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Directorate C: Excellence in Science
Unit C1: e-Infrastructure



Deliverable 4.6

eduroam Implementation



A project of the Seventh
Framework Programme (FP7)



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Abstract: This document describes how was the deployment of eduroam in two RedCLARA NRENs and their eduroam interoperability and interoperation with Latin America Confederation.



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For more information on ELCIRA, its partners and contributors please see <http://elcira.redclara.net> (this website will be available in October 1st 2012).

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TABLE OF CONTENTS

COPYRIGHT NOTICE	2
DELIVERABLE ROUTE	3
1.- Introduction	5
2.- Implementation process	6
3.- Recognition of the Compliance Statements	7
4.- Argentina	9
4.1 Project Team in argentina	9
4.2 Training	9
4.3 Eduroam-Architecture in argentina	9
5.- Ecuador	12
5.1 Project Team in Ecuador	12
5.2 Training	12
5.3 Eduroam-Architecture in Ecuador	12
6.- Eduroam monitoring	14
6.1 Overview	14
6.2 Data collection	15
Appendix 1: Schema for <a href="http://www.eduroam.<tld>/general/realm.xml">http://www.eduroam.<tld>/general/realm.xml	16
Appendix 2: Schema for <a href="http://www.eduroam.<tld>/general/institution.xml">http://www.eduroam.<tld>/general/institution.xml	18
Appendix 3: Schema for <a href="http://www.eduroam.<tld>/usage/realm_data.xml">http://www.eduroam.<tld>/usage/realm_data.xml	22
Appendix 4: Schema for <a href="http://www.eduroam.<tld>/usage/realm_usage.xml">http://www.eduroam.<tld>/usage/realm_usage.xml	23
Appendix 5: Schema for <a href="http://www.eduroam.<tld>/usage/institution_usage.xml">http://www.eduroam.<tld>/usage/institution_usage.xml	24
Appendix 6: eduroam statement	25



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1.- INTRODUCTION

This document has the objective to present how the implementation of eduroam in two RedCLARA's NRENs (INNOVARED – Argentina and CEDIA – Ecuador) was made.

As described in the deliverables “D4.3 Virtual course for technical staff training and eduroam pilot deployment”, “D4.4 Pilot eduroam Infrastructure for training purposes” and “D4.5 Report on eduroam preparation Deploying an eduroam Federation”, ELCIRA team has worked together with INNOVARED, CEDIA, INICTEL-UNI (Peru), and RENATA (Colombia) in order to increase the number of Roaming Operators (ROs) in the Latin America.

Although INICTEL-UNI is not an ELCIRA member, the participations of José Luis Quiroz Arroyo and Javier Richard Quinto Ancieta were fundamentals to help ELCIRA reach the goals. They help us to make some person to person pressure and support, besides that, they also work operating the FTLRS (Federation Top Level RADIUS Server) of Latin America, located in the RedCLARA's datacentre in Miami.

The Figure 1 and Figure 2 are comparing the eduroam coverage in the months of September 2012 and October 2013.

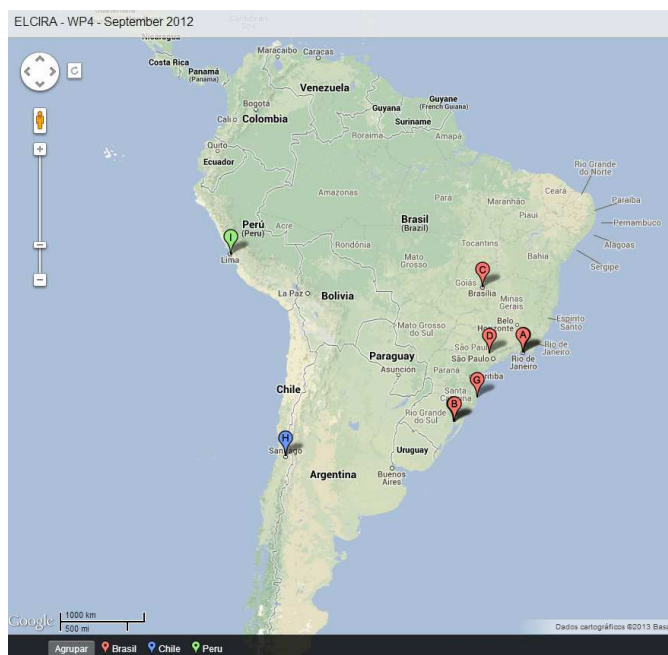


Figure 1: eduroam coverage in September 2012.



