

# Deploying Educational Roaming (eduroam) in a Rural Research Institution in Rakai, Uganda; Challenges and Lessons Learned

Lloyd SSENTONGO<sup>1,2</sup>, Rodgers KIMERA<sup>1,2</sup>, BenKAKEETO<sup>1,2</sup>, Moses MUBIRU<sup>1,2</sup>, Brian K MOYER<sup>1</sup>, Matthew ECONOMOU<sup>3</sup>, Christopher J WHALEN<sup>1,3</sup>, Michael TARTAKOVSKY<sup>3</sup>

<sup>1</sup>. *Research Data and Communication Technologies, Inc., Garrett Park, MD, USA*

<sup>2</sup>. *Rakai Health Sciences Program, Uganda Virus Research Institute, Masaka-Mutukula Road, Kalisizo, Uganda*

<sup>3</sup>. *Office of Cyber Infrastructure and Computational Biology, National Institute of Allergy and Infectious Diseases, National Institutes of Health, 5601 Fishers Lane, Rockville, MD 20852*

## Abstract

The NIAID International Center for Excellence in Research (ICER) in Uganda, RHSP (Rakai Health Sciences Program) recently deployed the eduroam service at the laboratories and offices in the village of Kalisizo and the main offices at Entebbe. Eduroam is a global framework to allow academics and researchers to have wireless access from any participating institution. An acronym for *educational roaming*, eduroam is a user friendly solution that provides a common WiFi network (SSID) at all participating universities and research organizations. Unlike the typical model of “guest” networks, this system provides a real identity to which network administrators and security staff can map both traffic and activity. There are clearly defined structures in place for reporting inappropriate activity to the home institution. The deployment of eduroam by the Office of Cyber Infrastructure and Computational Biology at the Ugandan ICER faced challenges and taught the team a number of lessons. The implementation began May 2016 in a test environment and was one of the first organizations to do so in Uganda. We share our experience in as far as challenges and lessons learnt.

**Keywords:** eduroam, RENU, GEANT, NAPTR, NREN, RADIUS server,

## 1. Background

All national roaming authentication traffic is aggregated into a national proxy server and all international roaming traffic is aggregated into a set of international proxy servers. This model works under most circumstances though there are drawbacks in efficiency and a lack of flexibility when it comes to routing realms which do not fit into the national aggregation model because they do not use the national ccTLD (country code Top Level Domain such as .us, .uk, .ug, .ml) ending of their federation (e.g. realms in ".net", ".org", etc.). Such was the case for the RHSP which uses rhsp.org. Dynamic Discovery places routing hints towards the responsible authentication server or national proxy into DNS, making routing more efficient. As an IdP (Identity provider), the RHSP IT staff had to ensure our realm is dynamically discoverable by adding a single resource record into our domain's DNS zone.

While adding this DNS record is optional, it has advantages in that it reduces the time it takes to authenticate users when roaming internationally, so eduroam operations recommend to add these records if your national federation supports dynamic discovery protocol

