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The Dawn of the Internet in Brazil[1]

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Abstract
This paper describes the implantation of the Internet in Brazil as a sociotechnical construction, i. e., as the result of a set of regulatory and governmental acts, academic initiatives, strategic investments of the government and its agents, market actions of telecommunication companies and efforts of the third sector. It initiates with a historical account of computer networks, starting from their roots in the United States in the 60s, examines some issues of the networking standards movements, describes a variety of networking initiatives in Brazil and reaches the deployment of the commercial Internet in the mid-90s, culminating in the institution of governance mechanisms of this network in the country.

The implantation of the Internet, as to any technological artifact, is an inseparable entanglement of science, technology and society. So in order to understand it, one must go beyond technicalities, and observe the recruitment of numerous allies and their involvement in different scenarios that ended by giving the form and robustness materialized in the way we see it today, but which is still partial, unfinished and constantly changing.

In order to highlight the local specificities of the implantation process of the Internet in Brazil, the present text goes through a series of facts and artifacts that, along the last quarter of the 20th Century, shaped the trajectory of the Internet in the country.

The text starts with the emergence of data communication networks and services in the early 80s, as well as the information control policies supported by national security concerns, which were highly important

1 The present paper is based on Marcelo Savio Carvalho's master dissertation (Carvalho, 2006), supervised by Henrique Cukierman. Both authors had been involved since 2004 in researching the beginnings of Internet in Brazil. We would like to thank the time and attention of Prof. Paulo Aguiar and Prof. Michael Stanton, who besides the interviews gave us access to their valuable personal archives, from where we took much of the information written here. In addition, we want to thank other contributions received from Alexandre Grojsgold, Carlos Afonso, Carlos Lucena, Charles Miranda, Demi Getschko, Ivan Moura Campos, Nelson Ribeiro and Saliel Figueira.

to the dictatorship by then ruling the country, followed by the dawn of a Brazilian information society and by its redemocratization.

A great part of the text is dedicated to present the several isolated attempts of forming academic networks in Brazil and the aspirations of the research community for connection with the outside world, touching issues involving the use of official standards for data communication protocols and negotiations with state-owned telecom companies, culminating with the consolidation of a national academic network in the early 90s.

Within this same time frame were also depicted some very important initiatives of the civil society, which began with amateur bulletin board systems, implemented by home users of personal computers, that later evolved into international connections to global networks of non-governmental organizations, which became a key element in the maturation process of the of implantation of the Internet in Brazil.

Finally, the text presents the paths along the 90s, which led to the emergence of the commercial Internet, arousing interests and intrigues for the commercial exploitation of this new market and its governance and control mechanisms.

The research was inspired by Science and Technology Studies—among many others, see Callon (1986), Latour (1987) and Law (1992), which show that the history of sciences and technologies can be historiographically richer when viewed not as a chronological sequence of "inventions" and "discoveries," but as a history that recognizes the contingencies, bifurcations and alternative paths which could have been followed, and especially the existence and the role of socio-technical networks.[2]

First moves for the construction of computer networks

At the height of the Cold War, stuffed in a period of nuclear bombs testing, conflicts in various regions of the planet and a starting space race, the United States of America's Department of Defense created the Advanced Research Projects Agency (ARPA), an agency which aimed, ultimately, to restore the USA leadership in science and technology, battered by the successes of Soviet Union in its nuclear and space programs. This Agency, in partnership with some handpicked universities, invested millions of dollars in various projects and, among these, the creation of a network that could connect different computers from the sponsored universities, distant and

2 The concept of "sociotechnical network" aims to overcome the separation between "science" and "society." The extension and composition of networks are always contingent, so that it is no longer possible to identify something purely "social" or purely "technical." Everything is in a constant entanglement, constituting a seamless fabric.

isolated from each other. This network, ARPANET, came into operation in late 1969 and has expanded over the following years (Abbate, 2000).

In parallel, some other non-commercial networks (such as USENET, BITNET, CSNET, FREENET etc.) have started to operate without any direct support from the USA government, working on a cooperative basis between academic institutions. Such networks represented an alternative communication between researchers from institutions that were not connected to ARPANET.