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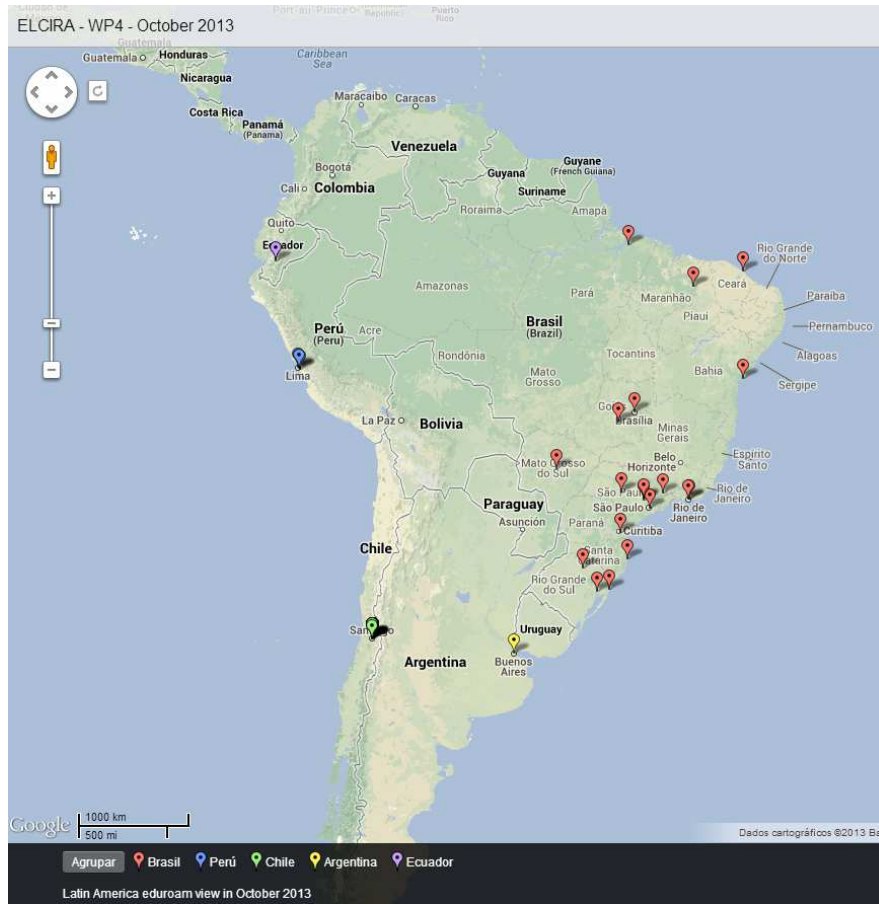


Figure 2: eduroam coverage in October 2013.

2.- IMPLEMENTATION PROCESS

After the online course has been completed, the NREN’s technical team started to work in their own federations in order to have all infrastructure and documentation ready to create a roaming operator for their countries.

In Brazil, eduroam was implemented after the Identity Federation, CAFe, but in the ELCIRA was not possible to follow the same way, because the knowledge gap was bigger and a little more difficult to explain the effort to create an Identity Federation with no service associate yet. Therefore, the project team has decided to work separately, eduroam and Identity Federation.

After some months, the project has reach with Argentina, Costa Rica and Colombia with all details ready to have eduroam working in their countries. Mexico has shown very anxious in implement



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eduroam there too, but they are focusing in Identity Federation first and then eduroam. Uruguay has all infrastructure ready too, but before they have some political issues to be solve.

3.- RECOGNITION OF THE COMPLIANCE STATEMENTS

A list of current and potential Roaming Operators (ROs) is available at:
<https://confluence.terena.org/display/GeGC/eduroam+Roaming+Operators>.

As the page referenced above is restricted for GeGC members, the information about those Roaming Operators is listed below:

Country/ Economy	ccTLD	Roaming Operator	Signed Statement	Notes
Argentina	(.ar)	INNOVARED	✓ Accepted 2013-08-23	RedCLARA/ELCIRA
Ecuador	(.ec)	CEDIA	✓ Accepted 2013-08-23	RedCLARA/ELCIRA (66th)
Colombia	(.co)	RENATA	✓ Accepted 2013-08-23	RedCLARA/ELCIRA
Mexico	(.mx)	CUDI	✓ Accepted 2013-08-23	RedCLARA/ELCIRA

Compliance Statements were received from the following countries:

- Costa Rica (RedCONARE)
- Argentina (INNOVARED)
- Colombia (RENATA)
- Mexico (CUDI)
- Ecuador (CEDIA)

The Figure 3 shows the number of eduroam hotspots in Latin America, available at:
http://monitor.eduroam.org/eduroam_map.php?type=levels, and the Figure 4 shows the table of available domain and XML files, accessible at: <http://monitor.eduroam.org/database.php>.



