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Elijah's Network: Building the Internet from Copperwire[1]

<u>Introduction</u>:

This paper constructs a history of the development of the Internet in South Africa. It does not attempt to account for the evolution of the enabling technologies of the Internet, namely, the telephone or even the laying of copper cables for that matter. It is more specifically concerned with events of the last twelve years, which saw the building of the Internet in South Africa, by a few individuals with the simplest of materials, and a distinct lack of capital.

The reasons for approaching the history of the Internet in South Africa from this standpoint are numerous. Firstly, various government schemes involving the use of the Internet as a means of community development and empowerment are immediately stricken by the lack of significant investment by the private sector.   Secondly, I would suggest that in the process of these discussions, the real issues of the lack of electricity, basic telecommunications and the widespread problem of illiteracy are subsumed by the grandiose vision of the what the Internet can do. These problems are not significantly explored within the scope of this presentation but as this paper will show, constructing a network with access to the Internet can be done, and was done, without the financial fanfare that usually surrounds setup of such technology.

Firstly though, I feel inclined to justify the writing of a history that to many, may not even qualify as such. The Internet and the technologies associated with it have evolved at a rapid pace and continue to do so on a day to day basis. I believe, as Manuel Castells explains, that the current *Information Revolution* is as significant as the eighteenth

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[1] The title is inspired by the parable of Elijah from the Christian Bible which speaks of the miraculous creation of plentiful bread from just "handful of flour ... and a little oil." The parable is a fitting title for this paper which sets out that the enormous achievement of connecting to the Internet was, at the root of it, a matter of twisting copper wire. See ***The Holy Bible-Old Testament***, (1 Kings: Chapter 18: Verses 10-16.)

century's Industrial Revolution "inducing a pattern of discontinuity in the material basis of economy, society, and culture."[2] That this revolution is as pervasive, as Castells goes on to argue, can only be assertion by examining its effects within a specific historical context. As a generalization across the world though, the notable diffusion of the Information Revolution remains a long way off the mark of the effects of the Industrial Revolution, as a majority of society still remain outside the margins of technology rather than within it. In addition, the sophistication of technology advances at a pace much faster than the transfer of knowledge associated with it. Ultimately this obsolescence of user knowledge, for one, reduces the number of persons with relevant skills, and secondly, also increases the dependency of man on the machine. In this light the words of Marx and Engels when they wrote: "They, the creators, have bowed down before their creations," rings a prophetic alarm bell.[3]

And it is precisely because of the constant and rapid reinvention of the technology that this history has to be written in the immediate present, and rewritten to make room for the changes effected by society on this process and vice-versa. Perhaps Henry Hardy explains it best when he writes of Internet history in general: "Although the Net can really be said to have begun in the late 1960's, and thus within the lifetime of many of its citizens, its early history has been obscured by the erasure of much that it once recorded and the obsolescence of the technologies and software that once made it go."[4]

In addition, the very nature of the materials that document the early history of the Internet in this country, namely MS Word documents, text files on obscure ftp (File Transfer Protocol) and gopher servers, and email correspondences, are as easily disposed of as a simple click of a mouse button! With time these documents amount only to wasted space

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[2] Castells, Manuel. *The Information Age: Economy, Society and Culture Volume 1: The Rise of the Network Society.* Oxford: Blackwell Publishers, 1996, page 31.

[3] Marx, Karl and Friedrich Engels. *The German Ideology.* United States: International Publishers, 1988, page 38.

[4] Hardy, Henry Edward. "The History of the Net" (Masters Thesis). Michigan: Grand Valley State University, 1992. Available at http://isango.und.ac.za/downloads%20Docs/history_of_the_net.htm

on valuable RAM to individuals for whom they hold no historical significance. It is exactly this problem that consistently challenged a proper treatment of this topic but I have nonetheless tried to fill in as many of the blanks as possible.

"A fundamental paradox hangs like a shadow over telecommunications in Africa. The Internet is proclaimed to be a great leveller that will enable the continent to leapfrog over its own economic limitations; but at the same time, widespread use of the Internet in Africa is held back by a lack of technological infrastructure caused by those very limitations."[5]

 The history of South Africa's presence on the Internet (the "Net" hereafter) followed a different path to that of its American or European predecessors, having emerged in an academic context far removed from the realms of the government or the military. And as this paper will show, the unique methods used to set up the Net in South Africa questions the presumption that the establishment of networks with Internet access is contingent upon heavy capital investment. It is exactly the paradox set out in the above quote that the South African instance of Net history overcame, spawning an entire industry, the collective capital worth of which, ironically, ensures that the Internet cannot as easily be distributed as it was originally set up.

