A HISTORY OF THE INTERNET IN SENEGAL

(1989-2004)

Olivier Sagna, Christophe Brun, and Steven Huter

This version revised, updated and completed by Olivier Sagna
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May 30, 1999

Historical accuracy

"A History of the Internet in Senegal" was originally written in 1998. It was first revised and updated in 2004. Where relevant, we have updated the text to reflect significantly important changes since the time of writing: the number of Internet registries, the population of the country, etc.

URLs and online resources were also verified, to ensure that they still point to valid resources. If this is not the case, we have attempted to locate the new location for the resource, and have indicated this in the footnotes.

Otherwise, the text has been left in its original context.

June 30, 2012

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First meeting scheduled to establish the Internet Society (ISOC) Chapter of Senegal in May 1999. Attended by: Christopher Brun, Mouhamet Diop, Alex Corenthin, Abou Sidibe, Malick Ndiaye, Maimouna Diop and Tidiane Seck. The ISOC Chapter was established in Senegal in 2001. Photograph by Steven Huter (NSRC).

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1. Senegal: An Overview

Senegal is located at the western edge of the African continent, adjoining the Atlantic Ocean, where Europe, Africa and the Americas meet, and at a crossroads of major sea and air routes. It is bordered to the north by Mauritania, to the east by Mali, to the south by Guinea and Guinea-Bissau, and to the west by a 500-kilometer coastline along the Atlantic Ocean. The Gambia cuts into the center of Senegal. The capital, Dakar, is located on the Cape Verde peninsula, facing the islands of the same name. Senegal is mostly made up of wide plains, intersected by three large rivers: the Casamance River in the south, the Gambia River in the center, and the Senegal River in the north and east. The climate is tropical, with a hot and humid rainy season lasting from May to November. In general, the dry season lasts from December to April and is characterized by a dry, warm wind known as the Harmattan.

The first documents to mention Senegal date from the 8th century, when Senegal was part of the Ghana Empire. In 1444, Portuguese navigator Dinis Dias discovered the island of Gorée, where he made a stop along the route to India. From 1627 to 1677, the island was occupied by the Dutch, who had driven out the Portuguese. Then, between 1677 and 1815, Gorée was passed between the English and the French. Due to its geographic position, Gorée played an important role in the trading of slaves to the Americas until the beginning of the 19th century.
In 1659, France settled on the continent permanently by taking strategic control of Saint-Louis. Finally, in 1814, the Treaty of Paris granted Senegal to France definitively. In 1854, Faidherbe created the colony of Senegal. At the end of the 19th century, France ruled over all Senegalese territory, with Saint-Louis as the capital. In 1895, the West African territories conquered by France[4] came together as a federation called French West Africa (Afrique Occidentale Française, AOF), with Dakar as its administrative capital. From the end of the First World War until the end of the 1950s, in the four self-governing Communes of Dakar, Gorée, Rufisque and Saint-Louis (whose inhabitants were French citizens), figures such as

[4] Ivory Coast, Dahomey (Benin), Guinea, Upper Volta (Burkina Faso), Mauritania, Niger, Senegal, French Sudan (Mali) and Togo, which was taken from the Germans after 1918.

Blaise Diagne, Ngalandou Diouf, Lamine Guèye and later Léopold Sédar Senghor played an active role in the politics of both the local area and mainland France.
When the colonial period came to an end, Senegal and French Sudan united in April 1959 to form the Mali Federation, which gained independence on June 20, 1960. However, the union was short-lived and the Federation dissolved in August of the same year. At that time, Senegal became an independent state with Léopold Sédar Senghor as the first President of the Republic. Senghor voluntarily withdrew from power in 1981 and Abdou Diouf, who had been Prime Minister since 1970, took over as President of the Republic. In 1982, Senegal and The Gambia decided to form a confederation called Senegambia. However, the integration that had been hoped for between the two countries did not materialize and the confederation was dissolved in 1989. In March 2000 Abdoulaye Wade, Secretary General of the Senegalese Democratic Party (Parti Démocratique Sénégalais, PDS), who had ran in every presidential election since 1978, was elected President of the Republic. Following his election, Mr. Wade strove to give Senegal a more prominent role on the regional and international scene, in particular by promoting the New Partnership for Africa's Development, NEPAD[5], of which Senegal is responsible for information and communication technologies.

Senegal has more than ten million inhabitants (at the time of writing), nearly a quarter of whom live in the metropolitan area of Dakar. The country is both a geographic and a human crossroads, where different peoples, religions and cultures have existed side-by-side for centuries. Senegal boasts around twenty ethnic groups, the largest of which is the Wolofs, who represent 40% of the population. The other groups with a significant share of the population are the Haal Pulaars (24%), the Serers (15%), the Diolas (5%) and the Mandinkas (4%). Since Senegal's independence the Wolof language and culture have spread, and Wolof is spoken by about 70% of the population. However, French is still the official language and is used throughout the country. Over 90% of the population is Muslim. The rest are Christians or followers of traditional religions.

At the time of independence in West Africa, Senegal was one of the most developed countries in the region, with well-established physical and social infrastructures and diversified basic industries. Today, the Senegalese economy is dominated by tourism, phosphates and fishing, but telecommunications also have an important role, contributing 6% of the gross domestic product (GDP).

[5] The New Partnership for Africa's Development.

2. The Age of Pioneers

Senegal's first steps towards the Internet go back to the end of the 1980s when, at the initiative of *ORSTOM*, known today as the *Institut de recherche pour le développement* (Development Research Institute, *IRD*)[6] and of the non-governmental organization, *Environnement et Développement du Tiers-monde* (Environment and Development Action in the Third World, *ENDA-TM*)[7], the country's first two email systems were installed.

2.1 ORSTOM and the Réseau Intertropical d'Ordinateurs (Intertropical Network of Computers, RIO)

The first major project was carried out by *ORSTOM* who decided in 1989 to set up an email system to improve communication between its laboratories, but also, and most importantly, to connect its researchers to the international scientific community that was present on the Internet, regardless of their location.

ORSTOM's email network, given the name *Réseau intertropical d'ordinateurs* (Intertropical Network of Computers, *RIO*)[8] by its creator, Pascal Renaud, is based on *Sun* workstations and the *UUCP* protocol.[9] Within the scope of its information technology development plan, *ORSTOM* decided to equip its centers with Sun stations and local *Ethernet* networks, which at that time was a standard choice among researchers. Furthermore, *UUCP* was shipped as standard with the *SunOS* operating system.

RIO is structured in a star topology around a central node in Montpellier, in southern France. Secondary nodes, installed in each *ORSTOM* center, then serve as a focal point for a third level of local sites. Whenever possible, traffic is channeled between the secondary nodes and the main node in Montpellier via the *X.25* networks. The Montpellier node, which has both an *X.25* line and a permanent *IP*[10] connection over the *Réseau national de télécommunications pour la technologie, l'enseignement et la recherche* (National Telecommunications Network for Technology, Education and Research, *RENATER*)[11], serves as a gateway between the entire *UUCP* network and the Internet. Simple telephone lines are used between the secondary nodes and the third level of local sites.

It was in this context that Hervé Chevillotte and Marc Souris, two IT specialists from *ORSTOM*, installed Senegal's first *UUCP* node at the *Centre de Recherche Océanographique de Dakar-Thiaroye* (The Dakar-Thiaroye Center for Oceanographic Research, *CRODT*) in June 1989. It was a *Sun3/260c* station with a 600 MB hard drive, linked to a *X.25* connection on the *SENPAC*[12] network and on which *UUCP* is installed. The tests were conclusive: the

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6 *ORSTOM*, which became the *Institut de recherche pour le développement* (Development Research Institute, *IRD*) on November 5, 1998, is an institute for scientific research located in France, in the French Overseas Departments and Territories, Latin America, Asia, the Pacific Ocean, the Indian Ocean and most Francophone African countries, including Senegal.

7 *ENDA*: http://www.enda.sn/ (site doesn't exist anymore, but is archived at http://web.archive.org/web/20080703045753/http://www.enda.sn/)

8 The original name "*Réseau informatique de l'Orstom*" was changed to "*Réseau intertropical d'ordinateurs*" to take into account the opening up of the system to structures outside of *ORSTOM*.

9 *UUCP*: Unix to Unix Copy

10 *IP*: Internet Protocol

11 *RENATER*: http://www.renater.fr/

12 *SENPAC* is the trade name for the X.25 network in Senegal.

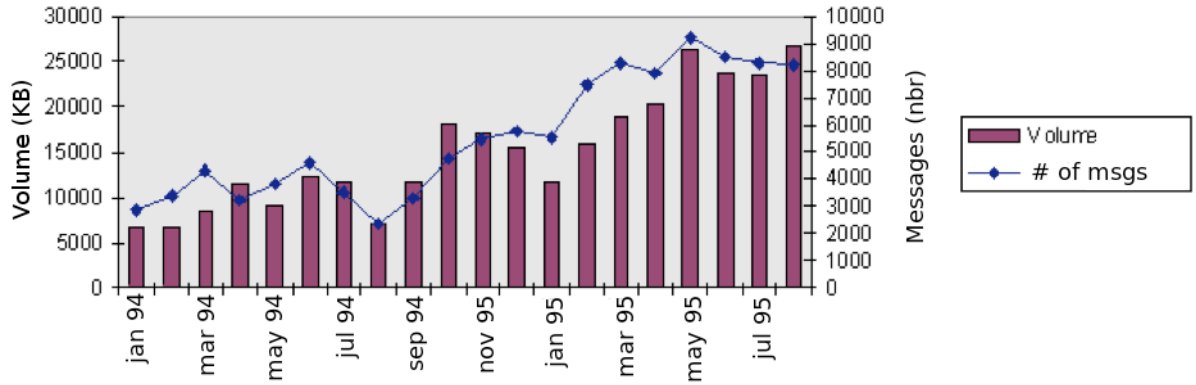
X.25 line worked well, and the first messages were sent between Dakar and Montpellier, and later to the Internet as a whole.
Two months later, a similar configuration, with a *Sun3/60c* station, was set up in the *ORSTOM* laboratory in Hann (Dakar). A multiport card was added to the station, with two V.22bis modems attached to receive local incoming calls. This machine, whose configuration would evolve over time, was the focal point of the *RIO* device in Senegal, for both local and international traffic routed to the Montpellier gateway. "*At first, we would program one UUCP connection per day with Montpellier,*" recalls H. Chevillotte. Just before switching to *TCP/IP*, the Hann *UUCP* node would establish a connection at all hours of the day.

As for available services, email was available permanently and *IP* services like *TELNET* and *FTP* were available on demand. For remote users with a microcomputer and a modem, there were two email options:

- Using terminal emulation communication software (*Kermit* or equivalent) to connect to the server, then, with *UNIX*, reading and writing messages online with simple interfaces like the *UNIX mail* command.
- Configuring the *PC* as a *UUCP* node with the *UUPC/Extended* kit. This solution had several advantages: a domain name specific to each site could be registered, an unlimited number of mailboxes could be set up on that site and finally, messages could be read and written offline. *ORSTOM* provided *UUPC/Extended* with the email interface *UU-Messor*, developed to make up for the lack of user-friendliness in the default interface with *UUPC/Extended*. *UU-Messor* also marks a first step towards the development of a Francophone email interface that would allow diacritic characters.[13]

RIO, serving as de facto service provider for the scientific community in Senegal until 1995/1996, had up to 300 users. Figure 1 illustrates the evolution of *UUCP* traffic from *RIO* in 1994 and 1995.

Figure 1 - RIO UUCP Traffic (1994-1995)



[13] Diacritic characters are é, è, ê, ë, à, â, ù, û, ç, etc.

2.2 APC, ENDA and the FidoNet Network

The second major project was the work of the *Association for Progressive Communication* (*APC*)[14] which was made up of NGOs involved in social development and solving environmental problems. To facilitate communication between its members, in 1990 *APC* developed an email system of the "store and forward" type, based on the *FIDO* protocol. Designed for use in developing countries, it was a robust system that could adapt to poor quality telephone lines and did not require sophisticated equipment: a simple microcomputer such as *PC AT* working with *MS-DOS*© and a V.22 modem were sufficient to create a node. Mail exchange between *FidoNet* and the Internet took place through about ten gateways located mostly in northern countries. *GreenNet*, the British arm of *APC* in London, Great Britain, thus set up the *FIDO* gateway for Africa.

FidoNet was presented to Senegalese NGOs in June 1992, during a week-long workshop led by Doug Rigby who coordinated a *FIDO* email network connecting the East African NGOs. This network, known as *NGONet*, was created by the NGO *Environment and Liaison Centre International* (ELCI)[15] and Rigby set out to implement several regional access points in West and Central Africa. One of the participants, Moussa Fall, from *ENDA*, was very interested in email and spoke to his director, who decided to install *FIDO*. *ENDA* dedicated a phone line to the email system and relieved Moussa Fall of his usual duties so that he could oversee the system. In this context of goodwill, Rigby chose *ENDA* to host one of the four nodes in West Africa. "*I admit that at the time, I had no skills in MS-DOS,"* explains Moussa Fall, "*ENDA only used Macintosh. But, as I was very interested in this new technology, I bought books about DOS and computers in general, and I began to study. When you are motivated, you can move mountains."*

In August 1992, Moussa Fall configured Senegal's first FIDO node. It was a PC 386 with *FrontDoor*™ software and a *Telebit* V.32 modem that connected to the gateway in London. At the local end, the *ENDA* node then served as an email relay for other *FIDO* sites. Thanks to Moussa Fall's enthusiasm, *ENDA* would go on to connect over a hundred users in Senegal, mostly NGOs, but also government departments and individuals.

2.3 RINAF, PADIS, and SYFED

Following these pioneer projects, other email systems, such as *RINAF*, *PADIS* and *SYFED*, were introduced in Senegal with the help of international aid.

At the end of 1993, the *Regional Informatics Network for Africa* (RINAF)[16], with support from UNESCO, had a regional focus on West Africa, and also had email access installed at the *Centre national de documentation scientifique et technique* (National Center for Scientific and Technical Documentation, *CNDST*). Later, the network was extended to the *Laboratoire Informatique Education* (Computer Learning Laboratory, *LIE*) of the Ecole normale supérieure (*ENS*), to the *Direction de la Prévision et de la Statistique* (Directorate of Forecasting and Statistics, *DPS*), to the *Délégation aux affaires scientifiques et techniques* (Delegation for Scientific and Technical Affairs, *DAST*), to the *Bibliothèque universitaire centrale de*

14 APC: http://www.apc.org/

15 ELCI: http://www.ecouncil.ac.cr/about/SPID/elci.hml - expired, but archived http://web.archive.org/web/20090528002928/http://ecouncil.ac.cr

16 Coordinated by UNESCO and financed by the Italian government, RINAF's objective is to facilitate access to electronic information for African countries.

l'Université Cheikh Anta Diop de Dakar (Central Library of the Cheikh Anta Diop University of Dakar, *UCAD*) and to the *Bibliothèque universitaire de l'Université Gaston Berger de Saint-Louis* (Gaston Berger University Library of Saint-Louis, *UGB*).

The *Pan African Documentation and Information System Network* (*PADIS Net),* coordinated by the *Commission Economique des Nations Unies pour l'Afrique* (United Nations Economic Commission for Africa, *ECA*)[17], aimed to connect the documentation centers of African countries electronically in order to facilitate exchanges and access to databases. A *FIDO* node was thus installed at the *Centre régional africain de technologie* (African Regional Center of Technology, *ARCT*) in Dakar.

From October 1995, users of the *SYFED* center[18] and the eight *SYFED* access points[19] installed by the *Association des universités partiellement ou entièrement de langue française (*Association of Partially or Wholly French-language Universities, *AUPELF*)[20] on the Cheikh Anta Diop University of Dakar campus were then able to access email, but via the *Minitel*. To get an account, they simply had to connect to the "*MinitelNet*" service and create their own electronic address, along the lines of today's free email services such as *Hotmail* or *Yahoo*, but far less user-friendly![21]

Separately from these projects, various individuals and private companies finally began to subscribe to email services from European or American Internet service providers. Mail was retrieved through international telephone connections.

2.4 ESP and the ".sn" Domain

In 1990, Alex Corenthin and Mouhamed Tidiane Seck, two student researchers at the "Computer Engineering" department of the *Ecole nationale supérieure universitaire de technologie (ENSUT*), which is today part of the *Ecole Supérieure Polytechnique* (*ESP*)[22], configured a PC 286 with *UUPC/Extended* and a 1200 b/s modem to connect to *RIO*. "*We told ourselves that we really had to get involved in it,"* they explain, recalling the excitement that followed the first message exchanges. The students shared in this excitement: *"At that time, I was writing my graduate thesis on the X.400 email system,"* explains Eric Damiba, now a network administrator for the *Agence pour la Sécurité de la Navigation Aérienne en Afrique et à Madagascar* (Agency for Air Navigation Safety in Africa and Madagascar,

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17 ECA: http://www.uneca.org/

18 Inaugurated in June 1991, the SYFED center in Dakar gave instructors, researchers and graduate students free access to a wide range of electronic information sources and allowed them to order primary documents as well. Set up by the Agence francophone pour l'enseignement supérieur et la recherche (Francophone Agency for Higher Education and Research, AUPELF), the network of SYFED centers and access points was completed by the Réseau Electronique Francophone de l'Enseignement et de la Recherche (Francophone Electronic Network for Education and Research, REFER).

19 A SYFED access point is made up of a Minitel, a printer and a memory card reader to manage credits for inquiries to online databases.

20 In 2000, AUPELF became the Agence universitaire de la Francophonie (University Agency of la Francophonie), (http://www.auf.org/)

21 Later, AUPELF introduced an email interface, known as *Wref*, in the SYFED centers. This interface was developed jointly by ORSTOM and the Centre international de recherche agricole pour le développement (International Center of Agricultural Research for Development, CIRAD), under the name of *X-Rio*.

22 In 1994, the Ecole polytechnique de Thiès (EPT), the Ecole normale supérieure d'enseignement technique et professionnel (ENSETP) and ENSUT merged to create the Ecole supérieure polytechnique (ESP).

ASECNA)[23], "*Internet mail was so easy to use, so light compared to X.400 that in the end my dissertation ended up being a comparison of X.400 and Internet messaging*."
Throughout this period, as the *Country Code Top Level Domain* (*ccTLD*) ".sn" had not yet been registered, Internet addresses in Senegal ended in ".ca", ".fr", ".org" or ".com", depending on the service provider. It wasn't until 1992, when the "Computer Engineering" department of *ENSUT*, in collaboration with *ORSTOM*, notified the Internet management authorities that it would manage the ".sn" domain, that the first addresses using the ".sn" designation appeared.

The story behind the introduction of the ".sn" *ccTLD*, though not very well known, is somewhat comical and worth mentioning here. In November 1991, Pascal Renaud, "father" of the *RIO* network, was surprised to see that the RFC821/822 addresses of the African nodes belonging to the *ORSTOM* network were identified with addresses from the French domain "orstom.fr". The direct result of this was that there were addresses such as "dakar.orstom.fr," or worse, "isra.orstom.fr" even though the *Institut Sénégalais de Recherche Agricole* (Senegalese Institute for Agricultural Research, *ISRA*)[24] is a Senegalese research institute! As Pascal Renaud himself admits, this was "*not very appropriate, and rather... colonialist*." Unable to find anyone in France who could tell him how to obtain authorization to use domain names such as "orstom.sn," he sent a message to Larry H. Landweber, an IT professor at the University of Wisconsin-Madison.[25] Landweber suggested contacting Randy Bush, a pioneer in the introduction of *IP* networks in developing countries.[26] In his response to Monique Michaux, coordinator of the *RIO* network, in January 1992, Bush stated that it was highly unlikely for a French governmental organization to be authorized to act as manager of the domain for Senegal and pointed out, ironically, that the French would certainly not have appreciated an American organization acting as manager for the domain ".fr"!!! Faced with what seemed like a dead end, he proposed having a Senegalese organization or individual act as manager for the ".sn" domain, also pointing out that that domain name "belonged" to the Senegalese.[27]

Armed with this advice, the "Computer Engineering" department of *ENSUT*, together with *ORSTOM*, informed the *Network Coordination Center* (*NCC*) of *RIPE*[28] that it would act as manager for the ".sn" domain in 1992. However, the process was not final until February 1993, when the administrative management of the national domain was attributed by *InterNIC* to *ENSUT*, with Alex Corenthin as the point of contact. As stated in RFC1591[29], the technical management of a *ccTLD* requires a permanent *IP* connection, which was not the case for

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23 ASECNA: http://www.asecna.aero/

24 ISRA: http://www.isra.sn/

25 In 1997, Larry H. Landweber established the Theorynet network at the University of Wisconsin, comprising an email system that served over one hundred IT researchers. Later, he devoted much of his time to updating the chart detailing worldwide Internet connectivity (Cf. The Definitive Internet Story http://www.zakon.org/robert/internet/timeline/).

