

LIMES-App

Mobile applications as an opportunity for cultural tourism along the Roman Limes in Europe

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Abstract:

The Roman Limes connects ten European countries and is one of the most important cultural heritages in Europe. Since the Roman Limes is often not accessible or not recognizable, new mobile service applications are vital to create an understanding and raise awareness of this historical asset which is often located in rural areas.

The mobile software and hardware industry is rapidly changing and new applications must meet the requirement of long-term sustainability and competitiveness. This large-scale demonstrator project LIMES presented in this paper proposes a mobile system for a richer enjoyment and experience for cultural tourism with a new interaction technology: Augmented Reality (AR) as an element of the "Limes-App" is a new development on the market and the future of mobile applications. LIMES does not only refer to the Roman Frontier, it is also an abbreviation for "*Large Scale Innovative and Mobile European Services for Culture Tourism in Rural Areas*". LIMES brings together the ancient (Roman Frontier) with new services (LIMES-App) in order to present cultural heritage in an innovative way.

Keywords: Mobile service, application, cultural heritage, augmented reality

Introduction

The Roman Limes is the only European cultural heritage which interconnects ten European countries. Three of these countries are currently involved in "LIMES - Large Scale Innovative and Mobile European Services for Culture Tourism in Rural Areas" and developing a mobile application for the tourism exploitation and marketing of this cultural heritage located at decentralized sites. Germany, Austria and Bulgaria will develop a "role model" for adaptation in order to connect all touristic sites in the ten European countries along the Roman Limes via mobile services as a long term perspective. New mobile service applications are the new perspective creating awareness of the historical setting that is often in the countryside (DRDA-KÜHN, 2010). The designated target is to advance sustainable tourism and to support the mobility especially in rural European regions by the practical application of highly innovative mobile services. This service contains touristic Limes information about the three involved countries Germany, Austria and Bulgaria (LIMES BLOG, 2013).

Technologically it is about the interaction amongst mobile Internet, Global Positioning System, mobile phone camera and social networks. The Mobile Information System will base on Limes-relevant data and information, displayed especially as historical reconstructions of monuments of the Roman Frontier. Best

practice models in context to the European LIMES project will be made public and applicable for the seven other European countries along the Roman Limes.

The European Mobile and Mobility Industries Alliance (EMMIA) implemented the concept of large-scale demonstrators to prove the feasibility of exploiting innovative mobile services to foster sustainable cultural tourism in rural areas in Europe. "LIMES - Large Scale Innovative and Mobile European Services for Culture Tourism in Rural Areas" was launched by the European Commission's Directorate-General for Enterprise and Industry and started in December 2011 for duration of 2 years (EMMIA, 2013).

The Roman Frontier – Area of LIMES Mobile

This Roman Frontier, also known as Limes, represented the border line of the Roman Empire at its greatest extent until the beginning of the 3rd century AD. The Roman Empire lasted for over 2000 years and was one of the greatest states which world has seen. Successive generations have built on that heritage and modified it, thus helping to shape our modern world. Partly it became UNESCO world heritage site: The Hadrian's wall, Antonines Wall and the Germanic Limes were added to the world heritage list (JILEK, KUTTNER, SCHWARCZ, 2011, p. 8ff).

