

USIA /GTC Assessment of Internet Connectivity Needs of Nigerian Universities

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Introduction

This report is the culmination of ten days of interviews and site visits across Nigeria. I was invited by the United States Information Agency's Office of Technology Partnerships to fulfill a request from the U.S. Embassy in Nigeria to assess the state of Internet connectivity at Nigerian universities and outline potential projects.

Specifically, my Global Technology Corps contract asked me to:

- Provide an assessment of the equipment needs and costs, given the limited infrastructure resources of Nigeria, to provide Internet connectivity to the Nigerian universities deemed most appropriate by the US Embassy and the [National Universities] Commission.
- Provide actual steps: i.e. amount of money needed, equipment needs, political considerations, contacts for the selected universities to gain continuous access.
- Assess the availability and reliability of ISP's in Nigeria.

The results of this investigation are summarized in the following document:

- Executive Summary

The following documents contain links to detailed reports on the ten institutions and Internet Service Providers I visited between October 10 and October 20, 1999, an ambitious plan to create Internet connectivity across the NUC universities, as well as several documents describing relevant issues. There are two ways to view the documents:

- Chronological Itinerary
- Index of Documents

Your feedback and corrections will be highly treasured. Please feel free to contact me at missenc@widernet.org

Author's notes:

There's nothing more pathetic than a computer nerd crying over spilt batteries, but that was the scene at the airport in Lagos on October 20th when I opened my travel case to find my Palm Pilot disembattered and dead. I lost many of my notes and, especially, the names of my contacts during the previous ten days. I've done what I can to resurrect the material, although some names remain to be added to this report.

Your assistance and corrections would be highly appreciated.

Larger versions of most of the pictures in this report can be viewed by clicking on the picture itself.

Executive Summary

The Need for Internet Connectivity

Nigerian universities have been practically decimated by the past two decades of economic and political upheaval. The Nigerian university system, once well respected around the globe and envied by others in Africa, has been reduced to a shadow of its former self. Now it is left to a new generation of university administrators and professors to rebuild their capacity and their reputation.

Nigeria's much heralded return to democratic rule in 1999 has left many in the academic community hopeful that they will once again have the resources and the freedom to reinvent their teaching and research missions. Nigerian universities remain essentially unscathed by the digital revolution that has swept through Western academia in the past decade. In the digital realm, the Nigerian university represents a blank slate.

In most countries, the universities are depended upon to deliver to the marketplace and ever-growing cadre of young professionals who have mastered digital technologies and henceforth diffuse them into the public and private sectors. While many Nigerian universities offer one form or another of a computer science program, few of their graduates can offer contemporary or relevant expertise and very few have had practical experience with modern equipment and software.

Given the radical and rapid technological change and the increased and intensive digitization of virtually every realm our human endeavor, it is imperative that the next generation of Nigerian professionals have broad understanding and practical skills with these digital technologies.

At the same time Nigerian scholars and researchers need to have access to the enormous wealth of online information, scholarly journals, and digital collaboration opportunities if they are not to be rendered irrelevant in the world of modern academia.

Yet providing Internet connectivity and e-mail access to the hundreds of thousands of Nigerian academics is a formidable challenge. While it may be tempting to look to an outside source for an off-the-shelf and immediate solution, the key to sustainable and economical growth in these areas lie in developing Nigerian capacity to build, support, and expand upon these systems.

So the overarching aim of any project in this area should be to develop the capacity to develop and maintain digital communication technologies at Nigerian universities while at this same time encouraging and developing partnerships with the public and private sector to create broader opportunities for students to gain practical expertise.

The State of Internet Connectivity at Nigerian Universities

Only one university in Nigeria, Ile-Ife, has direct Internet access at this point. They have a satellite connection, set up by a contractor for the national telecommunications monopoly,

NITEL, which delivers -- on a good day -- up to 64K of bandwidth. On a bad day (and it appears that most days are bad days) their connection is inconsistent, and slow. The university pays (when it is able to pay) an amount equal to four times the going rate for international satellite connectivity.

Several universities use a telephone-based email system sponsored by the National Universities Commission (NUC) that routes email through the International Center for Applied Physics in Trieste, Italy. Others have a handful of email accounts with Nigerian Internet service providers. However, the NUC email system has frequent outages -- sometimes lasting up to six weeks -- largely because of their dependence upon NITEL. As well, it is not uncommon to hear the customers of the handful of Nigerian ISPs complain of having to dial hundreds of times over several days to gain a connection. Testing of ISP connections revealed speeds of up to 14,000 baud, but most often the connection is so slow as to make it impossible to open a Web page without being timed out repeatedly.

Four of the universities visited have intentions to install satellite ground stations, but only two have gone so far as to collect bids from vendors and prepare a plan. Satellite connectivity is the only current viable option for most Nigerian universities since the telephone infrastructure is in poor condition and the distance between campuses is great. Two federal universities -- with over 10,000 students apiece -- reportedly operate without a single functioning phone. Most institutions subsist with a handful of working telephones and barely functioning intercom lines.

All Nigerian universities face a major hurdle in connecting to the Internet via satellite: licensing. The Nigerian Communications Commission (NCC), which is charged by the Ministry of Communications to authorize new satellite installations, currently charges \$42million for permission to connect with Internet services outside of Nigeria. The only internal option for Internet connectivity is the national telecommunications monopoly, NITEL. However, NITEL's connection to the Internet is severely limited and overburdened already. Those who use NITEL's Internet service report dramatic delays and frequent outages.

While the new democratically-elected government is making telecommunications a priority, it is expected to take years before most of the trappings of conventional Western Internet connectivity -- leased lines, T1 connections, ASDL, etc. -- will be available in Nigeria.

Potential Solutions

There's no doubt that Nigerian universities need to be connected to the Internet, but the problem, while it may appear to be technical, has both a hardware and a human component.

Virtually every person interviewed decried the lack of computer and network expertise in the country. Universities that have tried to train a cadre of technologists find themselves in a losing battle as the private sector poaches their skilled staff members. Administrators at each university expressed frustration at not even knowing what questions to ask.

So beyond assisting Nigerian universities with hardware and Internet bandwidth, it has proven equally imperative to provide capacity building assistance. From decision-makers to librarians to

lecturers, the entire academy needs exposure to the potential and practicalities of implementing digital communication technologies.

Hence, consultations with the National Universities Commission, the one organization capable of formulating a cohesive connectivity strategy for the federal universities, focused on both putting the hardware into place while training the technologists to make the process sustainable.

In conjunction with the National Universities Commission and the more general consultations with potential partner universities, a plan was designed which integrated both technical and capacity-building components. This plan, estimated to cost \$1million USD, would place satellite receivers at eight prominent universities around Nigeria and provide walk-in, drive-in, or dial-in Internet access to every academic in the federal university system. This plan would also provide for training of satellite technologists.

See the NUC Satellite Proposal at www.widernet.org/sites/default/files/Satellites.pdf for more details.

An additional proposal to provide capacity building in networking and using the Internet, as well as create U.S. institutional linkages, was developed. This proposal would provide both "on-seat" and U.S.-based training for university decision-makers, technologists, and innovators. By focusing on developing a digital culture at universities as well as promoting inter-university cooperation and discourse, this proposal seeks to hasten the adoption process by promoting best practices.

See the Nigerian Universities Digitization Project Proposal at www.widernet.org/proposals/NUC-AUDPproposal.htm for more details.

Other Issues

As mentioned earlier, Nigeria's telecommunication policies are dramatically hindering progress towards Internet connectivity for all sectors, but most especially the universities. Whatever assistance the U.S. might be able to provide in terms of informing policy makers or providing high-level contact with prominent Internet advocates might help to clear the way for the universities to proceed. Several universities have indicated they would have the wherewithal to connect immediately if they could overcome the prohibitive licensing fee.

Finally, it does not hurt to mention the fantastic democratizing potential of the Internet. At the University of Jos, the Computer Centre staff was able to take a single unreliable telephone connection and turn it into a communication link that connected 1,200 people at UNIJOS with the nearly billion individuals around the world who have access to email. The Centre reported sending 5,000 messages a month out to the Internet. Those using the UNIJOS email system were emphatic in making the point that they had no other means of reliable communication with their colleagues in the outside world and that the news and tools they gleaned from their email was as good as gold in an information-starved environment.

Itinerary / Chronology

Monday October 11, 1999

- 8pm -- Arrive Lagos Airport.
- Picked up by USIS driver. Overnight at American Embassy Guest House.

