IMPACT OF UNDERSEA CAPACITY ON KENET AND EAST AFRICA

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What I'll cover.....

- Regional undersea connectivity before 2009 and as at the end of 2009
- Current connectivity
- Impact of undersea on KENET
- Some changes since the undersea
- Possible connectivity future
- Q&A
CONNECTIVITY IN EAST AFRICA BEFORE 2009 AND AS OF THE END OF 2009
Pre 2009

- 100% satellite connectivity
- Very expensive – prices starting from $2,000 per Mb (Megabit) up to $12,000 per Mb
- In country fiber was available but expensive local loop and not far reaching
- In Kenya, only one strong PDNO (KDN) and UTL for Uganda
- In Tanzania, Tanesco (Power company) and TTCL but not much reach, several small ISPs with own fiber
Pre-2009 prices (VSAT)

- Kenya – starting from around $2,000 – 3,500 USD per Megabit for one to one contention
- Uganda – similar, around $2,100 USD per megabit 1:1 to 3,500 USD
- Tanzania much more expensive – starting from 4,000 USD but could go as high as $12,000 USD per megabit
Pre-2009 connectivity

- Undersea connectivity was coming but many in the region were skeptical
- The three main cables on the way were: SEACOM, TEAMS (1.28 Tb each) and EASSy (3.8 Tb)
- SEACOM to connect East Africa to London
- TEAMS to connect Kenya to UAE (Fujairah)
- EASSy focusing on inter-Africa connectivity with no transit
Cables completed in 2009

- SEACOM reaches Kenyan port of Mombasa and activates in June 2009
- TEAMS completes link from Kenya to Fujairah and activates in July 2009
- For Kenya, a lot of excitement especially in regards to drop in bandwidth prices
- Seacom is more favoured, lands in Europe where transit prices are cheaper and has a contract in Kenya with provider to distribute its capacity in country and to Uganda
SEACOM vs TEAMS

- SEACOM cheaper per Megabit for the ISPs
- London IP Transit around $10 USD per Mb, Fujairah IP Transit around $90 USD
- TEAMS is more expensive, because of monopoly prices in UAE, took time to take off but is currently in use
- TEAMS encountered some problems in Kenya
- Some of its shareholders were unable to pay up and went to court to challenge their being thrown out with their shares being distributed among the larger shareholders.
As at end of 2009....

- SEACOM and TEAMS completed but EASSy still in progress, estimated completion is mid 2010
- SEACOM Fiber in Uganda is via UTL
- Same story in Tanzania available via TTCL
- Rwanda also served by SEACOM via RTL from September 2009
- Rwanda and Uganda are landlocked so their capacity is served via Kenya
Uganda in 2010

- There is undersea capacity with some redundancy via ISPs in Kenya
- Still maintain some VSAT
- Traffic passing via Kenya and the stiff competition in Kenya sometimes leads to inter ISP sabotage and Uganda and Rwanda unfortunately suffer
- Route is via Kenya ending up in Mombasa
- Price of 1 Mbps around $700 USD negotiable on bulk purchase
Tanzania 2010

• SEACOM capacity is available via TTCL
• No other planned under sea cables at the moment apart from EASSy
• EASSy completed connectivity in mid 2010
• Current price around $800 USD negotiable on bulk purchase
Kenya 2010

- The best served in terms of bandwidth and reach of the three countries
- Prices have reduced but not to expected levels because ISPs still have Satellite contracts
- Best current price per Megabit around $280
- Some ISPs offered buy 1 get 4 offer at $150 USD
- Mainly because in country infrastructure is not really ready to absorb all the bandwidth, ISPs have much more than they can sell but can't really reduce cost very much due to VSAT contracts
- ISP market is highly competitive, vandalism and sabotage is common
Kenya 2010 cont'd

- As at the end of 2009, one ISP reported vandalism/sabotage cost them close to USD 31 million
- A lot of road construction on going resulting in frequent fiber cuts
- Current average price of $400 USD per meg
- Initially, no internal redundancy but ISPs forced to build redundancy due to heavy SLA penalties
Kenya Education Network
KENET pre 2009

- 13 active sites mainly via fiber downlink and copper/ISDN uplink via KENET core
- High latencies 700-800ms and slow speeds
- Received World Bank grant to purchase 200 Mbps of VSAT capacity for Higher Education Institutions
- Contract officially started in January 2009 for 2 years
- KENET combines buying power of the Universities to bring the price of VSAT to $USD 1,700 per meg bit from commercial $ 3,000 USD per meg bit
- KENET introduces clause of re-negotiation of contract if fiber does land!
KENET 2009 - undersea

- Undersea capacity a reality from 2009 June via SEACOM
- Split the 200 Mbps VSAT to 100 Mbps VSAT and 100 Mbps fiber equivalent
- Fiber equivalent is 350 Mbps so total of about 450 Mbps for KENET but much more available because upstream provider not limiting undersea capacity. Price around 600 USD per meg
- University usage does not improve much because of poor local networks
- 48 connected members by end of 2009
KENET - 2010

- KENET has undersea capacity via KDN (SEACOM partner) and as of 28th January 2010, direct connectivity to London via acquired STM 1 IRU (20 year NREN price)
- In one year, capacity increases from 12 Mbps to 606 Mbps
- 77 connected sites mostly on fiber
- Enjoys massive support from large Universities – free DC hosting!
- Effective price down to $400 USD per meg
- High quality capacity 180ms – 300ms latency
Consumption in KENET...

