Regional Internet Development Dialogue-Africa

Research and Education networks: Responding to the challenges of African Research

Regional Internet Development Dialogue-Africa

Kigali, Rwanda, 8-9 May, 2017

Pascal Hoba, PhD

CEO, Ubuntunet Alliance

OUTLINE OF THE PRESENTATION

❑Introduction & Challenges on ICT infrastructure

❑How RRENs & NRENs respond to the challenges of African Research

❑What's ubuntunet alliance actions?

❑Best Practices

❑Recommendations

Challenges that affect ICT infrastructure

History: February 2005: AAU General assembly in Capt Town

- Higher cost of Internet (Bandwidth)

- Inadequate infrastructure: In term of capacity and dedicated network for Higher Education and research institutions

- Poor quality of infrastructure of: Campus network, National Backbone infrastructure in many countries

How RREN & NRENs responded to African Reseach Challenges

Necessity to mutualize resources…on campus level, national level and regional level

- Necessity to create adequate ICT infrastructure: national fiber infrastructure

- Necessity to create dedicated Network for connectivity

- Training on bandwidth management

- National, regional and international collaboration as solution of African research challenges
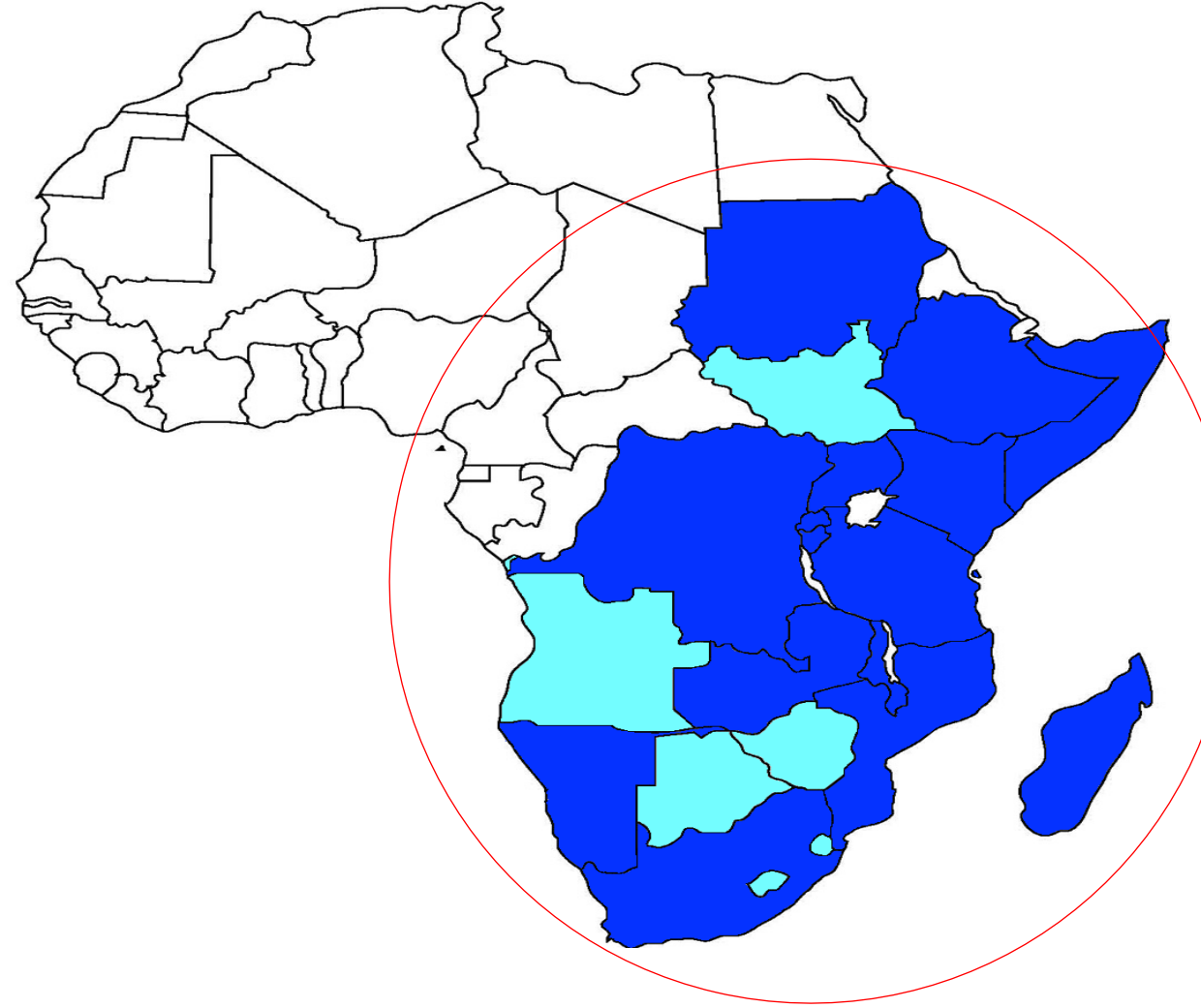
WHAT IS UBUNTUNET ALLIANCE ?