26 Randy Bush is one of the sponsors of the Network Startup Resource Center, created in 1992 in an effort to promote the use and introduction of appropriate technologies in developing countries. (Cf. http://www.psg.com/~randy/nsrc.html - see http://nsrc.org/ nowadays). From 1998, he played a pioneer role in the introduction of the Internet in Africa by designing and assisting in the implementation of a sub-regional network using Fido and UUCP technologies.

27 Electronic message from Randy Bush to Monique Michaux, January 24, 1992.

28 Created in November 1989, RIPE (Réseaux IP Européens, or European IP Networks) is one of the five Regional Internet Registries (RIR) in the world. Along with ARIN (American Registry for Internet Numbers) and APNIC (Asia Pacific Network Internet Center), LACNIC (Latin American and Caribbean Network Information Center), and AfriNIC (African Network Information Center), RIPE at that time covered, at that time, Europe, the Middle East and some parts of Asia and Africa, including Senegal (http://www.ripe.net/).

29 Cf. http://www.ietf.org/rfc/rfc1591.txt

Senegal at that time. It was, therefore, *ORSTOM* that provided technical management of the *ccTLD* in agreement with *ENSUT*, until ENSUT itself had a permanent *IP* connection. In November 1996, the *Ecole supérieure polytechnique* (*ESP*) established a permanent *IP* link, and the ".sn" domain returned home from Montpellier to Dakar. However, the technical management of the ".sn" domain would continue to be coordinated by *ORSTOM* Montpellier's Monique Michaux until February 1997 before being taken over by Mouhamed Tidiane Seck from *ESP*.

2.5 The First Online Web Server

Although the country was officially connected to the Internet in March 1996, the first online Web server made its historic debut in November 1995 at the *SYFED-REFER* Center in Dakar. The server, a *Sun Sparc5* station, used an *X.25* line for its connection, on which *IP* datagrams were encapsulated in *X.25* frames. It was this slow and costly technique (*X.25* frames are only partially filled by the datagrams) that nonetheless enabled *AUPELF-UREF* to post its server on the Web[30] several months before the Internet officially arrived in Senegal. It is worth noting here the vital role played by the Dakar *SYFED-REFER* Center in particular and by the *AUPELF-UREF* in general in the diffusion of the Internet in academia.[31]

2.6 The Public Telecommunications Operator Steps In

From 1989 to 1995, the Internet was reserved for the privileged few who mainly worked in research and higher education institutions, NGOs and some government departments. The existing email systems certainly did evolve, but even though equipment was modernized, the basic technique options did not change: it was still the "store and forward" technique with either *FIDO* or *UUCP*, on the switched telephone network (STN) or the *X.25* network. There was a reason for that. The public telecommunications operator, *Société Nationale des Télécommunications du Sénégal* (*SONATEL*)[32], which had a monopoly on the establishment of public telecommunication services and networks, did not offer *IP* service. Despite many pleas for SONATEL to connect the country to the Internet, the operator failed to heed such requests, claiming that Internet connectivity was not a part of its development plans. In fact, *SONATEL* simply observed the development of email projects, and it could even be said that SONATEL completely overlooked the strategic benefit of the Internet.

SONATEL did not become seriously interested in the Internet until 1995. Several factors caused the operator to change its attitude. First of all, there was the explosion of the Internet in the northern countries, catapulting the network to the forefront of the media. It was on the front page of the newspapers, on the radio and on western television channels that could be viewed as far away as Dakar. The trend intensified in 1995, when the Senegalese people learned about the existence of the Net thanks to a series of conferences— theoretically, at least, since live demonstration were still not possible.

The signal for change would come from the government. In April 1995, Mr. Idrissa Seck, then Minister for Trade, Crafts and Industry, paid a working visit to Washington, in the

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30 Ex. The Dakar SYFED-REFER Center: http://www.refer.sn/

31 Since 1994, the SYFED Center, which in October 2000 became the Campus numérique francophone de Dakar (Dakar Francophone Digital Campus) has offered low-cost Internet access as well as training opportunities to academics. In this way, a large number of students, instructors and researchers have been able to familiarize themselves with Internet services.

32 SONATEL: http://www.sonatel.com/

United States. During the trip, he attended Internet demonstrations and immediately realized its significance. "*We must connect Senegal to the Internet!"* he said to the press upon his return, and he summoned the *SONATEL* officials in order to ask them to do just that. The next month, at the *Third African-African American Summit* in Dakar, there was a significant breakthrough. The IT delegation seized the opportunity and organized a media coup, which turned out to be a winning strategy. The delegation asked *Omnes Cable and Wireless* to connect Senegal to the Internet during the summit. A 64 Kbps VSAT connection was installed for the occasion at the *Senegalese International Center for Foreign Trade* (*CICES*)[33] and for nearly a week, political and economic delegates and other visitors witnessed what could be described as the first public demonstration of the Internet in Senegal. The event received a high level of media attention, and those present were enthusiastic about the demonstrations. Given the success of the project, and faced with pressure from the authorities, *SONATEL* announced its decision to connect Senegal to the Internet in the coming months.

Then things really began to take off. Having written up the requirement specifications in April for implementing Internet access, SONATEL launched a call for bids in July. After analyzing the bids, *SONATEL* selected *Omnes* and the equipment – *Sun* and *Cisco* – was installed in December 1995. At the same time, *SONATEL* negotiated with *MCI*[34] to obtain a 64 Kbps satellite link via Intelsat 635. The issue of connecting Senegal to the Internet became so important that President Abdou Diouf stated in his end-of-year speech that the country would be connected at the beginning of 1996.[35] Access became operational in March 1996: Senegal was online!

2.7 Rivalry for Senegal's Domain

While the Internet was set up quickly and, it seemed, easily, the same cannot be said for the management of the Senegalese "Top Level Domain" .sn, which was rife with conflict.

As the only operator authorized to use a public telecommunication network in Senegal, *SONATEL* felt that it had the right to manage the national domain. It was for this reason alone that SONATEL asked the *l'Ecole Supérieure Polytechnique* (*ESP*) to transfer its management privileges. As *ESP* was acting in compliance with the regulations of RFC1591[36] and was fulfilling the role of domain manager, SONATEL's request was not motivated by technical hiccups or discrimination in dealing with domain requests. Rather, SONATEL's attitude can no doubt be explained by a long-standing culture of monopoly, lack of understanding of the role of a ccTLD manager, as well as a certain mistrust in the academic sector's ability to efficiently manage such a service.

ESP's refusal to concede to *SONATEL* led to a crisis: management of the national domain had become a political issue. State arbitrators of the highest level were called in. They questioned *ESP* and *ORSTOM* about the duties of a ccTLD manager. Also, conciliators from within *SONATEL,* such as Mouhamet Diop, were essential in order for the idea of leaving ccTLD management to the academic sector to finally be accepted. From that time on, *SONATEL*

33 CICES: http://www.cices.sn/
34 MCI: http://www.mci.com/
35 Message from President Abdou Diouf to the nation, December 21, 1995.
36 Cf. http://www.ietf.org/rfc/rfc1591.txt

provided *IP* access and addresses, while *NIC Sénégal*[37], part of the Cheikh Anta Diop University of Dakar, assigned domain names.

2.8 Help from Overseas, and a Spirit of Volunteerism

The introduction of the Internet in Senegal owes a great deal to the enthusiasm and energy of people who, working from the United States and France, provided support and assistance for the local pioneers.

Registering the *ccTLD* would never have happened so quickly without the help of Randy Bush from the *Network Startup Resource Center* (*NSRC*)[38], who, by offering his assistance and his time, was a great help to *ENSUT* and *ORSTOM* in their efforts. But it was not only Bush. Most Senegalese Internet pioneers benefitted at one time or another from the advice of Steve Huter (*NSRC*) and Monique Michaux (*ORSTOM*), whether it was technical assistance, or simply an explanation of the uses and regulations governing the Internet globally.

Organizations such as the *Internet Society* (*ISOC*)[39] also played a vital role. Annual training sessions that took place in the margins of the *INET* conferences were essential for the local adoption of *TCP/IP* technologies. Virtually all the Senegalese pioneers attended *ISOC* workshops: Moussa Fall from 1994, and Alex Corenthin, Mouhamed Tidiane Seck, Boubakar Barry and Mouhamet Diop in 1996. They all remember these workshops as being an important part of their understanding of the Internet. Furthermore, these training sessions had a remarkable catalytic effect: students would go on to become trainers themselves, emulating the *ISOC/NSRC* workshop model to lead national and regional *TCP/IP* trainings.

[37] NIC Sénégal: http://www.nic.sn/
[38] NSRC: http://www.nsrc.org/
[39] ISOC: http://www.isoc.org/

3. The Economy of the Internet in Senegal

In this chapter we will take a look at the economic models that evolved in Senegal thanks to Internet access. We can identify two distinct periods: email systems (1989-1996) and the current period (1996-today).

3.1 The Economic Model of Email Systems (1989-1996)

Although *RIO* and *FIDONet* never had a commercial purpose, users of these two email systems nonetheless paid communication fees. *RIO*, by choosing *X.25* to route messages between Dakar and the Montpellier gateway, opted for a certain level of technical reliability, but at a high cost. Fees for *X.25* were calculated on a volume and time basis and from 1992-1995 amounted to 200 CFA francs per Kb sent or received, charged to the end user. This rate did not include sending file attachments or participating in discussion forums. *ENDA*'s rates were significantly lower: 50 CFA francs per KB sent or received. These rates should, however, be compared to international telephone rates at the time, which made access to providers in Europe or America even more expensive.[40]

3.2 Today's Economic Model

Today's economic model is based on three factors: the incumbent operator's monopoly on national and international IP lines, competition in the ISP market, and the weak purchasing power of the population, which has led to the development of public and community Internet access options.

- **The IP Supply Monopoly**

  In Senegal, the establishment of national and international IP lines is the responsibility of the long-standing monopoly, SONATEL (Cf. 5. The Institutional, Legal and Regulatory Context). The operator was able to impose its own rate policy and technical solutions to a totally captive market.

  Since 1996, SONATEL has offered connections via dedicated lines (LS). Between 1996 and 1999, *SONATEL* sold only 64 Kbps connections, costing as much as 1,064,000 CFA francs per month. It wasn't until February 1999 that supply improved, in terms of bandwidth and price (Cf. Table 1). Since that time, prices have continued to fall, mostly thanks to the use of high-speed international infrastructures like *SAT3-WASC*. A 2 Mbps line therefore cost less in 2004 than a 64 Kbps line did in 1996.

[40] In 1993, it cost 990 CFA francs for one minute of telecommunication with France, and 1,650 CFA francs for the United States.

Table 1: Changes in SONATEL's prices for dedicated lines						
	64 Kbps	**128 Kbps**	**256 Kbps**	**512 Kbps**	**1024 Kbps**	**2048 Kbps**
1996	1,064,000					
1997	1,064,000					
1998	1,064,000					
1999	996,400	1,550,000	2,765,000			
2000	600,000	996,000	1,550,000	2,550,000	3,200,000	3,600,000
2001	480,000	796,800	930,000	1,530,000	1,920,000	2,520,000
2002	384,000	597,600	697,500	1,071,000	1,344,000	1,764,000
2003	203,700	340,200	451,050	680,350	852,500	962,500

Source: SONATEL

- **Internet Service Providers (ISPs)**

Provision of service to the public falls under the regime of free competition, as it is in the category of value-added services. There are ten ISPs in Senegal[41], all of whom connect upstream to *SONATEL*. Service for the public is provided via the ISDN switched telephone network[42] or, since March 2003, via *ADSL* and *wireless*. For dial-up connections, subscribers must obviously pay telephone charges as well as their Internet plan.[43] However, SONATEL does not distribute profit generated by Internet surfers back to the ISPs: the ISP model offering free service in return for just the amount of telephone traffic generated does not exist in Senegal.

The number of ISPs multiplied rapidly for the first few months following Senegal's connection to the Internet in 1996. After that, the number was relatively stable. There were several non-commercial providers, such as AUPELF and ENDA, who only offered service to certain groups: students, NGOs, etc. Among the commercial providers were IT services companies such as *Arc Informatique* and *Silicon Valley*, *SONATEL* via its subsidiary *Télécom-Plus*[44] as well as new arrivals such as *Métissacana*. Competition was especially fierce during the first three years, which saw a succession of price reduction announcements. The first plans cost as much as between 15,000 and 30,000 CFA francs in the spring of 1996 for ten hours of connectivity. Additional hours were charged separately. In 1998, the *ISPs* agreed on a fee of about 10,000 CFA francs for unlimited connection time.

The high cost of dedicated lines led to chronic under-sizing of bandwidths, resulting in line overload, and, consequently, poor response time, for the early ISPs. Most ISPs used 64 Kbps, 128 Kbps and, more rarely, 256 Kbps lines. *Métissacana*, the renowned Dakar cybercafé and ISP, boasted one thousand subscribers at the beginning of 1999, with the same 64 Kbps bandwidth since 1996. It was the same for the other ISPs, like *Arc*

41 The full list of ISPs can be found in the Appendix.

42 Marketed under the trade name of *Sénéris.*

43 Billing based on the cost of a local telephone call, regardless of the location of the call: 50 CFA francs for 2 minutes. The cost of local telephone calls went up by 30% on July 1st 1998 when the billing unit went from 3 to 2 minutes. At the time, *SONATEL* refused to call it an increase, quietly passing it off as an adjustment to local telephone calls.

44 In 2001, *Télécom-Plus* became *Sonatel Multimédia,* a subsidiary with capital owned at 82.66% by *SONATEL* and 17.34% by *France Câble et Radio*.

Informatique[45], *Cyber Business Center* and AUPELF. The only exception, *Télécom-Plus* was generally considered to offer a better-quality service. The company's prices were close to the average and did not constitute a comparative advantage, but it did have the benefit of technical support from its parent company, a benefit that would often be classed as unfair competition by the rest of the ISP sector. Quality of service was never a distinguishing factor for the public Internet access market; rather, concerns about pricing were the primary issue for most users.

The drop in the price of dedicated lines in recent years has enabled ISPs to improve the quality of their service by increasing bandwidth at the same, or lower, operational cost— a price drop that, however, has yet to reach the end users. Nor has this price drop been able to prevent the first stages of consolidation in the sector. For this reason, *Point Net*[46], *Inf247*[47], *Wait*[48] and *Jokko* ceased operating, as did *Métissacana*, which ceased *ISP* activities in May 2002. The main public providers still on the market are *SONATEL Multimédia*, *Silicon Valley*[49] and *Arc Informatique*.

- **The Public**

There are many obstacles for the Internet's public accessibility in Senegal. These include location, gender, age, and level of education. The most significant obstacle, however, is cost.

Statistics show the magnitude of this obstacle. While an entry-level computer costs around 500,000 CFA francs, and a monthly plan costs 10,000 CFA francs plus telephone charges, 54% of the population lives on less than 1 US dollar per day, and minimum wage amounts to 35,000 CFA francs per month.

In fact, it is more or less only high-tech companies, expatriates and members of the privileged classes of Senegalese society who can afford a plan. The breakdown of *Télécom-Plus* customers in April 1997 demonstrates this fact:

- Foreign and Senegalese businesses: 39%
- European, American and Asian customers: 20%
- African private individuals and small-scale professionals: 18%
- NGOs, education, government departments, hospitals: 16%
- Customers who already use SONATEL and Télécom-Plus: 6%
- Other: 2%

This revenue variation can also be seen in different regions, with urban areas having the highest concentration of wealth and infrastructure and the most Internet users. The breakdown of *Télécom-Plus* users indicates that 90% of its customers live in Dakar or the surrounding area. The Senegalese capital accounts for 65% of the total number of fixed telephone lines, but only 24% of the population. Besides the imbalance of users between the North and the South, which is fairly common, there is a digital divide within the

45 Arc informatique: http://www.arc.sn/

46 *Point Net* was created in 1998.

47 *Inf247*, created in 1998, ceased operating in March 2003.

48 *Wait* was created in 1999.

49 *Silicon Valley* is also known by the trade names *Cyber Business Center* and *Omnet.*

country. This internal imbalance mirrors levels of poverty, but other factors also come into play.

For all those who are unable to afford the equipment they need to connect to the Internet, either at home or at work, there are several public access options. Commercial access points, such as ISP browsing rooms, cybercafés and telecenters[50] are one of these options and non-commercial access points managed by NGOs or higher education and research institutions are another.

In general, ISP browsing rooms have better equipment: they offer several networked computers connected to the Internet via a dedicated line. Most cybercafés and other telecenters, on the other hand, only have a few computers with a dial-up connection. Cybercafés can be found in secondary cities like Saint-Louis, Thiès and Ziguinchor, but most are located in Dakar. In a document entitled "P@sseport Internet au Sénégal" ("Passport to the Internet in Senegal"), the NGO *Ynternet.org* surveyed nearly one hundred telecenters in Dakar, fifteen in Thiès, ten in Saint-Louis, and six in Kaolack, Tambacounda and Ziguinchor in June 2001.[51] According to a study carried out by Thomas Guignard in 2001 and based on 184 cybercafés[52], 61% were in Dakar, with much lower numbers for Thiès (13%), Saint-Louis (8%) and Kaolack and Ziguinchor (4%). On average, cybercafés had 7.21 computers each, and 68.5% of the cafés were connected via STN. As for customer breakdown, a survey of 135 Internet users showed that 60.7% of cybercafé users were students. 60% of customers were under 26 years old, and of those, only 37.8% were women.

Billing was based on charges for connection time. At the end of the 1990s, one hour of Internet browsing cost 1,500 CFA francs at the *Métissacana* cybercafé. *Télécom-Plus* charged 500 CFA francs per 20 minutes at its Dakar telecenters.[53] In general, Internet access in telecenters and cybercafés was charged by the hour, half hour, or per 20-minute period. In 1999, one hour ranged from 1,000 to 2,500 CFA francs. At one time, some of the telecenters came up with an original billing method for email: a set price per message (500 to 1,000 CFA francs) or even per line (25 CFA francs per line)!

The continued drop in price of dedicated lines, the availability of *ISDN,* the arrival of second-hand computers on the market and a general increase in demand for several reasons, in particular, a greater effort to introduce information and communication technologies in the education system[54] led to the creation of cybercafés all over the city of Dakar and in the country's main towns. As a result of the increase in the number of Internet access points, in 2004 connection costs in a cybercafé were between 250 and 500 CFA francs per hour, which is three to five times cheaper than at the end of the 1990s.

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50 Telecenters are private locations found throughout the country where telephones, fax machines and sometime even computers connected to the Internet via the switched network are available.

51 Ynternet.org. P@sseport Internet au Sénégal. Dakar, June 2001, 27 p.

52 Cf. Internet au Sénégal : Une émergence paradoxale. Thomas Guignard, DEA thesis under the supervision of Elisabeth Fichez, Charles de Gaulle University, Lille 3, May 2002, 180 p.

53 At the time, *Télécom-Plus* had three telecenters, located at the Place de l'Indépendance, Avenue de la République, and near the Cheikh Anta Diop University of Dakar.

54 The World Bank's *WorldLinks* program connected all Senegalese high schools to the Internet, and many other NGO projects, such as *GEEP*, through decentralized cooperation and help from individuals, were a major factor in introducing ICTs into the Senegalese education system, from the elementary school to graduate level.

3.3 SONATEL at the core of all debates

The first market capitalization on the Abidjan stock exchange, *SONATEL* is one of the flagships of the Senegalese economy. The company has established a modern telecommunication infrastructure in Senegal and is an Internet pioneer in the sub-region. However, SONATEL's long-standing monopoly and shockingly high profits, despite glaring poverty which can be seen clearly in the streets[55], have made it the target of criticism from almost all those involved in the Internet. SONATEL is often accused of impeding the public accessibility of the Internet. What are the charges being brought against SONATEL?

Between 1996 and 2000, the greatest obstacle to the development of the Internet in Senegal was, without a doubt, the cost of dedicated lines. Members of civil society and Internet professionals alike continually complained about SONATEL's rates. In 1998, Abdou Karim Ndiaye, from the community program *Ecoyoff*, said: "*Prices must go down! Personally, I want to offer the Internet for free in my neighborhood. But with SONATEL's prices and the monopoly, it's impossible!"*[56] *"It's the cost of dedicated lines and the high price of the telephone that are putting the brakes on the development of the Internet in Senegal,"* said Michel Mavros, one of the founders of *Métissacana*, before the cybercafé ceased operations as an *ISP* in 2002.