Amid the proliferation of these networks, two international organizations were working in parallel, since the mid-70s, for standardization in the scenario of telecommunications and computer networks: the *Comité consultatif international télégraphique et téléphonique* (CCITT), which acted as the spokesperson of the public postal services, telegraphy and telephony providers (at the time, were mostly state-owned enterprises), and the International Organization for Standardization (ISO), composed of national standards bodies. In 1983, these two organizations had combined their efforts and published a standardized reference layered model called Open Systems Interconnection Reference Model (OSI-RM) (Russel, 2013).

However, and while ISO and CCITT were specifying and refining their standards, a new set of computer network communication protocols—that had being developed since 1973 under the sponsorship of ARPA, and later called Transmission Control Protocol / Internet Protocol (TCP/IP)—was being tested and matured over the years, distinguishing facilities for interconnection between heterogeneous networks. Its adoption grew substantially after January 1st, 1983 when it substituted NCP (Network Control Protocol) and became ARPANET's official communication protocol, which allowed connecting to other networks that were already using or recently migrated to TCP/IP (Abbate, 2000).

After migrating to TCP/IP, ARPANET was split into two separate networks: MILNET (Military Network) to be devoted to the operational activities of the Department of Defense and ARPANET, which would be able to continue to pursue computer network research activities. Almost 2/3 of the existing hosts moved to MILNET and gateways between the two networks provided internetworking communication (Norberg & O'Neill (1996).

In 1986, the National Science Foundation (NSF), a governmental foundation to support research & development in the USA, created the NSFNET, a TCP/IP network maintained by the USA government, initially as a network backbone structure, connecting several universities and research institutions in some supercomputing centers, in order to share these expensive computing resources. In 1990 ARPANET ceased operations and its remaining hosts moved to NSFNET, which became the backbone of the, so called, Internet. This opened possibilities to connect with academic institutions from different countries, including Brazil, growing exponentially the number of machines and users connected worldwide.

Networks in Brazil and the state control

Data transmission started in Brazil as a matter of the State, specifically submitted to the interests of the Ministry of Communications (Minicom) that, by ordinances, reserved to Embratel, the state-owned Brazilian Telecommunications Company, the monopoly for installation and operation of data communication services in the country, leaving a few value-added services to the (also state-owned) local telecom companies, operators of the Brazilian Telecommunications System (Telebrás). At the end of 1988, these companies were also allowed to compete with Embratel in the provision of statewide data communication services (Stanton, 1993).

Leading government documents supported the deployment of networks in the country aiming at the competitiveness of the domestic industry and at the purposes of strategic military order. In their view, the domestic industry should achieve greater technological development in tune with other "developed" countries and, since Brazil was ruled by the military, geopolitical issues raised the telecommunications area into a strategic theme for national autonomy and security (Benakouche, 1997).

The state control over the flow and the disclosure of electronic information was not restricted to the Minicom. In the early 80s, the then powerful Special Secretariat of Informatics (SEI), created by the military government security agency, decided to intervene in this subject by creating the Special Committee on Teleinformatics, whose objective was to analyze the national landscape of telecommunications and informatics sectors and guide the government (including the Minicom) in directing a development policy, which should be integrated within the wider framework of the national communication and information technology policies (Benakouche, 1997). Later in its National Plan for Informatics and Automation, SEI had established guidelines relating to the so-called "Transborder Data Flows," in which it had the only and ultimate decision on authorizing computerized data communications across national borders (Lins, 2002). By that time, airline and banking networks were the only ones allowed to operate internationally, with their access points installed in facilities from Embratel, who was also responsible for the equipment operation (Stanton, 1993).

The first national data communication networks

The first data communication service in Brazil, offered in 1980 by Embratel to the market, was TRANSDATA, a point-to-point (not switched) network of private circuits, leased at fixed prices, calculated based on the distance between the ending points and the corresponding transmission capacity (Benakouche, 1997).

In 1982, Embratel created CIRANDA,[3] a pilot project for an information services network restricted to employees of the company and accessible from shared computers installed at their offices. The participating employees were also granted with the purchase of microcomputers with modems to be installed at their homes, in order to extend the reach of the pilot network (Benakouche, 1997).

