Appendix I
University of Dar es Salaam

The University of Dar es Salaam was formed in 1970 when the then University of East Africa was split into three independent universities for Keneya, Uganda and Tanzania.

The university is situated on Observation Hill, 13 km to the west of the city centre of Dar es Salaam.

1. Introduction

The University of Dar es Salaam has two connections to the Internet; its own VSAT connection and a leased line connection. The VSAT link is 1 to 2 Mbps, with a 512 Kbps uplink (the link to the Internet).

The leased line link is 512 Kbps with a 256 Kbps uplink. However, the large VSAT connection is not used for general access. Only the University top ranking staff get their access through the VSAT link. The rest of the bandwidth on the VSAT link is sold by the University Computing Centre to commercial clients, while regular University staff and students use the leased line link.

Therefore, the University has a 256/512 Kbps link for all practical purposes. This link is heavily utilised throughout the day.

Within the University compound there is a fibre backbone, and links to outside sections of the campus are via Wireless LAN. Some dial-up services are offered.

All students are allowed to access the Internet at several Internet Access rooms. There are more than 5000 students in the University.

2. The University Computing Centre Ltd

The University Computing Centre Ltd is a limited liability company wholly owned by the University of Dar Es Salaam. It originally presented computer related courses, along with supplying computing services for the university. Since early 1999, all academic matters have been transferred to the new Computer Science department.

The UCC now supplies computing services and Internet access to the university and the rest of community in Tanzania, and is business oriented and self financing. It still presents in short courses in applications such as word processing, spreadsheets, databases, presentations, desktop publishing, project management, web design and similar other courses.
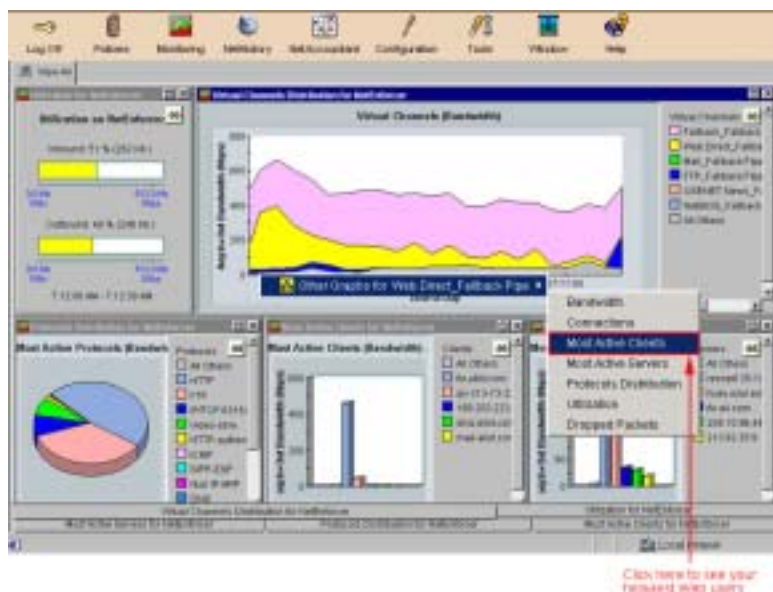
This model of a self financing Computing Services company may be of interest to other institutions not only because it is self financing, but also because it lets the University benefit from a pool of skills and talent that are developed through working for other institutions / companies. The inherent danger is that the University students and researchers might get lower priority in terms of bandwidth and service.

The UCC also has a multi-media laboratory for contents development for distribution via CD-ROM or email.

3. The network

The VSAT link, provided by Newskies (http://www.newskies.com) in conjunction with SimbaNet (http://www.simbanet.net) has its dish on the campus. It has a DVB downlink (from the Internet) of 1 Mbps CIR (Committed Information Rate) and a Burst Excess of 2 Mbps. (This means that the link is never less than 1 Mbps, but up to 2 Mbps is available when it is not used by other Newskies customers).

The leased line link is via DSL and is a 256 Kbps uplink (to the Internet) and 512 Kbps downlink. This is provided by Tanzania Telecommunications Company Ltd (TTCL) on a separate link.