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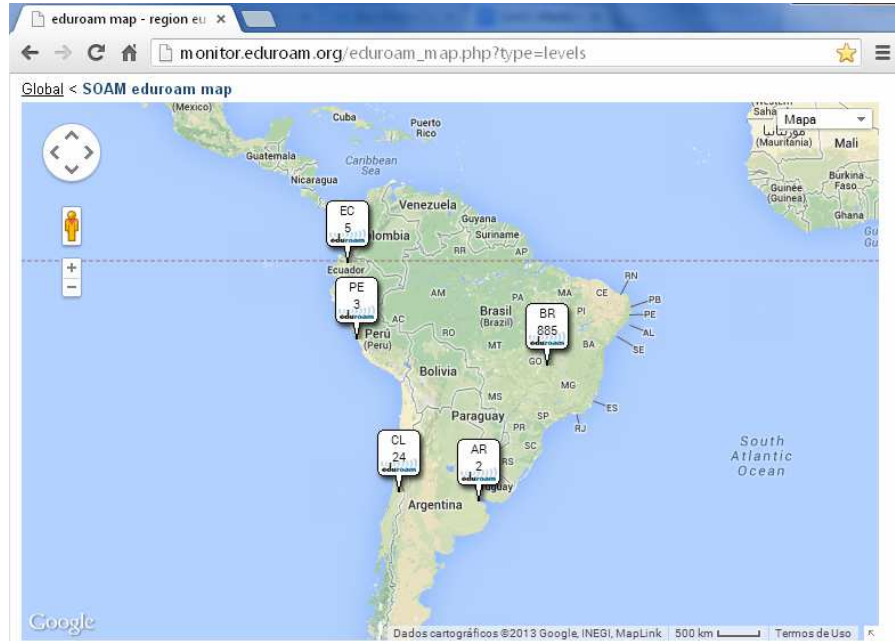


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Figure 3: number of eduroam hotspots in Latin America.



Country	PO	www	RE	IN	RE_DA	RE_US	IN_US
ad	1	1	1	1	-1	-1	-1
am	1	1	1	1	-1	-1	-1
ar	3	1	1	1	-1	-1	-1
at	1	1	1	1	-1	-1	-1
au	3	1	1	1	-1	-1	-1
az	1	-1	-1	-1	-1	-1	-1
be	1	1	1	1	-1	-1	-1
bg	1	1	1	1	-1	-1	-1
br	3	1	1	1	-1	-1	-1
by	1	1	1	1	-1	-1	-1
ca	3	1	1	0	-1	-1	-1
ch	1	1	1	1	-1	-1	-1
cl	3	1	1	1	-1	-1	-1
cy	1	1	-1	-1	-1	-1	-1
cz	1	1	1	1	-1	-1	-1
de	1	1	1	1	-1	-1	-1
dk	1	1	1	1	-1	-1	-1
ec	3	1	1	0	-1	-1	-1
ee	1	1	1	1	-1	-1	-1

Figure 4: table of available domain and XML files.

Code results are -1 data is not present, 0 data is present but not valid, 1 data is present and valid.

In case of policy (PO) 1 = country signed European eduroam policy document and 3 = country signed GeGC compliance statement.

For www.eduroam.TLD (www) -1 mean no DNS entry for domain, 0 DNS entry is present, but no WEB server, and 1 domain is present and WEB server is available.

Source: <http://monitor.eduroam.org/database.php>



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4.- ARGENTINA

4.1 PROJECT TEAM IN ARGENTINA

- Marcelo Cancer and Angel Martinez (installation, implementation and training institutions).
- Fernando Moreno (mounting the eduroam website).

4.2 TRAINING

- Through eduroam courses taught by the RedCLARA network in 2012 and 2013.

4.3 EDUROAM-ARCHITECTURE IN ARGENTINA

The infrastructure used on eduroam network in Argentina has been installed, hosted and administered by **INNOVARED**, the Argentinean National *Research and Education Network (NREN)*, and is shown below in the Figure 5 and Figure 6.

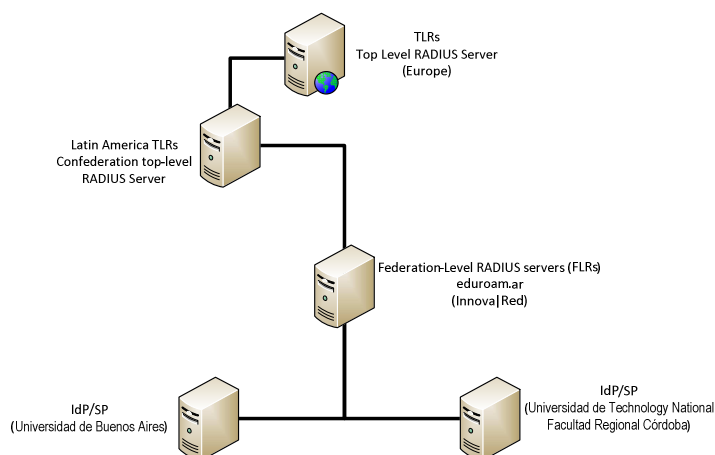


Figure 5: Architecture of pilot.