- Made the big leap from VSAT to Fiber
- Member campus networks were not ready – were only absorbing <10Mbps each
- Even on VSAT, campuses were poorly designed and equipped
- KENET distributed Google switches donated by NSRC to help mitigate this, were a big success allowing students to be reached better
- Campuses still poorly designed, trainings done in March with NSRC and UoO
KENET training Partners

- NSF via NSRC
- University of Oregon
- ISOC
- AfNOG
- Aptivate
- INASP
- Among many others
More on KENET

- Has carried out E-Readiness surveys in the region to evaluate how prepared the countries are to absorb capacity – http://eready.kenet.or.ke
- Have a link to UbuntuNet (Africa Regional REN) in London via STM 1
- Run several trainings programs and mailing lists to promote bandwidth/network management and optimisation
- Mailing lists have grown to include members from Malawi, Zambia, Sudan, Tanzania and Rwanda. Also active in AfNoG
Even more on KENET..

• Using leased lines to reach members
• Government has donated its TEAMS capacity to Fujairah – STM 4 may be activating this soon
• Will also benefit from National Fiber Optic Backbone Infrastructure NOFBI project
• Currently only HEIs but may expand to include schools
• Also have 100Mbps VSAT till Jan 2011 but will retain some capacity for redundancy
• Building a NoC – estimated completion by Quarter 1 2011
KENET Network

- IPv4 /16 and /19
- IPv6 /32
- Migration to /16 underway, /19 to be used for infrastructure. IPv6 also being introduced and will be complete once DNS transitioned to BIND 9
- Previously, network was pure OSPF but became unstable, difficult to manage
- Now BGP for traffic and OSPF for infrastructure – more stable and manageable
- Total bandwidth – 500 Mbps undersea plus 100 Mbps VSAT (23Mbps up 78Mbps down)
OPTICAL FIBER NETWORKS FROM DIFFERENT OPERATORS SUPERIMPOSED ON KENET NETWORK
Current 2010 KENET Network

**EDGE LAYER**
- eBGP
- TRANSMIT DISH
- RECEIVE DISH
- 23 Mbps Uplink
- 78 Mbps Downlink
- 155 Mbps Downlink
- 155 Mbps Uplink
- 350 Mbps Downlink
- 350 Mbps Uplink

**CORE LAYER**
- iBGP
- PRIMARY ROUTER USIU - 7606
- BACKUP 7606 (currently offline)
- IXP ROUTER

**DISTRIBUTION LAYER**
- OSPF and some iBGP
- KISUMU CLIENT ROUTERS
- NAIROBI CLIENT ROUTERS
- NAKURU CLIENT ROUTERS
- ELDORET CLIENT ROUTERS
- MOMBASA CLIENT ROUTERS
- MOMBASA 7604
- ELDORET 7604
- NAKURU 7604
- IXP ROUTER
- PRIMARY ROUTER USIU - 7606
- BACKUP 7606 (currently offline)

**INTERNET**
- LONDON UBUNTUNET 7609 ROUTER
- GEANT CLOUD
- INTERNET

**INTERNET**
KENET traffic

- Google AS is highest in flows and volume
- Akamai generally second
- A lot of FaceBook traffic (a lot)
- More than 95% is commodity traffic
- Mostly browsing HTTP traffic
- Some peer 2 peer traffic which is increasing
Regional NREN summary

- Uganda are very close – possibly before the end of 2010? Difficult to say
- Tanzania are also close and SEACOM have terminated. Once internal issues are sorted, they could come up before the end of 2010 but also difficult to say
- KENET has been up and could provide NoC services for NRENs in the region. UbuntuNet has contacted KENET about this
- National backbones being dug in all countries and will be completed soon and NRENs to benefit
Major changes Since undersea

- Can't talk about VSAT anymore unless its redundancy!
- More demand for online services – users are more active online
- Demand for better services – infrastructure has to work eg DNS. KENET building a NoC
- More security issues – mail server blacklists, port scans, viruses, server breaches and more dictionary attacks
- Bandwidth is no longer the problem, Universities now understanding this
- More services available from KENET– secondary MX, smarthosts, backups etc
More changes since undersea

- Heavy online usage - “Need to transfer 1 TB per week to London, can you make it possible?”
- More p2p traffic → More AUPs developed
- 3G usage very popular, more ISPs want to get in, regulator in Kenya drops $25 million USD license to $10 million, 4G testing
- Students and Staff have more online presence – Facebook and Skype accounts
- More digging – more ISPs wanting to expand infrastructure to meet demand
- Prices will drop further
Capacity usage in the future?

- Still a lot of unused capacity on the cables but demand and usage is growing
- Prices will drop further in 2011 when more satellite contracts expire including KENET's
- More emphasis will have to be put on security in our campuses (Kenya just named worst hit EA country by viruses)
- More redundancy and infrastructure to be built
- More trainings to be done in 2011, training room being built for this
Possible Future Design
Sub-Saharan Undersea Cables

- SAT3/SAFE: 340 gigabits, Active
- TEAMs: 1280 gigabits, Active
- Seacom: 1280 gigabits, Active
- Lion: 1300 gigabits, Active
- MalIN One: 1920 gigabits, Active
- GLO-1: 2500 gigabits, Q3 2010
- EASSy: 3840 gigabits, Active
- WACS: 5120 gigabits, Q2 2011
- ACE: 5120 gigabits, Q2 2012

African Undersea Cables (2012)
http://manypossibilities.net/african-undersea-cables
Version 22 - Aug 2010

Mediterranean Undersea Cables

- Atlas Offshore: 320 gigabits, Active
- SEA-ME-WE 4: 1280 gigabits, Active
- I-ME-WE: 3840 gigabits, Q2 2010
- EIG: 3840 gigabits, Q2 2010

N.B. Several smaller Mediterranean cables not shown.
Thank you!

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Q&A