FEAST Feasibility Study for the AU-EU AfricaConnect initiative

Deliverable D2D-2: African Workshop Report
Introduction

The FEAST project is a feasibility study being undertaken by a partnership between KTH, DANTE and TERENA. Several European NRENs, most notably DFN in Germany are supporting the project with resources and undertaking informal capacity building activities.

The Research and Education Networking (REN) track was organised by the FEAST partners to provide a forum in which issues of building and maintaining a sustainable network infrastructure for research and education in Africa could be discussed and explored.

The track was organised with three main discussion areas:

- Policy and Infrastructure
- State of the Art of African Research and Education Networking
- Computing & Communication Intensive Applications and Usage

The day concluded with a 90 minute roundtable discussion during which panel members expressed their views on a range of questions posed by the co-chairs. This led to a lively discussion from the floor. The REN track was well attended with up to 50 delegates present at any one time. Awareness and publicity for the project was reinforced by the distribution of FEAST information brochure given to each delegate as they arrived at IST Africa 2009. A copy of the information brochure is appended to this report.

This report summarizes the highlights from each of the presentations along with capturing the main discussion points. For completeness the slide sets of the presenters are appended to this report.

Session I – Policy and Infrastructure
Chair: Albert Nsengiyumva, Vice Chairman of the UbuntuNet Alliance

Antti Peltomäki, Deputy Director of DG INFSO explained how the world has become so complex problems often need to be solved by cooperation between researchers in different institutes and indeed different countries. Similarly, research instruments are sometimes so large and expensive (for example: The Large Hadron Collider; Very Long Baseline Interferometer, etc.) that they need to be shared with numerous distributed researchers. The GÉANT network is at the forefront of connecting researchers in these ways and is today the world’s leading research and education network with a global reach. The major missing connection that needs to be put in place is that of connecting Africa. Antti Peltomäki went on to explain that
the development of such capacity for Africa would make running a wide range of applications possible bringing with them advances in agriculture, health and geosciences, distance learning and social cohesion. He went on to explain that success depends on the synergies provided by local, national and regional government actors and their determination to make it happen.

Moses Bayingana from the African Union Commission (AUC) made a presentation on AfricaConnect and the African Virtual Campus (AVC). These initiatives fall within the context of the African Regional Action Plan on the Knowledge Economy (ARAPKE), Consolidated Plan of Action (CPA) and the AUC-EC Book of Projects. Moses went on to say that the expected results of these projects are: online collaboration; training of students and a hierarchy of online libraries at the national, regional and African continent level. All of these developments will contribute to the modernization of education in Africa. In the discussions that followed, Moses explained that a major objective of the AVC is to train local people to build local content. Working with content developers outside of the region will help the African community develop localised tools and content. The AUC operates as a member-state coordination body and where there are existing bodies such as the Association of African Universities Networking Unit or the UbuntuNet Alliance, the AUC will look to them to take the lead in their areas of expertise.

The African policy and regulatory environment was presented by Tusu Tusubira, the acting CEO of the UbuntuNet Alliance. He said that the key barriers to progress in the region are: slow reform of the sector; inadequate access to affordable bandwidth and inadequate policies and regulation.

Historically, Africa has had to use low bandwidth solutions such as VSAT for connectivity. Now that fibre-optic sea-cables with their associated fibre-optic terrestrial backhauls are becoming available along with connectivity from other players such as mobile operators and the utility providers, there is an opportunity to make the change to high bandwidth. Tusu warned that the community must demand bandwidth equality with their peers elsewhere and not accept a small increment over what they currently have. Africa needs to develop a low-cost high-volume telecommunications sector if it to participate in the information society on an equal footing in the global community. Ownership and access to essential infrastructure is an issue in many countries with incumbent operators often regarded as the only permissible owner of such facilities. In many countries NRENs are only able to obtain access to fibre from licensed public operators, and not allowed to own infrastructure themselves. In summary change is not happening fast enough and the NRENs should make themselves strong advocates to make this happen, lobbying politicians, governments and regulators. Documents on policy and regulation are available from the UbuntuNet Alliance website at www.ubuntunet.net

Michael Nowlan of DANTE presented the global context of GÉANT explaining that although the network is the most advanced in the world, the one major region still to be connected is Africa. As previously mentioned by Antti Peltomäki, the consequence is that Africa is unable to fully participate in the global knowledge society, so important collaboration in areas including: health; agriculture; geosciences and education is not possible. The lack of high-bandwidth and pervasive connectivity stems from the reliance on VSAT technology. VSAT is inherently narrowband and expensive and requires traffic transit through third party networks before emerging onto the global Internet.
FEAST project partners have been undertaking a survey of the operators on the continent and requesting information from those able to deliver sea-cable and/or terrestrial fibre links in Africa. The slides provide the details, but in summary, it will be easy to connect on the seaboard through the sea-cables. Backhauls into some landlocked countries are being planned, but some countries will still have to rely on VSAT for the time-being. Michael explained four possible scenarios for developing regional networks:

- Two rings: Eastern and Southern
- Three Rings: North-Eastern, Eastern and Southern
- A STAR based on London (sub-optimal but viable as an interim solution)
- Hybrid of the above

The topology that is chosen for implementation should be to keep as much intra-African traffic in Africa.

In the discussions that followed the presentation it was suggested that although expensive, the STAR option based on London might represent a helpful initial solution from the regulatory perspective. An intervention from Michal Przybylski expressed the importance of good publicity towards the commercial ISPs is needed to make clear that the NRENS are not in competition with them, but are serving a different purpose.

**Eric M.K Osiakwan, Executive Secretary AfrISPA** presented the AXIS project on the establishment of African Internet Exchange points. AXIS is the 2nd Lighthouse Project, being included in the ARAPKE Flagship Projects (Phase 1) to be implemented under the AU-EU Partnership on Science, Information Society and Space. Whilst promoting the industry perspectives, the key objective of AfrISPA and AXIS is to promote the development of Internet Infrastructure such as IXPs and fibre connectivity on the African Continent. Eric explained that African Internet users spend in the region of $400 million per year sending traffic outside of Africa and back in again because of the lack of local infrastructure. It is essential to keep intra-African traffic on the continent. Progress is being made with 23 IXPs already operational in Africa with another 4 under development. AXIS has the objective of achieving 44 operational IXPs, 5 regional hubs and 4 regional carriers in Africa by 2010. The AXIS project is working with AfriNIC on the technical level and AUC on the political level.

In the general discussions that followed it was suggested that introducing caching at the IXPs in Africa could help with the bandwidth shortage in Africa by reducing external traffic. In response, Michael Nowlan explained that this has been done in Europe many years ago when transatlantic bandwidth had been scarce and expensive, but as the availability of high-volume, low cost bandwidth became available, the majority of content caching had been phased out. Indeed content caching on advanced networks can be counter-productive and can reduce performance.

Tusu mentioned that content is indeed a challenge, but the costs of bandwidth at around $8000 per Mb per month is an even greater hindrance to development. Duncan Martin emphasised the importance of ensuring all players (particularly the ISPs) recognise that NRENs and RREns are not in competition with the commercial market they will operate in parallel serving a different group of users. The purpose of the NRENS and RRENS is to enable research and education, not compete and there
would be significant benefits for both ISPs and the Research and Education community if good collaboration can be achieved.

Session II - State of the Art of African Research and Education Networking
Chair: Moses Bayingana, African Union Commission (AUC)

Duncan Martin of TENET, South Africa and non-executive director of the UbuntuNet Alliance gave a progress report on the work of the Alliance which now has 10 participating NRENs. He presented details of the organisation, its officers and the secretariat which is based in Malawi. The Alliance is foremost a bottom-up organisation owned and controlled by the member NRENs. Duncan described the current connection from UbuntuNet into London and explained how it will be switched from an STM-1 (155 Mps) on the SAT3 submarine cable to the SEACOM cable. This will provide much greater bandwidth at the same cost as the STM-1. The SEACOM submarine cable owners recognise the importance of NRENs and RRENs and have offered capacity at a fraction of the full commercial rate. Duncan went on to present maps of the current and planned backhauls which can be seen in the attached presentation. In summarising he said that the UbuntuNet Alliance was about getting affordable bandwidth for the NRENs, not about identity, recognition or charity. With its enthusiastic and competent board, CEO and staff, the UbuntuNet Alliance takes a businesslike approach to its activities. It has the strong support of development agencies and broad acceptance of the NRENs in Africa and is gaining recognition as a regional REN.

In the discussions that followed this presentation there were questions about costs and prices. Duncan responded that any procurement undertaken would be open and public and may result in differential prices being charged to the Alliance depending upon link geography. The UbuntuNet Alliance has a policy of solidarity and will deliver bandwidth to the NRENs at a single price per Mb per month, independent of geographic location. It is expected that the AfricaConnect Initiative will exert a large and beneficial pressure on the African telecommunications market.

Meoli Kashorda from Kenya presented KENET as a case study in which he gave an overview of the governance, management and structure of the organisation. KENET was initiated with a 1.1million USD grant in 1999. Operations started with the lease of links and purchase of some equipment but this was subsequently transferred to Telekom Kenya. KENET currently leases its bandwidth and provides its users with connectivity, co-location, training, support plus the usual network services including: mail, web-hosting, DNS and monitoring. The member institutions contribute annually to the running costs of KENET and additional external contributions have been received for specific projects.

KENET has been extremely effective in negotiating bandwidth price reductions over the years since it inception and now finds that the organisational running costs are becoming the dominant component of the total KENET cost structure. Fortunately KENET has been given a grant of $19 million from the Kenyan government which will be used for leasing broadband connectivity for the institutions, building a NOC and purchasing IRUs. The competitive bids for the IRUs are due to be submitted in June 2009. Meoli went on to mention important ICT application such as E-learning and E-health which are very important to Kenya. They are also building up the level of doctoral research in the country.
Albert Nsengiyumva, coordinator of RwEdNet presented information on the Rwandan educational network. The strategic objectives of RwEdNet are to provide infrastructure, build capacity and provide value to the users through applications and services. In summary, RwEdNet works on supporting the development and promotion of Research and Education networking communities in and outside the country. Currently five universities and two research institutions are connected by fibre. This number should be increase when the national fibre backbone is completed in December 2009. Albert reported that Rwandan regulator makes a contribution to the cost of RwEdNet connectivity. The future challenges for RwEdNet include finalizing the backbone plans, integrating the new member institutions, validating the business plan and recruitment of permanent technical and administrative staff. Maps of the national and RwEdNet topologies are to be found in the presentation slides.