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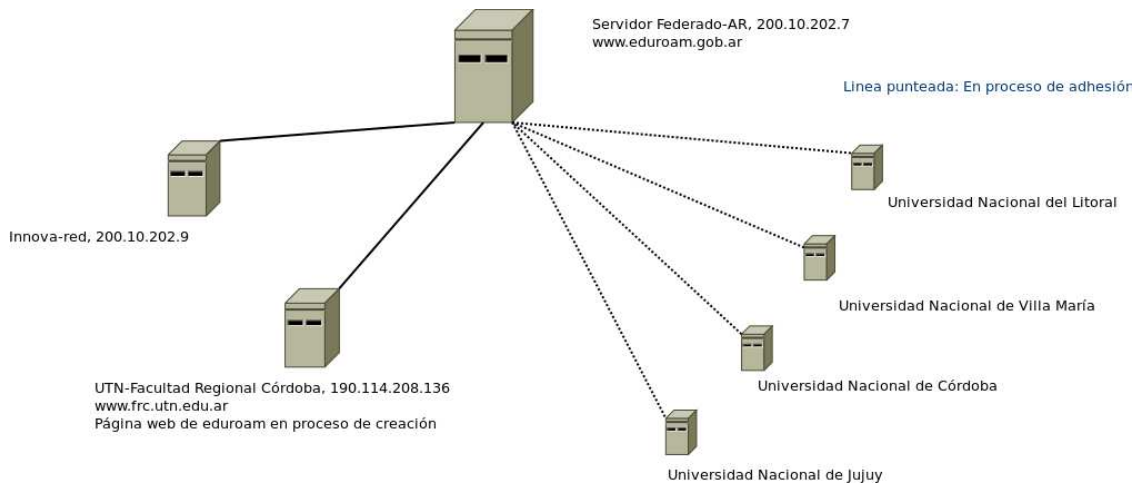


Figure 6: Architecture of eduroam in Argentina (production state).

The Figure 7 shows the webpage from eduroam in Argentina, available at: <http://www.eduroam.gob.ar/>.



Figure 7: Webpage from eduroam in Argentina.



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The Figure 8 shows the eduroam coverage in Argentina, available at:
<http://www.eduroam.gob.ar/?q=Mapa%20de%20presencia>.

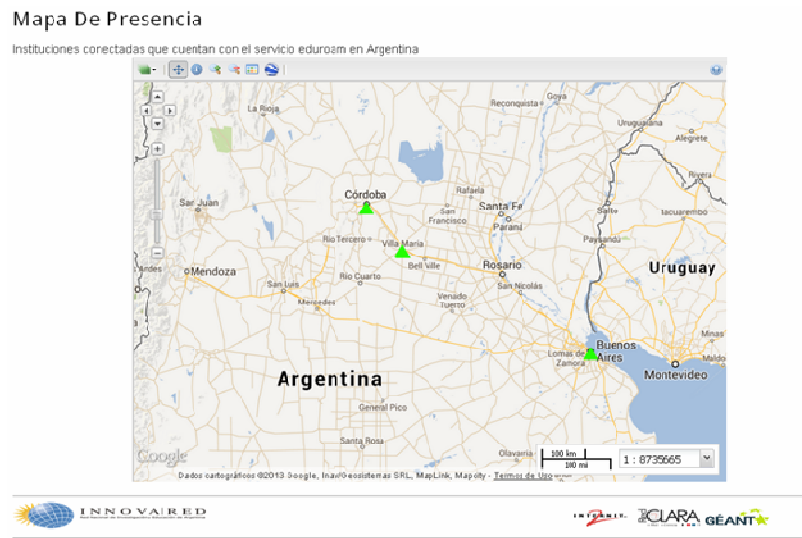


Figure 8: eduroam coverage in Argentina



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5.- ECUADOR

5.1 PROJECT TEAM IN ECUADOR

- Claudio Chacón (installation, implementation and training institutions).

5.2 TRAINING

- Through eduroam courses taught by the RedCLARA network in 2012 and 2013.