In 1985, Embratel launched RENPAC, the national packet network, which was a public data transmission network that used the X.25 protocol (based on the OSI Reference Model). To increase its use, Embratel expanded the CIRANDA project to the general public, through RENPAC network, creating the CIRANDÃO[4] Project, an information service offering which few years later became the STM-400 service (Benakouche, 1997).

The difficulties of interconnecting Brazilian universities

In 1979, the National Laboratory for Computer Networks (LARC) was created by several universities in Brazil to integrate the institutional efforts in the area of computer networks, in order to generate a nationwide expertise in this area and to promote the exchange of scientific information and software through the integration of local computing laboratories (Rodrigues, 1987).

In 1984, LARC launched the Rede-Rio Project, aiming at creating a network to link the computers of some academic institutions in the state of Rio de Janeiro. The project proposed the study and implementation of OSI protocols, the training of professionals and the widespread use of RENPAC network within the academic community. This project received funding from the Financing Agency for Studies and Projects (FINEP), an organization of the Brazilian federal government devoted to the funding of science and technology projects in the country (Rodrigues, 1987).

Seeking alternatives to ensure the creation of an academic network in Brazil, the board members of LARC visited, in June 1985, the academic

3 Named after the Brazilian northeastern popular dance, where people get together in a big circle dancing and singing, drawing on the metaphor of cooperation.

4 “Cirandão” is the aumentative of “Ciranda” (see previous footnote). The announcement positioned “Cirandão” as an opportunity to redeem the democratic ideal.

network of *Deutsches Forschungsnetz* (DFN) in Berlin, Germany,[5] a supporter of the OSI protocols, as many European countries at that time. As a consequence of this visit, the Brazilian Science Information Network (BRAINS) Project was conceived to be a network that would interconnect academic institutions in Brazil. Since this network was planned to be similar to the DFN, it would be OSI compliant, which was accordant to what was recommended by the national information and communication policies running in Brazil. In April 1986, the technical director of DFN was in Brazil presenting the German project at the IV Brazilian Symposium on Computer Networks (SBRC) and visiting some national academic institutions (Rodrigues, 1988).

By 1987, there were more than 50 academic networks in over 30 countries worldwide. In Brazil, despite the operation of RENPAC network by Embratel, the academic community was still totally disintegrated, because Rede-Rio and BRAINS projects were, for several reasons, nothing else than pieces of paper, as well as some other projects for setting up regional or national networks in the country. At a meeting held at the VII Congress of the Brazilian Computer Society (SBC), in July 1987, Prof. Michael Stanton from the Pontifical Catholic University of Rio de Janeiro (PUC-Rio)[6] convened a birds of a feather session to discuss the importance of academic networks as well as to exchange information about experiences that began to take place at several institutions all over the country. That meeting led to another one, held in October 1987, at the Polytechnic School of the University of São Paulo (USP). At this one, called “Preparing for the National Research Network in Computer Science,” happened the first attempt for recruiting allies,[7] as representatives from many academic and research institutions were invited and attended the meeting, together with the members of LARC, SEI, Embratel and the Brazilian National Council for Scientific and Technological Development (CNPq). As a result, it was planted the seed for a Brazilian academic network. In November of the same year, three Brazilian researchers—Alexandre Grojsgold (LNCC), Michael Stanton (PUC-Rio) and Paulo Aguiar (UFRJ)—attended the VI International Academic Networking Workshop[8] that took place at the University of Princeton, USA, in which they knew about several academic networks in the world (Rodrigues, 1988).

5 There was a cooperation agreement between Brazil and Germany at that time that supported many technological projects, such as nuclear power plants.

6 In 1975, during the 1st Latin American Seminar on Data Communication at São Paulo, an access to ARPANET in the USA was demonstrated by the first time in Brazil. The international experts who carried out this task were Vinton Cerf (Stanford University) and Keith Uncapher (University of Southern California).

7 The formation of a socio-technical network depends on the ability of enlisting allies. The number of allies, their qualifications and how they interact in the network will result in success or failure of the network (Latour, 1987).

