



The global free wi-fi Roaming Service



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Covering...



- What the service provides
- Background
- Overview of the technology
- How it works in practice
- The Location Independent Networking (LIN) trial
- The ERNET Roaming service
- The eduroam federation
- Parallel international effort



What is eduroam

- ❑ eduroam (Education Roaming) is the secure, world-wide roaming access service.
- ❑ Allows users to securely access the internet free of cost across campus and also at visiting eduroam enabled participating institutions using their *home credentials*.

The service



- Enhances user mobility
- Provides hassle free guest network access
- Promotes single sign-on
- [Clip View](#)

Problem Statement



- Students come with own mobile devices wanting to connect
- Visiting faculty and Scholars bound by complex policies at Institutions
- Different wireless networks on campus
- Overseas campuses access in different languages or require data roaming
- Regulations, complexity
- Running after Sysadmin at Guest Institution



Background

- Conceptualisation started in Europe in 2003
- Develop a location independent networking infrastructure to enable networks to support guest users in a transparent & secure manner
- Proof of concept tests carried out on RADIUS (Remote Authentication Dial-In User Server) hierarchy



RADIUS Hierarchy



- **Organisational** RADIUS Proxy Server (ORPS)
- **National** RADIUS Proxy Server (NRPS)
- **International** RADIUS Proxy Server (IRPS)