5.3 EDUROAM-ARCHITECTURE IN ECUADOR

The infrastructure used on eduroam network in Ecuador has been installed, hosted and administered by CEDIA, the Ecuadorian National *Research and Education Network (NREN)*, and is showed below in the Figure 9.

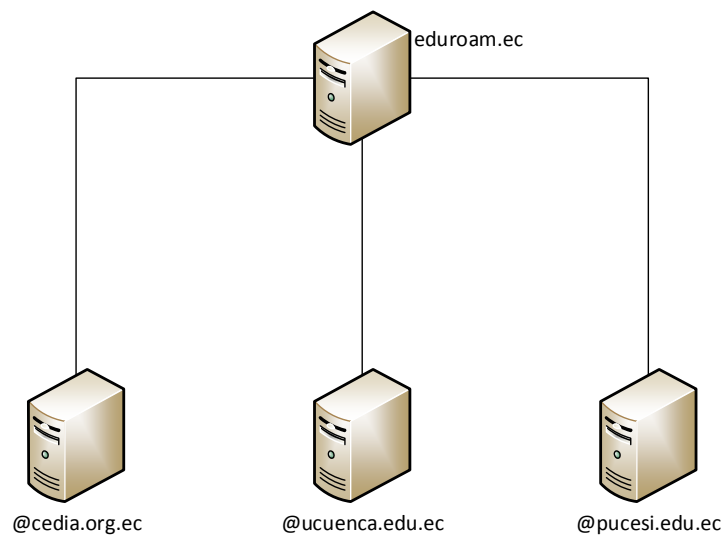


Figure 9: Architecture of eduroam in Ecuador.



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The Figure 10 shows the webpage from eduroam in Ecuador, available at:
<http://www.cedia.org.ec/index.php/grupos-y-comunidades/grupos/eduroam>.



Figure 10: Webpage from eduroam in Ecuador.

The Figure 11 shows the eduroam coverage in Ecuador, available at:
http://monitor.eduroam.org/eduroam_map.php?type=levels.

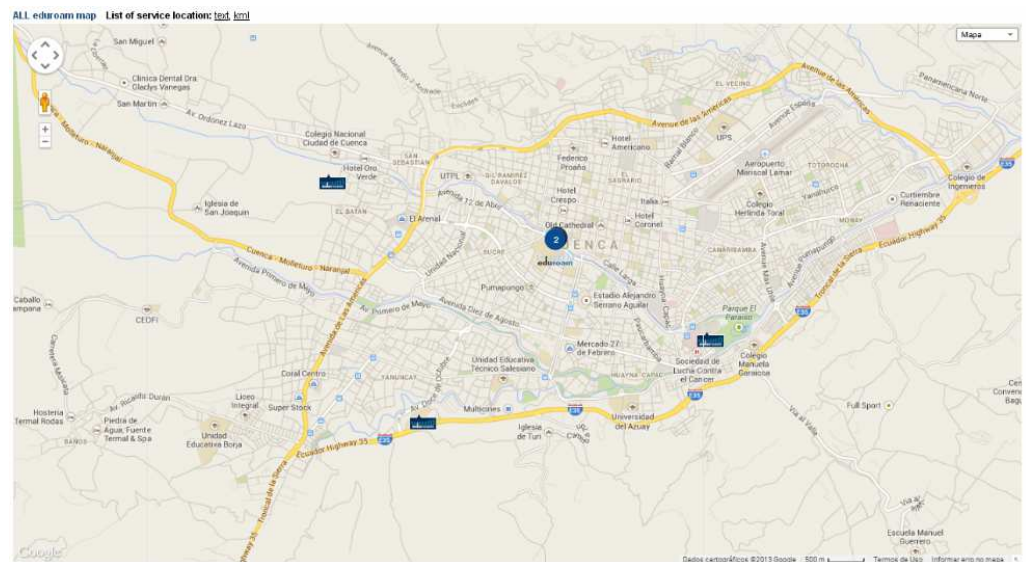


Figure 11: eduroam coverage in Ecuador.



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6.- EDUROAM MONITORING¹

6.1 OVERVIEW

The eduroam database is introduced in order to provide necessary information needed for operation of the eduroam service. The eduroam database will be built as a central database but with the mechanism that enables automatic data collection from NROs (National Roaming Operators). It is the task of GÉANT SA5 group to finalize the design of eduroam database and ensure its properly implemented and duly filled with respective information. The eduroam OT should provide proper maintenance and tools in order to ensure day to day operations of the eduroam database as well as it's connection with other elements of eduroam service (i.e. web site).

The information stored in the eduroam database includes:

- NRO representatives and respective contacts.
- Local-institutions (both SP and IdP) official contacts.
- Information about eduroam hot spots (SP location, technical info).
- Monitoring information.
- Information about the usage of the service.

