KENET Network Status Update and Outlook 2012

Presentations at the Internet2 Spring 2012 Meeting

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Executive Director, KENET and Professor of Information Systems, USIU
Kenya – Did you know ...
Is classified as a low-income country but a University GER of 3.1%

<table>
<thead>
<tr>
<th>Population</th>
<th>41.6 million, 50% &lt;= 15 years</th>
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<tbody>
<tr>
<td>GDP (2010)</td>
<td>$32,198,151,217</td>
</tr>
<tr>
<td>GDP per Capita PPP (2005)</td>
<td>$1,428</td>
</tr>
<tr>
<td>% of population living below $1.25 per day</td>
<td>19.7</td>
</tr>
<tr>
<td>% Public expenditure on education</td>
<td>7%</td>
</tr>
<tr>
<td>Life expectancy at birth</td>
<td>57 years</td>
</tr>
<tr>
<td>Private / Public Universities/ student enrollment</td>
<td>24 / 24/250,000</td>
</tr>
<tr>
<td>University student mobility</td>
<td>Highest in Africa (estimated 30,000)</td>
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Country of marathon winners?
Is a leading tourist destination?
### Has Vibrant Mobile /Internet Industries

<table>
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<tr>
<th></th>
<th>Dec-2011</th>
<th>Dec-2010</th>
<th>Penetration 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mobile Users Growth</strong></td>
<td>28,080,77</td>
<td>24,968,891</td>
<td>71.3 per 100 inhabitants</td>
</tr>
<tr>
<td><strong>Mobile money subscriptions</strong></td>
<td>18,981,443</td>
<td>13,355,354</td>
<td>Total deposits $2 billion!</td>
</tr>
<tr>
<td><strong>Text messages per Subscriber per month</strong></td>
<td>10.71</td>
<td>7.63</td>
<td>Over 900 m SMSes in Q4 2011</td>
</tr>
<tr>
<td><strong>% Mobile coverage by population/Geographical</strong></td>
<td>89.10/34.45</td>
<td>84.5 / 34</td>
<td>Kenya is BIG</td>
</tr>
<tr>
<td><strong>Internet Users Growth</strong></td>
<td>17,382,034</td>
<td>8,884,850</td>
<td>Over 6 million mobile Internet subscriptions;</td>
</tr>
<tr>
<td><strong>Broadband connections (&gt; 256 kb/s permanent connections)</strong></td>
<td>131,829</td>
<td>88,575</td>
<td>Dial-up Mobile 3G Internet is 3G not counted</td>
</tr>
</tbody>
</table>
Has Estimated 20,000 KM of Commercial and Government fiber all over the country?

- Uganda
- Tanzania
- Somalia

INDIAN OCEAN

Ethiopia

Kenya

Data Network fiber
Telkom Kenya fiber
Kenya Power and Lighting company fiber
KPLC fiber Nodes

National Optical Fiber Backbone Infrastructure

KENET@Internet2 2012
KENET background
KENET > NREN

• KENET was licensed as a private networks operator since 2002
  – All license fees waived by the government
  – Alternative Network Facilities Network Operator
• KENET recognized by ICANN and AfriNIC as an NREN and allocated AS# and IP block
• KENET combines Internet2 + EDUCAUSE roles
• KENET is a human network and is more than an NREN (i.e., > specialized ISP)
• KENET is an implementation agent of the Government of Kenya and other donors (KTCIP, Google, RF, FF)
KENET Vision and Mission

• **Vision** –
  – *To be a leading research and education network driving quality higher education and research through ICT*

• **Mission**
  – *To be a key catalyst and driver of the integration of ICT in teaching, learning and research through quality, cost-competitive and efficient ICT services and to be a key partner in the development of the Kenyan ICT society*
KENET Membership is Growing

No. of Member Institutions

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Member Institutions</th>
</tr>
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<tbody>
<tr>
<td>2007/08</td>
<td>41</td>
</tr>
<tr>
<td>2008/09</td>
<td>47</td>
</tr>
<tr>
<td>2009/10</td>
<td>55</td>
</tr>
<tr>
<td>2010/2011</td>
<td>75</td>
</tr>
<tr>
<td>Budgeted 2011/12</td>
<td>125</td>
</tr>
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</table>
Price per Mb/s at Member Institution the Key Competitive Advantage
Where are the institutions we are serving (connecting)?

**Map Showing Institutions:**
- **Uganda:**
  - Lodwar
  - Kitiwa
- **Tanzania:**
  - Lokichoggio
- **Somalia:**
  - Wajir
- **Ethiopia:**
  - Mekelle
  - Kibos
- **Indian Ocean:**
  - Mombasa
  - Malindi
  - Kilifi

**Table of Institutions Connected:**

<table>
<thead>
<tr>
<th>POP</th>
<th>Number of Institutions Connected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nairobi POP</td>
<td>55</td>
</tr>
<tr>
<td>Kisumu POP</td>
<td>11</td>
</tr>
<tr>
<td>Mombasa POP</td>
<td>7</td>
</tr>
<tr>
<td>Eldoret POP</td>
<td>9</td>
</tr>
<tr>
<td>Nakuru POP</td>
<td>8</td>
</tr>
<tr>
<td>Meru POP</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total Institutions connected</strong></td>
<td><strong>98</strong></td>
</tr>
</tbody>
</table>