Tuesday October 12, 1999

- 8:30am -- Meet at USIA office with various staff.
People were frantically preparing for visit by Secretary of State. Few persons "on seat." I'm greeted by librarian Steve Perry and assigned to CAO Shirley Lisenby. Shirley is new to the job and has not worked with Nigerian universities before, but is game for the adventure. It is assumed that I have a meeting scheduled with UNILAG folks, but we won't know until we get there. The group's computer support person, Elizabeth Akinde, agrees to help by calling around to ISPs to see if she can set up afternoon appointments.
- 10am -- Meeting at University of Lagos.
Accompanied by Shirley Lisenby, Cultural Affairs Officer of USIA. Met with Vice Chancellor (Prof. Jelili Adebisi Omotola), DVC Academic (Prof. Sulaiman A. Adekola), the Head of the Law School, the registrar, and Director of NUNet/Computer Centre.
- UNILAG Report – see page 11
- 3:00 pm -- Talk with Thomas Hobgood, Country Director, USAID
We spoke via phone while I was in the Lagos office of USIS.
The Nigerian office of USAID, which had been running at minimal capacity during the previous military regime, is still in the process of gearing up its operations and deciding its directions. The long-term project emphasis is expected to be on democracy building, economic growth, woman and child welfare, and education. (However, the latter focus is on primary education.) No timeline has been developed to date; planning is expected to start this year. The Leland Initiative has not designated Nigeria to be a target country. It would take almost a year's worth of planning and preparation to do so. Current efforts are being focused on building up civil society and assisting the executive office. Mr. Hobgood expressed interest in a copy of this report, but declined to meet.
- 3:30 - 6:30 pm -- Meet with Lagos ISPs
- Lagos Internet Service Provider Report
- 8 pm -- Meet with Jim Callahan at Embassy Guest House

Wednesday October 13, 1999

- 6.30 - 7:30 am -- Fly from Lagos to Abuja
- 10.00 am -- USIS in Abuja
- Met with staff, got updated on projects, and did a little research at the USIS library.
- Noon -- Toured National Legislature
- National Legislature Report
- 2:00 pm -- Nigerian Universities Commission
- National Universities Commission

Thursday October 14, 1999

- 10:00 am -- Meeting at Nigerian Communications Commission
- Nigerian Communications Commission
- Noon -- Meet with NUC Executive Secretary
Professor Munzali Jibril and I have met several times to discuss computer and network matters, so we fell quite easily into our discussions. He particularly interested in seeing some significant progress made soon on the issue of connecting universities to the Internet. We covered some of the basic ideas outlined in the Satellite Project Proposal and he reiterated his commitment to making Internet connectivity a reality in the following year. I gathered from his comments that he is anxious to see something occur soon. We discussed a potential linkage project between the University of Iowa and several NUC institutions. Professor Jibril recounted the difficulty in getting member institutions to cooperate --pointing out that several have yet to spend funds allocated to them in previous years for information technology -- and stressed that future undertakings must be well planned and successful.
- 2:30 pm -- Meetings/Inspections at the National Mathematical Centre, Abuja
- National Mathematical Centre Report

Friday October 15, 1999

- All Day -- Meetings at NUC Abuja
- Spent the day crunching numbers and getting broader staff input on the NUC satellite proposal. Toured building and consulted on network expansion.
- NUC Planning Meeting Report

Saturday October 16, 1999

- 7 - 10 am -- Road Travel from Abuja to Jos
- 11am - 7pm -- Meetings at the University of Jos
- University of Jos Report

Sunday October 17, 1999

- 2 pm -- Road Travel Jos to Kano

Monday October 18, 1999

- 10 am -- Meetings/Inspections at Bayero University, Kano
- Bayero University Report
- 2 pm -- Road Travel Kano to Zaria
- 4pm -- Arrive Zaria. Meet with Prof. Taylor
- 7pm -- Dinner with Prof. Taylor and others

Tuesday October 19, 1999

- 8am -- Meet with Prof. George Kwanashe (DVC academic) and Prof. Taylor.
- 10.00 a.m. -- Meetings/Inspections at ABU Zaria
- Ahmadu Bello University Report
- 2.00 p.m. -- Road Travel Zaria to Abuja
- 6.30 p.m. -- Check-in at NICON Hilton, Abuja

Wednesday October 20, 1999

- 9 am -- Debrief with NUC staff. Finalize details of satellite plan. Discuss university concerns with Dr. Ibrahim.
- NUC Satellite Proposal – see www.widernet.org/sites/default/files/Satellites.pdf
- 11 am -- Meetings/Inspections at University of Abuja
- University of Abuja Report
- 2 pm -- Leave for Abuja Airport, Depart for Lagos
- Met and transported by NUC Liason Office staff
- 5 pm -- Revisit UNILAG
- 10 pm -- Depart Lagos Airport for USA
- Escorted through airport and customs by NUC Liason Office staff

The University of Lagos

UNILAG has 35,000 students and -- despite a national professional staff union strike that had grounded every other university in Nigeria -- was bustling with activity. (UNILAG's professional staff quit the union a couple of years ago.) This situation is significant: UNILAG has the best record for maintaining an academic calendar. Whereas other Nigerian universities struggle to complete a semester a year -- hampered by student protests, administrative closures, staff strikes, and student "cult" activity -- UNILAG stays open and on-course.

Many of their colleagues at other universities expressed a mix of admiration and contempt for UNILAG's ability to make money from their corporate training and various consultative activities. UNILAG is viewed by its members and colleagues as being "in the right place." By this they mean "Lagos," the largest city in Nigeria and the hub of Nigerian commerce.

The VC, Professor Jelili Omotola, relates that UNILAG has tried unsuccessfully to put a computer program into place and build a network. He has determined that he has, "the wrong persons in place" and said he has recently (having just been elected to a second term as VC) "cleaned shop." In fact, the VC took this opportunity to scold the director of the UNILAG computer Centre, deride his group's productivity (he declared the computer center was "just a bunch of outdated and dusty machines") and announce that he had sacked several people that very morning.

UNILAG Vice Chancellor,
Professor Jelili Omotola



Originally quizzical about my visit, Professor Omotola did a dramatic and edifying double take when he connected my name with the University of Jos. He immediately called for a half dozen department heads to join our meeting and asked me to come to work for the university. I assured him I could not. The VC pointed out that UNILAG has a chunk of government grant money that it needs to spend and is looking for ideas on how to do so in the next few weeks. He asked me to return for several days (if not years) at the end of my tour to work with his staff to develop a plan. I agreed to stop by for a couple of hours on the 20th before flying back to the 'States.

The VC is interested in UNILAG becoming a "reference point" for all the other Nigerian universities.

(Of course, I heard the standard pitch about UNILAG being "the biggest, the baddest, and the best University in all of sub-Saharan Africa."

There's no reason to fret about the Nigerian's sense of self esteem...)



From L-R: The director of the Computer Centre (?); the DVC Admin, Prof. Adekola; USIS CAO, Shirley Lisenby; and the Dean of the Law School (??)

After meeting with the "Ogas", we met for about an hour with the Director of the Computer Centre, the DVC Admin, and the Dean of the Law School.

They admitted that no computer project they have launched to date has been effective. They got a couple dozen computers from a local bank, but have sequestered them for security reasons. Their plans are pretty standard and uncomplicated: buy a bunch of computers; get a satellite dish; parcel out the computers to those who need them most; and sell their Internet connectivity to make money for the university.

I coached them on considerations for either installing their own network or contracting with a local vendor. I introduced the idea of defining cable pathways between buildings that would be safe and upgradable. I suggested that they run fiber between buildings and copper inside building; leaving the original fiber installation to an outside contractor and focusing on training their people to install the copper segments.

I also advised them not to think about being Internet Service Providers. For more on this topic, see the topic: Universities as Internet Service Providers?

Our meeting having run overtime, Shirley and I were looking forward to touring the student dining facilities on our way buy Naira before our afternoon meetings. However, the dean of the Law School (whose name still escapes me!) insisted that we visit the Law school and discuss some more pressing matters. He sent his assistant off to find food and we agreed to a short meeting.



UNILAG Law School Dean
Professor ???

The meeting took several awkward turns as guests filed in and out. The gentleman was apparently trying to talk with Shirley and I separately while we were in the same room.

He spent a determined amount of time with me trying to get me to concede to return to the Univ. of Lagos in the spring and hold a training. Given my penchant for training, I'd normally love to do something along these lines except for one thing: the good professor wasn't talking about training university staff or students -- he was talking about using the university facilities and my expertise to put on a for-profit training for the private sector.

"You really should think about it, boy. You could go home with a lot of money in your pocket."