IP prices charged by *SONATEL* were singled out by the entire sector. The *ISPs* made their dissatisfaction clear in April 1999, when price reductions that Internet professionals considered laughable were announced.[57] "*My 64 Kbps SONATEL dedicated line costs me four times more than my T1 in California,*" Souleymane Sall, Director of the *Cyber Business Center* said at the time. There was a second reduction of 40% a year later, on March 1st, 2000[58], followed by a third after a proposal from the President of the Republic to mark the "Internet Fair" of April 2001.[59] At the same time, the shutting down of *Métissacana* for non-payment of arrears upset many people.[60] *Métissacana*, a flagship of ICTs in Senegal, denounced *SONATEL*'s "*abuse of monopoly*," pointing the finger at the operator's failure to remunerate ISPs for the telephone traffic they generated. After a brief period of reconnection, the iconic cybercafé definitively ceased all operations as an ISP in May 2002.

Besides pricing, the ISPs also took issue with the regulations. "*Companies that have had the benefit of a monopoly, and that have made their mark on almost the entire market in their respective sectors thanks to aid from the State, must now understand that their role in contributing to the country's development is to help create an environment that will foster initiatives to create jobs and wealth*," said a Dakar-based ISP.

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55 65% of the population live beneath the poverty threshold. Source: PNUD-Sénégal.

56 This initiative, launched in the commune of Yoff, was the basis of the first Système d'information populaire (Public Information System, SIP). It aimed to train members of the community to use computers and the Internet, especially in order to improve their management and planning skills.

57 Reductions of 6% for 64 Kbps, 21% for 128 Kbps and 28% for 256 Kbps.

58 Monthly rates for these dedicated lines dropped to 600,000, 996,000 and 1,659,000 CFA francs (Cf. *Le Soleil*, February 10, 2000).

59 Reductions of 20% to 40%

60 Cf. . http://web.archive.org/web/20020614094659/http://www.osiris.sn/batik19.htm#La Sonatel déconnecte les mauvais payeurs (archived version)

SONATEL's monopoly was under attack. Attack from members of civil society, who were hopeful that the complete liberalization of the sector would go hand-in-hand with competition–and consequently, lower prices–, pressure from private parties who dreamed of taking a share of the market, and who tried, discretely or otherwise, to push the regulations aside. This led to the creation of *IP* radio links that were not declared to the regulatory authorities, to *VSAT* connection "tests" without an operating license and even to the resale of bandwidth by companies operating private networks. In April 2001, the second-largest mobile phone operator, *SENTEL*, sent out a challenge to the regulatory authorities with a highly publicized announcement of its intention to enter the market as a *wireless* IP provider. This was an idea that never came to fruition, as the regulators issued a statement pointing out that "*SENTEL is not authorized to install or operate a wireless local loop network*".[61]

The recent price drops for dedicated lines and the media campaigns of the last few years[62] have done nothing to silence SONATEL's critics, who feel that the company continues to abuse its monopoly by maintaining high prices and stifling any attempt at competition. However, SONATEL merely continues to justify the privileges attributed to it by the State when it was privatized. At that time, the State had reorganized the regulations (Law 96-03) before awarding *SONATEL* a 20-year operating license for infrastructures in the public domain. The license included specifications defining SONATEL's obligations up to the year 2004. The specifications, however, did not include any specific obligations relating to the development of the Internet. *SONATEL* fulfilled its obligations to the State and even exceeded goals relating to, for example, rural telephone systems.

Of course, SONATEL's social responsibility could be brought into question. The company could do more to bridge the digital divide. But it is the responsibility of the government, not a private company, to define, identify the goals of, and create conditions favorable to the implementation of, Senegal's telecommunications policy, in particular by appointing an independent regulator. Now it must be pointed out that these goals are not clear, as neither a sectoral policy paper nor the arrangements for the liberalization of the market have been published. It should also be pointed out that the newly created Agence de Régulation des Télécommunications (Agency for Telecommunication Regulations, ART) has yet to prove its ability to effectively oversee the sector and to enforce its authority over a former public company that is both powerful and indispensable. It is worth recalling that in Ghana, the total liberalization of telecommunications in 1996 did not have the expected outcome because the regulator was unable to do its job.

It is up to ART to impose new systems of compensation for ISPs based on a share of the profits from telephone traffic generated, to force unbundling of the local loop to allow competitors to use SONATEL infrastructures and to define start-up arrangements for new ISPs, if indeed the government's intention is actually to foster competition for Internet service.

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61 Statement from the *Direction des Études, de la Prospective et de la Réglementation* (Directorate of Studies, Forecasting and Regulations, *DEPR*), April 17, 2001.

62 To improve its image, SONATEL launched a media campaign in June 2001 highlighting its role in Senegal's development in terms of investment, job creation, and share of GDP. In January 2002, the SONATEL Foundation was created to carry out social projects.

4. Infrastructure and Telecommunication Services

4.1 Core Indicators

The Senegalese telephone network is one of the most sophisticated in West Africa, and the telecommunications sector accounted for over 6% of the country's GDP in 2004. By December 31, 2003, there were 229,000 fixed lines, an overall penetration rate of 2.29%. Residential lines accounted for 70%, while 30% were used by businesses. There were also 17,840 public lines, of which 97% were used by private telecenters.[63] Though modest when compared to indicators for developed countries, these figures are nonetheless among the highest in sub-Saharan Africa. It is estimated that the telephone network reaches 85% of the population, who would have access to a telephone within 5 kilometers from home, or less than an hour away on foot. Nonetheless, most fixed lines (63%) are located in Dakar, which accounts for only 24% of Senegal's population. Overall, there is a great disparity between the urban areas, which account for virtually all telephone lines, and rural areas, with less than one percent.[64]

As has happened all over the world, mobile phone use has literally skyrocketed. *Alizé*, *SONATEL*'s mobile phone network, launched in 1996, and *SENTEL GSM*, which began operating in April 1999, boasted 782,000 subscribers in 2003, a penetration rate of 7.2%. Overall, geographic distribution is almost identical to that of fixed telephony, with 65% of subscribers coming from Dakar, and 35% from other Senegalese towns. Furthermore, while the number of mobile phone users overtook the number of fixed line users in 2001, traffic on fixed lines is three times greater than on mobile phones, and is continuing to climb. *SONATEL* set a goal of increasing the number of fixed lines to 400,000 by 2005.

[63] Senegal's 13,000 telecenters contributed to the creation of 30,000 jobs and accounted for 38% of all revenue from fixed line telephony, amounting to 50 billion CFA francs, with 7.5 billion francs filling the State's coffers in the form of value-added tax. (Cf. Ibrahima Ndiaye: Exploitation de télécentres: Les exploitants vont être soumis à un cahier de charges, in Le Soleil, September 30, 2004).

[64] All these figures come from the 2003 annual report of the Agency for Telecommunication Regulations.

Table 4-1 - Core Indicators								
TELEPHONE NETWORK	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Main telephone lines	95,070	115,902	139,549	164,962	208,582	228,000	224,623	228,844
Main telephone lines per 100 inhabitants	1.11	1.32	1.55	1.79	2.20			2.29
Main digital lines (%)	94	99	100	100	100	100	100	100
Public lines (Publiphones and Telecenters)	5,867	7309	9,444	10,830				17,840
MOBILE SERVICES								
Cell phone users	1,412	6,942	22,110	125,000	250,251	373,965	553,645	782,000
Cell phone users per 100 inhab.	0.02	0.08	0.24	0.95	2.64			7.50
INTERNET								
International bandwidth	64 Kbs	1 Mbs	1 Mbs	2 Mbs	34 Mbs	34 Mbs	34 Mbs	310 Mbs
Nmbr of ISPs	7	7	7					10
Nmbr of dial-up subscribers	2,000	3,500	5,000					15,000
Nmbr of dial-up users per 100 inhab.	0.02	0.04	0.05					1.5

Sources: SONATEL, ITU, ISOC Sénégal, ART

4.2 Transmission Infrastructures

The transmission network is 100% digital and is structured around SDH loops (STM4 and STM16) and some PDH links, all on top of almost 3,000 kilometers of fiber optic cable. Radio links are also used for remote access and the network is divided into three transit zones:

- Zone 1, covering the Dakar area
- Zone 2, based around the center of Kaolack and the south and east of the country
- Zone 3, based around the center of Thiès and covering the northern half of the country

SONATEL's switching network is made up of twelve subscriber telephone exchanges and almost 70 remote connection units. An intelligent network platform provides support for advanced services, namely: advanced toll-free calling, kiosk solutions, universal number, pre-payment, etc. The CCITT Signaling System No. 7 is used over the whole network.

SONATEL's international network uses *Intelsat* satellite links, submarine cables and, to a lesser extent, regional radio frequency links. It is made up of two international transit centers (CTI-M and CTI-T) created in 1996, a center for connection to the international network (CLRI), launched in 1995 to manage all international circuits, as well as two centers that transmit telecommunication signals, one being a submarine cable (CSM) operation center and the other a center for satellite telecommunication at Gandoul (CTS-GDL), pointed to *Intelsat*'s 355.5° east satellite. There is also a permanent hub for VSAT services with technologies such as SCPC/DAMA and TDM/TDMA, pointed towards *Intelsat*'s satellite at 328.5°. All of this equipment corresponds to a capacity of 2,500 international circuits.

Senegal, located at the crossroads of sea routes between Europe, South American and South Africa, is connected to the Atlantis-2 and SAT-3/WASC/SAFE cables.

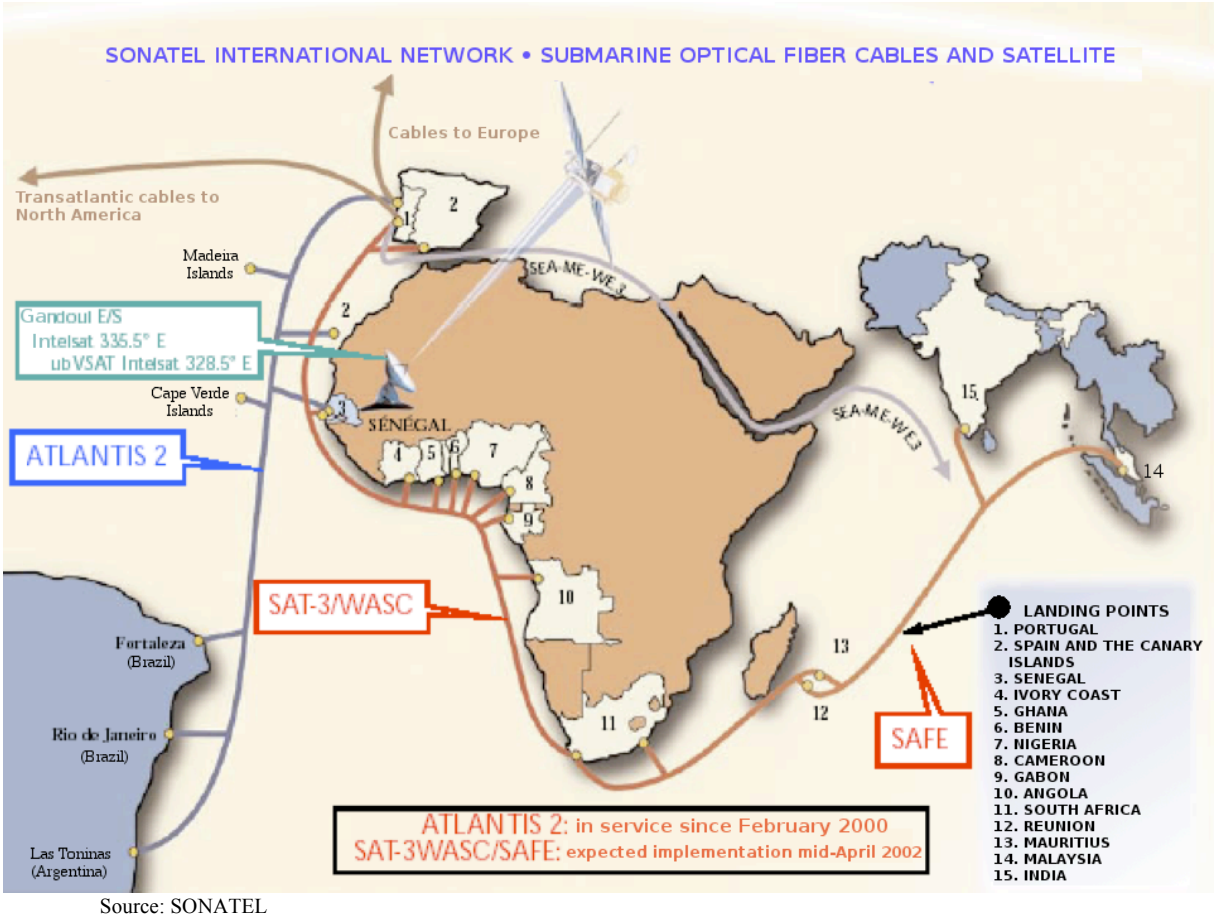
Atlantis-2 is a fiber optic-based submarine cable system inaugurated in May 2000. 12,000 km long and with a total capacity of 20 Gbps, this cable links South America to Europe, via Cape Verde and Senegal. Atlantis-2 belongs to a consortium of operators who invested a total of 370 million euros for its installation. The principal investors were Embratel (19%), Deutsche Telekom (14%), Telecom Italia (12%), Telecom Argentina STET/France Telecom (11%) and Telefónica Argentina (11%). SONATEL was part of the consortium, with a 1.9% investment. Atlantis-2 replaced Atlantis-1, an analog coaxial cable laid in 1982. This previous cable was made up of two segments: Atlantis-1 S1, linking Dakar to Recife, with a capacity of 1,380 circuits including 12 belonging to SONATEL, and Atlantis-1 S2, linking Dakar to Burgau (Portugal), with a capacity of 2,580 circuits, of which 560 belonged to SONATEL.

SAT-3 belongs to the family of submarine cables known as *South Atlantic Telephony* (SAT). The first of this family, SAT-1, was laid in 1969 to link South Africa to Portugal. It was replaced in 1993 by SAT-2, a 9,500 kilometer fiber optic cable running from South Africa to Europe via Madeira and the Canary Islands. SAT-2 was financed by a consortium of fifteen operators, the largest of which were Telkom SA, FCR, Deutsche Telekom, Marconi, BT and Teleglobe.

SAT-2 had a capacity of 565 Mbps. According to Telkom SA projections, this would be sufficient to meet South Africa's bandwidth requirements until 2013. However, the explosion in Internet use saturated SAT-2 by the end of the 1990s, and Telkom SA had to install its

replacement, SAT-3, ahead of schedule. Work on this third cable, initially slated for 2003-2005, began in 1998 and it became operational in 2002. Initially known as *West Africa Submarine Cable* (WASC), SAT-3 was integrated to another submarine cable system called SAFE (*South Africa Far East*). SAFE linked Cape Town to Penang in Malaysia, via Mauritius, Reunion and India. The merging of these two systems created SAT-3/WASC/SAFE, a 600 million euro project led by a consortium of forty operators headed by Telkom SA. France Telecom invested 76 million euros, covering its own share and that of SONATEL and Côte d'Ivoire Telecom, in which it held 42% and 51% of the shares, respectively. SAT-3 offered a capacity of 20 Gbps, which could be expanded up to 120 Gbps.

The coaxial cables ANTINEA and FRATERNITE, the final components of SONATEL's submarine cable system, have been updated. Laid in 1977, ANTINEA linked Dakar to Casablanca, while FRATERNITE, laid in 1978, ran from Dakar to Abidjan.



Source: SONATEL

In addition, the *optical ground wire* (*OPGW*)[65] operated jointly by *SONATEL* (Senegal), *SOTELMA* (Mali), *MAURITEL* (Mauritania) and the *Société de gestion de l'énergie de Manantali* (*SOGEM*), and linking Nouakchott to Bamako via Rosso, Bakel and Manantali, made it possible to connect the telecommunication networks of the three countries.

65 The ground wire is a safety device protecting the line carrying electricity generated by the Manantali Dam from lightning strikes. It was used to support a fiber optic cable made up of six pairs of fiber and capable of a flow equivalent to 36,000 telephone calls or 48 television channels.

SONATEL also used a radio frequency network to communicate with countries in West Africa, made up as follows:

- PANAFTEL, linking Benin, Mali, Senegal, Burkina Faso and Niger, and which included a branch within Senegal serving Kaolack, Tambacounda and Kidira before continuing on to Mali
- INTELCOM linked the capitals of the 16 countries belonging to the Economic Community of West African States (ECOWAS)[66]
- A link between Senegal and The Gambia[67]
- A link between Senegal and Guinea-Bissau

4.3 International Bandwidth, National IP Network

Senegal's first connection to the Internet was made possible thanks to a 64 Kbps link over the Intelsat 635 satellite operated by *MCI*. After that, *SONATEL* continued to increase the bandwidth speed by using the services of Canadian operator *Téléglobe* at the same time. Thus, two more 64 Kbps lines were added in May 1997, then upgraded to a 1 Mbps line in November 1997. This line was then expanded to 2 Mbps in September 1999. In June 2000, a new 2 Mbps line, this time operated by *France Télécom*, was added to the two existing lines, bringing bandwidth to over 4 Mbps. An important milestone was passed in December 2000 when bandwidth increased to 34 Mbps, then 45 Mbps in May 2003 and 53 Mbps in June of that year.[68] Another significant milestone was met in September 2003 when the international bandwidth increased to 310 Mbps[69] following the installation of the *SAT3/WASC* submarine fiber optic cable.

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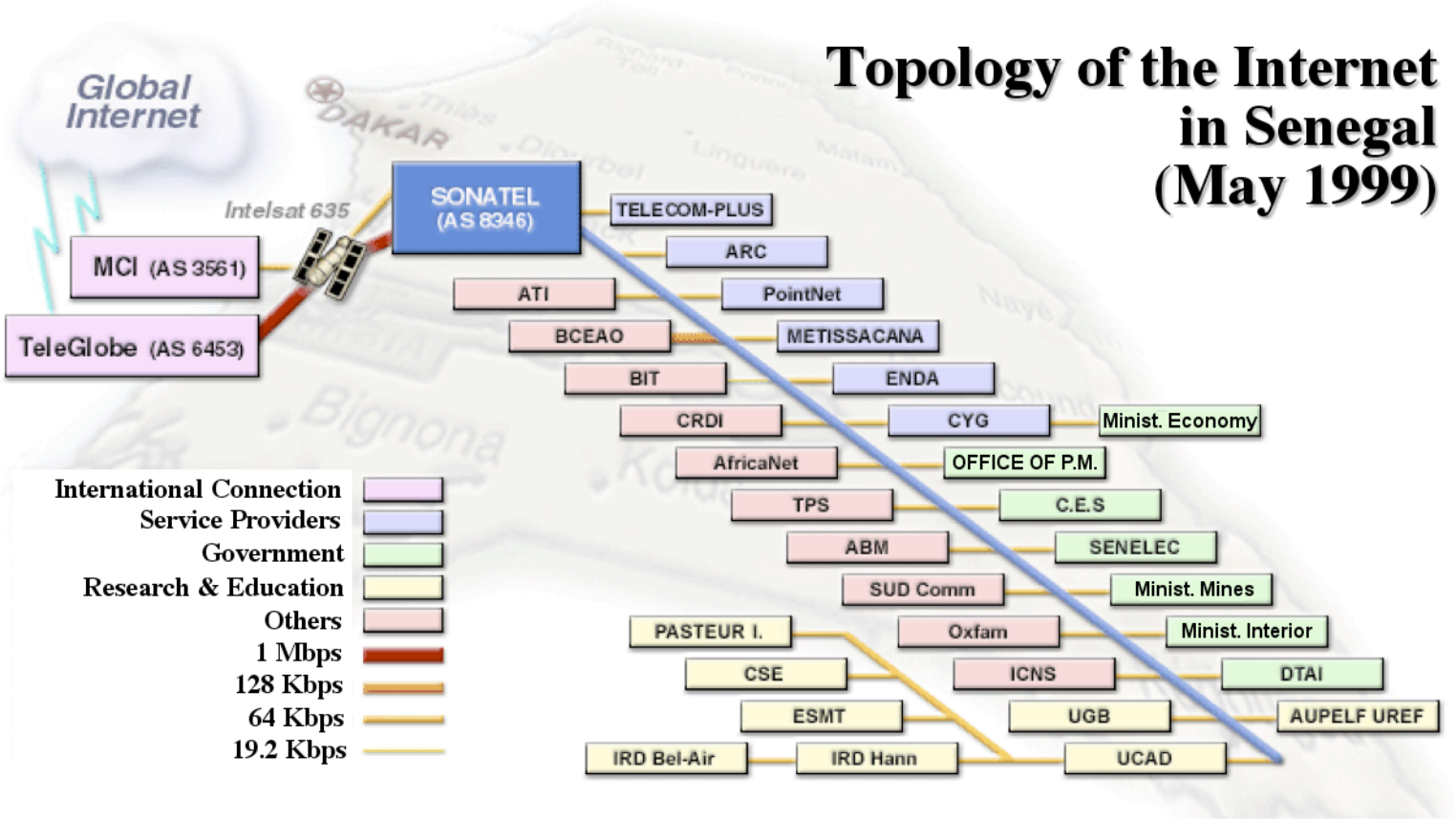
[66] Benin, Burkina Faso, Cape Verde, Ivory Coast, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

[67] *SONATEL* is responsible for the STM 1 fiber optic link and *Gamtel* provides back up for this radio frequency link.

