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SAICSIT-95
RESEARCH & DEVELOPMENT SYMPOSIUM



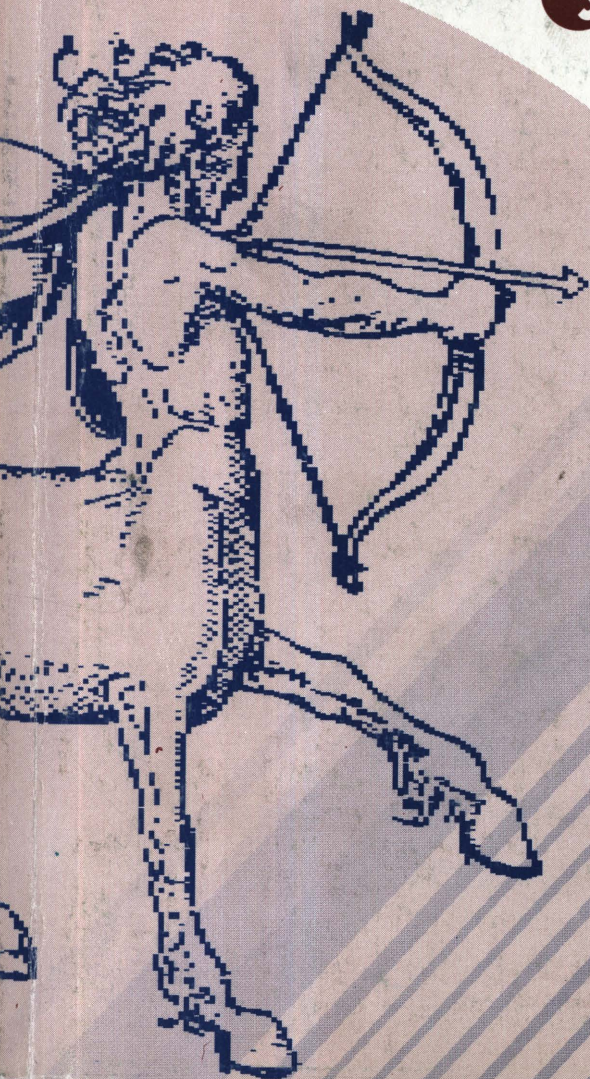
INDUSTRY MEETS ACADEMIA

25 & **26** MAY 1995

3 DISCIPLINES

- COMPUTER SCIENCE
- SOFTWARE ENGINEERING
- INFORMATION SYSTEMS

A. L. STEENKAMP (RED.)



Papers delivered at the
SAICSIT • 95
Research & Development Symposium

Organised under the auspices of the

- ◆ *South African Institute for Computer Scientists and Information Technologists* and endorsed by the
- ◆ *Computer Society of South Africa* and the
- ◆ *University of South Africa*

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PREFACE

On the occasion of the first symposium of the *South African Institute for Computer Scientists and Information Technologists* I wish to welcome everyone to this forum for the exchange of ideas and results on research and development in the disciplines of Computer Science, Software Engineering and Information Systems. The growing demand for information and computer systems of ever-increasing size, scope and complexity has emphasized the need for approaches which acknowledge the interrelationships between the various technology strands in the field of information technology. The three disciplines of this symposium reflect the broader interests of the membership of our restructured institute. It has been a pleasure to participate in the organisation of this event that has attracted such a number of fine contributions. I wish to acknowledge and thank all the members of the organising and programme committees who contributed their efforts to make the symposium the success that we aimed for. A special word of thanks to *Persetel* and *Siemens* for providing financial support, to the *University of South Africa* for making its services and venues available, and to the administration of the *Computer Society of South Africa* for their assistance. We are also indebted to the *Department of Computer Science and Information Systems* of *UNISA* who made the resources and infrastructure of the *Centre for Software Engineering* available to organise the symposium. Special mention is due to our efficient secretary El-marié Botha who devoted so much effort to the administration of the symposium and preparation of the proceedings.

Prof A L Steenkamp
President: SAICSIT

WELCOMING MESSAGE

It is a pleasure to welcome the participants of the first symposium of the *South African Institute for Computer Scientists and Information Technologists* at the University of South Africa.

Recent developments in computers and information technology have opened new and exciting possibilities for mankind. These developments have irrevocably turned *concepts* which we thought that we understand into *problems*, for instance:

- the concept *Wealth of Nations* does not depend anymore on visible products produced in visible factories, but on the invisible flow of information and services along invisible lines of communication which are managed by virtually invisible machines, using invisible software;
- the concept of the *mega-organisation*, (like mega states, mega-churches, mega-universities, mega-businesses) with its central control and mega-burocracy, is being replaced by the concept of *small-is-also-powerful* - "organisations" run by individuals all around the globe linked up in virtual structures and are eliminating the powers of states, councils and boards; and
- some of our concepts about *education and training* of two millenia, are suddenly being replaced by new ones depending upon telematics and information technology, which leaves the traditional educationalist in a state of bewilderment and indecision.

These are important problem areas to be studied - and UNISA has an interest in the solutions to all of them - especially in the problem area of education-over-a-distance, since we are moving towards the implementation of the new technologies to serve our students better.

I am pleased to see that some of the speakers of the symposium are addressing these and other areas of interest, and I express the hope that your deliberations will contribute to their solution.

Prof C J H Schutte
Chief Executive Director:
Science, Technology & Informatics, UNISA

OPENING MESSAGE

Information Technology and the undergirding *computer sciences* will have a profound impact on the reconstruction and development of South Africa. This is however not simply a national or regional concern. In order to become a competitive economy the deployment of a national information technology infrastructure and the effective and judicious use of these resources will be critical.

Trained human resources will be required. There is, more importantly, a need to develop an understanding of how information technology can redress and overcome the educational and development deficits which result from our past.

Research in this critical field cannot therefore take place in a vacuum without being informed of our context. I have initiated a process to develop a *Science and Technology White Paper* which will, among other things, address information technology and its impact on the endeavours of science and technology and, more pervasively, on the competitiveness and development needs of the nation.

The *SAICSIT* will I hope, with other specialist institutes and role players, contribute to the direction setting envisaged in the *White Paper* and develop a rich texture of responses that will enhance our national information technology endeavours. I wish you well for this important symposium.