I cite this as an example of the shenanigans that have become commonplace in Nigerian universities. To be fair to the entrepreneurial professors, their salaries, even in Nigerian terms, are chump change. Every proud practitioner in higher education has been compromised by the economic drubbing the university is taken over the last many years at the hands of the military administrations.

I returned to UNILAG the evening I was to fly out. It was a rushed meeting, since I only arrived in Lagos at 5:00 PM and I needed to be at the airport at 8:00 PM. I met briefly with the Vice Chancellor, and he let me know he would like me to meet with his computer committee and then meet again -- privately -- with him before I left.

I did meet with the computer committee; it was an enthusiastic and fruitful endeavor. The computer committee had been doing its homework. They announced that they had abandoned the notion of becoming an ISP and were now planning to put their money into a basic Ethernet network and email system. They identified four stages they'd like their growth to follow:

- Stage One - Build basic campus network
- Stage Two - Connect to Internet via ISP
- Stage Three - Hook up distance campus via wireless LAN
- Stage Four - Hook up Medical School

They reiterated their doubts about waiting on the NUC to deliver satellite connectivity and declared that they were a more powerful university than all the others and would be in the best position to secure a satellite dish on their own.

They asked if they could send their technicians to Iowa for training and I said, "We'll have to wait and see."

We discussed a few other technical issues, I gave them a pep talk about "Commando Networking" and "overtraining," and then they took me on a tour of a room which had -- gasp -- over 100 Pentium computers STILL IN THE BOX and languishing because they hadn't yet determined what to do with them.

I stopped by to see the VC as I was rushing to leave for the airport. Unfortunately, two of the committee members joined me for the "send off." Hence the VC did not get his desired private consulting. I could tell the VC was disappointed. However, given my tight schedule, there was no room to maneuver.

This underlines for me the suspicion and confusion that surrounds a lot of these issues at the universities. Here's a group of people making large, expensive, and potentially explosive decisions without much information to go on. At virtually every university I've worked with I've met individuals on such committees who were simply trying to line their own pocket. I met others who didn't know who they could trust in the process. And virtually every player has complained that they suffer for a lack of impartial advice.

As one VC quoted, "Everyone who wants to talk to us has something to sell."

It's a tough situation.

Lagos Internet Service Providers

While in Lagos, I took the opportunity to visit three of the most popular Internet service providers. Gratifyingly, at two ISPs a member of the staff recognized me for the presentation I gave at last year's AfriNet99 conference. This seemed to make it easier to get a good conversation going.

Motophone-Hyperia

The first visit was to a group called Motophone-Hyperia. Their offices were relatively well appointed, with a half dozen or more Nigerian clerks and secretaries to greet us, but the technical questions and the business considerations were handled by two of the Lebanese management staff, Tony Khoury and Mona Farchaikh. They were able to handle basic questions about dial-up service and some of the wireless and microwave connections they provide to business clients in Lagos. But they referred the larger technological questions as well as the questions about partnership with the universities to their boss, who unfortunately I didn't have a chance to meet.

Not wanting to be too precise about things, I'm sure to protect their company's interests, they were able to tell me that Motophone-Hyperia had about twelve hundred dial-in customers whom they handled with about thirty modems.

They claimed to have a direct connection to the Internet that doesn't go through NITEL, but I was unable to confirm this. I find it suspicious because Motophone-Hyperia is one ISP NITEL publicly endorses. Their satellite bandwidth is currently 256K, but they expect to upgrade it to 512K shortly. They are currently working on a satellite installation in Port Harcourt.

Motophone-Hyperia has a couple of dozen business clients in the Lagos area as well. Some are serviced via a dedicated dial-up and a handful of others are served via local microwave units at speeds up 9.6K. They report that the radio traffic around Lagos is wild and unregulated. As such, they have had varying results with different technologies. They have managed to send a microwave signal up to five kilometers and they are just starting to experiment with spread spectrum technologies. I asked if they thought they'd be able to service the University of Lagos campus with microwave, and they seriously doubted that they could get a signal to travel that far in the Lagos environs.

Their company has tried to set up ISPs at other cities, Abuja in particular, but they mentioned three or four endeavors that have fallen through so far. Their current focus is to set up an Internet presence in Port Harcourt.

Their server system includes a firewall server and a proxy server with four gigabytes of cache for Web pages.

I proposed the idea of possibly working with the universities to create additional connectivity, or even partnership, partnering with the universities to create new access points around the country. The two managers I spoke with seemed agreeable, but again, said I should talk to their General Manager and Owner.

I tried dialing into Motophone-Hyperia from friend's account and was unable to connect after several tries on a Saturday afternoon. Two long-term customers related serious difficulties getting connections and remarkably slow Web browsing. They use the service for POP email.

Cyberspace

My second visit was to the Cyberspace Limited. There I met with the Managing Director and owner, Sunny A. Imudia, as well as his main assistant.



Cyberspace Limited
Managing Director and owner
Sunny A. Imudia

Cyberspace is the oldest Internet service in Lagos, and it appears to be entirely Nigerian owned. They boast of more than a thousand customers and have fifty dial-in lines feeding into their main office. Prominent in the courtyard of their business' compound is a 3.8 meter send and receive satellite dish, the exact make and model that the NUC wishes to install at universities around Nigeria.



Mr. Imudia reported that he had a license to send and receive data outside of Nigeria for his company's own uses and not to provide such services to his customers, although I would be the first to doubt the NCC's ability to detect and discern whether this was actually taking place. The Managing Director didn't confirm this, but neither did he deny it.

Mr. Imudia seemed particularly interested in the concept of working with the Nigerian universities, especially if the partnership meant that he could create more access points for his services around the country. I asked him if, should the NUC purchase services and equipment from another source, he would be willing to contract as a resource person for the universities to help them maintain their routers and servers, and he said, "Yes." All in all, I found him very easy to talk to

and much interested in doing innovative and creative things with the universities.

Cyberspace has been working on creating points of presence at other parts of Nigeria. Mr. Imudia talked about trying to set one up in Jos and in Abuja, but he found it difficult to find reliable people to manage them so they eventually closed down. He's still working on it, however, and today his two main targets are Abuja and Port Harcourt.

I've held a CyberSpace account, so I'm more than familiar with the common difficulties of establishing a connection and browsing the Web. I did not get a chance to try their new satellite connection...

Microcom

The third ISP I visited was Microcom. There I met with the Assistant Manager, Mr. Mohammadu Aliyu, as the Lebanese manager, Mr. Raghid Kheir, was out of the country at the time. Mr. Aliyu responded to almost all inquiries positively. He seemed eager to please and no doubt would have offered to wire the universities up himself if I had posed the option.

Microcom
Assistant Manager
Mr. Mohammadu Aliyu



He was good enough to tell me that Microcom has about a little over a thousand customers with fifty dial-in lines hosted at NITEL and a two Mbit microwave connection from NITEL's main switches to his office. Microcom has two Sun Sparc workstations acting as servers, a UNIX box, and NT server providing various other facilities. Their server room was neither state of the art, nor was it inadequate either. Some things were twist tied together, and most things were plugged in according to spec. (Once again, I am struck at how ordinary these server rooms look now that the technology has advanced to this point. Microcom's server room looks no different than those of hometown ISPs all over America.)

Microcom had a room with about sixteen computers as a Cyber Café for their customers. Using one of these machines, I logged on to the Internet and tried to open the Exchange e-mail home page for the Department of Physiology at the University of Iowa. After five minutes, I gave up.

Instead I went to the home page of my Internetworks class. The text popped up relatively quickly, but the images took five minutes before they were completely downloaded. This is a page of probably about 60K. I mentioned this to demonstrate the kind of bandwidth that Microcom (and virtually every other Nigerian ISP) has at 6:00 PM in the evening.

General Observations

I asked at both at Microcom and Cyberspace if they could assist the universities with installing their new satellite dishes. Both had essentially the same equipment set up in their courtyards, but neither had installed the satellites themselves. The satellites have been installed by their outside service providers who sent a technician to Nigeria to manage the installation.

I asked around at a number of technical shops and was unable to find a Nigerian technician who could install a send and receive satellite (as opposed to a receive-only television dish.) There are plenty of satellite dishes around the country collecting television signals, and many, just to look at them, are obviously installed by local technicians. The great question remains as to how much more difficult and precise a send and receive satellite dish installation might be.

Both organizations, though, felt comfortable and confident about their ability to configure their routers and switches and both were more than happy to contract with the NUC to support the universities at this level. I opted not to discuss prices or contracts, given that we are still very preliminary in our planning.

