

A Strategy for ICT talent development for African NRENs

The case of KENET

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By Meoli Kashorda, PhD, MIET
Executive Director,
Kenya Education Network (KENET)

Outline of Paper

- A brief history of African NRENS
 - Origin and Evolution
- Evolution of KENET as an Organization
- KENET services and ICT talent requirements
- Context of Engineering and Computing Education in Kenya
- Strategy for ICT Talent Development and Retention
 - Employee Value Equation for KENET
- Conclusions
 - What future for African NRENS?

A Brief History of African NRENs

- In the late 1990s African universities and research institutes started forming national “associations” or bandwidth consortiums to address issues Internet affordability and access
 - Secondary motivation was to promote collaboration and sharing of resources
 - ICT in higher education advocacy groups
- African Bandwidth consortium supported by PHEA supplied satellite bandwidth to some African universities up to 2008
 - (see *Weaving Success* by Megan Lindow)
- Association of African Universities had developed guidelines for Campus ICT readiness self-assessment by 2001
 - Most universities were purchasing some bandwidth from either the consortiums or commercial ISPs / operators (see next slide)
 - KENET researchers developed an e-readiness assessment tool in 2006; NRENs were critical for accession to higher stages of readiness
- By June 2013, UbuntuNet Alliance had 14 NRENs in different stages of development
 - But only five out of 14 were operational NRENs/organizations with a physical network
 - *Primary motivation has remained affordable bandwidth*

Internet availability indicators (2008)