Education Network of ESA region

- **NRENs from 16 countries**
  - Eb@le, DRC
  - EthERNet, **Ethiopia**
  - iRENALA, **Madagascar**
  - KENET, **Kenya**
  - MAREN, **Malaw**i
  - MoRENet, **Mozambique**
  - XNet, **Namibia**
  - RwEdNet, **Rwanda**
  - SomaliREN**, Somalia**
  - SudREN, **Sudan**
  - TENET, **South Africa**
  - TERNET, **Tanzania**
  - RENU**, Uganda**
  - ZAMREN, **Zambia**
  - BERNET, **Burundi**
  - ZARNET **Zimbabwe**

WHERE ARE WE NOW? - CURRENT NETWORK

- **10 POPs in total**
  - ❑ **8** in Alliance region
  - ❑ **2** in Europe (London and Amsterdam)

- **Backbone covering 7 countries in ESA region**

- 2.18Gbps capacity between Africa PoPs and European PoPs
  - ❑ 2 links along the west coast
  - ❑ 2 links on the eastern coast

- **Some NRENs connecting directly to our European PoPs**
  - ❑ KENET(Kenya) – (approx. 4 Gbps)
  - ❑ TENET(South Africa) – 2 x 10Gbps
  - ❑ MoRENet (Mozambique) – 1xSTM-1
  - ❑ TERNET (Tanzania) – 1xSTM-1

Our current Network…

✓ Peering with GÉANT in London and Amsterdam

- **Transit to Research and Education community World-wide**

✓ Peering at **London** Internet exchange (LINX)

✓ Peering at **Amsterdam** Internet Exchange and (AMS-IX)

✓ Peering at **NAPAfrica** (Johannesburg)

✓ Transit to Internet at LINX and AMS-IX

Ubuntunet Alliance's Network Topology

What is an NREN?

- National Research and Education Networks (NREN) typically provide advanced congestion-free internet connectivity and services dedicated to support the work of universities and research institutes in a country.

- Vital to progress local and global education and research by providing e-learning and e-science applications (eg. telemedicine).

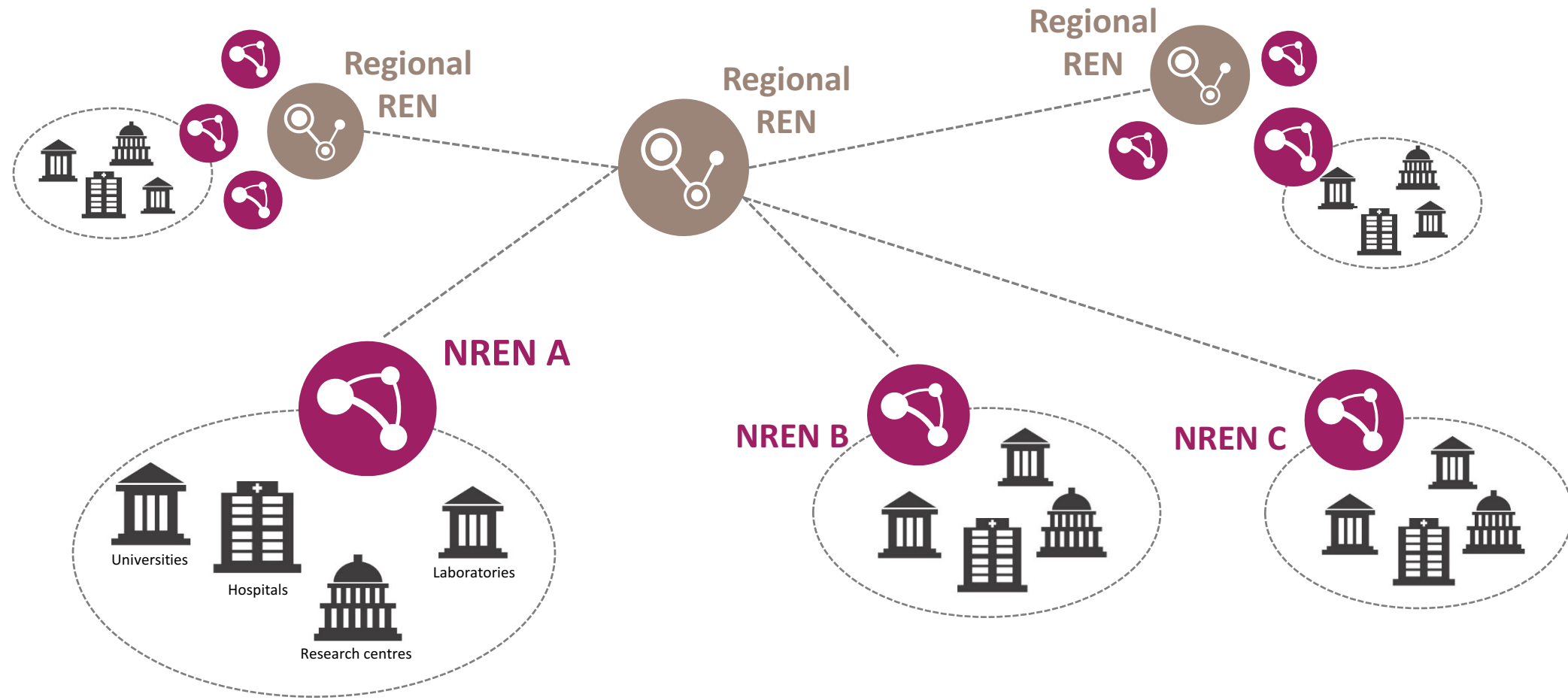- Over 100 NRENs worldwide, 33 in Africa.
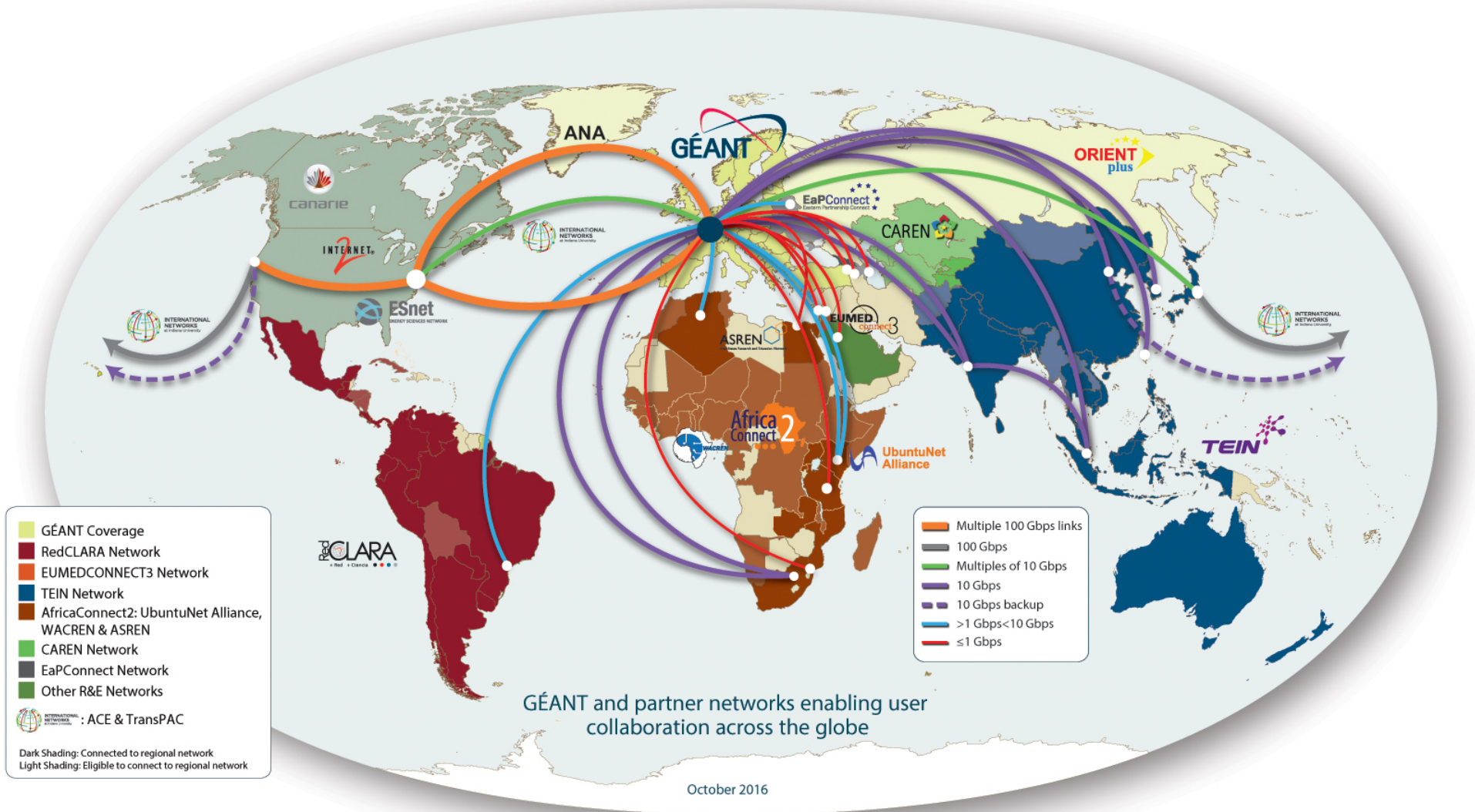
NRENs are SDG enablers