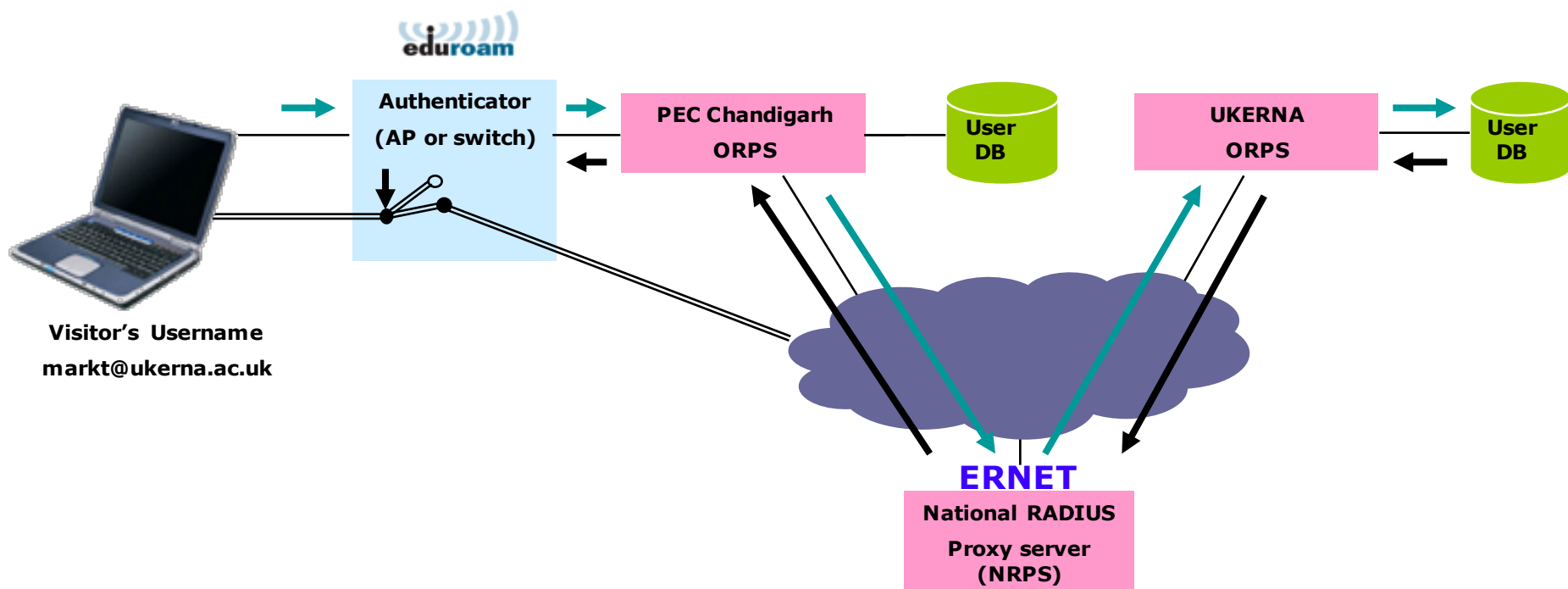


Federated Trust Model

- Participating institutions sign-up to the federation policy
- Institutions trust each other to keep their user databases up to date
- Network access is granted to a visitor after their credentials have been verified by their home institution



For example...



Location Independent Networking (LIN) Trial



- January 2005 – January 2006
- 36 institutions in the UK
- Positive feedback from JANET community
- Transition to service





Indian eduroam status

- Explored in 2010 during discussions with AARNET
- Discussions and Technical inputs were collected 2010-11
- Demo setup to build technical capabilities – 2011
- Website operation in end of 2011
- Proposed to Diety and the project was sanctioned in early 2012