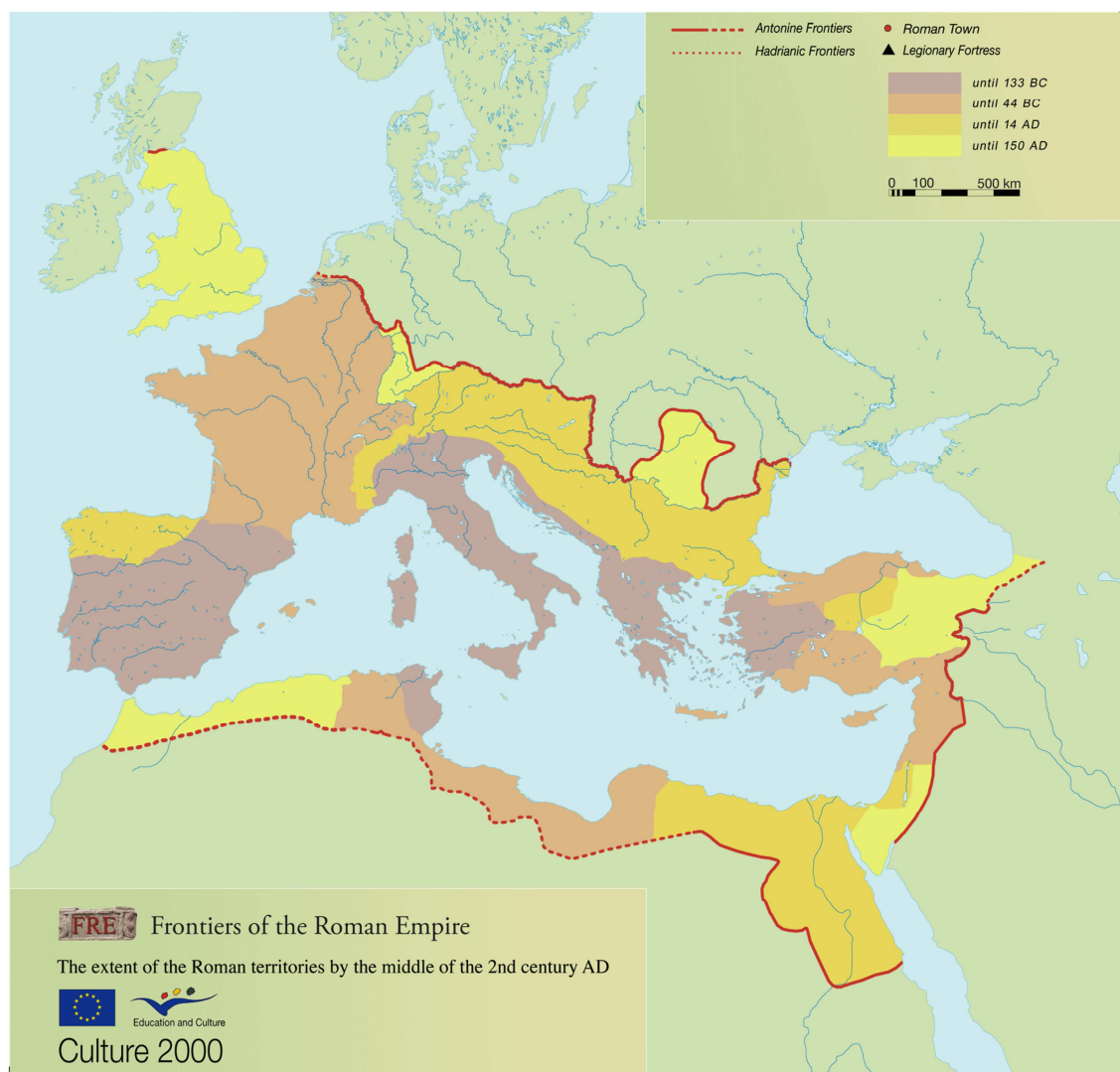


Fig. 1 – Chronological map of the Roman Frontier, source: FRE project

The frontier of the Roman Empire was actually called *finis* and *termini*. Limes was originally the name of a military road constructed by Tiberius in A.D. 10 (ISAAC 1988, p.125ff).

Now the Large Scale Demonstrators of the European LIMES project picks up the northern Roman border line to develop mobile services and to revive the intercommunity along the Roman Limes. The three Large Scale Demonstrator Regions in particular are Rhineland-Palatinate in Germany with the "Limes Germanicus", Lower Austria along the Danube and the city of Ruse in Bulgaria, also located at the Danube (LIMES BLOG, 2013).

Mobile services as perspective for cultural heritage and the roman frontier

Cultural Heritage is becoming a greater attraction factor for tourism worldwide and many countries are aiming to offer lower-cost, but higher-quality content and services that can provide better visibility and improved understanding of their sites and landscapes. In order to improve the perception of cultural heritage and in particular the Roman Frontier in an innovative way, mobile services become more and more relevant in the field of cultural tourism and awareness raising of archeological sites (RYAN, MOHR, MANZAROLI, et al, 2008). The arrival and rapid diffusion of smartphones are changing the way cultural heritage and its content is represented. Additionally, innovation in software and applications make these devices more versatile – providing a new tool to make cultural heritage around us more visible (EUROPEAN COMMISSION, 2013).