https://sustainabledevelopment.un.org/?menu=1300

How do NRENs connect students and researchers?

Regional REN

Regional REN

Regional REN

NREN A

Universities

Hospitals

Research centres

Laboratories

NREN B

NREN C

At the Heart of Global Research and Education Networking

GÉANT and partner networks enabling user collaboration across the globe

October 2016

Legend:
- GÉANT Coverage
- RedCLARA Network
- EUMEDCONNECT3 Network
- TEIN Network
- AfricaConnect2: UbuntuNet Alliance, WACREN & ASREN
- CAREN Network
- EaPConnect Network
- Other R&E Networks
- : ACE & TransPAC

Dark Shading: Connected to regional network
Light Shading: Eligible to connect to regional network

- Multiple 100 Gbps links
- 100 Gbps
- Multiples of 10 Gbps
- 10 Gbps
- 10 Gbps backup
- >1 Gbps<10 Gbps
- ≤1 Gbps

www.geant.org

Funded by the European Union

What is the situation in Africa

- 2011 – 2015: EU co-funded AfricaConnect project brought to life the 1st sustainable regional research and education network in Sub-Saharan Africa, interconnecting 7 NRENs and connecting the region to the rest of the world via the European regional network

Southern and Eastern Africa
DG DEVCO co-funding
2011-2015
ubuntunet-map-latest-may2015.jpg