- National Infrastructure and International peering was established – early 2012
- ERNET Institutional Server established and Global roaming tested – 2012
- SRM Institutional Server tested successfully – mid 2012
- Successfully demonstrated in International Conference, Kolkotta – end 2012
- Resilient National eduroam infrastructure established – 2013
- Support team by ERNET
- Consultancy & Turnkey Implementation service by ERNET
- Online documentation: deploying, using and supporting the service
- Invitation to all stakeholders to join

eduroam federation



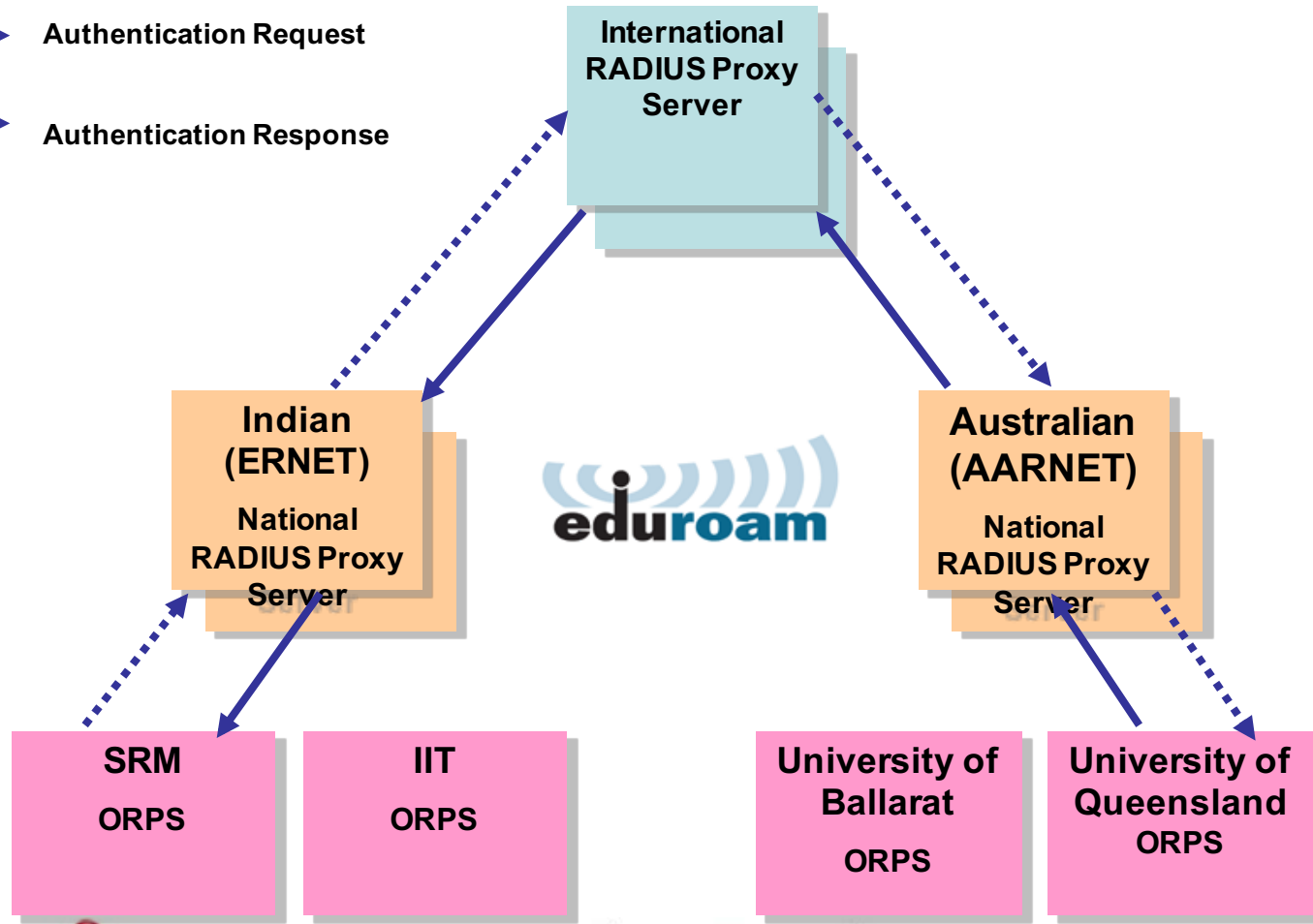
- European countries, US, Asia Pacific, Brazil
- Based on the same technology (RADIUS)
- IRPS hosted in Denmark and the Netherlands on behalf of TERENA and in Japan for AP, US
- Enabling international roaming



