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Mobilnost uporabnikov – danes in v prihodnosti
User Mobility - Now and in the Coming Years

Povzetek

Vzorci uporabe omrežij IP se spreminjajo: uporabniki niso več le računalniški zanesenjaki, temveč vsakodnevni uporabniki, katerih pričakovanja niso več le, da omrežja zgolj delujejo, temveč gredo drugam, če vse ni, tako kot želijo. Od storitev se pričakuje, da so povsod dostopne (in nezadovoljnih uporabnikov ne zanimajo razlogi za nedostopnost). Nacionalna raziskovalna in izobraževalna omrežja ter njihovi uporabniki morajo zato delovati ob upoštevanju teh pričakovanj uporabnikov ter uspevati v okoljih, kjer so v neposredni konkurenci s komercialnimi ponudniki enakih storitev. To je precejšen izziv, pri katerem ni jasnih odgovorov. Zato je z vidika mobilnosti čas, da se nacionalna raziskovalna in izobraževalna omrežja preoblikujejo.

Ključne besede: mobilnost, brezžična povezljivost, LTE, lokacijske storitve, politike dostopa.

Abstract

Usage patterns of IP networks are changing - the user base is moving: from the "Geeks" to the "John Doe's", from expectations like "Happy if it works" to an annoyed "If it doesn't work, I'll go elsewhere!"; services are expected to be ubiquitously accessible (and annoyed users don't want to know if they are not and do not care why they wouldn't be). NRENs and their customers need to operate while keeping these user expectations in mind, and need to thrive in an environment in which commercial equivalents of their services are a direct competitor. This is quite a challenge - one with no clear solution. In terms of mobility, now is the time for NREN networks to re-invent themselves. This conference talk will present findings of the ASPIRE study [1], which investigated the future of national research networks and their users. One of the four main areas of study was “The Adoption of Mobile Services” [2].

Key words: mobility, wireless connectivity, LTE, location based services, access policies

Introduction

The history of National Research and Education Networks (NRENs) is often based on the great successes in fixed-line interconnection of campus networks and their uplink to the wider internet. Many NRENs look back at a decades-long history of excellent connectivity service, and of pioneering internet access in general. The times are changing, though: fixed line connectivity can easily and with reasonable quality be procured by numerous commercial parties; and many players in the ICT industry compete for innovation. NRENs have to realise that they are no longer the unrivalled provider of campus connectivity solutions nor a spearhead innovator of new services. They also have to adapt to the fact that users are demanding access to services from anywhere and even expect to get the connectivity for this service access regardless of their location. Instead of looking back at past successes, attempting to continue the “status quo”, NRENs

should look forward and see how to integrate into the diverse marketplace of services in the ICT industry – for the benefit of their users, and to stay relevant.

ASPIRE Mobility Study

The findings of the ASPIRE Mobility Study [2] can be grouped into three areas: Network Connectivity; Mobile Services; Factors for Improving Footprint of Mobility:

Network Connectivity

Many campus networks have transformed from a pure wired connectivity solution to one which includes wireless (Wi-Fi) enabling a limited amount of mobility *on campus*. NRENs have subsequently worked together to interconnect these Wi-Fi islands into a cohesive roaming consortium: eduroam. This has enabled nomadic mobility *between campuses*. That is the current status quo, and a big success story. eduroam is widely recognised as an excellent way of providing connectivity to an institution's own users at more than 6,000 eduroam hotspots world-wide; and for an easy way to provide guests from other institutions from all over the planet with Wi-Fi connectivity on campus without any administrative overhead for provisioning. The ASPIRE Mobility study recognises the huge success of eduroam and has many recommendations for developing the service even further.

However, user demand has already outgrown the nomadic, campus-only use case that eduroam satisfies. In many countries, the commercial market has created a near-ubiquitous internet connection; very often for a flat fee when using the service nationally: 3G networks and the next-generation alternative which is currently being deployed in a number of countries: LTE.

3G connectivity has the upside of ubiquity, but the downside of poor network quality in terms of throughput. It can be seen as a secondary, supplemental data service in comparison to eduroam. This has the potential to change significantly with LTE, though, because it promises more throughput for more users per cell.

It should be recognised by NRENs that an eduroam user will have eduroam connectivity only during a tiny fraction of his time; travelling between campus and home, recreational activities, holidays and weekends are all spent off campus.

A campus or NREN can, of course, decide not to care about time spent off campus. This void will then be filled by commercial operators with special student tariffs. Some NRENs, however, have negotiated privileged access to 3G/LTE networks for their constituency under their own conditions, and have created successful services out of that. The ASPIRE Mobility Study [2] lists several examples; one incentive is to create framework negotiations so that the constituency gets better prices than the general public; or that traffic from the constituency gets routed via the fast and uncongested NREN backbone, leading to improved connectivity; or that users get an IP address from their home university when connecting.