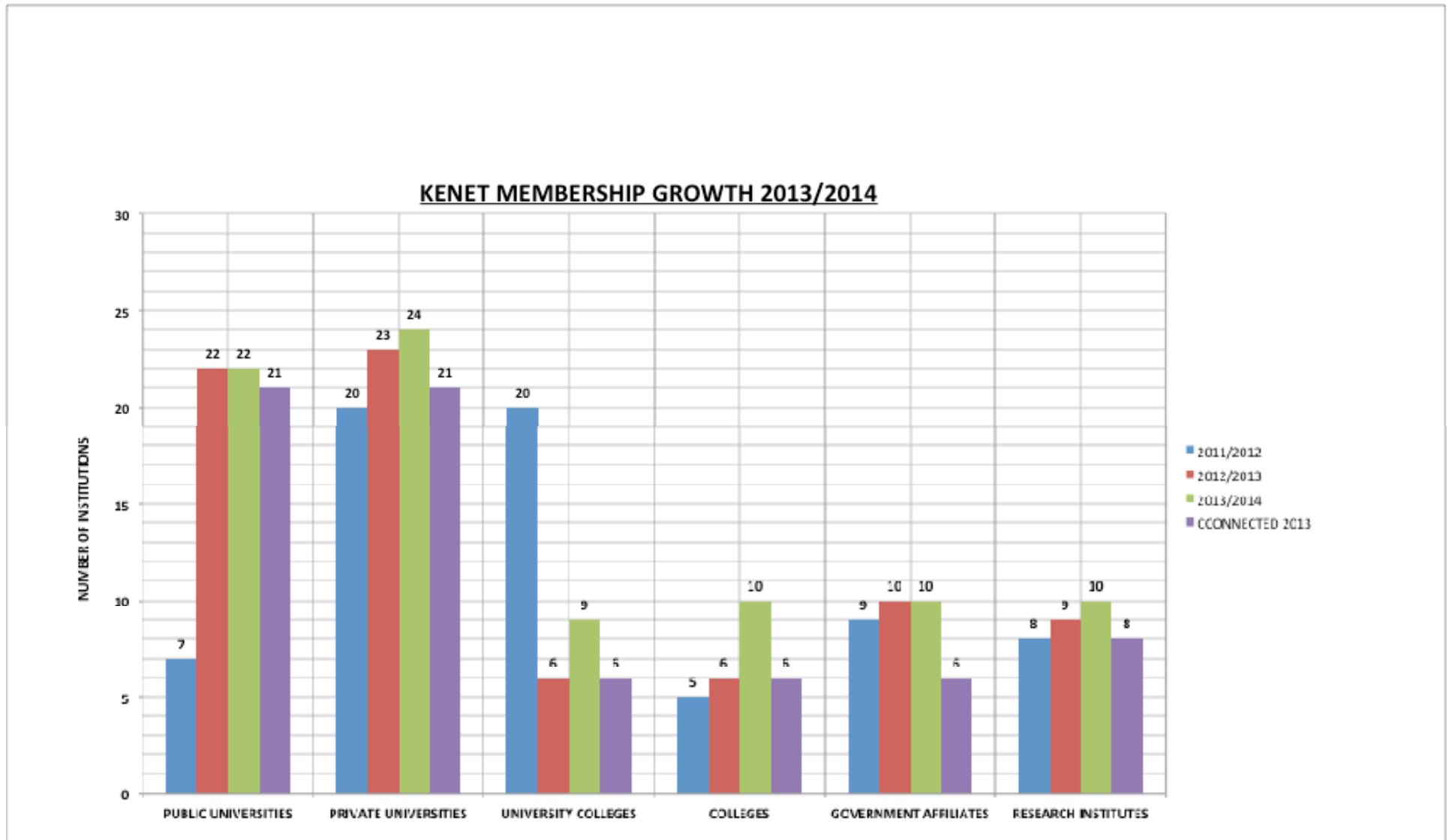
see change for 2013 Kenya

Country	Number of Institutions	Total students	Total students PCs	Total Bandwidth (MB/s)	BW per 1000 students	PCs per 100 students
Burundi	5	20,537	308	2.4	0.115	1.5
Kenya	17	162,319 (279,559)	8,544 (16,539)	71 (1,474)	0.436 (5.3)	5.3 (5.9)
Rwanda	7	32,450	2,367	31.5	0.971	7.3
Tanzania	9	41,816	1,130	17.2	0.412	2.7
Uganda	10	95,550	6,489	29.7	0.311	6.8
Total	48	352,672	18,838	151.6	0.430	5.3