eduroam RADIUS Hierarchy



→ Authentication Request
- - - - - Authentication Response



The Educational & Research global free wi-fi roaming service

www.eduroam.ernet.in

Opportunities



- Matured Technology
- 802.1x/ RADIUS / RADSEC technologies available with all vendors and even on open source
- All OS now support eduroam
- Man-in the middle attack stopped via Certificates
- Eduroam supplicants widely available for end devices
- Hassle free roaming service – Control with home Institution
- Enhanced productivity and Communication



National Proxy server running live from two location. i.e. Delhi & Bangalore.



Peering with different TLR international server



Users are able to avail the eduroam service both at Domestic and International level.





How to Join!!!

- ❑ Fulfill Technical Prerequisite...
- ❑ The institution needs to signup for eduroam services with ERNET India.
- ❑ The institution needs to provide visiting users to use the Internet through eduroam authentication.



Technical Prerequisite for User Institutions

- ❑ Institution should have internet connectivity.
- ❑ Should have wi-fi campus
- ❑ Should have ability to radiate “eduroam” ssid
- ❑ Should have server to run radius software
- ❑ The institution needs to provide visiting users to use the Internet through eduroam authentication.



eduroam Milestones in India



The National level .in FLR servers deployed successfully
flr1.eduroam.ernet.in & flr2.eduroam.ernet.in



More than 150 institutions server are deployed at different
Institutions locations and connected with National server.
E.g. IIT's, IIM's, IISc, NIT's, Universities etc.



All connected Indian Institutions are availing the roaming
facility service in globe.



The Institutions eduroam server are created on Microsoft Windows Server , RedHat, CentOS, Ubuntu also integrated with SQL, AD, LDAP, DC, ADC etc..



- Web Portal has been created with domain eduroam.in & eduroam.ernet.in
- Created the survey form & Provide the help desk facility for availing eduroam user.
- Created the portal for Resetting/changing password.
- Created the Testimonials of institutions feedback.
- Providing Support to users and institutions.