8 This series of workshops were attended by individuals who were pioneering the

Inspired by these meetings, in August 1988 LARC drafted a proposal to the recently established Ministry of Science and Technology of Brazil (MCT) for the creation of the, today called, National Education and Research Network (RNP). This proposal was based on the premise that data communication with other overseas research networks should be done through dedicated lines for a fixed cost, which needed the approval from Minicom and also from SEI (its authorization was needed for the international traffic of data). If the traffic routed through Embratel international access channels was priced according to volume of data transferred, the final cost would be more than ten times the estimated, turning the nascent academic network into an unfeasible project. In addition, according to the draft project, all the national connections to the upcoming RNP would flow via RENPAC network, and that institutions without mainframe computers could connect their PCs or minicomputers to a parent institution and, through a cooperative agreement, would have access to the RNP services (Rodrigues, 1988).

It was enough for the frictions to emerge. The telecommunications monopoly forbade the transport of third-party traffic within any customer circuits of Embratel (either local or abroad), thereby precluding the creation of gateways and, ultimately, the creation of a data communication network that could connect the academic community. The other contentious issue concerned the recovery model. Earlier, in January 1988, LARC sent to Embratel an application for the establishment of a dedicated connection to a foreign country for a fixed cost, in order to facilitate the creation of an international gateway for the upcoming RNP. Embratel negatively responded to this request, stating that this would violate the by then current standards against the sharing of network circuits as well as the billing process (which did not allow fixed costs). Embratel only waved with a possibility of solution, based in similar cases of other networks (such as for banking and airline companies) in which the costs, although variable per volume of data transferred, could have an estimated reduction of approximately 25% of the total amount to be charged if the international access from RENPAC network were used, which was refused by LARC (Rodrigues, 1988).

development of national networks in their countries. The goals were to educate, share experiences and encourage the connection to the Internet. These events were organized by Prof. Lawrence Landweber (University of Wisconsin), who also helped to establish many network gateways between the USA and other countries. The Brazilian attendees of this edition were sponsored by IBM Brazil.

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The first international connections

If, on the one hand, efforts to create RNP were facing political and economic issues, on the other hand the need for linking universities and research centers in Brazil with international networks was getting more and more urgent. By the beginning of 1988, the National Laboratory for Scientific Computing (LNCC) requested an international dedicated line (9600 bps) to connect to the University of Maryland in order to get access to the BITNET network. Embratel was initially reluctant to grant the request, fearing the problem of sharing circuits. This episode was only resolved—positively to LNCC—after a meeting in April 1988 at the federal capital, Brasilia, between SEI, Embratel, LARC and LNCC, when it was finally decided that this request was authorized by SEI and should be attended as quickly as possible by Embratel. More importantly, that meeting also decided that any other request made by any university for a non-shared connection to academic networks abroad would be automatically approved and should be promptly attended.

The successful access to BITNET in September 1988 was an enormous victory not only for LNCC[9] but also to the Brazilian academic community as a whole, although it had not been possible to implement the long-awaited international gateway in Brazil yet. This decision reinforced the interests of other institutions seeking their own international connections. So, following that path, the Foundation for Research Support of the State of São Paulo (FAPESP), led by Prof. Oscar Sala, initiated contacts with the Fermi National Laboratory in Chicago (USA), obtaining, as of November 1988, its international connection (4800 bps) to the BITNET and HEPnet[10] networks, which led to the creation of the Academic Network at São Paulo (ANSP). In sequence, an awaited connection from UFRJ to the BITNET via the University of California at Los Angeles (UCLA) finally took place in May 1989.

Thus, Brazil ended the 80s with a connection to HEPNET and three distinct islands of access to BITNET, whose communication with each other occurred only through international network routes. The end of the restriction on third-party traffic in the upcoming years opened the doors to resolving this situation as well as for the creation of a national

9 LNCC was looking for its connection to BITNET since May 1985, after contacts with Glenn Ricart (University of Maryland), who had been in Rio de Janeiro promoting BITNET. And even before BITNET went live in Brazil, LNCC had an account on the system of the University of Michigan, which was accessed by international dial-up, and through which they could send and receive messages.

10 High-Energy Energy Physics Network (HEPnet) was an international network that linked academic and research institutions dedicated to high energy physics. This network used the DECNET communication protocol.

network that would allow the sharing of access to international networks (Stanton, 1993).