Nicholas Baran refers to the Internet as "an expensive toy for the affluent segments of our society," in a 1995 *Monthly Review* article in which he discusses the interplay of "computers and capitalism" as the self-sustaining mechanism of the technology industry.[6] Baran argues that while low-cost alternatives are available, (and he gives several examples), these are simply ignored in pursuit of a greater profit margin.

Baran writes: "The information highway is a commercial enterprise and the enormous investments that telecommunications and computer companies are pouring into telecommunications will be recouped by passing these costs (plus a little extra for profit) to the customers." Telecommunications in this country is caught up in the antagonism between the economic outlook towards privatization and the State's policies of community upliftment using the Internet. The tussle between the Internet Service

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[5] Goldstuck, Arthur. "Spreading the Web," in *BBC: Focus on Africa: Volume 11, Number 4.I* England: E.T Heron, Maldon, October – December 2000, page 48.

[6] Baran, Nicholas. "Computers and Capitalism: A Tragic Misuse of Technology," in Monthly Review:

Providers Association – ISPA and Telkom illustrated this point precisely. The South Africa Telecommunications Regulatory Authority – SATRA ruled in favour of the technology giants in the country against a parastatal, which it could have used to further its initiatives. The move by SATRA represented, for me, a setup backward for widespread diffusion of access to the Internet in South Africa.

Central to this paper has been the invaluable contributions of the erstwhile manager of Uninet, Mike Lawrie. Lawrie's unpublished paper, "The History of the Internet in South Africa – How it Began," written in 1997, in addition to interviews, sharing of documents and answers to constant questions, has been as fundamental to this paper as his role in the history of the Net in South Africa.[7] "The History of the Internet" is an invaluable narrative of a process that has been ignored in historical circles in South Africa. This paper attempts to flesh out the story started by Lawrie's paper, taking cognizance of the changing political climate in the country.

Approaching the subject of the emergence of the Internet in South Africa from an historical vantage point raises a number of related questions beyond a simple historical narrative. Consideration has to be made for the absence of State involvement in this process especially if we are to accept, as Castells asserts, that "the role of the state, by either stalling, unleashing, or leading technological innovation, is a decisive factor in the overall process, as it expresses and organizes the social and cultural forces that dominate in a given space and time."[8] Consideration is made of this point of view in the process of evaluating the level of involvement of the South African State in the development of a what it believes is a tool of infinite possibilities.

Furthermore, while the administrators and supporters of Uninet openly lauded the Internet as a victory against the repressive tactics of the Apartheid state, it must be

Volume 47, Number 4. New York: Guilford Publications, Inc., September 1995, page 42.
[7] Lawrie, Mike. The History of the Internet in South Africa- How it Began. Available at http://www2.frd.ac.za/uninet/history/, 1997.

[8] Castells, Manuel. *The Rise of the Network Society – Volume 1: The Information Age: Economy, Society and Culture.* Oxford: Blackwell Publishers, 1996. page 13.

remembered that the Internet was only available to a limited user base, and eleven years on, continues to be so, despite an increase in usage in schools and institutions of higher education. Despite the remarkable achievement that SA's connection to the Internet represents, I would suggest that it was at the time, not a significant victory for the South African people as a whole, as it remained the preserve of an already privileged sector of the population, and the growth of the use of the Internet within these same circles. This, I believe is the result of the fact that the actual growth spurt of the Internet in SA was driven by business and not government, running contrary to the State's historically central role in the development of industries fundamental to modern South Africa.

South Africa's first connection to the Internet circumvented the very problems that continue to pose an obstacle to Internet connectivity in numerous African countries, and currently within SA itself, that of a lack of infrastructure or the money to setup that infrastructure.