Testing done on various devices



- ✓ Ruckus Wi-Fi.
- ✓ Ruckus zone controllers.
- ✓ Ucopia with Ruckus controllers.
- ✓ Motorola Wi-Fi & Controllers
- ✓ Cisco Wi-Fi and Controllers.
- ✓ Cisco Linksys E900.
- ✓ Cisco ISE.
- ✓ Cisco Linksys E1200.
- ✓ Aruba Wi-Fi & Controllers.
- ✓ D-Link Wi-Fi & Controllers.
- ✓ Juniper Wi-Fi & Controllers.
- ✓ Atilo Wi-Fi & Controllers.
- ✓ H3C Wi-Fi & Controllers.
- ✓ FortiGet Wi-Fi & Controllers

Testing done on various Mobile Device & OS



- ✓ Samsung Mobile.
- ✓ Sony Mobile
- ✓ Android OS.
- ✓ Apple (IOS).
- ✓ Mac OS.
- ✓ Nokia
- ✓ Plam OS.
- ✓ Samsung Bada OS.



www.eduroam.ernet.in



IPv4

202.141.18.2

IPv6

not available

» Site Counter: **484,262**

SEARCH

About Us

eduroam® is a global service that enables students, researchers and staff from participating institutions to obtain Internet connectivity across campus and when visiting other participating institutions by simply opening their laptop or activating their smartphone or other portable device through wifi.

With eduroam, you get Internet access not only via your institution's wireless network, but also when visiting other participating universities, colleges, research centres and libraries. This facility would enable users visiting other eduroam enabled institutions globally to get authenticated and connected to the visiting institutions network using their home institution ID and password and use it for free internet access.

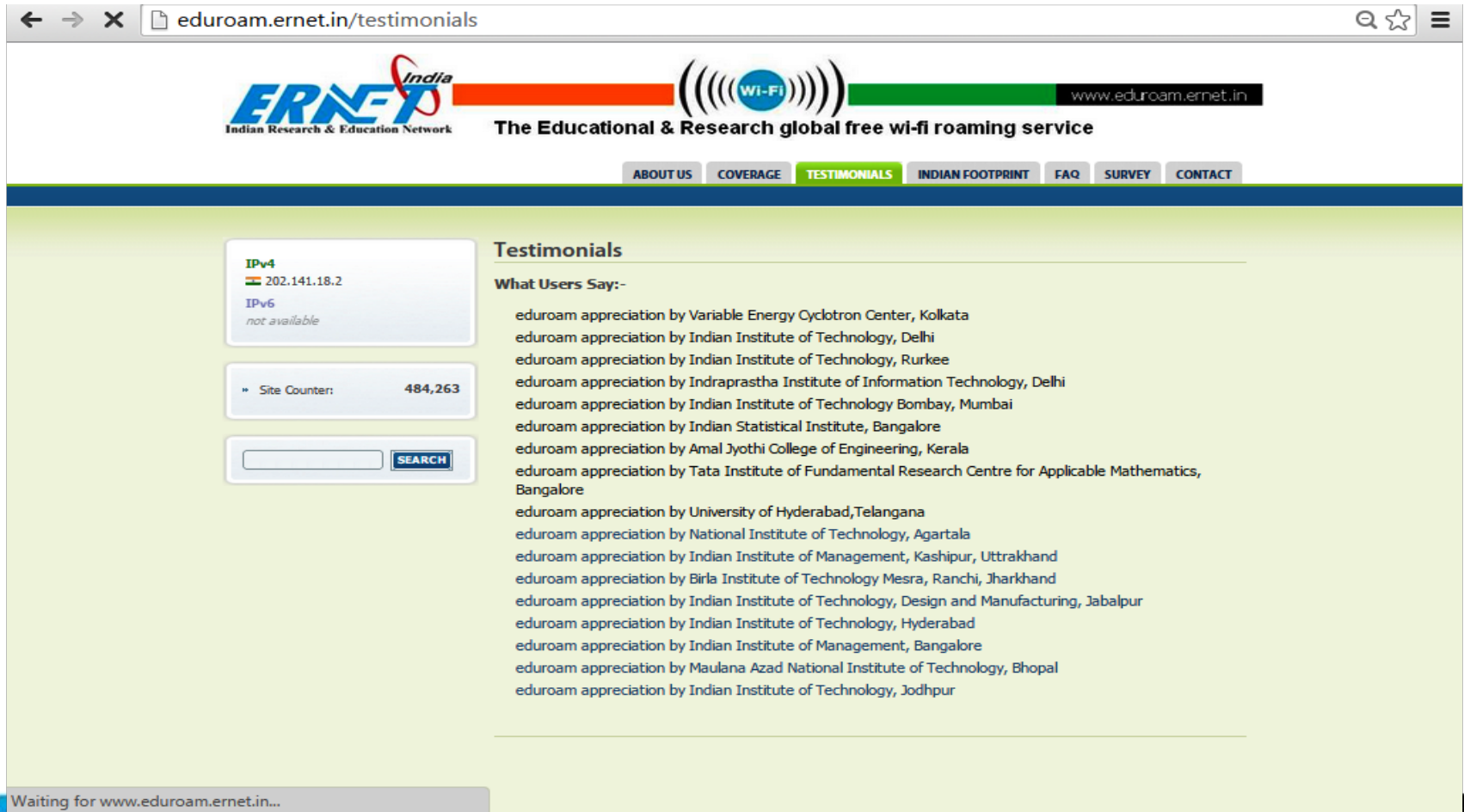
In order to join this initiative one and foremost requirement is that you should have the infrastructure in place, which comprises of a user database server, where your users' ID and password are stored along with a RADIUS server for authentication and logging. You will also need to configure your existing wireless LAN with an additional SSID "eduroam".