Mumuni Dakubu from University of Ghana presented the development of NRENs in West and Central Africa. He recommended the AAU briefing paper “Turn on the NREN Wheel” by Lisham Adam and reviewed by Boubakar Barry as a good source of information. Mumuni displayed a map of the countries in the region and explained the activities focussing on the Ghana Research and Academic Network (GARNET). The underlying infrastructure and institutional connectivity was presented in his slides. The usual problems of: human resources, obtaining capacity, strengthening campus networks and funding of ICT activities are the future challenges which continue to be addressed. GARNET has had a fourteen year gestation period being originally proposed during 1995, and emerging as an NREN in 2009.

Session III - Computing & communication intensive applications and usage
Chair: Gerti Foest, DFN, Germany

Margaret Ngwira, a director of the UbuntuNet Alliance presented the benefits of good connectivity for libraries for research and education in Africa. Margaret noted that libraries are often the first bandwidth hungry consumer of an institution as collaboration and networking is central to the librarians work. In order to fully participate in research, it is important that African based researchers and students have full access to internationally generated journal literature on a par with their peers worldwide. In addition the ability to digitize and provide access worldwide to locally generated content is of prime importance as frequently this content will be a unique resource unavailable elsewhere on the globe. The African research sector could benefit by gaining exposure to international expertise and tools, so they can transfer this knowledge to building their own online African resources and share this with the rest of the world. It was suggested that once these facilities have been put in place there will be less motivation for Africans to leave their own countries which will result in benefits the local society and economy. In answer to questions from the floor, Margaret explained that digitization is an excellent way of preserving historic archives which may crumble in the physical world.

Isaac Singini from Malawi University made a presentation on the role of ICT in Biomedical Research at the Malawi-Liverpool Wellcome Clinical Research Programme. The programme provides a platform for research on Malaria, Tuberculosis and HIV Related Pathogens. The project involves human capacity building for local scientists and technical staff through collaboration with other teams worldwide in 21 countries. The projects include topics such as identification of
genetic variants in malaria. Isaac explained that currently the clinical samples collected in Malawi are sent to Cambridge, UK for analysis and the data is returned to Malawi where a huge dataset is being amassed. Due to the lack of bandwidth this data has to be exchanged on disc or flash memory sticks which are both slow and inconvenient. Unfortunately the institute has lost research grants due to the poor connectivity and consequent time-lag in obtaining and distributing results. In discussions it was suggested that in addition to obtaining sufficient bandwidth to disseminate results, it would be prudent to develop sufficient laboratory infrastructure to undertake the specimen analysis locally.

John Kondoro of Dar es Salaam Institute of Technology, Tanzania used DIT as a case study on the challenges of connectivity in providing IT applications and services to remote sites the country. The centre provides professional IT courses in advanced computing, wireless & mobile computing, embedded systems design, networking & system security. John described the supercomputer, software and applications being used at the institute. He went on to provide details of the delivery of E-learning and Telemedicine material to ten pilot Community Information Centres (CICs) spread throughout the country connected with VSAT links. The satellite links are of low bandwidth, very expensive and can only support three simultaneous links between the centre at Dar es Salaam and the CICs. It is expected that when there is a national fibre backbone available towards the end of this year, operations will be migrated away from VSAT to the terrestrial fibre.

In discussions a delegate from South Africa explained that the problems facing DIT are very similar to those at the High Performance Computing Centre in Cape Town. It was agreed that the two groups could usefully attack technical hurdles together. It might also be useful to establish an African forum similar to PRACE in Europe.

Professor Lars L Gustafsson from Karolinska Institutet, Stockholm presented the concept and application of community health portals in Africa with a focus on drug therapy. He explained that the challenge is that 1.7 billion people have inadequate or no access to life-saving medicines, and even those drugs that are available may be of poor quality. In rural areas there is a lack of precision in diagnosing diseases such as malaria and many drugs are prescribed without following guidelines. The concept of Community Health Portals is to provide online entry points for patients and healthcare workers in order to disseminate information on good practice, wise drug formulary, drug interactions and case studies. The approach of such portals is to provide a tool to simplify communications with patients and support health systems. Professor Gustafsson showed the example of the portal in Stockholm (in Swedish) at http://www.janusinfo.se. The challenge is to develop an Afrodrug community portal using high speed connectivity on the African continent.

The topic of e-infrastructures and applications was presented by Roberto Barbera of University of Catania, INFN, and Consorzio COMETA, Italy. He explained that the Grid uses networked data processing centres and “middleware” as the “glue” between resources, enabling researchers to perform their activities and interact with colleagues regardless geographical location. Roberto mentioned a number of grid projects around the globe, focussing on some important applications to demonstrate the capabilities of grids. These included an in-silico simulation of docking of malaria (WISDOM), heart simulation and salt water intrusion simulation. He went on to stress that the training of researchers in grid techniques is essential to
ensure the most comprehensive use and uptake of Grid technology. As an example of what is being done, he mentioned “Exchange Programme to advance e-Infrastructure Know-How” (EPIKH) and also that several Grid Schools have been held in Africa. He concluded by saying: "Past experience on Grid training are at disposal of all the African Organizations wanting to create e-Infrastructures or just wishing to get started on Grid Computing”. Contact should be made direct to Roberto Barbera at roberto.barbera@ct.infn.it

During the discussions that followed, it was suggested that the Certification Authorities needed for Authorisation and Authentication should be run by NRENs. In discussing the provision of Grid training in Africa, Roberto said he would be happy for the Grid Schools approach to be cloned in Africa. He also mentioned the benefits of getting experience of using Grid Applications by running them locally within institutions. This provides local system administrators the opportunity to learn how to run Grid Applications and gives something to demonstrate to policy makers even before the institution can be connected to the global grid community with broadband connectivity.

Session IV – Roundtable Discussion.

The Research and Education Networking (REN) track was concluded with the panel discussion in which panel members were asked to provide their personal response of a numbers of questions:

1) What are the key challenges facing the development of NREN’s in Africa?
2) What are the killer applications?
3) Is making progress just a question of just spreading “best-practice”?
4) How can we all work together more effectively?
5) Can you identify any other burning issues?

Co-chairs: Konstantinos Glinos, European Commission, DG-INFSO
            Vera Brenda Ngosi, African Union Commission

Panel Members: Albert Nsengiyumva, RwEdNet & UbuntuNet Alliance
               Margaret Ngwira, UbuntuNet Alliance
               Mumuni Dakubu, University of Ghana

What are the key challenges facing the development of NREN’s in Africa?

A major challenge in a number of countries is the question of ownership of infrastructure. As we heard during the presentations in some cases NRENs are forbidden to own infrastructure by regulations. This can make obtaining the high-bandwidth connectivity required by the research and education community at affordable costs very difficult. When dealing with the institutions that are to be connected it can be difficult to persuade them to join the NREN consortium before there are demonstrable benefits. The institutions need to see the value which reliable international high-bandwidth connections can bring and understand the damaging issues if connectivity is not provided to their users. A general appreciation of what is
required can be found in institutions, but it is often low-key and not given high political or funding priority. As more scientist become aware of the need for good connectivity attitudes are changing, but the creation and support of NRENs needs influential champions such as vice-chancellors. It was agreed that the AU and the AAU have a key role in raising awareness, building trust and changing attitudes. This can be achieved through publicizing the benefits of the Internet to African education and research. A major task will be persuading university management to invest in their campus networks in order to distribute the broadband connectivity within the institutions to the users where it is needed.

It is vitally important that politicians, government officials and regulators understand the importance of NRENs and develop regulatory and policy frameworks to enable and encourage the development of sustainable NRENs and services. The NRENs must take a role in this change process by demonstrating their value and benefits. In many European countries the NRENs are regarded as an independent source of expertise that can be consulted when developing national policy and regulation. Bringing these issues to the attention of senior government officials, politicians and heads of states at their meetings would be helpful in raising the issue of NREN importance and help build regional policy.

What might be the “Killer Applications” for the networks?

Would the “killer application” be the Grid? There are very many potential applications for Grid technology in Africa: Drug design and testing; water monitoring and management; agriculture etc, but it is not clear that this will be the “killer-application” for the network. In some respect the answer to the question depends on who the NRENs are allowed to connect. In Europe, large data repositories, e-government and e-health are important uses of the NRENs network and can consume large chunks of bandwidth however the NREN connection policy and regulatory status must permit such connections if the community is to benefit.

In Rwanda, a very small percentage of the population have access to Higher Education, so distance learning would bring huge benefits. To enable this to be realised however the funding models for HE and research will need some modernization. The environment is dynamic and challenges are changing all the time, so institutions must adapt and invest Access to high quality services will be key to a successful future. An important aspect to be addressed when talking of e-health is the need for patient privacy, data integrity and security. Appropriate authorisation and authentication facilities will need to be put in place to support these uses of the network.

Digitization, preservation and online repositories will provide access to valuable material, but will require a significant investment in effort. The benefit will be widespread access and as a result social inclusion.

John Dyer noted that much of the discussion had centred on filling up the network and warned that filling the network with applications would in fact be an "application-killer". Practice in Europe is to over-provision the network (i.e. to load only lightly under normal conditions) so as to provide a high Quality of Service with little delay.
or jitter which is often a prerequisite for developing and using advanced applications which are sometimes bandwidth hungry. Michal Przybylski of CEENET said that in his experience, peer-to-peer applications have a habit of filling networks.

**Is making progress just a question of just spreading “best-practice”?**

The question of whether providing adequate bandwidth alone to the institutions will be sufficient to “make-things-fly” was raised. None of the panel members thought this would be sufficient and cited a number of reasons why not. Albert Nsengiyumva said that there is a whole range of supporting facilities such as power and maintenance that need to be provided. Support services for ICT have to be bought and paid for, so the politicians and professional staff have to be sensitized to this and be persuaded by arguments of value and benefits. Margaret Ngwira said that particularly in the case of E-Learning, content has to be relevant in the local context. People come from different backgrounds they have different levels of experience and expectations. E-Learning has to be customised and adapted to local needs. Mumuni Dakubu explained that reliability of essential infrastructure such as power cannot be relied upon. Challenges such as how to deal with a power outage for students taking a practical ICT exam have to be addressed.

A major issue however seems to be selling the value and benefits of providing, affordable and reliable high-bandwidth connectivity to the end users. Raising awareness and changing the opinion of politicians and decision makers is key. Training of users, support staff and managers is another vital element that must be incorporated in the roll out of new advanced networking services.

**How can we all work together more effectively?**

Vera Brenda Ngosi of the African Union Commission asked the panel members and delegates to consider how all the stakeholders could work together more effectively to bring about the successful implementation and connection of Africa Research and Education Networks.

Björn Pehrson of KTH and coordinator of FEAST project explained that there are a lot of external challenges. Connectivity to GÉANT does not seem to be the major problem with the increasing availability of sea-cables. Sea-cable operators will also be able to provide international connectivity within Africa with their backhauls. What is more problematic, as demonstrated by the responses to the FEAST RFI is the availability of national infrastructure within some countries. In some cases it is government policy that is a major constraint in others, business models. In summary, affordable access to national infrastructure continues to be a major challenge.

