Regional Internet Development Dialogue-Africa

Research and Education networks: Responding to the challenges of African Research

Regional Internet Development Dialogue-Africa
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CEO, Ubuntunet Alliance
OUTLINE OF THE PRESENTATION

- Introduction & Challenges on ICT infrastructure
- How RRENs & NRENs respond to the challenges of African Research
- What’s ubuntunet alliance actions?
- Best Practices
- Recommendations
Challenges that affect ICT infrastructure

History: February 2005: AAU General assembly in Capt Town
- Higher cost of Internet (Bandwidth)
- Inadequate infrastructure: In term of capacity and dedicated network for Higher Education and research institutions
- Poor quality of infrastructure of: Campus network, National Backbone infrastructure in many countries
Necessity to mutualize resources…on campus level, national level and regional level

• Necessity to create adequate ICT infrastructure: national fiber infrastructure

• Necessity to create dedicated Network for connectivity

• Training on bandwidth management

• National, regional and international collaboration as solution of African research challenges
WHAT IS UBUNTUNET ALLIANCE?

Education Network of ESA region

- NRENs from 16 countries
  - Eb@le, DRC
  - EthERNet, Ethiopia
  - iRENALA, Madagascar
  - KENET, Kenya
  - MAREN, Malawi
  - MoRENet, Mozambique
  - XNet, Namibia
  - RwEdNet, Rwanda
  - SomaliREN, Somalia
  - SudREN, Sudan
  - TENET, South Africa
  - TERNET, Tanzania
  - RENU, Uganda
  - ZAMREN, Zambia
  - BERNET, Burundi
  - ZARNET, Zimbabwe
WHERE ARE WE NOW? - CURRENT NETWORK

10 POPs in total
- 8 in Alliance region
- 2 in Europe (London and Amsterdam)

- **Backbone covering 7 countries in ESA region**
- 2.18 Gbps capacity between Africa PoPs and European PoPs
  - 2 links along the west coast
  - 2 links on the eastern coast

- **Some NRENs connecting directly to our European PoPs**
  - KENET (Kenya) – (approx. 4 Gbps)
  - TENET (South Africa) – 2 x 10 Gbps
  - MoRENet (Mozambique) – 1xSTM-1
  - TERNET (Tanzania) – 1xSTM-1
Our current Network…

✓ Peering with GÉANT in London and Amsterdam
  • Transit to Research and Education community World-wide
✓ Peering at London Internet exchange (LINX)
✓ Peering at Amsterdam Internet Exchange and (AMS-IX)
✓ Peering at NAPAfrica (Johannesburg)
✓ Transit to Internet at LIX and AMS-IX
Ubuntunet Alliance’ s Network Topology
What is an NREN?

• National Research and Education Networks (NREN) typically provide advanced congestion-free internet connectivity and services dedicated to support the work of universities and research institutes in a country.

• Vital to progress local and global education and research by providing e-learning and e-science applications (eg. telemedicine).

• Over 100 NRENs worldwide, 33 in Africa.
NRENs are SDG enablers

https://sustainabledevelopment.un.org/?menu=1300
How do NRENs connect students and researchers?
What is the situation in Africa

• 2011 – 2015: EU co-funded AfricaConnect project brought to life the 1st sustainable regional research and education network in Sub-Saharan Africa, interconnecting 7 NRENs and connecting the region to the rest of the world via the European regional network.

• Started in 2015: AfricaConnect2 aims to build other sustainable regional networks in Africa to create a pan-African network fully connected to the global research and education network.
What are the African regional partners involved?

- The regional approach allows to adapt to the size of the continent (nearly 3 times Europe) and its existing regional specificities (regulations, political integration, language, stage of NREN development, etc.) in order to facilitate the building of a viable pan-African network.

- The AfricaConnect2 project is self-inclusive, i.e. all interested and ready countries are invited to participate to expand the network.

- Interconnections will take place either via international routes and/or direct routes depending on costs and funding.
Why do we need these EU co-funded projects?
Africa is still the least connected continent on the planet
Africa internet penetration has more than doubled since 2011.

Source: Internet World Stats – 30 June 2016

- 2011: 13%
- 2016: 28.70% (x 2.2)
Africa internet capacity growth continues to lead world

Source: TeleGeography
Connected countries share high economies of scale

Before and After connecting to the EU-funded network

<table>
<thead>
<tr>
<th>NRENs, Countries</th>
<th>Capacity growth</th>
<th>Cost drop (per Mb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZAMREN, Zambia</td>
<td>X60</td>
<td>-94%</td>
</tr>
<tr>
<td>RENU, Uganda</td>
<td>X8</td>
<td>-77%</td>
</tr>
<tr>
<td>ARN, Algeria</td>
<td>X55</td>
<td>-97%</td>
</tr>
</tbody>
</table>