Both places reminded me very much of the ISPs that I know in the United States. These are Mom-and-Pop shops where they have a relatively small amount of equipment, set up haphazardly but functionally in space usually designed for something else entirely, and run by eager fortune seekers who are willing to put in long hours and respond to customer requests at any time of the day.

Nigerian National Legislature Report

At the behest of Mr. Tim Smith of the US Information Agency, I visited the new National Legislature Building on Thursday to meet with their information technology people.

The Director of their computer and networking area was out of town, so I spent an hour or so with the Assistant Director, Mr. Lawal Usman. He showed me around the building and explained that the contractors that built the new Legislative Building ran category five copper wire throughout, in anticipation of a major network installation. However, the networking group has made no progress since that point. So while there are hundreds of jacks in the walls, there are no devices connected and they have yet to obtain common network components like servers and hubs.

I visited Mr. Usman's office. He had an older computer, probably a late 486 or early Pentium with a broken printer and a decrepit scanner attached. There was neither a network card nor network cables. Mr. Usman graduated with a Master's in computer science from a US university in 1985 (about the start of the PC revolution) and has had little formal training since then.

When pressed for his plans on networking the building, his answers were oblique and unconvincing. He clearly sees the need for a network server and network concentrators and wires, but had a hard time distinguishing between the network server and network services.

He explained to me that he is having a difficult time finding people with skills, and that they desperately need training at the National Legislature and coaching to help them set goals and make decisions.

After a brief tour of the building led by Mr. Usman, we wandered next door to the Congressional Library building. The Main Librarian was also out of town, but I met with two Assistant Librarians who were able to show me around the physical plant. I saw probably half a dozen functioning personal computers, but they were all stand-alone computers -- some hosting CD ROM databases and some looking like they had already fallen into disrepair.

There was wiring in the walls and cable pathways defined through all the rooms, so it's clear that networking is expected in the library, yet the Assistant Librarians made it clear that they also lack skilled technicians and a vision of what they hope to accomplish. The library has no concrete plans for connecting to the Internet, although the staff I spoke to surely like the idea and expect that it will happen at some point.

The National Universities Commission



NUC Headquarters in Abuja

The National Universities Commission is the federal umbrella organization which oversees the administration of higher education in Nigeria. With 27 federal universities and dozens (soon to be hundreds) of teaching hospitals and colleges under its wing, the NUC has the potential to change the lives of a million Nigerian scholars and academics.

Federal universities in Nigeria are fairly autonomous, receiving the bulk of their funding directly from the federal government with the NUC simply acting as a conduit. But some portion of the funds are managed by the NUC, giving the NUC the ability to affect change at the universities through "earmarked" funds.

Regional competition for federal monies is a popular blood sport in Nigeria and the universities play hard to get their share. As such, the NUC must be ever vigilant that they not appear to be favoring one region over another, making allocation decisions just a little harder on everyone.

Through a UNESCO-sponsored linkage project with the International Center for Applied Physics in Trieste, Italy, the NUC has been able to train a handful of technicians and develop an email gateway for member institutions who want to participate. The NUC has expressed some dissatisfaction with their ICAP linkage, since they have seen only a modicum of progress in the project's three-year span and the technicians who have been trained in Italy and elsewhere haven't made much progress in Nigeria. (It doesn't help that the NUC and other participating universities consistently lose the technicians who are sent for training to the private sector.)

The NUC runs a project called the Nigerian Universities Network (NUNet) that is designed to encourage universities to invest in digital communication and training. The most successful part of this project is their email gateway with ICAP. Even so, only about a dozen universities use the NUNet email system. The NUNet email system works well on occasion, but has experienced

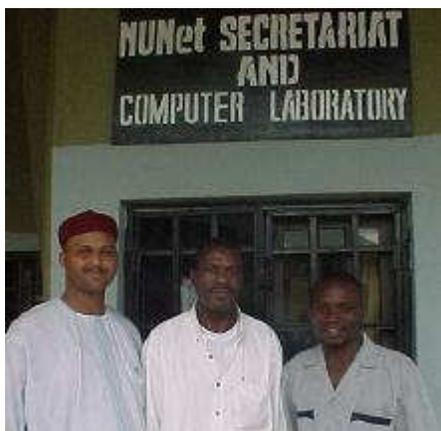
downtimes that stretch into weeks. A handful of universities who are using the NUNet email system maintain dual systems with other Internet service providers. Except for one or two institutions who use an ISP for limited email connectivity, the remaining universities operate without email.

Even the NUC headquarters has little to show for the years of effort: though the building was built with network wiring in every room and a sophisticated backbone and an emergency power supply, only a handful of computers are attached to the network and the only network service is TELNET email access.

Dr. Mamman Aminu Ibrahim
NUC Deputy Director for Research
Chairman of the Nigerian Universities Network (NUNet)



NUNet is currently chaired by Dr. Mamman Aminu Ibrahim. I have met and worked with Dr. Ibrahim and NUNet staff several times over the past year. NUNet had been languishing until he took over the reins about eight months ago. Since his term began, Dr. Ibrahim has been seeking to define a wider use of the technology and broaden the NUC's training efforts. His current pipe dream: a satellite dish in place at NUC headquarters before the millennium.



Rilwan Abdulsalami, NUC Library Services Unit
Eze ???, NUNet Head Technician
Richard Sanusi, NUNet Technical Officer
(Richard, by the way, trained with me as an intern in Jos!)

I'm particularly interested in the role of the NUC in the development of network technologies in Nigeria. Setting up a computer requires a certain amount of local expertise and elbow grease, but hooking up county-wide communication systems takes lots of cooperation and standards. I've found the fastest way to build capacity is to train cadres of technicians centrally and farm them out. This is such a complex endeavor and each institution of higher education is going to have to learn that same lessons in deploying nearly identical systems that it simply makes sense to centralize the effort. By not "reinventing the wheel" at every university and creating an atmosphere where institutions help each other out, the NUC stands to see their work go a lot faster.

Currently, the NUC is seen by many of its member universities as yet another layer of bureaucracy that's thrust upon them by the federal government. The NUC -- and NUNet in particular -- have not been known to be able to deliver the goods. With a new chairman and a new government, it's up to the NUC to prove it can do the job.

Preparing for Satellite Connectivity

When I first arrived in Nigeria in 1998 the NUC was still in the mode of "waiting for NITEL." All their Internet plans were hung on the promises of NITEL to deliver high-speed networking to all cities and universities in Nigeria. Of course, NITEL was years behind their promised delivery dates and the systems, though largely installed, were not functioning.

I worked with NUC staff and the Executive Secretary, Professor Munzali Jibril, to explore the option of stand-alone satellite systems.

This brainstorming has led to a full-blown proposal to provide on-site, dial-in, or drive-in Internet access to every NUC institution. See www.widernet.org/sites/default/files/Satellites.pdf for details.

During this particular visit I spent time with my NUC cohorts exploring further possibilities and attempting to attach some real figures, personnel, and dates to such a potential project.

Dr. Ibrahim and his staff had been doing their homework, trying to ascertain which institutions should be encouraged to join in the project, inventorying what infrastructure was already put in place, and identifying potential partners.



Plotting satellite connectivity for NUC institutions with NUC staff

The Nigerian Communications Commission

The new chief of the NCC was out of town, so I met with the second in charge, a Mr. Abdul-Rahman Ado, the director of the Commercial Services (the group which regulates ISPs and satellite connections.)

I started our discussion by inquiring into the satellite applications submitted by the University of Jos earlier this year. Mr. Ado reported that the application had been approved by the prior NCC administration. However, they immediately put the approval on hold so that the new NCC administration could review it. Hence UNIJOS was not informed.

Mr. Ado reported that a commission has been established by the President to review telecommunication policy and deregulation. Mr. Ado said (and I must note that I don't know how reliable he is, although he seemed earnest enough and several things he predicted have since come true) that most of the members of this Commission are either from NITEL or from wannabe telecommunications competitors.

Mr. Ado suspected that the outcome of their deliberations would be a recommendation to deregulate telecommunications but to consolidate all data communications, i.e., the Internet under NITEL. He thinks that this would mean even those ISPs that currently have licenses will have them revoked and will need to get their Internet connection directly from NITEL. If anybody in this whole scenario is known to be unreliable, it's NITEL. So this potential outcome could only be detrimental to the entire process.

Mr. Ado speculated that there might yet be free satellite licenses for universities, but that we simply won't know until the results are released in the next few weeks. Mr. Ado encouraged me to pass the word along to VCs and executive secretaries of the NCC that they need to be prepared to attend public hearings in November to defend the interests of the universities. (I did.)

