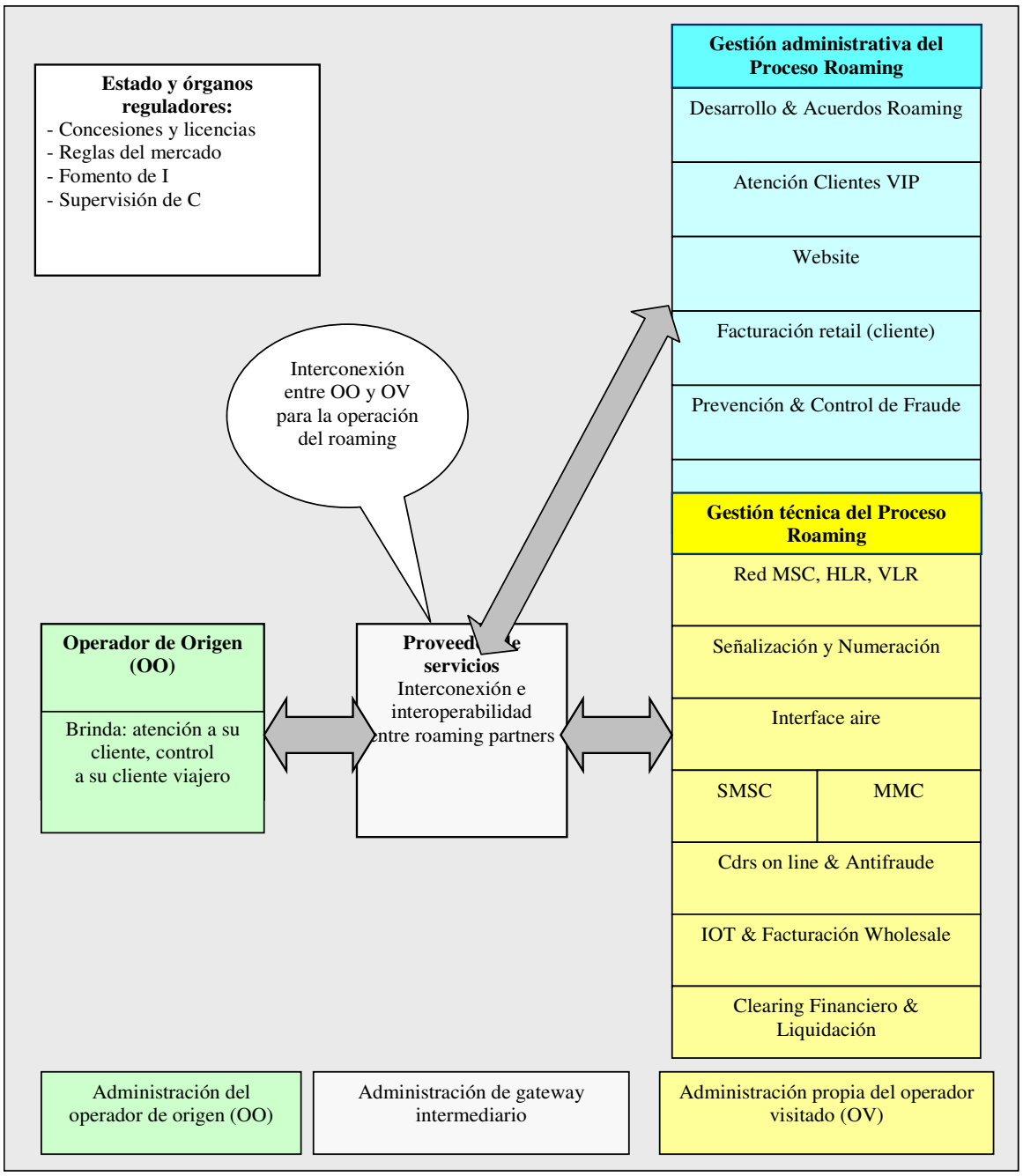
In their beginnings, all of these points were under the direct management of each operator. Afterwards, some of these activities were gradually externalized, through companies that centralized the investment and made it feasible to have an operationality that would have been unmanageable if the operator-by-operator management scheme had been kept.

This change started up with the technical segment: bilateral direct connection (one per operator) is replaced by a single signaling gateway connection, which aligns point codes and international addresses and coordinates the interoperability between all connected operators, which is complemented by translations that harmonize the different technical versions linked to MSC, HLR, VLR. The change continues with the administrative segment, with the controversial topic of inter-operator billing, is replaced by one-to-one billing by a financial clearing house to receive and exchange valued data records, calculating positive or negative contra payment balances among all the affiliated operators, conducting one single payment or account withdrawal operation, depending on whether the outgoing traffic is greater than the bill for the incoming traffic or vice-versa.