Such national efforts are admirable and successful, but lack in structure compared to the Europe-wide homogeneous access that eduroam provides. Negotiated tariffs with 3G providers typically are limited to national use, with dreadful surcharges for roaming in other countries. The conditions for and

technicalities of access to the networks also differs among all the national agreements.

It remains to be seen whether a larger setup of pan-European roaming on 3G/LTE networks for academic users can be established. The GN3 project has conducted an investigation of feasibility of such a European framework contract for ubiquitous access to mobile data networks; and a business case is currently being formulated. [3]

Mobile Services

It is certainly a good thing to have ubiquitous mobility – but what for? Making users mobile will only be achieved if excellent network connectivity is paired with excellent services on these networks.

The ASPIRE study made several important points about services, and what NRENs and institutions can do to make them excel.

Access from everywhere. Services need to be accessible from everywhere, and with a vast range of devices and corresponding screen sizes. It should not matter whether a user is accessing the service from a campus network, a 3G data service, or from abroad. For example, operators of a service should not make any assumptions about which IP address the user is connecting from (a popular mistake is to believe that the university's own IP range is “good”, while all others are “evil”; solutions like federated login – AAI, SAML – can provide IP independent authentication and authorisation). They should also keep in mind that users from 3G or abroad may have low-bandwidth or high-delay connections, or that their screen size is possibly not the typical “desktop” experience. Services should always have light versions with few bandwidth requirements, and solutions for small screens available.

Being aware of competition. A great many services that are typically offered by NRENs have an equivalent on the commercial market; and the market evolves so speedily that even if the academic community produces a brand-new service, the market would very probably develop a version for the general public very quickly. One example is the popular FileSender, developed by the NREN community, which quickly found a counterpart in Thunderbird's FileLink feature. As a consequence, the operator of a service needs to a) realise that his service has competition; b) make sure his users understand what the academic version's unique selling point is compared to the commercial version; c) make sure that their own version is as easy to use as the commercial version.

One example of tough competition is e-mail: there may have been a time when a university e-mail account was a highly valued service, appreciated by users – but nowadays, students will have had an e-mail address from third parties (say, Microsoft Hotmail or Google Mail) long before they join the academic community; they will want to continue using it, and do not have much use for yet another e-mail account they have to check in addition to their usual set.

An example where an NREN or university can play on unique selling points is file synchronisation: while there are commercial services which synchronise between devices (like “DropBox”), they have some subtle disadvantages: the data is being

stored with an unknown third-party, possibly in a world region where laws make the content available to unintended recipients. Especially in an academic environment, confidentiality of research results is of paramount importance. Having an own file synchronisation inside a controlled environment (e.g. The TERENA Trusted Cloud Drive) is an important plus.

An example where ease-of-use is important is, again, file synchronisation: a university might think it can counter commercial offerings like DropBox by more traditional means, say an NFS or CIFS file share, with access to it being protected by a VPN. Technically savvy people might value such a solution for technical excellence and use of open protocols – but the vast majority of ordinary users will probably be appalled by the need to set up a VPN, find an NFS client for their device, etc. – and for those, the conclusion “I'll just use DropBox” will be an easy one.

Environmental awareness. The advent of smartphones has brought with it an entirely new set of parameters that can be used by services: devices can report about their location, current speed, can capture photos of their current location, etc. Apps which take the location and environment into account already exist (Augmented Reality apps being one example), but there is enormous potential in expanding on sensor availability today.

The classroom is virtual. One specific service which is currently on the rise and which has great value for mobile users is that of online teaching. There are offerings from the commercial market: iTunes U [4], YouTube EDU [5], Khan Academy [6], but also online teaching material by individual universities. The key idea behind making teaching material available online is the realisation that the physical presence of students during lecture time is often not very important. The core role of a university – and the reason why students come and pay tuition fees – is that of an accreditation body: with exams and grades - the university will assess whether the knowledge of a student in a certain topic is at the required level.

Of course the student needs to be lectured to get to a point where he can pass the exams – but it is not necessary to take these lectures at a pre-defined point in time at a certain physical location. By making the material available online, universities enable the students to learn at their own pace (pausing lectures, cross-checking facts on websites) in their preferred environment (at home, on campus, someplace outside) at their preferred time. Depending on the subject matter, it may also enable the student to learn about the topic from his preferred lecturer; not from the one who happens to be doing the course in the current semester. This makes the learning process more flexible, and the university more attractive to students.