The TTCL link is for serving the University community and the VSAT link to serve other customers who are not university members. In practice, there are overlaps as both links are over-sold and sometimes when one is not in service, traffic is routed through the other link. The network team estimates that the university uses 5 GB per month. (This must in reality be much more, given the amount of bandwidth and usage). The leased line link is 99% utilised most of the time. The PCs on the campus run a variety of operating systems ranging from Windows 95/98/ME to Windows XP. There are also some Macintosh and Linux computers. Servers are mostly Linux. Most of the network is on private address space (RFC 1918 addresses)

The university web site is also run on the local servers, and therefore outside visitors to the web site competes with university users for bandwidth on the Internet link.

4. Optimization

4.1 Bandwidth management

Bandwidth is managed with Allot (www.allot.com) NetEnforcer device, a Linux based bandwidth manager, which allows different policies per protocol, IP range, service etc. It also displays real time graphical utilisation. It is found to be a robust system. The equipment cost $6,000. Much of NetEnforcer is built from Open Source but proprietary graphical interfaces/programs are in use. It is installed at the UCC and manages both links. It is used in many ways, for example to allocate bandwidth from the commercial (VSAT) link to a department if they need it. During INASP workshops Allot was used to double the available bandwidth to the library.

Below are some NetEnforcer screenshots. The Java-based Policy Editor (below) enables the administrator to define which types of traffic are allowed, and during which times.

4.2 Monitoring

Monitoring is in the early stages of implementation, but Flowscan and Flowtools will be used, in conjunction with the Allot NetEnforcer's own monitoring capabilities.

The NetEnforcer monitoring tool (below) enables the administrator to monitor applications, protocols, clients and servers in real-time.

NetEnforcer also enables the administrator to identity the most active clients, as shown below:
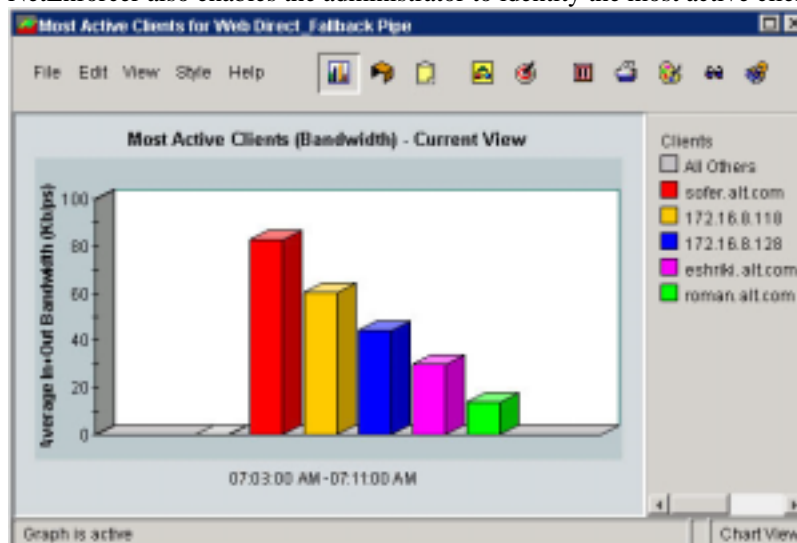
Web usage is analysed using Webalizer. The top categories of web sites are

- Web based email
- Academic use
- Pornography

Statistics are not kept, and Webalizer and the data produced by Allot and Flowscan are only accessed when there is a specific problem to be solved.

4.3 Content filtering and control

No content filtering is done, because students "must be free" to access any sites. However, Kazaa is blocked on well-known ports, and by blocking port 80 on client PCs, because Kazaa runs its own web server. However, since these programs keep changing the ports on which they operate, some Kazaa traffic is observed.

There is supervision of the computers and students in the Internet Access Rooms. This is to prevent abuse and to protect the PCs from users installing unwanted or undesirable software

such as Kazaa. In practice, there is much bandwidth abuse by students. These computers are fairly old (running Windows 95/98/ME), and cannot be locked down / protected in the same way as newer operating systems.