SA's connectivity to the Internet is a history that occurred in three distinct phases. The first involved the creation of a local South African academic network called Uninet, which as of 1 March 2001, ceased to exist in its original form and function. Initially only conceived of as a national linkup of research facilities across the country, Uninet eventually became the first Internet Service Provider (ISP), in South Africa, (i.e. a provider of a point of access to the Internet), remaining exclusively in the hands of a section of the national academic and research community.[9] (Uninet continues to exist in the form of TENET- Tertiary Education Network but this will be discussed elsewhere). [10]

The second part of South Africa's Internet history finds its roots in Grahamstown, at the campus of Rhodes University, where the first sustainable electronic mail link between the local area network of that campus, known as RHODENT, and various international networks, such as the DARPA Internet, Bitnet, EARN and Janet, amongst others, was

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[9] Lawrie, Mike. A Brief History of Uninet. Available at ftp://ftp.frd.ac.za/pub/docs November 1998.

[10] Martin, Duncan Dr, Chief Executive Officer. TENET: Tertiary Education Network: http://www.tenet.ac.za.

created in 1989.[11] This link represented South Africa's first international connection and paved the way for eventual full Internet connectivity a year later. The lessons learned from the creation and maintenance of this link from Rhodes proved vital in the pursuance of full Internet connectivity by the same individuals. The final part of the story involves local South African technicians and the assistance of American individuals who *unofficially*, allowed .ZA to connect to the Internet despite an official American stance that objected to any involvement with South Africa.

This thesis tries to construct a holistic and critical history of the Internet in South Africa. It takes the viewpoint that the creation of such community networks, as the case with Uninet will be shown, need not be dependent upon the exorbitant costs of telecommunications these days, and indeed can be achieved with the bare minimum. As this chapter will show, every conceivable corner was cut on the path to establishing the Uninet network and more so in the realization of full Internet connectivity, leading to the conclusion that there were alternative means to achieving technological advancement despite South Africa's isolation, which in itself represented an obstacle to the expansion of networks.

Elijah's Network - Uninet

Without a doubt the Internet is today hailed by its advocates as the shape of things to come, a paradigmatic shift in the way the world organises itself, time, space and work, and as the panacea for the ills borne of 20th century society. The Internet, and its accompanying theme of (technologically-facilitated) globalization, forms a part of nearly every contemporary discussion and debate. This reaction is no different in South Africa, where public access to this global computer network is just over a decade old – South Africa having registered with the Internet at the end of 1990.

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[11] Lawrie, Mike. E-mail: A Major Breakthrough, in **Rhodos,** Vol 1 No 2: 23 March 1989. Grahamstown, South Africa: Rhodes University, page 1.

South Africa currently stands apart from the rest of the African continent as the most wired (that is, the country with the most number of individuals who have full access to the Internet).[12] It is a situation, which gives South Africa a technological edge but also demands of the country expertise and leadership for the rest of the continent in this regard. The history of South Africa's path to the Internet can most usefully be cited as an example of achieving a measure of technological capacity in a milieu short of expertise, experience, restrictive telecommunications capabilities and infrastructure, and a severe lack of any significant capital investment with which to experiment; a scenario that continues to play itself out in many an African country today.[13]

I would suggest though that the history of Uninet's connection to the Internet cannot so easily be reproduced given the South African government's curious relationship with the national telecommunications provider Telkom, and the Internet Service Providers Association, which makes the one reliant on the other but also allows both to dictate the costs of telecommunications in this country. In addition the government's narrow appreciation of the uses of the Internet: an expression of which demonstrates a distinct disregard of the issues of literacy, censorship and the implications of restrictions of universal access on basic constitutional rights, aggravates the situation.

The nationwide research and academic network Uninet, currently referred to as TENET, was the first locally based South African network to achieve a connection to the Internet. The root of the network can be traced to Grahamstown, at the campus of Rhodes

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[12] The disparity between the number of Internet users in South Africa and the rest of the continent continues to be significant despite the growth of Internet access across Africa. "It is estimated that there are now over 1 000 000 subscribers in Africa. Of these North Africa is responsible for about 200 000 and South Africa, leaving about 150 000 for the rest of the 50 African countries." Jensen, Mike. "African Internet Status: September 2000", from Africa: Internet Status in APIC Newsgroup: apic@igc.org

[13] "On a regional basis, Africa has the least developed infrastructure with only 2% of the world's telephones and 12%of the population. There are huge disparities in the state of exisiting telephone networks from one African country to another." Jensen, Mike. More Lines Needed in *M&G Online*, 8 May 1998. South Africa: http://www.mg.co.za