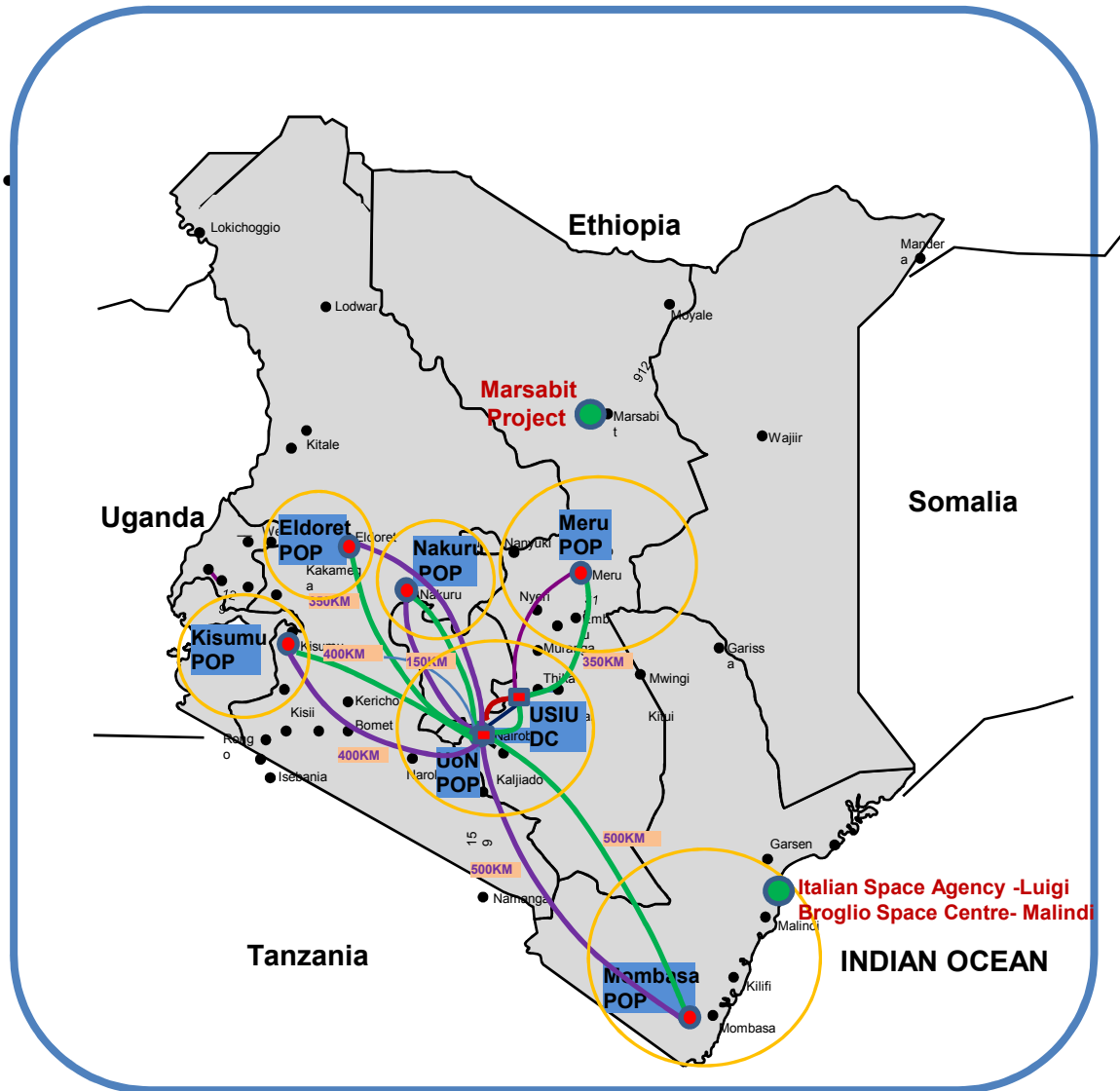
Evolution of KENET as an organization

- KENET founded in 1999 and constituted as a Trust with members as beneficiaries
 - 5 VCs were founder Trustees
 - Key Objects were to provide affordable broadband Internet, facilitate collaboration of faculty and researchers and sharing resources
- KENET licensed by CCK as Alternative Network Facilities Operator for ALL educational and research institutions in 2013
- KENET initially only a secretariat mainly coordinating Internet services through commercial operators and institutional ICT staff training
 - KENET was also a higher education community with ICT advocacy role
- First physical network in 2005 – PHEA funded a VSAT network and KENET used leased lines to distribute 12 Mb/s satellite bandwidth to 8 universities
 - Has now built a broadband network connecting 135 campuses and distributing about 2600 Mb/s as of October 2013
 - Infrastructure Funding by GoK/KTCIP and Member Institutions
- Recognized as the the National Research and Education Network for Kenya
 - See <http://www.kenet.or.ke> for details
- As of October 2013, an SME with 26 full-time staff members, 20 being technical staff members at different stages in the talent pipeline (only 2 technical staff in 2007)
 - Another 5 part-time (researchers, data analysts, accountants) + Interns

KENET Membership – 84



KENET Backbone Fiber Network (Leased lines + KENET-owned)



- Primary fiber links
- Backup fiber links
- KENET POP

POP	Number of Campuses Connected
Nairobi POP	72
Kisumu POP	16
Mombasa POP	11
Eldoret POP	14
Nakuru POP	11
Meru POP	11
Total Campuses connected	135