The cost involved is almost negligible if you have a wi-fi infrastructure in place or intend to deploy one in the near future with eduroam services riding on the same infrastructure.





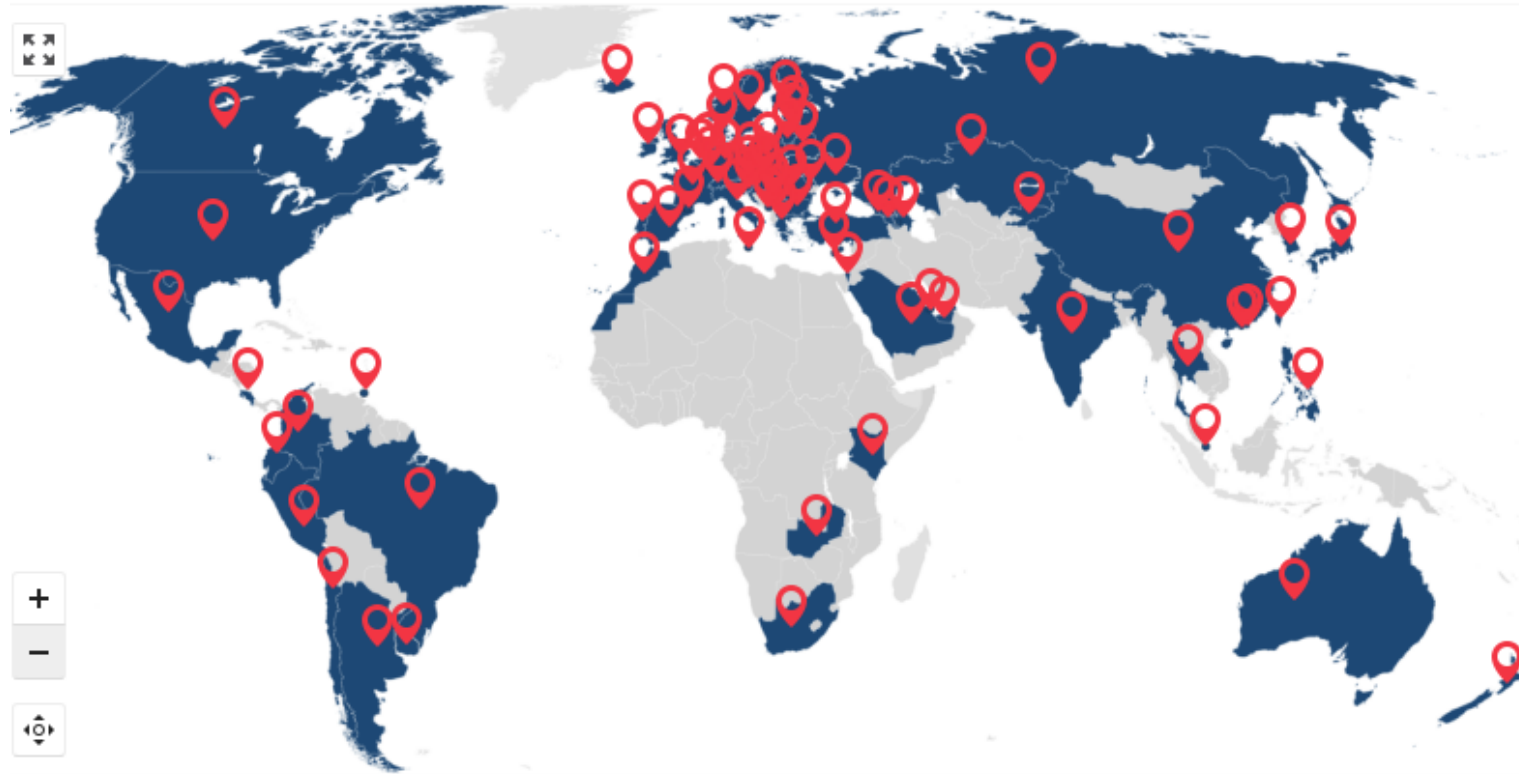
http://eduroam.ernet.in/testimonials




The screenshot shows a web browser window displaying the testimonials page of the eduroam website. The browser's address bar shows the URL <http://eduroam.ernet.in/testimonials>. The website header features the ERNET India logo, a Wi-Fi symbol, and the text "The Educational & Research global free wi-fi roaming service". A navigation menu includes links for "ABOUT US", "COVERAGE", "TESTIMONIALS", "INDIAN FOOTPRINT", "FAQ", "SURVEY", and "CONTACT". The main content area is titled "Testimonials" and includes a "What Users Say:-" section with a list of appreciation messages from various institutions. On the left side, there are utility boxes for IP information (IPv4: 202.141.18.2, IPv6: not available) and a site counter showing 484,263 visits. A search bar is also present.



National Roaming Operators (NRO)




World Map Of Participants


F-Ticks home
GLANT | TERENA

eduroam home

- F-Ticks Statistics
- Table
- Map
- users coming from
- users traveling to
- Technical information
- Description
- HowTo



F-Ticks FLRS requests collecting system

TLD	Operator	Statistics Graph	Statistics Data	Communication matrix
am	ABINET-AM	72h Custom	72h Custom	72h Custom
at	ACOnet	72h Custom	72h Custom	72h Custom
be	BBINET	72h Custom	72h Custom	72h Custom
bg	BREN	72h Custom	72h Custom	72h Custom
by	BAINET	72h Custom	72h Custom	72h Custom
ca	CANARIE	72h Custom	72h Custom	72h Custom
ch	SWITCH	72h Custom	72h Custom	72h Custom
cy	CYNET	72h Custom	72h Custom	72h Custom
cz	CEBNET	72h Custom	72h Custom	72h Custom
de	DFN	72h Custom	72h Custom	72h Custom
dk	UNIC	72h Custom	72h Custom	72h Custom
es	Rediris	72h Custom	72h Custom	72h Custom
fi	FUNET	72h Custom	72h Custom	72h Custom
fr	RENATER/CRU	72h Custom	72h Custom	72h Custom
gr	ORNET	72h Custom	72h Custom	72h Custom
hr	CARNET free	72h Custom	72h Custom	72h Custom
hu	HUNGARNET	72h Custom	72h Custom	72h Custom
ie	HEAnet	72h Custom	72h Custom	72h Custom
il	ISOC	72h Custom	72h Custom	72h Custom
in	ERNET	72h Custom	72h Custom	72h Custom
it	GIARR	72h Custom	72h Custom	72h Custom
lu	RETERNA	72h Custom	72h Custom	72h Custom
md	RENAM	72h Custom	72h Custom	72h Custom
me	MREN	72h Custom	72h Custom	72h Custom
mk	MARNet	72h Custom	72h Custom	72h Custom
nl	BURFnet	72h Custom	72h Custom	72h Custom
no	UNINETT	72h Custom	72h Custom	72h Custom
pl	PIONIER/U.Tours	72h Custom	72h Custom	72h Custom
pt	FOON	72h Custom	72h Custom	72h Custom
re	AMRES	72h Custom	72h Custom	72h Custom
ru	JBOC	72h Custom	72h Custom	72h Custom
se	SUNET	72h Custom	72h Custom	72h Custom
sg	SingAREN	72h Custom	72h Custom	72h Custom
sk	SANET	72h Custom	72h Custom	72h Custom
tr	ULAKSIM	72h Custom	72h Custom	72h Custom
uk	JANET	72h Custom	72h Custom	72h Custom
za	SANREN	72h Custom	72h Custom	72h Custom