University, which was also the workplace of the individuals who pursued South Africa's connection to the Internet. Initially reserved only for academic and research purposes, it was not long after the first 'sale' of access to the Internet within the private sector, that the Net as a research and academic tool ceased to be seen only as such. South African Internet usage merely mimicked international trends as the Internet quickly turned from an innocuous conduit of free speech and free information to an international economy closely guarded by its capital backers, and trading mostly in information, the free availability of which was fundamental to the initial development of the Internet.[14] The Internet itself initially sprang from American roots emerging out of a US military initiative known as ARPANET, (Advanced Research Projects Agency Network), a network under the maintenance of the US Department of Defence, in its efforts to maximize the effectiveness and efficiency of electronic communication or the transmission of information, and to achieve this above and beyond the usual means of communication.[15]

From the outset then the Internet grew under the watchful eye of an organ of government, specifically the military, but as is the nature of a network of rapidly increasing and diffuse interconnections, the Net quickly expanded without these boundaries. Henry Hardy encapsulating the history of the Internet in a short description, writes:

> "The Internet. The Internet we make so much of today – the global
> Internet which has helped scholars so much, where free speech is
> flourishing as never before in history – the Internet was a Cold War
> military project. It was designed for purposes of military communication

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[14] Arthur Goldstuck writes that the first commercial link to the Internet was provided by The Internetworking Company of South Africa (Ticsa – which is today known as Internet Africa, one of the major Internet Service Providers in this country), giving access to four companies on 1 November 1993, followed by another 6 a week later. Taken from Arthur Goldstuck, *The Histchiker's Guide to the Internet: A South African Handbook*. South Africa: Zebra Publishers, 1995., page 17.

[15] Castells, Manuel. *The Information Age: Economy, Society and Culture, Volume 1: The Rise of the Network Society.* USA: Blackwell, 1998, page 7.

in a United States devastated by a Soviet nuclear strike. Originally, the Internet was a post-apocalypse command grid."[16]

South Africa's access to the Internet though took a markedly different path to that of its American forefather, largely escaping the attention of the military or State in its early days thus giving providing it with a particularly unrestricted context in which to develop, but with the consequent lack of financial fanfare that the Americans enjoyed. It has only been within the last four or five years that the South African government has started to engage with this new media to the extent of incorporating some discussion around its constructive uses, and means of censure of its destructive potential, into national policy formulation. The ANC Government currently even uses the Worldwide Web (the public face of the Internet), to create a sense of State-citizen interaction towards a much needed reinvention of a public domain in South Africa, and towards a greater sense of participatory democracy. Whether these measures and uses of the Internet in government improves these relations is not for me to consider in this paper but it is a worthwhile undertaking.

The early days of the Internet in this country remained within the hands, and minds, of a few individuals with little or no resources and a lack of knowledge owing to the political ostracization of South Africa by the international community. Uninet originated from a mandate handed down by the Committee of University Principals (CUP).[17] The CUP represented a national gathering of principals from 17 South African universities, irrespective of their politically divergent roots. The Inter-University Computer Committee – IUCC-was formed in the 1970's as a subsidiary of the CUP, "growing out of the efforts by the University IT (Information Technology), staff for a forum to discuss common issues."[18]

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[16] Hardy, Henry Edward. "The History of the Net" (Masters Thesis). Michigan: Grand Valley State
    University, September 1993, page 6. Available at
    http:isango.und.ac.za/downloaded%20Docs/history_of_the_net.htm

[17] The Committee of University Principals is currently referred to as the South African Universities Vice-
    Chancellors' Association.

[18] Lawrie. "History of the Internet in South Africa", page 16. See also the " Committee of University

A number of internal networks (intranets) existed within these institutions at the time, including the network of the Centre for Scientific and Industrial Research originating in Pretoria and linking units across the country; the Potchefstroom University/Witwatersrand University/Pretoria/CSIR network; University of Cape Town/Stellenbosch University network and the intranet of the University of Natal across its Durban and Pietermaritzburg campuses. The problem with simply hooking these networks up into a national net were numerous and are discussed much later.

In June 1985, the Networking Sub-committee was created out of the IUCC, and charged by the CUP, with the specific task of facilitating the establishment of a national university and research network, an initiative christened "The Network Project." Philip Welman, Director of Information Technology at the University of Potchefstroom was chosen to head up the project.[19] The task seemed a simple one, to create a link between computers based at various tertiary and research institutions within the country to facilitate faster and more efficient exchange of information consequently stretching the use of the limited research resources in South Africa. The solution to this need though, proved a lot more difficult, and hugely expensive.