Mr. Ado declared that no new licenses had been granted to Internet service providers in the last year, and that he was not aware of any Internet service providers who had direct connections to the Internet without going through NITEL. I chose not to challenge him on this assertion. (Sleeping dogs and all that...)

The NCC plays a confusing role in all this regulatory muddle: they are the actual licensing agency for satellite and telephone connectivity, but they work under the Ministry of Information. The two major groups under the Ministry of Information are NITEL, the telephone monopoly, and the NCC, the regulatory arm. According to many legal scholars, the NCC should actually be regulating NITEL. But NITEL is the cash cow and wields far more power. Hence any licenses which NCC might want to approve, must also garner the approval of the Minister of Information, who, it is reported, is much more likely to listen to NITEL than NCC.

A couple of people within the NCC have said that it's likely that there will be a legal challenge to the current state of affairs regarding these two organizations and their roles in Nigeria. Their interpretation of the laws that are on the books is that NCC is supposed to regulate NITEL and other communications service providers in Nigeria. However, due to the autocratic decrees of

multiple military administrations, NITEL has gained the upper hand. If the presidential commission doesn't set this imbalance straight, the legal challenge is expected. Although it could be two or three years before any results are seen.

National Mathematical Centre

My visit to the National Mathematical Centre was unexpected in many ways: I was surprised to hear a visit had been scheduled, I was surprised that it existed at all (let alone in Abuja), I was surprised to find a high-caliber staff in place... and I was pleasantly surprised to find a first-class example of "commando networking" within its walls.

The Centre's mission is to work on all school levels to improve math education in Nigeria. During my visit I met with several teachers from around the country who were temporarily attached to the Centre to develop curriculum and improve their own skills.

The National Mathematical Centre collaborates with various international agencies to develop capacities in Nigerian schools and as such has a definite need for reliable communication systems.



Outside the NMC with staff representatives.

While I met with a delegation of the Centre's management staff, the high-level administrators originally scheduled for the meeting were absent. I met with some of the most skeptical resistance from this group: they wanted to know why I was taking their time and what I possibly had to offer. However, my sense of this group's mood was that what I was experiencing was less of the standard skepticism of NUC and/or USIA and more of an informed sense of urgency and a desire not to be side-tracked by outside factors.

Indeed, the Centre already has a network installed and a redundant set of email links (with NUC and a Lagos ISP) as well as an occasional Internet dial-up browse capacity. They are fiercely interested in developing a better link to the Internet and are pursuing this objective with their collaborators.

The key to the progress the Centre has seen apparently is Dr. O. A. Fakinlede, a mathematician who recently spent some time studying overseas and has a good idea of what is possible with digital technology.

Dr. O. A. Fakinlede, Systems Manager
and Head of the Computer Laboratory
National Mathematical Centre, Abuja



Dr. Fakinlede reported that the Centre had over 30 computers attached to the network and four servers. While walking through the building I noted about a dozen machines which were actually in working condition (many of the computers were older 486 and 386 clones) while most were in one state or another of disrepair. The Centre has an Ethernet network using older coaxial and thinnet cabling, which they hope to upgrade to twisted pair in the near future. The servers also functioned as workstations and were running Linux and Windows NT. The servers were in a single room with significant security. I noted a wide variety of mathematical modeling and instructional software in use in the server room. Outside the server room was a larger room with over a dozen computers for general use. Many were in disrepair, but those still functioning were being used.

Dr. Fakinlede's cohort's recognized his unique contribution to the Centre's digital communication systems and voiced concerns several times that he might leave or desire to return to his own teaching and research. Dr. Fakinlede is working informally with some students to teach them networking skills, but he seemed to shrug off the effort as not necessarily productive.

The Centre is particularly interested in mounting cached Web sites on their servers and Dr. Fakinlede was, refreshingly, the first Nigerian I spoke with who understood the concept without detailed explanations.

By the time I left, I felt that the discourse had been productive and the possibilities for collaboration with the Centre were rich. Dr. Fakinlede thanked me for planting some new ideas and I suspect the Centre's innovative staff will probably implement some before I visit again.

Nigerian Universities Commission (NUC) Planning Meeting

There's very little centralized information about what each university has accomplished so far in the digital realm. What little reporting there is tends to be technically oriented: it accounts for one technical feat or another, but does not accurately describe its impact or use. An important measure which has been ignored (and this happens in institutions around the world) is participation: how many people have access to the technology and how many of these have the training and wherewithal to access the information they need efficiently?

We discussed the need to gather better statistics from each NUC institution. Possible indicators at this point are:

- Number of computers?
- Number of computers available to faculty? Students?
- Network?
- Number of ports?
- Number of Email accounts?
- Amount of Internet bandwidth?
- Plans and goals?
- Number of trained staff?

We discussed how a tendency to exaggerate reporting will require developing a means of verification. How to enforce?

We discussed setting entry requirements for those institutions wanting to participate in a NUC satellite Internet access project, requesting institutions to meet a standard set of requirements to participate. i.e. a certain number of computers on a LAN, a backup power supply, a secure area, etc.

How do we measure participation? Ile-Ife has a much-heralded wireless network, but few actual connections and few participants. What constitutes participation?

The NUC staff would very much like to work with reluctant institutions like Calabar. Calabar has been strongly encouraged and enticed to join NUNet, they even had a few technicians trained at NUC expense, but hasn't yet participated.

If the NCC will issue a single license for the entire NUC university system, the NUC would be willing to pay a one-time fee.

Need to be on the lookout for possible collaborations with those who already have satellite dishes or other Internet connections.

It may be feasible to partner with a current ISP so that the NUC ground stations act as a POP for them while they cover a portion of the expenses and/or possibly provide free dial-in service.

One of the key reasons to use satellite dishes is to reduce the number of potential points of failure. Setting up a wireless feed from a partner should be viewed with this in mind.

NUC's linkage with Italy has run its course and the Nigerians are feeling like they haven't seen as much progress as they'd like.

The University of Jos

The University of Jos continues as the only Nigerian university with a world class network on its campus. And UNIJOS continues to expand their local area network: they now have over 150 Pentium-class computers hooked up to their LAN with fiber optics connecting eight buildings and category5 copper wiring inside the buildings.

While there, they showed me where a handful of student interns had wired up twenty-four new Ethernet ports in the bursar's office in just a matter of a weekend.

They now claim more than twelve hundred e-mail accounts and are processing thousands of e-mail messages a week. UNIJOS maintains an Intranet Web server with 4GB of Web sites from around the world and the "Webmasters Club" continues to attract dozens of members to its monthly meetings.



UNIJOS Vice Chancellor,
Professor Nenfort E. Gomwalk

The Vice Chancellor, Professor Nenfort Gomwalk, was not there during my visit but has passed along his reiteration of his enthusiasm for putting up a satellite link at UNIJOS.

Over a year ago, Prof. Gomwalk set aside funds for a stand-alone satellite link using the same technologies planned for the NUC project. Caught in a use-it-or-lose-it situation, he spent some of the money last year buying more computers, but still remains committed to a satellite connection. Last May, the University of Jos submitted an application to the NCC for a 128K satellite connection to Lyman Bros. in Utah. Due to the change in military political situation in Nigeria, further consideration of a license has been put on hold until a presidential commission has had a chance to advise the new president on licensing practices and policies.



Scenes from around the UNIJOS Computer Centre

UNIJOS has a well-established computer committee headed by Professor Lennox Liverpool. They have a well-conceived plan for further expansion of the network to the University's satellite campuses (especially the teaching hospital.)

The University has a vibrant internship program with dozens of students involved, and has recently implemented a longer-term apprenticeship program.

The University is midway through a computer center expansion project which will essentially double the size of their current computer center.

The UNIJOS Computer Centre
Doubling in Size



Interestingly enough, where the University of Jos has spent a good deal of time and money developing their computer capacity and has set the pace for other Nigerian universities, the Vice Chancellor is currently under fire for prioritizing computers. Vice Chancellors usually operate with complete almost autocratic control of the university, although they face re-election every four or five years. This year however poses a whole set of concerns. Nigeria's newly elected democratic government is in the process of trying to weed out corrupt officials in the government and in the academic institutions.

This an intriguing and confusing process in a country where those academics with contacts and wherewithal left the country a long time ago, and virtually everybody who remains had to come up with creative ways to keep body and soul together during the lean years of the military government. Needless to say, it may be difficult to find someone who hasn't been tainted by all this.



