EDiNA

Mobile Technology

Development Strategy

Document details	
Author(s):	Paul Walk
Date:	2015-01-19
Version:	revision 3

Contents

About this document

This technology strategy document is intended to complement the work of EDINA's *Mobile Internet* project. That project is, in part, designed to help generate a 'mobile strategy' for EDINA through a process of research, development, reflection and synthesis. This document then will undergo substantial revision as the Mobile Internet project progresses, and will constitute an expression of the deepening understanding within EDINA of 'mobile' as a strategic technology issue.

Elevator pitch

To ensure that EDINA:

- can and does respond proactively to the challenges presented by the growing significance of 'mobile'

- is equipped and well-positioned to exploit opportunities indicated by this new paradigm

- is positively recognised by significant stakeholders (Jisc, University of Edinburgh) as a centre of expertise in the development and delivery of mobile services

Terminology

The following terms (not based on any particular set of external, official definitions) are used throughout:

'mobile'

> is used as a catch-all term, couched in inverted commas, in order to embrace the broad range of technologies, cultural and business issues related to the use of mobile computing devices.

mobile device

> is a computing device which is normally characterised by:

>> - being very portable

>> - being personal to the user - i.e. not normally shared

- having a touch-screen as the primary user-interface; this may be changing as wearable technologies become reliant on other user-interface technologies such as voice control.

mobility

is a user-centric description of the geographic mobility of the user of a mobile device and their distance from what were traditionally fixed locations for activity, such as classrooms and libraries.

mobile services

are online services delivered to mobile devices, either solely or as well as to desktop/laptop devices.

app

is a software application installed on a mobile device.

web application

is a 'traditional' web application, delivered to a web browser from a central server. (Note that this might be delivered to a web browser on a desktop/laptop computer or on a mobile device.)

Towards a Mobile-first Strategy

EDINA has committed funds and priority for resources focused on an internal *Mobile Internet* project. The strategy outlined here both gives direction to, and is informed by, that project. Mobile access to services should not be seen as 'service enhancement': mobile access is fundamentally more important than that, as are the new forms of interaction that users want of the services EDINA delivers.

It may risk a cliche to suggest that information technology is *fast-moving*, yet this is particularly true of mobile technology. Although the smart-phone is less than a decade old it has already become the default class of device used by people to access Internet services. Each generation of smart phone has introduced a new or an improved set of technologies to the consumer market: e.g., touch screens, GPS, accelerometers, sophisticated voice control, high definition cameras etc. The affordances of these

technologies have both created new application possibilities and challenged existing services.

Users' expectations increase in step with the capability and power of the devices they carry with them. Furthermore, the range and power of the available infrastructure available to the consumer through these devices is significant. While Software as a Service (SaaS) is certainly not a new idea, the value of the SaaS approach is being realised as the sophistication of online services for mobile users continues to grow.

The business context of higher and further education is also - unusually – in a protracted period of change. Universities and colleges must now recognise that their 'customers' have more capacity (and incentive) to be *mobile* in both their behaviours and their affiliations.

Of more general significance, but with relevance for education and research, it is not merely that the *devices* are mobile, with connection via the Internet, it's the (geo-) mobility of the *people* who carry and use those devices and have tasks that may, or may not, be specific to their location. The days in which learning and teaching only took place in classrooms and books and journals were only consulted in libraries are long gone.

The need for a 'mobile technology strategy'

The growth in importance of the mobile device, together with the services and applications which make it useful, presents a set of challenges for EDINA which turn out to be profound but which also create huge opportunity for EDINA given its expertise and experience.

In the late-1990s, EDINA made the decision to standardise on the Web as the default for the delivery of its online services. In 2014/15, that default requires review.

That earlier decision has served EDINA well as the Web has remained largely unchallenged for the better part of two decades. The evolution of consumer services and applications for mobile devices prompts an alternative approach to the delivery of services by EDINA.

Mobile access to EDINA's services should not be seen as a 'service enhancement'. It is fundamentally more important, alongside recognition of the need to support new forms of interaction that user want with services. This should be being considered at the outset of any new project or service development and the trigger to review how to transform existing services.

Some particular challenges and opportunities are introduced below, from the standpoint that these are universal in terms both of technologies and user-context, across all service development and delivery at EDINA.

The development of a 'mobile first' strategy

It is clear that any strategic approach to engaging with 'mobile' must accept that little in this space is certain or fixed: significant change should be anticipated. For this reason, both strategic objectives and the success (or not) of their implementation must be subject to frequent review and to some mechanism for iterative development.

