

East African National Research and Education Networks – *Connecting EA Universities to the World*

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Agenda

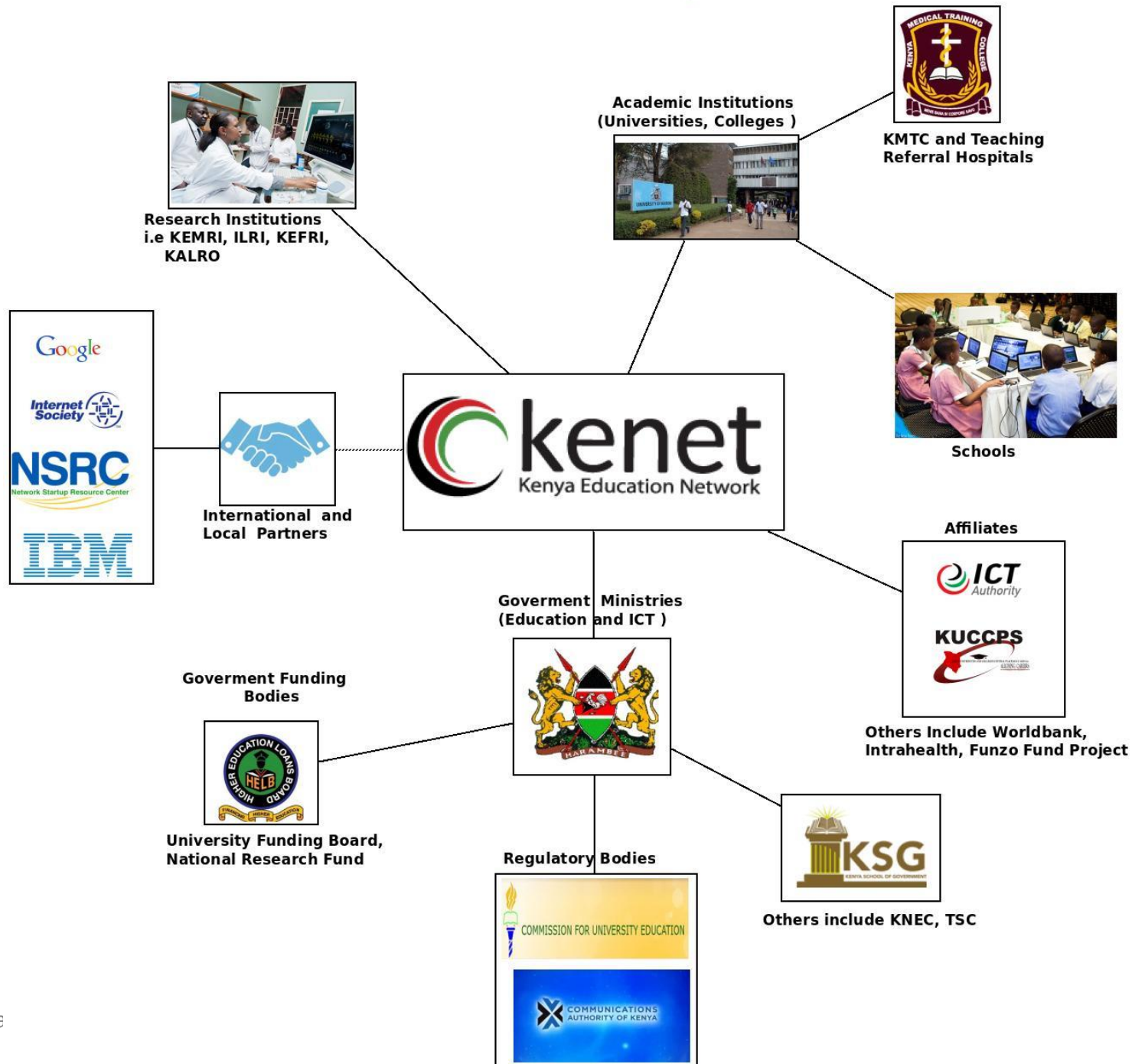
- What is an NREN ?
- East African, African, and Global NRENs
 - Status and financing
- NREN services
 - NRENs promote / facilitate research collaboration and benchmarking
 - Community Research Infrastructures and services
 - Core Data Collection and e-readiness assessment
- Conclusions – Implementation vehicle for Governments and IUCEA?

What is an NREN?

What is a National Research and Education?

- It is an **interconnected academic community** that includes the following institutions:
 - Core Institutions – Universities + Research Institutes
 - Other educational institutions – TVETs, TTCs, Nursing schools, Teaching hospitals, schools, etc
 - Human network
- It is a **research and education platform** for
 - Providing high-speed Internet services
 - Hosting educational content and research data
 - Shared research and research infrastructures + research instruments
 - Identity Provider (visibility in the Internet space) + Digital certificates + Cybersecurity Emergency Response Team (CERT)
 - Specialized engineers and high-end ICT talent
- ICT advocacy + Internet Governance + Development