- Started in 2015: AfricaConnect2 aims to build other sustainable regional networks in Africa to create a pan-African network fully connected to the global research and education network.
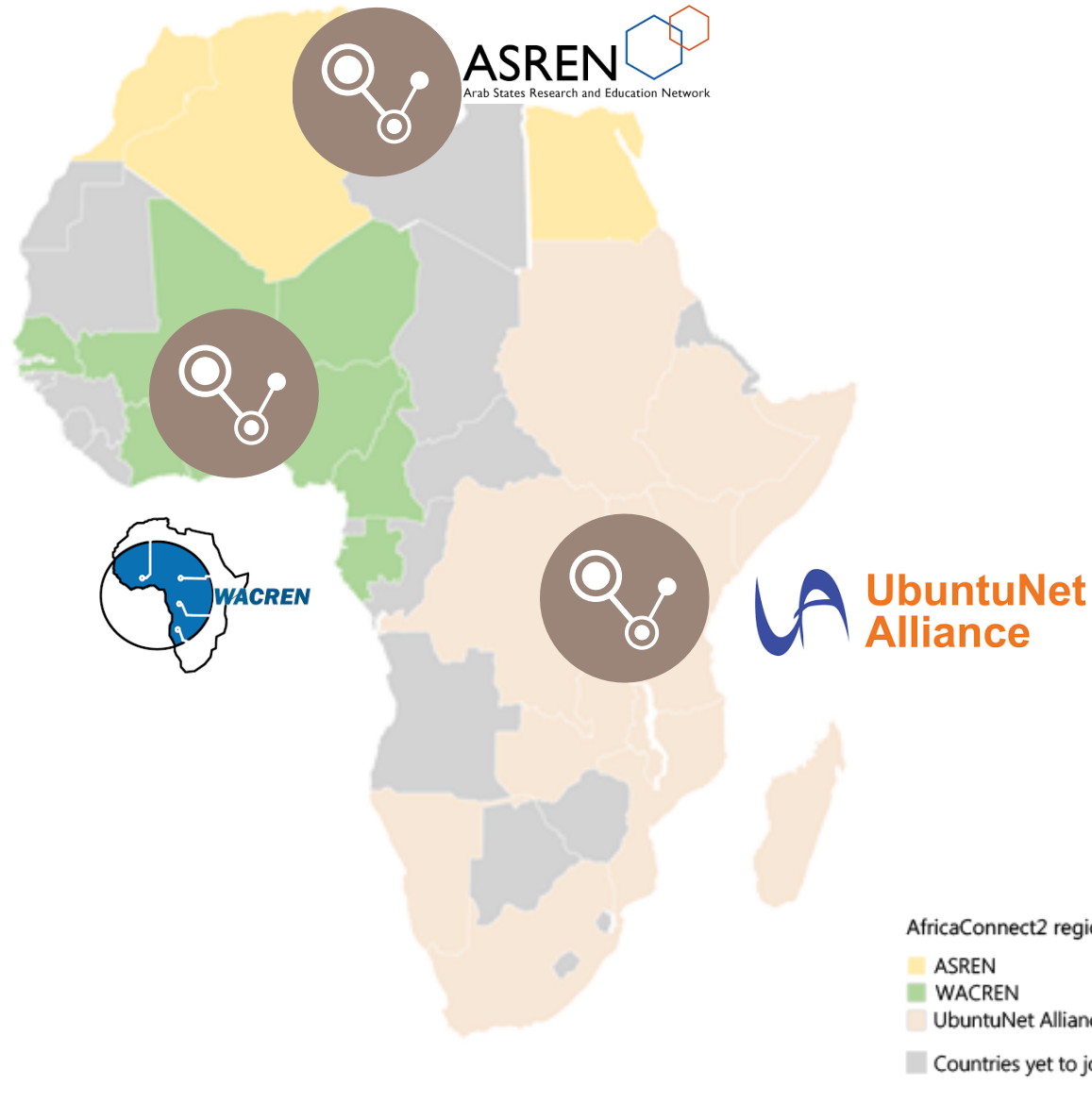

Pan-African
DG DEVCO co-funding
Started in 2015

What are the African regional partners involved?

- The regional approach allows to adapt to the size of the continent (nearly 3 times Europe) and its existing regional specificities (regulations, political integration, language, stage of NREN development, etc.) in order to facilitate the building of a viable pan-African network.

- The AfricaConnect2 project is self-inclusive, i.e. all interested and ready countries are invited to participate to expand the network.