Source: NRENs
## Connecting African research and education communities

### Connected Countries (NRENs) vs. Institutions (Higher Ed & Research)

<table>
<thead>
<tr>
<th>Connected Countries (NRENs)</th>
<th>Institutions (Higher Ed &amp; Research)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASREN North Africa</td>
<td>154</td>
</tr>
<tr>
<td>Algeria (ARN)</td>
<td>124</td>
</tr>
<tr>
<td>Egypt (EUN)</td>
<td>30</td>
</tr>
<tr>
<td><strong>Ubuntunet Alliance</strong></td>
<td><strong>513</strong></td>
</tr>
<tr>
<td>Kenya (KENET)</td>
<td>180</td>
</tr>
<tr>
<td>South Africa (TENET)</td>
<td>86</td>
</tr>
<tr>
<td>Mozambique (MoRENet)</td>
<td>83</td>
</tr>
<tr>
<td>Uganda (RENU)</td>
<td>42</td>
</tr>
<tr>
<td>Zambia (ZAMREN)</td>
<td>75</td>
</tr>
<tr>
<td>Tanzania (TERNET)</td>
<td>27</td>
</tr>
<tr>
<td>Rwanda (RwEdNet)</td>
<td>20</td>
</tr>
<tr>
<td><strong>WACREN</strong></td>
<td><strong>na</strong></td>
</tr>
<tr>
<td><strong>TOTAL 2016</strong></td>
<td><strong>667</strong></td>
</tr>
</tbody>
</table>

### Out of 33 existing African NRENs, 9 are connecting over 650 institutions to the global research and education network:

- training, developing and retaining local talents
- helping to connect remote users
- allowing international researchers and students to gain valuable input from their colleagues in Africa

All three regional networks are still being developed or consolidated.
Enabling scientists to feed the world

**Challenge:** Agriculture is a key driver of Sub-Saharan economy and at the heart of the food security challenge. One difficulty is identifying soils that are suitable for agriculture.

**Solution:** Use the AfricaConnect network to access, process and modelize satellite maps to identify soil properties and classify lands.

**Benefit:** Provide input to sustainable land management in Zambia.
How do NRENs connect students and researchers?
Linking Students To The Global Community

- Free secure wifi provided by NRENs between campuses.
- A global network of users across 80 countries. Over 2 billion international authentications and counting.

eduroam in Africa

- 6 African NRENs have deployed eduroam
- 9 are conducting pilots

- Kenyatta university connects **70 000 students** thanks to eduroam
- In Zambia, **over 40 000** can access digital resources on and off-campus thanks to eduroam

www.eduroam.org

Legend:
- Dark blue: eduroam
- Light blue: eduroam pilots
National strategy on ICT infrastructures
African Governments support to RENs
Development partners contributions: EUC, World Bank, SIDA, ADB, AUC
Platform for research collaboration
Collaboration between African Higher Educations Institutions
Global strategy on ICT integration
Thank You For Your Attention
Merci Pour Votre Ecoute

To learn more visit: www.africaconnect2.net

Follow us on : @AfricaConnect2

For more information about the project partners:
http://ec.europa.eu/europeaid
www.geant.org
www.ubuntunet.net
www.wacren.net
www.asrenorg.net
Enabling scientists to tackle climate change

African Earth Observation Group

• **Challenge:** ensure scientists, regulators and technology work together to tackle climate change.

• **Solution:**

• **Benefit:** speed up global research on climate change (incl. water management and food security) by allowing pan-African and international exchange of earth observation data.

[Images and logos related to the African Earth Observation Group and its partners]
Land preservation in Morocco

• **Challenge:** Agadir protected UNESCO Biosphere Reserve plays a key part in Morocco’s fruit and vegetables export BUT the land is very vulnerable to man-made and climatic changes.

• **Solution:** Moroccan and French researchers have used the Eumedconnect network to download, process and analyse satellite images to produce thematic maps of the area.

• **Benefit:** Monitor land cover, water resources or the progress of natural hazards, which could have socio-economic impact on the region.
Cancer Research in Northern Africa

• **Challenge:** a cure for cancer is possible but depends on how well researchers are supported and can work together.

• **Solution:** an e-learning portal, The EuMed Cancer – GeMed network, deployed under Eumedconnect2 allowed cancer research students in Northern Africa to get specialist training and interact with their peers in Europe.

• **Benefits:**
  - remote training, empowering local students (over 130)
  - international collaboration contributing to global cancer research
Enabling scientists to tackle epilepsy

Treatment of epilepsy in Tunisia:

• **Challenge:** 50 million people worldwide have epilepsy. Most people with epilepsy living in low- and middle- income countries do not get appropriate treatment.

• **Solution:** Eumedconnect2 allowed Tunisian surgeons to collaborate remotely with their French colleagues using *e-telemedicine* applications to diagnose and surgically treat epilepsy patients.

• **Benefit:**
  - More patients able to get correct diagnosis and treatment locally, preventing seizure occurrences.
  - Surgeons in Tunisia could advance their work remotely saving time and money.
Thalassaemia research in Northern Africa

*Challenge:* Thalassaemia is a potentially life-threatening affection common amongst populations originating from the European and the North African margins of the Mediterranean.

*Solution:* EU-funded ITHANET project (Electronic infrastructure for Thalassaemia Research Network) used the Eumedconnect2 network to allow researchers in Europe and Northern Africa to work together to improve diagnosis, treatment and drugs.

*Benefit:* Hundreds of people were able to receive correct diagnosis and appropriate treatment locally.
The total budget for AfricaConnect2 is €25.6m for a period of 3.5 years, with €20m being contributed by the European Commission’s Directorate-General International Cooperation and Development (DG DEVCO). The remaining funds (€5.6m) are being provided by the African partners.

Co-funding model by region

<table>
<thead>
<tr>
<th>Region</th>
<th>EC (Max %)</th>
<th>African partners’ contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Africa</td>
<td>50%</td>
<td>40%</td>
</tr>
<tr>
<td>West and Central Africa</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>Eastern and Southern Africa</td>
<td>75%</td>
<td>25%</td>
</tr>
</tbody>
</table>

To learn more visit: [www.africaconnect2.net](http://www.africaconnect2.net)