The access to the database will be provided via eduroam web site with the different access rights in relation to the use cases.

Whole eduroam database can be divided into 3 main parts:

- general data.
- monitoring data.
- usage data.

The general data part is used to store information about the:

- NRO representatives and respective contacts.
- institutions (both SP and IdP) official contacts.
- eduroam hot spots (SP location, technical info).

The general and usage data will be collected from the NROs on regular basis. It is envisaged that the usage data will be collected monthly while general data will be refreshed weekly or on NROs demand. Monitoring data will be automatically acquired from the monitoring system.

NROs should provide general and usage data in the defined XML format. The data should be available at the specified URL (<http://www.eduroam.<tld>/usage/> for usage data and <http://www.eduroam.<tld>/general/> for general data) which should be accessible only from the eduroam database server site. SA5 will develop detailed proper tools for data collection.

¹ Source : <http://monitor.eduroam.org/database.php>



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6.2 DATA COLLECTION

As explained in Section 6.1. NROs should provide general and usage data in the defined XML format. The data should be available at the specified URL (<http://www.eduroam.<tid>/usage/> for usage data and <http://www.eduroam.<tid>/general/> for general data) which should be accessible only from the eduroam database server site.

The data collection mechanism will allow both pull (standard) and push data collection method. Pull method will be used by the central server according to the agreed schedule. Push method will provide NRO with ability to select the time for data collection and initiate the process regardless of the agreed schedule. This might be used in case of massive changes in the data or when an urgent correction is needed. eduroam database model is presented by the Figure 12.

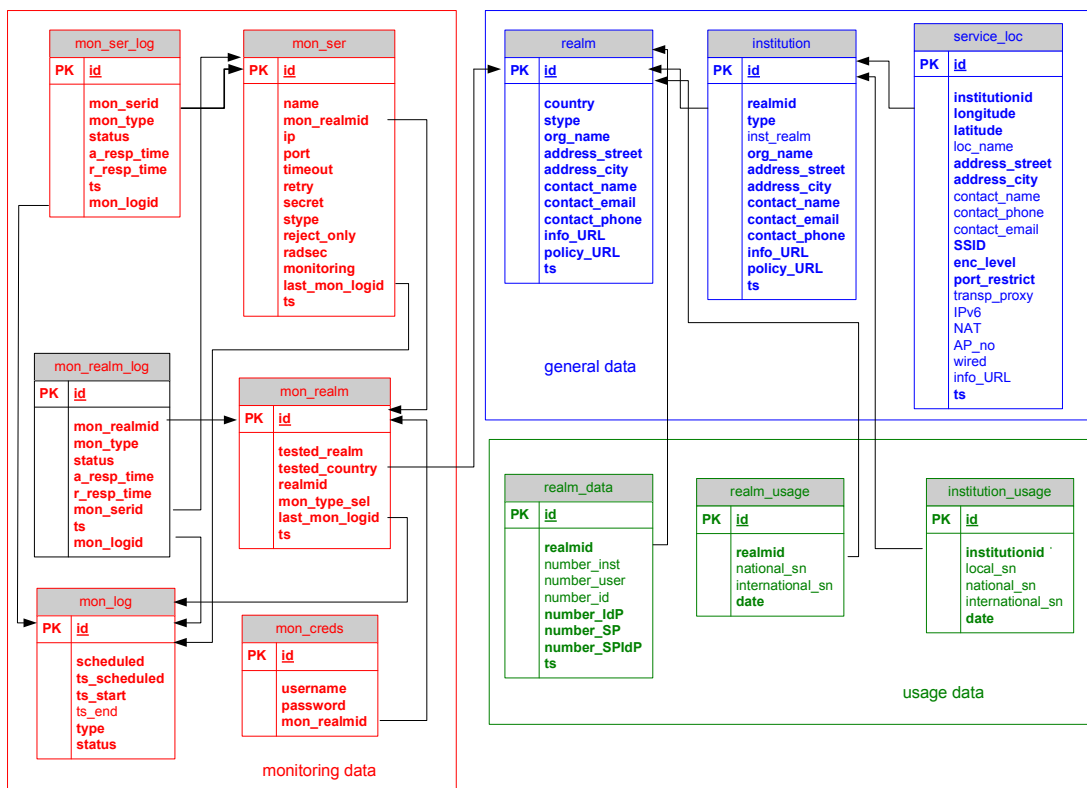


Figure 12: eduroam database model.