- Interconnections will take place either via international routes and/or direct routes depending on costs and funding.
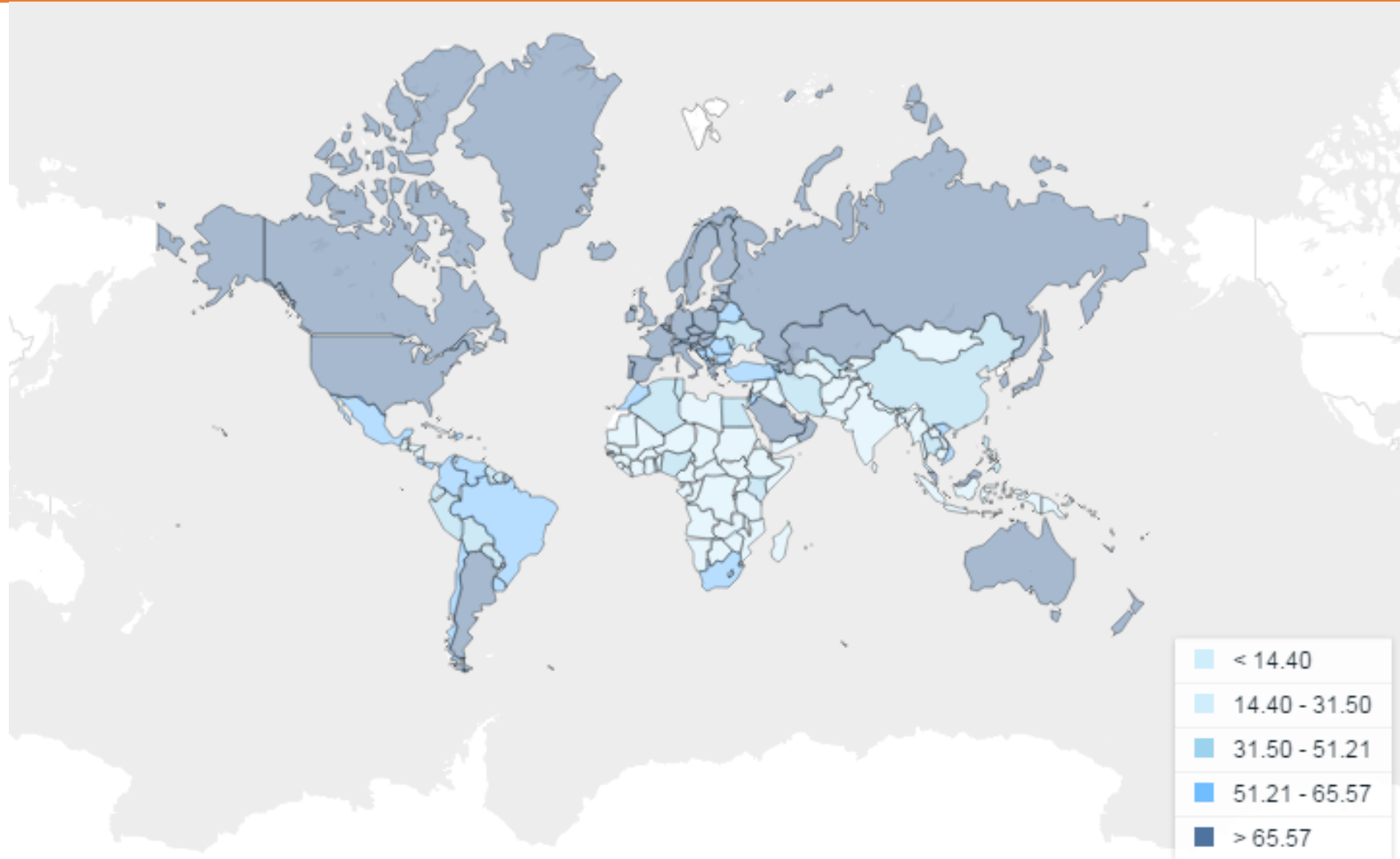

ASREN
Arab States Research and Education Network

WACREN

UbuntuNet Alliance

AfricaConnect2 regions coordinated by:

- ASREN
- WACREN
- UbuntuNet Alliance
- Countries yet to join

Why do we need these EU co-funded projects?

Africa is still the least connected continent on the planet
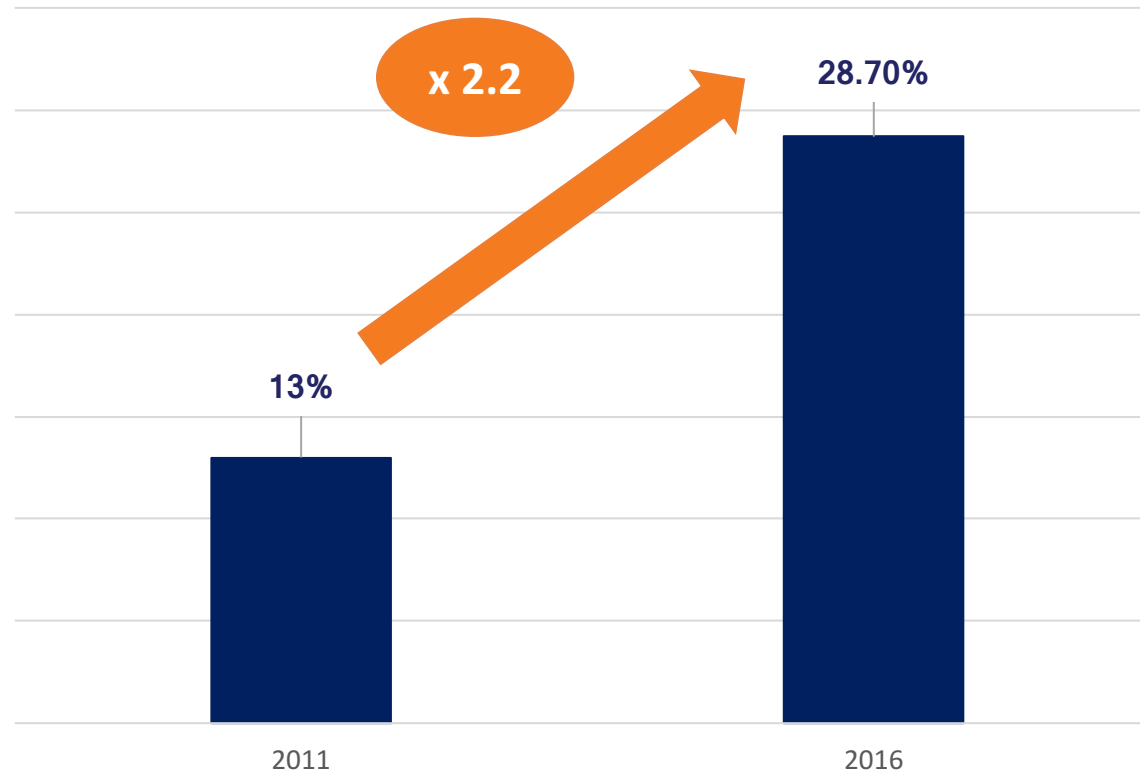