In an internal memorandum circulated to the Foundation for Research Development (FRD), the Center for Scientific Investigation and Research (CSIR), and the South African Bibliographic Information Network (SABINET) in 1989, the authors explained the need for such a national computer network:

Principals – CUP – Newsletter": Vol 4 No 3, August 1991. University of Natal-Durban: E G Malherbe Library, J 378.68.C8, page 6.

[19] Lawrie. "History of the Internet in South Africa", page 16. There were already a number of wide area networks in existence at this time including that of the University of Natal Durban and Pietermaritzburg campuses and the research network of the Center for Scientific Investigation and Research-CSIR, but the aim of Uninet was to bring these networks together so that they could all be accessed by researchers.

"Access to computing facilities is an increasingly important component of academic and research activities, and developments in electronic communication are facilitating communication among academics and researchers, enabling more rapid exchange of ideas, pooling of intellectual resources and collaboration among workers in the same field."[20]

Mike Lawrie comments that despite the effort and dedication of the Networking Sub-Committee, they "could not … produce acceptable proposals for installing and running a network because of the high costs of Telkom circuits."[21] The lack of funding and the excessively high costs of negotiating the network with the parastatal Telkom (originally part of the South African Post Office-SAPO), in the effort to create this network, remained a consistent obstacle to the members of the Network Project. I would suggest though, that it was precisely due to the lack of substantial capital backing that Uninet's pursuance of a connection to the Internet a few years after its establishment progressed without any attention from the relevant telecommunications authority nor the government.

While the initial spark for Uninet came from an academic gathering of intellectuals, teachers and researchers, the process towards the implementation of the network was driven by the efforts of technicians and computer scientists, concerned primarily with the task of setting up the network, and not the political or social consequences of a national network of communication. As a result the network, unhampered by the constraints of a political bureaucracy, developed quickly.

Lawrie writes that the failings of the Networking Sub-Committee to find speedy and cost-effective solutions, was taken on as an immediate challenge by the President of the Foundation for Research Development (NRF) in 1987, Dr Rein Arndt. The personal attention of this individual was perhaps a stroke of good fortune for The Network Project

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[20] Shaw, Vic; Philip Welman and W Coetzee. Memorandum on Common Interest Group in Academic and Research Activities. http://www2.frd.ac.za/uninet/cig.htm, 1998. page 2.

[21] Lawrie. "The History of the Internet in South Africa," page 16.

as the interest generated by Dr Arndt came with some startup funds for the network at the expense of the NRF."[22] Thus the development of the network from this point on represented a break with the Network Project, whose work had officially concluded with the establishment of Uninet, the administration and financial support of which continued within the realm of the Foundation for Research Development - FRD. Unfortunately, in the absence of any real figures, it is apparent that the support from the FRD was not substantial. It is possible that this was the case since the network was not originally conceived of as a profit-making initiative, and startup funds, (which Mike Lawrie aptly calls "seed money), were just that, the means to setting the network in operation and nothing more.[23]

To establish a network of a national type such as Uninet would become, required the approval of the telecommunications provider at the time, The South African Post and Telecommunications Office, also the South African Post Office – SAPO. Vic Shaw, appointed manager of Uninet in 1988, took on the responsibility of securing the official nod of approval for the setup of the network from the sole telecommunications provider in the country, now known as Telkom. The "Post Office Policy on Private Data Communications Networks" prevented the establishment of a computer network that would carry "third-party traffic," on a leased line from SAPO/Telkom. Third-party traffic referred to traffic that would be routed to, and from, parties not directly connected by a line. However, an escape clause termed the "Common Interest Group" was an option open to the Network Project and one that Vic Shaw pursued in order to gain the necessary approval for Uninet.

The Common Interest Group clause allowed "for a private data communication network to provide data communication and processing facilities to a common interest group and not be extended to any other party."[24] Vic Shaw's protracted correspondence with the

[22] Lawrie. The History of the Internet in South Africa, page 16.

[23] Lawrie. "The History of Internet in South Africa," page 16.