Albert Nsengiyumva stressed the importance of implementing AfricaConnect as soon as possible and said it should connect all of Africa. Many African nations are ready to proceed. He would like to see greater collaboration between the European Commission, the African Development Bank and the World Bank. In addition, the Association of African Universities (AAU) should provide support to bring together regional groupings of universities. There needs to be a forum in which rectors and other decision makers can meet, discuss and formulate ICT policy and plans. Mumuni Dakubu (speaking as a chemist) agreed using the metaphor that the AAU should be
the crucible where things can come together and the catalyst to make things happen.

Meoli Kashorda from KENET said that the needs of the end users is a good starting point, to be followed by the analysis of the campus, national, regional and international elements. The campuses must concentrate on providing what is needed for the end users. Another delegate expressed the importance of a symbiotic relationship between the institutions and the NREN and emphasised the implicit need for the NREN to understand the needs of the campus user. Duncan Martin went further saying that there would be benefits for all if there was more general collaboration between the institutions, NRENs, Regional initiatives such as the UbuntuNet Alliance and the commercial ISP sector. We had heard from Eric Osiakwan of the AfrISPA how Internet Exchange Points were being developed across the continent. It was suggested by Duncan that a workshop between these actors should be held in which possible collaborations could be discussed and agreed. There was universal agreement from the floor so it was recommended by the panel that such a workshop should go ahead.

Identification of other burning issues

Vera Brenda Ngosi said that in her view, members of the African NREN community had been discussing how to make progress in obtaining a better connectivity. Whilst it is important that this continues so that experiences may be shared, it is vitally important to involve key government officials, politicians and other decision makers.

In answer to a question from the floor she went on to suggest that although awareness raising and publicity is often taken for granted, it is important and should be explicitly planned as an important element of developing African connectivity.

Margaret Ngwira explained that she had been involved in the process of bringing the idea of African participation in the global research and education network for more than three years. During this time many different actors had been working together and as a consequence had built a good level of understanding and trust. Since this trust has reached a high and tangible level, now is the time to capitalise on that work and “make it happen!”

Summary by Konstantinos Glinos, European Commission, DG-INFSO

Kostas summarised the main points of the discussion session saying that we should not forget the external challenges and that some African countries have their own additional national issues to overcome.

He went on to say that when we meet at the next IST-Africa event in 2010, we will have made significant progress. The FEAST feasibility study will be completed by October 2009 and is on schedule. The AfricaConnect should be well advanced by May 2010.

It is agreed that we need champions to push forward networking and associated ICT infrastructure development. We must ourselves continue to build awareness of the value and benefits of connecting all African nations. Promotion needs to be
structured in the appropriate way for each of the key stakeholder groups: NRENs; Donors; University and other Institutions; AAU; AUC and the commercial ISP sector.

Access to information is key for Africa in order to allow its scientists and researchers to collaborate on an even footing with their peers around the globe. Such developments will bring with them social inclusion and improvements in health, education and agriculture.
PROGRAMME

Research and Education Networking Track
THURSDAY 7 MAY 2009
IST Africa 2009, Kampala, Uganda

Overall Co-chairs for track

Africa: Tusu Tusubira, UbuntuNet Alliance
Europe: John Dyer, FEAST Project and TERENA

BLOCK 1 - Policy and Infrastructure

CHAIR: Albert Nsengiyumva, Vice Chairman of the UbuntuNet Alliance

- European perspectives, Antti Peltomäki, European Commission, Belgium
- AfricaConnect and African Virtual Campus Projects, Moses Bayingana, AUC
- African Regulatory Situation, Tusu Tusubira, Ubuntunet Alliance
- Availability of links for African (sub-)regional REN backbones, Michael Nowlan, FEAST
- Establishment of African Internet Exchange points in AXIS, the 2nd Lighthouse project, Eric M.K Osiakwan, Executive Secretary AfrISPA

BLOCK II - State of the art of African Research and Education Networking

CHAIR: Moses Bayingana, AUC

UbuntuNet Alliance membership area - Eastern and Southern Africa:
- Ubuntunet Alliance, Duncan Martin, TENET
- NREN Development in KENYA, Meoli Kashorda, KENET
- RwEdNet, Albert Nsengiyumva

West and Central Africa:
- NRENs in the making in West and Central Africa, Mumuni Dakubu University of Ghana

BLOCK III - Computing & communication intensive applications and usage

CHAIR: Gerti Foest, FEAST Project and DFN, Germany

- Benefits of connection libraries in the region, Margaret Ngwira
- Computing intensive Wellcome Trust funded Malaria Genome Research, Malawi, Isaac Singini
- Dar Es Salaam Supercomputer Centre, John Kondoro
- African Grid activities, Roberto Barbera
- Health Portals, Lars Gustafsson, Karolinska Institutet, Sweden

BLOCK IV - Round table on next steps and synergy between actors

CO-CHAIRS:
EUROPE: Konstantinos Glinos, European Commission, DG-INFSO Unit F3
AFRICA: Mrs. Vera Brenda Ngosi, Director, HRST African Union Commission

Participants:
- Albert Nsengiyumva, UbuntuNet Alliance & RwEdNet
- Mumuni Dakubu University of Ghana
- Margaret Ngwira, UbuntuNet Alliance
AfricaConnect and Africa Virtual Campus Projects

By
Moses Bayingana

ICT Expert

HRST Department, African Union Commission

Outline

- Continental Framework
- Africa-EU Partnership on Science, Information Society and Space
- Africa Connect Project
- African Virtual Campus Project
- Conclusion
Continental Framework

- ICT activities on the continent are guided by two main plans of action which are the “African Regional Action Plan on Knowledge Economy (ARAPKE) and Africa’s Science and Technology Consolidated Plan of Action (CPA)”, and by major decisions taken by different summits of the AU assembly, the executive council and The African Union Conference of Ministers in charge of communication and information technologies.

Africa-EU Partnership on Science, Information Society and Space

- Following the adoption of the Partnership, the Joint Task Force identified 19 priority projects (12 in Science, 5 in Information Society, 2 in Space) for the short-medium term implementation of the Partnership which were compiled into a "Book of Lighthouse Projects".
The College to College meeting of 1-2 October 2008 identified six of the Lighthouse Projects as "Early Deliverables" (2 for each P8 component).

The *Book of Projects*, including the 6 Early Deliverables were officially supported by the AMCOST (African Ministerial Conference on Science and Technology) Bureau in Abuja on 5th December 2008.

- Consolidation of the emerging National Research and Education Networks (NRENs) with sufficient capacity to provide internet connectivity to the research and education community.

- Development of Regional Networks between the National Research and Education Networks providing international internet connectivity with sufficient capacity and available on a stable basis.

- Connection of the Regional networks to the European GEANT2 Network

- Development and promotion of the use of ICT applications for elearning, distance learning, tele-medicine, etc.)
African Virtual Campus Project (Expected Results)

- Network of fully operational Distance Learning Centers
- Trained experts and tutors in distance education
- Trained teachers in the production of multi-media courses

African Virtual Campus Project (Expected Results)

- High quality online curriculum modules in African Universities
- Training of students online
- An online African Virtual library in Science and Technology
Conclusion

- Building a Research and Education Network Infrastructure in Africa will contribute to the modernization and development of education and research and foster research collaboration between African and European Peers.

- The African Virtual Campus Project will contribute to the development of localized curriculum content that is of high quality and ultimately lead to the African Virtual library.

- Access to the African Virtual library will require internet connectivity with sufficient capacity and available on a stable basis.
Thank you for your attention.
The Policy and Regulatory Environment vis a vis REN Activities

F F Tusubira (Ag CEO, UbuntuNet)

Contents

• Focus of presentation
• Survey: Key barriers to broadband access
• Slow reform in policy and regulation
• Inadequate access to backbone infrastructure
• Ownership and access to essential facilities
• Conclusion
Focus of presentation –
The ability of NRENs and RRENs to:

• Operate independent networks covering multiple campuses;
• Set up and own independent networks (access to controlled resources like spectrum; rights of way)
• Own VSATs as well as international gateways;
• Operate cross-border connections

Survey:
Key barriers to broadband access as

• Slow reform in the communication sector
• Inadequate access to backbone infrastructure at affordable prices
• Inadequate policies and regulation with regards to ownership and access to essential infrastructure by universities and research institutions
Slow Reform in Policy and Regulation

- Access to spectrum; ownership of fiber infrastructure (such as dark fiber);
  interconnection and tariffs – unclear and vary from closed to open, e.g.:
  - Kenya, South Africa, Tanzania and Uganda - progress in reforming, and adopted technology neutral converged regulatory frameworks that promote access to broadband infrastructure
  - Djibouti, Eritrea, Ethiopia and Swaziland still favour monopoly and restrictive regimes that hamper ownership and operation of broadband fibre and wireless networks.

Inadequate access to backbone infrastructure

- Insistence on monopolies/ very limited competition for a long time – no incentive for private sector backbone roll-out (the mobile voice feast). Consequences:
  - Existing infrastructure is mainly low capacity, wireless-based infrastructure designed for voice;
  - Reliance on costly satellite access due to the absence of fiber network (now challenged by imminent arrival of fiber).
  - Challenge of backhauls and domestic backbone (most of the membership region now rolling out national backbones – exceptions are Djibouti, DRC, Lesotho and Somalia)
Ownership and access to essential facilities

• Traditional incumbent operators are regarded as sole owners of the network including national gateways.
• NRENs do not have rights of way
• Eritrea and Ethiopia: VSAT ownership and operation by academic institutions prohibited.
• Most countries - NRENs can only purchase fiber capacity from existing licensed providers: cannot consider ownership option or build networks for special research purposes.
• No provisions for NRENs to be operators of networks with equal access to essential facilities (TENET, KENET, MAREN licensed).

Conclusion

• There is improvement in the environment, but it is not fast enough to enable NRENS and RRENs to seize current opportunities;
• NRENS and RRENS have to play a strong and targeted advocacy role to create faster change.
• (Detailed with country by country analysis available at www.ubuntunet.net )
  • Thank you!
Thank you
Availability of links for African Regional Backbones

Michael Nowlan
FEAST Project Consultant, DANTE
IST-Africa Kampala 7th May 2009

What is GÉANT?