This also implies investment of some time and effort being earmarked explicitly for monitoring and evaluation of emerging technologies, trends and usage-patterns.

Revising service levels definitions for mobile-first services

The Service Level Definitions (SLD) mainly fit the model of browser-accessed server-side web application. Several of the issues raised here will impact on service level descriptions and upon the associated performance measures. EDINA will need to understand the similarities and differences between web applications and mobile apps and incorporate this understanding in the formulation of SLDs.

Testing

The testing of mobile apps, and to a lesser extent mobile web applications, introduces some challenges not encountered in the testing of desktop-browser targeted web applications. EDINA currently has a *de facto* standard set of desktop browsers it tests services against but is largely agnostic about the hardware or operating system running those browsers. With mobile web apps, the device (both make and model) and the OS (including version) are significant, so the range of necessary testing is increased considerably. Access at EDINA to the different devices for testing is ad hoc, and to an extent depends on staff-owned devices. In addition to this, it is often necessary to test apps 'in the field' or, at least, away from a fast WIFI network.

EDINA will need to regard the facilitation of testing of mobile apps as a central concern. This is in keeping with the general thrust of the DevOps initiative which is seeking to standardise on some of the tools and practices of production of software.

Technical issues for strategic-led mobile-first development

EDINA already has several mobile development projects under way. Some of these are closely related to existing services - others are more experimental. The *Mobile EDINA* component of the *Mobile Internet* project is tasked with achieving a synthesis of understanding from these projects which will both inform strategy and be guided by an agreed strategy. There is associated need to consider what additional measures should be undertaken in order to equip EDINA in developing and delivering mobile-first services.

The suitability of the *Mobile Internet* project as the best vehicle for such strategic-led development should itself be reviewed once the strategy is in place.

The re-emergence of the dedicated software client

EDINA should anticipate a mixed economy of dedicated apps and browser-based Web applications. The underlying mechanisms of the Web - HTTP and HTML - remain very important. However, the delivery of all content through a single client application - the Web browser - is challenged as an approach by the rise of the mobile 'app'.

The concept of the 'app' sees a revival of the idea of a heavier and client in the client/ server balance, and of a dedicated client, with the software application (with typically highly-focused functionality) deployed locally on the user's client device - in this case a mobile device.

The development and distribution of 'apps' is substantially different to the development of server-based Web applications delivered through a Web browser - each has its own set of opportunities, affordances and risks.

A particular challenge which is introduced by the development of client software for mobile devices is the use of that software with differing levels of 'connectivity'. Generally, web applications are designed so that the server responds to the client immediately if something goes wrong. Not all mobile apps will be designed to function offline, but where they do, greater levels of quality assurance - especially related to the user's data - may be required. EDINA will need to develop a clear understanding of and approach to safe-guard the data which the user creates or collects whilst offline.

The release and deployment of mobile apps is quite different from that of traditional web-applications, requiring *distribution* to the user. The contemporary approach to this is via one of the 'app stores', but some of the old problems which browser-accessed web

applications mitigated have returned with mobile apps. For example, with a browser-accessed web application, the supplier of the service can 'upgrade' the service for all users simultaneously. Release which are found to be broken can be (more or less) instantly replaced with 'fixed' versions. With distributed software, several versions of the software are likely to be in use at any one time. The app store approach reduces this problem, but it does not entirely solve it - and therefore EDINA will need to pay particular attention to how it manages releases.

'Push' - a new service delivery paradigm

The success of the Web may, in part, be traced to its highly constrained architecture. The dominant service delivery paradigm supported by the Web is that of a simple, stateless request/response approach. Most EDINA services are constructed around this paradigm. An important feature of most traditional Web applications is that the user's client device and software are both arbitrary - in the sense that the user need have no personal relationship with either. This is a strength - it allows Web services to scale massively since they can get away with paying scant attention to the user's client infrastructure. Despite sporting a rich graphical interface, the typical PC and Web browser combination is still very close to the 'dumb terminal' of the mainframe era.

However, the mobile device is typically a *personal* device. This means that a mobile app, where it interacts with a Web service, may register itself there, and become the recipient of 'pushed' information. There are signs that mobile device operating system user-interfaces are beginning to re-orient themselves around screens which display and manage incoming 'notifications'.

Opportunities for shared middleware service development

The great majority of mobile apps have a 'server-side' component in addition to the software deployed on the mobile device. Some concerns addressed by such components will be faced by more than one development, so opportunities for server-side middleware which serves more than one mobile development are likely to arise.