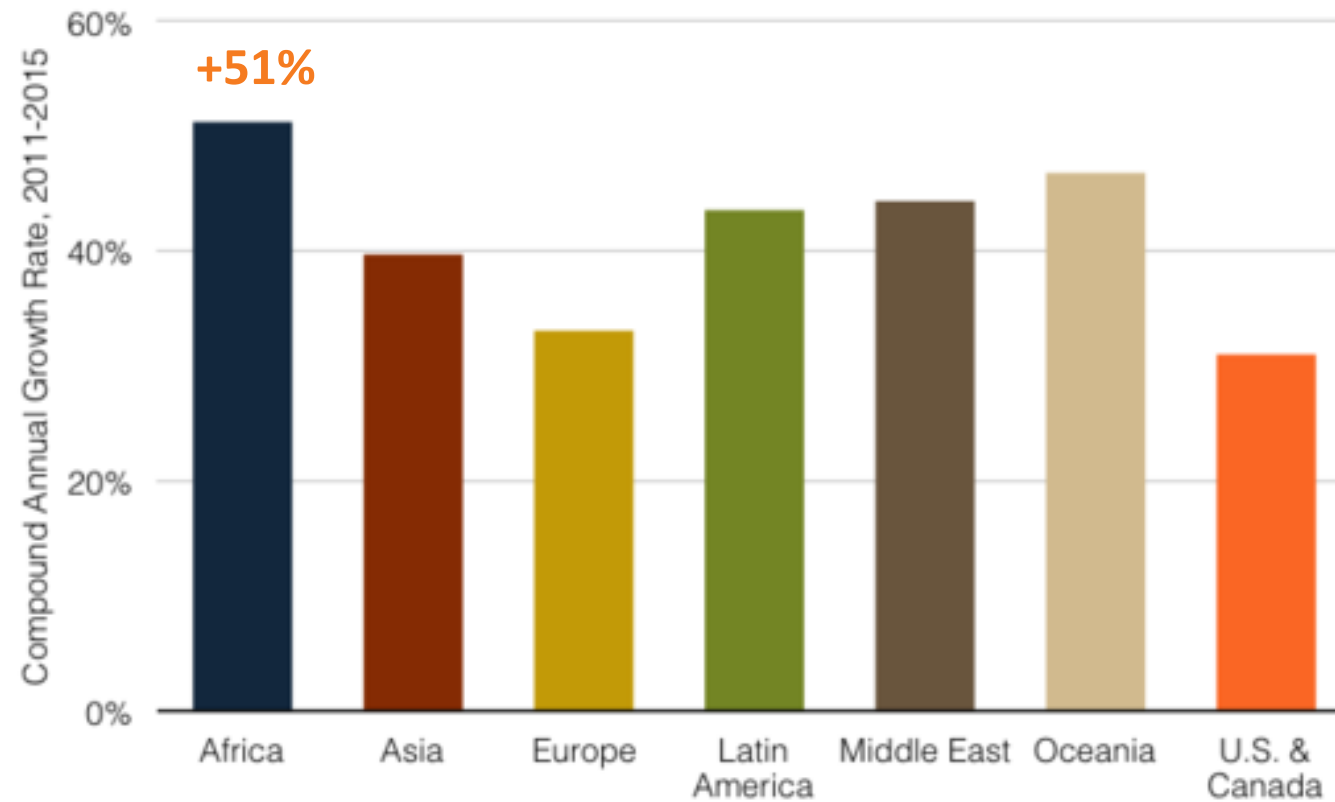|	
	< 14.40
	14.40 - 31.50
	31.50 - 51.21
	51.21 - 65.57
	> 65.57

2015
Source: World Bank

Africa internet penetration has more than doubled since 2011

x 2.2

28.70%

13%

2011

2016

Source: Internet World Stats – 30 June 2016

Africa internet capacity growth continues to lead world

+51%

Compound Annual Growth Rate, 2011-2015

Africa, Asia, Europe, Latin America, Middle East, Oceania, U.S. & Canada

Source: TeleGeography

Connected countries share high economies of scale

Before and After connecting to the EU-funded network

NRENs, Countries	Capacity growth	Cost drop (per Mb)
ZAMREN, Zambia 2011 / 2015	X60	-94%
RENU, Uganda 2012 / 2015	X8	-77%
ARN, Algeria 2003 / 2015	X55	-97%

Source: NRENs

Connecting African research and education communities

Connected Countries (NRENs)	Institutions (Higher Ed & Research)
ASREN North Africa	**154**
Algeria (ARN)	124
Egypt (EUN)	30
Ubuntunet Alliance	**513**
Kenya (KENET)	180
South Africa (TENET)	86
Mozambique (MoRENet)	83
Uganda (RENU)	42
Zambia (ZAMREN)	75
Tanzania (TERNET)	27
Rwanda (RwEdNet)	20
WACREN *Network under construction*	na
TOTAL 2016	**667**

- Out of 33 existing African NRENs, 9 are connecting over 650 institutions to the global research and education network:

  - training, developing and retaining local talents
  - helping to connect remote users
  - allowing international researchers and students to gain valuable input from their colleagues in Africa

