



Technical Capacity Building and the Growth of an NREN

Case Study: RENU since 2014

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Presentation Outline

- Background
- Campus networks – the reality
- The RENU capacity building program
- Successes, outcomes and results
- Challenges





An NREN is an aggregation of campus networks.





RENU History

- **Genesis: 2006 to 2010**
 - January 2006: Resolution by VCs and CEOs.
 - Association, accreditation, and awareness.
- **Dark Ages: Sept. 2010 to Feb. 2014**
 - “Bandwidth Consortium”
- **Renaissance: March 2014 to date**
 - Independent RENU owned network





The promises of 2014

- Optic fibre
- Much lower bandwidth pricing
- More bandwidth with same budget
- Uncapped local traffic
- **FASTER SPEEDS!**





The Reality after Rollout

- Optic fibre
- Much lower bandwidth pricing
- More bandwidth with same budget
- Very little or NO local traffic
- **SAME OLD SLOW SPEEDS!**



NO DIFFERENCE WITH COMMERCIAL PROVIDERS





The Speed Problem

“Multifaceted”

- Service Provider (easiest to blame)
 - Access, backbone, peering, IP Transit ...
- Content location
 - Typically distant from Africa
 - (BUT same user experience expected in Africa)
- **Campus networks!**
 - Peering, backbone, access, end user





Campus Networks

- **Budget Issues (Low Funding)**
 - NO new equipment in ages
 - Unmanaged switches
 - Staff training completely absent
- **Network Design Issues**
 - Flat networks
 - One VLAN, one subnet, no segmentation
 - Many issues arise out of this
 - Loops
 - Subnet not expanded progressively
 - Rogue DHCP servers
 - ...
 - Congested backbone links
 - Building interconnections (copper)





Campus Networks

- **Operational issues**
 - NO monitoring
 - Equipment very poorly maintained
 - Accumulated dust in switches and APs
 - No idea what connects where
 - NO motivation and NO dedication
 - Staff lacking in confidence
 - Staff in very resigned mood





RENU Capacity Building Program

- Started in April 2014
- Workshop Tracks
 - 3 residential
 - Scalable Campus Network Design (SCND)
 - Campus Network Security (CNS)
 - Campus Network Monitoring and Management (CNMM)
 - 2 online
 - Introduction to Network Operations
 - Advanced Network Services
- Direct Engineering Assistance (DEA)

Partners

- NSRC
- ISOC
- UbuntuNet Alliance
- INASP

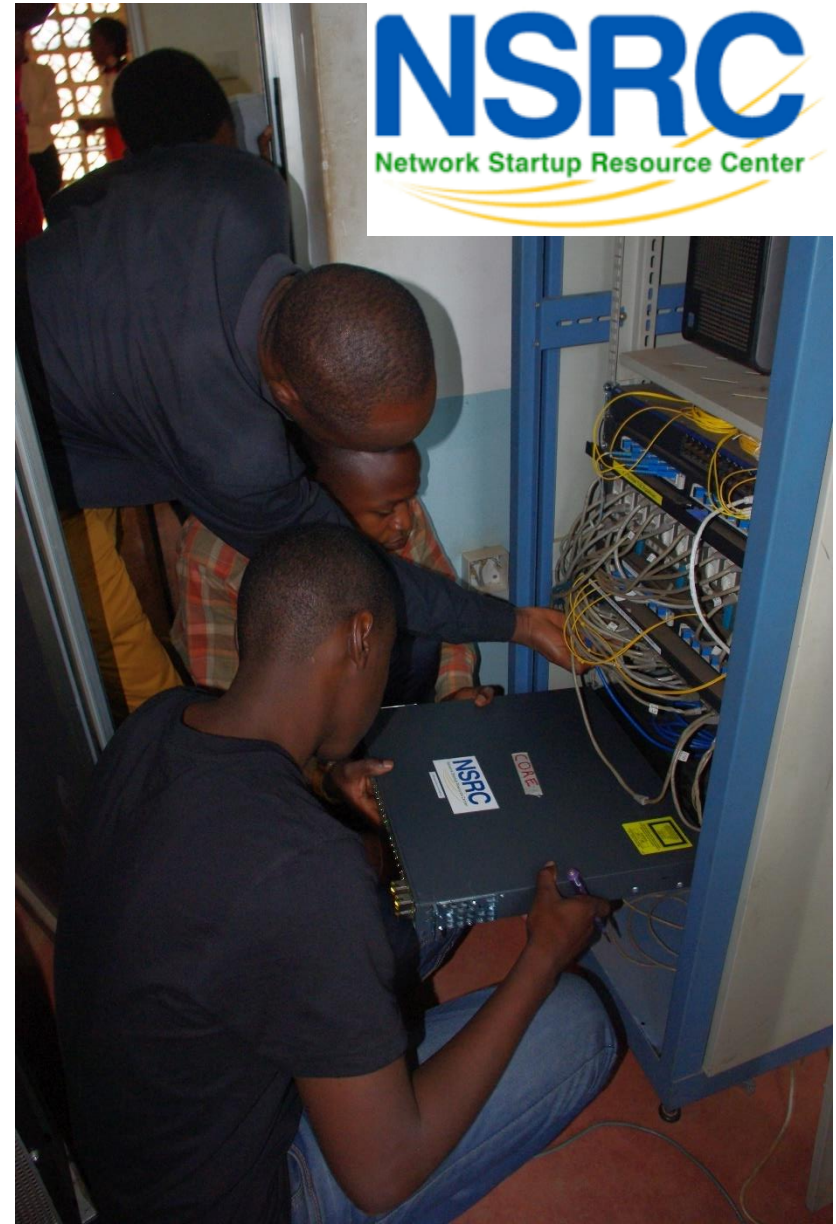
And what was/is the rationale?