4.4 Proxy servers

Squid proxy is used extensively. There are 6 Squid proxies – two big ones and one for each department. Peer caching between the proxies is configured. Webalizer is used to analyse the Squid access logs.

4.5 Mail

All mail servers are Linux based. They are protected by Mailscanner
(see http://www.sng.ecs.soton.ac.uk/mailscanner), which scans email for viruses and spam. It uses McAfee anti-virus engine (http://www.mcafee.com/) and Spamassasin (http://www.spamassassin.org). It also stops certain file extensions, for example executables from being distributed via the mail system. There is also a web based email system (screenshot below).
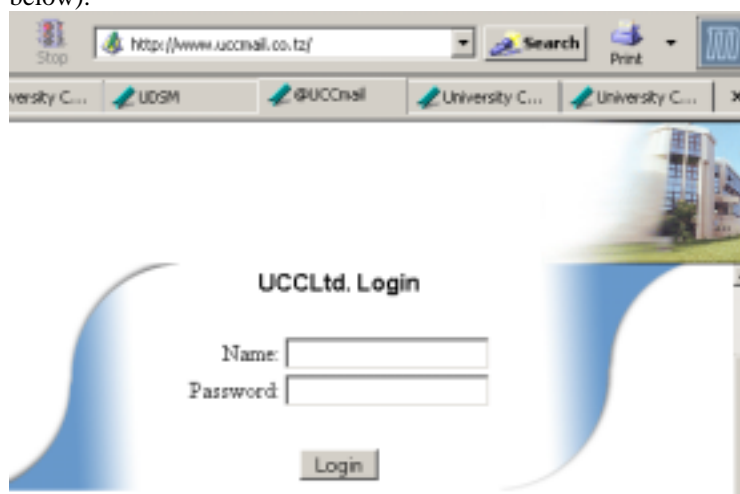
4.6 Usage of night bandwidth.

Cron jobs are used to download service packs etc overnight. Users can ask for the UCC staff to download large documents for them.

5. Anti-virus

McAfee Enterprise is used for anti-virus scanning. This is felt to be a bad solution for this network because with so many computers running Windows 95/98/ME there is no central security context for the distribution server to connect to all the different workstations. (McAfee Enterprise is designed to work in an Active directory or domain environment where all workstations belong to the domain.) The updates therefore tend to fail and PCs are often unprotected from the latest viruses.

Flowscan was used on a server that also had many other functions. However, it was abandoned because it used too much CPU. It is planned to re-implement it on another machine.

No centralised authentication system such as Windows NT domains, Windows 2000 active directory, Kerberos or LDAP

6. Charging

There are no access charges for Internet use at the University, but Internet access at the halls of residence is charged at 300 Tanzanian shillings per hour. When using the Internet, student online time is measured via Internet Cafe Manager Pro. http://www.cafemanager.com).

This product does not look at bandwidth usage; it measures how long the computer is being used, and allow for pre-payment.
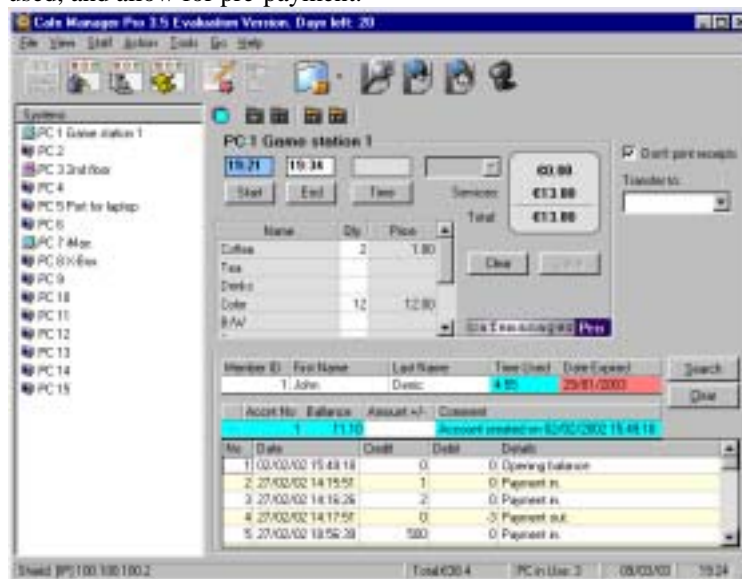
There is a project planned to replace this system with a smart card system. This will be done in a deal with ICL South Africa.