- 7th generation of pan-European research network infrastructure – continuation of a success story
- Connects 36 European countries through 32 NREN partners
  - Serves over 3,500 research and education establishments across Europe
  - Over 30 million users
- Provides extensive international connectivity to other world regions
African Opportunities

- Reliance on Satellite Technology
- Sea cables on West Coast
- No active cables on east Coast
- Three cables coming soon
  - SEACOM
  - TEAMS
  - EASSy/WIOCC
Direct link Mombasa <-> Fujirah
East Africa Backhaul system (EABs) connect • communicate • collaborate

Land Locked Countries

- Connectivity easy for countries with coastline
- Lack of suitable connectivity inland
- Lack of physical infrastructure and capacity of companies to interconnect across national borders
- Use Cable “Corridors” for Landlocked countries
Sea Cable Opportunities

- “Gold Rush” of suppliers
- Highly Competitive Market
- Enormous Challenges for NREN
- NRENs must consolidate position with their customers to avoid fragmentation
- NRENs provide much more than basic internet connectivity

DANTE RFI early results

- Sea Cables opening market
- Easy connection to seaboard countries
- Providers planning backhaul networks, especially in Eastern Africa
- Some countries still reliant on Satellite
- Early days, offerings developing rapidly
Possible Scenarios

- Two Rings: Eastern and Southern
- Three Rings: North-East, Eastern and Southern
- Star Network based on London
- A hybrid of the above

GÉANT global connectivity – February 2009
AXIS - African Internet eXchange System

Eric M.K Osiakwan
Executive Secretary

AfrISPA
www.afrispa.org

AfrISPA
African Association of ISP Associations

- ISPA South Africa
- TESPOK Kenya
- UISPA Uganda
- GISPA Ghana
- ISPAN Nigeria
- ICTA Mauritius
- TISPA Tanzania
- ISPA-DRC Democratic Republic of the Congo
- BISPA Botswana
- MISPA Malawi
- AFIM Mali
- AFAIB Benin
- AAPSIA Angola
AfrISPA Objectives (summarised)

• To provide industry perspectives on policy formulation and regulation as it relates to the Internet industry and to act as an interface with Governmental bodies and the public at large.
• To develop policies and positions in the best interest of the Members and protect and promote these interests in regional and International Fora.
• To promote the development of key Internet Infrastructure on the Continent – IXPs & Fibre
• To promote the development of a free and open telecommunications market.

AfrISPA Funding & Support

• Member contributions
• CATIA
• IDRC
• OSI
• Support: -
  – Cisco
  – NSRC
  – AfNOG
  – KTH
  – AfriNIC
Why an Internet Exchange Point?

- Local traffic exchanged over international links is slow, poor quality and expensive
- Africa spends ~ US $400M a year on talking to Africa via the Internet (2002)
- AfrISPA focusing on fostering IXPs

Success so far

- To date, there are 22 operational IXPs in Africa, with another 4 in progress
- Almost all of these were formed with the assistance of AfrISPA people
- To date, there are 13 operational ISPAs in Africa, 8 formed with the help of AfrISPA
Operational Internet Exchange Points

- Johannesburg Internet Exchange (South Africa)
- Kenya Internet Exchange Point
- Mozambique Internet Exchange
- Uganda Internet Exchange Point
- Tanzania Internet Exchange
- Kinshasa Internet Exchange (DRC)
- Cairo Internet Exchange (Egypt)
- Grahamstown Internet Exchange (South Africa)
- Zimbabwe Internet Exchange Point
- Rwanda Internet Exchange
- Swaziland Internet Exchange
- Ghana Internet Exchange
- Botswana Internet Exchange
- Mauritius Internet eXchange
- Lusaka Internet Exchange (Zambia)
- Angola Internet Exchange
- Namibia Internet eXchange *
- Blantyre Internet eXchange (Malawi)
- Lagos Internet eXchange (Nigeria)
- Abidjan Internet eXchange (Ivory Coast)
- Bamako Internet eXchange (Mali)
- Arusha Internet eXchange (Tanzania)

IXP Map - 2001
Current Project

Strategic and Sustainability Plan

• Consultants employed
• Meeting Nairobi June 2007
• Meeting Joburg February 2008
• Full time Secretariat in Nairobi
• Revised fee structure
• Other revenue opportunities

2010 Project - AXIS

• AXIS - African Internet eXchange System
• ARAPKE: African Regional Action Plan for the Knowledge Economy short listed
AXIS as a flagship project to be implemented under the AU-EU Partnership on Science, Information Society and Space

-- Objectives: -
  • 44 Operational IXPs in Africa
  • 5 Regional Internet Hubs
  • 4 Regional Internet Carriers
  • Digital Arteries

• Regional IXP for East and West Africa
Route from SA to Kenya

- 20 Hops
- Via: -
  - London
  - Amsterdam
  - Hamburg
  - Oslo
Conceptual Model

Regional Carriers

- Required to offer connectivity between 6 initial IXPs: MozIX, JINX, TIXP, KIXP, UIXP, Nigeria
- Expand to include more IXPs
- Service provided to ISPs to connect to ISPs
- Common infrastructure, lower costs
- Direct connection – no hops via Europe / USA / Asia – better quality
- Market open to additional entrants
Process

- AfrISPA Request For Service: Inviting Regional Carriers
- Successful engagement with regional regulatory bodies
  - EARPTO: East African RXP Task Force
  - TRASA
  - WATRA
- Policy level “Buy-In”
  - WSIS Plan of Action
  - NEPAD E-African Commission
  - National Development Plans

Milestones

- 2003: IXPs and ISPs discussed the best model for regional Internet traffic exchange
- 2003: AfrISPA sent out a call for proposals based on model
- 2004: Two strong proposals received
- 2005: AfrISPA announces Regional Carriers
Milestones continued

- Collaboration with regulatory authorities to develop pro-IXP policies
- Development of an “IXP Toolkit” as a resource for regulators interested in promoting IXPs
- Encourage licensing for Cross-Border networks and inter-country infrastructure
- Encourage investment in long haul optical fiber
- The AXIS project is engaging with the AfricaConnect project at the regional level towards interconnecting our networks but also at the national level, most NRENs are interconnected with IXPs to peer with local Internet service providers. AXIS and AfricaConnect would ensure that some of the international transit is done on the continent to reduce the over dependency on Europe and United States, ensuring a robust African Internet Infrastructure.

Thank You

http://www.afrispa.org
Eric@afrispa.org
The UbuntuNet Alliance Progress Report

Duncan Martin  
Director (non-exec): UbuntuNet Alliance  
Director and CEO: TENET, South Africa

UbuntuNet: a Regional REN

Participating NRENS  
Eb@le (DRC)  
KENET (Kenya)  
MAREN (Malawi)  
MoREN (Mozambique)  
RENU (Uganda)  
RwEdNet (Rwanda)  
SUIN (Sudan)  
TENET (South Africa)  
TERNET (Tanzania)  
ZAMREN (Zambia)
Organisation

• Non-profit association
  – Registered in Amsterdam
  – Secretariat located in Lilongwe
  – Administrative and banking assistance from University of Malawi
  – Registering as an NGO in Malawi

• Office Bearers
  – Chair: Prof Zimane Kadzamira (Malawi)
    • Nominated by the AAU
  – Dep. Chair: Albert Nsengiyumva (Rwanda)
    • Elected by the Board from the current Directors
  – CEO: Dr F F (Tusu) Tusubira (Uganda)
  – Head of Secretariat: Margaret Ngwira (Malawi)

Management Board

• Ex officio Directors
  – Chair (ex officio): Prof Kadzamira
  – CEO (ex officio): Dr Tusubira

• Elected Directors
  – John Kandoro (Tanzania)
  – Meoli Kashorda (Kenya)
  – Iman Maaly Abdulrahman (Sudan)
  – Duncan Martin (South Africa)
  – Margaret Ngwira (Malawi)
  – Albert Nsengiyumva (Rwanda)
  – Steve Song (South Africa)

  2-year terms of office
  elected by Representatives of Participating NRENs at AGMs
UbuntuNet operations today

- UbuntuNet, London
- SEACOM submarine cable
- VSAT connection. GRE tunnel to UbuntuNet
- KENET
- UbuntuNet, Johannesburg
- Swaziland
- Lesotho
- TENET/SANReN
- SAT-3 submarine cable

SEACOM’s REN support

- Offered to UbuntuNet:
  - 2 STM-4’s from Nairobi
  - 1 STM-4 from Dar
  - 1 STM-4 from Maputo
  - 2.5 Gb/s in total
- Already contracted with TENET:
  - STM-64 from Mtunzini
  - 10 Gb/s
- London
- Nairobi
- Dar es Salaam
- Maputo
- Mtunzini
What about cross-border backhaul?

Challenges

• Talk Shop ➔ Service Provider
• Business model is complicated
  – Multinational from the beginning
  – NRENs are customers AND suppliers
  – Lack of start-up capital / borrowing capacity
  – NRENs’ procurement rules
  – Monopoly control of cross-border links
• Learning to trust and share
  – Collaborate across national borders?
  – Using our own NREN money??!!!
  – WE’LL be cross-subsidising THEM!!!
  – We can’t give up our independence like that!
Approaches

• It’s about Bandwidth for African NRENs
  – not Identity; not Recognition, not Charity
  – businesslike interconnection agreements with other
    African regional RENs

• Businesslike stance
  – Frequent open, consultation with NRENs
  – Lean and mean operations; quality services
  – Demanding but fair customer of upstream suppliers
  – Achieve sustainable financials asap
  – Abide by the rules of REN

• The price must do the talking!

Strengths

• Strong support from development agencies
  – Andrew W Mellon (through FRENIA), Carnegie,
    European Commission, IDRC, OSI, OSISA, SIDA

• Broad acceptance by NRENs of the region

• Worldwide acceptance as a Regional REN

• Very attractive offer from SEACOM
  – Provides UbuntuNet’s first real opportunity to offer
    an important service at an amazing price to the
    NRENs

• Enthusiastic, competent Board, CEO and
  staff
Exciting times for Research and Education Networking in Africa!