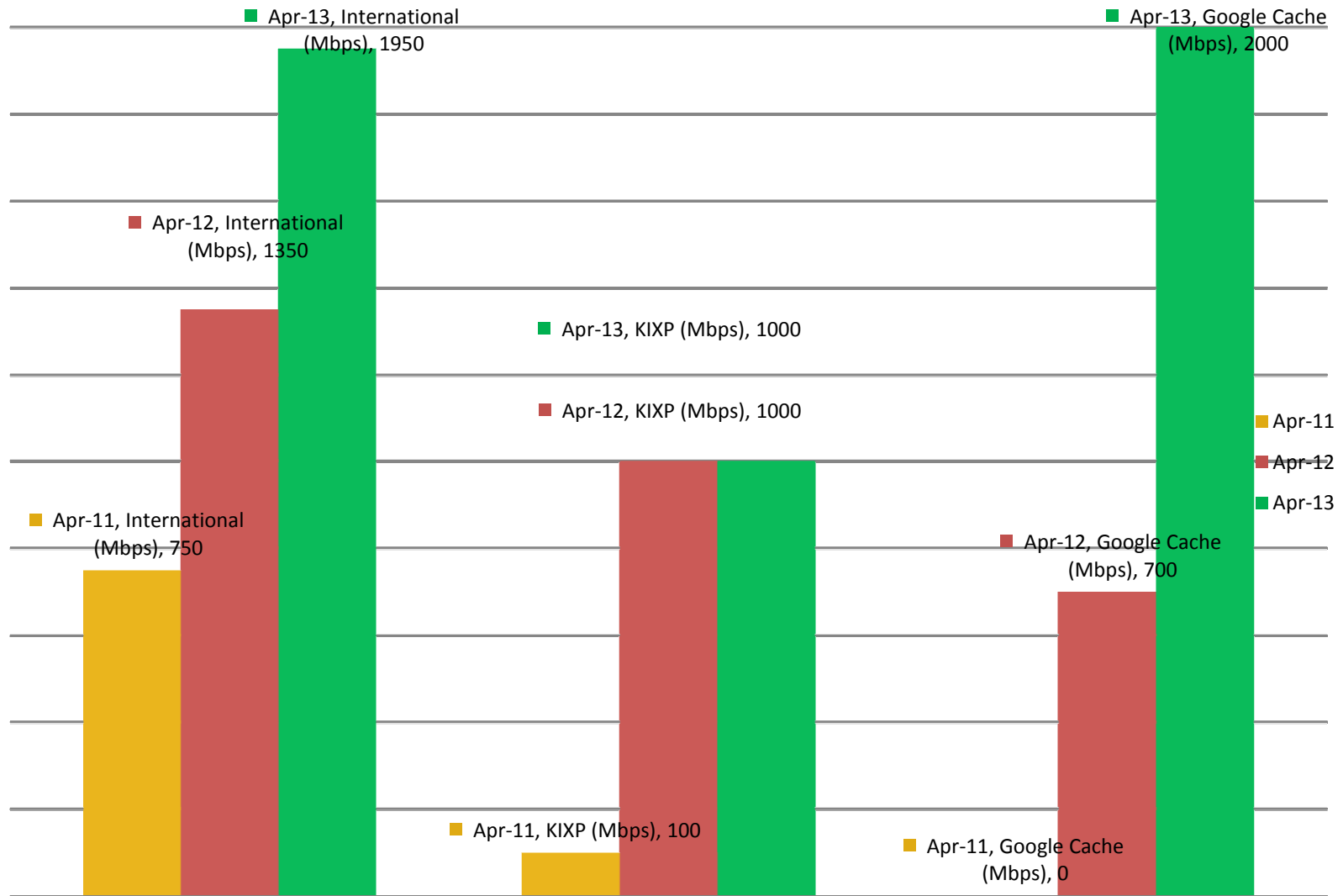
What does KENET do for member institutions?

- **Aggregates demand** for bandwidth, leased lines and dark fiber/IRUs
 - Increasing buyers power of the higher education sector
 - KENET is a “platinum” customer to ALL major suppliers of leased lines – Liquid, Jamii, Safaricom, TKL
 - Procures IRUs / dark fiber using supplier financed arrangements
- **Aggregates Internet traffic**
 - Free private peering at Google PoP in Kenya and a Google cache in KENET network
 - Economies of scale drive down prices
- **Is one of the voices of the research and education community in Kenya / Africa**
 - IBM Africa research lab a partner in reaching out to academic community
 - Vehicle for GoK / World Bank broadband funding for universities
 - Attracts donor funding for higher education – PHEA, USAID, NSRC, NSF, EU, ISOC etc
 - Conference sponsorship and organization (e.g., IST Africa 2013 or UbuntuNet Connect 2011)
 - Represents academic sector in education and ICT policy formulation (e.g., ST&I Act 2013)
- **Aggregates high-end ICT talent** – technical + project management
- **A vehicle for Capacity building** for ICT staff and senior leadership in HE
 - Forums and training programs

KENET services and talent requirements

Service	Service provider institution	Engineering and ICT skills required	Relevant undergraduate degree
Broadband Internet service, and NOC services	KENET (NREN)	Network engineering, Network Administration Programming and applications development	Electrical Engineering (EE), Computer Science (CS) and Information Systems (IS)
Shared services	KENET / HE institutions	Network engineering, Systems administration Network administration Programming skills Database administration	EE, CS, IS
Campus Networks Services	HE institutions / KENET	Network engineering Network administration Wireless Network Design and Operations Bandwidth management Systems Administration	EE, CS, IS
Procurement Project management services	HE institutions / KENET	Electrical and Power Engineering Technical communication skills Consulting skills Preparation of Technical Bidding (tender documents) Negotiation skills	EE + MBA or MIS CS + MBA or MIS IS + MBA or MIS
Training services	HE institutions / KENET	Training skills; technical skills in systems and network administration, cybersecurity skills	EE, CS, IS