The KENET Academic Community And Partners

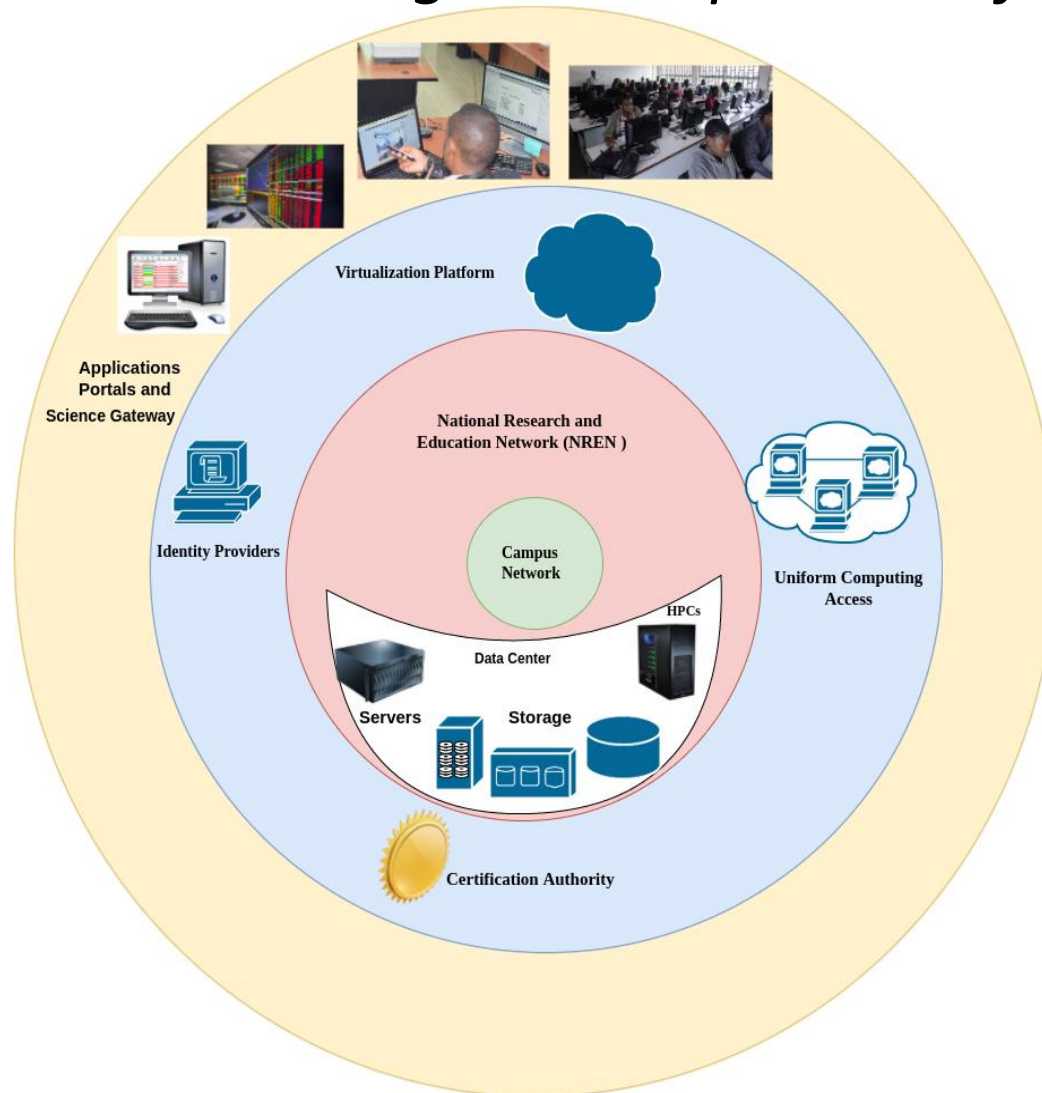


What are the main services of an NREN

- Internet bandwidth services
 - Low-congestion and high quality Internet services
 - EDUROAM (WiFi for academic institutions)
 - Internet addresses
 - Support
- Data Center Services
 - Collocation of servers; community cloud services (storage and Virtual machines)
 - Web and applications hosting services
- Research and educational technology services –
 - Web and video conferencing; research data storage; research productivity; virtual labs;
- Capacity Building for Faculty and ICT staff
- Direct engineering Support Services and Technical Advisory Services
- Core Data Collection and Analysis + E-readiness survey
- Facilitating Community Forums – of VCs, heads of member institutions, researchers, heads of department, registrars etc, ICT directors,