Cultural heritage sites become more and more preserved because it is one of the main revenues - especially in rural areas. Sustainable and cultural tourism is often an important source for income, attracting new businesses and new growth opportunities (NWHF, 1999). As a key driver for fostering cultural tourism in rural areas, innovative solutions like mobile services (e.g. apps) can enhance the attractiveness, economic and social development (KNIEJSKI, 2010). Connecting the "ancient" (Roman Frontier) with the "new" (mobile services) is one of the main goals of the LIMES large-scale demonstrator through the development of the "LIMES-App".

The LIMES-App

A central element of the Large Scale Demonstrator LIMES is the implementation of a mobile information and service application for cultural tourism around the Limes in Europe. This application is developed as a prototype for the three partner countries, Bulgaria, Austria and Germany and forms the technical base for an extension of the information system to all Limes-countries in Europe.

The LIMES-App provides an innovative tool for the perceptibility of the Limes in Europe and, in the course of implementation, will create a multi-national instrument for the collection and output of limes-relevant data to several "mobile" and also "stationary" information systems. A core element of the LIMES-App is a map for the visualization of geodata within the native LIMES-App. The map for the LIMES-App is based on Google maps and contains all the relevant sights ("Points of interest") in the three partner regions (GOOGLE MAP, 2013).



Fig. 2 – Screenshots of the native Android application “LIMES-Mobile” (start screen, points of interest, map, category “knowledge”)

The limes information provides a general overview of the whole limes in Europe, as well as specific information about the limes sites in the partner region. The goal is to create an immersive experience for the visitors of the Roman limes, but on the other hand to help users that are not in the area to understand and learn about the history of the sights and potentially attract them as visitors.

The specific site categories are as follows:

- Ancient Facilities (watchtower, castle, frontier, ancient settlement),
- Tourism attractions (museums, guided tours, events),
- Touristic-relevant (Creative Tourism, accommodation, gastronomies, other sights)

Within these categories, the specific information is structured as follows:

- Address / Geodata (Location)
- Basic information (short description, about 500 signs for each sight)
- Further (linked) information (name URL for further information about the specific sight)
- Visualization (pictures, paintings, videos)

Because of the high dynamic developments in the mobile technology sector, the designated system has to have a high flexibility in order to respond to these fast changing conditions of the mobile service industries (GSMA, 2012). As a result, the technical concept behind the LIMES-App can serve as a role model for a sustainable information management for location-based services in the tourism sector. Local governments, tourist agencies and service providers will be given a platform to promote their locations, sights and services according to the state of the art.

A first prototype ("Alpha-Version") of the application "LIMES-Mobile" is available for test purposes. The prototype contains basic information about the Limes in Europe, the three involved Limes-regions and about 70 Point of interests along the Limes in Lower Austria (AT), Rhineland-Palatinate (DE) and the Ruse region (BG). LIMES-Mobile is available for smartphones with Android OS only.

The back-end system of the LIMES-App

The back-end is required to compile and manage all the information that is collected during the runtime of the LIMES. Furthermore, the back-end is the central tool for the further development of the LIMES-App concerning further input and extension to other Limes countries.

The back-end system is developed as a web-platform. The entered data will be automatically converted for the usage with mobile applications, but also can be used for other information services like static web platforms via common interfaces and clients. This "multi-delivery" attempt is the core of the drafted mobile information system: One central back-end contains all the relevant data which then can be delivered to several different frontends.

Thus, the back-end consists of several technical modules and interfaces and follows a modular development. The usage of common interfaces and the modular development allows customizing and updating the back-end and in this context also the look of the frontend(s): Additional categories like touristic relevant data can be easily implemented without changing the basic technical structure.