RENU Capacity Building Program

- **10** residential workshops
- **240** attended residential workshops
- **3** online workshops
- **120** attended online
- **13** DEA campuses

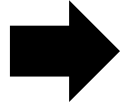


Internet
Society



Outcomes - Direct

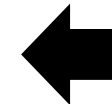
Before



| Building on Campus | Test Destination A NOC Building On campus | Test Destination B UCU Mukono Campus Off campus |
|--------------------|---|---|
| NOC Building | 94.2 Mbps | 2.35 Mbps |
| Annex A | 94.2 Mbps | 2.37 Mbps |
| Block A | 93.8 Mbps | 2.60 Mbps |
| Block D | 0.325 Mbps | 2.67 Mbps |
| Graduate Block | 0.453 Mbps | 2.65 Mbps |

| Building on Campus | Test Destination A NOC On campus | Test Destination B UCU Mukono Campus Off campus |
|--------------------|--|---|
| NOC Building | 94.2 Mbps | 90.9 Mbps |
| Annex A | 94.2 Mbps | 88.5 Mbps |
| Block A | 94.2 Mbps | 72.4 Mbps |
| Block D | 93.8 Mbps | 83.6 Mbps |
| Graduate Block | 94.0 Mbps | 87.6 Mbps |

After





Outcomes - Direct

| Institution | Bandwidth Before DEA | Bandwidth September 2017 |
|-------------------------------|-----------------------------|---------------------------------|
| Makerere University | 160 Mbps (2014) | 1000 Mbps |
| Uganda Christian University | 60 Mbps (2014) | 201 Mbps |
| Uganda Martyrs University | 30 Mbps (2015) | 95 Mbps |
| Islamic University in Uganda | 22 Mbps (2015) | 69 Mbps |
| Infectious Diseases Institute | 16 Mbps (2015) | 61 Mbps |
| Uganda Management Institute | 7 Mbps (2015) | 40 Mbps |
| Ndejje University | 6 Mbps (2015) | 36 Mbps |
| Gulu University | 5 Mbps (2015) | 30 Mbps |

Increased Bandwidth Subscriptions





Outcomes - Direct

- **Network Expansion I [Regions after DEA]**
 - East
 - Jan. 2015 – DEA at UCU Mbale Campus
 - Jul. 2015 – 3 campuses connected in Mbale
 - North
 - Mar. 2015 – DEA at Gulu University
 - Aug. 2015 – Gulu University connected
- **Network Expansion II [campuses after DEA]**
 - UCU – **5** campuses
 - UMU – **4** campuses
 - IUIU – **3** campuses
 - Ndejje – **3** campuses
 - IDI – **3** campuses

2015!