Dr B Ngubane
Minister of Arts, Culture, Science and Technology

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SYMPOSIUM PROCEEDINGS

Copies of the proceedings will be handed out at the symposium. Delegates who attend the symposium will receive a copy of the proceedings free of charge. Additional copies will be sold at R100.00 each. An order form for the symposium proceedings is in the folder handed to you at registration.

Tabular Notations

PROF JEFFERY ZUCKER

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Abstract: Tabular notations were developed by D L Parnas and his co-workers for the formal documentation, inspection and validation of large software systems. Such notations provide a formalism which combines mathematical precision with ease of use. This formalism has, on the one hand, important practical applications in software engineering. On the other hand, investigation of it leads to interesting problems in theoretical computer science.

An Overview of the Internet Services Available in South Africa

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Abstract: South African networking history started in the mid 1980's. Within less than ten years, the country became the 15-th fastest growing network within the Internet community. Today, the South African network offers a variety of services on more than 20,000 Internet servers. The new information retrieval tools, as well as the new networking technologies, has pushed research towards a South African version of the "Information Superhighway".

Keywords: South African Internet services; South African Internet providers.

Computing Review Category: C.2.1, C.2.3, C.2.m, H.1.4, H.4.3, H.5.1, J.1, K.4.1

1. Introduction

After only a few years of being part of the Internet, South Africa, with more than 20,000 servers at the beginning of 1995, became the 15th fastest growing network in the Internet community. The South African academic research network played the biggest role in the network and services expansion. From mid 1994, the network growth has significantly spread to the business community, offering a bigger number and greater variety of services and involving users outside of the academic sphere. This article presents the results of a combined literature and Internet survey of the network services available in South Africa.

2. A Brief History of the Internet in South Africa

The Internet originated in early 1969 under the name ARPANET (Advanced Research Projects Agency). In the late 1980s, the National Science Foundation's network, or NSFNET, was developed to connect its five supercomputer centres. Eventually, all publicly and privately founded networks joined the regional NSF networks. ARPANET was dismantled in 1990, when its function was taken over by NSFNET. Today, the NSFNET, together with other networks, form what we call the Internet.

The Internet spans every continent across the globe. It became so large that its size can only be estimated. From the growth rate of one network per twenty days in the 1970's it evolved to a growth rate of one network per 30 minutes at the end of 1994.

The Internet is not governed or run by any institution or person. However, there is a voluntary membership organization, the Internet Society, or ISOC, whose purpose it is to promote global information exchange through Internet technology.

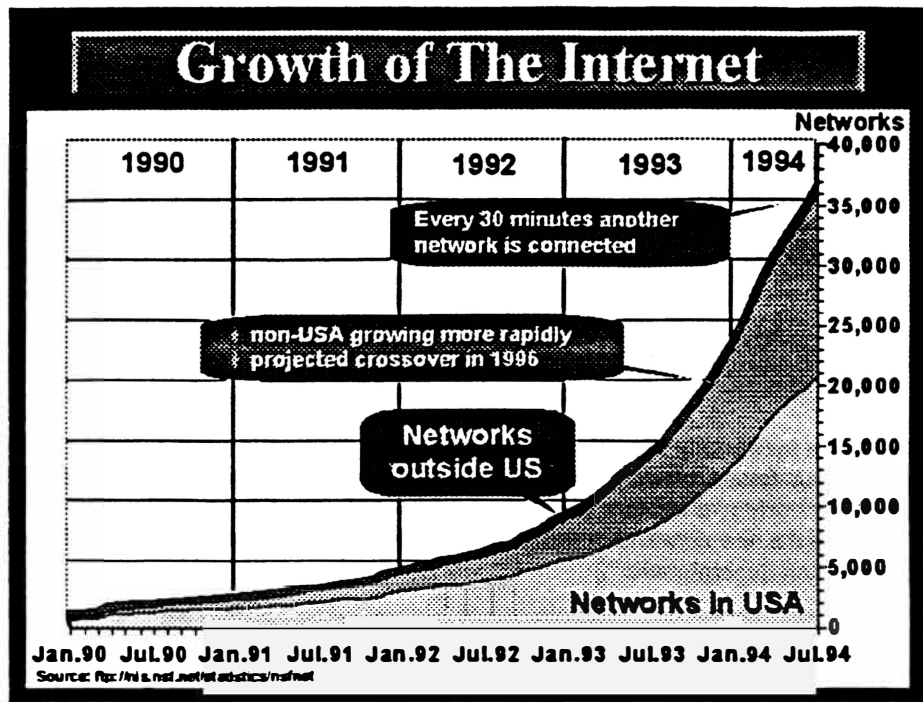


Figure 1. The Internet growth (Source: Internet Society)

As a part of ISOC, the Internet Architecture Board (IAB) oversees the architecture of the network and receives reports from the Internet Engineering Task Force (IETF) as a standard making body, and the Internet Research Task Force (IRTF) which develops and maintains networking and internetworking information science experiments. A new organization, the InterNIC (Network Information Centre), provides general information services, such as directory information, to the Internet community.

In South Africa, the connection to the Internet evolved from the South African academic research network, UNINET-ZA, which is coordinated by the Foundation for Research Development. In 1986 several universities in the Transvaal (now Gauteng) linked their systems to a network based on the IBM technology. Two years later, a link was made to the Rhodes and Potchefstroom universities. The Foundation for Research Development began to fund the project and 64kbps leased lines were used to form the UNINET-ZA. [8]

At the beginning there was only an E-mail service based on the FidoNet, a bulletin board system which can exchange electronic mail. By moving to a UNIX platform, the UUCP protocol was employed to handle mail. In 1990 the first TCP/IP link between the University of Cape Town and Rhodes University was established. In November 1992 South Africa obtained a permanent Internet connection: UNINET-ZA was linked to the Internet by a digital line that connects Rhodes University in Grahamstown to ICMnet-Atlantic in Washington D.C. [8]

Today, the South African part of the Internet includes a growing number of academic, governmental, commercial, and non governmental institutions as well as organizations that are neither "academic" nor "commercial". In December 1994, South Africa had more than 27,000 established Internet hosts which makes this country the 15th largest user in the world.