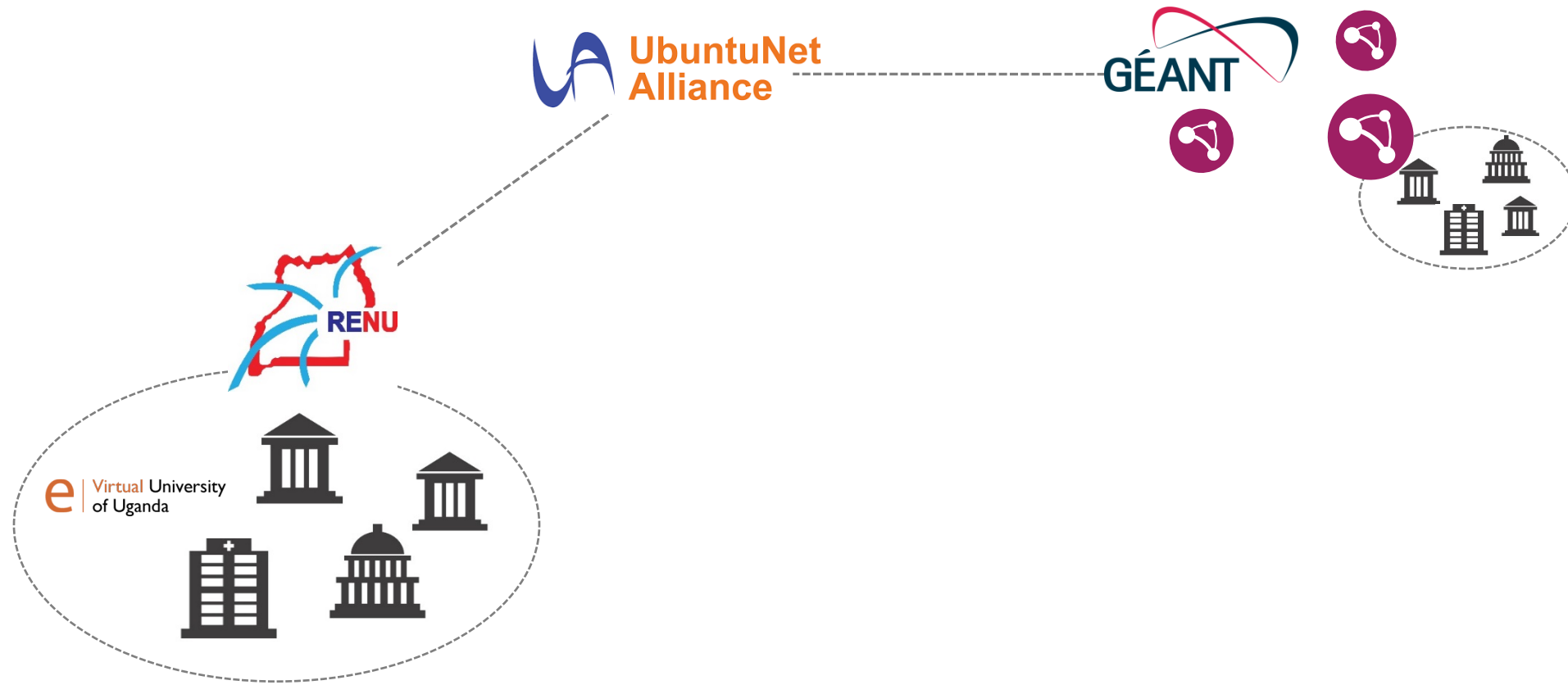All three regional networks are still being developed or consolidated

Enabling scientists to feed the world

- Challenge: Agriculture is a key driver of Sub-Saharan economy and at the heart of the food security challenge. One difficulty is identifying soils that are suitable for agriculture.

- Solution: Use the AfricaConnect network to access, process and modelize satellite maps to identify soil properties and classify lands.

- Benefit: Provide input to sustainable land management in Zambia.

Dr Lydia Chabala
How ZAMREN helped me advance my research
Click here to watch the interview

How do NRENs connect students and researchers?

Linking Students To The Global Community

- Free secure wifi provided by NRENs between campuses.

- A global network of users across 80 countries. Over 2 billion international authentications and counting

A worldwide success story

From its early beginnings 10 years ago as a joint venture between a few European universities to today – with millions of users in over 80 countries worldwide, eduroam has been an amazing success story and an example of research and education collaboration.

www.eduroam.org

eduroam in Africa

- 6 African NRENs have deployed eduroam
- 9 are conducting pilots

- Kenyatta university connects **70 000 students** thanks to eduroam

- In Zambia, **over 40 000** can access digital resources on and off-campus thanks to eduroam
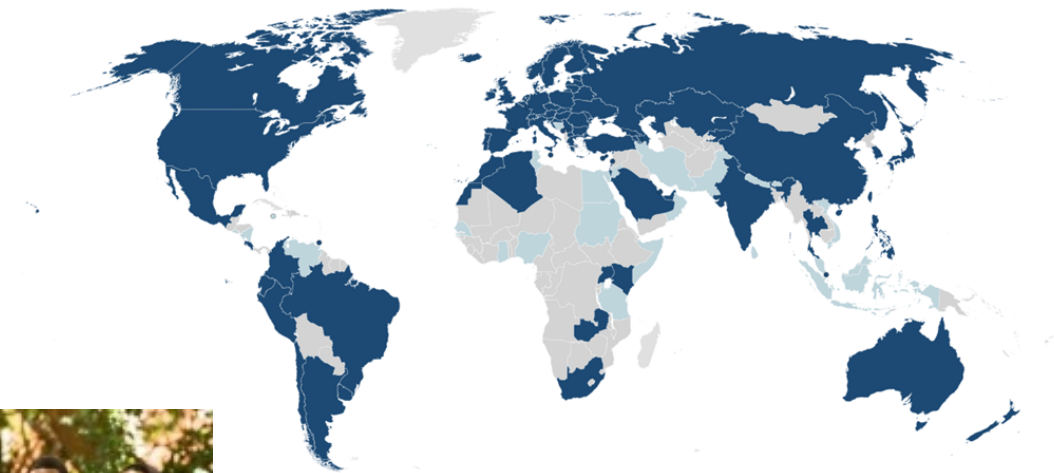
Legend:
Dark blue: eduroam; Light blue: eduroam pilots

Recommendations

National strategy on ICT infrastructures

African Governments support to RENs

Development partners contributions: EUC, World Bank, SIDA, ADB, AUC

Platform for research collaboration

Collaboration between African Higher Educations Institutions

Global strategy on ICT integration

Thank You For Your Attention
Merci Pour Votre Ecoute

To learn more visit: **www.africaconnect2.net**

Follow us on 🐦 📘 : **@AfricaConnect2**

For more information about the project partners:
http://ec.europa.eu/europeaid
www.geant.org
www.ubuntunet.net
www.wacren.net
www.asrenorg.net

African Earth Observation Group

- Challenge: ensure scientists, regulators and technology work together to tackle climate change.

