Africa: cyclists on **the superhighway**

Dave Wilson

A RECENT BBC BROADCAST dealing with the Internet gave a figure of one telephone per 100 people as being an average for the African continent. Given the vast differences in telecommunications infrastructure in this region, it should come as little surprise that much of the continent has a telephone density of more like 0.1 per cent, or one telephone per 1000 people. In this context, terms like "information superhighway" become virtually meaningless, and any form of Internet connection appears to be a largely unattainable dream for the majority of African countries.

The Internet Society regularly publishes a global map showing international Internet connectivity by country, with connected countries being shown in various shades indicating the type of connection available (whether it be a dialup FidoNet or UUCP link, or a dedicated IP link). However, what isn't apparent from this diagram is the relative density of connected points in each country. A country shown as being connected may really mean a single researcher operating a PC-based dialup link at around 200 characters per second, with no internal links to other parts of the country. Equally, it may just as easily indicate millions of users with access to multi-megabit per second (millions of characters per second) networks and all the latest Internet facilities and applications. What is probably needed in this situation is one of those maps usually published to illustrate an economic point, for example, gross domestic product. These usually have varying size blobs showing the relative GDP of each country. Something similar for number of international connections and/or Internet node density would probably be a lot more informative.

In Ghana, there are approximately 50 000 telephones installed, with 40 000 of those in the capital city, Accra. Work is underway on replacing the aged analogue-based infrastructure with digital exchanges and new trunks, but in the meantime telephone availability as well as reliability remains limited. At a recent workshop I ran in Accra, it was impossible to make a call from a PC and modem to a PC and modem on an adjoining desk. We eventually resorted to internal PABX dialing. In Zambia, an international call to the USA, for example, can cost as much as the monthly salary of a university lecturer. That country, too, has its infrastructural and other problems. A dialup link based at the University of Zambia, which served hundreds of users, was regularly disconnected on a Friday evening because of a long-standing dispute over an item on a monthly telephone account. Unfortunately, it would take until Monday morning to raise someone at the local telecommunications organisation, explain the situation, and have the line reconnected. Zambia has been directly Internet connected since late 1994, but is still operating over a 14.4Kb line. Egypt, another country lucky enough to have a direct link, has approximately 78 000 users and a single 9.6Kb international line.

One could easily become discouraged in this situation. It is to the eternal credit of African researchers, academics, businessmen, and the like, that this does not happen. On the contrary, the enthusiasm for getting connected is overwhelming, and the sense that whole countries are missing out on one of the most important technological developments this century is very real. Why, then, does this situation persist, and why is the information accessibility gap between the haves and have-nots widening by the day? Well-motivated, enthusiastic proposals for network development usually have no problem attracting significant donor funding, especially if it can be shown that the plans lead to self-sustaining networks within relatively short time periods. In addition, folk who are encouraged to embark on such projects very quickly reach a point where outside help is no longer needed.

The major problem appears to be infrastructural, whether in government or telecommunications. A country like Nigeria, with the second largest GDP in Africa, should be close behind South Africa in the international Internet arena. Instead, it lags behind many other African countries, including those that are much smaller and poorer, like Ghana, Côte d'Ivoire, Mozambique and Tanzania.

There appear to be a number of issues which should be focused upon in order to overcome these difficulties. The success of many networking ventures is usually characterised by a number of these factors. They are:

COOPERATION While it is true that projects should be driven in as cooperative a fashion as possible, and cognisance must be taken of other efforts, one shouldn't become embroiled in cooperative ventures which often result in delays in the actual implementation of the network. Cooperation has overheads of its own, which can sometimes sink a well-intentioned project.

INTERNET STANDARDS Incredible as it may be to believe, there are still folk around these days who are advocating the use of network technologies that do not adhere to Internet standards, and have very little chance of meeting those standards anytime soon. Full Internet connectivity should be the ultimate goal of any networking project, and one should use these, even if only a small subset thereof, from the beginning. This is the only rational way to allow for the evolution of fledgling networks into those capable of supporting future demands.

EXISTING TECHNOLOGIES Making the best use possible of existing technologies is very important in the African context. The temptation is to delay the initiation of network projects because newer, better technology may be available in a short while. This is undoubtably true, but one can become enmeshed in a never-ending waiting game. A better approach is to use what is available, and upgrade in time.

LEAP-FROGGING This is probably the most crucial aspect of any network planning. Plans must allow for the bypassing of intermediate steps which may have been followed in other initiatives. This is the only way the information gap is going to be narrowed — if new plans faithfully follow each and every step of previous initiatives, the gap will become wider and considerable time and effort will be wasted.

LOCAL EXPERTISE This must be identified and developed as far as possible. Responsibility for the running of each participating site must lie with local staff, and new developments must be driven by local needs and conditions.

FLEXIBLE ROUTING Sites should not be forced into particular routing arrangements without taking technical issues into account. Routing should be flexible enough to take failures in telecommunications infrastructure into account.

DEVELOPMENT EXPANSION Network development should follow an exploding model. Initial developments will take place at central hub nodes, and will expand out to nodes further afield, as new developments happen centrally. In this way, technical knowledge and experience built up by central operations can be passed on to downstream sites, who in turn may pass them on to further downstream sites.

MINIMUM EQUIPMENT Networking sites should be able to start operation with a minimum of equipment and training, regardless of the technical sophistication of equipment in use. Any further networking developments should not exclude or hinder the operation of the simplest node in the network.

SELF-SUSTAINABILITY The network, once implemented, must be self-sustaining. Costs of network operation should be recovered from users of the network, preferably dependent on usage volume. Cost recovery should also allow for further network development.

PARTNERSHIPS The concept of partnering should be applied as far as practicable, in order to facilitate the transfer of knowledge and experience from more developed sites to those still in the developing phase.

TECHNICAL DECISIONS These should not be taken until absolutely necessary for the further development of the network, so as to take advantage of the latest facilities available at as close a time as possible to actual network implementation.

It should not be forgotten that even in our infrastructurally sound country, the first efforts at international connectivity used a low-speed dialup link running on a single PC with a locally-developed gateway in place to move mail and documents to and from local networks. This has evolved in a relatively short period of time to a situation where this country has more than 40 000 Internet nodes and more than 30 Internet service providers. Small beginnings grow into sophisticated end-products very quickly once an initial momentum is achieved.

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