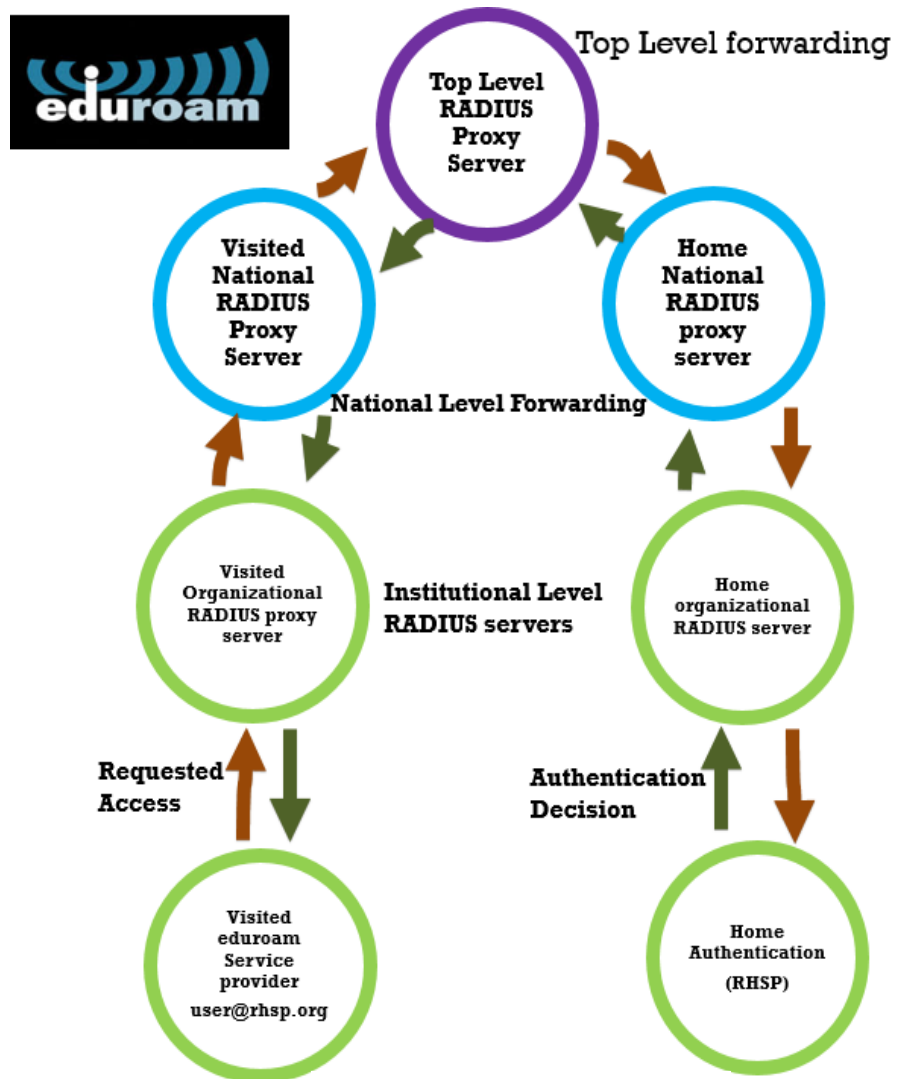


Figure: 1 Eduroam radius hierarchy

## 2. How eduroam wireless infrastructure works

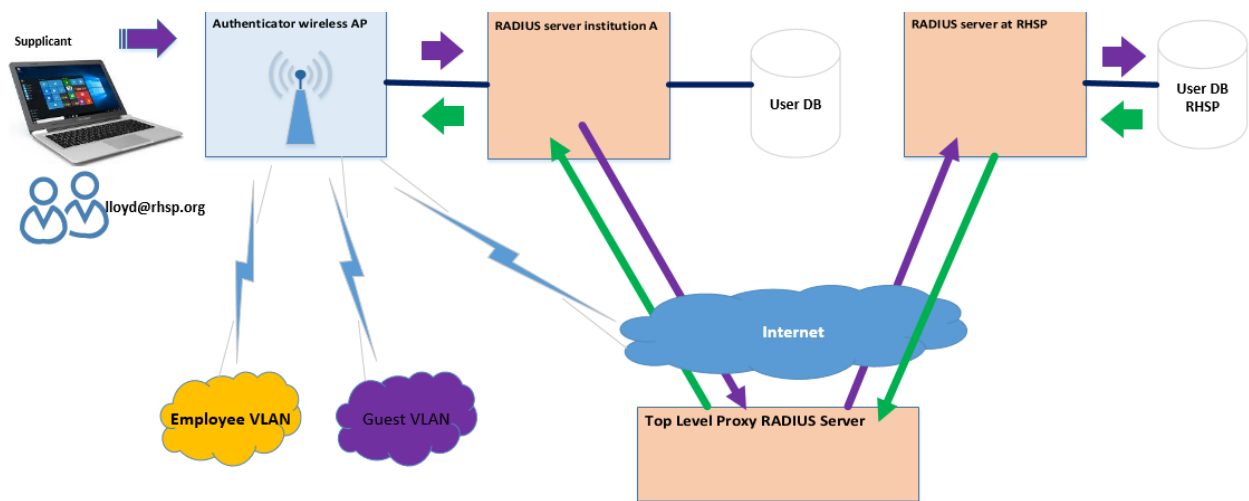


Figure: 2 eduroam infrastructure

The guest user LLOYD from the institution RHSP wants to use institution A's eduroam wireless network.

LLOYD will provide his credentials to the authenticator (here the wireless Access Point of institution A). The credentials are constituted by a username and a realm; it looks like an email address. (That is: lloyd@rhsp.org)

The AP asks institution A's RADIUS server if LLOYD can access the network using the provided credentials.

The RADIUS server notices that the realm is not one it can serve itself.

It will then forward the request to the national top level RADIUS proxy server.

If the realm belongs to a national institution, then the national top level RADIUS proxy forwards the request to the institution serving the realm.

If this is not the case, the national RADIUS server will forward the request to the European top level RADIUS server that will forward the request to the appropriate national proxy RADIUS.

In this case, the request is sent to the institution RADIUS server at RHSP.

User LLOYD is given access to the WiFi network

### 3. Resolving National roaming issues by Adding Dynamic Discovery hints

to determine which discovery target name they had on their national RAIDUS proxy server. The target name entered at RENU had to be the same as the value in our DNS entry. Added Dynamic Discovery hints to our DNS zone of record type Network Authority PoinTeR (NAPTR) and this entry enabled RHSP users roam at eduroam participating institutions in Uganda.

#### 3.1 How NATPR works

NAPTR record is a generic entry to any kind of service. It specifies which service a particular NAPTR entry is for, how that service is handled and who is handling it. It also provides basic failover and load-balancing mechanisms; there can be multiple NAPTR entries for the same service, with different priority and different weighting.

### 4. Resolving international roaming issues by adding an exemption for rhsp.org at the European Top Level radius server

Because RHSP does not use the Country code Top Level Domain(.ug) ending its federation , the European Top Level Radius (ETLR) Servers did not know how to route traffic for rhsp.org user accounts roaming outside Uganda. Through the Uganda National NREN (National Research and Educational Network) RENU, we did request GEANT (pan-European data network for the research and education community) to put an exemption at their ETLR servers so that international roaming traffic for rhsp.org users is routed back to the Ugandan national NREN which is then routed back to RHSP to authenticate user credentials before the roaming user gets access to internet.

### 5. Testing

Eduroam was tested to be working at the locations below using rhsp.org login credentials.



## **Acknowledgements**

The authors wish to acknowledge the following for their efforts towards the success of this project.

Brook Schofield, GEANT

RENU – Research and Educational Network Uganda

Dr. Fred Nalugoda – RHSP program Director