Since the early use of BITNET, it was clear that only email services would not be sufficient for most academic users, whose requirements went through the interactive remote access to applications and more comprehensive file transfer, features that were already available on the existing Internet, which by that time was still inaccessible from Brazil and practically unknown from the great majority of Brazilian population, except for a few researchers who had international experience and started demanding for it.[11]

The resumption of the Brazil national network and the dawn of the Internet access

The creation of an infrastructure for Internet access collided with the disputed choice of communication protocols. SEI was a strong advocate of the OSI model, and although BITNET was initially tolerated as a pragmatic and immediate solution to a restricted service, the technology of the Internet (TCP/IP) was not considered a suitable alternative solution, since it was not governed by formal international standards bodies.

With the beginning of the Fernando Collor presidential government in 1990, it took place the dismantling of the national communication and information technology policy, through reducing the power of the SEI, then transformed into an information technology policy department of the Science and Technology Secretariat of the Presidency. An immediate consequence was the weakening of frontal opposition from the government to the academic use of the Internet technologies, although it was still maintained (and subsequently enhanced)[12] the government's preference for OSI technologies.

The implementation of a national academic network, as widely known, required a heavy and expensive infrastructure, therefore relying strongly on governmental support. In September 1989, in a keynote speech at SUCESU, the most important IT Conference and Exposition event at that time, the

11 In September 28th, 1987 UFRJ received a letter signed by Prof. Lawrence Landweber, on behalf of Stephen Wolff (NSF Division Director for Networking and Communications Research and Infrastructure), which granted access to the Internet. Unfortunately this was not enough, since besides the inexistence of a data communication circuits between the two countries, there was no equipment capable of routing IP traffic available in the Brazil at that time, and importing one was very expensive and too much complicated due to the existing Information Technology market reserve policy.

12 A presidential decree published on May 8, 1992, stated about the mandatory adoption of OSI by the entire federal public administration, which should also follow the newly published Brazilian Government OSI Profile (POSIG).

secretary of science & technology of the federal government officially recognized the need to improve the national infrastructure of communications as well as to involve (and commit) the various R&D actors in cooperative activities in order to contribute more effectively to the development of the RNP. A working group was created, under the coordination of Tadao Takahashi (from CNPq), who set up and executed a strategy to implement a network architecture similar to the one adopted by NSFNET in the USA, i. e. with three levels: the national backbone, regional networks and institutional networks. In Brazil, the national backbone would be a project of the federal government, while regional networks would be the responsibility of the state governments (individually or collectively). In functional terms, the regional network would interconnect institutional networks in a given region, and the national backbone of the RNP would provide interconnection services between regional networks, as well as international connections.

The communication protocol of the new national network walked toward TCP/IP, but to accommodate some interests and (unlikely but possible) future requirements for OSI, the national backbone and the regional networks should adopt multiprotocol routers. RNP began its implementation, starting with the state backbones.

Despite the pressure from the government (and some sectors of the IT market), it was already clear to most universities in the late 80s, that TCP/IP would supplant OSI at the global level, at least in academic and research networks. This academic view resulted in the first official[13] use of technology to support TCP/IP in Brazil when, in September 1990, the project for a network of the state of Rio de Janeiro was announced, stating that it would be connected to the Internet. This project, funded by the Foundation for Research Support of the State of Rio de Janeiro (FAPERJ), initially interconnected three institutions—LNCC, UFRJ and PUC-Rio—and was called Rede-Rio.[14] Although its deployment has taken almost two years to conclude, it served as a model for other states and for the recasting of the national network project that was beginning to take shape.

In November 1990, RNP team organized a workshop to which Barry Leiner was invited to present the organizational structures of academic networks in the USA and also internationally. Leiner was a managing director at ARPA and a founding member of the Internet Activities Board

13 Paradoxically, at that moment, the position of the government was already being smoothly subverted in many research laboratories at several federal institutions, since their newly acquired scientific workstations already came with Ethernet LAN adapters and TCP/IP protocols support, which were immediately put into work (Stanton, 1998).

14 Following the suggestion of Prof. Michael Stanton, although being a different and new network project, it took the same name of the old LARC project (Rede-Rio), as a way to honor the initial efforts and work done in the development of computer networks in the State of Rio de Janeiro.