Authorisation data is a key asset. A service in which the academic community has an edge over most commercial offerings is that of managing user properties. It is important to stress that there is little to no value in a pure authentication context: every organisation is able to issue a username and password; Google does this just as well as a university does.

On the contrary: authentication with a big industry player of the likes of Google has many benefits for a user: a very large number of services on the internet allow users to log in with their Google/Facebook/LinkedIn/... identity. Compared to that, an educational login, even if it is embedded in authentication infrastructures like a national (educational) AAI or an international one like eduGAIN, is only usable at a tiny number of niche service logins. So, for authentication purposes, an end user probably sees a lot more value in his commercial electronic identity than in his educational one.

The value in institutional logins lies in the amount of properties that a university has about the user. This data probably includes, but is not limited to, knowing the fact that the user has an education level that entitles him to attend university studies, a set of qualifications the student has already completed, the fact that he is properly enrolled, etc. With the consent of the student (and *only* with that consent), this data can be used to make authorisation decisions about the user in a non-university context.

Example: A cell phone contract could be cheaper for young people who are still involved in the educational process; if a user could simply be offered the option to log into the operator's account management web page with his university account and consent to release his enrolment status, then the discount status could be automatically verified. This has advantages for the user (easy account management; no more photocopying and delivery of a student card), for the operator (real-time, automated checks instead of personnel verifying a student card), and for the university (reach-out to third parties, making the institutional login more relevant in everyday life).

Improving Mobility Footprint

When connectivity is ubiquitous while on the move, and services can be used and even thrive when used while on the go, a third question remains to be answered: how to maximise the number of users that can benefit from mobility in the education and research sector, and how to make them move?

New user groups. The various NRENs in Europe have a very diverse set of user groups; some restrict themselves very stringently to higher education and publicly funded research, others include secondary education and libraries, and yet others include public administration and public welfare organisations; others consider privately funded research organisations to be as eligible as publicly funded research facilities. The limits of what is allowed and what not is very often determined by the statutes of the NREN and its Acceptable Use Policy (AUP), which is often closely intertwined with the national governments and regulation authorities. In terms of mobility in an international context, this has a potential for friction because the definitions of valid users (i.e. users authorised to use a service) can differ greatly.

It might be beneficial to revise statutes and AUPs towards a more coherent definition of a user. This will ultimately lead to a more predictable delivery of service, and to fewer failed expectations by users who are used to getting a service in one country, but are not considered “good enough” when roaming into another. One user group which deserves particular attention in that respect is that

of public administration: in the upcoming European Commission framework programme “Horizon 2020”, a public administration backbone is envisaged within the so-called “Connecting Europe Facility” (CEF). This service might in whole or in parts be delivered by NRENs and their established backbone; depending on whether there is an appetite for including public administration in the NREN's user base or not.

Cooperating with commercial entities. The usability of services depends, among other factors, on their footprint. Many NRENs have a tradition of delivering their services all on their own, independently of external cooperation partners. This is again often attributable to NREN statutes and AUPs. However, creating an isolated “ivory tower” causes many missed opportunities.

An example in the Wi-Fi area is: there are many commercial hotspot operators, and there is the academic community's eduroam. It would be of mutual benefit if a business agreement could be reached: the commercial network is provisioned on the academic hotspots and vice versa – as a result, users from both sides can use many more hotspots than before. While this sounds easy, the implied consequence of carrying commercial users' traffic on the academic backbone is currently prohibited in many NREN statutes. The result is that an opportunity for more 'footprints' of mobility solutions is missed.

A second example is the use of commercial identities for login into academic resources. When students enrol at the university with their pre-existing logins from commercial systems like Google or Facebook, there is no inherent reason why they shouldn't be allowed to use those same electronic identities when accessing academic resources: the university merely needs to outsource the authentication bit to the commercial provider; it still maintains a record of user properties and attributes and keeps that private for internal use. This creates an excellent opportunity to make users' lives easier, but requires that the academic resource provider is willing to let go on self-provisioned electronic identities.

Conclusion

NRENs and their constituent institutions have a number of unique strengths. They excel in cooperating with each other, and can provide services that range to national and even European scales; eduroam and AAI federations are excellent examples of that.

To enable a true mobility-friendly environment, they must use these strengths to work together: they have to consistently define who exactly their users are, have to create a set of mobile services that is available to all these users, have to make sure that their services span as many service locations as possible, and have to make the services as easy to use as possible.

Even if it is not traditionally in the focus of the NRENs and institutions, this cooperation will have to extend beyond the borders of the academic community to include business agreements with commercial service providers.

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