7 DEAs

30 Campuses





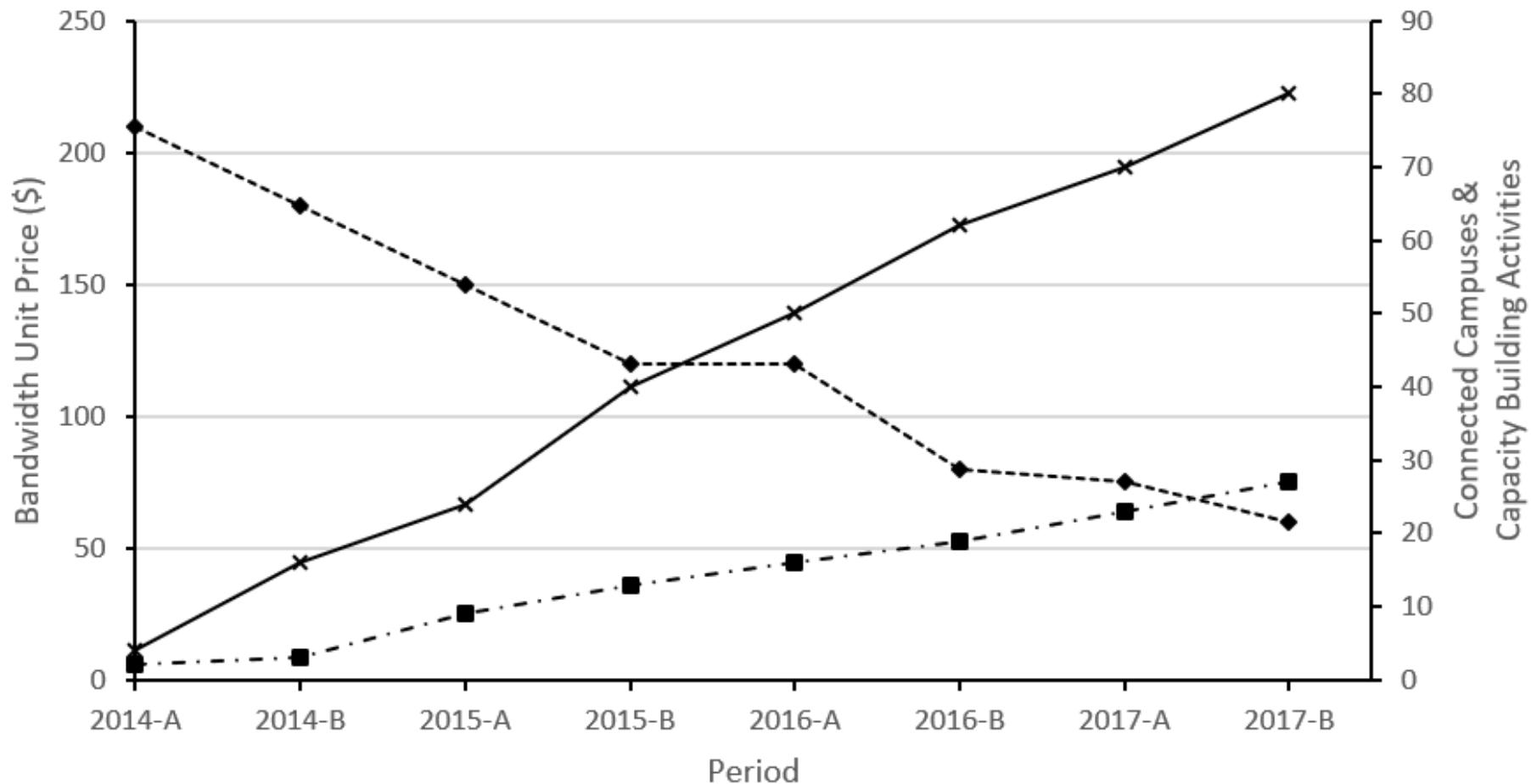
Outcomes - Direct

- **Services**
 - eduroam [**10** campuses]
 - Web and domain hosting [**15** campuses]
 - SSL certificates
 - Leased lines
- **Payment collection**
 - Residential workshops
 - Free
 - Only **25** participants!





Connected Campuses Capacity Building Activities Bandwidth Unit Price



---◆--- Unit Price (\$/Mbps/Month)

—×— Connected Campuses (No.)

- · ■ · - Capacity Building Activities (No.)





Outcomes - Indirect

- RENU not an ISP! (RENU best ally!)
 - Capacity building gave us edge over ISPs
- Community built
 - Problems can be solved internally and free
- Confidence and trust in NREN
- Regional collaboration
 - Kenya, Tanzania, Zambia, Ethiopia, Ghana
- Equipment sales for vendors
 - Over **100** Juniper nodes in RENU!





Challenges

- Aligning expectations
- Growing the core engineering unit
 - The better the busier!
- Good techies leave institutions
- Life after DEA
 - NO review program in place





Conclusion

- Good for emerging NRENs without government support
- Gives NREN edge over competition.
- Things get much easier with “***a community***”!
- Service affordability and reliability contribute greatly to growth
- Contribution of capacity building should not be underestimated!



THANK YOU !!!

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