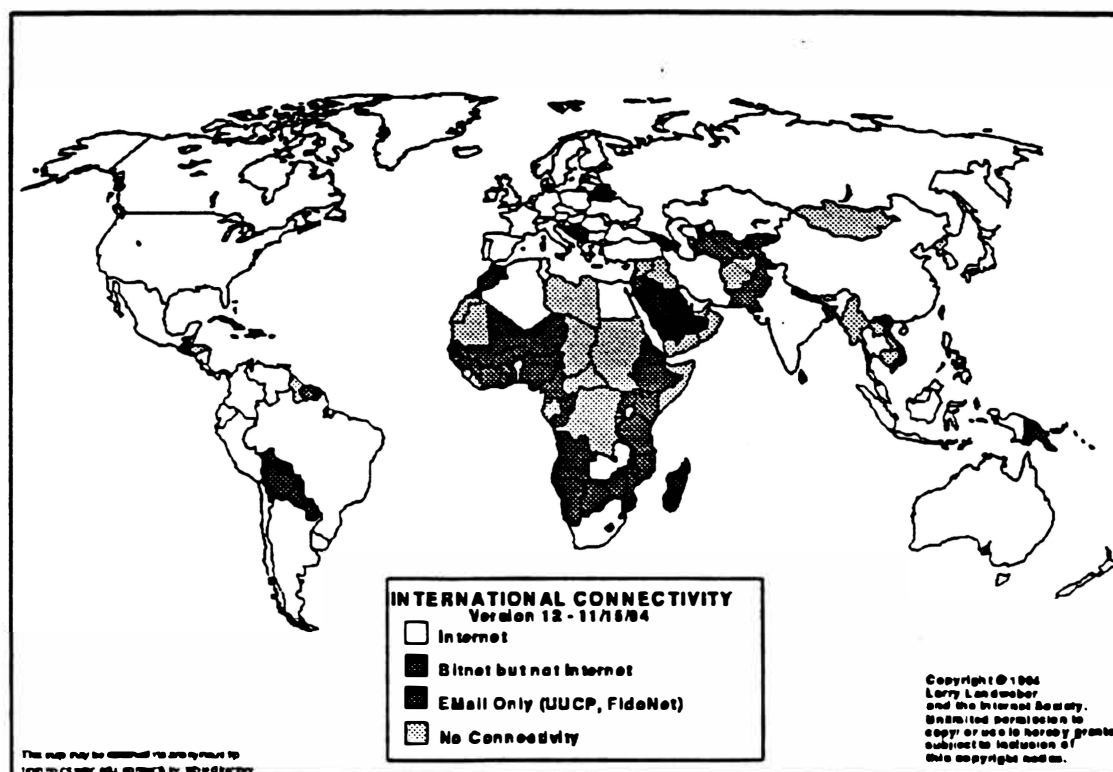


Figure 2. The Internet connectivity (Source: Internet Society)

3. South African Internet Services

The South African network offers a variety of services ranging from the traditional, like Electronic mail, Telnet and FTP (File Transfer Protocol), to the new hypertext based facilities. In addition to the growing number of UNINET-ZA servers a number of commercial sites and services is emerging. These new service providers are commonly oriented towards E-mail, hypertext and multimedia.

3.1. The Internet ARCHIVE Listing Service

Currently, Archie tracks the contents of over 1,200 anonymous FTP sites throughout the entire Internet, which involve over two million files. The Archie service is available on two UNINET hosts: the University of Cape Town and the University of Natal, Durban (Table A). The database search can be done locally, on the host server, or on one of the 26 Archie servers around the Internet.

3.2. E-mail

E-mail is the most widely used Internet service in the world, as is the case in South Africa. The South African Matrix comprises Internet, UUCP, USENET, FidoNet, CompuServe and MCI mail (Table B). The FidoNet and UUCP have become access networks that reach new countries, like it was the case with South Africa, and later, neighboring countries.

3.3. File Transfer

The possibilities for distributing, finding, and organizing files on the Internet are numerous. However, the most commonly used are anonymous FTP servers, which, once it is set up, is one of the simplest Internet information distribution services to maintain. It is an important and widely used service in South Africa. There are 13 major FTP sites, and a number of smaller ones maintained by academic departments at some universities (Table C).

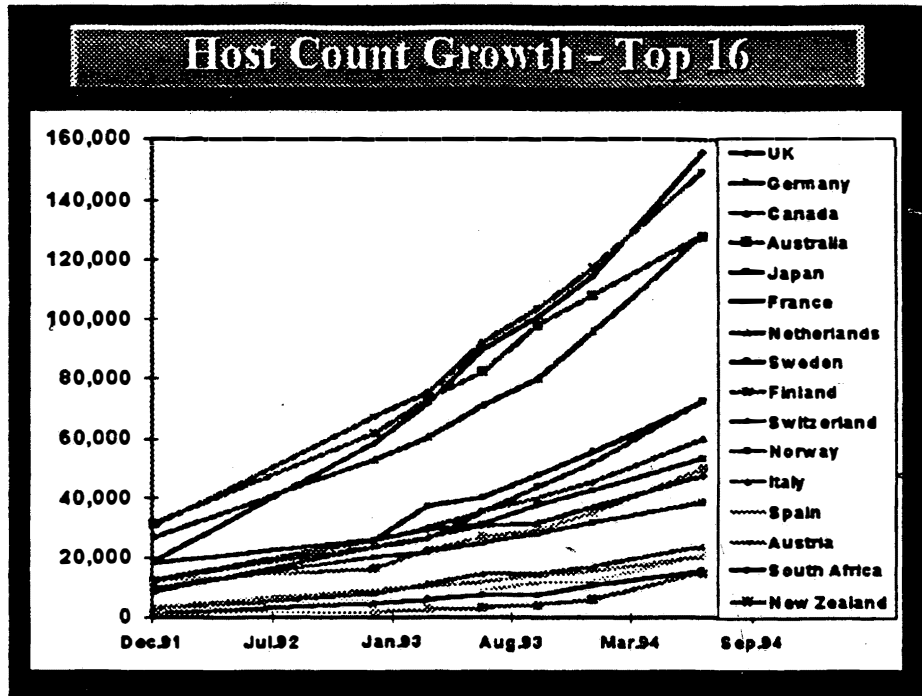


Figure 3. The Internet Hosts Growth (Source: Internet Society)

3.4. Internet Gopher

In the past few years, a wide variety of Internet applications have been developed expanding on the basic variations of Telnet, FTP and Electronic mail (including USENET). Gopher, a menu-based front-end to documents, information and services available on the Internet, ties the functionality of all these applications together with the added advantage of not having to know a lot of computer names to exploit the service fully. Two additional services are available through Gopher: Veronica, an index of the names of Gopher servers, and X.500, the ISO-OSI directory and name service. The X.500 service is still not universally accepted, and is not widely used in South Africa (Table D).