Thanks for listening!
Building and Operating a National Research and Education Network – The case of KENET

A presentation at IST conference, Kampala, Uganda
May 7, 2009

Meoli Kashorda, PhD, MIEEE
Executive Director, KENET and Professor of information Systems, USIU
Agenda

- Kenya Education Network Trust (KENET)
  - Governance & Management
  - Secretariat support by Trustees and Founder members
  - Membership fees
- Sustainability of KENET
  - Grants and founder member support
  - Pricing bandwidth services
  - Other services
- Kenya Transparency & Communication Infrastructure Project (KTCIP) bandwidth and connectivity expansion project
- What next?
  - Strategic plan of KENET
  - Interconnection with NRENs
KENET Governance

• Current Trustees:
  – Prof. George Magoha, VC UoN, Chair
  – Prof. Freida Brown, VC USIU, Secretary
  – Prof. Godfrey Nguru, VC Daystar, Treasurer
  – Prof. Richard Mibey, VC Moi
  – Prof. Mabel Imbuga, VC JKUAT
  – Charles Njoroge, DG, CCK
  – Dominique Saint-Jean, CEO, Telkom Kenya LTD
  – PS in charge of Higher Education

• Schedule of Meetings – Two physical meetings and two electronic meetings – last was March 17, 2009

KENET Management

• Provide oversight of KENET on a regular basis on behalf of Board of Trustees
• Prof. Tim Waema, Chair, Management Board
• CEO of KENET – secretary; 50% KENET; 50% USIU
• Five representatives from founder institutions (UoN, JKUAT, Moi, USIU, Daystar)
• One representative from research institution (ICIPE)
• Two senior faculty representatives
• Two private sector representatives (finance & ICT expertise) – not filled yet
KENET Secretariat and NoC

- Seven IT professionals permanent staff (young EE, CS, IST graduates); increase to 8 by June 2009
  - 2 to 3 IT Interns at any one time from member universities
- One accountant and one office administrator
- One CEO donated by USIU, one of the founding members (IT faculty member)
- Physically hosted by the University of Nairobi in the Jomo Kenyatta Memorial Library
- One NoC in Nairobi
- All services running on open source
- Cisco routers used for routing, BGP sessions with both uplink providers
- Colocates some e-learning servers for researchers or institutions
What KENET offers to members

- Bandwidth services
  - 2000-present - Access to Telkom Internet services at 50% of commercial rates
  - 2006-2008 – 12 Mb/s Intelsat bandwidth through the Bandwidth Consortium that was originally part of African Virtual University (contract ended on October 31, 2008)
  - February 2009 – Present – 214 Mb/s of satellite bandwidth procured in bulk competitively for 55 member institutions
    - Price is $1700 per Mb/s per month; compare with BW consortium price of $3,000!

- Services – mail hosting, backup, web hosting, setting up of custom servers, DNS Record hosting, monitoring for all connected hosts
- Server co-location; Technical training; Network support and design

How did KENET start?

- $1.1 million USAID grant in 1999
  - Stakeholder meetings – bottom up!
  - Invested in Telkom Kenya digital leased line network to interconnect universities
  - Last mile digital radios for six strategic institutions (Daystar, JKUAT, Moi, Baraton, ANU, Maseno)

- Equipment has been transferred to Telkom Kenya to pay for bandwidth services
  - Most of it used to operate KENET up to 2006
KENET Secretariat Operations Support

- CCK support of Ksh 3 million per year from 2002-2005.
- Membership, annual subscription, and founder member contributions
- The US$ 1.1m capital investment converted to operational budget
- Administrative and capacity development components of PHEA grants

KENET Financial Support by Founder and Member Institutions

- University of Nairobi hosts KENET secretariat and data center at the Jomo Kenyatta Memorial Library
  – Donated services of CEO V. Kyalo from 2001-2007
- Moi, Egerton host the VSAT equipment
- USIU processes payroll and has donated CEO from 2007 to present.
- Founder institutions can contribute finances in case of need e.g.,
  – Ksh 300,000 per institution in 2005 (1.5 million)
- KENET PoPs and NOC equipment rooms provided free by member institutions
Financial Support by Partnership for Higher Education in Africa

- $105,000 for VSAT equipment and bandwidth management training
  - Extended up to June 2009
- $140,000 by Rockefeller & Ford Foundations
  - E-readiness survey + capacity development
- $600,000 for EA Accession Project by Rockefeller Foundation
  - $300,000 disbursed for e-readiness survey of EA universities
  - $250,000 for Instructional Design and Technology Support by Ford Foundation

Challenges faced over the years?

- Lack of policy both at KENET and at member institutions to govern ICT
- Lack of own infrastructure hence relying on other providers
- Lack of qualified/skilled technical staff at several member institutions
- High cost of bandwidth and bandwidth mis-management
- Poor penetration in terms of reach to the students, poor PC to student ratios
- ICT budgets at some Universities are constrained hence not able to purchase servers, wireless equipment etc
- E-readiness surveys a method of communicating with members and other stakeholders
KENET strategic and sustainability plan

• KENET strategic plan 2007-2011
  – Emphasis on cost-effective Research and Education Network (KTCIP)
  – Data driven advocacy and ICT strategy formulation (E-readiness survey)
  – Collaboration in research in priority sectors
  – Collaboration in content development (on-line courses, e-books, digital libraries)
  – Financial sustainability
• KENET has developed a sustainability plan 2008 – 2011
  – Network services operated as a not-for-profit operator, pricing to cover all related costs
  – Data center services division for members – self-sustaining
  – Research division driven by government and donor grants

Pricing of bandwidth

• Price of BW = Int’l cost + national distribution cost + KENET operational costs
• Int’l cost is coming down ($3000 → $1700 → $500 → $150
• National distribution cost = $160 per 10 Mb/s!
• KENET operational cost = $300 -- $500 for 214 Mb/s – Other “business” services required!
  – Techie salaries, equipment depreciation, utilities?
KENET bandwidth and connectivity Project

• Government of Kenya $19 million grant has changed everything!
• First grant since 1999 when KENET was created
• Effective evidence-based advocacy?
  – E-readiness studies, relationship with Government?
• Vision 2030 and TEAMS?
• KENET was ready to absorb the grant!

Kenya Transparency & Communications Infrastructure Project (KTCIP)

• Four components of the grant
  – Building broadband universities national network and purchase of leased line capacity for 2 years ($3.2 million)
  – Purchase of 215 Mb/s international satellite bandwidth ($8.8 million)
    – 2-year contract
  – Building of a Network Operations Center (NOC) - $1 million
  – Purchase IRUs ($12 million)
• 23 KENET institutions already connected with a bandwidth consumption of 119 Mb/s to increase to 214 Mb/s
  – Bandwidth consortium capacity to KENET was only 12 Mb/s
  – Excellent learning opportunity!
Undersea Optical Fiber Bandwidth & Distribution Network

- Three undersea cables expected
  - SEACOM – June 28, 2009
  - TEAMS – July 2009
  - EASSy – 2010

- $12 million to purchase IRUs
  - Competitive bids to be issued in June 2009

- Optical-fiber leased line network will initially distribute bandwidth
  - Ownership of last mile? Connection to NOFBI?
Why is KENET so important?

• Drives down the cost Internet BW and leased lines? The buyer power?
• Impact on learning?
  – Student and faculty demand very high! (Google and Facebook most popular sites)
• Global competitiveness? Knowledge economy/knowledge society
  – Improve ranking in GCI, NRI, KEI, Webometrics ranking of universities?

East African Accession Project

• 2 year project starting November 2007
  – $300,000 Year 1 grant received on December 28, 2007
• Project formally launched on April 1, 2008
  – Delay due to Post-Election violence in the period January – March 2008
• Planned Year 1 activities
  – E-readiness survey of 50 EA universities and report
  – Developing and Dissemination Generic Accession Road Maps
Collaboration with other NRENs

- Associate Researchers were identified through the NRENs in respective countries.
  - Burundi – Mr. Albert Nsengiyumva / Dr. Rachel Akimana, Lecturer, University of Burundi
  - Rwanda – Mr. Albert Nsengiyumva, CEO, RWeNET
  - Uganda - Dr. Patrick Mangheni, CEO, RENU
  - Tanzania – Ms. Magreth Mushi (Assistant Lecturer, Open University of Tanzania)

- Formalised engagement by signing contracts

---

Some Demographic data

<table>
<thead>
<tr>
<th></th>
<th>Burundi</th>
<th>Kenya</th>
<th>Rwanda</th>
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<td>17</td>
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<td>10</td>
<td>11</td>
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<td># of students</td>
<td>14,000</td>
<td>152,319</td>
<td>33,861</td>
<td>41,079</td>
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<td>337,470</td>
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<td>PC s per 100 students</td>
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<td>8</td>
<td>8</td>
<td>3</td>
<td>7</td>
<td>6</td>
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</table>
Research Agenda of KENET?

• What are the priority research areas based on the two projects?

Establish an ICT in Universities Observatory

• Establish observatory in KENET to routinely collect and analyze e-readiness data on HE
  – Starting with our e-readiness framework
  – Extend framework to an index for ranking universities
• Conduct another e-readiness survey for EA universities in 2010
  – To assess impact of accession project!
• Publish annual ICT policy and strategy briefs to inform and influence policy
• Start an on-line journal of ICT in Higher Education
ICT and learning & health

• E-learning
  – Scaling up the innovative e-learning projects
  – Implementing in pilot areas, e.g. health, energy, urban planning, agriculture, education
  – We host the Tufts e-learning server that supports collaboration between Schools of Medicine in Tufts, UoN, Makerere and Dar

• E-health
  – Carry out a study on the use of ICTs to provide health services
  – AMREF is keen to support to work with KENET to support their e-learning program for nurses in Africa!
  – Design and implement a pilot project on how ICTs can be used to improve access, affordability, and quality of health care

ICT capacity building

• B.Sc. curricula
  – Assess the capacities of B.Sc. (CSc/IT/IS/EEE, etc.) curricula in Kenya
  – Strengthen B.Sc. (CSc/IT/IS/EEE, etc.) curricula in Kenya

• ICT doctoral research
  – Assess ICT doctoral research capacities in universities in the region
  – Make appropriate interventions to support ICT doctoral research in universities in the region
  – Collaborate with other NRENs and universities in the region
Thank You

Meoli Kashorda, Ph.D., MIEEE, MIET
Executive Director, Kenya Education Network
(http://www.kenet.or.ke)
and
Professor of Information Systems, USIU School of Business, Kenya (http://www.usiu.ac.ke)
E-mail: mkashorda@kenet.or.ke or meoli@usiu.ac.ke

Meoli Kashorda Building KENET 31
1. RWEDNET Background

- **Genesis**
  Enhanced quality education, increased access to higher education and improved research to facilitate the attainment of the Vision 2020

- **Promises:**
  - Greater connectivity over fiber optic within and outside the country
  - National fiber optic backbone to be completed by December 2009
  - Private Telco’s fiber and Wireless Networks rollout (Rwandatel, MTN, TIGO)
  - Sub Marine cables: SEACOM, TEAMS and EASSY

- Expected Results: Competitive prices for Internet Connectivity
- New area of better Quality of Services at reduced operational cost and user charges (consortium, common hosting facilities)
2. Strategic objectives for RwEdNet

- Based on the three following pillars: Infrastructure, Capacity Building and Value (Applications, services)

3. Strategic objectives of RwEdNet (cont’d)

- 1. Accessing national fiber backbone and International Gateway (cross-border and submarine) using Public and/or Private networks to allow full participation in the regional and global research and education networks

  **Output:** Reliable Fiber backbone linking RwEdNet to RREN and the GREN through the UA Eastern Cluster

- 2. Enhancement of functionalities, performance and capacity building in Internetworking and other relevant areas of Internet Governance.