The back-end will operate with a basic shared hosting solution in the first step of the development. This server infrastructure will cover the requirements of the back-end (amount of data, number of user) which is needed for the release of the first version of the LIMES-App.

With a view on the data format and the current project status, the collection of limes-relevant data lead to a first output of Limes-locations in Bulgaria (Ruse), Austria (Lower-Austria) and Germany (Rhineland-Palatinate): The most important locations have been identified and wrapped up, including most of the information, that is relevant for the first version of the LIMES-App.

The back-end-system can be seen as a very sustainable instrument for centralizing limes- and touristic-relevant data. The technical specifications and the drafted structure allow a high flexibility while the “multi-delivery” attempt guarantees a great effect for the mobile user. Furthermore the collection of limes- and tourism-relevant data offers several opportunities for creating value and thus, the development of new business.

Integration of limes-relevant Data in Augmented-Reality-Apps

The concept of a “multi-delivery” back-end-system provides the opportunity to deliver the Limes-POIs into three more applications than only the native LIMES-App: LayAR, Wikitude and Junaio. These apps are defined as “augmented reality browser” and combine location-based services with an augmented reality viewer. Thus they are predestined for the visualization of three-dimensional models (3d-models) via smartphone (MADDEN, 2011).

Augmented Reality (AR) can be described as “a live, direct or indirect, view of a physical, real-world environment whose elements are augmented by [...] sound, video, graphics or 3D models” (Wikipedia, 2013). It allows the visitors and tourists to see computer-generated reconstruction of the Limes sites without cutting them off from the real surroundings of the site.

Because LayAR, Junaio and Wikitude have the property to be used as tools for augmented 3D-visualizations, they are the perfect channel to promote the planned virtual reconstructions (“AR-Scenarios”) regarding to LIMES. Furthermore in combination with the back-end-system, these apps offer a great possibility for adding more virtual reconstructions in the future (MADDEN, 2011). A long term approach could be to visualize destroyed Roman buildings along the Limes in whole Europe through the collaboration of archaeologists, universities and start-ups and implement these reconstructions into the established back-end-system.



Fig. 3 – Testing the first prototype of a virtual Limes border at Sexaginta/ Bulgaria and in Pohl/ Germany with LayAR

The compiled points of interest (POIs), including descriptions, have been stored in a central database, which has an interface to the three applications LayAR, Wikitude and Junaio. These named applications offer the opportunity to create so called “Subapplications” (MADDEN, 2011). Thus, the POIs along the Limes can be presented, without implementing a native or web-based application. It can be seen as a big advantage, that these applications already have a high number of users and are available for a lot of different operating

systems (Android, iOS, Windows Mobile, Symbian, Blackberry). LayAR for example has been downloaded over 10 Million times only from Google Play (GOOGLE PLAY, 2013).

Additional component - Museological concept

In addition to the development of a European LIMES App further measures for marketing and presentation of the Limes using innovative technologies will be developed. The Limes in all three partner countries is particularly visible by remains or reconstructions of several buildings, mostly forts and settlements. These historic structures or reconstructions represent a significant focal point for tourists and are therefore significant for the tourism marketing of the entire Limes. The "Museological Concept" provides to offer detailed information about individual parts of these selective sights via QR code. QR codes were originally designed for the automotive industry in Japan, but are now more integrated in the public space for marketing, advertisement and tourist information (WIKIPEDIA; 2013).



Fig. 4 – Sketch of how the QR Code can be used at the Limes sites

By scanning a QR Code which is placed on a cultural heritage site like a Limes watch tower or a castle, the tourist can access easily the information related to the object. This information is based on a website, adjusted for the interface of smartphone or tablet ("Web App"), where it links by scanning the QR code. This can be used without a previous installation. Sole requirement is a camera phone with internet access and a QR or barcode reader (already preinstalled on many smartphones). The advantage is that the Web App works with all operating systems, whether Apple iOS, Google Android, Windows Mobile or BlackBerry (WEBTRENDS, 2013). It runs on the web browser of the smartphone. Signs at the Limes sites make users aware of the service and allow access to information directly via scanning a QR code.