An example of this is the need for mobile apps to be authenticated on behalf of the user to the UKAMF. This requirement, together with a working solution, has recently been developed by the MediaHub team who have, quite rightly, suggested that such a solution could be of use to other services at EDINA. It is, moreover, worth considering the possibility of developing this as a new middleware service for external users.

There is clearly a 'business development' dimension to this - and these kinds of opportunities will need to be identified and recognised in that context.

Efficient development of mobile apps

The range of frameworks available for the development of mobile apps is already considerable. These frameworks continue to evolve, in keeping with the rapid pace of development of mobile devices and their operating systems. EDINA should consider standardising on a subset of these frameworks and developing broad expertise in them.

As the number of mobile app developments at EDINA increases, opportunities for sharing and re-using components and software libraries are created. Building software components with an intention that they be re-usable (packed into libraries etc.) introduces an overhead into the initial development process, with the expectation that efficiency benefits are realised later - and not necessarily by the initial developer. EDINA will need to be practiced in both recognising where such an opportunity exists and in ensuring that resource can be provided to exploit it in the short term, saving resource for the longer term.

The development of re-usable software libraries can apply to any domain - including mainstream web-application development. However, it is particularly significant in a domain where the client-side software may involve interfacing with a range of hardware and local software.

Developing an awareness of user context

The term 'awareness' is used here rather than 'understanding' because the 'user context' is essentially dynamic – in part due to the fact of user mobility - and can be quite volatile.

Geo-spatial location. One aspect of user context which is especially significant to EDINA is that of geo-spatial location, and this is directly relevant to significance of the user's mobility and location-based services. EDINA has enjoyed great success with developing and delivering Web services which exploit geographical data. It seems likely that these services, and others besides, may be potentially enhanced when the user's client (software & hardware) is aware of its location in space. EDINA has begun to explore this opportunity already, but a strategic approach to this is called for.

It should be recognised that the importance of geo-location for mobile devices and their users goes deeper than the opportunities provided by online mapping data. The emergence of Near Field Communications (NFC) and technologies such as iBeacon bring

the significance of geo-location "indoors". In addition, the user will soon need to be regarded as moving through a cloud of short-range signals emanating from instrumentation and communications devices, each of which may alter the user's context in subtle ways. EDINA needs to consider how it will develop and deliver services in an era of "ubiquitous computing".

Device-specific differences. The type of mobile device being used to access a given service can affect how that service should be delivered. Smart-phones and tablets, for example, are suited differently to different tasks. Knowing something about the user's device can inform the delivery of the service to achieve a better 'user experience'. EDINA also needs to understand the factors which influence the user's choice of device and software in any given use case. More generally, some level of understanding of how users select devices for certain types of tasks would be valuable. EDINA should develop clear methods to evaluate for example when a tablet, as opposed to a smart-phone, is the tool most likely to be used for a given task/function in a service.

Connectivity and offline functionality. The traditional paradigm of serving online services to users sitting in front of a desktop computer assumes, for the most part, that the computer is connected to the Internet. While the mobile device often enables the user to be connected to the Internet, this may not always be the case, typically when out of range of wifi or of other connectivity. However, since the device is to hand, user expectation is that they can use services at any time. Recent developments in mobile services have seen greater attention paid to this problem, and have included approaches where the service is usable in a limited way while the user's device is offline, with a manual or automatic synchronising of data with the remote service when an internet connection becomes available. The use of mobile devices enables the user to access services in a greater variety of ways.

'Bring Your Own Device' (BYOD) and Internet identities. HEIs have become very aware of the impact of BOYD on their ability to deliver online services, and are taking steps to accommodate this phenomenon. In some respects this is not a 'mobile' matter. However, through the device, and especially with a smart-phone, the user arrives with an array of 'identities' to a service touch point relevant to almost any Internet transaction. For example, users will have become accustomed to using mainstream consumer identities (e.g. Facebook, Google, Twitter) to authenticate to other, very loosely related online services using OAuth. Moreover, biometric identification strategies are starting to appear on mobile devices, such as the finger-print recognition sub-system on the latest iPhones

from Apple, creating opportunities for new approaches to authenticating users to software services. This should be recognised and factored into the discussion about the possible development of middleware to support access control in mobile services. It is important for EDINA to develop some awareness of how any one of its services fits into the user's context of potentially complementary or competing services.

Organisational context. In addition to the personal aspects of the user context, what is not plain is the extent to which the university or college context will remain important for users of the services delivered by EDINA. An understanding of the impact of organisational systems and requirements on the user's use of mobile apps (and even devices) would aid in the development of useful products and services.