3.5. Usenet

It is estimated that 2.7 million people read Usenet news on 93,000 hosts, and that 59 megabytes of news are transferred daily in the form of 27,000 messages. News is organized into more than 4000 newsgroups of which more than 3000 are available in South Africa. In addition, there are 22 news groups under the "za" hierarchy which are propagated to a large number of systems in Africa and also find their way to the rest of the world (Table E). These groups are intended for articles and postings about topics that are mainly of interest to people resident in Southern Africa. As nobody controls the groups, it is open to organizations and individuals to propose the creation of new ones.

3.6. WHOIS

The WHOIS service utilizes a centralized database to maintain information about people who ask to be listed. This information usually includes the electronic mail address, telephone number and postal address of a person. The service is convenient, but was initially intended to list hosts and network and domain administrators, so as in the case of a Yellow Pages telephone directory, only a small fraction of the Internet users are listed (Table F).

3.7. World Wide Web

Today, the most popular Internet service is the World Wide Web. In essence, this is a distributed system which links related information throughout the globe. Users connected to the Internet by using this browser can connect to any WWW site to retrieve files which include text, sound, pictures and animation. In South Africa this is the fastest growing service and covers education, entertainment, electronic publishing, business, sport and the weather (Table G).

4. Connecting to the Internet

In South Africa the majority of the academic centres are part of the UNINET-ZA. For the business community, there are a number of companies which provide access to the Internet (Table H). Some of the commercial Internet providers have their own high-speed link to the USA and Europe, as well as to some of the neighboring countries. The growing number of networks being connected to the Internet, created a need for a national, or African, registration authority. However, InterNIC considers the Foundation for Research Development to be the authority (Figure 4).

5. Conclusion

With the wide range of available services, the South African network is not inferior to any other network inside the Internet. It provides most of the services reliably and with an acceptable delay. It has a substantial growth, a constant demand for services oriented towards hypermedia, and is being upgraded to a higher bandwidth. The new networking technologies, such as ATM (Asynchronous Transfer Mode) has pushed research towards a local version of the "Information Superhighway". This will open up space for new services and applications.

```

South Africa (Republic of) top-level domain (ZA-DOM)
Foundation for Research Development
  UNINET Project
  P.O. Box 2600
  Pretoria 0001
REPUBLIC OF SOUTH AFRICA

Domain Name: ZA

Administrative Contact:
  Lawrie, Mike (ML70) mlawrie@FRD.AC.ZA
  +27 11 841-3542
Technical Contact, Zone Contact:
  Jacot-Guillarmod, Francois (FJG4) ccj@HIPPO.RU.AC.ZA
  +27 461 318284 ext. 284
Record last updated on 15-Apr-94.

Domain servers in listed order:

RAIN.PSG.COM           147.28.0.34
NS.UU.NET              137.39.1.3
UUCP-GW-1.PA.DEC.COM  16.1.0.18
UUCP-GW-2.PA.DEC.COM  16.1.0.19
MUNNARI.OZ.AU         128.250.1.21, 128.250.22.2
NS.EU.NET             192.16.202.11
DAISY.EE.UND.AC.ZA   146.230.192.18
UCTHPX.UCT.AC.ZA     137.158.128.1
HIPPO.RU.AC.ZA       146.231.128.1

Top-level domain for the Republic of South Africa

```

Figure 4. Response to "whois" query from the rs.internic.net

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12. University of South Africa, Marques Systems, and The Internet Solution Web servers

Table A: The Archie Servers

Address	E-mail	URL	The Site
archie.uct.ac.za	archie@uct.ac.za	http://www.uct.ac.za/ archieform.html	University of Cape Town
archie.und.ac.za	archie@und.ac.za	Points to the URL above	University of Natal (Durban)

Table B: The Internet Sites

Uninet Site	E-mail
Agricultural Research Council	postmaster@elsvax.agric.za
Cape Technikon	postmaster@ctech.ac.za
CCWR	postmaster@aqua.ccwr.ac.za
CSIR, Pretoria	postmaster@wabe.csir.co.za
Foundation for Research Development	postmaster@frd.ac.za
Hartebeesthoek Radio Astr. Observ.	postmaster@bootes.hartrao.ac.za
Human Sciences Research Council	postmaster@ludwig.hsrc.ac.za
Institute for Maritime Technology	postmaster@phoenix.imt.za
IO Systems Corporation	chris@iosys.co.za
Medical Research Council	postmaster@gondor.mrc.ac.za
MEDUNSA	postmaster@mcd4330.medunsa.ac.za
Natal Technikon	postmaster@rubicon.ntech.ac.za
National Accelerator Centre	postmaster@nacdh4.nac.ac.za
National Botanical Institute	postmaster@nbigis.nbi.ac.za
Onderstepoort Veterinary Institute	postmaster@ovisun.oivi.ac.za
Peninsula Technikon	postmaster@pentech.ac.za
Port Elizabeth Technikon	postmaster@ed.petech.ac.za
Potchefstroom University	postmaster@pukrs3.puk.ac.za
Rand Afrikaans University	postmaster@rauteg.rau.ac.za
Rhodes University	postmaster@hippo.ru.ac.za
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Technikon SA	postmaster@laizy.trsa.ac.za
Technikon Witwatersrand	postmaster@twr2.twr.ac.za
UNISA	postmaster@risc1.unisa.ac.za
University of Cape Town	postmaster@ucthpx.uct.ac.za
University of Durban-Westville	postmaster@pixie.udw.ac.za
University of Fort Hare	postmaster@cd4380.ufh.ac.za
University of Natal, Durban	postmaster@und.ac.za
University of Port Elizabeth	postmaster@dolphin.upe.ac.za
University of Pretoria	postmaster@up.ac.za
University of the North	postmaster@unin1.unorth.ac.za
University of the Orange Free State	postmaster@convex.uovs.ac.za
University of the Western Cape	postmaster@uwcunx.uwc.ac.za

University of the Witwatersrand	postmast@witsvma.wits.ac.za
University of Transkei	postmaster@unitrix.ut.ac.za
University of Venda	postmaster@cotton.venda.ac.za
University of Zululand	postmaster@unizul1.uzulu.ac.za
Vaal Triangle Technikon	postmaster@vtt.tritek.ac.za
Weather Bureau	postmaster@cirrus.sawb.gov.za