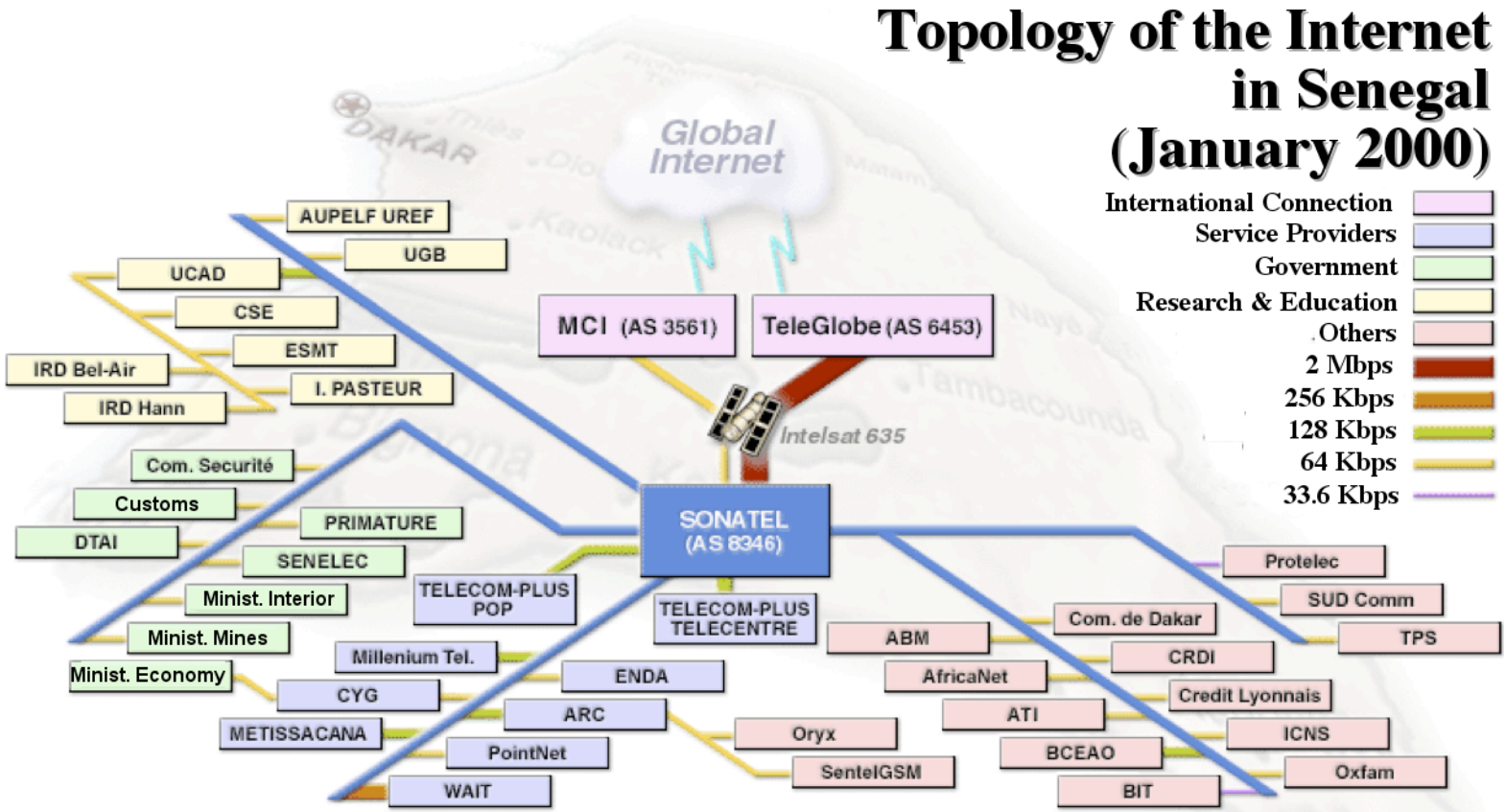
[68] Bande passante international au Sénégal : Un débit quatre fois plus important pour Internet, Alain-Just Coly, Le Soleil, October 31, 2003

[69] Satellite link providing only 8 Mbps of the total international bandwidth.

Topology of the Internet in Senegal (May 1999)

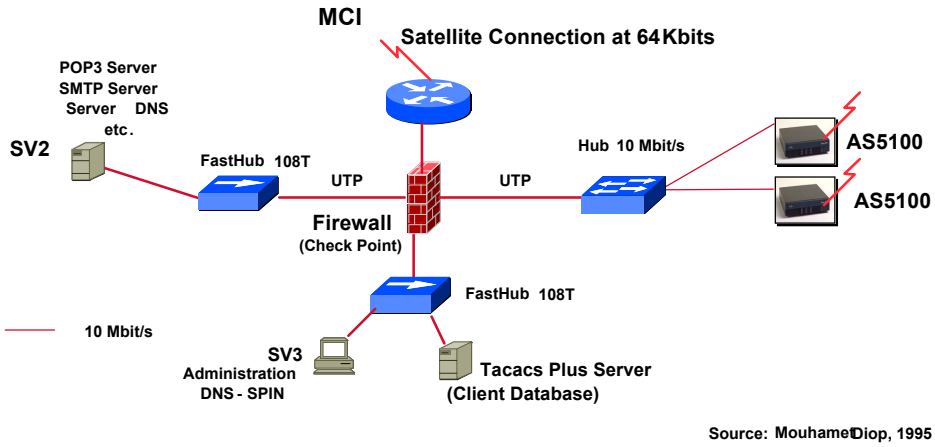


Topology of the Internet in Senegal (January 2000)



Since 1999, Internet users have benefitted from a modern national IP infrastructure, unmatched in West Africa. Work on its design started in July 1997 and installation lasted throughout 1998, with technical acceptance occurring in January 1999. The operator used an infrastructure based on optical fiber to constitute a backbone of ATM and Tag Switching technology, with OC3 (155 Mb/s), E3 (34 Mb/s) and E1 (2 Mb/s) links, which grew more complex over time.[70]

The SONATEL IP Network in 1995



Source: Mouhamet Diop, 1995

According to Mouhamet Diop, former head of *SONATEL*'s Forecasting and Innovation Department, and the project's initiator, implementing the national IP network allowed SONATEL to start offering data services.[71] A wide range of services is available: simple (local network configuration, router configuration, NAT, etc), complex (information system migration, integration of SNA, IPX solutions, etc.) and Extranet solutions (VPN, VPDN, QoS, etc).

In spite of this, from a technical point of view, *SONATEL*'s Internet service suffers from a lack of IPv4 addresses. In the absence of a national and African IP registration office, SONATEL had to turn to its own IP provider, *MCI*, to obtain sixteen class Cs. This explains why the 64 Kbps line was maintained with *MCI* although SONATEL had access links with much higher speeds with *Téléglobe* and *France Télécom*, under more favorable conditions. There were repercussions, however, because in order to limit its dependence and the extent of inevitable renumbering that would result from obtaining its own IP block, *SONATEL* only sparingly distributed extremely limited sub-classes to its customers (/27, /28 or even /29 in certain cases), and the connection of the main local networks suffered. The arrival of the *African Information Network Center* (*AfriNIC*) at the end of 2004 and the beginning of 2005 gave *SONATEL* a temporary response to its immediate needs, before the introduction of IPv6.

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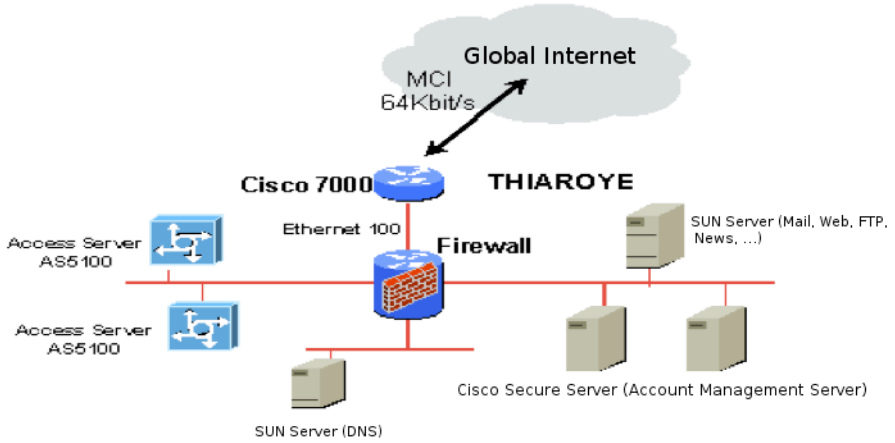
70 The evolution of the national IP network is shown in figures 2, 3, 4, 5 and 6.

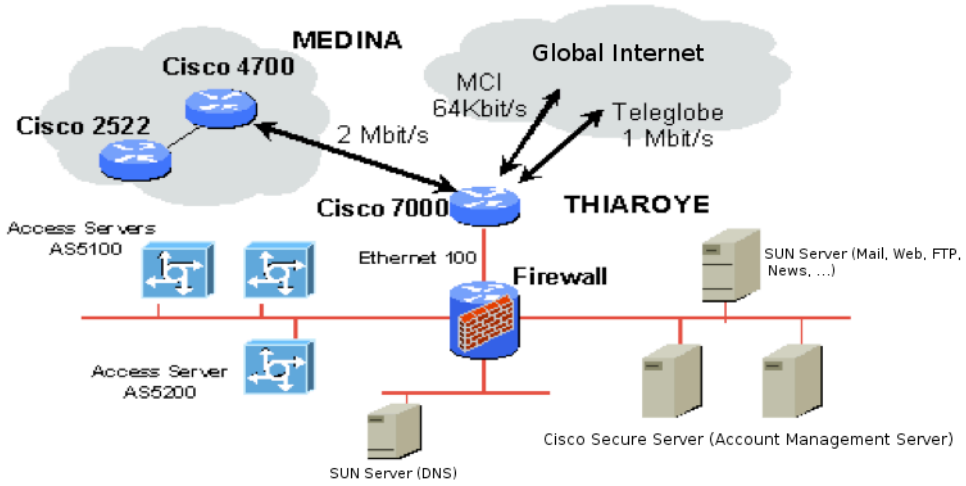
71 Furthermore, this project was part of the government's plan to make Senegal a country of telecommuters.

The SONATEL IP Network in 1996



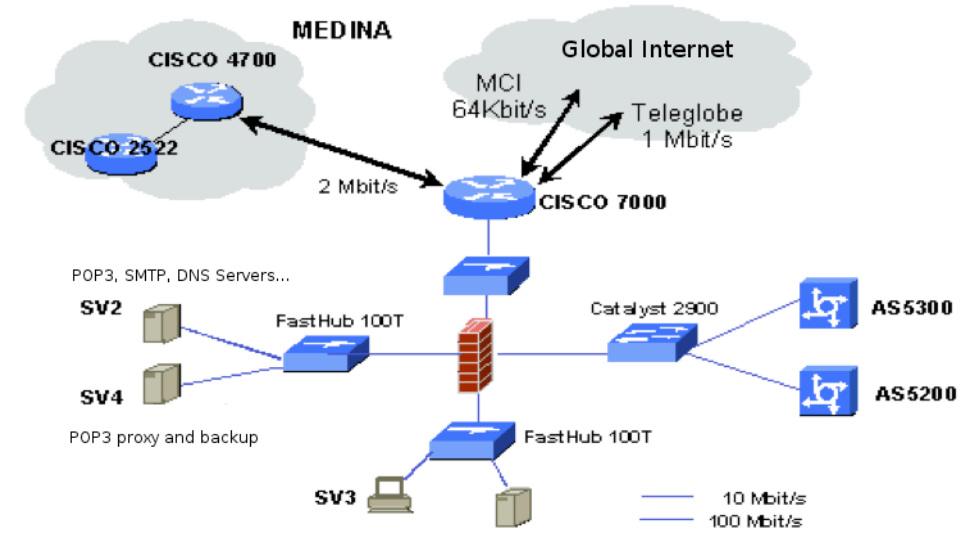
Source : Mouhamet DIOP - SONATEL/DR/PLA/SPIN

The SONATEL IP Network in 1997



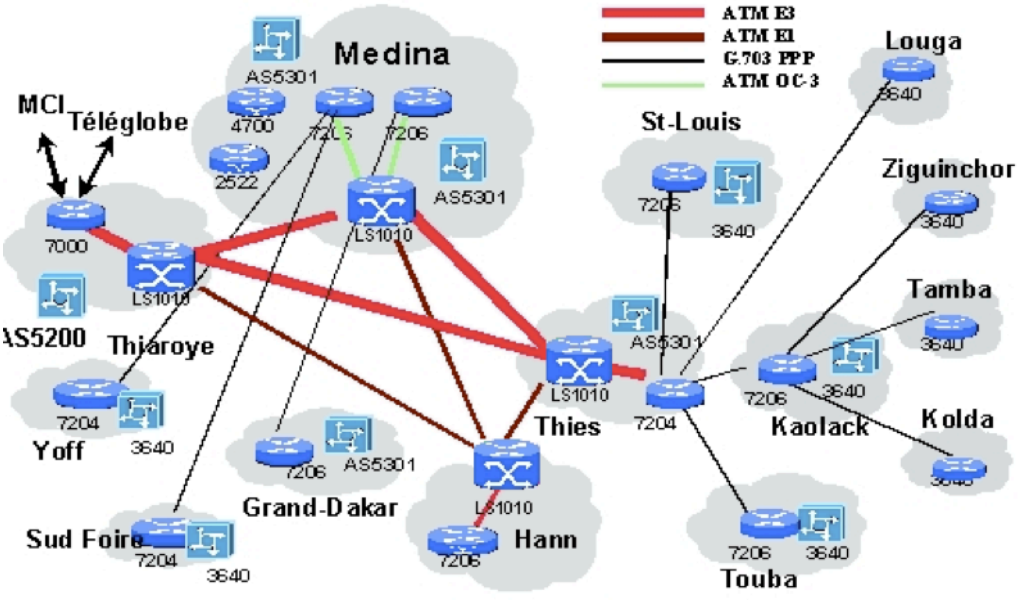
Source : Mouhamet DIOP - SONATEL/DR/PLA/SPIN

The SONATEL IP Network in 1998

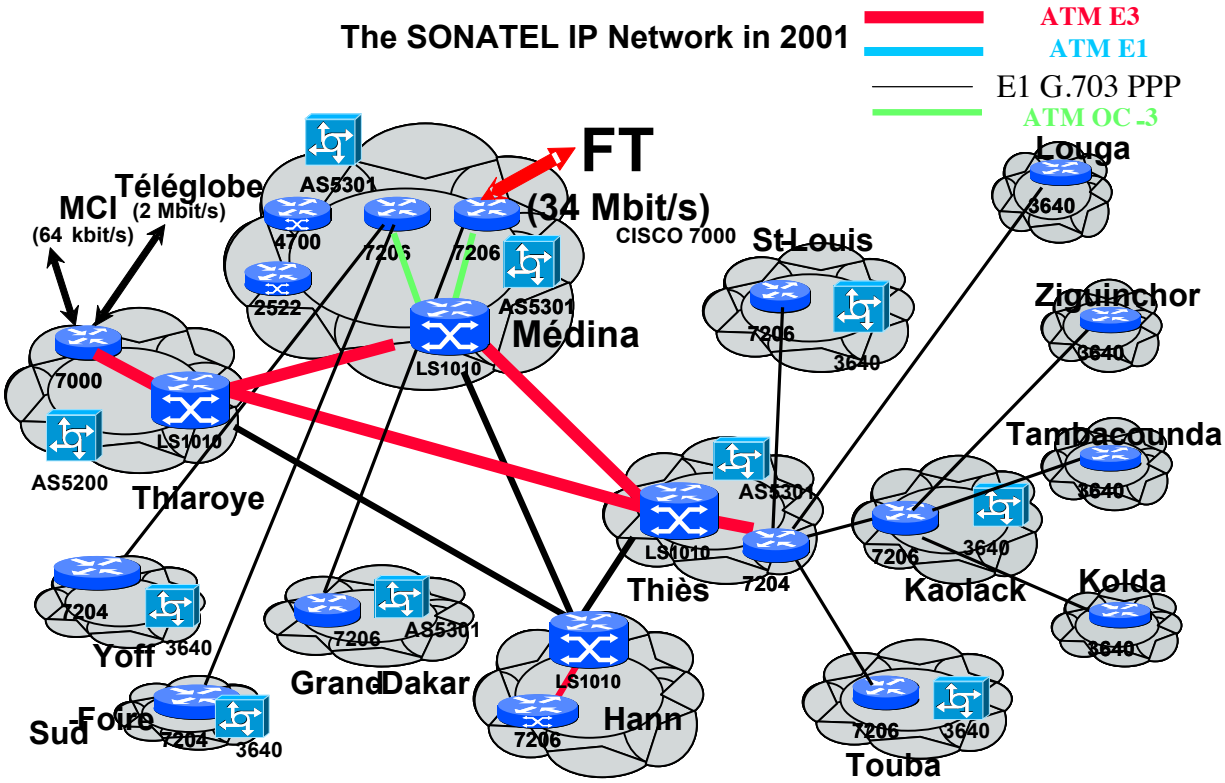


Source : Mouhamet DIOP - SONATEL/DR/PLA/SPIN

The SONATEL IP Network in 1999



Source : Mouhamet DIOP - SONATEL/DR/PLA/SPIN



Source: Mouhamet Diop, 2001

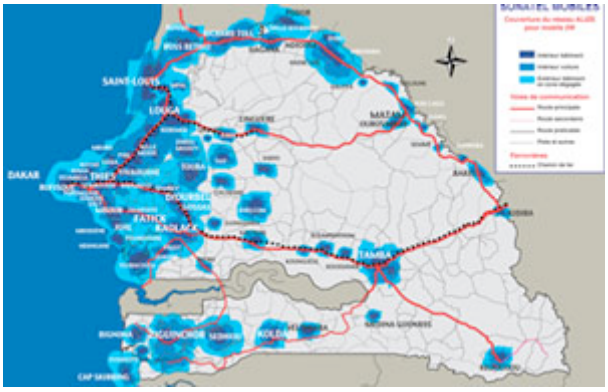
4.4 Services

Cellular phone services

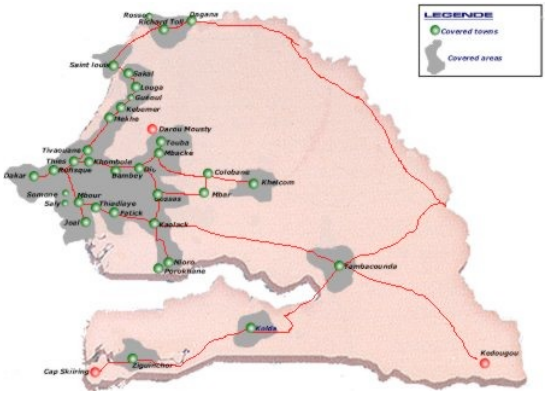
The use of cellular phones truly began in Senegal in 1996 when *SONATEL* launched the *Alizé* network.[72] In 1999, a second operator, *SENTEL*, emerged on the market as the winner of a call for bids launched by the government as part of the limited competition regime that applied to this telecommunication sub-sector. Due to the explosion in cellular phone use (there are currently 3.5 times as many cell phone users as there were fixed line users in 2003), the 900 MHz band became saturated, especially in the Dakar area. In order to maintain the quality of service in this area, *ART* transferred frequencies to *SONATEL* in the 1800 MHz band. In 2003, Senegal's largest cities and main roadways were covered by the GSM network of 300 BTSs[73] of which 215 were installed by *SONATEL* and 85 by *SENTEL*.

[72] From 1993, the cities of Dakar and Thiès were partially covered by the Radiocom 2000 system.

[73] BTS (Base Transceiver Stations) are made up of 2-way radios and form the interface between the BSC (Base Station Center) and cellular phones. These are telephone relays made up of antennas.



SONATEL Mobiles Network Coverage



SENTEL Network Coverage

Rural Telephone Services

Since 1997, *SONATEL* has connected an average of 140 villages per year, and 1,350 rural communities had been connected to the telephone system in Senegal by the end of 2004. *SONATEL* exceeded by 40% one year ahead of its deadline the commitment it made at the time of privatization to connect 976 communities by August 2005. In fact, the operator predicts that it will have connected more than 1,600 rural communities by July 31, 2005. To achieve this level of development for rural telephony, SONATEL has invested more than 40 billion CFA francs since 1997. The work continues, with the annual investment of more than 6 billion CFA francs for the fixed line network alone. Most of this investment has been related to point-to-multipoint (PMP) and point to point (PtP) technology, via remote digital concentrator (RDC) or overhead cable.

