<p style="text-align:center">Extended Abstract</p>

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Title: Visualising roaming within eduroam

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Abstract

The eduroam federated access service is a valuable tool for supporting collaboration and resource sharing worldwide, with its primary purpose being to facilitate seamless wireless roaming between users at participating institutions.

There are over 100 participating sites in the UK that have joined the UK instance of eduroam known as the JANET Roaming Service (JRS). However, while the JRS is gaining traction in deployment, there is a lack of visualisation tools for users, site administrators or JANET managers to understand and see the general roaming patterns.

This paper will describe the implementation of and demonstrate a number of three-dimensional, interactive visual representations of eduroam log data from the JRS. These visualisations give a comprehensive overview of JRS roaming in the UK that, for example, communicate the 'value' of the service in a single image [Figure 1], give overviews at the institutional level [Figure 2] and provide diagnostic information to the service operators [Figure 3].

The software is open source and is being developed with a view to it being offered for adoption by other NRENS and the international core eduroam infrastructure.
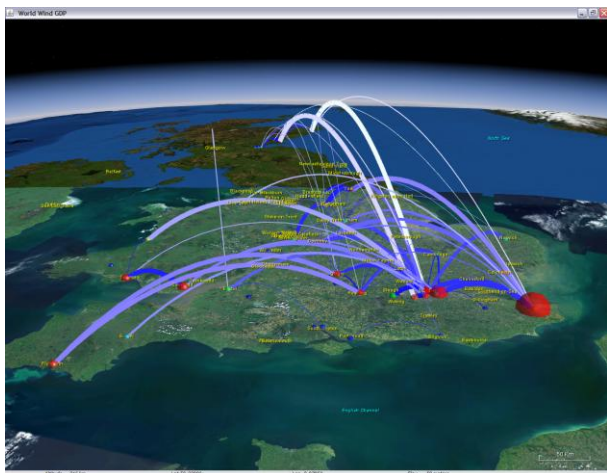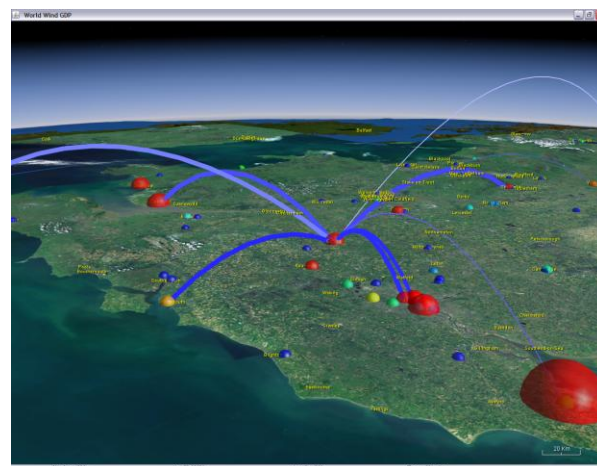
Figure 1 - One day's JRS roaming activity

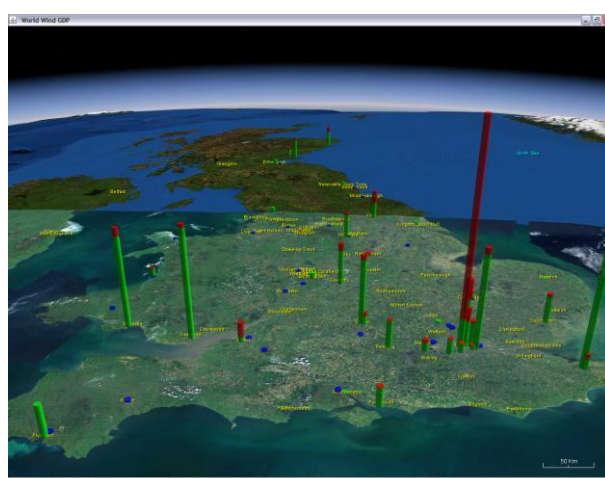**Figure 2 - A day's roaming to and from a site**

Figure 3 - Excess *Access-Rejects* indicate a problem at one JRS site

Visualising the data in these ways presents significant challenges, not least those of preserving user privacy within existing legal frameworks. Privacy-preserving 'data blurring' techniques used will be discussed, preventing the inference of individual user location from the visualised data. It is possible, for example, to 'blur' the usage patterns to general users, while making more accurate representations available to administrators.

Currently the visualisations are generated from historical log data (typically weekly), but the data may be made available more immediately for live or near-live views in the future. The software also includes a mode where time-lapse visualisations can be displayed full screen over a given period of time, which may be interesting for JANET conferences or similar events.

This paper will also describe the novel framework within which JANET(UK) commissioned this application. It was created by MSc students from the University of Southampton within the context of their final year studies; the delivery of the application and the ways in which they worked with JANET(UK) as customer were assessed as a direct component of their course of study. This mechanism presents an opportunity for NRENs both to achieve meaningful contributions to their

operations and to engage with their community members outside of pure service delivery, a model that could profitably be adopted elsewhere.

Finally, this paper will address the implications of the future developmental roadmap of eduroam, focusing on the accessibility of the data that is required to generate the visualisations described above. The increasing adoption of RADSEC in particular poses difficulties for documenting the use of eduroam *at all*. We will propose a novel solution to the problem of publishing roaming data, based upon the relatively unknown IF-MAP[1]. It specifies the publication and search protocols required to allow network infrastructure to publish, retrieve or subscribe to information relating to the dynamic state of contributing infrastructure. This mechanism could be adapted to allow organisations to publish securely their eduroam transactions in real time, avoiding the complications of aggregating disparate logs generated by various flavours of RADIUS. Driven by eduroam benefits, an international public IF-MAP infrastructure might find additional uses in monitoring of federation activity, network 'weather maps' etc.

Acknowledgements

The students of the Southampton/JANET(UK) Group Design Project

References

1. http://www.infoblox.com/solutions/pdf/IFMAP-spec.pdf

Vitae

Dr. Tim Chown works at the School of Electronics and Computer Science at the University of Southampton. It was a JISC project he led called 'Mobile Ad-hoc Wireless Access for Academia' that drove the proposals for a UK and subsequently European RADIUS-based trust hierarchy. The first use of what is now eduroam was between Southampton and a site in the Netherlands. Dr. Chown's other interests include wireless networking, IP multicast, network security and IPv6.

Mark O'Leary is a JANET technical specialist and manages JANET(UK)'s network access programme. This area covers mobility within and between network contexts at the edge, taking in for example wireless, aDSL last mile, location awareness and network access control. He works with TERENA's Mobility and EMC2 task-forces, and teaches fundamentals of 802.11 wireless around the UK. He has worked on roaming initiatives in the UK from the early Location Independent Networking Trial days.