Uninet link to neighboring country	E-mail
National University of Lesotho, Roma	postmaster@isas.nul.ls
University of Botswana, Gaborone	postmaster@motswedi.ub.bw
Universidade Eduardo Mondlane, Maputo, Mozambique	postmaster@dzowo.uem.mz
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Argus Group, Jbg (Newspaper publishers)	postmaster@star4.argus.co.za
Aztec Information Management, C.T.	postmaster@aim1.aztec.co.za
Bloemfontein Padworks (Pty), Bloem	postmaster@spanner.ofsroads.co.za
BTR Dunlop, Dbn (Industrial holdings)	postmaster@dunpyr.btrd.co.za
C Users Group, Pta	postmaster@silmaril.cug.co.za
Catalyst BBS, P.E. (mail+news)	hwolsink@catpe.alt.za
Communica (Electronic component suppliers)	postmaster@comca1.communica.co.za
Compustat, C.T. (commercial email)	steve@cstat.co.za
Dimension Data, Jbg (networking)	postmaster@didata.co.za
Duxbury Transmission Eqpt, Cape, (EE manf)	robert@duxburycap.co.za
Electronic Media Networks (Subscription TV)	postmaster@corp2.mnet.co.za
Eskom, Jbg (Electricity supply utility)	postmaster@duvi.eskom.co.za
Europe Assistance Worldwide Svcs (Travel)	chris@eurassi.co.za
Executive Communications, Pta (Radio paging)	postmaster@execom.co.za
First National Batteries, Benoni (Manf)	postmaster@fnbat1.fnbat.co.za
Free Range Comp Systems, Pta (comms services)	paul@frcs.alt.za
GommaGomma, Pta (Furniture manufacturers)	postmaster@gomma1.gomma.co.za
Hi-Performance Systems, Jbg (HP agents)	postmaster@netsys.hipsys.co.za
Infoplan, Cape	postmaster@iplan.co.za
Intl Seismic Surveys Inc, Welkom (consult.)	postmaster@frgiss3.frg.issi.co.za
Internetworking Cape, C.T. (IP+Dialup access)	info@inca.za
Investec Property Group, Jbg	postmaster@kcms.ipgis.co.za
IO Systems, Jbg (Unix education/consulting)	postmaster@svr4dev.iosys.co.za
Lasernet, Jbg (SCO support)	aris@unisup1.lasernet.co.za
LinkData, Claremont	postmaster@linkdata.co.za
MacLove Computer Systems, Jbg (MCBA agents)	postmaster@mc486.maclove.co.za
Malachite Electronic Systems, CT	andrew@malachite.co.za
Megabyte Digital Comms, Jbg (Comms consulting)	postmaster@proxima.alt.za
Micro & Peripheral Distributors, Jbg	postmaster@unisup1.mpd.co.za
Netsys International, Pta	postmaster@inetsys.alt.za
Olivetti Africa, Jbg	postmaster@olsa99.olivetti.za
Paradigm Systems Technology, Pta	postmaster@silmaril.paradigm.co.za
Perseus Computer Systems, Jbg (Data General)	postmaster@persys.perseus.co.za
Plessey-Tellumat, CT (Electronics)	pressinger@plessey.co.za

Posix, Pta (commercial mail/news)	postmaster@mje99.posix.co.za
Rascal Systems	postmaster@rascal.co.za
Standard Merchant Bank, Jbg (Standard Bank)	postmaster@server2.smb.co.za
Synergy Computing, C.T. (PowerHouse agent)	postmaster@ptns.synergy.co.za
Telkom, Jbg (National PTT)	postmaster@telkom.co.za
The Star, Jbg (Daily newspaper)	postmaster@star4.argus.co.za
Tradenet, Jbg	postmaster@tradenet.co.za
Transvaal Pressed Nuts & Bolts, Alberton (manf)	postmaster@tvlpnb.co.za
Uniforum SA, Jbg	postmaster@ufrmsa1.olivetti.za
Unique Technology, Midrand (SCO support)	kevin@support.utekza.co.za
Unix Information Systems, C.T.	postmaster@uiscpt.uis.co.za
Van Zyl Eng Bureau, C.T. (EE consulting)	mwwz@vzeb.co.za
Vector Computers, Jbg (Sun agents)	postmaster@vector.vector.co.za
Wearcheck, Pinetown (Oil analysis lab)	postmaster@wearchk.co.za
Worknet Information Assocn, Jbg (NGO support)	postmaster@worknet.alt.za
Zeus Software, Pta	hendrik@zeusa.co.za

Table C: The FTP Servers

The Site	Address	Conents
University of Natal (Durban)	ftp.und.ac.za	PC software (mainly network related) Windows Software Useful Unix software Some Uninet FAQs Garbo PC stuff CICA Windows stuff Microsoft stuff Sun patches Borland software from ftp.borland.com Pegasus Mail Trumpet Software FreeBSD 2.0 Some overseas ftp directory listings
University of Natal (Durban - Elec. Eng.)	ftp.ee.und.ac.za	PC software (mainly network related) Useful Unix software RFCs
Stellenbosch University	ftp.sun.ac.za	*LOTS* of useful stuff for PC's and Unix Some of the mirrors: Sound stuff Listserv program CUTCP + NCSA Telnets XFree86 OS/2 Windows stuff from ftp.cica.indiana.edu FSP ZX Spectrum stuff TEX stuff Trumpet software Game hints Demos X11 Archiving programs from garbo Modula3