**Notes:**
- **KDN fiber-underground (Primary)**
- **FON dark fiber-underground**
- **Jamii fiber -overhead(Backup)**
- **KENET POP**

*Project Acknowledgements*
- **Italian Space Agency -Luigi Broglio Space Centre- Malindi**
- **577**
- **129**
- **159**
- **321**
- **318**
- **70**
- **371**
- **UoN POP**
- **USIU POP**
- **KENET@Internet2 2012**
Status of KENET network (March 2012)

• Connects 98 campuses of member universities
• Uses 140 leased lines provided by commercial operators
  – KDN, Jamii and Safaricom
• Distributing 1,350 Mb/s during the day up from 25 Mb/s in January 2009
  – Has capacity to distribute over 2 Gb/s!
• 2 x STM-4 TEAMS/SMW4 IRU from Nairobi to London UA PoP; 1 x STM-1 SEACOM IRU from Nairobi to London
• 1 x STM-4 TEAMS donated IRU from Mombasa to Fujaira
  – Activated for one year February 2011 – Jan 2012
• 110 KM Nairobi dark fiber IRU (10 years)
• KENET-owned Last Mile radio links serving about 10 university campuses
Who has been Financing KENET Infrastructure development?

• Before 2007
  – USAID initial network leveraged on incumbent operator ($1.1 million) and 6 last-mile radio links
  – Rockefeller Foundation and Ford Foundation financed first VSAT network (about $550,000) in 2005
  – Institutions paid the recurrent costs

• After 2007
  – Kenya Transparency and Communications Project / Government of Kenya grant - $23 million over 4 years!
  – Universities – donate equipment and office rooms at no cost; and pay the bills making KENET a viable business builds sustainability fund.
  – Google $260,000 grant and used switch donations
  – Frontier Optical Network (FON) supplier financing for purchase Nairobi IRU
  – SEACOM supplier financing of purchase of STM-1 ring

• Lesson for all emerging NRENs – have a plan and look for partners!
Progress in Building a National Broadband Network
Drivers for KENET Network Upgrade and Growth

0 KENET network availability was too dependent on single operator optical fiber network (KDN)
   0 Critical KDN network instability starting about May 2011 (all manner of problems)

0 Limited reach optical fiber KDN leased line network
   0 Eldoret and Nakuru had research universities that were not well served

0 Increasing cost of commercial last mile leased lines
   0 unsustainable OPEX ($16 per Mb/s to $700 per Mb/s for leased lines
   0 Increasing demand for broadband Internet in all universities
   0 6x reduction in int’l bandwidth → 6x increased in leased line capacity!

0 New member institutions and growth of university campuses
   0 Partnership with mobile operators with reach in rural areas
Backbone Network Solutions

0 Installation of backup of all Inter-PoP links using alternative commercial optical fiber leased line provider
   0 50 Mb/s – 150 Mb/s Jamii Telecom Inter-PoP leased lines - Completed in October 2012
   0 3x increase in recurrent costs of Inter-PoP leased lines!

0 Plans to use government fiber infrastructure for 2 PoPs in 200 KM and 500 KM outside Nairobi
   0 Part of World-Bank funded ongoing project; STM-4 links

0 Purchase of the 110 KM Nairobi Dark Fiber ring covering high capacity research universities
   0 $836,000 10-year IRU, partly supplier (New operator) financed over 36 months
   0 Commissioned in March 2012 (It is configured as an MPLS ring)
Eldoret Area Last Mile Solution -

$500,000 last mile project completed in Feb 2011
Ongoing Last Mile Fiber Projects

0 KTCIP - World-bank funded development of 188 KM of last mile fiber spurs to 18 rural universities

   0 $2.4 million contract for the fiber spurs alone awarded to SAGEMCOM LTD

   0 KENET will purchase 800 KM of National fiber IRU at a total cost of $ over a period of 2 years

   0 $1.5 million contract for supply and installation of lighting equipment awarded to Alcatel-Lucent

   0 $1.2 million for 10 wireless networks in 10 campuses + 2 PoP – awarded to Dimension Data.

   0 Expected Completion date – September 2012

0 Development of 20 KM access fiber ring in Nairobi to connect 6 high-capacity university campuses (USIU to UoN segment)
Conclusions - Critical success factors

• Internal technical and managerial capacity of NREN crucial
  – KENET has grown from 2 techies to 15 techies and needs many more!
  – KENET is already a medium-sized business in Kenya
• Internal partnerships help in transfer of high-end networking business skills
  – DFN – KENET Twinning Agreement
  – TENET – KENET collaboration –
• Trust by donors and member institutions a top-priority
  – Google partnership based on trust
  – KTCIP/Kenya Government support based on Trust
  – Heads of institutions trust KENET and preferred partner; Annual forums and communications
• KENET – NSRC – Training and research partnerships for both KENET and member institutions
• Shared innovative services are the future of KENET
  – KENET strategy 2011-2015
• “Teacher appears when the student is ready” Chinese saying
Contacts

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