[24] Letter from The Postmaster General: South African Post Office – Telecommunications Division, to The

South African Post Office to gain recognition as a Common Interest Group (CIG), began with a letter (dated 7 January 1988), that explained the composition of the group and its needs:

> "The Common Interest Group which unites this group is Academic and Research Activities, and the organizations concerned are Research Councils, Universities, and SABINET (South African Bibliographic and Information Network.[25]

Attached to this initial letter was an extensive memorandum detailing the aims, uses, network configuration and administrative details of the proposed network. The memo gave specific examples of other such internationally established research networks and stressed the imperative for South African academics to establish communication with their peers overseas. What is peculiar about the application to SAPO was the list of member sites submitted for approval.[26] The list differed from the group that made up the CUP, the same body that sanctioned the network in the first place, in that so-called "historically-Black" institutions were excluded.

If this was a result of the lack of computing facilities or significant networking at these universities, then no mention was made of an intention to assist in the setting up of such facilities at a later stage. It is a striking exclusion especially since the CUP openly expressed its desire for equality of education at the tertiary level.[27] It is unclear though,

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Co-ordinator: Network Project. "Recognition of Common Interest Group (Ref: 3K92/67/88), 20 April 1988, page 1.

[25] Shaw, Vic. "Application for Recognition of a Common Interest Group": Foundation for Research Development Letter to The Postmaster General: South African Post Office (Ref: NET-/1/1), 7 January 1988. page 1.

[26] The sites submitted as part of the application for Recognition as A Common Interest Group included: The Research Network of the Council for Scientific Investigation and Research (CSIR); Medical Research Council; Human Science Research Council (HSRC); Water Research Commission; Potchefstroom, Witwatersrand, and Rhodes Universities; The South African Bibliographical Network (SABINET); Universities of Natal, Stellenbosch, Cape Town and the Western Cape. See Shaw. "Application for Recognition." Page 5.

[27] An editorial in a CUP Newsletter, the expressed organisation's support for unity in tertiary education:

whether this exclusive list of institutions was drawn up at the level of the CUP or the National Research Foundation, who drove the process at this point, even though the application was written by Vic Shaw, the first manager of Uninet. Nonetheless, the list drawn up for Common Interest Group recognition was eventually approved by SAPO on 20 April 1988.[28] Eight days earlier the FRD resubmitted their application, reworked as an application for connection to an international network, namely Fidonet.[29]

Fidonet was one international network that was prepared to allow a South African network to connect to it. At this point, Rhodes University had already managed to establish an e-mail link with Fidonet and the above application was really an application for the Rhodes link to act as a "zone gateway" that would provide a "store and forward" facility for email intended for South African users. Much of the activity of these latter stages of the establishment of the Internet in South Africa happened within the walls of Computing Centre at Rhodes University in Grahamstown.

This was due to the fact that the key players in this process namely Mike Lawrie, Francois Jacot Guillarmod and Dave Wilson, were employed in various positions at the Computing Centre. The work of these individuals were not part of the original mandate of the CUP and really occurred more in parallel to the process of the establishment of Uninet rather than part of it. Uninet was brought into the process by the common presence of Philip Welman, who was part of the Network Project, and also the IT Director at Potchefstroom University, one of the sites connected to Rhodes when it eventually achieved its link to Fidonet.

"The seventeen universities often represent widely divergent views in terms of their historical development, the communities they serve, their missions, and – inevitably in the South African society of the eighties and before – in terms of politics … On one issue though there has always been unanimity: tertiary education in South Africa, and the universities in particular should resort under one ministry of education." "CUP/KUH Newsletter/Nuusbrief, Volume 3 No 2": August 1990. Pretoria: CUP Secretariat, page 2. It is questionable then why this desire for unity did not extend to a shared computer network of research resources.

[28] Letter from the Postmaster General to the Co-ordinator: Network Project, (Ref: 3K92/67/88).

[29] Letter from Shaw, Vic: Manager: The Network Project, to the Deputy Postmaster General: Mr van Loggerenburg. "Connection to International Academic and Research Networks", (Ref: Net-/2/1), 12 April 1989.

Rhodes Computing Centre, prior to 1987, had established a link with an existing network consisting of the Universities of Potchefstroom, Witwatersrand and Pretoria. Lawrie writes that the attempt to connect Rhodes University to this network via Potchefstroom University via a leased line was "simply unaffordable" so Rhodes established a dialup connection to Potchefstroom. This process involved some creative solutions to simple tasks necessitated by the lack of funding but the lessons learned from the setup of this network were many and invaluable to the setup of the Internet.