		<p>RFC's Archie clients Simtel DJGPP GNU Software Linux 4.3bsd-reno</p>
Human Sciences Research Council	ftp.hsrc.ac.za	<p>Very large site - mainly mirrors Census data Walnut creek CDRom (ftp.cdrom.com) GNU utilities RFC's Mirror of ixpdslib.seas.ucla.edu/ cica.indiana.edu/ ds.internic.net/ ftp.borland.com/ ftp.cdrom.com/ ftp.cica.indiana.edu/ ftp.ee.und.ac.za/ ftp.eu.net/ ftp.indiana.edu/ ftp.intel.com/ ftp.merit.edu/ ftp.microsoft.com/ ftp.msstate.edu/ ftp.novell.com/ ftp.stsci.edu/ ftp.sun.ac.za/ ftp.sunet.se/ ftp.uwasa.fi/ ftp.wustl.edu/ ftp.x.org/ hobbes.nmsu.edu/ isuux.isu.edu/ ncsa.uiuc.edu/ oak.oakland.edu/ prep.ai.mit.edu/ ra.msstate.edu/ risc.ua.edu/ rtfm.mit.edu/ software.watson.ibm.com/</p>
University of Cape Town (Comp. Sci.)	ftp.cs.uct.ac.za	Some gnu, pc and unix utilities.
Wits University (Comp. Sci.)	ftp.cs.wits.ac.za	<p>A FAQ on general African stuff DOS and Windows utils Some Linux stuff Lots of Unix utils Some images</p>
Rhodes University	ftp.ru.ac.za	<p>Some very useful Uninet documents Lots of useful Unix and PC stuff</p>
University of Natal (Pietermaritzburg)	ftp.unp.ac.za	<p>Some PC, Windows, NT and Unix utils CICA CD mounted</p>
Uninet office	ftp.frd.ac.za	Various DOS stuff
Siltek Distribution Dynamics	ftp.sdd.com	<p>Many printer drivers (mirrors of developer's sites) FreeBSD 2.0 Linux Slackware</p>

		WWW stuff Mirrors of following: Borland Adaptec Creative Labs HP Intel Microsoft Novell SCO
Vector	ftp.vector.co.za	Useful information on Suns, SunOS and Solaris
The Internet Solution	ftp.is.co.za	African mirror site for: Internet Drafts IETF and IESG information official mirror for: RFC's comp.sources.reviewed Mirrors of: comp.sources.misc comp.sources.unix comp.sources.games GNU software Linux Slackware large chunks of SunSITE Linux archive Networking collection, strong on mail and DNS

Source: Russell Vincent, 1995, *Usenet posting: FAQ: Some useful Internet sites in Uninet-ZA*

Table D: The Gopher Servers

The Site	Address
University of Cape Town	gopher.uct.ac.za
University of Natal (Durban)	gopher.und.ac.za
University of Natal (Durban - Elec. Eng.)	gopher.ee.und.ac.za
Rhodes University	gopher.ru.ac.za
University of Pretoria	gopher.up.ac.za
University of Pretoria (Comp. Sci.)	rkw-risc.cs.up.ac.za
University of Natal (Pietermaritzburg)	gopher.unp.ac.za
University of Cape Town (Comp. Sci.)	gopher.cs.uct.ac.za
University of South Africa	gopher.unisa.ac.za
Sabinet and Uninet	web.sabinet.co.za
CSIR (Mikomtek)	gopher.mikom.csir.co.za
The Internet Solution	gopher.is.co.za
The CricInfo Cricket Database	gopher://cricinfo.cse.ogi.edu:7070/11/link to database
Rugby Information Gopher Site	gopher://gopher.ru.ac.za:70/11/rugby
Southern Africa Student Association	gopher://isumvs.iastate.edu/1%7edb.CYNET%20FRAMES/fd.SA/SO5024
US Department of State Background Notes on SA ANC (non SA server)	gopher://UMSLVMA.UMSL.EDU:70/00/LIBRARY/GOVDOC/CS/BNOTES/BNOT0081
ANC	gopher://wn.apc.org:70/11/anc

Source: Russell Vincent, 1995, *Usenet posting: FAQ: Some useful Internet sites in Uninet-ZA*

Table E: The Local Usenet Groups

Description	News group
Looking for a job?/Offering a job?	za.ads.jobs
Want a lift from Bulawayo to Cape Town via Durbs?	za.ads.lifts
For sale/to swap/wanted to buy	za.ads.misc
Who's got what, where... and how...	za.archives
Xhosa culture	za.culture.xhosa
Discussions on the use of computers in education	za.edu.comp
Environmental issues in Southern Africa	za.environment
Conferences, events and happenings nationally	za.events
A cool imitation of the real thing	za.flame
General announcements from the Foundation for Research and Development	za.frd.announce
Humour/jokes/fun	za.humour
Telecommunications and information policy in Southern Africa	za.info-policy
General chat, comments, announcements etc	za.misc
Local UUCP maps [uucpmap@lasernet.co.za] (Moderated)	za.net.maps
Miscellaneous ramblings on networking in ZA	za.net.misc
Statistics on network usage, automated postings etc	za.net.stats
Announcements and feedback from the Uninet-ZA office	za.net.uninet
Politics in Southern Africa	za.politics
Issues affecting primary and secondary education	za.schools
Finer points of jukskei or the Comrades marathon	za.sport
Testing of news links and configurations	za.test
General discussion, questions and chat about Unix in ZA	za.unix.misc

Source: Russell Vincent, 1995, *Usenet posting: FAQ: Some useful Internet sites in Uninet-ZA*

Table F: The WHOIS Servers

Address	E-mail	The Site
whois.uct.ac.za	Not available	University of Cape Town
whois.und.ac.za	whois@und.ac.za	University of Natal (Durban)
whois.ru.ac.za	Not available	Rhodes University

Source: Russell Vincent, 1995, *Usenet posting: FAQ: Some useful Internet sites in Uninet-ZA*

Table G: The WWW Servers**Business**

Company	URL
Active Access	http://www.active.co.za/
Africa.COM	http://www.africa.com/
Africa Growth Networks	http://www.is.co.za/agn/agn