  **Output:** technical and managerial expertise in areas related to Internetworking and eLearning/online learning

- 3. Stimulate, foster and support collaboration and research among member institutions and external partners sharing the same vision
3. Strategic objectives of RwEdNet (cont’d)

- Output: Development and promotion of Research and Education networking communities in and outside the country


- Currently RwEdNet members are connected to Rwandatel fiber optic (5 academic institutions + 2 research centers)
- Access to Internet connectivity through New Artel satellite link (availability of Universal Access funds)
4. Current cost sharing arrangement for sharing Internet connectivity

- **Rwandatel fiber link**
  - USD 1,200 per month for all institutions (fiber link from each institution to Rwtel + fiber link between RwTel and New Artel)

- **New Artel Satellite Connectivity**
  Price: USD 3,000 per Mbps per month

- The regulator pays USD 2,500 per Mbps per month
- Individual institutions pay USD 500 per Mbps per month
5. Capacity Building Activities

- Hands on training in Sys. Admin. and Network management
- Technical assessment of ICT support services within member institutions
- Development of Strategic / Business Plan

6. Future Plan: Integrating Private universities

<table>
<thead>
<tr>
<th>UNIVERSITIES AND RESEARCH CENTERS</th>
<th>PROVINCE</th>
<th>DISTRICT</th>
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<td>Kigali Institute of Science and Technology (KIST)</td>
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<td>Nyarugenge</td>
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<td>Kigali Institute of Education (KIE)</td>
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<td>Gasabo</td>
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<td>School of Finance and Banking (SFB)</td>
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<td>Kicukiro</td>
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<td>Kigali Health Institute (KHI)</td>
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<td>Nyarugenge</td>
</tr>
<tr>
<td>Independent University of Kigali (ULK)</td>
<td>KIGALI CITY</td>
<td>Gasabo</td>
</tr>
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<td>Adventist University of the Great Lakes region (UNILAK)</td>
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<td>Gasabo</td>
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<td>Université catholique de Musanze</td>
<td>NORTHERN</td>
<td>Musanze</td>
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<tr>
<td>Institute of Agriculture and Husbandary (ISAE)</td>
<td>NORTHERN</td>
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<td>NUR-RUSIZI</td>
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<td>Rusizi</td>
</tr>
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</table>
6. Universities and Research centers location

7. Physical Network Design – Backbone Network
10. National Backbone Network

- Very High Capacity Transmission
- Easy upgrade & expansion for the future
  as adding DWDM Shelf & Module in MSPP
- High Capacity Transmission
- MSPP (Multi Service Provisioning Platform)
- Support flexibility for IP Network Configuration
- Hierarchical Configuration
to decrease the routing hops
- MPLS for network based-VPN service and QoS

-------------------------------
- Local Area Network
- End Users

IP Network Diagram - Universites

- Internet Router
- Backbone Router
- L3 Switch (MPLS)
- MSPP
- L3 Switch (MPLS)
- MPLS Router
- Switch
- Firewall
- PCs
- Servers
- L3 Switch (MPLS)
- MSPP
- L3 Switch (MPLS)
- MPLS Router
- Switch
- Firewall
- PCs
- Servers
- L3 Switch (MPLS)
- MSPP
- L3 Switch (MPLS)
- MPLS Router
- Switch
- Firewall
- PCs
- Servers
11. IMPLEMENTATION AND OPERATION STRATEGIES

- The implementation of the national fiber optic backbone is underway and will extend access network to all academic and research institutions in the country.
- The main National Data Center and Data disaster recovery system will be located at RDB/IT (former Rwanda Information Technology Authority) – consideration to host RwEdNet servers as well.
- The national NOC will also be located at RDB/IT – RwEdNet proposes to set up two NOCs on its own, one at NUR (Hupe) and a second at KIST (Kigali) with a redundancy mechanism.
- RwEdNet business case suggests the creation of a pool of Network technicians to maintain the network and provide adequate services to member institutions on cost recovery basis.
- Government will support the physical layer through a Public Private Partnership utility. RwEdNet will take care of the Layer three management up to the institution premises.
- The ownership and management of international connectivity over fiber (cross border and sub marine) is not yet clear at this point.

12. TIME FRAME

- Construction of the National Backbone (Oct 2008 – Nov 2009)
13. Way forward

- Finalize the design of the new RwEdNet network backbone with integration of new member institutions
- Finalize and Validate the strategic/business plan
- Recruitment of permanent staff (technical and administrative)
NRENs in the making in West and Central Africa

Mumuni Dakubu
University of Ghana
GHANA

What is covered in presentation

• Importance of NRENs and efforts made towards their realisation in Africa.
• Outcome of these efforts
• The challenges faced in NREN formation
• Using Ghana as a test case to illustrate the challenges in NREN formation
• The way forward
Importance of NRENs

- "Education, research and ICTs are like three peas in a pod. It is impossible to develop a knowledge-driven economy and to conduct research to develop solutions to pressing social and economic problems in Africa, without connectivity. Academic and research network is now regarded as an essential national infrastructure comparable to road, water and energy services due to its implication on learning, teaching, research and many other scientific endeavours that have a positive impact on general economic development and social cohesion."

- [Turn on the NREN Wheel:- A briefing paper for University Leaders and Policy makers by Dr. Lishan Adam reviewed by Dr Boubakar Barry AAU 2007]

AAU efforts towards NRENs

- Further AAU efforts:-
  - The AAU indeed has set up a whole unit in its outfit (2005) headed by Dr. Boubakar Barry, in an attempt to push for the formation of National Research Education Networks.
  - In November 2006, the AAU organized a special Regional workshop on National Research Education Network (NREN) establishment processes in Accra.
  - The workshop dealt with the role and vision of the AAU towards the establishment of (NRENs) and Regional Research and Education Networks (RRENs) in Africa and the eventual evolution to an African Research and Education Network (AfREN).
  - AfREN has been in existence for the past 3 years
Methodology/data

- Information from AAU Workshop in Accra, November 2006
- AAU publication “Turn on the NREN Wheels” A briefing paper document for University Leaders and Policy makers by Dr. Lishan Adams and edited by Dr. Boubakar Barry 2007
- Questionnaire administered to colleagues in the sub-region working on NREN formation
- Private communications (mainly Bjorn Pehrson)

Countries discussed

- Mauritania, Cape Verde, Guinea Bissau, Gambia, Senegal, (Sierra Leone, Liberia), Côte d’Ivoire, Burkina Faso, Mali, Niger, Ghana, Togo, Benin, Nigeria, Chad, Cameroon, Central African Republic (CAR), Gabon, Congo Brazzaville, and DR Congo. (23)
- See Map
Outcome of survey

- GARNET has only just been formed in Ghana
- DR Congo has EBALE and is also a member of the UbuntuNet Alliance
- Senegal is close to forming an NREN
- Nigeria with the emphasis on Nigeria forum and NgNOG could also be close!
- Cameroon shows promise with the universities all linked with VSAT
- All the other countries do not presently show promise.
- Liberia, Sierra Leone, Gabon, Chad, Guinea Bissau and Congo Brazzaville are way behind. They need to be brought in the ICT community in West and Central Africa
- (Cf East and southern Africa there are nearly 7 NRENs)
- Senegal, Ghana, Nigeria, Congo, Cameroon in better position to form RREN (WACREN)
Challenges in NREN evolution

- How ICT emerged in the country.
- State of campus network, and policy.
- Human resource both quantity and quality
- National network infrastructure.
- Difficulty in obtaining consensus among the universities/research institutions.
- Finance
- Bandwidth issues (old problem)

GARNET example of new NREN

- Process started in 1995
- NREN stage reached only March 2009
- National fibre Backbone will facilitate physical link,
- Following slides show this.
Planned connections next 2 years Source:- NCBC

Legend:
- **existing**
- **proposed**
- **blue** proposed for international connections

Topology institutional connectivity

Source: Barfi Adomako M,Sc theses
Way forward

- Follow NREN roadmap
- Strengthen building of campus network and develop policy documents
- Country network infrastructure very necessary but not absolute!
- Budget must be provided internally for ICT activities.

THANK YOU FOR YOUR PATIENCE
The Benefits of **Good Connectivity** for Libraries for the Research and Education Community In Africa

Research and Education Networking Track
Block 3: **Computing and Communication intensive applications and usage** 
THURSDAY 7 MAY 2009
IST Africa 2009, Kampala, Uganda

**Margaret Ngwira**  
Director, UbuntuNet Alliance

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**Context : Libraries – root or branch?**

- Many of the NRENs in the region now developing with a prime focus on connectivity had their roots in linking academic libraries in their quest to provide access to multiple sites and institutions—this is true for SUIN Sudan, Eb@le DRC, TENET South Africa, MAREN, Malawi
- Libraries are one of the first Bandwidth-hungry elements of an institution and also are elements that by their nature require to collaborate and network!
Benefit 1: Prompt Access to

- World class internationally generated electronically hosted journal literature at par with their peers anywhere in the world
- in support of their research design and outreach
- which is currently available and ip authenticated through University Libraries and licensed through the Library Consortium

Benefit 1 cont’d

This level playing field in information access affects many categories such as:

- Medical and Health Scientists and therefore the health of the nation and region
- Environmental and Agricultural Scientists and therefore the food security and environmental sustainability of the nation and region
GRADUATE NURSING STUDENT in MALAWI BENEFITTING FROM PUBMED THROUGH HINARI

Access to journal articles in the commercial publishing environment

• Providing affordable access to journal articles normally available through commercial channels has involved careful negotiations with the publishers to negotiate licenses that do not threaten the publishers’ commercial market. INASP and eIFL have a major role in this.
• Access is normally provided through Library Consortia in the various countries.
• The Consortia negotiate access and sign licenses and aggregate and forward payment on behalf of their members.
BUT

• Lack of bandwidth limits access
• Lack of bandwidth is linked with cost of VSAT bandwidth at about US$3000 Mb/s in one direction so US$6000 Mb/s up and down!

Benefit 2: Local Content

• Access to locally generated knowledge collected, organised and accessible over years in Library Local Collections and now being Digitized and preserved in electronic libraries
• This potentially gives access to a worldwide audience if there is the connectivity. This is often unique knowledge
Benefit 2 continued Local Content

- Access to digitised theses and dissertations – a specialised and unique category of information
- In Malawi Greenstone software is being used with support from eIFL and INASP.