(IAB), the organization that oversaw the operation of the Internet, and was also responsible for its international *liaison*. Leiner was also part of the Coordinating Committee for Intercontinental Research Networks (CCIRN), an organization that wished to rationally arrange continental networks interconnections. Before coming to the workshop, Leiner was advised by Steve Goldstein (NSF) on the existing conditions in Brazil, as presented to him by Michael Stanton. Goldstein also shared with Leiner his worries on avoiding proliferation of monoprotocol communication links between isolated institutions or subnational networks in Brazil and the NSFNET in the United States. Instead, the preferred solution would be to establish a connection between the backbones of the two continents, but since there was no such a thing as a "South American backbone," the (temporary) solution for Brazil would be connecting at the highest level in the country, i.e., at some point of the national backbone, which was still on paper.

The same workshop that brought Barry Leiner was also attended by Chris Jones, from the *Conseil européen pour la recherche nucléaire* (CERN), the European Laboratory for Particle Physics, located in Geneva, Switzerland, which happened to be the best place in terms of European connectivity at that time.[15] That stimulated the Brazilians to have two international links (North America and Europe) but despite the ideas of multi continental connectivity for the nascent national academic network, the international connection of Brazil took only across the United States[16] for many years.

The first internet connection in Brazil finally came into place in February 1991 when, after increasing the capacity of its connection to the Fermilab to a 9600 bps link, FAPESP began transporting the TCP/IP traffic of ANSP (besides BITNET and HEPnet traffics) through its access to the Energy Sciences Network (ESNET) which was connected to NSFNET, which, in turn, was part of the Internet. The organization of Internet access in Brazil by the end of 1991 was highly cooperative, where each participating institution funded its connection to São Paulo (and later to Rio). To avoid a repetition of what already happened to the BITNET connections in the country, the ultimate solution referred again to the implementation of a national backbone, definitely turned into an obligatory passage point (Callon, 1986) in the implementation of academic networks in Brazil.

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15 CERN was a sticking point in the operation of networks in Europe, besides having the best communication link between Europe and North America (EASINET-NSFNET), and besides being the end of the transatlantic link of HEPnet

16 If the connection with Europe had happened as first imagined, maybe Brazilians could have participated at the beginning of the World Wide Web project, as CERN was its place of origin in early 90s.

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The thrust of the third sector

Electronic access to information was not a privilege of academic institutions, as since mid-80s many Bulletin Board Systems (BBS) existed in Brazil, where their users exchanged messages among themselves and even internationally through FIDONET. Among users of BBS was the Brazilian Institute of Social and Economic Analysis (IBASE), a non-governmental organization founded in 1981, which in 1988 created Alternex, a BBS that served to civil society organizations (research, human rights, ecology etc.). In mid-1989, Alternex had linked up, via UNIX-to-UNIX Copy (UUCP), to the Institute for Global Communication (IGC) in California (USA), which later became the access point to the Internet for the Association for Progressive Communications (APC), an international organization which IBASE was part of. To facilitate international access for Alternex, IBASE obtained support from the United Nations Development Program (UNDP), which enabled it to receive foreign microcomputers and workstations, which were forbidden to be imported by the information technology market reserve[17] institutionalized by the national communications and information technology policy (Afonso, 1996).

At one of its preparatory conferences held in Nigeria in 1990, the United Nations delegated to APC the coordination and deployment of the communications infrastructure for its future global conferences. This delegation promoted an enormous step to Internet access in Rio de Janeiro, as IBASE, the APC representative in Brazil, was made the responsible for coordinating, planning, implementing and operating the network of information dissemination during United Nations Conference for Environment and Development (UNCED or Rio '92), the main global conference on environment and development that would take place in June 1992, in Rio de Janeiro, Brazil. In order to reach its scientific and political goals, Rio '92 needed to exchange information with the outside world and the Internet was clearly the best way to accomplish it (Afonso, 1996).