Conclusion and outlook

During the project life time, it could be analyzed that mobile services, especially applications are considered as an innovative way to promote the Roman Frontier. Locals, stakeholders and tourist agencies are seeing a huge potential for the implementation of the service in the targeted regions – also on wide range perspective. In the first period of the project lifetime, a first prototype ("alpha version") was developed which contains basic limes information from the three partner countries Germany, Austria and Bulgaria. In a second step the

app will be tested by selected users from the tourism and archeological fields. Until the end of the project (December 2013), an improved beta-version will be available for a wide audience.

References

ALTHOFF, S.; KRATZ, N.; LANDWEHR, G (2012): LIMES - Large Scale Innovative and Mobile European Services for Culture Tourism in Rural Areas; In: Schrenk M., V. Popovich V., Zeile P., Elisei P., Eds.: "REAL CORP 2012 - RE-MIXING THE CITY towards sustainability and resilience? - International Conference, Schwechat, Austria, May 14-16 2012, Proceedings". Schwechat/Austria: CORP - Competence Center for Urban and Regional Planning. 2012. Page 441-446.

DEMANDT, Alexander (2003): Kleine Weltgeschichte. Munich, Germany.

DRDA-KÜHN, Karin (2010): Mini-study in the field of services innovation in tourism niche markets, prepared for the European Commission DG Enterprise & Industry, Bad Mergentheim, Page 20.

EUROPE MOBILE AND MOBILITY INDUSTRIES ALLIANCE (EMMIA), available under <http://www.mobilise-europe.mobi/>, 18.09.2013.

EUROPEAN COMMISSION (2013): Competitiveness and Innovation Framework programme (CIP), Impact of European Cultural Routes on SMEs' innovation and competitiveness, Brussels, Page 94.

GOOGLE MAP, <https://maps.google.com/>, 20.09.2013.

GOOGLE PLAY: <https://play.google.com/store/apps/details?id=com.layar&hl=de>, 26.02.2013.

GSMA (2012): European Mobile Industry Observatory 2011, available under <http://www.gsma.com/publicpolicy/wp-content/uploads/2012/04/emofullwebfinal.pdf>, 20.09.2013.

ISAAC, Benjamin (1988): The Meaning of "Limes" and "Limitanei" in Ancient Sources, in: Journal of Roman Studies 78/1988. London, UK,

JILEK, S., KUTTNER, E., SCHWARCZ, A. (2011): The Danube Limes in Austria, in: Breeze D., Jilek, S., Thiel, A. (Eds.): Frontiers of the Roman Empire., Central Europe Project "Danube Limes – UNESCO World Heritage.

LIMES BLOG, activities, available under <http://limes.per-rlp.de/activities/>, 20.09.2013.

KNIEJSKI, W. (2010): "The Role of Innovative Services in the Tourism Market to support Regional Development", Mini Study prepared for the SMART Tourism project, European Commission (Eds.), Brussels, Page 4-10.

MADDEN, L. (2011): Professional Augmented Reality Browsers for Smartphones – Programming for Junaio, Wikitude and Layar, Wrox Programmer to Programmer (Eds.), Essex.

NORDIC WORLD HERITAGE FOUNDATION (NWHF) (1999): Sustainable Tourism and Cultural Heritage - A Review of Development Assistance and Its Potential to Promote Sustainability, available under http://www.nwhf.no/files/File/culture_fulltext.pdf, Oslo, Page 6.

RYAN, N., MOHR, P., MANZAROLI, D. et al. (2008): Interoperable multimedia mobile services for cultural heritage sites, in: David Arnold, Franco Niccolucci, Daniel Pletinckx, Luc Van Gool, Eds. "EPOCH Conference on Open Digital Cultural Heritage Systems.

WEBTRENDS, "What is a web application?" available under: http://webtrends.about.com/od/webapplications/a/web_application.htm, 20.09.2013.

WIKIPEDIA: Augmented Reality, available under: http://en.wikipedia.org/wiki/Augmented_reality#cite_note-1, 26.6.2013

WIKIPEDIA QR Code, available under: http://en.wikipedia.org/wiki/QR_code, 20.09.2013.

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