When Lawrie sets out the differences between Rhodes and Potchefstroom in "The History of the Internet in South Africa," he also stresses the inferiority of equipment in the hands of Rhodes owing, quite simply, to the lack of funds: "Coming from the thin edge of the net at Rhodes, we inevitably made our own cables, and often tweaked them to minimize the number of strands in the cable, thereby reducing the cost."[30]

Lawrie writes of the "homebrew devices" that formed the physical structure of a rundimentary local area network based at Rhodes, in the face of the excessive costs of modems. He amusingly comments that "there was a serious attempt to "legalise" the situation regarding the use of Telkom's copper cabling that ran around Grahamstown," but the financial shortcomings of Lawrie and his colleagues in their pursuits were quite serious.[31] The link to Fidonet came at the expense of the people involved in the process: "The costs were made out of their own pockets, so there was every reason to get the last ounce out of the computers and out of the network. This led to implementing all kinds of cost-saving schemes."[32] The lesson inherent in the experience of Mike Lawrie and his colleagues is that a network can be set up with the bare minimum and that in the absence of sophisticated equipment even the archaic can be put to good use!

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[30] Lawire. "The History of the Internet in South Africa", page 9.

[31] Lawrie. "The History of the Internet in South Africa", page 6.

[32] Lawrie. "The History of the Internet," page 10.

The success of this network can be measured in terms of the fact that the Fidonet system went into general use, as an e-mail carrier, on the Rhodes campus in March 1989. A headline in a local Grahamstown paper: "E-mail: A Major Breakthrough," announced what was a remarkable achievement for a rather small and cheap operation, adding that Rhodes was now able to connect to the Internet via the Fidonet mail system.[33] It was also at this time that Uninet was brought into the picture and in time Rhodes University became the zonegate for e-mail flowing to Uninet sites. This part of the process though, was funded by the FRD. The Fidonet system proved a costly experience nonetheless and it was obvious that a simpler and more cost effective solution was needed to run an international network of this sort.

With the increased number of sites connected to Fidonet, the traffic of international email increased so significantly that the cost of dialing-up was eventually double the cost of a leased line. Eventually a leased line was established to the Internet, with recognition from Telkom as a Common Interest Group. In November 1989 Mike Lawrie approached the Chairman of the Internet Activities Board, Vinton Cerf (also one of the developers of the internet standard TCP/IP), for permission to register the South African domain with the Internet.[34] By the end of the month, Lawrie received a reply saying: "At present, it appears that U.S. policy would restrict the direct connection of a US Government sponsored network to your network in South Africa. Indirect connections through third parties would appear to be acceptable", and so South Africa was cleared to connect to the Internet.[35]

In 1990, networkers at Rhodes University acquired the public domain software called TCP/IP – Transmission Control Protocol/Internet Protocol, which has today become the

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[33] Lawire. "E-Mail: A Major Breakthrough," page 1.

[34] Letter from Mike Lawrie to Vint Cerf: Chairman, Internet Activities Board, 9 November 1989. Taken from http://www2.frd.ac.za/uninet/history/zacleaerd.htm

[35] E-mail from Vint Cerf to Mike Lawrie: Manager, Uninet, 24 November 1989. Taken from http://www2.frd.ac.za/uninet/history/zacleared.htm

enabling language of the Internet. The value of this package lay in its ability to accommodate existing operating systems and did not entail a drastic overhauling of the system. In 1991, the option of installing a dedicated line to the United States was again investigated. Eventually an analogue line was decided upon since other options were "out of the question for monetary reasons, and it was decided to proceed with the cheaper option, on the premise that, while far from ideal, it would provide a valuable starting point and give experience in managing a national network."[36] The line connected Rhodes University to RainNet, in Portland, Oregon, which was connected to Alternet, an American Internet Service Provider – a connection that gave South Africa a presence on the Internet.

It is exactly the kind of experience associated with the establishment of the Internet in South Africa has proven invaluable in investigating the possibilities of establishing networks with full Internet connectivity in a financially-deficient environment. Francois Guillarmod captured the implications of South Africa's connection to the Internet when he wrote: "The implementation of UNINET-ZA has been an exercise in boot-strapping from a position of ignorance and isolation to a situation where it can be compared to that of many of the regional networks in the USA.[37]

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[36] Guillarmod, Francois Jacot. "From Fidonet to Internet: The Evolution of a National Network," ftp://ftp.ru.ac.za/pub/doc/fidonet-to-internet.ps, 1990.

[37] Guillarmod. "From Fidonet to Internet", page 10.