See http://www.itweb.co.za/sections/business/2001/0111280854.asp

7. Library related

There are three main library centres: one at the UDSM main campus, MUCHS and UCLAS.

The entry page for web based library services is at http://www.udsm.ac.tz/library There is a computerized catalogue (OPAC) in place since 1998. The card system covers all material acquired up to 1998, and OPAC all material acquired since then. There is a project under way to add the pre-1998 material to the computerized catalogue. The catalogue system is available at http://www.libis.udsm.ac.tz/adlib/ but this is not reachable from outside the campus network.

8. Other ICT related projects

8.1 TEIL(Technology Enhanced Independent Learning) Environment

This E-learning project aims to develop and implement a virtual campus environment, which facilitates the integration of Information and Communication Technology in teaching and Learning. The project has funding from the Flemish University Council (http://www.vlir.be), and uses Blackboard software (http://www.blackboard.com). The Teil front page is shown below:

8.2 Sida/SAREC

The department for Research Co-operation (SAREC), and the Swedish International Development Agency (SIDA) has a joint project for improving the university's ICT capacity. The aims of the project are to create UTP network access points in every faculty office and laboratory, and install computers in offices, the library and the Computer Cluster Rooms.

Initially, 350 computers were installed, and the possibility for installing another 1650 PCs are being assessed. The project enable university staff to put the learning materials on the network, and enable the student to get access to learning materials electronically. The student should also be able to support from his lectures via email.

Upgrading the existing network backbone from 10 Mbps to 100 Mbps . It is also proposed to establish fibre optic backbone networks on the College campuses, including on the UCLAS and MUCHS campuses.

The project also aims to upgrade the link to the Internet to 1 Mbps, and to upgrade the wireless links between the main campus, MUCHS and UCLAS from 2Mbps to 11Mbps.

8.3 INFOPOL

INFOPOL consists of a number of sub-projects that all aim to increase the institutional capacity of the University in the areas of academic and administrative management as well as research and development through the improvement of its ICT capacities. The sub-projects are listed below:

- Financial Information System(FIS) project: aiming at the development and implementation of a computerized information system for UDSM's financial administration;

- Academic Register Information System(ARIS) project: aiming at the development and implementaion of a computerized information system for UDSM's academic register

- Library Information System(LIBIS) project: aiming at the development and implementation of a computerized information system for UDSM's library system

- Data communication INFRAstucture(INFRA) project: aiming at the development and implementaion of a university-wide data communication network;

- UCC construction (UCCcon) project: aimed at the construction of a building for the UDSM's current computing center(UCC)

- The upgrade Professional level Computing Centre(PROFCOM) project: aiming at the development of th organisational arrangements required for securing the continuos operation and maintenance of UDSM's information resources.

- The Human Resource Management(HRM) Information system project.

9. Conclusion

ICT at the university appears to be developing fast, and network optimisation appears to get due attention. With the large numbers of computers that are being added to the network, and the fact that the Internet link is already fully utilised, it would not be surprising if the bandwidth is upgraded in the near future.

Being a competitive IT company, the UCC has the technical capabilities to address any problems. In view of the small amount of bandwidth available, it is surprising that content filtering is not applied, given the large proportion of web based mail and pornography in the usage figures.

This appears to be because the UCC was left to decide whether such measures are needed, and as a commercial company their interests is not necessarily the same as those of the University. It is suggested that the University should give the UCC strict guidelines as to what the Internet link be used for.

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