The international importance of the conference facilitated the recruitment of allies, resulting in a broad government support at all levels, plus the support of the UFRJ, which allowed a quick installation of (international and local) connections with a very high capacity for that time (64 kbps). This infrastructure set up for the Rio '92 event expedited deployment of Rede-Rio project, which had included, in addition to an international link, a network operations center, originally installed at UFRJ. This effort boosted the São Paulo network (ANSP) to increase its access to 64 kbps

17 In order to obtain a better understanding of the so-called computer market reserve policy that occurred in Brazil during the 70s and 80s, (Marques, 2003).

and leveraged the implementation of the first national backbone of RNP, providing Internet access to the other states of the country by sharing the ANSP and Rede-Rio networks.

The Brazilian Internet Company and commercial access

In some countries, mainly in the United States, the non-academic usage of the Internet started to become a reality, especially with the emergence of commercial Internet Service Providers in the early 90s. This trend would soon be followed in Brazil.

After the Rio '92 event, IBASE, as a member of Rede-Rio, expanded its Alternex services in order to operate as an Internet access provider to the general public, the first in Brazil. By that time, the Internet began to be more widely known by the Brazilian society through articles in newspapers and magazines. The provisioning of access services aroused interests (and intrigues) in the running of the newly created Brazilian market for Internet access. Controversial issues emerged from the "commercial" traffic Alternex was carrying through a supposed strictly academic network and, although IBASE and Rede-Rio had been allies until then, a split happened and Alternex networking services ended up being rerouted to the Academic Network at São Paulo in order to not be disconnected from the Internet, as ANSP did not had such an issue (Afonso, 1996).

In late 1994, the federal government announced, through the ministries of Science & Technology and Communications, its intention to promote the development of the Internet in the country, charging to the state-owned Embratel the creation of the infrastructure necessary for its commercial exploitation. But without any experience in dealing with TCP/IP, Embratel had to look for help with RNP people in order to assembly the infrastructure of a high capacity network capable to support the implementation of the commercial Internet, based on experience RNP gained in the deployment of the academic Internet (Guizzo, 2002).

Finally, Embratel began operating its service for Internet access via dial-up modem (14,400 bps) on a trial basis through a public test with five thousand users. In May 1995, it began to offer the service in a definitive way. Nevertheless, the monopoly of Embratel displeased the private sector and some other sectors of society. Much had been written in the press about the fear of the emergence of an "Internetbrás"[18] which, according to the malcontents, would plunge the country into a new market

18 The suffix "brás" denotes that the economic activity in reference is exploited by a state controlled entity, as for example in "Petrobrás," the state controlled company for the exploitation of petroleum, or Eletrobrás, the equivalent to electric energy business.

reserve. Accordingly, the Federal Government, represented by the Minister of Communications (Sérgio Motta), announced in the same year that the Internet was a value-added service where there would be no monopoly, and that telecommunications companies (still state-owned) could not provide access to end users anymore (Prata, 1999). Then an inter-ministerial decree from 1995, issued by MCT and Minicom, created the Brazilian Internet Steering Committee (CGI.br), with the purpose of coordinating and integrating all Internet service initiatives in the country, comprising representatives of the government, backbone operators, service providers, academia and the end user's community.

Since that decision, alongside with the explosion of the World Wide Web, many Internet access and content service providers appeared (and disappeared) in the Brazilian market. The Internet started to appear on TV shows and soap operas, new professions emerged (web designer, webmaster etc.), new concerns arose (such as privacy, security etc.) and cyberspace opened for a few million Brazilians, today classified as "digitally included citizens."

Conclusion

The analysis of the early days of the Internet in Brazil may show that, as proposed by Edwards (1996), technological changes correspond to technical choices, in turn inextricably linked to political choices and values socially constituted, where technology supports (and is supported by) discourses that emerge among the complex interactions between engineers and scientists, funding agencies, government policies, market laws, civil society institutions, ideologies and cultural frameworks.

These complex interactions show the interplay between nationalism and technology and between technology and the government, first the dictatorship and then the civil power, out of the conventional frame of the so called "sociology of interests." The interests are complex and multiple, especially because they are not fixed but rather are displaced along the negotiations between the various actors (humans and non-humans) involved in the implantation of the Internet in Brazil. No actor had the control of the outcome of their negotiations, but rather were leaded to the risky and unforeseeable task of building and stabilizing a technological artifact.

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