NRENs Provide Specialized Research E-Infrastructures

But Universities need good campus ICT infrastructures

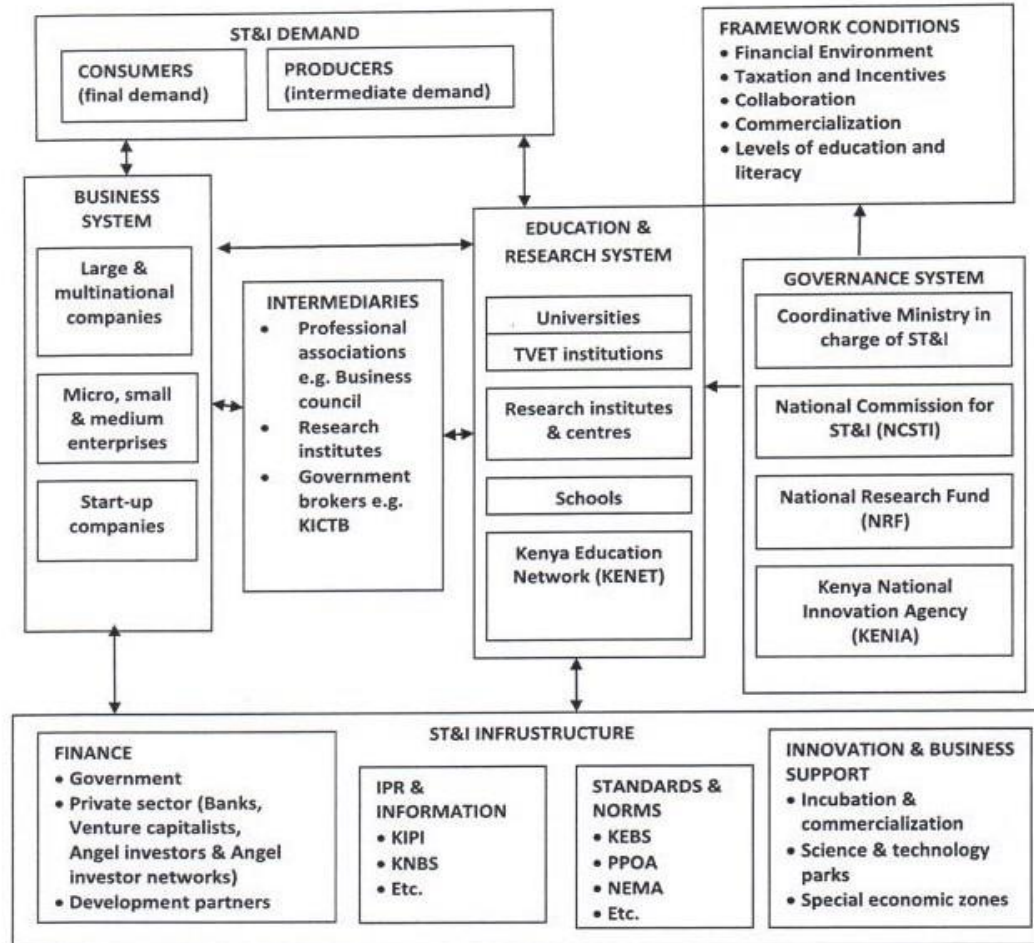


Heads of Institutions Forum 2017



9th Annual Heads Of Institutions Forum at Sarova Whitesands Beach Resort & Spa on 7th - 8th December 2017 Mombasa Kenya

KENET is part of National Innovation System of Kenya

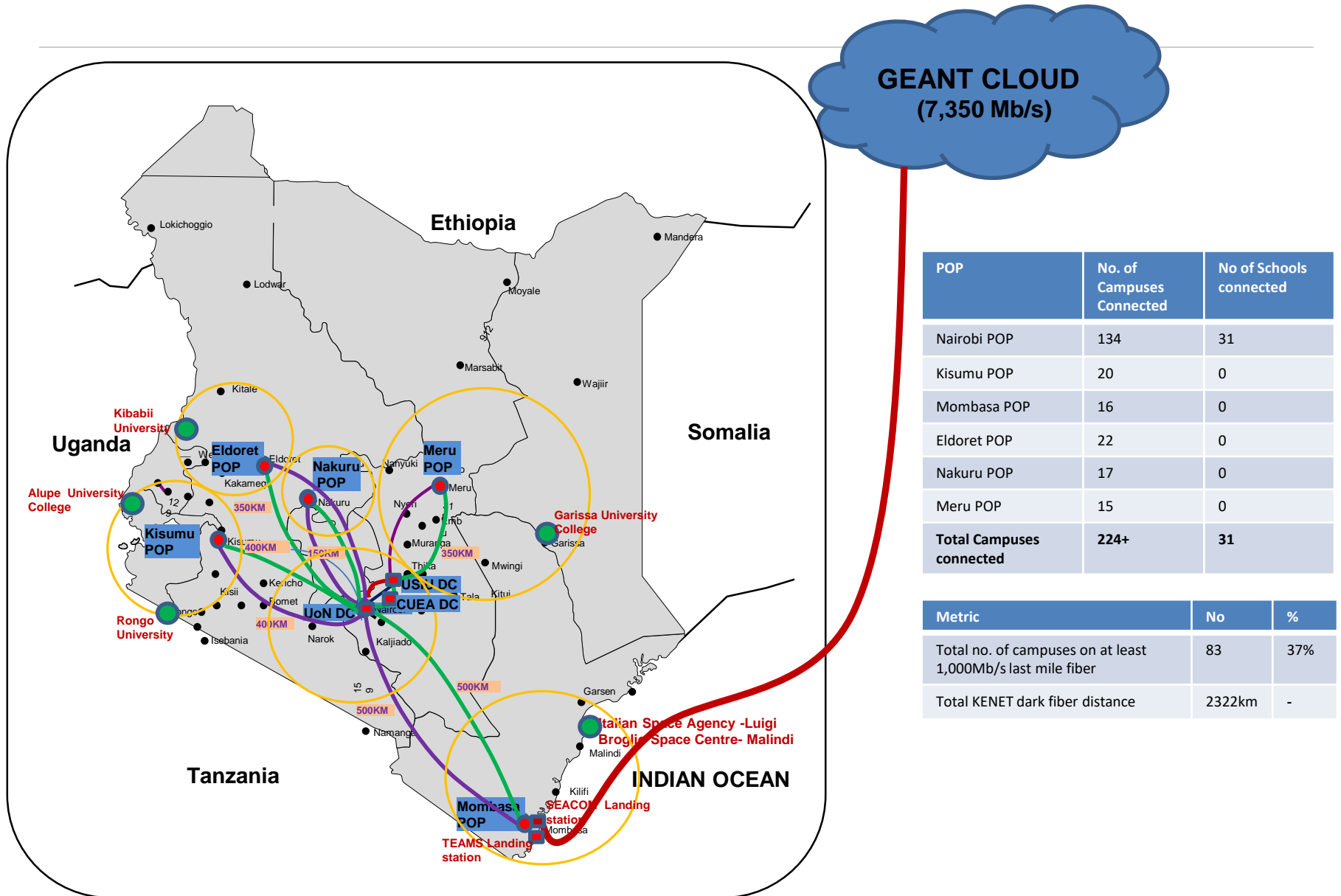


East African, African and Global NRENs

EA NRENs Status

East African NREN	Legal Status	Members / Size of Community	Total Internet BW	Recognition Status by Governments	Source of Funding
BERNET	Registered as a Non-Profit Association according to the Ministerial Ordinance N° 530/276 dated 24/02/2016 and signed by the Minister of Home Affairs.	14 Member Universities Institutions	100 Mb/s	Officially recognized by the Government of Burundi.	Gov
KENET	Incorporated as a Trust with member institutions, students, faculty, staff as beneficiaries; licensed operator	128 members; ~ 750,000 users	18,000 Mb/s	Endorsed by Ministry of Education as NREN of Kenya; Licensed by ICT regulator as a private network operator	Members
RENU	A not-for-profit membership Institution incorporated as a Company Limited by guarantee and registered by the URSB.	55 members; ~ 250,000 users	2,600 Mb/s	Licensed by regulator as a private network operator (PNO) and endorsed by Min. of Educ. as Uganda's NREN.	Members
RWedNET	In the process of being established as a consortium.	~ 55,000	600 Mb/s	N/A	N/A
TERNET	Incorporated as a Trust with member institutions, students, faculty, staff as beneficiaries; not licensed operator	58 members / ~ 210,050 users	1050 Mb/s	Not officially recognized by the government	Members