This outsourcing is comprised of organizations that provide their specialized input and interconnected infrastructure. Their services are rated as a fixed monthly rental charge or on the basis of the volume of the traffic that is processed, which reduces or eliminates the need for operators to make investments.

[7] *As part of the same technology, terminals are capable of operating at frequencies that are different from those of their local operator. Intertecnologías, Qualcomm has developed CDMA terminals with the connection capacity in roaming at the MHx frequency and technology of GSM networks.*

Figura 4. Elementos de infraestructura del Roaming Internacional



The roaming infrastructure model and the many options for growth.

On the road to consolidating roaming in Latin America, various models have been developed, applied at the different stages of the service's life cycle. The first is the *bilateral model* where each operator draws up an individual roaming agreement with another operator whose market is attractive to it. This model prevailed in the start-up stage of roaming but its drawback was that it required huge administrative efforts.

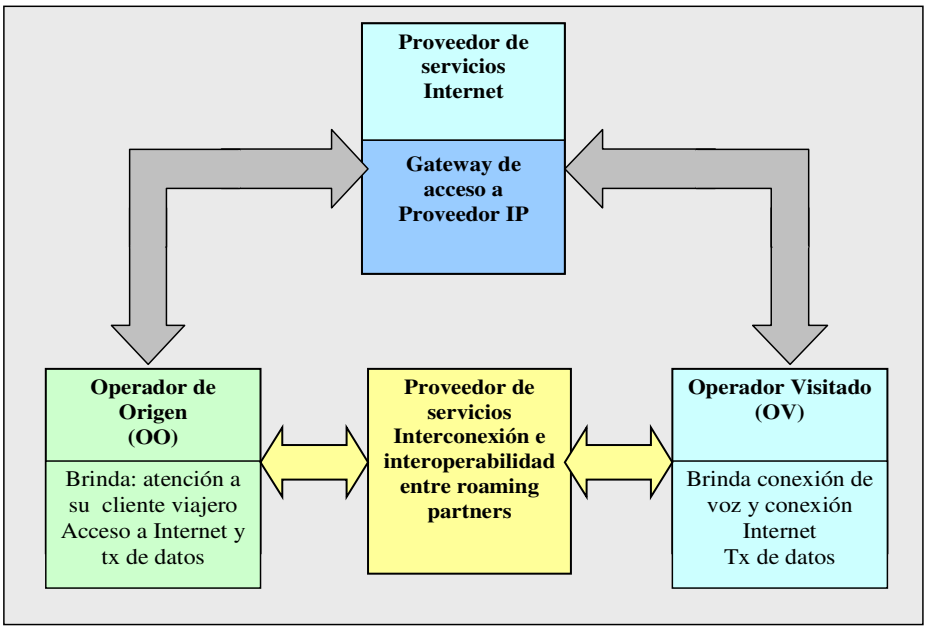
In the second model, bilateral agreements are drawn up and the interconnection takes place through a gateway that centralizes the interconnection network and the signaling whereby each operator gains access to markets where it has roaming agreements in force. The administrative task is minimized by the exchange of tariff-setting records, referred to as call detail records (CDRs), and calculating contra payment settlements through a clearing house. It is the model that is currently in force in 2G and 2.5G technologies.

The third model is a more sophisticated version of the second and is called *hub roaming*; it involves a gateway that provides access to networks and controls billing and fraud. The hub is an expanded *piggy back*. This model strives for high performance and offers rapid expansion of coverage and lower administrative

expenses. By means of a unique network connection, operators gain access to voice and data services, in addition to data exchange, contra payments and financial settlement, and fraud protection.

With the breakthroughs being made in convergence and high-speed broadband, the *IP roaming* model is being drawn up; it involves an IP gateway that is used as a port of entry to an Internet network operator that enables access to the network and data transmission when it is in roaming, as shown in Figure 5. In the future, it shall be the basis for voice roaming through the Internet protocol, which would require a business model that as yet does not exist.

Figura 5. Estrategia de desarrollo del roaming



There are other relevant cases in the development of international roaming in the region. They enabled the start-up and growth of service in some cases or led to setbacks or even prevented the consolidation of business in others.

ENTEL PCS was the first operator that switched technology in the region. Its decision to install the first GSM network on the continent was crucial over the long term. AT&TW provided its code points for the installation of RAI, and if it had not done so service would not have been possible. Likewise, the decision taken in Buenos Aires in 1995 by Telefónica's task force on roaming for the implementation of its own roaming network,[8] as well as the negotiation proposed by Movilnet and sponsored by AHCIET[9] for the signing of the original regional traffic agreement.