Available Downlink Capacity To Members



Context of Engineering and ICT Education University Education in Kenya

Higher Education and Research Sectors in Kenya Highly regulated

- **Universities Act 2012**
 - Defines a university – public or private
 - Universities Fund to be established; Universities will apply / justify funding by government
 - Degree granting + executive education
 - Regulations + supervision require a lot of data
 - ERP essential now
- **Science, Technology and Innovations Act 2013**
 - Registration of research institutes; funding; governance and funding of research + innovations
 - 2% OF GDP to create National Research fund
 - Finance research in universities and research institutes except Agricultural research institutions
- **TVET Act 2013**
 - Regulates technical institutes / polytechnics / tertiary colleges

Engineering Education

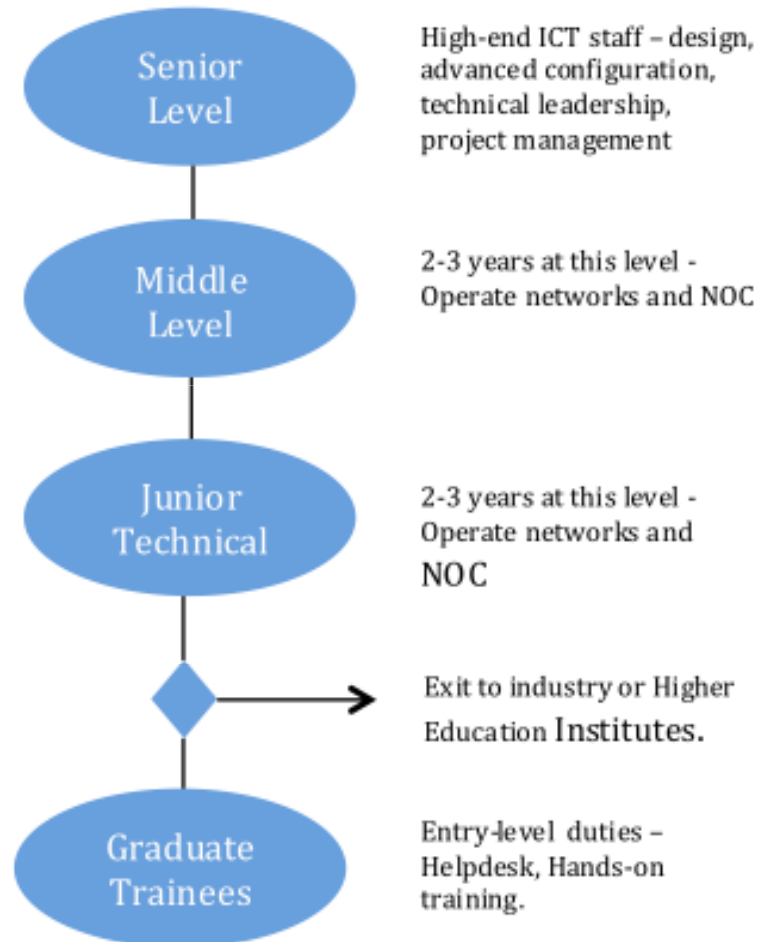
- Engineering education regulated by the Engineers Act 2011
 - 5-year degree program
 - No new programs accredited in the last 10 years! (claim no human or infrastructure capacity)
 - Recognized electrical engineering degree programs only in three universities
 - (University of Nairobi, Jomo Kenyatta University of Agriculture and Technology and Moi University)
- About 300 EE graduates per year, most cannot be absorbed by local industry
- Is Quality of Engineering Education Falling?
 - Engineers Board, Local ICT Industry and IBM Corporate Service Corp consultants think so!
 - Increased enrollment with increase in funding, lab facilities or faculty development
- KENET hires top electrical engineering graduates from universities with recognized degree programs – *engineering schools admit only A students!*