Voice over IP

Before the full liberalization of the sector, the regulatory authorities always felt that voice over IP was part of the monopoly held by the long-standing operator, which provided voice services (Cf. Chapter 5 - The Institutional, Legal and Regulatory Context). *SONATEL* has been carrying its international voice traffic over IP since May 2001 when it signed an agreement with the American company *ITXC*.[74] Calls to Senegal originating from communication service provided by *ITXC* partners are also completed by VoIP. VoIP use led to the development of offshore call centers such as *Premium Contact Center International* (*PCCI*)[75] that use voice over IP to provide services.[76]

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74 ITXC: http://www.itxc.com/ - doesn't exist anymore, but archived at http://web.archive.org/web/20011108085800/http://www.itxc.com/index2.html

75 PCCI: http://www.pcci.sn/ - now redirects to http://www.pcci.fr/

76 Cf. Le premier call-center séné-gaulois est né, Isabelle Renaud, January 8, 2003 (Novéthic: http://www.novethic.fr/)

ADSL
SONATEL has offered *ADSL* service since March 2003. Two options are available:

- Unlimited connection for residential customers at 256 Kbps for downstream and 128 Kbps for upstream

- An unlimited plan for business customers at 1024 Kbps for downstream and 128 Kbps for upstream

For the first option, *ADSL* was only available in certain parts of Dakar.[77] However, in the second half of 2003, this new means of connecting to the Internet became available in more neighborhoods.[78] In January 2004, *ADSL* coverage had spread to some of the Dakar suburbs, such as Thiaroye, and even to some regional towns such as Saly and Saint-Louis. Since July 2004, *ADSL* coverage has included all regional capitals[79], the Dakar suburbs[80] and Mbour.

WIFI
Wireless access, known as *WiFi*, was officially launched in Senegal on July 15, 2004 by *SONATEL Multimédia*. To take advantage of this service, customers had to be in an area covered by *ADSL*, be near a "Hot Spot" (WiFi access point) and have a WiFi-enabled computer. *SONATEL Multimédia* offered three WiFi plans: one for the hospitality industry (Sentoo Wifi Hôtels), one for businesses (Sentoo Wifi Entreprises) and one for individuals (Sentoo Wifi Home). The introductory price for the individual plan was 99,000 CFA francs (including tax), while prices for the other services were set on a case-by-case basis.

Other Services

Beside fixed and mobile telephone systems, and the services described above, there is an entire range of available telecommunications services, including:

- Telex, use of which is declining
- The *Senpac* X.25 network, launched in 1988
- Minitel, launched in 1994 and which provided access to Senegalese (Vidéotel) and international (Minitelnet) videotex providers
- Infotel, launched in 1995 and providing access to voice providers
- Synchronous digital hierarchy (SDH), introduced in 1997
- Integrated services digital network *Sénéris*, launched at the end of 1997 and providing a basic 2B+D service, or a primary 30B+D service
- The X.400 email system, introduced in 1998
- Intelligent network with services such as prepaid cards, toll-free numbers, access to voicemail, etc., introduced in 1998.

77 Plateau, Médina, Grand-Dakar, Sicap, Liberté, Fann, HLM, VDN, Dieuppeul, Castors and Mermoz
78 Yoff, Almadies, Ngor, Hann and Sud Foire
79 Diourbel, Fatick, Kaolack, Kolda, Louga, Matam, Saint-Louis, Tambacounda, Thiès and Ziguinchor
80 Patte d'Oie, Guédiawaye, Parcelles assainies, Cambérène and Rufisque

5. The Institutional, Legal and Regulatory Context

In Senegal, telecommunication policy is established by the Head of State in accordance with the Constitution, which states in its Article 36 that the President of the Republic "shall determine the nation's policy, which is to be implemented by the Government under the direction of the Prime Minister."[81] A sector policy paper is drawn up and the Post and Telecommunications Minister, under the authority of the Prime Minister, is responsible for implementing the policy. The Agency for Telecommunication Regulations (ART), a public body with a legal personality and financial autonomy, also comes under the authority of the President of the Republic.

Until the mid-1990s, the main bodies that established and implemented Senegal's telecommunication policy were:

- The National Committee for the Coordination of Telecommunications under the Presidency of the Republic, created in 1960
- The National Information Technology Committee under the Presidency of the Republic, created in 1972[82]
- The Information Technology Delegation, created in 1987[83]
- The Ministry of Communication, responsible for the regulation of the telecommunications sector by means of the Directorate of Studies and of the Regulation of Post and Telecommunication, established in 1994[84]
- SONATEL, the country's sole telecommunications operator

Nonetheless, Senegal was one of the first African countries to initiate reform of the telecommunication sector, which led first of all to the privatization of the incumbent operator, and then to the full liberalization of the sector.

An Early Reform Process

As early as 1981, Senegal began its first major reform with the separation of national and international telephone services. National services were placed under the *Office for Post and Telecommunications* (*OPT*) and international services fell to *TéléSénégal.*[85] After the Senegalese Telecommunication Days, which were held from June 15 to 18, 1983, the next reform, involving the legal and regulatory context of the telecommunication sector, was implemented in 1985. Law 72-39 of May 26, 1972, relating to the telecommunication sector, was dramatically modified. The principal result was the separation of post and telecommunication services, with the creation of the both the *Office des Postes et de la Caisse d'Epargne* (Post Office and National Savings Bank, *OPCE*) and the *Société Nationale des Télécommunications* (SONATEL).

In 1992, the Comité National de Coordination des Télécommunications (National Committee for the Coordination of Telecommunications, CNCT) decided to organize a seminar on the

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81 Constitution of the Republic of Senegal, adopted by referendum on January 7, 2001.

82 Decree 8543/PM /SGG, August 2, 1972.

83 Established by Decree 87-1402 of November 17, 1987, the Information technology Delegation was replaced by the State Information Technology Directorate in January 2002

84 Decree 94-896/MICOM/SAGE, September 5, 1994.

85 Gadio, Cheikh Tidiane: Institutional reforms of telecommunications in Senegal, Mali and Ghana: The interplay of structural adjustment and international policy diffusion. Ph. D., Ohio State University, 1995, p. 182.

changes within telecommunication and information technology. The seminar finally took place in 1994 and resulted in the creation of a National committee to evaluate Senegal's options in the field of telecommunications. The committee's principal mandate was to evaluate and classify the various telecommunication services according to their possible liberalization. An important discussion followed, under the auspices of the *Groupe de réflexion sur la compétitivité et la croissance* (Study Group on Competition and Growth, *GRCC*)[86] about the concepts of liberalization, privatization, deregulation, bringing in new shareholders, etc. However, the discussion was confined to political decision-makers, technicians, leaders of the private sector and lenders, leaving out all other sectors of society.

After two seminars in August and September 1995 about new information technologies for communication, a joint government/private sector commission was established. Its mission was to continue to study and to define guidelines to restructure the telecommunication sector again, to create an environment favorable to private investment and to undertake activities that would contribute to growth. At the end of October 1995, principal guidelines for restructuring the sector and a draft legislation for the Telecommunications Code were put forward. A final seminar was organized at the end of November 1995 with representatives from all sectors and consensus was reached on the guidelines for a third major reform of the telecommunication sector, relating to the liberalization of certain sectors of the market and bringing in new shareholders for *SONATEL*.[87] The draft was presented to the government at the beginning of December 1995, and in January 1996 the new telecommunications Code, featuring most of the proposals made by the *GRCC* (which had played a key role in the process), was adopted by the National Assembly. One year later, in February 1997, Senegal signed the basic agreement on telecommunication services of the *World Trade Organization* (*WTO*)[88] with a view to the full liberalization of the sector by 2004.[89]

Privatization of the Incumbent Operator

The privatization of *SONATEL* was part of the policy for the privatization of public companies initiated by Senegal in the mid-1990s and long advocated by international financial institutions. The privatization also responded to the need to form strategic alliances, given the context of global deregulation of the telecommunication sector. Overall, privatization favored momentum, with the help of the *Délégation à l'informatique* (Information Technology Delegation, *DINFO*), whereas *SONATEL*'s priority was to maintain its monopoly. Because the discussion had, in fact, been limited to the specialists, there was no debate among public opinion relating to the opportunity of *SONATEL*'s privatization, nor about the ways in which the telecommunication sector would open up to competition. However, the procedure was unique in that it involved labor unions in the privatization process, thereby reducing their opposition. Because the sector was by definition open to the world and changes occurring in the world, *SONATEL*'s labor unions quickly realized that privatization was unavoidable and rather than oppose it in vain, they tried to take maximum advantage. The unions consulted an expert to elaborate on their position in the privatization process, and demanded that a portion of the shares be allocated to their members and paid for

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86 The "Groupe de réflexion sur la compétitivité et la croissance," created by the Ministry for the Economy, Finance and Planning, included representatives from all sectors of the Senegalese economy.

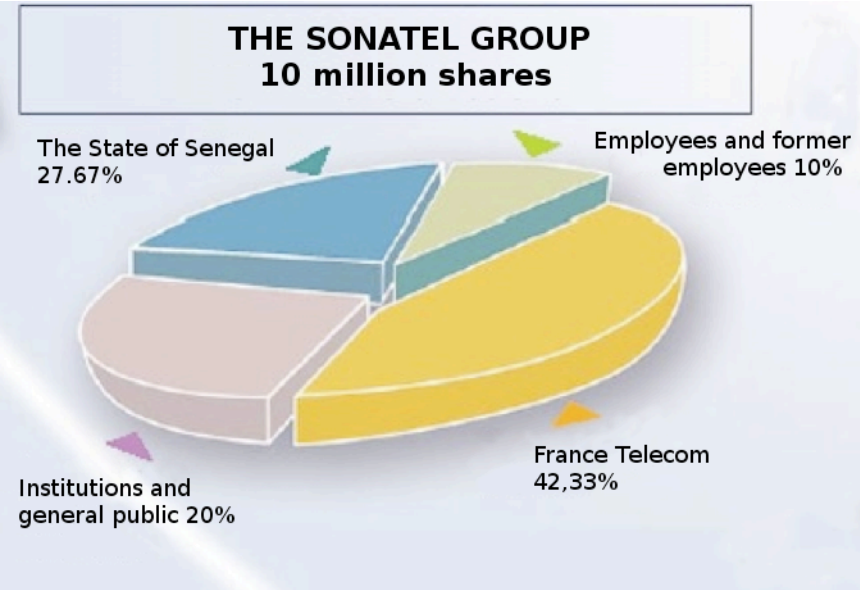
87 Presentation by Hamath Sall, Secretary General of the GRCC, at the policy forum for participants in the "Stratégie Acacia-Sénégal," held on December 17 and 18 1997, in Dakar.

88 WTO: http://www.wto.org/

89 WTO, GATS/SC/75/Suppl. 1 April 11 1997. Commerce des services, Sénégal liste d'engagements spécifiques.

by a mechanism involving the State. In the end, following privatization, *SONATEL* employees owned 10% of the company's capital, for which they paid much less than the market rate.

A the time of the privatization of the *Société Nationale des Télécommunications* (*SONATEL*) in July 1997, shares were distributed as follows: 33.3% to a significantly large foreign telecommunications operator, 10% to the company's employees, 5% to an African operator and 17.7% to the general public. After initially being awarded to the Swedish group *Telia Overseas* and then withdrawn, 33.34% of the shares, worth approximately 65 billion CFA francs (about 107 million USD) were finally allocated to *France Câbles et Radios* (*FCR*), a subsidiary of *France Télécom.*[90] Following privatization, the State awarded *SONATEL* a 20-year operating license for infrastructures still in the public domain (fixed lines). Additionally, the agreement included specifications setting out the operator's responsibilities for the following six years. In December 1997, small investors acquired 17.7% by public offering and in October 1998 *SONATEL* shares were offered on the *Bourse Régionale des Valeurs Mobilières d'Abidjan* (the Abidjan Regional Stock Exchange, *BRVM*)[91]. Finally, in January 1999, following a visit to Senegal by Michel Bon, Director General of *France Télécom*, the Senegalese government gave up an additional 10% of *SONATEL* shares, with SONATEL then owning 42.33% compared to 27,67% owned by the Senegalese State.



Source: SONATEL

Gradual Liberalization of the Market

The liberalization of the telecommunication sector began in 1996 with the reform of the telecommunications code. Law 96-03, the relevant regulatory document, set out three distinct regimes: i) the monopoly on "*creation of telecommunication networks available to the public, the provision of telephone services between fixed points, telex and telegraph services, packet-switched data telecommunications services,"* ii) managed competition in the mobile phone sector and iii) free competition for value-added services.[92]

[90] It must be pointed out that *FCR* was already present on the Senegalese market with a 49% share in *Télécom-Plus*, a subsidiary of *SONATEL*.

[91] BRVM: http://www.brvm.org/

[92] Law 96-03 of February 22, 1996, promulgating the Telecommunications Code.

In this context, only *SONATEL* was authorized to operate a public IP network and to offer a service of full IP access. Therefore, development of the national IP network was the exclusive responsibility of SONATEL, as was management of connecting the country internationally. Dial-up service was, on the other hand, open to free competition, as a value-added service. As for *VSAT* services, these were authorized for private-use networks. However, the provision of these types of services always required permission from the authorities in charge of regulation of the telecommunications sector.

In 1997, *Access Télécom*, a private company, offered a one-way paging service called "*Balafon*" but it was not successful. In fact, the development of mobile phones soon made the product obsolete and Balafon joined Minitel in the graveyard of other defunct services.

From 1999, the mobile phone sector experienced managed competition with the arrival of *SENTEL*. With 75% ownership by *MILLICOM INTERNATIONAL CELLULAR*[93]*, SENTEL GSM* acquired the second mobile telephone service license in July 1998 for a period of 20 years and launched its service in April 1999.[94] Two GSM operators were therefore in competition: *SONATEL Mobiles* service "*Alizé*" launched in 1996, and *SENTEL GSM*.

From 1996 to 2004, there were no major changes in the telecommunication market in Senegal, until the State of Senegal notified *SONATEL*, at the end of December 2003, of its decision to fully liberalize the sector starting on July 19, 2004. The direct result of this decision was the ability of other telecommunication operators to provide fixed and international telephone service as well as IP access. However, although the telecommunication sector was, in theory, liberalized, the State had not yet clearly defined the direction that sector policy would take, in particular relating to the number of new operators, and the way in which these operators would enter the market.

The Senegalese people found out somewhat inadvertently, at the end of December 2003, that the government had informed SONATEL about its decision to fully liberalize the market starting on July 20, 2004. The first to react were the *SONATEL* workers who formed an inter-union association bringing together the *Syndicat national des encadrants de la SONATEL* (*SYNES*), the *Syndicat national des travailleurs de la poste et des télécommunications* (*SNTPT*), the *Syndicat des travailleurs de la SONATEL* (*SYTS*) and the *Amicale des cadres de la SONATEL* (*ACSON*) by publishing a document entitled "*Libéralisation des télécommunications : Contribution du personnel de la SONATEL*" ("Liberalizing Telecommunications: SONATEL employees' contribution"). While accepting the government's decision to proceed with the full liberalization of the telecommunication markets as of July 2004, the inter-union association demanded the formation of a policy group, warned of the risk to SONATEL's stability, stated its support for the limitation of the number of operators, demanded the separation of *ART*'s regulation definition and regulation duties and asked the State to quickly publish a policy sector letter setting out its vision and priorities.

Given the complexity of the issues resulting from the liberalization of the telecommunication sector, the *Collectif des journalistes économiques du Sénégal* (Senegalese Union for

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93 MILLICOM INTERNATIONAL CELLULAR: http://www.millicom.com/

94 Along with *SONATEL* and *SENTEL*, *Société Internationale de Télécommunications Aéronautiques* (*SITA*), who specializes in data transmission for the air transportation industry but whose network is strictly private, is also present (SITA: http://www.sita.com/)

Economic Journalists, *COJES*) organized, with the *Friedrich Ebert Foundation,*[95] a seminar from March 19 to 21, 2004, entitled "Les enjeux de la libéralisation des télécommunications : quelles opportunités pour les consommateurs, les entreprises et l'économie sénégalaise ?" ("The Challenges of Liberalizing Telecommunications: What are the Opportunities for Consumers, Businesses and Senegal's Economy?")

However, despite calls for consultation with participants from all sectors, the State did not listen, and those involved in the telecommunications sector could only speculate. A consultation meeting about the liberalization of the telecommunication sector was finally quickly summoned by the authorities on July 3 and 4, 2004.[96] Nonetheless, given the uncertainty that always surrounds the State's true intentions, three months after the full liberalization of the telecommunication sector, no major changes had occurred.

Moving Towards Independent Regulation of the Sector

As a public operator with a monopoly on telecommunication services, *SONATEL* was responsible for regulation of the sector until 1994. From 1994 to 2001, the *Direction des Etudes et de la Réglementation de la Poste et des Télécommunications* (Directorate of Studies and of the Regulation of Post and Telecommunication, *DERPT*)[97] of the Ministry of Communication took responsibility for regulation policy. In this role, *DERPT* approved rates for services under the monopoly regime, issued authorizations to provide services, managed the allocation of radio frequencies, etc. In spite of its commitment to the WTO in 1997, Senegal had not established an independent regulatory body by December 31, 1997. Though mentioned frequently, the creation of the *Agence de régulation des télécommunications* (Agency for Telecommunication Regulations, *ART*)[98] did not occur until the Telecommunications Code of December 27, 2001 was adopted, and later upon the nomination of its first Director General, Matar Seck, on January 17, 2002.

Placed under the authority of the President of the Republic, *ART* oversees the application of the regulations and ensures that the provisions of the telecommunications code are respected, and in particular is responsible for:

> "... drawing up, at the request of the President of the Republic or on its own initiative, draft legislation and regulations to improve the legal, economic and security-related framework in which telecommunication and information technology activities take place;
> ... keeping up-to-date the conditions in which telecommunication activities take place:
> ... approving rates for telecommunication services as part of the monopoly regime as well as general rates;
> ... representing the State within regional and international organizations dealing with telecommunication issues, in cooperation with the Minister for Foreign Affairs."[99]

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95 Friedrich Ebert Foundation: archived: http://web.archive.org/web/20080429170950/http://senegal.fes-international.de

96 Several participants received their invitation by fax on July 1st 2004, only two days before the meeting began!

97 Decree 94-896, September 5, 1994.

98 ART: http://www.art-telecom-senegal.org/

99 Cf. Art. 43 of the Telecommunications Code of December 27, 2001

The ART Director General[100] is assisted by a Regulatory Board made up of five members and has the support of various technical services.

According to the Telecommunications Code, regulation of the sector is based on five (5) regimes:

- A licensing regime covering all telecommunication networks that are open to the public such as fixed networks, mobile networks, satellite networks, radio networks, optical fiber networks and cable networks

- An authorization regime that applies to all independent telecommunication networks for private or shared use

- An approval regime, relating to: (1) radio equipment, whether or not it is to be connected to a public telecommunications network, (2) terminal equipment, but only when intended for connection to a public telecommunication network, and (3) installers of radio equipment, independent or working for a third party, relating to radio equipment and installations and terminal equipment, in the following situations: (1) manufacture for the domestic market, (2) imports, (3) holding with a view to sell, (4) offering for sale, (5) distribution for free or at a cost and (6) advertising

- A declaration regime for value-added services defined by the telecommunications code as "all telecommunication services that, not being diffusion-related and using support services or final telecommunication services, add more services to the support service, or meet new specific telecommunication needs." The list of so-called value-added services is set by ART and includes: email, voicemail, electronic data interchange (EDI), file transfer, Internet services, etc.

- A regime of liberties involving internal networks and radio installations made up only of low-power and limited-range equipment[101] as well as terminal equipment that is not meant to be connected to a public telecommunication network.[102]

Since ART was created, its principal activities have been:

- Acquiring the equipment necessary for controlling the frequency spectrum
- Setting up a working group on interconnection issues
- Setting up a working group on the national numbering plan
- Drawing up a national plan for the allocation of frequencies for cellular telephony
- Ruling on rates for telecommunication charges and services
- Drawing up an entire series of legislative and regulatory texts
- Dealing with complaints from various parties within the sector

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100 Malick F. Guèye has served as ART's Director General since May 27, 2003.