Eduroam Usages



ERNET India being a National Roaming Operator, only capture the usage of Statistics of roaming users, as part of eduroam service. Based on the same ,there have been following roaming sessions was established till April 2016

- ❖ Total number of user instances : 795909
- ❖ Instances of International user to India : 477565
- ❖ Instances of Indian Roaming user : 318344
- ❖ [Global Table](#)



How to configure Institutional server on Cent Os





1. Install these Packages

```
#yum install freeradius2 freeradius2-mysql freeradius2-utils mysql-server -y
```

2. Star MySql Services

```
# service mysqld start or # service mysqld restart
```

3. Change password and security settings

```
#usr/bin/mysql_secure_installation
```

4. Login MySql database

```
#mysql -u root -p
```

5. Give root password

6. Create database and Grand all privilege

```
mysql> CREATE DATABASE radius;
```

```
mysql> GRANT ALL PRIVILEGES ON radius.* TO radius@localhost IDENTIFIED BY "radpass";
```

```
mysql> flush privileges;
```



7. Import the tables for radius

```
mysql> use radius;  
mysql> SOURCE /etc/raddb/sql/mysql/schema.sql  
mysql> exit
```

8. Open /etc/raddb/sql.conf

```
#vi /etc/raddb/sql.conf  
#Connection info  
server = "localhost"  
port = 3306  
login = "radius"  
password = "radpass"  
#Database table configuration for everything except oracle  
radius_db = "radius"
```

9. Open /etc/raddb/radiusd.conf

```
#vi /etc/raddb/radiusd.conf  
Go to line no 735 and uncomment  
$INCLUDE sql.conf
```



10. Open /etc/raddb/site-available/default

```
#vi /etc/raddb/sites-available/default
```

Uncomment the line containing 'sql' in the following section

```
✓ authorize{
```

```
✓ accounting{
```

```
✓ session{
```

11. Open /etc/raddb/site-available/inner-tunnel

```
#vi /etc/raddb/sites-available/inner-tunnel
```

Uncomment the line containing 'sql' in the following section

```
✓ authorize{
```

```
✓ session{
```

12. Open /etc/raddb/clients.conf

```
client IP {
```

```
secret = your secret here(Eduroam)
```

```
shortname = your VPN (IITK)
```

```
nastype = other
```

```
}
```


13. Open /etc/raddb/proxy.conf

```
realm DEFAULT {  
  authhost = Public IP  
  secret = your secret here (testing123)  
  shortname = yourVPN  
  nostrip  
}  
realm xyz.in {  
  authhost = LOCAL  
}
```