Computer Science and Information Systems Education

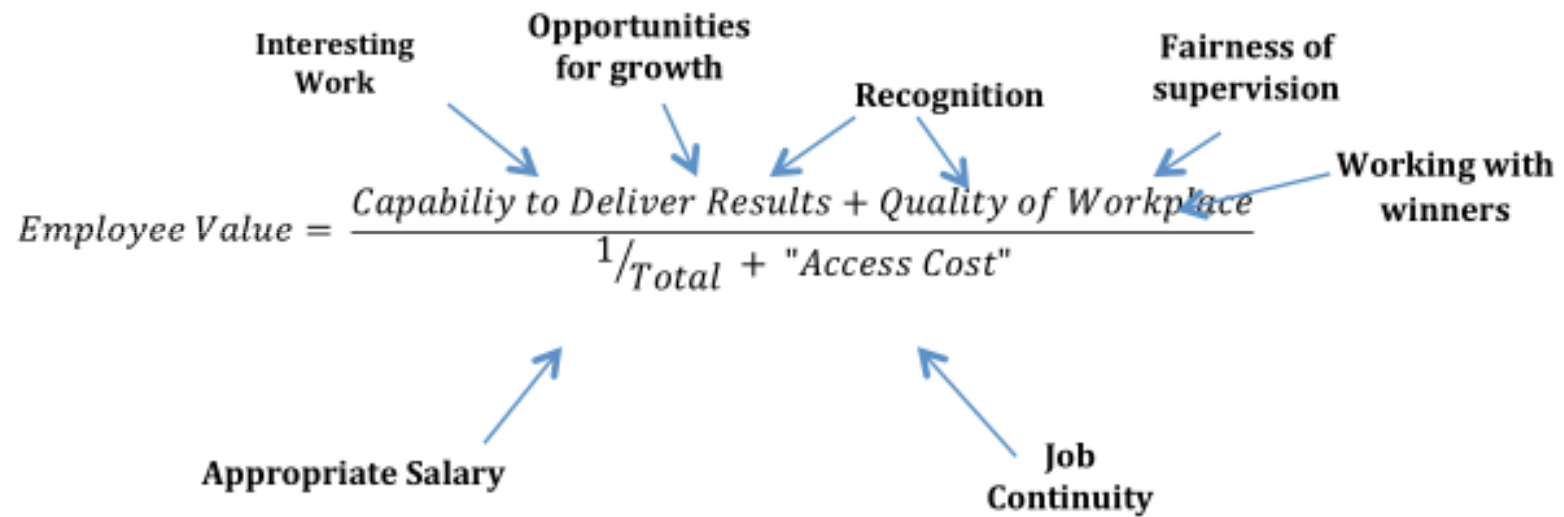
- Almost all universities offer Information Systems degree programs
 - And many offer CS degree programs
 - Large pool of ICT graduates
- 4-year degree programs and not regulated by professional accreditation boards
 - External quality assurance by Commission for University Education
- ICT industry complaining that graduates not prepared for career development and additional training required
 - IBM CSC consultants made same conclusions about high-end ICT talent
 - Kenyan industry spends huge amount of money on expatriate ICT talent for complex projects
 - *CTOs of all leading operators in Kenya are now expatriates!*
- KENET is part of the university eco-systems and plans to participate in transformation of ICT education in Kenya
 - *Working groups in ICT and Engineering Education*
 - *KENET currently hires top-ranked graduates and then trains them!*

ICT talent development and retention strategy

KENET ICT Talent development pipeline



Employee Value Equation



Conclusions

- African NRENs must transition to operational organizations or lose relevance
 - They are start-up businesses serving a specialized group
 - Primary service / primary source of revenue remains bandwidth!
- NRENs must provide bandwidth and NOC services at levels similar or better than large commercial operators
 - Lowest Price + Excellent Service (high-end ICT talent) essential
 - Institutions have choice - Commercial operators focusing on data services in Africa
- ICT talent development pipeline and the Employee Value Equation have worked for KENET in attracting and retaining ICT staff
 - The primary role of CEOs must be to build NRENs as organizations with capacity to provide services
 - Competitive salaries in the SME ICT sector still necessary
- The future of KENET (and maybe NRENs) depends on offering additional unique educational and research computing services
 - Authorization and Authentication services; EDUROAM
 - Educational technology / instructional design services
 - Shared services

Thank You

Q&A

E-mail: mkashorda@kenet.or.ke

Phone: +254 732 150500

Website: <http://www.kenet.or.ke>