KENET Builds and Operates the Research and Education Network of Kenya

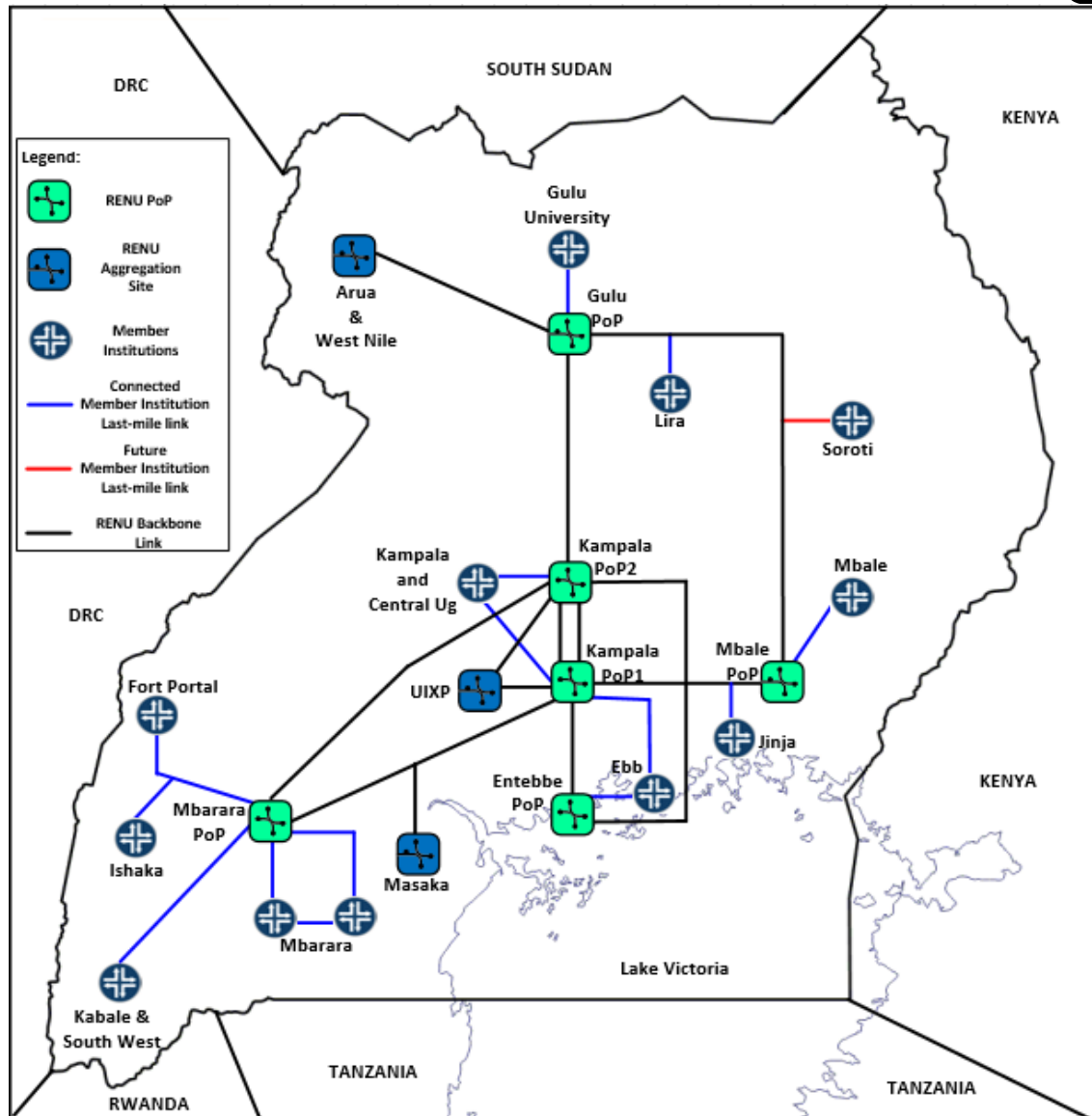


KENET Builds Networks - Fiber Development Photos (2012)