APPENDIX 1: SCHEMA FOR HTTP://WWW.EDUROAM.<TLD>/GENERAL/REALM.XML

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:simpleType name="eduroam_realm_stype">
    <xs:restriction base="xs:int">
      <xs:enumeration value="0">
        <xs:annotation>
          <xs:documentation>FLRS</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="1">
        <xs:annotation>
          <xs:documentation>(E)TLRS</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:element name="realms">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="realm">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="country" type="xs:string"/>
              <xs:element name="stype" type="eduroam_realm_stype"/>
              <xs:element name="org_name" maxOccurs="unbounded">
                <xs:complexType>
                  <xs:simpleContent>
                    <xs:extension base="xs:string">
                      <xs:attribute name="lang" type="xs:string" use="required"/>
                    </xs:extension>
                  </xs:simpleContent>
                </xs:complexType>
              </xs:element>
            <xs:sequence>
              <xs:element name="address">
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name="street" type="xs:string"/>
                    <xs:element name="city" type="xs:string"/>
                  </xs:sequence>
                </xs:complexType>
              </xs:element>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>

```



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```
</xs:complexType>
</xs:element>
<xs:element name="contact" maxOccurs="unbounded">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="name" type="xs:string"/>
      <xs:element name="email" type="xs:string"/>
      <xs:element name="phone" type="xs:string"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="info_URL" maxOccurs="unbounded">
  <xs:complexType>
    <xs:simpleContent>
      <xs:extension base="xs:anyURI">
        <xs:attribute name="lang" type="xs:string" use="required"/>
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>
</xs:element>
<xs:element name="policy_URL" maxOccurs="unbounded">
  <xs:complexType>
    <xs:simpleContent>
      <xs:extension base="xs:anyURI">
        <xs:attribute name="lang" type="xs:string" use="required"/>
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>
</xs:element>
<xs:element name="ts" type="xs:dateTime">
  <xs:annotation>
    <xs:documentation> Format: 2008-02-29T12:00:00 </xs:documentation>
  </xs:annotation>
</xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
</xs:schema>
```



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APPENDIX 2: SCHEMA FOR HTTP://WWW.EDUROAM.<TLD>/GENERAL/INSTITUTION.XML

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:simpleType name="eduroam_institution_type">
    <xs:restriction base="xs:int">
      <xs:enumeration value="1">
        <xs:annotation>
          <xs:documentation>IdP</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="2">
        <xs:annotation>
          <xs:documentation>SP</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="3">
        <xs:annotation>
          <xs:documentation>SPIdP</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:element name="institutions">
    <xs:complexType>
      <xs:sequence maxOccurs="unbounded">
        <xs:element name="institution">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="country" type="xs:string"/>
              <xs:element name="type" type="eduroam_institution_type"/>
              <xs:element name="inst_realm" type="xs:string" maxOccurs="unbounded" minOccurs="0"/>
              <xs:element name="org_name" minOccurs="1" maxOccurs="unbounded">
                <xs:complexType>
                  <xs:simpleContent>
                    <xs:extension base="xs:string">
                      <xs:attribute name="lang" type="xs:string" use="required"/>
                    </xs:extension>
                  </xs:simpleContent>
                </xs:complexType>
              </xs:element>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
```



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```
<xs:element name="address">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="street" type="xs:string"/>
      <xs:element name="city" type="xs:string"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="contact" maxOccurs="unbounded">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="name" type="xs:string"/>
      <xs:element name="email" type="xs:string"/>
      <xs:element name="phone" type="xs:string"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="info_URL" minOccurs="1" maxOccurs="unbounded">
  <xs:complexType>
    <xs:simpleContent>
      <xs:extension base="xs:anyURI">
        <xs:attribute name="lang" type="xs:string" use="required"/>
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>
</xs:element>
<xs:element name="policy_URL" maxOccurs="unbounded">
  <xs:complexType>
    <xs:simpleContent>
      <xs:extension base="xs:anyURI">
        <xs:attribute name="lang" type="xs:string" use="required"/>
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>
</xs:element>
<xs:element name="ts" type="xs:dateTime">
  <xs:annotation>
    <xs:documentation> Format: 2008-02-29T12:00:00 </xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name="location" maxOccurs="unbounded" minOccurs="0">
  <xs:complexType>
```