Aztec Information Management	http://www.aztec.co.za/
BIC	http://www.os2.iaccess.za/bic/index.htm
Classic Malts, The	http://www.os2.iaccess.za/ud/index.htm
CompuServe Africa	http://www.ru.ac.za/compuserve.html
Compustat (Pty) Ltd.	http://www.cstat.co.za/
Commercial Sites	http://www.ru.ac.za/commercial-sites.html
Connectica	http://www.nez.com/
Currency Converter	http://gnn.com/cgi-bin/gnn/currency
Data Research Africa	http://www.iaccess.za/~epages/dradata/index.html
Dimension Data	http://www.didata.co.za/
Eagle Technology, Cape Town	http://www.aztec.co.za/~davidt
e-PAGES	http://www.iaccess.za/~epages/index.html
europ assistance - South Africa	http://www.eurassi.co.za/ea/ea.html
ExiNet - South African trade information	http://www.aztec.co.za/exinet/exinet.html
Global Internet Access	http://www.global.co.za/
Heritage Diagnostics (Aids)	http://www.aztec.co.za/heritage/index.html
Hill Cunnington & Associates	http://www.hca.co.za/
HiPerformance Systems	http://www.hipsys.co.za/
Impex Connect	http://www.aztec.co.za/impex/index.html
Internet Africa	http://www.iaccess.za/iaccess/home.html
Internet Solution, The	http://www.is.co.za/
JH Isaacs	http://www.is.co.za/services/jhi/jhi.html
Just Accomodation	http://africa.com/pages/just/just.htm
Juta & Company	http://www.os2.iaccess.za/juta/index.html
Jutastat	http://www.os2.iaccess.za/jutastat/index.html
KSI	http://www.ksi.co.za/
Liberty Life	http://www.is.co.za/services/liberty/liberty.html
Marques Systems	file://localhost/c:/internet/servfile/marqsys.htm
Martin & Co.	http://www.is.co.za/services/martin/martin.html
Middleware Technologies	http://www.os2.iaccess.za/middleware/index.htm
Mosaic Software	http://purple.mosaic.co.za/
MTN	http://www.is.co.za/services/mtn/mtn.html/
Pam Golding Properties	http://www.os2.iaccess.za/pgp/index.html
PCB Technologies	http://www.pcb.co.za/welcome.html
Proxima Research & Development	http://info.proxima.alt.za/
PiX	http://info.pix.za/
PSB Communications	http://www.aztec.co.za/psb/index.html
Realtime	http://www.realtime.co.za/
Rhebokskloof Estate, Paarl	http://www.os2.iaccess.za/rhebok/index.htm
SABINET	gopher://web.sabinet.co.za:70/1
SACOB	http://africa.com/pages/business/coc.htm
Sangonet	http://wn.apc.org/sangonet.html
SDD - Siltek Distribution Dynamics	http://www.sdd.com/
Sharenet	http://www.nis.za/
Shepstone & Wylie	http://www.durban.iaccess.za/sw.htm
Software 4 Africa	http://www.eurassi.co.za/
SABC	http://www.sabc.co.za/
South African Reserve Bank	http://www.is.co.za/services/resbank/resbank.html
The South African Investors Guide.	http://africa.com/pages/jse/page1.htm
SouthLight PictureNet	http://www.aztec.co.za/slpr/index.html
SPL	http://www.spl.co.za/Welcome.htm
Systems Publishers	http://www.systems.co.za/Systems/Systems.html
Unit Trust Prices	http://www.nis.za/ut.html
Unix Academy	http://www.aztec.co.za/unixacad/unixa.htm

Telkom	http://www.telkom.co.za/Welcome.html
Tripple - S Computers	http://www.aztec.co.za/sss/index.html
Vironix Corporation	http://www.vironix.co.za/
Welkom Industrial Controls.	http://minotaur.marques.co.za/SABus.htm/welindco.htm
Wild Ways Safaris	http://www.aztec.co.za/exinet/wildways.html
Wilson Keller Marketing	http://www.aztec.co.za/wka/index.html

Source: University of South Africa, Marques Systems, and The Internet Solution Web servers

Universities

University	URL
Cape Town, University of (UCT)	http://www.uct.ac.za/
Natal, University of (UN)	http://www.und.ac.za/
Natal, University of (UN) - Pietermaritzburg Campus	http://www.unp.ac.za/
Port Elizabeth, University of (UPE)	http://www.upe.ac.za/
Potchefstroom, University of (PUK)	http://www.puk.ac.za/
Potchefstroom, University of (PUK) - Vaaltriangle Campus	http://watuni.puk.ac.za
Pretoria, University of (UP)	http://www.up.ac.za/
Randse Afrikaanse Universiteit (RAU), Johannesburg	http://www.rau.ac.za/
Rhodes University, Grahamstown	http://www.ru.ac.za/
South Africa, University of (UNISA), Pretoria	http://www.unisa.ac.za/
Stellenbosch, University of (US)	http://www.sun.ac.za/
Witwatersrand, University of the (Wits), Johannesburg	http://www.cs.wits.ac.za/

Source: University of South Africa, Marques Systems, and The Internet Solution Web servers

Technicons

URL	Technicon
http://peniwise.ee.ctech.ac.za/	Cape Technicon
http://www.techpta.ac.za/	Pretoria, Technikon

Source: University of South Africa, Marques Systems, and The Internet Solution Web servers

Schools

URL	School
http://www.ecape.school.za/	Eastern Cape SchoolNet Project
http://www.sac.ecape.school.za/	St Andrews College
http://www.wcape.school.za/	Western Cape Schools Network

Source: University of South Africa, Marques Systems, and The Internet Solution Web servers

Other educational institutions

Institution	URL
SOS Children's Villages	http://ekhaya.sos.pta.school.za/welcome.html

Source: University of South Africa, Marques Systems, and The Internet Solution Web servers

Entertainment

Institution	URL
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Showdata	http://www.eurassi.co.za/showdata/showdata.html
South African Broadcasting Corporation	http://www.sabc.co.za/

Source: University of South Africa, Marques Systems, and The Internet Solution Web servers

Magazines

Magazine	URL
Africa Information Afrique	http://minerva.cis.yale.edu/~jadwat/me/sa-resources.html
Anglican News	http://www.aztec.co.za/cpsa/indexd.html
ANC News	gopher://wn.apc.org/11/anc
Computer Week	http://www.systems.co.za/CWeek/CWeek.html
Clarinet News Feed	http://www.clarinet.com/safrica.html
Engineering Week	http://www.systems.co.za/EWeek/EWeek.html
EngineeringWeek Report	http://www.systems.co.za/EWeek/EWeekReport.html
Telnet to Government Gazette	http://minotaur.marques.co.za/SANews.htm/telnet://gazette@info1.sabinet.co.za:23/
J.S. Gericke Library (US)	http://lib.sun.ac.za/home.html
"Long Walk to Freedom. Nelson Mandela"	http://sunsite.wits.ac.za/books/Mandela/Welcome.html
Management Report	http://www.systems.co.za/MReport/MReport.html
Marketing Mix	http://www.systems.co.za/MMix/MMix.html
South African Computer Journal, The	http://www.mosaic.co.za/sacj/sacj.html
SA Constitutional Repository at Wits Law School	http://pc72.law.wits.ac.za/
TopCar Magazine	http://www.aztec.co.za/topcar/index.html
Transformation	http://www.iaccess.za/~epages/trans/index.html
Weekly Mail & Guardian	
ZA Internetkoerant	http://www.io.org/~marcovh/afrikaans/zaink.html