UNIJOS Student Interns
Managing Email and NT Servers

Currently there are review panels, high level commissions put together by the executive branch, which are touring from university to university and holding reviews of the university operations and university officers. Like every VC in the Nigerian university system, Prof. Gomwalk is also under review. A lot of accusations have been leveled, and a lot of rumors have been floated, but every university is waiting on pins and needles for the release of the final reports. Those who follow the public hearings at UNIJOS report that a number of deans and professors complained bitterly about the amount of money that was being spent on computers and networking when the university's roads, water, and electricity were barely functional. On the other hand, some

members of the review panel were reported to be impressed with the kind of progress that UNIJOS has made. So we'll just have to wait and see if these efforts have any bearing on the fate of Prof. Gomwalk.

Bayero University in Kano

At BUK, I met with the Vice Chancellor, the DVC Academic, the DVC administrative, and the chairman of their NUNet committee (Dr. Ado Dan Isa – Dept. of Electrical Engineering).

My affiliation with the Nigerian Universities Commission did not seem to impress them. Apparently they've had less than sterling experience with the NUC. However they are using the NUC's NUNet e-mail. Everyone was cordial enough as I explained my mission, although the VC seemed a little irritated that I didn't have anything more concrete to offer them.



BUK Vice Chancellor,
Professor Musa Abdullahi

They reported having several machines wired up into a network, four in one building and three in another, the library, but as the conversation matured, it turns out that two of the machines in the library are no longer functioning and the radio link between the two networks has failed.

The Director of their NUNet program, Dr. Ado Dan Isa, kept mentioning “monkey networking.” I wasn’t sure what he was talking about. Later, however, we met one of his technicians who, it turns out, had attended one of our trainings in Jos a year prior where I had taught about “guerilla networking.” (Given the cultural context and the geographical proximity to East Africa, as well as the unfamiliarity with Latin American politics in Nigeria, I am afraid I am going to have to abandon my guerilla networking concept. I rephrased it for this group calling it "commando networking".)

So, it turns out that the gentleman who had been to our training in Jos the year earlier, had returned to BUK and wired up the first seven computers at Kano.

The machines I saw were all low-end Pentium clones.

BUK Committee
Vice Chancellor Professor Musa Abdullahi at center,
Dr. Ado Dan Isa (NUNet) at right



Like many of their counterparts in Nigeria, BUK is at a loss at how to train their technicians and where to go from this point forward. Like many other universities, BUK is still in the mode of training faculty members – not staff – to set up and maintain their computers, as if they expect professors will end up supporting the network long-term. They reported having several dozen e-mail accounts but very light actual message traffic through their system. They reported a number of problems in dialing consistently into NUC.

I asked them if they had investigated getting connected to the Internet and they reported, a flat “no.” They have heard of others making attempts to set up an ISP in Kano, but to date there has been no success. Some in the room had experience with dialing in to Lagos and said it was both expensive and terribly slow.

They stated very clearly that they could not afford a satellite connection to the Internet, as they understood it to be prohibitively expensive (having been approached by a Lagos-based Internet service provider.) I asked them how much they were willing to pay and mentioned the four million Naira suggested in the NUC plan. They didn't exactly say yes, and they didn't exactly say no.

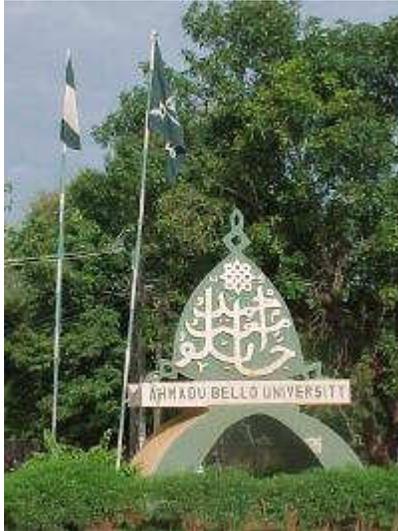
We arrived early on Monday night and reported to the VC's house after finding no reservation for us at the University Guest House. The VC seemed flustered, and declared he wasn't sure if and when to truly expect us. So the VC put us up at the council guest house and was cordial but cool the next day. It wasn't until a member of the meeting injected a testimonial about what he'd seen at Jos and what his staff had learned at Jos that VC seemed to recognize me and warm up. Nevertheless, when we said good-bye, I could sense that he was frustrated at the lack of concrete results



BUK NUNet Chairman
Dr. Ado Dan Isa

Ahmadu Bello University

Despite many Nigerian universities' claim to being the "biggest and the best university in all of Nigeria, if not Africa," Ahmadu Bello actually IS the largest university in Nigeria, with approximately 35,000 students, a very large main campus, two smaller teaching hospitals campuses, as well as a handful of research institutions nearby.



Ahmadu Bello University in Zaria
Nigeria's Largest and The North's Most Prestigious

Ahmadu Bello is a reasonably well-maintained and very impressive facility. I've consulted with Ahmadu Bello University twice in the past, so I'm familiar with their staff and ambitions.

Last year, Ahmadu Bello University was the recipient of a \$1,000,000 (yes, that's dollars, not Naira) grant from the outgoing Head of State to develop their computer networking and Internet access. Since then, they have formed a committee to craft a plan and carry it out. The head of this committee is Dr. Patrick F. U. Taylor, a Sierra Leonian and electrical engineering professor who taught for years at Kano University before moving to ABU. He is a very insistent, dynamic, and energetic individual.

I met Dr. Taylor on arrival and we discussed business clear from 4 -9 PM. The good professor views me as a valuable outside "change agent" and wanted to brief me on various conundrums he was facing which he hoped I would in a larger meeting the next day.

Dr. Dikko, Head Librarian and
Dr. Patrick Taylor, NUNet Chair



The person whom I did not get a chance to meet with this trip, who portends to be a major player in the networking of ABU is Dr. Dikko, the Chief of the K.I.L., ABU's main library. Dr. Dikko has already purchased a server and is working to network the library. He has declared an intention to secure a satellite Internet connection for the library in addition to the one planned for the campus. Those who know him well expect him to follow through.

Oh, the Joys of Committee Work...

The University actually received a down payment from the departing Abubakar government for their \$1,000,000 grant. However, it was reported that this sum of money was snagged by the bursar, put into an interest-attracting bank account, and it is now locked up until December. The bursar, it is reported, will use the interest for other purposes around the University.

Dr. Taylor reports that several of the members assigned to this committee have little experience or understanding about computers or networking. A couple of them announced early on that they weren't going to work on anything having to do with computers until this committee assumed responsibility for and came up with a solution for the University's languishing intercom system. Dr. Taylor relates that he didn't feel he had any choice and so things have been on hold for three months while he worked to resolve the intercom crisis.

The committee has made a few decisions. One of them (a decision that I did not quite fathom) was to purchase a vehicle for the committee. However, since the assets are all tied up in the bank, this purchase has yet to be made.

Most impressive, though, is the investigative work the committee has done. Visiting half a dozen universities around Nigeria that had a reputation for doing computers and networking well, Dr. Taylor supplied me with an advanced draft of this report that shed some interesting light on projects around Nigeria.

The highlights:

- **Obafemi Awolowo University (OAU)** in Ile-Ife has deployed a 64K satellite link via a NITEL link in Lagos. It has proved more reliable than other forms of linkage, although the actual bandwidth is not up to expectations. OAU has had a three-year relationship

with the International Center for Applied Physics in Trieste, Italy, where several OAU staff have been trained. OAU has a small wireless network spanning the campus (currently 3Mbit but they are planning to expand to 10Mbit) and only a few functioning workstations. The visiting committee was impressed with how few of the staff and students had access to the system.

- **The University of Calabar** in Calabar was visited because of its advertised use of wireless networking with a 24km reach. However, the visiting committee found that the equipment had not been installed. They were told by their Calabar counterparts that fiber optics had been abandoned and wireless adopted because of the fear of vandalism.
- **Abubakar Tafawa Balewa University (ATBU)** in Bauchi has just finished the first phase of their campus network, with fiber optics installed in a few buildings and plans to install computers in every faculty office.

Several committee members made the point that they really don't have a lot to go on or other examples from which they can draw conclusions, but they also can't afford to take risks. So they are proceeding with caution.

Currently, the plans include a VSAT Internet connection, a fiber optic backbone spanning the main campus, category5 copper cabling within buildings with a Ethernet port in every faculty office, and wireless links to the distant campuses.

ABU runs an e-mail system that they have used somewhat successfully for the past several years. They report about 150 accounts on this e-mail system. Although it is only currently available to those who are willing to go to the NUNet offices and use one of the two or three workstations there.

