

# DjNRO: Django-based application for National Roaming Operators, or how to manage your eduroam database

**Leonidas Pouloupoulos**  
([leopoul@noc.grnet.gr](mailto:leopoul@noc.grnet.gr))  
Software Development

**Zenon Mousmoulas**  
([zmousm@noc.grnet.gr](mailto:zmousm@noc.grnet.gr))  
Network Applications Developer

Greek Research & Technology Network (GRNET) NOC  
56, Mesogeion Ave.  
11527 Athens, Greece

*Keywords:* eduroam, NRO, database, distributed, management

*Abstract:* Eduroam database management is an important responsibility for eduroam National Roaming Operators (NROs). In this paper we present a web-based application we developed, which tackles the management of the eduroam database, among other things. The application has been deployed in GRNET since 2012 and is vastly simplifying and improving operations for the NRO as well as drawing attention from end users and administrators of Greek eduroam federation member institutions. The project is released as open-source and has already attracted several interested parties into deploying it.

Eduroam stands for EDUcation ROAMing. It offers users from participating academic institutions secure Internet access at any other eduroam-enabled institution. The eduroam architecture that makes this possible is based on a number of technologies and agreements, which together provide the eduroam user experience: "open your laptop and be online". The crucial agreement underpinning the foundation of eduroam involves the mechanism by which authentication and authorization works [1]. An eduroam federation comes with administrative as well as technical requirements. A National Roaming Operator (NRO) is the administrative entity responsible for running eduroam at a country level. The NRO must maintain a comprehensive overview of eduroam within its' service area and must regularly report about the state of the national eduroam federation. In the European region the vehicle for such reports is provided by the eduroam database, where information about the NRO, the SPs and IdPs is stored. In this paper we present and propose a management application for NROs, which initially has a twofold purpose: provide local information in a structured format to eduroam.org and serve as a national eduroam web frontend. DjNRO was designed and developed by members of GRNET NOC using the Python Django framework.

GRNET (Greek Research and Technology Network) provides Internet connectivity and services to the Greek Universities and academic and research institutes. GRNET maintains points-of-presence in all major Greek cities (approximately 40) and leases dark-fiber across the country for its backbone and access network.

Maintaining and managing a local eduroam database is an important responsibility for an NRO. Eduroam.org periodically polls the members of the European eduroam Confederation and gathers information in a structured XML format, which includes information about participating

IdPs, SPs and service locations, as well as basic accounting data [2]. The source of information should be the NRO database, so that any changes there are reflected in the XML files harvested by eduroam.org. Therefore service locations, contacts etc. should be kept up-to-date in order to provide a consistent view of eduroam service availability make it easier for eduroam users to seek support when necessary. This was the original design goal for DjNRO.

Before moving on, it is worth mentioning how GRNET previously maintained the NRO database and exposed information to eduroam.org. A minimal schema was used for the database and records were maintained by eduroam administrators of GRNET, collecting information from Greek IdPs and SPs via e-mail and tracking changes through the all-purpose trouble ticket system employed by GRNET. In practice, however, such procedures would often be neglected, thus database records would become stale. On the other hand, the eduroam web site had been developed quite some time ago using technologies now obsolete, making it hard both to use and (mainly) to maintain. Considering the above, it was clear that we needed to make it easier and more attractive for institution administrators to manage their own database records as well as to expose this information to end users on the eduroam web site, through a clean and functional interface. Where possible, we also opted for a domain-agnostic and multi-lingual design, anticipating that the code would eventually be released as open-source software and hoping that it may be used by other NROs. This is how DjNRO was born.

Beyond keeping eduroam.org up-to-date, DjNRO is essentially a distributed management application. It is distributed in the sense that information about institutions, locations and services is maintained by the respective eduroam administrators. In proportion to the federated nature of eduroam, our deployment uses SAML-based federated authentication and authorization through GRNET's AAI federation. Institution eduroam administrators provision their own accounts in the management application and then NRO administrators simply verify their association with a particular institution. After that, they can manage their eduroam service locations, contact points and institution information. Extensive geo-location and mapping functionality is included in the management application, using Google Maps, which makes it easier and faster for eduroam administrators to accurately provide coordinates of service locations. Also included in the application is provisioning of configuration and monitoring for the underlying eduroam RADIUS infrastructure. Automatic generation of template-derived configuration for Nagios is initially supported, since that is employed by GRNET for this task.