Benefit 2 cont’d : Local content

- Various Software Options
- AAU DATAD /ETD Project very significant both in terms of capacity building and in spotlighting African research output
Benefit 3: Local Content; Intellectual Property Issues

- Vital area in the field of Digitisation
- The Open Access movement has a part to play in this: licensing our output with a Creative Commons licence
- Important work being done through Library Consortia by e-IFL to make sure paper based rights are not lost in an e-environment
- www.eifl.net
BENEFIT 3 Human capacity for research

• Access for the research sector to **Human Capacity** with *information literacy skills* who have been exposed to local and international knowledge and can apply it: there should be no talk of “half baked” graduates when our students have the same knowledge advantage as their peers in the north.
Benefit 4: Expanded human capacity through e-learning

Most of our countries are “Human resource rich” but higher education opportunities are lagging because of limitations on campus space

• Improved national human resource base as access is expanded through e-learning. These are not only potential researchers but may serve throughout society

• To serve distance or e-leaners the Library needs a generous up-link to the Internet so that the resources needed by students throughout the country or region can be accessed as efficiently as possible

E-learning and Distance Learning

The demand by our Governments to increase Access to higher education becomes an opportunity to put the issue of Connectivity and NREN development high on the agenda as it is the essential tool to expand access. Most universities now have e-learning initiatives and many are using Open Source platforms such as Moodle.
Benefit 5: less reason for brain drain

Brain drain limitation as researchers may find less reason to leave for more resourced research environments when the access to the world’s knowledge they have at home is at least as good.

Conclusion

• The University Libraries’ life blood is bandwidth
• Good connectivity for its Libraries will enable the NRENs to reap a harvest in rich access to information, international and local, in improved Human capital for research and for the wider society, possibly reduced brain drain
THANK YOU!

Reference

The role of ICT in Biomedical Research at Malawi-Liverpool Wellcome Clinical Research Programme (MLW)

Isaac Singini, MSc, DLSHTM, BSc – College of Medicine, University of Malawi

Background

- The Malawi-Liverpool Wellcome Clinical Research Programme (MLW)
  - Collaboration between Malawi College of Medicine, Liverpool University with funding from Wellcome Trust. Situated in Blantyre - South of Malawi, Unit has research laboratories linked purpose-built paediatric research ward, Queen Elizabeth Central (Teaching) Hospital

- Programme provides a platform for Research on Tropical Medicine
  - Malaria
  - TB
  - HIV Related Pathogens

- Local capacity building
  - Training Local Scientists
  - Local Technical Staff

- Collaborates closely with the US Funded Blantyre Malawi Project
  - QECH grounds
MLW Malaria Genome Project

- Collaboration between 21 countries
  - Malaria Endemic Regions
    - Africa, Asia (Thailand + Vietnam)
    - Austrasia (Papua New Guinea)

- Three Consortial Projects (CP1-CP3)

- Consortial Project 1 (CP1)
  - MalariaGen’s flagship study
  - Perform large-scale Genome-wide association (GWA) studies

- MLW is in CP1 & CP 3 (CP3 in the offing)

Objective of CP1

- Identify genetic variants
  - Associated with resistance
  - Susceptibility to severe Malaria
Scientific Rationale

- Known as Genome-wide association (GWA) Analysis
- Surveying genetic markers
  - SNPs; single nucleotide polymorphism
  - Genomes of patients with malaria (Cases)
  - Healthy individuals from the same population (Controls)
- Assess diff’s btwn groups that correlate wt resistance to Dz
  - Needs large sample size
- CP1 uses a ‘brute force’ approach
  - Genotyping hundreds of thousands SNPs
  - Across genomes of thousands of individuals
  - Increase power of the study

Resource Development

- 10,000 cases of severe malaria
- Similar number of ethnically matched controls
- >2,000 parents of cases of severe malaria
  - (Family-based association studies)
- DNA samples for each subject collected
- Detailed clinical & Epid’ data collected for malaria cases
- Provides an accurate phenotype classification
Generating Data

• Pilot case-control GWA study completed in The Gambia

• 500,000 SNPs Genotyped in 2500 subjects

• Approx 100 regions of genome identified
  – Showed evidence of association with severe malaria

• Expansion on sample size and SNP coverage
  – Surveying 1 million SNPs
  – 4000 Malawian cases and controls

• Performing family-based assn studies in The Gambia and Malawi

• Undertake a meta-analysis of all GWA data

Data being Generated

• GWA studies genotype hundreds of thousands of genomes

• Hundreds of thousands of bytes being generated

• Gigabytes of datasets sent into repositories

• Gigabytes of datasets ideally being exchanged among scientists

• Genetic data/information localised
  – Remote Scientists
Generating Data Cont’d

• Voluminous amounts of data in central repository

• Data exchanged using disks

Computer applications used

• Programming PDAs
  – Visual CE

• MS Assess
  – Clinical Data

• MySQL
  – Web-based interface
  – Open Source

• FireFox, Internet Explorer
Data Analysis

- Partial Analysis of clinical data done at local institutions
- Full analysis done in the proxy institutions west
- Results published in high impact journals
- Local scientists get frustrated in the process
- No funding for ICT infrastructure
- Funding only available for informatics

ICT Infrastructure in Malawi (MW)

- Six Internet Service Providers (ISPs)
- Services provided
  - Wireless Connection (VSAT)
  - Leased Lines
  - Dial up Connection
  - GPRS (Zain & Telekom)
- Connection speeds
  - 64 Kbps
  - 1 Mbps (Max)
- Costs of connection are prohibitive
  - ~1 USD / minute
Limitations of existing ICT Infrastructure (MW)

- Exorbitant costs of Bandwidth
- Scanty regional ICT collaborations
- Fragmented regional ICT infrastructural policies

Consequences of ICT Limitations (MW)

- Local scientists frustration
- Limited replication of results
- Withdrawal of Research Grants
  - No ICT capacity to support big research innovations
- Disjointed (void) brainstorming sessions among regional scientists
  - Absence of real-time scientific discussion groups
- Major scientific discoveries lag behind
  - Genomic research needs top of the range ICT infrastructure
  - Development of vaccines against endemic diseases
Opportunities of cutting edge ICT Infrastructure (MW)

- Strengthen position of local scientists with cutting edge science
- Enhance speedy and quality research
  - Real-time discussions forum (including webinars)
  - Video / Voice Conferencing over IP
- Running / Recurring cost reduction
  - Eliminate costs of data media (Disks)
- More funding to research grants
  - Enough capacity to handle volumes of research data
- Reduction of potential risks of unauthorised access to confidential data
  - No portable media in circulation

Thank you for your attention
Challenges of connectivity in providing IT Applications and Services:

The case study of DIT IT-Centre of excellence

John W.A Kondoro
Dar es Salaam Institute of Technology
P.O. Box 2958, Dar es Salaam, Tanzania
principal@dit.ac.tz

IT Centre of Excellence @ DIT
Advanced Professional IT courses

Vocational courses for 6 months

(a) Advanced computing
(b) Wireless & mobile computing
(c) Embedded systems design
(d) Networking & System security
IT Centre of Excellence @ DIT
Super-Computer

(a) High performance scalable computing cluster with a peak computing power of Teraflop

(c) Storage system has been designed to provide a primary storage of 5 Terabytes scalable to 22 Terabytes

(d) Has an I/O performance of up to 2 Gigabytes/second

(e) The secondary backup storage subsystem is scalable from 10 Terabytes to 100 Terabytes

Supercomputer- Software

Software environment

(a) Parallel processing libraries based on MPI standard debuggers.

(b) Parallel processing compilers for C, C++, Fortran languages with support to MPI standards.

(c) Job scheduling and sequencing software.

(d) LINUX based file system with volume management and back up softwares.

(e) Networking and security software for the facility.
Supercomputer- Software Applications

(a) Bio-informatics
(b) Finite Element analysis.
(c) Computational Atmospheric Science
(d) Seismic Data Processing
(e) Evolutionary Computing
(f) Computational Chemistry
(g) Computational Fluid Dynamics

Multiple operating systems shall be supporting LINUX and windows

IT Centre of Excellence @ DIT
e-Learning & Tele-medicine

(a) Linked with pilot 10 CICs spread throughout the country.
(b) Link with 10 CICs through VSAT using internet and Video conferencing facility.
(c) Equipped with:
   • Electronic cardiogram machine
   • Tele-pathology μ-scope with digital camera
   • Scanner for x-ray, ultra-sound and ECG
IT Centre of Excellence @ DIT

Central Site
- 4.5m C Band Antenna
- 10 Sat Modem
- 20 W RFI(1+1)
- 3GSM Router
- Poly Com Video Conferencing
- To LAN
- NMS Sat Modem

Satellite

Remote Sites
- 2.4m Antenna
- 4 W BUC
- 2011 Router
- Poly Com Video Conferencing
- To LAN
- NMS Sat Modem

10 Remote Sites

IT Centre of Excellence @ DIT CICs in Tanzania

IT Centre of Excellence @ DIT
The Challenges in connectivity

(a) The supercomputer will be connected to LAN. For easy real-time accessibility on the internet, a very fast router will be required which is currently not available because:

(i) Internet is slow.

(ii) Bandwidth is small.

(b) Connectivity with the pilot CICs is via VSAT. It is very expensive; therefore limitation in bandwidth. It costs about USD 72,000.- for a total of 1.4 MHz. This enables simultaneous link between the Hub and 3 CICs only.
Community health portals in Africa-concept and application for drug therapy

Lars L Gustafsson, professor
Division of Clinical Pharmacology
Karolinska Institutet Stockholm
Stockholm Health Authority

Multicountry/multidisciplinary collaboration

Lars L Gustafsson Karolinska Institutet Stockholm
Dan Kibuule Makerere University Kampala
Victor Kyalo ICT Board Nairobi
Amos Nungu, Dar-es-Salaam Institute of Technology
Jasper Ogwal-Okeng Makerere University Kampala
Jan M Olsson Karolinska Institutet Stockholm
Björn Pehrson Royal Institute of Technology Stockholm
Cecilia Stalsby-Lundborg Karolinska Institutet Stockholm
Göran Tomson Karolinska Institutet Stockholm
Winnie Tumwikirize Makerere University Kampala
Bruce Zamaere University of Malawi Blantyre
Stockholm - Sweden

The NOBEL PRIZE
in Physiology or Medicine
Disposition

A: Stockholm
B: Challenging drug therapy
C: Concept of community health portals
D: Concluding remarks

Global trends
Drugs for the rich

● 1.7 billion people have inadequate or no access to life-saving medicines, poor quality

● Antiretroviral therapy for < 10% of those in need

● 1 million die from malaria, 2 million from tb and 3 million from AIDS yearly

● 30-50% of health care budget for drugs in resource poor countries

● Knowledge-practice gap-3% efficiency in malaria
**Needs and solutions**

- Less than half of prescribed drugs follow guidelines in rural Tanzania
- Even less precision in diagnosis of malaria
- Poor access to articles and Internet in district health facilities in Uganda
- National and island based fiberoptic links allow rapid, reliable, and cost-effective access and sharing of knowledge in Africa
- User friendly techniques to provide knowledge in a community health portal

**Disposition**

A: Stockholm  
B: Challenging drug therapy  
C: **Concept of community health portals**  
D: Concluding remarks
Community health portals

Entry points for
- The public
- Patients and their family
- Health care workers
- Drug distributors

Access terminals
- Mobile phones
- Handhelds
- Laptops
- Desktops

Services
- Health information
- Health centre contacts
- Drug information
- Drug authentication

Access locations
- Internet cafes
- Health centers
- Homes
- Access networks
- Broadband
- Mobile broadband
- GSM/GPRS
- WiFi/WiMAX

Website:
“all information needed for health care”

www.janusinfo.se
Examples of contents and tools in community health portals

- News
- Newsletters
- Virtual communities
- Drug-wikipedia
- Patient info
- Drug interactions
- Guidelines
- New drugs
- Wise drug formulary
- Patient cases
- Links
- Patient info

www.janusinfo.se
II: Drug formulary: access to Pubmed

The effects of mefloquine treatment in pregnancy.