i. Last Mile Fiber Development in Nyahururu town for Laikipia University



UG NREN - RENU Coverage

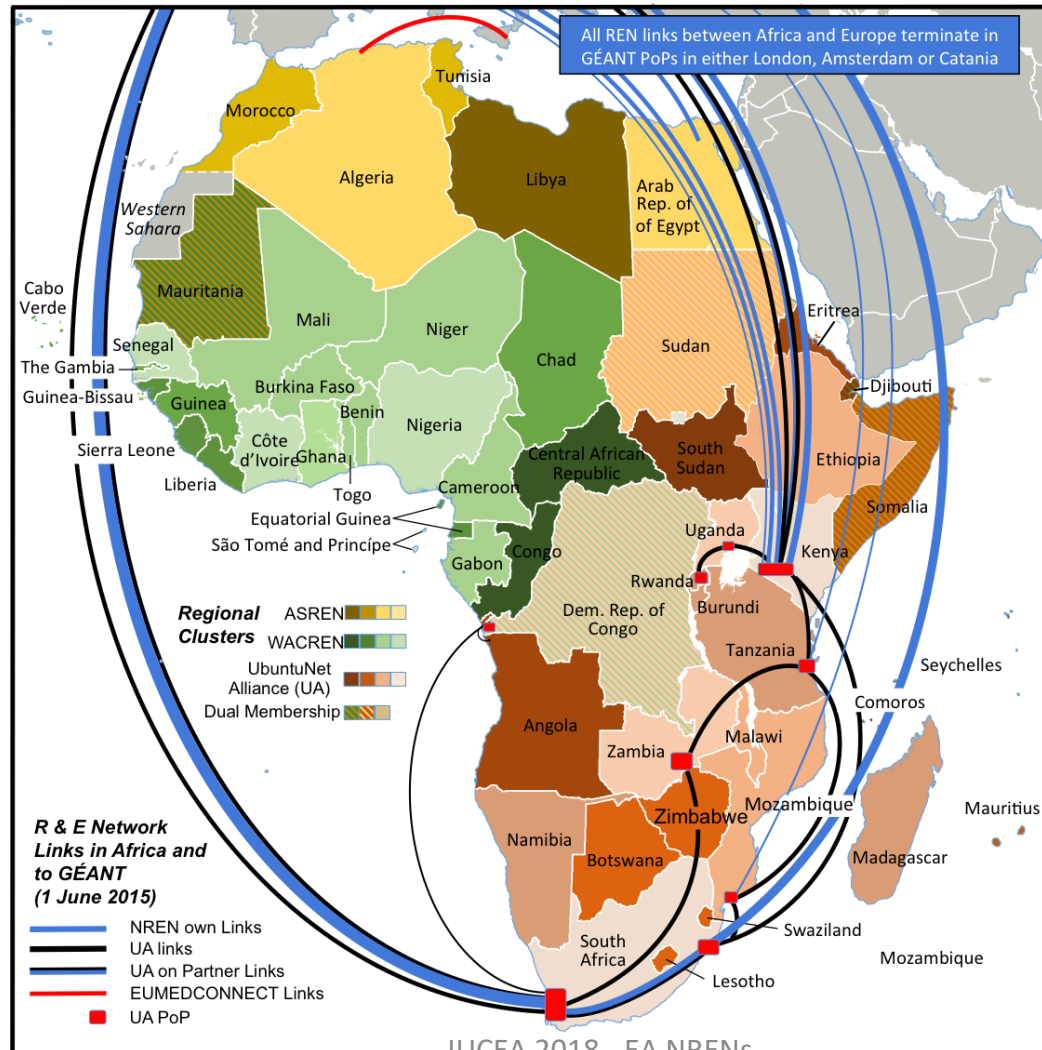


TZ NREN - TERNET Coverage



KENET community is connected to other African and Global NRENs

source: World Bank report 2016



Example NRENs Outside Africa

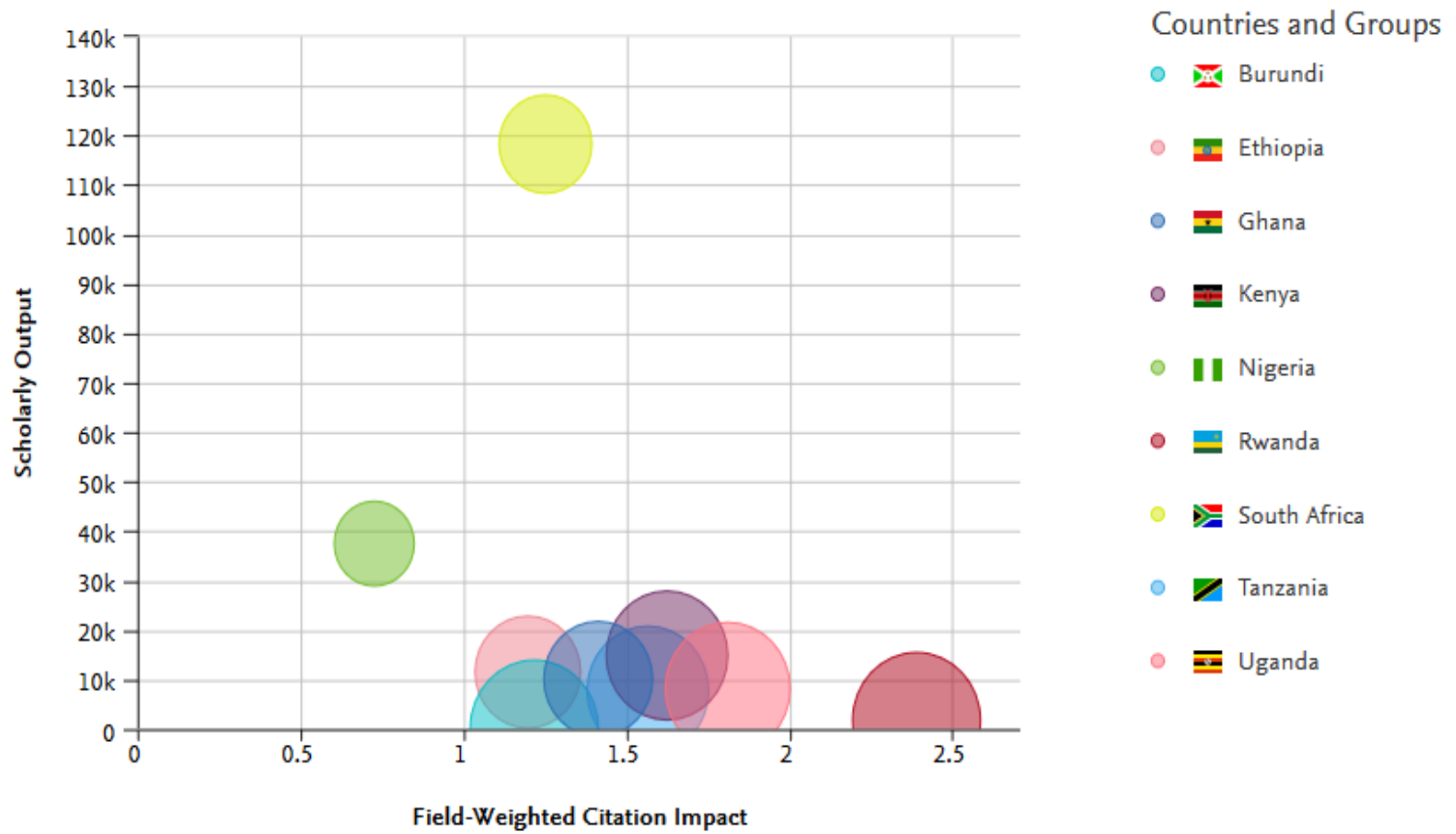
Name of Network	Type of Organization / NREN that operates the network	Sources of Funding
CENIC – Corporation for Education Network Initiatives of California	Company by Limited Guarantee Operates the California State REN (CalREN)	Member subscriptions State of California appropriations for community colleges, public libraries, museums and hospitals
DFN – German Research Network	DFN-Verein or association is non-profit organization Operates the German REN	Members of the association through subscription to services
JISC – Joint Information Systems Committee	JISC a not-for-profit company limited by guarantee (Charity); It is a membership organization Operates JANET – Joint Academic Network, the high-speed network of UK research and education community	Higher education subscriptions; UK funding bodies for HE and FE
SANREN / TENET –South African NREN	SANREN Competency Area of CSIR and TENET is a limited company by guarantee owned by research universities	Government through CSIR + subscriptions to member services (includes Internet services)
ZAMREN – NREN of Zambia	The association of tertiary level research and education institutions ; Registered as Company by Limited Guarantee	Universal Access fund through ICT regulator; Free access to government fiber; Member subscriptions to services