Location information is visualized on the front-end through dynamically generated maps that instantly reflect updates, again using Google Maps. Location data beyond the territory of the NRO are also fetched periodically from eduroam.org in KML format. This enables the provision of maps showing eduroam service locations around the world, rather than having to redirect users to eduroam.org for such functionality. Using this data, a tool was also developed that enables users to find the eduroam service location that is closest to either their current location (provided through browser geo-location APIs) or a location they search for; both are shown on the map, along with a walking trail showing the user how to reach the automatically selected eduroam location. We believe this tool can be useful to anyone exploring the availability of eduroam around the world, including travelers. It does require the user to go online, unlike offline navigation applications (for example on mobile devices); however it is fast and lightweight, since the user only provides coordinates of his location and computation is done server-side, and can be handy, since no prior installation or preparation is necessary.

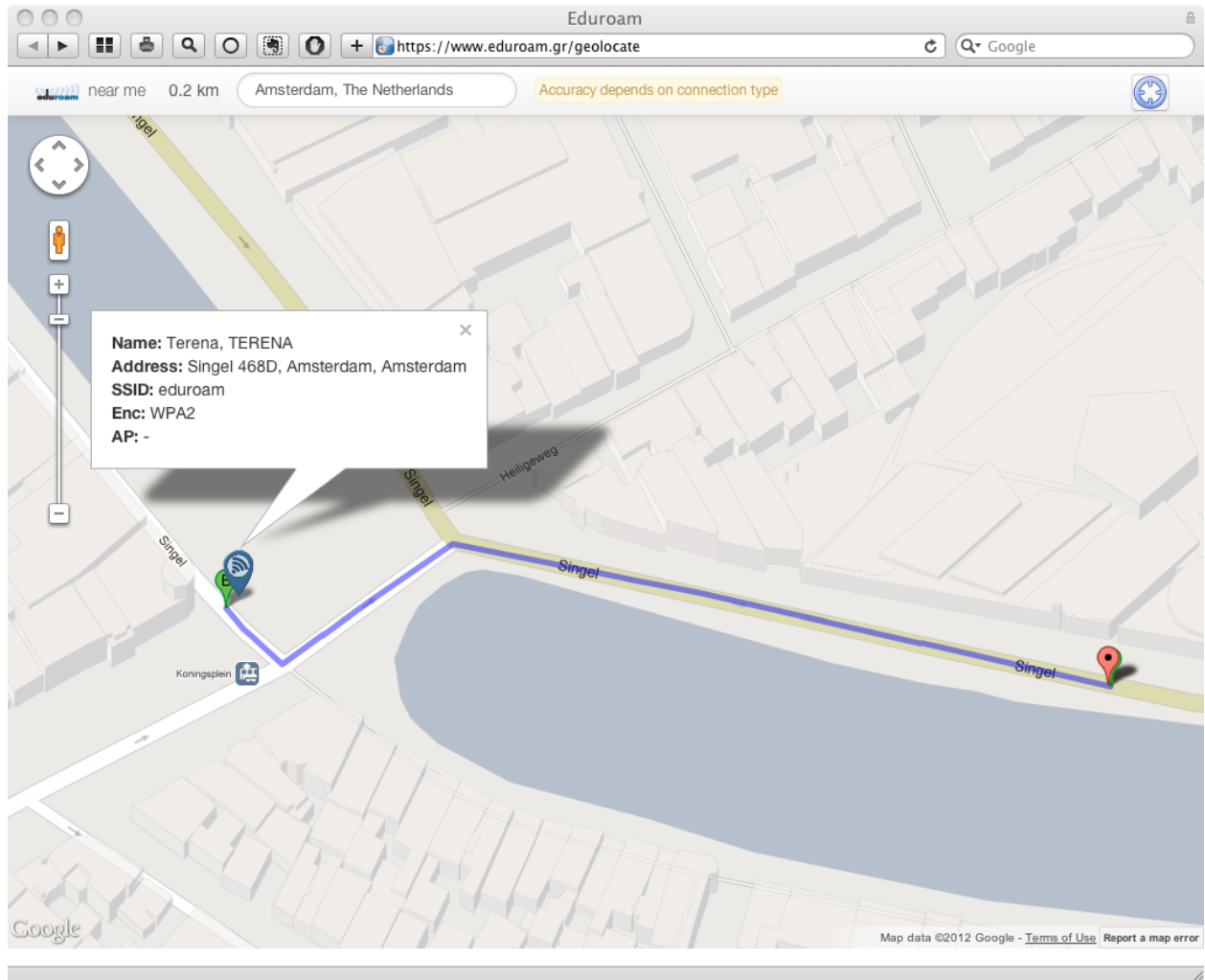


Figure 1 eduroam geo-location tool demo

From a more technical perspective, DjNRO is served by an Apache HTTP server using a Python WSGI adapter module. The application is developed entirely in the Python Django framework. The user interface makes extensive use of the Twitter Bootstrap CSS framework. Apart from the core Google Maps library, some more advanced libraries have been deployed to serve the needs of geo-location, marker grouping, (front/reverse) geocoding and path finding. The application supports multiple languages through translation tags, which cover almost every text occurrence.

The Greek eduroam web site [3] is the frontend of DjNRO (the back-end being the management application). It was rolled out in mid-November 2012, with the majority of eduroam institution administrators having already been enrolled in the management application.

Building on a solid foundation as well as a modular and extensible design, there are many interesting features already planned or considered for extending the functionality of DjNRO. For example, once an administrator is enrolled in DjNRO, an account could also be automatically provisioned in eduroam CAT[4], if they so wish, via an appropriate API in the latter system. Connection to and/or interaction with general-purpose CRM systems that may be used by the

NRO, as well as multi-domain operation support systems (OSS) for eduroam (involved for example in abuse handling or troubleshooting for end users), may likewise also make sense, in order to further streamline eduroam operations for the NRO.