101 Cf. Art. 20 of the Telecommunications Code of December 27, 2001

102 Cf. Art. 27 of the Telecommunications Code of December 27, 2001

- Working on the development of access and universal service
- Managing and controlling the frequency spectrum
- Assessing *SONATEL*'s compliance with the commitments it undertook upon privatization
- Approving telecommunication operators' monitoring indicators
- Organizing consultations on the liberalization of telecommunications in July 2004
- Organizing a day of reflection on the draft specifications for the operating conditions of private telecenters in September 2004
- Participating in the work of the West African Telecommunications Regulators Association and in international meetings on the telecommunications sector

Since July 20, 2004, when the telecommunications sector underwent full liberalization following the removal of SONATEL's monopoly on certain services, ART has taken on considerably more responsibility than before. The smooth development of the sector has depended, from that moment on, on ART's ability to ensure transparent, healthy and fair competition among operators, to ensure access and universal service, and to respect the general interest.

Telephone use over the Internet is another source of friction between SONATEL and ISPs, with some providers offering, more or less openly, services such as Net2Phone. Others have tried to terminate international telephone traffic originating from the Internet over the Senegalese switched network, until SONATEL took precautionary measures by cutting the lines. In April 2001, the second-largest mobile phone operator, *SENTEL*, sent out a challenge to the regulatory authorities with a highly publicized announcement of its intention to enter the market as a *wireless* IP provider, at highly competive rates. This was an idea that never came to fruition, as the regulators issued a statement pointing out that "*SENTEL is not authorized to install or operate a wireless local loop network.*"[103]

From the privatization of SONATEL to the full liberalization of the sector in July 2004, the various regulatory bodies have always considered that voice over IP fell within the scope of the monopoly as it involved voice services. Therefore, it was banned and anyone who tried to offer that type of service in one form or another often, if not always, had to deal with *SONATEL* who simply cut the lines that showed proof, or even the likelihood, of VoIP activity. In May 2000, *Millennium Group Telecom*, which offers international telephone services over the Internet at prices much lower than *SONATEL*'s, had its lines simply cut, causing it to cease activities. In response, the company complained about *SONATEL* to the Dakar Regional Special Tribunal, asking to have the lines re-connected and sought 500 million CFA francs in damages and interest.

On the other hand, taking advantage of its monopoly, *SONATEL* did not hesitate to introduce IP telephone services with partner *France Télécom* and *with ITXC*[104] in May 2001. The ability to route international calls over the Internet is quite tempting due to the unbeatable prices. Thus, following an agreement signed in October 2001 with American company *ITXC*, which specialized in VoIP for its international traffic, *SONATEL* offered call termination in Senegal for communications generated by *ITXC*'s partners, and was able to generate its own telephone

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[103] Statement from the *Direction des Etudes, de la Prospective et de la Réglementation* (Directorate of Studies, Forecasting and Regulations, *DEPR*), April 17, 2001.

[104] ITXC: http://www.itxc.com/ - expired – see previous footnote

telecommunication and fax transmissions via the Internet using the *ITXC* network. In addition, some companies such as the Dakar-based call center *Premium Contact Center International* (*PCCI*)[105] used voice over IP to provide services.[106]

[105] PCCI: http://www.pcci.sn/

[106] Cf. Le premier call-center séné-gaulois est né, Isabelle Renaud, January 8, 2003 (Novéthic: http://www.novethic.fr/)

6. Evolution of the Internet in Senegal from 1996 to 2004

Things have certainly changed, since the end of the 1990s when the Internet was a phenomenon limited mostly to the Dakar area and was generally only available to expatriates, international organizations, diplomatic missions, aid agencies and large companies. Cybercafés spread from the Plateau neighborhood to spring up in all parts of the capital and its suburbs, and including even the poorest neighborhoods. Today there are cybercafés in all the regional capital cities and even in several district capitals. Additionally, at least two ISPs, SUD INFORMATIQUE[107] and CAPICOM[108], have been launched, one in Ziguinchor and the other in Kaolack.

This development owes much to the work of associations but also to the national policy of promoting ICTs and to support from international aid.

6.1 Estimating the Number of Internet Users

As sources of information about Internet users in Senegal are rare and inconsistent in terms of frequency and definitions of the notion of "Internet user," figures that are generally available are approximate. The only figure that can, in theory, be measured accurately is the number of people with an *ISP* plan, and this depends on the ISPs giving out this type of information. However, given the increase in Internet use within the government, the private sector and civil society and, of course, education and cybercafés, it is clear that the number of Internet users is far greater than the number of *ISP* customers.

In general, the numbers given for the period of 1996 to 2000 relate mostly to the number of email account subscribers. At the end of 1995, it was estimated that there were 500 users of the *RIO* network in Senegal[109] and in 1998, the number of Internet users in Senegal was estimated at 2,500.[110]

A survey carried out by Olivier Sagna on behalf of Osiris in July 1999[111] of commercial and non-commercial ISPs operating in Senegal showed about 8,735 email subscribers. Based on information often given reluctantly by service providers, we see the following breakdown:

- Télécom-Plus: 4,000 subscribers
- Métissacana: 1,500 subscribers
- Aupelf-Uref: 1,300 subscribers
- Cheikh Anta Diop University of Dakar: 610 subscribers
- Arc informatique: 500 subscribers
- Cyber Business Center: 300 subscribers

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107 SUD INFORMATIQUE: http://www.sudinfo.sn/

108 CAPICOM: http://www.capicom.sn/ - archived at http://web.archive.org/web/20050304091500/http://www.capicom.sn/

109 Cf. Des NTIC et du développement en Afrique, Danielle Beaugendre, December 5, 2002 (http://www.aedev.org/spip.php?article405)

110 Cf. Enjeux des nouvelles technologies de l'information et de la communication pour l'Afrique, Cyriaque Paré (http://membres.lycos.fr/mediafriq/enjeuxntic.html, redirects to http://membres.multimania.fr/mediafriq/enjeuxntic.html)

111 Cf. Le Sénégal à l'heure des technologies de l'information et de la communication : Etat des lieux, Olivier Sagna, October 1999

- Point Net: 20 subscribers
- Primature: about 175 subscribers
- Enda Tiers-Monde: 150 subscribers

To these 8,735 subscribers using public or private service providers, must be added users of entities like *ORSTOM* (230), *Gaston Berger University of Saint-Louis* (70), the *Centre de Suivi Ecologique* (50), *SONATEL* (166), *Trade Point Sénégal* (550), etc, not to mention foreign organizations like *USAID* (100) or international bodies like *ILO*, for a total of at least 10,000 users. By February 2001, the number of customers of these services had risen slightly to around 11,000. In its 2003 annual report, the Agency for Telecommunication Regulations estimated the number of Internet subscribers to be 15,000, of whom 3,000 were using *ADSL.*[112]

To respond to the frequently asked but never answered question of the number of Internet users, Afrique Initiatives launched a systematic survey on the subject in February 2001. Interviews were carried out with the major players involved in the Internet in Senegal as well as with users (government, companies and individuals) who accessed the Internet at home or via public access points (cybercafés and telecenters). Then, statistics were collected from the managers of public access points, to adjust the estimated number of Internet users who connected via these centers. The result of this pioneer effort, which unfortunately has never been updated, was a number of at least 80,000 to 90,000 regular Internet users, plus 20,000 to 25,000 occasional users, or approximately 1% of the population. The study showed that 50% of these users log on at work, 20% in schools and universities, 20% via public access points, and 10% at home.[113] Today, the figure most often cited is around 150,000 Internet users[114] although some estimate a figure of 200,000. Nonetheless, according to ART's 2003 annual report, 90% of users were in Dakar, with the remaining 10% distributed between the other Senegalese towns and cities— and Internet users were virtually unheard of in rural areas.

6.2 A Strong Momentum of Association

Internet users in Senegal have felt the need to join forces, resulting in the creation of several associations. This movement towards creating associations in the information and communication technologies sector has been in existence for a relatively long time. The *Association des Clubs de Micro Informatique du* Sénégal (Association of Senegalese Microcomputing Clubs, *ACMIS*) was formed in 1985. With the mission of developing and disseminating information technology tools, *ACMIS* reached its heyday in the late 1980s, but has since ceased operations.

Efforts continued at the end of the 1990s with a whole series of associations, sometimes short-lived, offering different levels of activity. These associations continually lobbied political decision makers, development partners, the private sector and civil society, and the government. The common objective was to facilitate the use and in particular the acquisition of as many ICTs as possible by highlighting social development.

February 1998 thus saw the beginning of a process that resulted in the creation, on March 28, 1998, of the *Observatoire sur les systèmes d'information, les réseaux et les*

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112 Agence de régulation des télécommunications. Rapport annuel d'activités 2003. Dakar, 2004, 69 p.

113 Cf. Plus de 100 000 internautes au Sénégal, Afrique Initiative, February 2001.

114 Cf. Paiement en ligne sur Internet : La SONATEL Multimédia lance la carte prépayée, Johnson Mbengue, Wal Fadjri, July 13, 2003

inforoutes au Sénégal (Observatory on Information Systems, Networks and Information Highways in Senegal, *OSIRIS*)[115] whose President, Amadou Top, was known for his service to ICTs in Africa and for his commitment to bridging the digital divide.[116] As the Senegalese representative to the *Advisory Network for African Information Strategies* (*ANAIS*)[117], a network created following recommendations from "*Rencontres de devenir*," organized by the *Fondation du devenir* (*FDD*)[118], held October 17 and 18, 1996 in Geneva, Switzerland on the theme "*Africa and the New Information Technologies*" and bringing together those involved in the development of the Internet in Senegal in different sectors of activity, *OSIRIS* set the following goals:

- 1) To contribute to the development of the Information Society by following the recommendations of the African Information Society Initiative adopted by the United Nations Economic Commission for Africa
- 2) To promote the use and dissemination of information and communication technologies
- 3) To review all initiatives relating to information and communication technologies and to promote synergy
- 4) To inform decision makers from various sectors, as well as individual citizens, about the opportunities and risks surrounding information and communication technologies
- 5) To encourage international aid in general, and sub-regional aid in particular, in the field of information and communication technologies

For the most part, OSIRIS carries out dissemination activities though its website and its monthly electronic newsletter entitled *Bulletin d'analyse sur les technologies d'information et de la communication* (Bulletin on the Analysis of Information and Communication Technologies), also known as *BATIK*.[119] In addition, *OSIRIS* has been a regular participant in the Senegal Internet Fair, (along with *ISOC-SENEGAL*), has been involved in the international meetings on the Information Society and has organized a multimedia caravan that traveled throughout the country to promote ICTs in the smaller towns and rural areas from August 2001 to January 2002.

The Senegalese Chapter of the Internet Society, *ISOC-SENEGAL*[120] was created on February 29, 1999. It is worth noting here, as an aside, that apart from a first in-person meeting and the constituent general meeting, the organization was formed entirely online. This was how the association's statutes were discussed over several weeks, and then adopted, followed by the online election of officers, with Alex Corenthin elected President. *ISOC-SENEGAL* set the following goals:

- To promote the use of the Internet in Senegal by highlighting the experiences it could offer, by providing a first level of information and by encouraging members to communicate with each other and with the other ISOC members

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115 OSIRIS: http://www.osiris.sn/

116 Amadou Top was Vice President of the Digital Solidarity Fund, created after the World Summit on the Information Society held December 10 to 12, 2003 in Geneva, Switzerland.

117 ANAIS: http://www.anais.org/ - expired

118 Fondation du devenir: http://www.fdd.org/

119 *BATIK* is sent out by email but back-copies are also available on the OSIRIS website in PDF and HTML formats.

120 ISOC-SENEGAL: http://www.isoc.sn/

- To encourage participation by Senegal in the work of ISOC
- To facilitate participation in various private and public aid projects, both in Senegal and in other countries
- To promote appropriate use of native languages on the Internet, to encourage the circulation of local content and to facilitate cooperation with the other African chapters of ISOC
- To provide information about the positions taken by the Chapter and by ISOC in regard to all physical and moral persons involved in the Internet
- To provide occasion for, organize and participate in formal and informal meetings, demonstrations, conferences, working groups and commissions, as well as in any work or publication, using electronic means (the Internet) or not, in accordance with the organization's purpose
- To undertake any activity that will lead to a suitable environment for, the public accessibility of, and generally promote the Internet in Senegal

Since 1999, *ISOC-SENEGAL* has organized the annual Senegal *Internet Fair*[121] as well as national and regional vocational training workshops. In November 1999, *ISOC-SENEGAL* organized the INET 99 Workshop on network technologies for developing countries, a symposium on the regulation of Internet use in Senegal in July 2000, an INET training workshop in October 2001, etc., as well as taking an active part in national and international forums, especially those involved in the founding of *AfriNIC*.

Also worthy of note is the creation of the *Réseau Genre et TIC* (*REGENTIC*)[122], founded from a partnership between *ENDA*, *OSIRIS* and *ART* following the "*Dimensions de genre des politiques de TIC au Sénégal*" workshop held in November 2002. The goal of this workshop was to give an assessment of the development of the information and communication technologies sector in Senegal, to analyze the situation from a gender-equality point of view, and to initiate a consultation process bringing together regulatory authorities, women's organizations and civil society organizations that work to promote women in Africa. Since then, *REGENTIC* has carried out many different activities and published a document entitled "*Citoyennes africaines dans la société de l'information : Manuel de première urgence à l'intention des décideur(e)s*" (African Women in the Information Society: a First-aid Manual for Decision Makers).[123]

Besides these associations, there have also been efforts to create organizations for private sector professionals. For example, the *Sen@robase* Foundation was created in May 1999 to promote new technologies whose goal was "facilitating the promotion and use of electronic networks and their development in Senegal in the most coherent manner possible and taking into full account the spirit of the country" and that aimed to "represent, for the Senegalese government, a definitive authority on electronic networks, new information technologies and emerging professions". The initiative did not last, however, and for a long time the sector was without proper organization.

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121 Sixième édition ce week-end : Fête de l'Internet : « 1001 usages au service des hommes », Alain-Just Coly, Le Soleil, March 19, 2004;

122 REGENTIC: http://www.famafrique.org/regentic/accueil.html - archived at http://web.archive.org/web/20061220054755/http://www.famafrique.org/regentic/accueil.html

123 The online version is archived here: http://web.archive.org/web/20090521151457/http://www.famafrique.org/regentic/e-citoyennes.pdf

Later, sector-specific initiatives were launched, such as the *Collectif des Opérateurs Privés de Terminaison d'Appels* (Private Call Termination Operators Collective, *COPTA*) founded in 2002. However, it was not until June 2003 that the *Organisation des professionnels des technologies de l'information et de la communication* (Organization of Information and Communication Technologies Professionals, *OPTIC*)[124], a labor union affiliated with the *Conseil national du patronat* (National Employers Council, *CNP*)[125], was formed. Presided by El Hadji Diop, of *ABM*, the organization's goals were:

- To study and uphold the economic, industrial and commercial interests of the information and communication technology sector
- To create a setting of exchange, synergy and solidarity between its members
- To be the driving force for initiatives and propositions, becoming a vital interlocutor for public authorities
- To set up a reference center of expertise for the new technologies, information and communication sectors
- To assist its members with legal, social and fiscal matters

In particular, in January 2004 *OPTIC* organized a seminar to lay the foundations of a long-term consultation framework aimed at drafting and implementing a development strategy for the ICT sector. The organization also actively participated in the consultation meeting on the liberalization of telecommunications, hosted by the Senegalese government on July 2 and 3, 2004.

A short time later, in July 2003, at the suggestion of the *World Information Technology and Services Alliance* (*WITSA*)[126] based in Washington, in the United States, some of the participants in the technology sector gathered at a seminar with the goal of highlighting the problems specific to the ICT private sector, reaching a general consensus among the sector's key players and laying the foundation for the creation of an ICT association in Senegal. In the end, an association entitled the *Senegalese Information Technology Association* (*SITSA*)[127] was formed in July 2004. This association for Senegalese ICT professionals, with Mouhamet Diop as its president, aims to promote appropriate decisions and establish a digital economy that benefits everyone. To do this, the association plans to provide its members and the government with advocacy support, research, information, advice, technical support, accreditation, education, certification, standardization, and will also organize events. Serving as a lobby group and an advisor for development of the ICT industry, but also as a "trustworthy source of information for the government," the association hopes to engage in direct dialog with the Senegalese government and assist in the government's efforts to draw up laws and regulations for the ICT sector.[128]

Finally, along with user associations and labor unions, consumers have become more and more interested in ICT issues. In 2002, in response to the outcry among young people caused by *SONATEL*'s sudden and unilateral decision to charge for SMS messages that had previously been free, the *Association des consommateurs du Sénégal* (Consumers Association

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124 OPTIC: http://www.optic.sn/

125 CNP: http://www.cnp.sn/

126 WITSA: World Information Technology and Services Alliance – http://www.witsa.org/

127 SITSA: http://www.sitsa.sn/ – unfortunately, it seems that this website no longer exists

128 Cf. Nouvelles technologies de l'information et de la communication : L'Association sénégalaise démarre ses activités, Alain-Just Coly, Le Soleil, June 18, 2004.

of Senegal, *ASCOSEN*)[129], led by Momar Ndao, the *Association pour la défense des usagers de l'eau, de l'électricité, des télécommunications et des services* (the Water, Electricity, Telecommunications and Services Users Association, *ADEETELS*), the *Union nationale des consommateurs du Sénégal* (Senegalese Consumers National Union, *UNCS*) and the *Association sénégalaise pour la défense du consommateur* (Senegalese Consumers Association, *ASDEC*) participated in the negotiations organized by *ART* to find a solution to the crisis. Finally, at the time of consultations on the liberalization of the telecommunications sector in July 2004, SOS Consommateurs, led by Mr. Massokhna Kane, and *ASCOSEN* called for support for *ART* to help protect consumers.

6.3 A National Policy Firmly Committed to ICTs

The Internet was able to evolve under favorable conditions in Senegal, mostly because the political authorities understood very early on what was at stake in the Information Society, as the issues had been identified in the prospective study "*Sénégal 2015*," carried out at the end of the 1980s. Since that time, a national policy and developmental projects have been drawn up.

In order to promote universal access to telecommunication services for all members of society, telecommunications were separated from the postal service in 1984, and in 1994, an evaluation of this reform concluded that priority should be given to the development of services. Most participants stood behind the reforms, and so a new Telecommunications Code (Law 96-03 of February 22, 1996) was adopted, replacing Law 72-39. At this time, the concepts of networks and services were taken into account, instead of just the one concept of telecommunications.

In addition, within the framework of the IXth Plan 1996-2015, "*Compétitivité et développement humain durable (1996-2015)*" (Competition and Sustainable Human Development), Senegal incorporated the recommendations of Resolution 812 of the *ECA* relating to the "*Mise en œuvre de l'Initiative Société Africaine à l'Ere de l'Information*" (The Implementation of the Initiative for the African Society in the Information Age). Among the ten strategic goals for the next five years was the need to "*strengthen and facilitate access to information and promote social communication*," and among the specific goals, it was recommended to:

> " - expand the use of information and communication technologies in order to facilitate changes in the operating procedures of companies and organizations
>
> - ensure a steady flow of information and communication for education, health, employment, culture, environment, trade, finance, tourism and commerce
>
> - make optimal use of information, favoring the implementation of systems to disseminate information on a large scale to individuals, companies, NGOs and the public sector
>
> - link Senegal to the global networks of the information society and participate in initiatives for worldwide information infrastructures

[129] ASCOSEN: http://www.ascosen.sn/ - archived at http://web.archive.org/web/20090408070103/http://www.ascosen.sn/

- create an environment favorable to the development of information and communication by implementing measures to encourage the private sector to play a major role in the provision of services

- strengthen the national information and communication network allowing the Senegalese people to communicate reliably and at a reasonable price

- provide each school, village, public service and company with access to information resources

- promote the emergence of new generations of Senegalese people capable of using ITCs, to speed development by improving education systems and highlighting the human resources needed to establish, maintain and operate ICTs

- implement timely measures to facilitate the creation of local, affordable Internet services that are widely accessible and that provide local news

- eliminate fees and import/access duties for information and communication technologies"[130]

6.4 Support from International Aid Sources

Within the framework of bilateral and multilateral aid, Senegal has benefitted from many initiatives that will help strengthen human capacities and therefore contribute to the achievement of the goals mentioned above. While we cannot list them all here, the most significant are the *Acacia* program, the *WorldLinks* project, the *@frinet* and *@friweb* projects, the *Leland Initiative*, *Trade Point Sénégal*, and the *NSRC*.