NRENs Promote Research Collaboration and Benchmarking

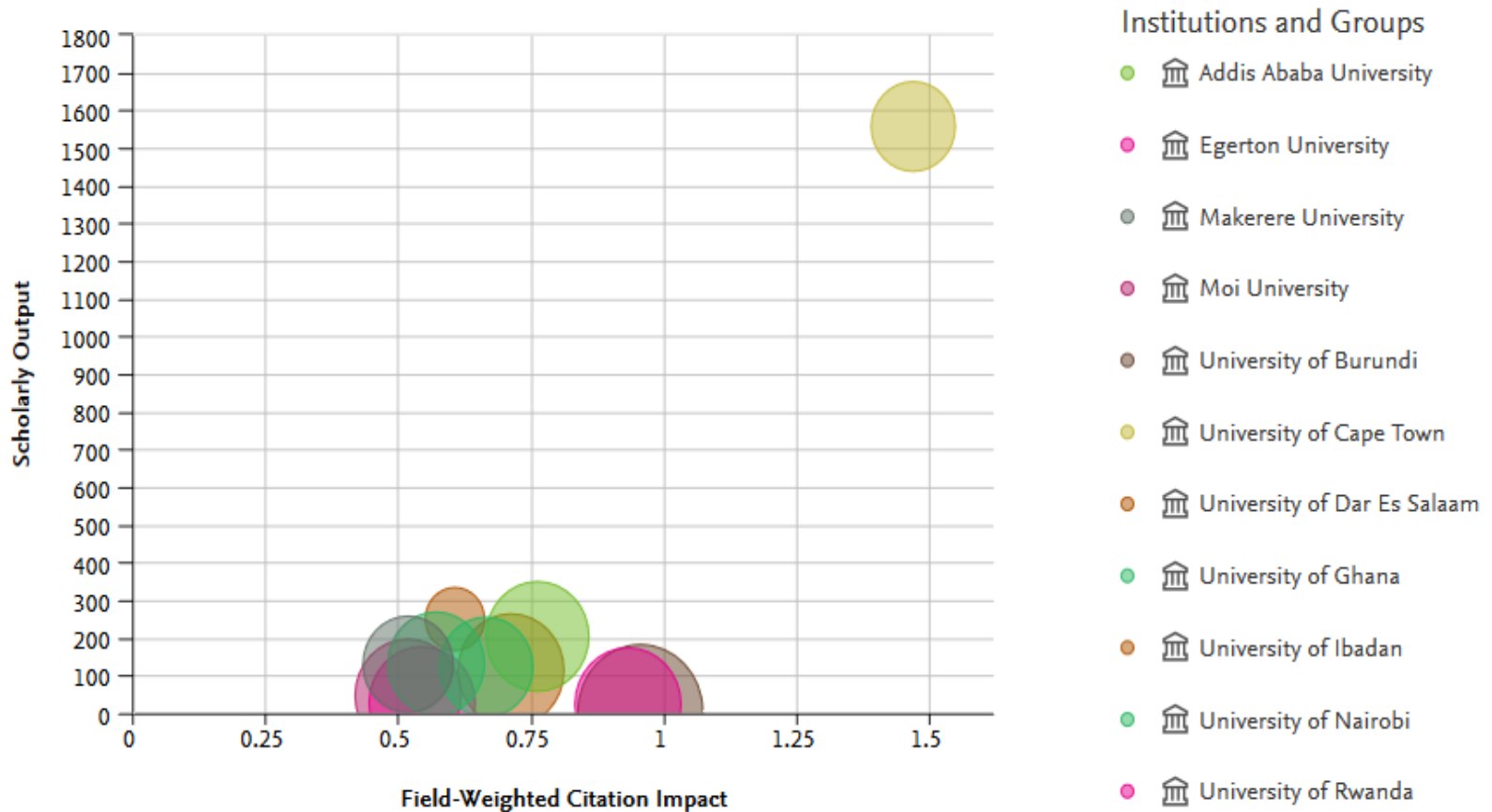
Scholarly Output of Selected African Countries – *source Elsevier SciVal*