DjNRO is released as open-source software [5] and it is actively supported by GRNET NOC. A mailing list has been created for user support, inquiries and troubleshooting [6]. DjNRO was presented at the 30<sup>th</sup> TF-Mobility and Network Middleware Meeting [7]. Apart from Greece, DjNRO has been setup by the Austrian NRO, the NRO in New Zealand - with reference to DjNRO in a presentation on eduroam [8] - and the Finnish NRO. There is also interest from the Netherlands NRO into setting up DjNRO as their official eduroam database manager plus eduroam.nl platform. Last but not least, there is an ongoing effort to fork its source code so that it can serve as a multitenant environment.

## **References**

[1] Eduroam in a nutshell:

<https://confluence.terena.org/display/H2eduroam/eduroam+in+a+nutshell>

[2] However the provision of accounting data has been superseded by the F-Ticks mechanism in recent years: <http://monitor.eduroam.org/f-ticks/about.php>

[3] <http://www.eduroam.gr>

[4] Currently in beta, deployed at: <https://cat-test.eduroam.org/>

[5] DjNRO homepage: <http://djnro.grnet.gr>

[6] <http://lists.grnet.gr/wws/info/djnro> (djnro@lists.grnet.gr)

[7] <http://www.terena.org/activities/tf-mobility/meetings/30/>

[8] <http://www.tertiaryictconference.co.nz/page/198/programme>

## **Vitae**

**Leonidas Pouloupoulos** received his Diploma in Electrical and Computer Engineering from the University of Patras in 2005 and his M.Sc degree on Computer Science from the Department of Computer Engineering and Informatics (University of Patras) in 2010. Currently, he is (with) the development team of GRNET NOC. He designs and develops network management applications and web platforms and quite often, a mix of both. His job/interest/research profile can be found at: <http://www.linkedin.com/in/leopoul>  
email: [leopoul@noc.grnet.gr](mailto:leopoul@noc.grnet.gr)  
phone: +30 210 7471096, +30 697 3845436

**Zenon Mousmoulas** studied law at the Democritus University of Thrace and the University of Athens, but shifted focus to ICT. He has been with GRNET since 2003, where he has participated in a wide range of national and European projects, undertaking both technical and management responsibilities. He holds the position of Network Applications Developer and, as of fall of 2008, he has also supported the then established in-house team of GRNET NOC. He has in-depth experience in a vast range of technologies, from networking to systems and multimedia. Among other tasks, he is developing and piloting live streaming and webcasting applications and services; he is also technically responsible for the Greek eduroam federation. In the past he has also worked on legal and promotion issues of free and open source software, having essentially helped in the establishment of the Greek Free Software Society and the Creative Commons affiliate organization in Greece.  
email: [zmousm@noc.grnet.gr](mailto:zmousm@noc.grnet.gr)  
phone: +30 210 7474244, +30 697 7780854