The Computer Centre has a 20-station LAN that is used for training students. A small local area network is apparently being constructed in the library and the first extension of the campus network is expected to be between NUNet offices and the library.

The folks at ABU are keenly interested in receiving more training at practically all levels of the digital endeavor. They asked me to consider mounting my Internetworks course there this next year, especially for their administrators and faculty. And they pledged to send a dozen people to the potential network training in Jos in February. As well, they asked if I could host a couple of visitors from ABU at the University of Iowa to demonstrate how these digital technologies are being used in education at Iowa.

In their plans for campus digitization, the committee has highlighted the training of Information Technologists as a major priority. They have identified a need to train 12 "Systems Administrators, Operators, and Engineers" and then another 50 staff to manage the various computer labs across campus.

Chief Librarian, **Dr. Dikko**
Deputy Vice Chancellor, **Dr. George Kwanashie**
Head of Department for Physics, **Dr. Ojo**

During the impressive
"Roof of the Senate Building Tour."



The view from on high..



With its own reservoir, dam, power plant, and shopping center, ABU-ites like to say their campus is a "City within a city."

ABU has gotten several bids for satellite connectivity, one from Lyman Bros. in Colorado, and two from Nigerian access providers. The bids of the Nigerian providers were three to four times more expensive than that of Lyman Bros.

ABU has great reservations about working in a project with NUC because they don't perceive NUC to be a reliable partner. They feel since they already have the money in hand and some of the groundwork covered, that they should proceed apace on their own trajectory. I actually encouraged them to do so, recounting the "bird in the bush" analogy, although I also advised them to watch the NUC's proposal because if it unfolds quickly enough for ABU, it will provide them redundancy and training that they wouldn't receive otherwise on their own.

For ABU and for their counterparts at UNILAG as well, I stressed the notion of how the current NUC satellite proposal is designed to provide a great deal of autonomy for all the participants, the point being that the NUC project would have them buying the same equipment and working with the same provider as if they had gone it alone, and that they could take over paying the satellite connection fees at any point in time if they wanted to be the stand-alone. But the NUC proposal added additional layers of redundancy in training. This assurance seemed very important to them, and I think it's indicative of how important it remains to design this project in such a fashion.

(Interestingly, early along in the process, the NUC has tried to define itself as a gateway for the satellite project. I think that I was able to demonstrate to them that the system as it's designed

does not need a gateway, nor does NUC have the infrastructure to provide gateway services to the member universities.)

The University of Abuja

Although the University of Abuja is not being considered by the NUC as a potential partner in the initial satellite Internet project, I was asked to visit the campus to gain a broader understanding of what various institutions are doing in the digital realm. Accompanied by Mr. Abdulsalami of the NUC's Library Unit, I visited the young campus, located about 60 kilometers from Abuja.

UNIABJ Vice Chancellor,
Professor Gambo Laraba Abdullahi

We met with Vice Chancellor Dr. Gambo Laraba Abdullahi, the acting librarian, and the acting director of Computer Centre.

The University of Abuja has 4,000 resident students, and -- being the nearest university to the burgeoning professional population of the nation's capitol -- they also have approximately 12,000 extension students. Hence, the university is keenly interested in distance and continuing education.



The VC is clearly interested in networking and Internet in general, but, after cordial greetings and introductions, seemed happy to leave details to staff. So I joined the Computer Centre acting director, the Chair of the NUNet committee, and the acting librarian for a short meeting at the Computer Centre.

UNIABJ Computer Committee members
(Acting Computer Centre Director in red. NUNet Chair to her right.)

The University of Abuja has not been idle. They report and demonstrate significant progress towards utilizing digital technologies on their campus.

The committee reports almost 50 computers -- mostly 486 and Pentium -- on campus. Of these, maybe 40 are attached to the network. The network is an older coaxial Ethernet, but the group hopes to upgrade to twisted pair soon. Currently, the network extends to seven departments.



The university hosts about 150 email accounts. The network manager reports 3-4000 messages a week through NUNet (although NUNet could not confirm this amount of traffic.)

The group has looked at a VSAT Internet connection, but has determined it is too expensive. They are waiting for NUC to define some less expensive options.

There are about 75 students in university's computer science program. Most students have email accounts. Approximately 30 computers are available to students.

I took a brief tour of the Computer Centre and saw an impressive array of computers with actual students at the keyboards. Most of the computers were running DOS, and several were clearly not functional, but those that were working were well utilized and available to students.

This group has done an admirable job with the resources at hand.

UNIABJ Computer Centre
Students Working on (mostly DOS) workstations



Universities as Internet Service Providers (ISPs)?

I drew from my impressions of the Nigerian ISPs I visited in Lagos, as well as my identical impressions of American ISPs, to coach my colleagues at UNILAG, Ahmadu Bello University, and Bayero University, Kano. All three of these institutions were -- and perhaps still are -- contemplating setting up a satellite with connections to the outside world and then becoming an Internet service provider for their community.

I pointed out three potential problems with these plans:

- The first potential problem being that their satellite bandwidth was going to be terribly expensive and highly valued. If they turned around and sold it to others, they could find themselves in the position where the private side of their business would be competing for bandwidth with university researchers and students – and there would be little incentive to decide in the favor of the academics.
- Secondly, managing an ISP takes a lot of time and energy, and a certain level of devotion -- if not fanaticism -- that's rarely found at a low-paying state institution. It is hard already, as Nigerians would say, to keep someone “on seat.” But those subscribed to an Internet service provider expect to get service twenty-four hours a day, seven days a week, and expect to have their phone calls answered when things aren't working. Providing for this at a state institution could be inordinately expensive.
- The third reason I coached against this is the risky technical and financial burden. Internet service provision calls for the installation and maintenance of reliable telephone service (a very expensive and problematical proposition when considering NITEL.) As well, it requires the installation and maintenance of specialized high-end equipment including modems, modem pools, routers, etc. (as well as their subsequent and unavoidable upgrades.) This whole enterprise is an expensive proposition. If NCC licensing becomes more liberal, the number of Nigerian ISPs is bound to grow and the competition is going to become more intense. The universities will have to dedicate some of their best technical staff and resources to a proposition that may, in the end, not be profitable. With the new worldwide satellite Internet technologies coming into service in the next couple of years, it's anybody's guess how profitable the ISP business will be.

However many of these universities, after being starved for cash for years by military governments, are forced to look for ways to bring in revenues to support their more academic endeavors.

While there's something peculiar about the university being in the situation of having to sell its basic infrastructure in order to provide for more basic infrastructure, this entrepreneurial sentiment is infused in virtually every new institutional mission. In many situations, there's no accounting for the money that never actually sees the bursar's office and winds up in individuals' pockets along the way. Given their perpetual inability to pay their staff reasonable salaries, administrators not only “look the other way,” but try to steer more business to their valued faculty members.

In light of all this, I think potential donors need to be cognizant that there will be very strong economic forces compelling the universities to sell rather than utilize their Internet connection. If funds for such connectivity projects are to come from outside donors, I believe donors are going to need to include some measures for verification and certification to insure that the Internet connections are used for bona fide administrative and academic purposes.

I coached the universities to think about the possibilities in another light. Not simply because I wanted to dissuade them from selling their bandwidth, but because I do believe that they stand a greater chance -- and a more sustainable chance -- of using these connections and this technology to make money by offer training and certificates in the development of networks and the use of the Internet. They would build upon their own knowledge base, train yet another cadre of technicians, and further their traditional roles in Nigerian society.

In fact, universities are in a unique situation in this respect. They need to secure Internet connections because they are academics and they need access to the overwhelming wealth of information on the World Wide Web. But they also need to set up classrooms with networked computers so they can teach about networking and the use of computer applications. And they need to set up lecture halls with projectors and connections to the Internet so that instructors can use these technologies to teach. And in order to support all this, they need to build up within their own walls a great deal of expertise at how to use the Internet and how to install and manage networks.

My suggestion is that they take all of this necessary infrastructure and use it, say on weekends and evenings, to offer certificate courses for the general public or specific skill-building courses for area private and public sector partners.

Using the example of our June training in Jos last year, I was able to demonstrate how we put on a four-day world-class training session, spoiled the attendees with handouts, food, and drink, rewarded all the classroom assistants handsomely, paid each presenter the equivalent of a month's wage, and still turned a N300,000 profit. (That, in Nigerian terms, is a large sum of money. It got my audience's attention!)