Source: University of South Africa, Marques Systems, and The Internet Solution Web servers

South African Organizations

Organization	URL
Afrikaanse Bladsye. Die	http://lib.sun.ac.za/afrikaans/afrikaan.html
ANC	http://www.anc.org.za/
Azisa	http://sprite.azisa.co.za/
Bloemfontein, Welcome to	http://www.pix.za/0/business/bloemfontein/bloemfontn.html
Captour	http://www.africa.com/captour/captour.htm
Cape Town, Notes on	http://www.aztec.co.za/exinet/ct_notes.html
Cape Town, Welcome to	http://www.aztec.co.za/aztec/capetown.html
Cape Primary Care	http://www.os2.iaccess.za/cpc/index.htm
CIA World Factbook: South Africa	http://www.ic.gov/94fact/country/219.html
Computer Faire and BEXA	http://www.durban.iaccess.za/faire/default.htm
CSSA - Eastern Cape	http://www.upe.ac.za/cssa.html
CPSA	http://www.aztec.co.za/cpsa/index.html
Digital Cafe	http://www.systems.co.za/Systems/Welcome.html
Durban	http://osprey.unisa.ac.za/0/docs/sa/durban.html
Fidonet	http://www.ru.ac.za/fidonet.html
Foundation for Research Development	gopher://web.sabinet.co.za:71/1
IDASA	http://www.iaccess.za/~idasa/idasa.htm

J.C. Kruger's Home Page	http://www.aztec.co.za/jckruger/jckruger.html
Johannesburg Biennale 1995	http://biennale.is.co.za/
Johannesburg	http://osprey.unisa.ac.za/0/docs/sa/johannesburg.html
Leigh Morum's Home Page	http://www.spl.co.za/leigh/welcome.htm
Mailing List List	http://www.NeoSoft.com/internet/paml/bysubj.html
Milky Way Internet Cafe. The	http://www.pcb.co.za/milkyway.htm
Omar Aswat's SA Links	http://minerva.cis.yale.edu/~jadwat/me/sa-resources.html
Pennsylvania U : SA Page	http://www.sas.upenn.edu/African_Studies/Country_Specific/S_Africa.html
Pretoria	http://osprey.unisa.ac.za/0/docs/sa/pretoria.html
Project Nkosi Sikelel' iAfrika	http://www.aztec.co.za/kdesign/nka.html
SOS Children's Villages of South Africa	http://ekhava.sos.pta.school.za/welcome.html
SAICSIT	http://osprey.unisa.ac.za/0/docs/saicr.html
South African Broadcasting Corporation	http://www.sabc.co.za/
South Africa Initiative	http://www.umich.edu/~saioum/
South African Reserve Bank	http://www.is.co.za/services/resbank/resbank.html
South Africa Home Page	http://osprey.unisa.ac.za/0/docs/south-africa.html
Sunsite	http://sunsite.wits.ac.za/sunsite/sunsite.html
Telkom	http://www.telkom.co.za/Welcome.html
Throb!	http://biennale.is.co.za/throb/intro.htm

Source: University of South Africa, Marques Systems, and The Internet Solution Web servers

Sports

Server	URL
Rugby Clubs World Wide	http://rugby.phys.uidaho.edu/rugby/Countries/country.html
Rugby World Cup : Just Accomodation	http://africa.com/pages/just/just.htm
Rugby World Cup Weather	http://cirrus.sawb.gov.za/rugby/rugby.html
SouthLight SportPictures	http://www.aztec.co.za/slpn/slpn_sport.html
Sport for Africa	http://www.os2.iaccess.za/sfa/index.htm

Source: University of South Africa, Marques Systems, and The Internet Solution Web servers

The Weather

Server	URL
South African Weather Bureau, Pretoria - Weather Server	http://cirrus.sawb.gov.za
Cape Town Weather Watch & Satellite Pics	http://aztec.co.za/weather

Source: University of South Africa, Marques Systems, and The Internet Solution Web servers

Table H: Commercial Internet Providers

Company name: Active Access CC

City: Stellenbosch

Postal address: Active Systems, P.O. Box 2282, Stellenbosch; 7599

Telephone number: (021) 887-1822

Fax number: (021) 887-1829

E-mail: info@active.co.za

URL: <http://www.active.co.za>

Company name: Aztec Information Management (Pty) Ltd
City: Johannesburg, Cape Town
Postal address: P.O. Box 6844, Roggebaai, 8012
Telephone number: (021) 419-2690 and (011) 402-3322
Fax number: (021) 25-1254 and (011) 402-8334
E-mail: info@aztec.co.za
URL: <http://www.aztec.co.za>

Company name: CSIR / Commercial Internet Services
City: Pretoria, Johannesburg, Cape Town, Port Elisabeth, Durban, Nelspruit
Postal address: Commercial Internet Services, P.O.Box 75885, Lynwood Ridge, 0040
Telephone number: 012/841-2892
Fax number: 012/841-3604
E-mail: info@cis.co.za
URL: <http://crux.csis.co.za/csis/csis.html>

Company name: Dynagen
City: Cape Town
Postal address: PO Box 228, Noordhoek, 7985
Telephone number: 021/789-1252
Fax number: 02/418-2613
E-mail: sysop@eugene.dynagen.co.za

Company name: Internet Africa
City: Cape Town
Postal address: PO Box 44633, Claremont 7735
Telephone number: 021/683-4370
Fax number: 021/683-4695
E-mail: info@iaccess.za

Company name: The Internet Solution (Pty) Ltd.
City: Johannesburg
Postal address: The Internet Solution (Pty) Ltd., P.O.Box 3234, Parklands, 2121
Telephone number: Tel. 011/447-5566
Fax number: . 011/447-5567
E-mail: info@is.co.za
URL: <http://www.is.co.za>

Company name: PiX (Proxima Information X-change cc)
City: Johannesburg
Postal address: P.O. Box 3036, Northcliff, 2115
Telephone number: (011) 476-2007
Fax number: (011) 678-5769
E-mail: info@pix.za
URL: <http://www.pix.za>

Company name: TerraNet cc
City: Pretoria
Postal address: P.O. Box 27990, Sunnyside, 0132
Telephone number: 083-226-7251