Naveen P. Vincent M. Simpson J. Yoi P. Therd KL. de Vries A. Chong-amnouyalthi T. White NJ.

Shindo Malai Research Unit, Mek Suai, Thailand.

We investigated the relationship between mefloquine antimalarial treatment and the outcome of pregnancy in Karen women living along the western border of Thailand where multidrug-resistant Plasmodium falciparum infections are common. Of 557 pregnancies investigated, 208 (37.3%) were exposed to mefloquine: 68.6% (197/286) to quinine only, and 809 (57.6%) to other antimalarials, and 17.2% (94/546) had no documented treatment. There were 68 stillbirths and 113 abortions. Women who received mefloquine treatment during but not before pregnancy had a significantly greater risk of stillbirth than did women treated with quinine alone (odds ratio [OR] 3.1; 95% confidence interval [CI] 1.5-6.7). women exposed to other antimalarials (OR 5.15; 95% CI 1.3-21), and women who had no antimalars (OR 3.46; 95% CI 1.6-7.9; p < 0.01). This association remained after adjustment for identified confounding factors. Mefloquine use was not associated with abortion, low birth weight, neonatal mortality, or congenital malformations. Mefloquine treatment during pregnancy was associated with an increased risk of stillbirth.

II: Links

Länkar

Länkar i Dokstavsordning

ABCDEFHIJKLMNOPQRSTUVWXYZ

1177.se (tidigare Sjukskötersordaämpningen, se)
Helseinformation för både barn och vuxna. Sjukskötersor, behandlare och artikelhållare består av meddel, av texter, bilder och animerade filmer. På sidan finns även en risk-
diagram-tjänst, en avsnitt av en förklarande, handsken, vändar sig till personal inom hälso- och sjukvård. Själva äga av Sveriges landsting och Apoteket.

Alternative Medicine
Databas för sökning av växter, naturlig medel mera.

Apothekerssällskapets
Förråd för alla med professionell intresse av läkemedel. Avancerad är ett stort antal kurser, temapäder och symposier inom läkemedelssällskapet.

Apothekets AB
Egenlänskapsdatabas, nyheter inom läkemedelssällskapet, adresser och

Australian Prescriber
Australian Prescriber som ger läkemedelstipsen.
III: Case-based pharmacological learning (PharmaPac tool)

Fictive patient cases with linked data –
URL- links, images, audios, videos are stored in a data base.
• No skills in HTML or programming needed
• Simple to include links or data from files
• Multiple choice or free text questions
• No limitation in number of, or order of events

IV: Drug interactions

Consequence
Concomitantly used chloroquine may increase the serum ciclosporin levels. The risk for ciclosporin toxicity may be increased.

Recommendation
Careful monitoring of ciclosporin serum levels and signs of toxicity is recommended. Dose adjustment of ciclosporin may be required.

• Interaction warnings are shown with colour symbols
• 8000 drug interactions
Disposition

A: Stockholm
B: Challenging drug therapy
C: Concept of community health portals
D: Concluding remarks

Effects of community health portals

- Tools for appropriate use of drugs by providing knowledge, simplifying communication and involving patients-
  100 million USD earnings in Stockholm yearly

- Research project in Mara region: ”ICT as a tool for drug therapy of malaria and HIV/AIDS: impact on health systems and development in rural Tanzania”
Next steps

● Establish AFRODRUG COMMUNITY HEALTH PORTAL INITIATIVE as a research, development and piloting exercise

● Use high-speed research connections in Africa

● Interest from IUPHAR-International Union of Pharmacology

Stockholm model for drug therapy

\[ E = \frac{K \times M^3 \times A^3}{B^5 \times P^7} \]

E = Effect  
K = Knowledge  
M = Motivation  
A = Activity  
B = Barrier  
P = Power
Final remark

Tell me and I will forget
Show me and I will remember
Trust me and I will learn

Chinese proverb?

THANKS!!!!

Lars-L.Gustafsson@ki.se
e-Infrastructures and Applications

Roberto Barbera
University of Catania, INFN, and Consorzio COMETA
Italy

Outline

• e-Science and e-Infrastructures
• Examples of Grid Applications
• Future opportunities: the EPIKH project
• Conclusion and outlook
Motivation, problem area

e-Science

Researchers perform their activities regardless geographical location, interact with colleagues, share and access data.

The Grid: networked data processing centres and “middleware” software as the “glue” of resources.

Scientific instruments and experiments provide huge amount of data.

Motivation, problem area
The Global Network

Session 7d, 7 May 2009
IST-Africa 2009
Motivation, problem area

Examples of Grid Projects

- BalticGrid
- DEISA
- EUChinaGrid
- EUGrid
- EUMedGrid
- EUIndiaGrid
- EUAsiaGrid
- TeraGrid
- OSG
- EELA
- NAREGI

The work plan of a Grid Support Action

- Seek, identify, and support e-Science communities in the Region and deploy their applications
- Set-up and manage a Pilot Infrastructure
- Disseminate, both “bottom-up” and “top-down”, the e-Infrastructure paradigm for long term sustainability of e-Science
- Train users and site administrators to use and operate an e-Infrastructure based on the EGEE middleware
Major outcomes/results
Examples of EELA-2 applications (1/3)
(applications.eu-eela.eu)

- **Problem Addressed**
  - *Wide In-Silico Docking Of Malaria* is a deployment of a *high-throughput virtual screening platform* in the perspective of *in-silico drug discovery for neglected diseases*.
  - The in-silico docking is faster and much cheaper than the experimental docking, which is restricted to the most successful ligands obtained after the simulation process.

- **Latin America Interest**
  - Collaboration is started in the analysis of new targets for malaria. ULA (Venezuela) has selected new targets of *Plasmodium Vivax* which have been included in large-scale docking experiments.

Major outcomes/results
Examples of EELA-2 applications (2/3)
(applications.eu-eela.eu)

- **Water control**
- **Latin America** (60%)
- **Europe** (40%)

- **NMR tomography**
- **Fire growth simulation**
- **Heart simulator**
Major outcomes/results
Examples of EELA-2 applications (3/3)
(applications.eu-eela.eu)

- Remote Data Acquisition of Instruments using Grid
- Sensors providing Real Time measurements
  - Hall sensor measuring the magnetic field of an oscillating magnetic pendulum
  - pH sensor

Session 7d, 7 May 2009
IST-Africa 2009
**Major outcomes/results**

Examples of EUMEDGRID applications (2/2)

- **Aim:** estimate sustainable extraction scheme - improve management
- **CODESA-3D:** Density-dependent 3D coupled groundwater flow and transport simulations
- **Data requirement**
  - Geology
  - Topography
  - Meteorology
  - Water extraction by the farmer
  - Aquifer properties
  - Soil maps
  - Land use

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**Research approach, Methodology**

The Triangle of Knowledge

- **Research & Development**
- **Innovation**
- **Education & Training**

Building e-Infrastructures is a waste if we don’t “build”, at the same time, their users.

Along with e-Infrastructures, **t-Infrastructures** are also needed.
Research approach, Methodology
The EPIKH Project (www.epikh.eu)

• “Exchange Programme to advance e-Infrastructure Know-How” (EPIKH)
  – EU FP7- Marie Curie Actions – People - International Research Staff Exchange Scheme (IRSES)

• Consortium “numbers”:
  – 23 partners;
  – 18 countries;
  – 4 continents (Africa, Latin America, Asia, Europe);
  – 115 persons involved;
  – >650 researcher-months;
  – >500 secondments;

• Duration: March, 1, 2009 – February, 29, 2012 (48 months)
• EC contribution: 1,188,000 €

Research Objectives
The EPIKH goals

• Strategic aims:
  – Reinforce the impact of e-Infrastructures in scientific research defining and delivering stimulating programme of educational events, including Grid Schools and High Performance courses;
  – Broaden the engagement in e-Science activities and collaborations both geographically and across disciplines.

• Specific actions:
  – Spreading the knowledge about the “Grid Paradigm” to all potential users: both system administrators and application developers through an extensive training programme;
  – Easing the access of the trained people to the e-Infrastructures existing in the areas of action of the project;
  – Fostering the establishment of scientific collaborations among the countries/continents involved in the project.

Eight 1-month Grid & HPC schools and related thematic workshops foreseen in Africa in the period 2009-2012!
Grid Schools

2 entire weeks devoted to applications’ "gridification"
call for applications widely open

Grid Training already done in Africa

Almost 100 people trained on e-Infrastructure from Algeria, Congo, Ghana, Kenya, Malawi, South Africa, Uganda, United Arab Emirates, and Zimbabwe
Major outcomes/results
Applications’ “virtuous cycle”

Dissemination → Training events → Deployment on large Infrastructures and inclusion in the portfolio of demonstrative applications → “Gridification”

Examples of “demonstrative” applications
- DEM-2-VRML
- RASTER-3D
- GATE
Conclusion and outlook

• Grid and Africa:
  – Past experience on Grid training is at disposal of all the African Organizations wanting to create e-Infrastructures or just wishing to get started on Grid Computing;
  – Help can be provided in the following respects:
    • Share best practices and common policies in Grid Authentication and Authorisation (creation of Certification Authorities and Virtual Organisations);
    • Share best practices and common policies in e-Infrastructure set-up and management;
    • Share training contents and material;
    • Test newtork links with some champion applications;
    • Trigger/foster scientific collaborations;
    • Discuss models of short-term and long-term sustainability of e-Infrastructures (see the speech in Session 9d tomorrow morning)
  – I would be very happy to listen to your needs and concerns about Grid during the rest of this conference and beyond. Feel free to contact me at roberto.barbera@ct.infn.it

Thank you very much! Any questions?