14. Check radius is working ?

```
#service radiusd restart  
# radiusd -X
```

15. Create users for Eduroam Service

```
#mysql -u radius -p  
Password  
mysql> show databases;  
mysql> use radius;  
mysql> show tables;  
mysql> DESCRIBE radcheck;  
mysql> INSERT INTO radcheck (id, username, attribute, op, value) VALUES (1, "test@ernet.in",  
"User-Password", ":", "password");  
mysql> exit;
```



lab demonstration

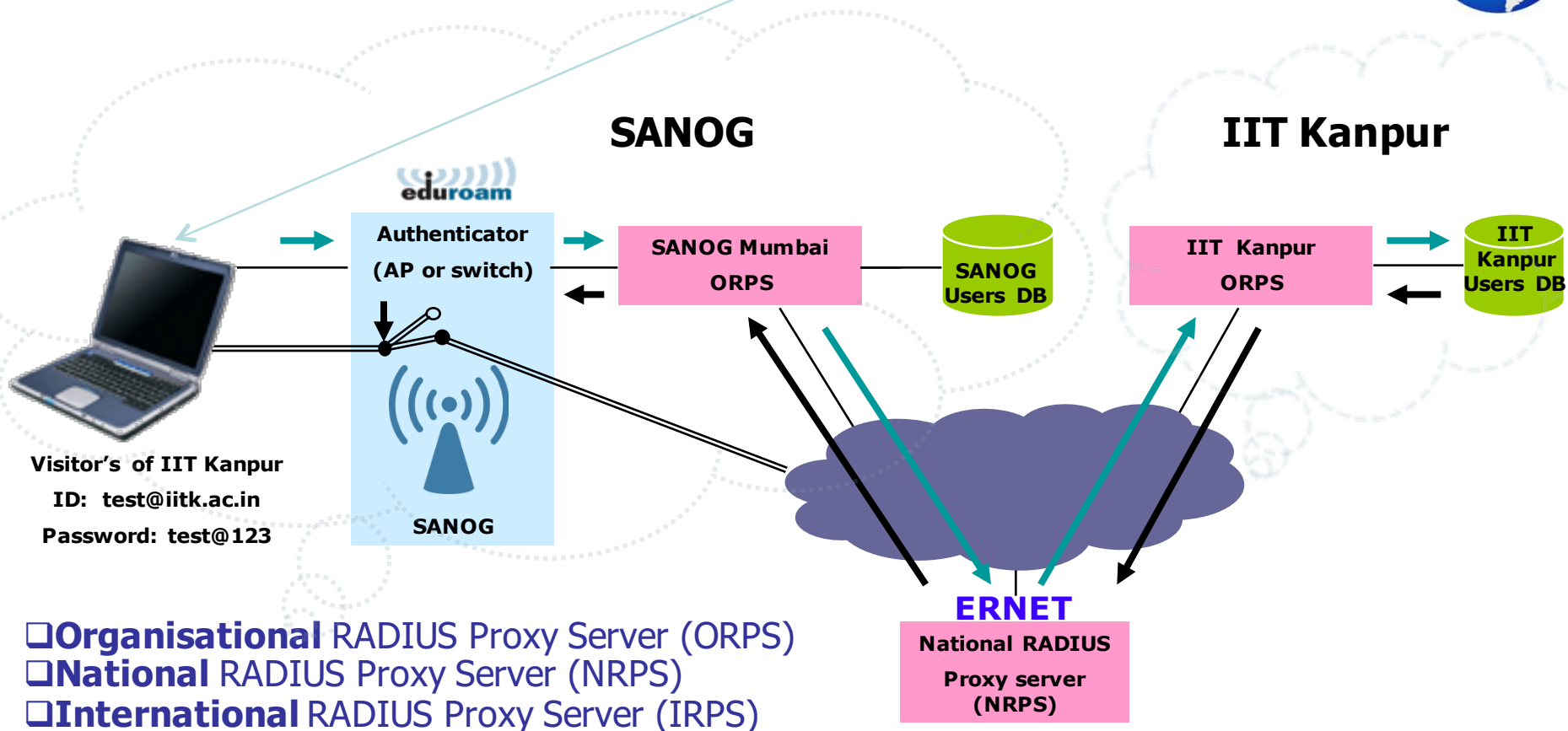




SANOG



IIT Kanpur



- Organisational** RADIUS Proxy Server (ORPS)
- National** RADIUS Proxy Server (NRPS)
- International** RADIUS Proxy Server (IRPS)





Questions?

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