Whether acting for philanthropic or political reasons, the international community has launched several significant initiatives contributing to the development of the Information Society in Africa. The year 1995 was significant because at that time:

- the World Bank launched its *Information for Development* (INFODEV) program,
- the United States, via USAID, implemented the *Leland Initiative*
- the United Nations Economic Commission for Africa (ECA) hosted the *African Regional Symposium on Telematics for Development*, held in Addis-Ababa, Ethiopia, in April 1995
- the 21st meeting of the ECA's Conference of Ministers adopted a resolution on "*Building Africa's Information Highway*"
- the Francophone Summit of Cotonou (Benin) adopted a resolution on the information society in November 1995

Thus, with the aim of contributing to the implementation of the *African Information Society Initiative*, in 1996 the *IDRC* launched the *Acacia Initiative*, a program to give African communities the skills needed to apply information and communication technologies to their economic and social development needs. As Senegal had included the recommendations of

130 IXème plan 1996-2015 "*Compétitivité et développement humain durable*".

the *ECA*'s Resolution 812 on the implementation of the recommendations of the African Information Society Initiative in its 9th social and economic development plan (1996-2015), and was carrying out a policy for the promotion of ICT use (through SONATEL), the country was chosen as a beneficiary, along with South Africa, Mozambique and Uganda. Conceived to be an integrated program involving pilot projects and research activities, the Acacia program covers the following four areas:

- Policy: providing research and support for policies aiming to stimulate the growth and development of the services offered by the ICT industry and facilitating the provision of goods and services with the help of ICTs
- Infrastructure: implementing technologies relating to the supply of telecommunications and infrastructure, and creating the skills necessary for acquiring knowledge and skills for managing, using, and deploying ICT infrastructure and its applications
- Technologies: researching innovative technical solutions allowing ICTs to be used by marginalized populations
- Applications and content: supporting the development of local applications in the relevant areas

In this way, the *IDRC* financed numerous projects, like the program for "cyber youth" areas of the *Groupe pour l'enseignement et l'étude de la population* (*Group for Increasing Awareness and Learning among the People, GEEP*)[131], Enda's "Cyberpop" project, *Trade Point Sénégal*'s outposts[132], the introduction of ICTs in the management of resources belonging to the regional village lands of the *Fondation rurale de l'Afrique de l'Ouest* (the West Africa Rural Foundation, *WARF*), the creation of a web-based incubator for new companies, support for political and institutional reform of the telecommunication sector, etc.[133]

The World Bank included Senegal among the beneficiaries of the *World Links for Development* (*World Links*) program based on five principal areas:

- Connecting schools (equipment, Internet connection, twinning with other schools)
- Partnering with the private sector to generate and maintain sufficient resources to expand the program beyond its pilot stage
- Telecommunications policy with regard to reducing telecommunication fees, to benefit the education sector
- Training leaders, teachers, students and technicians
- Follow-up and evaluation to measure the results and the impact of the program on the quality of education

As part of Phase I, the Martin Luther King CEM[134] and the Thierno Seydou Nourou Tall high school, both in Dakar, were equipped in 1997. During Phase II (1998), ten schools in Dakar, Thiès, Mbour, Diourbel, Kaolack and Saint-Louis had their turn. In Phase III (2000), 28 more

131 GEEP: http://www.refer.sn/geep/ - archived at http://web.archive.org/web/20070315021419/http://www.refer.sn/geep/geep.htm

132 Trade Point Sénégal: http://www.tpsnet.org/

133 The full list of projects was available at: http://web.idrc.ca/fr/ev-12200-201-1-DO_TOPIC.html

134 CEM: Collège d'enseignement moyen (middle school)

establishments were equipped and connected to the Internet, with a further 8 added to the list in Phase IV (2002). In all, almost fifty establishments, elementary schools, middle schools and high schools benefitted from the *World Links* program in Senegal.[135] As either a direct or indirect result of the initiative, all Senegalese high schools were connected to the Internet in 2004, and a convention between the Ministry of Education and *SONATEL* was signed on July 31, 2001. The convention allowed schools and universities to benefit from a free telephone connection, a 75% discount on the cost of dial-up service and a 50% reduction on permanent connections, as well as a 30% reduction on Internet plans offered by *SENTOO*.

Acting on the recommendations of the Francophone Summit of Cotonou (Benin), the Canadian International Development Agency (CIDA), in collaboration with the Agency for Technical and Cultural Cooperation (ACCT), initiated the *@frinet* project, which assisted in the installation of an Internet server in the Office of the Prime Minister.[136] Following the purchase and assembly of the required material and equipment and the installation of basic software, *TECSULT-EDUPLUS*[137] provided training for 24 people from the Offices of the President and the Prime Minister, from the National Assembly, from media organizations and from various ministries. After two weeks of training, the server of the Office of the Prime Minister was officially inaugurated on February 20, 1997. As part of a second phase, and thanks in particular to more training sessions offered as part of the @friweb project, the national daily paper *Le Soleil*[138] was able to publish an online version, thus becoming one of the first African newspapers with an online presence.

As for electronic commerce, Senegal was chosen by the *United Nations Conference on Trade and Development* (*UNCTAD*) to be part of the pilot phase of the implementation of the *Global Trade Point Network* (*GptNet*). At that time, the government created the *Trade Point Sénégal Foundation* whose members included the *Confédération Nationale des Employeurs du Sénégal* (National Confederation of Senegalese Employers, *CNES*), the Industry and Agriculture Chambers of Commerce (CCIA), the Centre international du commerce extérieur du Sénégal (International Trade Center of Senegal, *CICES*), the *Groupement des entrepreneurs du Sénégal* (Senegalese Entrepreneurs Group, *GES*) and *SONATEL*. Its goal was to serve as an economic and trade information center for businesses, to facilitate foreign trade by reducing transaction time using a system of simplified and automated procedures, to be a point of access to international e-commerce networks and related services, and to provide advice and assistance for economic efficiency. The result was the creation of a website offering mostly business opportunities[139] and the development of an electronic customs system known today as *Orbus 2000*.

The goal of the *Leland Initiative* was to enable Africa to take advantage of the global information revolution, through connection to the Internet and the use of technologies implemented as part of the global information infrastructure.[140] This project was the primary element of *USAID*'s strategy in Africa, which included strengthening Africa's capabilities for participating in the information society. With Senegal having been connected to the Internet

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135 World Links Sénégal: http://www.world-links.org.sn/ - redirects to auf.org, but archived at http://web.archive.org/web/20060114124107/http://www.world-links.org.sn/

136 The Office of the Prime Minister: http://www.gouv.sn/

137 TECSULT-EDUPLUS: http://www.tecsulteduplus.com/ - expired, but archived at http://web.archive.org/web/20071006114223/http://www.tecsulteduplus.com/

138 Le Soleil: http://www.lesoleil.sn/

139 Trade Point Sénégal: http://www.tpsnet.org/

140 Leland Initiative: http://www.usaid.gov/regions/afr/leland/ - expired, but partially archived at http://transition.usaid.gov/locations/sub-saharan_africa/

before the signing of the protocol agreement between *USAID* and the Senegalese government in 1998, action taken as part of the Leland Initiative consisted of support for the creation of the Senegalese chapter of the Internet Society (ISOC-SENEGAL), training for NGOs, awareness seminars for parliamentarians, etc.

More recent initiatives include the *ADEN* (Appui au désenclavement numérique, Supporting Digital Inclusion)[141] program financed by aid from the French government, *DFI* (Digital Freedom Initiative)[142] of USAID and *CATIA* (Catalysing Access to ICTs in Africa)[143] funded by aid from Britain. The goal of the *ADEN* program was to support the creation of a network of public Internet access points, with the equipment and subscription costs spread between public telecenters. This was the only way to reduce the cost of Internet access for individuals and to allow a larger share of the population to use these tools and new services. The goal of the *Digital Freedom Initiative* project, created to last for three years and with a budget of 6.5 million dollars, was to promote innovation to small and medium-sized businesses using technical assistance from Peace Corps volunteers, to push for legislative and regulatory reform that would create an environment favorable to growth, and to use existing ICT infrastructures. Finally, as part of the *CATIA* program, Britain supported both the *Open Knowledge Network* (OKN)[144] program, the goal of which was to capitalize on endogenous assets and disseminate them via the Internet, as well as the *Centre sur les politiques internationales des TIC pour l'Afrique de l'Ouest et du Centre* (Center for International ICT Policies – West and Central Africa, CIPACO), which aimed to strengthen the skills of the African people to help them participate more actively in international decision making.[145]

6.5 Use and Content

With the notable exception of the work of Thomas Guignard[146], there are few detailed studies on Internet users and on the use of the Internet in Senegal. According to the Guignard study carried out in 2001 and relating to 184 cybercafés, 61% of the cafés were in Dakar, with Thiès (13%), Saint-Louis (8%), Kaolack and Ziguinchor (4%) coming in far behind. On average, cybercafés had 7.21 computers each, and 68.5% of the cafés were connected via STN. In 2004, the major changes were mostly in relation to the number of computers per cybercafé, since there were more locations equipped with ten computers. Changes were also noted in the connection method, with more and more cybercafés using *ADSL* to connect to the Internet. As for customer breakdown, a survey of 135 Internet users showed that 60.7% of cybercafé users were students. Sixty percent of customers were under 26 years old, with women making up only 37.8% of that group. Higher education graduates made up almost 50% of customers.

Most of the other studies were carried out only in Dakar[147], or even only the Plateau neighborhood.[148] The studies are limited in scope[149] or deal with a targeted subject matter[150]

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141 ADEN: http://www.arc.sn/aden/ - expired and not archived

142 DFI: http://www.dfi.sn/ - expired, archived at http://web.archive.org/web/20060304041318/http://www.dfi.sn/

143 CATIA: http://www.catia.ws/ - expired, archived at http://web.archive.org/web/20050919003127/http://www.catia.ws/

144 OKN: http://www.openknowledge.net/ - expired, archived at http://web.archive.org/web/20060830223636/http://www.openknowledge.net/

145 CIPACO was initiated by the Panos Institute West Africa within the framework of its NTIC program

146 Cf. Internet au Sénégal : Une émergence paradoxale. Thomas Guignard, DEA thesis under the supervision of Elisabeth Fichez, Charles de Gaulle University, Lille 3, May 2002, 180 p.

147 Cf. L'expansion des télécentres à Dakar. Frédéric Barbier, Masters Thesis, under the supervision of Guy Mainet, the University of Western Brittany, 1998, 131 p.

which considerably limits their application in terms of conclusions and lessons to be learned. Furthermore, as there has never been a study using identical methodology but at different times, we do not have reliable data to allow us to make an analysis over time of Internet use from 1996 to today.

Among the highlights, the strong trend of introducing ICTs into the education system is particularly noteworthy, because in 2004, all Senegalese high schools, the two universities and the principal higher education establishments are connected to the Internet. ICTs are used for training in a classroom setting, but also remotely. Besides the remote training offered by the *Centre d'enseignement à distance* (Distance Learning Center)[151], the *Université virtuelle africaine* (African Virtual University, *AVU*)[152] and the *Agence universitaire de la Francophonie* (University Agency of la Francophonie, *AUF*)[153], there are other distance training opportunities offered locally such as the *Diplôme supérieur en sciences de l'information et de la communication* (Higher Diploma in Information and Communication Sciences, *DSSIC*) or the *e-certificat d'archiviste documentaliste* (Archivist-Documentalist E-certificate) offered by the *Ecole des bibliothécaires archivistes et documentalistes* (School for Archive and Documentation Librarians, *EBAD*).[154]

While the few studies carried out and empirical observation clearly show that Internet use has made a great deal of progress both quantitatively and qualitatively, it is nonetheless evident that the digital divide exists in various forms. First, the geographical divide: the Internet is still primarily an urban phenomenon given the infrastructure limitations of both the telecommunications network and the electricity supply network. Secondly, the economic divide: the Internet is still reserved for the privileged few who can either pay for a telephone line, buy a computer or pay for an *ISP* plan, or access the Internet at work, or have the opportunity to go to the cybercafés where the price of a hour of connection time is often close to the average daily income for most Senegalese: 500 CFA francs. Then, the gender divide: women are not only in the minority when it comes to Internet use, but they are also in the minority in the design, implementation, follow up and evaluation of ICT policies. Also, fewer women than men have the skills required to use the Internet. The generational divide: youth make up the vast majority of Internet users, both because of the attraction that information technologies have for this group, and because of the impact of initiatives in the education system implemented by the State, NGOs, local communities and international aid sources.

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148 Cf. Les cyber centres du Plateau de Dakar : Enquêtes sur les lieux et les usages d'Internet. Anaïs Lafite. Internship report, 2nd year of IEP under the supervision of Annie Chéneau-Loquay, September 2001, 35 p.

149 Cf. Plus de 100 000 internautes au Sénégal. A study of Afrique Initiatives by Séverine Candelier et Mathieu Lemoine. Dakar, February 2001, 31 p.

150 Cf. Study by OSIRIS for the 1999 SINEC, Dakar, 31 p., Etude panafricaine sur les télécentres : Sénégal. Khamate Sène, Pape Touty Sow and Mor Dieng, International Development Research Center, Dakar, 2001, 91 p. and L'Internet au Sénégal : Modes d'insertion, différents usages et réseaux de communication mis en place par les ONG dakaroises. Caroline Dulau, DEA thesis under the supervision of Annie Chéneau-Loquay, University of Bordeaux 3, 2002, 102 p.

151 The Centre d'enseignement à distance (CED-SENEGAL) was originally financed by the World Bank. Since the beginning of the 2004 school year, it has been independent.

152 The Université virtuelle africaine has a location at the Gaston Berger University of Saint-Louis, from where it offers a Masters in Computer Science awarded by Laval University (Canada), and a location on the campus of Cheikh Anta Diop University of Dakar.

153 The Agence universitaire de la francophonie (AUF) has a Campus numérique francophone (Francophone Digital Campus) in Dakar, equipped with one hundred computers, and a Centre d'accès à l'information (Information Access Center) at the Gaston Berger University of Saint-Louis, with twelve machines.

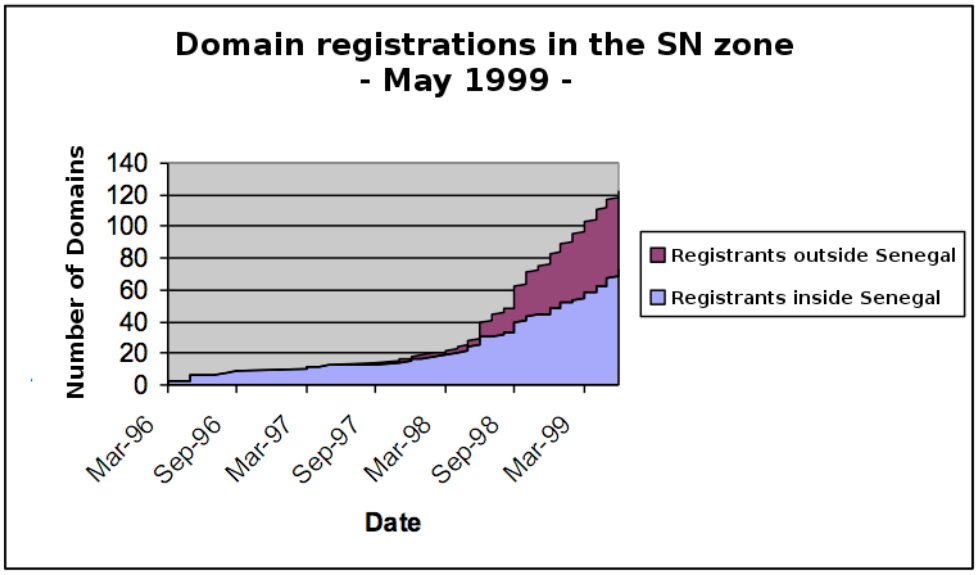
154 EBAD: http://www.ebad.ucad.sn/

The linguistic divide: most Internet users only have access to the small amount of Internet content that is in French. Finally, the educational divide: the large group of those who have no computer training, and the even larger group of those who are illiterate and for whom the Internet is a completely foreign concept, are both excluded.

Domain Registrations in the ".sn" Zone

Statistics regarding Internet content are some of the hardest to find. Once again, it comes down mostly to questions of definition. Should we talk in terms of web pages, identifiable by a URL or websites found via an address within a certain domain? Even if we limit ourselves to registered websites, this does not help, since the problem lies in knowing what defines the "nationality" of a website. Is it sites created by Senegalese people, sites about Senegal, sites with an ".sn" domain name, sites registered by physical persons of Senegalese nationality or moral persons with Senegalese rights?

For Senegalese content, the most reliable figures are those collected by NIC SENEGAL, which show the number of domain names registered as ".sn". From March 1996 to March 1998, the number of .sn sites registered was barely more than twenty, and there was little increase in the number of registrations.



Source: NIC SENEGAL

In March 2001, there were 648 ".sn" names registered, of which 231, or almost one third, were domain names that had been simply reserved[155], most often by large international companies who took the precaution of reserving an ".sn" domain name rather than see it used, or even taken over, by others. In March 2003, the number of ".sn" domain names registered reached 1,153 and by August 2004 the number rose to 1,516, of which 1,129 were simply reserved names. In March 2004, using the website directory provided by OSIRIS and after verifying their actual web presence, Thomas Guignard counted some 637 websites.[156] However, the number of domain names registered as ".sn" is only an indication of the number of Senegalese websites on the Internet, as a significant number are registered under generic

155 Information obtained by Olivier Sagna from NIC Sénégal

156 Electronic message from Thomas Guignard to Olivier Sagna, 2004.

domains (.com, .org, .int, etc.). Eric Bernard notes that 24% of Senegalese domain names are not ".sn".[157]

The choice between a generic domain name, most often ".com," and a geographic ".sn" name depends on several factors. For companies that have an international presence or simply plan to expand internationally, ".com" often seems like an indication of credibility. For other companies, buying a ".com" domain name is cheaper, as the prices charged by NIC SENEGAL are higher than those charged by other companies such as Gandi. Today, creating a domain name costs 50,000 CFA francs and will cost 30,000 CFA francs per year to maintain, whereas the cost with Gandi is less than 9,500 CFA francs.[158] However, the cost of a domain name is not the only factor to consider when going online. Some organizations do not have a credit card to purchase the name online, or simply do not have confidence in the procedure and prefer to pay more but using other payment methods with NIC SENEGAL. However it should be noted that NIC SENEGAL's prices have gone down dramatically since it was launched in 1996, as shown in the following table:

Year	Creating a Domain Name	Annual Maintenance Cost
2001	50,000 CFA francs	30,000 CFA francs
2000	50,000 CFA francs	50,000 CFA francs
1999	50,000 CFA francs	50,000 CFA francs
1998	100,000 CFA francs	100,000 CFA francs
1997	200,000 CFA francs	200,000 CFA francs
1996	200,000 CFA francs	200,000 CFA francs

Source: NIC Sénégal

Websites

A quick overview of Senegalese websites shows that the press is highly visible, with six online newspapers[159], one press agency[160], five radio stations[161] as well as television[162]. Portals are also appearing, such as *Sentoo*[163] and *Arc Informatique*[164]. Although there are a few more dynamic websites, most still offer static pages consisting of brochures for public or private organizations, or general websites (tourism, useful information, culture, geography, history, etc.). With the exception of *Trade Point Sénégal's* site[165] which offers a database on products, customers, markets, institutions and legislation, as well as more general data about

157 Cf. Eric Bernard : Le déploiement des infrastructures Internet en Afrique de l'Ouest. Thesis under the supervision of Henry Bakis and Annie Chéneau-Loquay, Montpellier University III, Paul Valéry, 2003, p. 284.

158 Gandi offers domain names for 14.35 euros per year, including tax.

159 These are: Le Soleil (http://www.lesoleil.sn/), Sud Quotidien (http://www.sudonline.sn/), Wal Fadjri (http://www.walf.sn/), Le Quotidien (http://www.lequotidien.sn/), l'Observateur (http://www.lobservateur.sn/) and Le Messager (http://www.lemessager.sn/ - has expired, but archived at http://web.archive.org/web/20050113064219/http://www.lemessager.sn/).

160 Agence de presse sénégalaise (http://www.aps.sn/)

161 RTS, Sud FM, Wal FM, RRM, Dunya FM

162 Radio Télédiffusion du Sénégal: http://www.rts.sn/

163 Sentoo: http://www.sentoo.sn/

164 Arc informatique: http://www.arc.sn/

165 Trade Point Sénégal: http://www.tpsnet.org/

Senegal, and *Taftaf.com*[166], there are no sites offering electronic purchasing applications for consumers to shop online. There are, however, applications in the field of e-commerce such as the *Orbus 2000* electronic customs system developed by *Trade Point Sénégal* and currently used by Senegalese Customs, and the *Time 2 Market* service developed by *Manobi*[167], which offers real-time market information, via mobile phone and the Internet, for fruit and vegetable growers and fishermen who have subscribed.

Thomas Guignard's current study of 643 websites relating to Senegal shows that 18% are dedicated to tourism, 8% to the public sector, 8% belong to NGOs and 7% relate to higher education and research. Of the total, 349 are in the ".sn" domain, distributed as follows: 13% for the public sector, 11% relating to the Internet, computer science and telecommunications sector, 10% for NGOs, 10% for tourism and 9% for higher education and research. Overall, therefore, there are many sites devoted to tourism, which, along with fishing and phosphates, is one of the pillars of the Senegalese economy, and a relatively large number of sites published by the public sector. Also evident is the dynamism of civil society and the higher education and research sector.