Metric / Country	Scholarly output	Authors	Field Weighted Citation Impact	Citation Count	Citations per Publication	Population (2016)	GDP (Billion USD) (2016)
South Africa	118,273	63,868	1.25	729,057	6.2	55,908,865	295.4
Nigeria	37,530	42,627	0.73	125,556	3.3	185,989,640	404.6
Kenya	14,740	12,759	1.61	121,365	8.2	48,461,567	70.5
Ethiopia	11,580	11,699	1.20	65,162	5.6	102,403,196	72.3
Ghana	10,158	8,906	1.41	69,251	6.8	28,206,728	42.7
Uganda	8,251	7,176	1.81	78,700	9.5	41,487,965	24.1
Tanzania	7,827	6,325	1.56	60,818	7.8	55,572,201	47.3
Rwanda	1,808	1,854	2.39	17,025	9.4	11,917,508	8.4

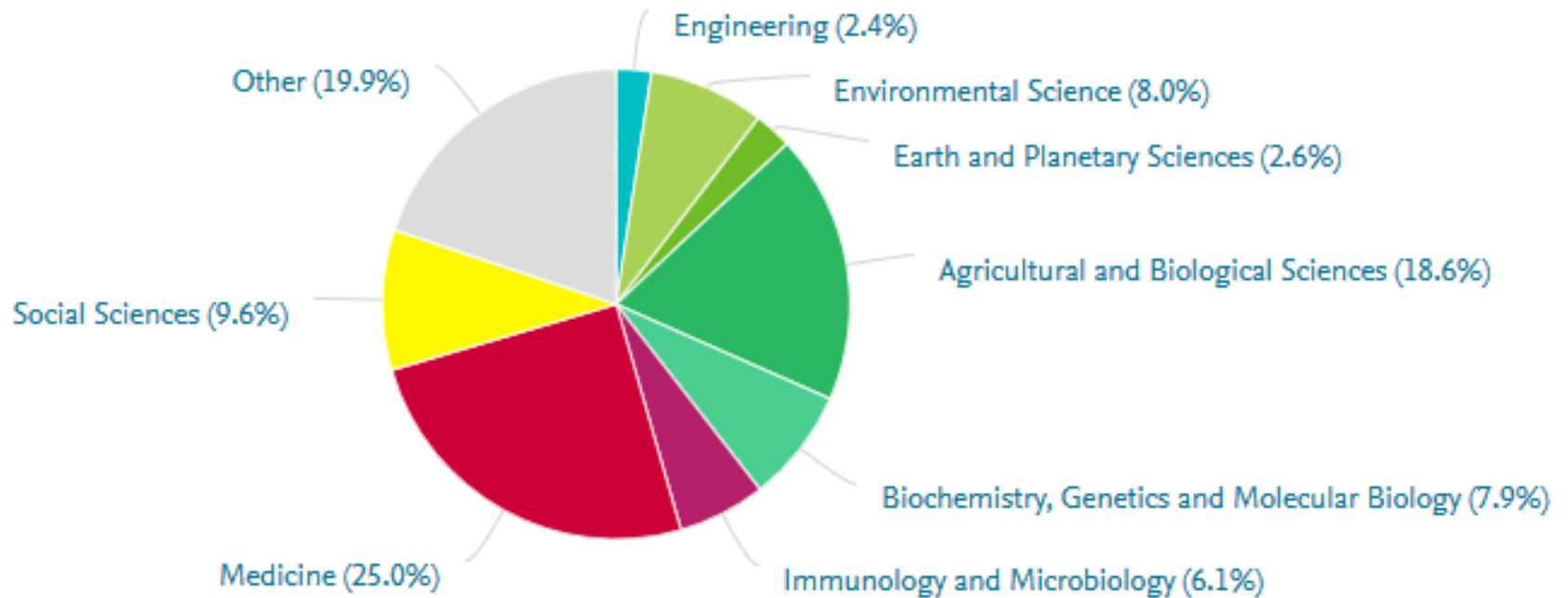
Benchmarking of Scholarly Output of Selected African Countries 2012-2017



Engineering scholarly output 2012-2017



Top research areas for KE



University leadership must create excellent learning / working environments for students / faculty

- High-speed Internet and adequate campus WiFi coverage
 - Libraries, cafeterias, hostels, labs etc
 - Specialized labs
- Easy access to e-journals and e-books and licensed software applications (e.g., SPSS, Matlab etc)
- Excellent learning spaces and comfortable/ affordable accommodation and food?
- Comfortable offices for faculty
- Innovation hubs and partnerships for industry for attachment and jobs

Conclusions

- Create appropriate Learning / working environments matter (called e-readiness of university campuses)
 - ICT and high-speed Internet are crucial
 - Adequate lab facilities
 - Comfortable and affordable accommodation
- Foster research collaboration and innovation
 - Innovation hubs, hands-on classes / labs
- Toward EA research platform
 - Research data storage and computing (access to HPC)
 - Data centers for disaster recovery and collocation of researchers' servers
 - High speed links promote data sharing and collaboration
- High speed Internet provides access to MOOCs and other Open Educational resources and journals
 - Internet is the primary library for university students!
- **EA NRENs could be implementation agencies for IUCEA broadband projects**

History and Growth of NRENs – the case of KENET in Kenya

KENET Trust Objects (2000)

1. provide a **sustainable and high-speed Internet connectivity** to educational institutions;
2. facilitate **electronic communication** among beneficiaries in educational institutions;
3. support **sharing of teaching and learning resources** among educational institutions;
4. support **teaching and learning over the Internet** for beneficiaries in educational institutions both in Kenya and outside;
5. **collaborate in developing locally relevant learning materials** in educational institutions; and
6. **collaborate in research** in educational institutions.