I invited them to hold that thought and expand upon it. I encouraged them to set up their local area networks, to set up the satellite connections, to install their networks, and then to use these resources to offer training to the public and private sector in a way that would not only enhance their pocketbooks, but also increase the skill level of their staffs as well as fulfill the university's prime mission: to educate.

Private and Public Partnerships

Nigeria's telecommunication and Internet scene is a frenzy of activity with businesses, NGOs, government agencies, universities, ISPs, and venture capitalists trying to define the market and establish their links. Yet it seems much of their efforts are being rendered unproductive by the shortsighted, vague, and capricious actions of the national telecommunications monopoly, NITEL.

Amidst the crisis-cum-opportunity which thrives in this environment of fear, uncertainty, and doubt, a whole array of new political intrigues comes to bear. Sensing an opportunity, some entrepreneurs look to their political connections to secure a university contract. Established ISPs actively seek to undermine other's efforts to connect to the Internet. University administrators fantasize about becoming their community's link to the Internet while making huge profits. The NUC draws up plans that would give it a national Internet presence twice that of NITEL. Nigerian ISPs offer proposals to universities which are four to five times the marketplace cost of connections. And all parties are taken aback at the expense and expertise required to establish and maintain Internet connectivity.

At this point it might prove useful to think about schemes which could involve multiple parties, both to save costs and to nip potential political problems in the bud.

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Once a university secures a license and installs a satellite dish, might there be a role for an ISP -- or maybe several ISPs -- to work with the university to share their equipment to help the university maintain their systems and generate some profits?

That is, where the ISP assumes the risk, installs the telephone lines, and contracts with the university for a certain segment of its bandwidth? Where the university brings to the table a satellite connection, a license, and the ground station equipment? (Perhaps, in turn, the ISP would devote a few dial-in connections to the university and be able to assist the university in maintaining its router and servers.)

Or perhaps the university might want to contract with an ISP to install, configure, and support the equipment. The university gains a partner who has significant skills and avoids the expense of training its own cadre of technicians. The ISP gains the experience of installing and maintaining multiple sites.

The other bandwidth/cost sharing scenario that the universities might want to consider that would be less risky than becoming a wholesale ISP, is to set up one or more links with organizations in their area. They could install microwave or spread-spectrum wireless links to their partner organizations. This way they would have fewer points of failure and an understanding that their partners will share with the university in the learning stages of setting up and maintaining reliable Internet service. This would shield the universities from the vicissitudes and expense of setting up an ISP and possibly also give them the ability to monitor and control the amount of bandwidth their partners are exploiting.

The other question to ask is, have models been developed at other African universities whereby they share their bandwidth with other agencies and still maintain their services? How successful have these been? The University of Liberia had such arrangements with local NGO's when they installed their Internet connection in 1998. This would be worthy of further research.

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On a technical level, the options get even more complicated.

Or perhaps in some areas where there are already ISPs (which at this point is only Lagos) universities might want to set up simplex service. In such a case, the university receives its incoming signal via less-expensive satellite broadcast but sends its outgoing signals via a dial-up connection to an ISP.

And of course we shouldn't ignore the possibility of the scheduled simplex service where, say, the University of Abuja dials in to the NUC or an ISP for the uplink and enjoys sole use of the satellite broadcast segment every day from 10:00 - 2:00, giving academics at that university a chance to browse the Internet for four hours a day, yet still not costing the university a full time expensive twenty-four hour by seven connection.

With digital communications technologies, it's easy to mix-and-match components to develop an optimal connection. In many cases this will probably involve both the private and public sectors.

At this point, it is worth keeping the options open...

Press Release

Prepared for USIA intern Nicci Kang Yang on 11/5/99

In October, Cliff Missen, a Systems Analyst and instructor at the University of Iowa, toured several Nigerian universities and Internet Service Providers to investigate options for providing Internet access to prominent Nigerian institutions of higher education.

Sponsored by the US Information Agency and the Global Technology Corps, Missen visited the University of Lagos, the University of Abuja, the National Mathematical Centre in Abuja, the University of Jos, Bayero University in Kano, Ahmadu Bello University in Zaria, and the Nigerian Universities Commission in Abuja. He met with the vice-chancellor of each institution as well as an array of deputy vice chancellors, librarians, computer center directors, and department chairs.

“Only one university in Nigeria has direct Internet access at this point,” reports Missen. “And their connection is expensive, inconsistent, and slow.”

Several universities use a telephone-based email system sponsored by the Nigerian Universities Commission that routes email through the International Center for Applied Physics in Trieste, Italy. Others have a handful of email accounts with Nigerian Internet service providers. But on the whole, there’s very little access to the broad array of Internet offerings that have become the mainstay of academics in the West.

Missen reports that four of the universities he visited have intentions to install satellite ground stations, but that only two had gone so far as to collect bids from vendors and prepare a plan.

Satellite connectivity is the only current viable option for most Nigerian universities since the telephone infrastructure is in poor condition and the distance between campuses is great.

“I heard reports of two federal universities – with over 10,000 students apiece -- that did not have a single functioning phone.” Says Missen. “Other institutions subsist with a handful of working telephones and barely functioning intercom lines.” While the new democratically-elected government is making telecommunications a priority, it is expected to take years before most of the trappings of conventional Western Internet connectivity – leased lines, T1 connections, ASDL, etc. – will be available in Nigeria.

All Nigerian universities face a major hurdle in connecting to the Internet via satellite: licensing. The Nigerian Communications Commission (NCC), which is charged by the Ministry of Communications to authorize new satellite installations, currently charges \$42million for permission to connect with Internet services outside of Nigeria. The only internal option for Internet connectivity is the national telecommunications monopoly, NITEL. However, NITEL’s connection to the Internet is limited and overburdened already. Those who use NITEL’s Internet service report dramatic delays and frequent outages.

Missen visited the NCC and was briefed on the changes expected from a presidential commission reviewing the federal communications policies. He was told (as it has recently been announced in the press) that the commission would move to deregulate telecommunications, allowing two or more competitors to enter the Nigerian market, but that data communications (Internet connections) would remain under the control of NITEL.

Several university vice chancellors expressed their intention to protest this policy and push for unfettered Internet access for higher education when the new policy is debated in the legislature this month.

Missen also visited the new legislature building and congressional library in Abuja to discuss Internet connectivity.

While in Lagos, Missen toured three of Nigeria's most successful Internet service providers: Cyberspace, Motophone/Hyperia, and MicroCom. All three reported over 1,000 dial-in clients and a handful of commercial clients in Lagos. A brief session at the keyboard revealed that throughput was no better than a slow modem.

Each of the ISPs have attempted to expand their services to other cities in Nigeria, but have been hampered by poor telephone infrastructure and management problems. Like many small businesses in Nigeria, the ISPs are owned and operated by one or two individuals who maintain a tight rein on the operations and manage most of the business themselves.

At the invitation of the Nigerian Universities Commission, Missen assisted with designing a plan to connect several campuses to the Internet directly and to provide drive-in or dial-in connectivity to those at the remaining institutions. (See <https://www.widernet.org/sites/default/files/Satellites.pdf>). One of the key components of this proposal is capacity building.

“Every institution I visited – the national legislature, the universities, the NCC, and even the ISPs – bemoaned the lack of networking technical expertise in Nigeria,” reports Missen. “Those ISPs that had satellite ground stations acknowledged that their dishes had been installed by a foreign contractor. Everyone I met offered me a job and then implored me to help them find trained technicians.”

Nigerian universities, having been so long neglected by previous military administrations, have had a difficult time attracting and training their information technology staff. While many universities have computer science programs, they are staffed with professors who have outdated degrees and very little contemporary equipment to work with. Those universities that have sent technicians for training elsewhere report that the trainees are frequently “poached” by the private sector as soon as they return.

Most of the administrators interviewed by Missen concurred: training a cadre of network and Internet technicians in Nigerian universities and civil service is vital to the sustainable and vibrant utilization of the digital communication technologies offered by the Internet.

Cliff Missen is a Systems Analyst and Instructor at the University of Iowa. He recently returned from teaching and conducting research as a U.S. Senior Fulbright Scholar at the University of Jos in Northern Nigeria.

He has taught the course "Internetworks in International Development" for six years at the University of Iowa and this year taught it, via the Internet, to over 50 students on three continents.

Mr. Missen has 15 years of professional experience building LANs, training systems managers, and developing multimedia teaching tools at higher education institutions. As well, he has worked in West Africa on rural water development projects and has produced handbooks and videos on water well drilling.

He received his B.A. from the Evergreen State College in Washington State and his M.A. in Development Support Communications from the University of Iowa.