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```
<xs:sequence>
<xs:element name="longitude" type="xs:string"/>
<xs:element name="latitude" type="xs:string"/>
<xs:element name="loc_name" minOccurs="0" maxOccurs="unbounded">
<xs:complexType>
<xs:simpleContent>
<xs:extension base="xs:string">
<xs:attribute name="lang" type="xs:string" use="required"/>
</xs:extension>
</xs:simpleContent>
</xs:complexType>
</xs:element>
<xs:element name="address">
<xs:complexType>
<xs:sequence>
<xs:element name="street" type="xs:string"/>
<xs:element name="city" type="xs:string"/>
</xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="contact" maxOccurs="unbounded" minOccurs="0">
<xs:complexType>
<xs:sequence>
<xs:element name="name" type="xs:string"/>
<xs:element name="email" type="xs:string"/>
<xs:element name="phone" type="xs:string"/>
</xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="SSID" type="xs:string"/>
<xs:element name="enc_level" type="xs:string"/>
<xs:element name="port_restrict" type="xs:boolean" default="0"/>
<xs:element name="transp_proxy" type="xs:boolean" default="0" minOccurs="0"/>
<xs:element name="IPv6" type="xs:boolean" default="0" minOccurs="0"/>
<xs:element name="NAT" type="xs:boolean" default="0" minOccurs="0"/>
<xs:element name="AP_no" type="xs:int" minOccurs="0"/>
<xs:element name="wired" type="xs:boolean" default="0" minOccurs="0"/>
<xs:element name="info_URL" minOccurs="0" maxOccurs="unbounded">
<xs:complexType>
<xs:simpleContent>
<xs:extension base="xs:anyURI">
<xs:attribute name="lang" type="xs:string" use="required"/>
</xs:extension>
</xs:simpleContent>
</xs:complexType>
</xs:element>
```



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```
</xs:extension>  
</xs:simpleContent>  
</xs:complexType>  
</xs:element>  
</xs:sequence>  
</xs:complexType>  
</xs:element>  
</xs:sequence>  
</xs:complexType>  
</xs:element>  
</xs:sequence>  
</xs:complexType>  
</xs:element>  
</xs:schema>
```



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APPENDIX 3: SCHEMA FOR HTTP://WWW.EDUROAM.<TLD>/USAGE/REALM_DATA.XML

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">
<xs:element name="realm_data_root">
<xs:complexType>
<xs:sequence maxOccurs="unbounded">
<xs:element name="realm_data">
<xs:complexType>
<xs:sequence>
<xs:element name="country" type="xs:string"/>
<xs:element name="number_IdP" type="xs:int"/>
<xs:element name="number_SP" type="xs:int"/>
<xs:element name="number_SPIIdP" type="xs:int"/>
<xs:element name="number_inst" type="xs:int" minOccurs="0"/>
<xs:element name="number_user" type="xs:int" minOccurs="0"/>
<xs:element name="number_id" type="xs:int" minOccurs="0"/>
<xs:element name="ts" type="xs:dateTime"/>
</xs:sequence>
</xs:complexType>
</xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
</xs:schema>
```



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APPENDIX 4: SCHEMA FOR HTTP://WWW.EDUROAM.<TLD>/USAGE/REALM_USAGE.XML

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:element name="realm_usages">
    <xs:complexType>
      <xs:sequence maxOccurs="unbounded">
        <xs:element name="realm_usage">
          <xs:complexType>
            <xs:sequence maxOccurs="unbounded">
              <xs:element name="usage">
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name="national_sn" type="xs:int" minOccurs="0"/>
                    <xs:element name="international_sn" type="xs:int" minOccurs="0"/>
                  </xs:sequence>
                  <xs:attribute name="date" use="required" type="xs:date"/>
                </xs:complexType>
              </xs:element>
            </xs:sequence>
          </xs:complexType>
          <xs:attribute name="country" use="required" type="xs:string"/>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:element>
</xs:schema>
```



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APPENDIX 5: SCHEMA FOR HTTP://WWW.EDUROAM.<TLD>/USAGE/INSTITUTION_USAGE.XML

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:element name="institution_usages">
    <xs:complexType>
      <xs:sequence maxOccurs="unbounded">
        <xs:element name="institution_usage">
          <xs:complexType>
            <xs:sequence maxOccurs="unbounded">
              <xs:element name="usage">
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name="local_sn" type="xs:int" minOccurs="0"/>
                    <xs:element name="national_sn" type="xs:int" minOccurs="0"/>
                    <xs:element name="international_sn" type="xs:int" minOccurs="0"/>
                  </xs:sequence>
                  <xs:attribute name="date" type="xs:date" use="required"/>
                </xs:complexType>
              </xs:element>
            </xs:sequence>
            <xs:attribute name="inst_realm" type="xs:string" use="required"/>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
</xs:schema>
```



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APPENDIX 6: EDUROAM STATEMENT

NREN	Country	Document
CUDI	Mexico	 Cudi - eduroam statement signed
INNOVARED	Argentina	 INNOVARED - eduroam statement
RedCONARE	Costa Rica	 RedCONARE - eduroam statement
RENATA	Colombia	 RENATA - eduroam statement signed



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