KENET's Brief History

- KENET Trust constituted in 2000 by five founder universities
 - Daystar, JKUAT, Moi, UoN and USIU
 - Respective VCs were founder Trustees
- Currently 10 Trustees – 6 VCs, CEO of KMFRI, DG of CA, PS Universities, and CEO Private sector rep
 - Assisted by 10 MB members
 - 128 members as of January 31, 2018
- KENET was
 - Appointed **implementation agency** of GoK in 2008-2013 (\$22.5 million World Bank funding),
 - **Endorsed** by Ministry of Education in 2009
 - **Licensed by CA** in 2002 as operator of private broadband network operators for educational and research institution
 - Granted VAT and income Tax **exempt status** by KRA
 - A Grantee for USAID (2001), Rockefeller and Ford Foundations (2005 – 2010)

KENET's Mission & Values

Mission

- To *catalyze* the transformation of education, research and administration of the KENET community using ICT and high-speed Internet

Values

- *Community focus, diversity, ethical behavior, innovation, and openness*

What Does KENET do for member HE institutions?

- **Aggregates demand** for bandwidth and leased lines
 - Increasing buyers power of the higher education sector
 - KENET is a “**platinum**” customer to ALL major suppliers of leased lines – **superior support for members**
 - Weighted price has dropped from \$300 per Mb/s in 2009 to \$46 per Mb/s as of March 2018
 - > **18 Gb/s** of International traffic as of March 2018
- **Attracts Global Partners and Content Distribution Networks**
 - Attracts partners like Google, Facebook, Microsoft, NSRC etc
 - Reduces cost of international traffic and content
- **Is one of the voices of research and education community in Kenya / Africa**
 - Vehicle for GoK / World Bank broadband funding for universities
 - Attracts donor funding for higher education – PHEA, USAID, NSRC, NSF, EU, ISOC, GoK/World Bank etc
 - **Catalyst** for transformation of research, education and administration in member institutions
- **Builds advanced research infrastructures** and community in different areas
 - National broadband network (over 2,000 KM of lit fiber)
 - Africa Science Gateway and federated services (KENET CA, iDP, EDUROAM)
 - **The first NREN in Africa to have a Certification Authority (CA) accredited by EUGRDPMA allowing Kenyan researchers access global e-infrastructures for FREE!**

KENET as the NREN of KE

- **Catalyst for transformation of education and research using ICT**
 - Discovers and supports research and innovation champions
 - Offers up to 10 travel grants per year to faculty researchers or post-graduate students in STEM areas
 - Sponsors innovative research projects using Mini-grants of \$10,000 per University faculty team (see <http://raspberry.kenet.or.ke>)
 - Organizes forums of faculty in different areas (e.g., engineering faculty forum in 2015)
- **Regularly Conducts E-readiness Survey of Connected Universities**
 - 2006, 2008, 2013 and 2015 (see <http://ereadiness.kenet.or.ke>)
 - *Data-driven advocacy and influencing ICT strategies to increase use of ICT in education and research*
- **Collects Annual Core Data Connected Higher Education Institutions**
 - 2017 data collected for 60 universities / university colleges connected to KENET
 - Data analyzed for member universities and for advocacy
- **New Initiative is measuring research collaboration and productivity of Kenyan universities and research institutes using Elsevier SciVal tool**

Example - KENET Community 2017

Member category	Number of members	Internet bandwidth subscription (Mb/s)	Size of Beneficiary community (students, faculty, researchers, staff)	% members subscribing to KENET Community Cloud services
Universities / University college	67	8,225	651,362	27%
Research Institutions	16	310	3,319	6%
Tertiary colleges (TVETs, medical colleges, TTCs etc)	20	202	83,095	15%
Government Institutions/ Affiliate members	19	215	4,877	42%
Schools (under schools initiative)	32	107	33,832	3%

Specialized Research ICT Services and Shared/Cloud-based Research Infrastructures Provided by NRENs

Research ICT Services are for students and faculty

- **Access to online research resources**
 - E-Journals, Webinars, research analytics software?
 - Research computing and storage (R for statistical analysis, MATLAB for engineers, big data analytics)
 - High performance computing
 - Open access repositories
- **Supporting Research collaboration**
 - Stable e-mail? Web-conferencing? Video conferencing?
 - Anti-plagiarism software?
 - Webinars and e-meetings
- **University research is now data intensive**
 - BIG data and faculty need high performance computing and high-speed links
 - CH{C of South Africa available to Principal Investigators for countries participating in Square Kilometer Array (includes KE)
- **EA Research Platform to promote research collaboration?**
 - Africa Open Science Platform – a project of Academy of Sciences of South Africa
 - Open Research Data Repositories?

Who Provides Research ICT Services in a University?

- ICT directorates under leadership of an ICT director or Chief Information Officer
 - Builds and supports the campus ICT infrastructure e.g., provides WiFi services
 - Operates university data center for Virtual Servers or storage
 - Research computing?
 - Stable e-mail? Web-conferencing? Video conferencing?
 - Access to external research services
- EA NRENs provide
 - Internet bandwidth
 - Access to global research networks and research computing services
 - EDUROAM services
 - Open Research Data Repositories
 - Capacity building for ICT staff or researchers
- Universities need achieve adequate levels of **e-readiness to benefit from high-speed Internet**

E-readiness of Universities

- **Definition:** The potential to take advantage of opportunities of ICT in administration, education, research and innovation
- ICT and Internet are a “**rising tide strategy** – it lifts all the universities”
- 2008 E-readiness of 50 EA universities conducted
 - Rockefeller Grant through KENET

Some well known E-readiness indicators

- Internet bandwidth per 1,000 students
 - 10 Mb/s per 1,000 students in 2008, 2013 surveys
 - If 10% of students online - 100 kb/s per student
 - **20 Mb/s per 1,000 students in 2015 surveys** (or 200 kb/s per student if only 10% online)
 - 2013-2017 National Broadband Strategy target is 256 kb/s per user; **40 Mb/s per urban household!**
- Computer lab computers per 100 students
 - 10 per 100 students
- Percent of students who own laptops
 - 90% for research-intensive?
- Campus-wide WiFi coverage

Thank YOU



Q & A

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