- Solution: GROUP ON EARTH OBSERVATIONS AfriGEOSS supported by Africa Connect 2

- Benefit: speed up global research on climate change (incl. water management and food security) by allowing pan-African and international exchange of earth observation data.

13 CLIMATE ACTION

Land preservation in Morocco

- <u>Challenge</u>: Agadir protected UNESCO Biosphere Reserve plays a key part in Morocco's fruit and vegetables export BUT the land is very vulnerable to man-made and climatic changes.

- <u>Solution:</u> Moroccan and French researchers have used the Eumedconnect network to download, process and analyse satellite images to produce thematic maps of the area.

- <u>Benefit:</u> Monitor land cover, water resources or the progress of natural hazards, which could have socio-economic impact on the region.

3 GOOD HEALTH AND WELL-BEING
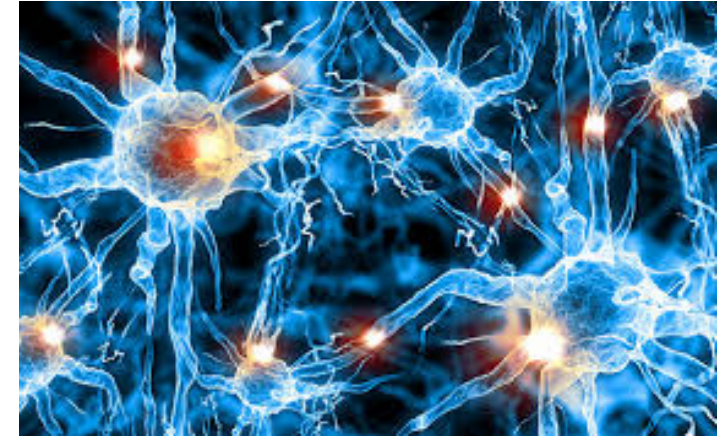
Cancer Research in Northern Africa

- Challenge: a cure for cancer is possible but depends on how well researchers are supported and can work together.

- Solution: an e-learning portal, The EuMed Cancer – GeMed network, deployed under Eumedconnect2 allowed cancer research students in Northern Africa to get specialist training and interact with their peers in Europe.

- Benefits:
  - remote training, empowering local students (over 130)
  - international collaboration contributing to global cancer research

3 GOOD HEALTH AND WELL-BEING

Treatment of epilepsy in Tunisia:

- Challenge: 50 million people worldwide have epilepsy. Most people with epilepsy living in low- and middle- income countries do not get appropriate treatment.

- Solution: Eumedconnect2 allowed Tunisian surgeons to collaborate remotely with their French colleagues using **e-telemedicine** applications to diagnose and surgically treat epilepsy patients.

- Benefit:
  - More patients able to get correct diagnosis and treatment locally, preventing seizure occurrences.
  - Surgeons in Tunisia could advance their work remotely saving time and money.

Thalassaemia research in Northern Africa

- Challenge: Thalassaemia is a potentially life-threatening affection common amongst populations originating from the European and the North African margins of the Mediterranean.

- Solution: EU-funded ITHANET project (Electronic infrastructure for Thalassaemia Research Network) used the Eumedconnect2 network to allow researchers in Europe and Northern Africa to work together to improve diagnosis, treatment and drugs.

- Benefit: Hundreds of people were able to receive correct diagnosis and appropriate treatment locally.
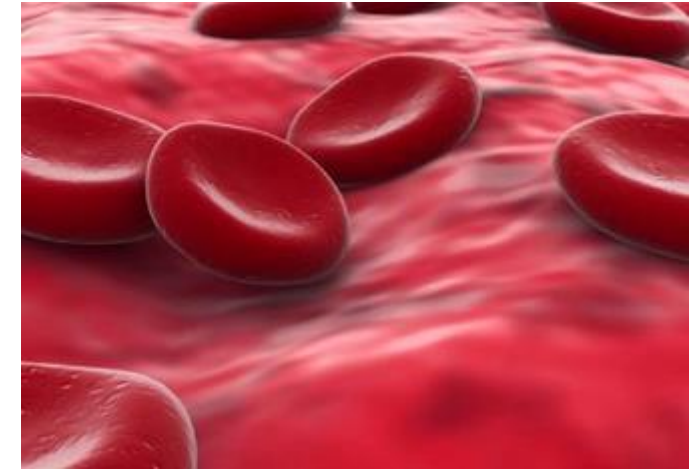
Funding

The total budget for AfricaConnect2 is €26.6m for a period of 3.5 years, with €20m being contributed by the European Commission's Directorate-General International Cooperation and Development (DG DEVCO). The remaining funds (€6.6m) are being provided by the African partners.

Co-funding model by region

	EC (Max %)	African partners' contribution
North Africa	60%	40%
West and Central Africa	80%	20%
Eastern and Southern Africa	75%	25%

To learn more visit: www.africaconnect2.net