The steady growth of automatic roaming came to an abrupt halt in 2000 because of two regional frauds that required service between all markets to be suspended for a considerable period of time. To date it has not been possible to recover the magnitude and dynamics of growth prevailing at that time. It is only recently, in 2007, that some operators have been able to reach the level they had that year.

V. ELEMENTS FOR THE FUTURE OF INTERNATIONAL ROAMING

Market development

- The cell phone market is concentrated, with two or three operators per country that comprise regional blocs. Is it possible to establish conditions of competition and/or competitiveness?
- Since mobile service is reaching its maturity (100% cell phones/population in Europe and Asia, more than 50% in Latin America). Is it feasible for roaming to start up its growth stage in the region?

[8] *Domínguez, Quitegui, Zamora, Burgaz, Acevedo.*

[9] *Mendoza, Gómez Alamillo.*

- In technological terms, there is the provision of roaming service for all users, whether contract or prepay. Commercially speaking, can the composition of exclusively postpay users be extended to prepay users?
- In the search of regional integration, is it possible to draw up a regional agreement for the creation of a supra-national body that would integrate local concerns and efforts to develop the sector and the service?
- Is there a business model that considers the potential economic yields of data services?

Investment and infrastructure

- Roaming is an element that is part of the technological renewal of operators, so that it is a sunk cost that is not being tapped. How can the perception, fostered by operators, that roaming is a marginal service be changed?
- With the new technological versions that facilitate the location of physical infrastructure outside the region, can there be infrastructure without physical installations? Is virtual infrastructure an infrastructure?
- Should discussion focus on infrastructure or on service architecture?
- How should increased fraud risk stemming from the new devices with third-generation technologies be managed?
- How can investment be encouraged? In what should investment be made?

Roaming regulatory framework

- Because of the sector's industrial structure and its trend toward maturity, it is likely that roaming shall be one of the next aspects on which the regulatory framework shall focus. Is a regulatory framework in roaming necessary or should it remain as it has been until now?
- Can it be said that the GSMA is successfully replacing the absence of a regulatory framework?
- Is there the possibility of a regulatory framework in GSM roaming in Europe and the Americas?
- What does the recent attempt to control rate ceilings in roaming in Europe mean?

Government policy

- Reducing social and economic exclusion by promoting the use of information technologies in emerging areas: How can the accessibility provided by roaming be used?
- If governments were to intervene in roaming, what aspects should it handle to give incentives to the service?
- Must public policymaking in the countries evolve and be consolidated regionally? Should it focus on issues such as ICTs and development, Internet Protocol, among others?
- Is there abuse of a dominant position in international roaming?
- Can the new wave of reforms in the regulatory framework be tapped to create a market in international roaming?

VI. PRELIMINARY CONCLUSIONS

As a result of the identification of business opportunities of international roaming service, the present paper highlights the dimensions of the telecommunication sector, specifically the cell phone business that affects roaming, defined as a product offered by mobile telephony operators.

As for the future, the paper describes the motivations and how international roaming started up and was developed among operators of the Americas, which took on a new perspective when privatization was

implemented, changing the industrial organization of telecommunications and broadening the sector's corporate missions and goals.

With respect to the dimension of the process, the prevailing vision of the roaming business, in the framework of the technological breakthroughs, which is the real provision of the product. This vision has been embodied in the service development strategies and customer segmentation and taking, which are rendered operational in the value-based pricing policy and not in the cost and satisfaction of the roamer.

As for the structural aspects, the quality variables that roaming should comply with are defined, along with elements of the service's technical quality, the organization of roaming in its technical and administrative segments, and international organization based on a multidimensional architecture model that was designed and implemented by the original makers, but that has been reduced to a functional unit of sales, after-sale service, billing or management of networks, limiting their scope and coordinating capacity.

In terms of the human dimension, when considering the sector's stakeholders, whether they are lawmakers, industry executives, operator managers, consultants, and associations, various interpretations have been used to explain the structural weaknesses and poor dynamics of the growth of roaming, some of which have been included in the present paper.

On the way to identifying the conditions that would enable the creation and consolidation of the infrastructure required for effective, efficient, and profitable roaming that might help to integrate the countries and create sectoral and corporate synergies, a renewed conceptual service approach is required, one that benefits from the service experience that has been built up, which changes mental models to think of scenarios and create visions that not only match but that are also shared and that systemically integrate the different ways of providing service. That is, designing the future of international roaming in the region and also building the future of the region's international roaming.

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ANNEX
ROAMING-RELATED STRATEGIC GUIDELINES: the future