Offshore Services

At the end of the 1990s, the teleservices sector was very much in fashion and the government was keen to reiterate its desire to make Senegal a "teleservices country". At that time, there were two pioneer companies, *Alphacad* and *Teleservices S.A.*, created in 1997 and 1998 respectively. Making use of the Internet, Alphacad mostly offered architectural drawing services, while Teleservices S.A. offered text input of legislative documents. Both companies had clients who were located outside Senegal. Since September 2002, a French company called "Sénégalaise de Saisie Informatique" (SESI) has also been operating in Dakar, offering typing services of scientific articles. A short time later, "Jouve informatique," specializing in document engineering and the creation of CD-ROMs, followed suit. However, in 2004 the leading companies in the teleservices sector are call centers, such as AFRICATEL AVS, the CHAKA group, PCCI and CENTER VALUE, which all use voice over IP in their activities. Besides teleservices, some companies offer the production of multimedia content, such as IMEDIA[168], DCNET[169], and PEOPLE INPUT[170] and training courses for ICT occupations, like FUTURIS[171] and SUPINFO[172], became more common.

166 Taftaf.com: http://www.taftaf.com/ - archived at http://web.archive.org/web/20050324003539/http://taftaf.com/

167 Manobi: http://www.manobi.sn/

168 IMEDIA: http://www.imedia.sn/

169 DCNET: http://www.dgcnet.com/

170 PEOPLE INPUT: http://www.peopleinput.com/

171 FUTURIS: http://www.futuris.sn/

172 SUPINFO: http://www.supinfo.sn/

Conclusion

Fifteen years ago, when pioneers experimented with the first email systems that could send and read messages once a day, who would have predicted the extent of the development of the Internet in Senegal? Today, we can all agree that the Internet was not just a passing trend, or a gadget that was too expensive for a developing country such as Senegal.

Of course, the Internet is not the technological miracle heralded at the end of the 1990s. Remember, it was supposed to revolutionize the world, with countries in the South taking an unprecedented leap forward to catch up with the North, it would be available to everyone and all humanity would finally be able communicate without restrictions... The bubble burst, taking with it the last utopia of the 20th century. The Internet revealed both its limitations and is faults, which were very real.

Cyber crime, especially fraud, began to appear. Online discussion forums are sometimes used for soliciting by those involved in prostitution. Sites relating to pornography, pedophilia and all sites that in general go against the values of Senegalese society are freely available to all. Their content often has nothing to do with the expectations nor the reality of the Senegalese people, both because of the language of the content, and the issues that the sites discuss. Offering remote services leads to the creation of unskilled and poorly paid jobs, while applications for the good of society in the areas of education, health and good governance are slow to appear. The Internet appears to widen the divide separating the privileged few from the vast majority of Senegalese, who are not able to take advantage of its benefits, despite the abundance of cybercafés springing up all over the country, the dramatic rise in the number of websites and the use of the Internet in all sectors of the economy and society.

Alongside these clear disadvantages, it is impossible to ignore the advantages and the progress that the Internet has offered to Senegalese society. With its system for information about the fruit and vegetable and fish markets, MANOBI has enabled producers to significantly increase their income. A large share of the press has obtained a worldwide audience and been able to reach the Senegalese diaspora, previously cut off from information about what was going on at home. Education, training and research continue to profit from the Internet to improve the quality of service. The administration, in particular in the implementation of the government intranet, is being updated. Cybercafés, call centers and other activities in the ICT sector have created many jobs, the telecommunications infrastructure has been rolled out and updated, companies have better visibility and are more efficient, etc.

All in all, if this were an accounting exercise, we could say that the balance is, overall, positive. Of course, plenty remains to be done, and the challenge is obviously to implement policies that will both offer Internet access to as many people as possible, and create a favorable environment for the Internet to be used for human social development. The Internet affects all sectors of society, and it will become whatever the people of Senegal decide to make of it. For this reason, the Senegalese people must be involved in the processes of design, implementation, compliance and evaluation of policies, so that their voices can be heard, and so that they can be involved in choices and directions for the future. We must always remember that while the Internet is neither intrinsically good nor intrinsically bad, it will never be neutral.

- Appendix A -
Dial-up ISPs

University Agency of la Francophonie Tel: (221) 824 29 27 Fax: (221) 825 59 58 Web: http://www.refer.sn/ Email: info@sn.auf.org	**Sentoo** Tel: (221) 869.97.00 Fax: (221) 860.01.64 Web: http://www.sentoo.sn/ Email:
Arc informatique Tel: (221) 823.54.74 Fax: (221) 822.70.99 Web: http://www.arc.sn/ Email: arc@arc.sn	**Sénégalaise des Télécommunications (STE)** Tel: (221) 822.64.00 Fax: (221) 822.64.01 Web: http://www.ste.sn/ Email: ste@ste.sn Note: Doesn't exist anymore
Capicom Tel: (221) 940.00.00 Fax: (221) 941.10.68 Web: http://www.capicom.sn/ Email: webmaster@capicom.sn Note: Doesn't exist anymore	**Sud Informatique** Tel: (221) 991.15.73 Fax: (221) 936.80.70 Web: http://www.sudinfo.sn/ Email: sudinfo@sudinfo.sn
Silicon Valley Tel: (221) 825.59.47 Fax: (221) 825.59.48 Web: http://www.omnet.sn/ Email: sall@omnet.sn Note: Doesn't exist anymore	**Trade Point Sénégal** Tel: (221) 839.73.76 Fax: (221) 839.73.73 Web: http://www.tpsnet.org/ Email:
Enda Tiers-Monde Tel: (221) 842.82.50 Fax: (221) 822.26.95 Web: http://www.enda.sn/ Email: enda@enda.sn Note: Doesn't exist under .SN anymore	**Cheikh Anta Diop University of Dakar** Tel: (221) 825.75.38 Fax: (221) 825.37.24 Web: http://www.ucad.sn/ Email: sndiaye@ucad.sn

- Appendix B -
Acronyms

ACSON	Amicale des cadres de la SONATEL (SONATEL Managers Association)
ADSL	Asymmetric Digital Subscriber Line
ADEETELS	Association pour la défense des usagers de l'eau, de l'électricité, des télécom. et des services (Water, Electricity, Telecom. and Service Users Association)
AfriNIC	African Network Information Center
ANAIS	Advisory Network for African Information Strategies
APC	Association for Progressive Communication
ARCT	African Regional Center of Technology
ART	Agence de régulation des télécommunications (Agency for Telecommunication Regulations)
ASCOSEN	Association des consommateurs du Sénégal (Senegalese Consumers Association)
ASDEC	Association sénégalaise pour la défense du consommateur (Senegalese Association for Consumer Defense)
ASECNA	Agence pour la sécurité de la navigation aérienne en Afrique (Agency for Air Navigation Safety in Africa)
ATM	Asynchronous Transfer Mode
AUF	Agence Universitaire de la Francophonie (University Agency of la Francophonie)
AVU	African Virtual University
BRVM	Bourse régionale des valeurs mobilières (Regional Stock Exchange)
BTS	Base Transceiver Station
CARI	Colloque africain sur la recherche informatique (African Conference on Research in Computer Science)
CATIA	Catalysing Access to ICTs in Africa
CDMA	Code Division Multiple Access
CEM	Collège d'enseignement moyen (middle school)
CICES	Centre international du commerce extérieur du Sénégal (Senegalese International Center for Foreign Trade)
CIPACO	Centre sur les politiques internationales des TIC pour l'Afrique de l'Ouest et du Centre (Center for International ICT Policies – West and Central Africa)
CNDST	Centre national de documentation scientifique et technique (National Center for Scientific and Technical Documentation)
CNES	Confédération Nationale des Employeurs du Sénégal (National Confederation of Senegalese Employers)
CNP	Conseil national du patronat (National Employers Council)
COJES	Collectif des journalistes économiques du Sénégal (Senegalese Union for Economic Journalists)
COPTA	Collectif des Opérateurs Privés de Terminaison d'Appels (Private Call Termination Operators Collective)
CRODT	Centre de Recherche Océanographique de Dakar-Thiaroye (Dakar-Thiaroye Center for Oceanographic Research)
DAMA	Demand Assigned Multiple Access
DAST	Délégation aux affaires scientifiques et techniques (Delegation for Scientific and Technical Affairs)
DECT	Digital Enhanced Cordless Telecommunications
DERPT	Direction des Etudes et de la Réglementation de la Poste et des Télécommunications (Directorate of Studies and of the Regulation of Post and Telecommunications)
DFI	Digital Freedom Initiative
DIE	Direction informatique de l'Etat (State Information Technology Directorate)
DPS	Direction de la prévision et de la statistique (Directorate of Forecasting and Statistics)
EBAD	Ecole des bibliothécaires archivistes et documentalistes (School for Archive and Documentation Librarians)
ECA	United Nations Economic Commission for Africa
ECOWAS	Economic Community of West African States
EDI	Electronic Data Interchange
ENDA	Environnement et Développement du Tiers Monde (Environmental and Development Action in the Third World)
ENS	Ecole normale supérieure
ESP	Ecole Supérieure Polytechnique

ESMT	Ecole Supérieure Multinationale des Télécommunications
FTP	File Transfer Protocol
GATS	World Trade Organization General Agreement on Trade in Services
GBPS	Gigabits per second
GDP	Gross Domestic Product
GEEP	Groupe pour l'étude et l'enseignement de la population (Group for Increasing Awareness and Learning among the People)
GES	Groupement des entrepreneurs du Sénégal (Senegalese Entrepreneurs Group)
GMPCS	Global Mobile Personal Communications by Satellite
GRCC	Groupe de recherche sur la compétitivité et la croissance (Competivity and Growth Research Group)
HT	Hors taxe (Excluding tax)
ICT	Information and Communication Technologies
IDRC	International Development Research Center
IRD	Institut de Recherche pour le Développement (Development Research Institute)
ISDN	Integrated Services Digital Network
ISOC	Internet Society
ISP	Internet Service Provider
ISRA	Institut sénégalais de recherche agricole (Senegalese Institute for Agricultural Research)
ITU	International Telecommunication Union
KBPS	Kilobits per second
LIE	Laboratoire informatique éducation (Computer Learning Laboratory)
LS	Ligne Spécialisée (Dedicated Line)
MBPS	Megabits per second
NCC	Network coordination center
NEPAD	New Partnership for Africa's Development
NGO	Non-governmental Organization
NIC	Network Information Center
NSRC	Network Startup Resource Center
NTIC	Nouvelles Technologies de l'Information et de la Communication (New Information and Communication Technologies)
OKN	Open Knowledge Network
OPCE	Office des postes et de la caisse d'épargne (Post Office and National Savings Bank)
OPGW	Optical ground wire
OPT	Office des postes et télécommunications (Office for Post and Telecommunications)
OPTIC	Organisation des professionnels des technologies de l'information et de la communication (Organization of Information and Communication Technologies Professionals)
OSIRIS	Observatoire sur les systèmes d'information, les réseaux et les inforoutes au Sénégal (Observatory on Information Systems, Networks and Information Highways in Senegal)
PADISNet	Pan African Documentation and Information System Network
PDH	Plesiochronous Digital Hierarchy
PDS	Parti démocratique sénégalais (Senegalese Democratic Party)
PMP	Point-to-multipoint
POP	Point of presence
PtP	Point to Point
RDC	Remote Digital Controller
REFER	Réseau électronique francophone pour l'enseignement et la recherche (Francophone Electronic Network for Education and Research)
REGENTIC	Réseau Genre et TIC (Gender and ICT Network)
RENATER	Réseau National de Télécommunications pour la Technologie, l'Enseignement et la Recherche (National Telecommunications Network for Technology, Education and Research)
RFC	Request for Comment
RINAF	Regional Informatics Network for Africa
RIO	Réseau Intertropical d'Ordinateurs (Intertropical Network of Computers)
SAFE	South Africa Far East
SDH	Synchronous Digital Hierarchy
SIMES	Système d'Information Multimédia sur l'Environnement Subsaharien (Multimedia Information System for the Sub-Saharan Environment)
SITA	Société internationale des télécommunications aériennes (International Society of Aerial Telecommunications)

SITSA	Senegalese Information Technologies Association
SMTP	Simple Mail Transfer Protocol
SNTPT	Syndicat national des travailleurs de la poste et des télécommunications (Postal and Telecommunications Workers National Union)
SONATEL	Société Nationale des Télécommunications
STN	Switched Telephone Network
SYFED	Système francophone d'édition et de diffusion (Francophone Publishing and Distribution System)
SYNES	Syndicat national des encadrants de la Sonatel (National SONATEL Leaders Union)
SYTS	Syndicat des travailleurs de la Sonatel (SONATEL Workers Union)
TCP/IP	Transmission Control Protocol/Internet Protocol
TLD	Top Level Domain
TPS	Trade Point Sénégal
TTC	Toutes taxes comprises (Including all taxes)
TVA	Taxe sur la valeur ajoutée (Value-added tax)
UCAD	Université Cheikh Anta Diop de Dakar (Cheikh Anta Diop University of Dakar)
UGB	Université Gaston Berger de Saint-Louis (Gaston Berger University of Saint-Louis)
UNCS	Union nationale des consommateurs du Sénégal (Senegalese Consumers National Union)
UUCP	Unix to Unix Copy
VPN	Virtual Private Network
VSAT	Very Small Aperture Terminal
WARF	West Africa Rural Foundation
WASC	West African Submarine Cable
WIFI	Wireless Fidelity
WLL	Wireless Local Loop
WTO	World Trade Organization
WWW	World Wide Web

- Appendix C -
Rates

A. Fixed Telephone Rates

Rates associated with fixed telephone service include connection tax, refundable deposit according to type of use (residential, business or government) and fiscal stamps. In 2004, the rates for the different types of use were as follows:

Table 1 - Telephone Costs (July 2004)
(in CFA francs, tax included)

Urban Areas			
	Residential	Business	Government
Deposit	16,500	44,000	0
Fiscal Stamps	4,000	4,000	0
Connection	23,400	23,400	19,500
Total	**43,900**	**71,400**	**19,500**
Rural Areas			
	Residential	Business	Government
Deposit	16,500	44,000	0
Fiscal Stamps	4,000	4,000	0
Connection	Varies according to the distance as the crow flies between the location of the equipment and the location of the central system: - from 0 to 5 km: 19,500 CFA francs - from 5 km to 15 km: 19,500 CFA francs + 10,700 CFA francs per additional whole km - more than 15 km: set rate of 126,500 CFA francs		

Source: SONATEL

Once the telephone line has been installed, each subscriber must pay a bimonthly subscriber fee, which includes line maintenance costs of 4,835 CFA francs excluding tax. Rates for telephone calls vary according to the following time bands:

Table 2 - Rate Time Bands

	12:00 a.m. to 8:00 a.m.	8:00 a.m. to 8:00 p.m.	8:00 p.m. to 12:00 a.m.
Monday to Friday	Off-peak	Peak	Off-peak
Saturday, Sunday and holidays	Off-peak	Off-peak	Off-peak

Source: SONATEL

Rates also vary according to the type of call, either domestic (local or long-distance) or international. Local calls are those between two subscribers in the same "département," in two different "départements" but within the same region, or in two neighboring "départements" whose capital cities are less than 120 km away from each other. Long-distance calls are those between two subscribers in two "départements" that are in two different regions, unless the "départements" are next to each other.

Table 3 - Rates for Domestic Calls (July 2004) *(in CFA francs, tax included)*		
Type of Call	Peak Rate	Off-peak Rate
Local Call	59 CFA francs/2 min.	59 CFA francs/4 min.
Long-distance Call	59 CFA francs/30 s.	59 CFA francs/60 s.
Landline to Mobile	200 CFA francs per minute	100 CFA francs per minute

Source: SONATEL

SONATEL has adjusted its prices five times since 1998 (February 1998, January 1999, July 1999, January 2000 and June 2004). Rates for international calls fell dramatically while local calls went up over the same time period by 33%, going from 50 CFA francs excluding tax per 3 minutes to 50 CFA francs excluding tax per 2 minutes.

For international calls, on June 1st 2004, *SONATEL* implemented a new fee structure, with one flat rate regardless of destination.

Table 4 - Rates for International Calls *(in CFA francs, tax included)*		
Destination	Peak Rate	Off-peak Rate
Africa	180 CFA francs per minute	160 CFA francs per minute
Rest of the world	180 CFA francs per minute	160 CFA francs per minute

Source: SONATEL

The adjustment in international rates brought *SONATEL* back into line with the European and North American operators. In this way, *SONATEL* was preparing for the full liberalization of the sector, and adapting to reform of the international accounting rate system. Previously, SONATEL had been highly dependent on revenue from the accounting rate for international traffic because, in 1996, the settlement balance brought in a net total of 35.6 million US dollars (29% of income from telephone services). This was an important source of revenue for a company that had to finance its investment with foreign currency. This balance allowed *SONATEL* to maintain a low debt rate and to finance projects itself, especially rural telephony projects. In 2003, international traffic accounted for a 19% share in total turnover.

B. Mobile Telephone Rates

In 2004, the cost for a new client to begin using a mobile phone is relatively low. It costs 10,000 CFA francs, of which 7,500 CFA francs are for telecommunication, for a *Diamono* plan from *Alizé*[173] and 7,500 CFA francs, including 5,000 CFA francs in communication costs for a *Hello One* plan from *SENTEL*[174]. This goes a long way to explaining the success of the mobile phone, which has gone from being reserved to a wealthy elite in the mid-1990s to a service widely used by the general public, in urban and suburban areas as well as in the country.

Rates for basic plans in July 2004 are as follows:

Table 5 - Mobile Phone Rates
(in CFA francs *tax included)*

	Peak	Off-peak	Night
Alizé to Alizé	150	120	50
Alizé to Sentel	180	180	180
Alizé to International numbers	300	300	300
Sentel to Sentel	200	100	
Sentel to Alizé	250	175	
Sentel to Africa	375	275	
Sentel to the Rest of the world	425	325	
SMS Alizé to Alizé	50		
SMS Alizé to Sentel	75		
SMS Alizé to International numbers	100		
SMS Sentel to Sentel	50		
SMS Sentel to Alizé	75		
SMS Sentel to International numbers	150		

Source: SONATEL Mobiles and Sentel

C. ADSL

ADSL plans have been offered in Senegal by *SONATEL* since March 2003. Two options are available:

- An unlimited residential plan at 256 Kbps downstream and 128 Kbps upstream, for which customers are charged 42,500 CFA francs excluding taxes for connection fees, in addition to a monthly fee of 46,750 CFA francs also excluding tax

- An unlimited plan for business customers at 1024 Kbps for downstream and 128 Kbps for upstream. For this second option, and with multiple users, connection costs are 63,750 CFA francs excluding tax, with a monthly fee of 212,500 CFA francs excluding tax

173 95% of SONATEL Mobiles customers purchase pre-paid plans.
174 SENTEL only offers pre-paid plans.

For *ADSL*, a service fee must first be paid to *SONATEL*. Following the 40% drop in *ADSL* service fees announced by SONATEL in July 2004, the fees are as follows:

Table 6 - Service Fees (one-time payment, in CFA francs **including tax)**			
	ADSL 256	**ADSL 512**	**ADSL 1024**
Sonatel Service Fees	25,075	25,075	37,613
Sonatel Multimédia Service Fees	17,000	17,000	41,300
Sonatel Multimédia Modem	24,925	24,925	63,087
Stamps	8,000	8,000	8,000
Total to be Paid by Customer	**75,000**	**75,000**	**150,000**

Then a *Sentoo*[175], *Arc informatique*[176] or *Sénégalaise des Télécommunications* (*STE*)[177] plan is required, with fees as follows:

Table 7 - Monthly Fees with a Sentoo Plan (CFA francs **including taxes)**			
	ADSL 256	**ADSL 512**	**ADSL 1024**
Sonatel Plan	17,275	33,651	152,958
Sonatel Multimédia Plan	11,725	14,350	47,200
Monthly Total to be Paid by Customer	**29,000**	**48,000**	**200,158**

Table 8 - Monthly Fees with an Arc Informatique Plan (CFA francs **including taxes)**			
	ADSL 256	**ADSL 512**	**ADSL 1024**
Sonatel Plan	17,275	33,651	152,958
Arc Informatique Plan	11,700	14,160	44,250
Monthly Total to be Paid by Customer	**28,975**	**47,811**	**197,208**

175 Sentoo: http://www.sentoo.sn/

176 Arc Informatique: http://www.arc.sn/

177 Sénégalaise des Télécommunications: http://www.ste.sn/ - expired, archived as http://web.archive.org/web/20040519073914/http://ste.sn/

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