DATA SERVICE DEVELOPMENT IN MOBILE NETWORKS

Katja Koivu
Omnitele
Mobile Communications
P.O. Box 969
FIN-00101 HELSINKI

Mervi Ranta
Helsinki University of Technology
Laboratory of Information Processing Science
P.O. Box 5400
02015 HUT

ABSTRACT

In this paper, we present a method for efficient data service development in mobile networks. It takes into account the fast developing mobile telecommunications technologies and their requirements. We review the special boundaries set by technology and their influence on the development process. The technology bottlenecks in the process can be detected with the aid of this systematic and reusable methodology, i.e., the methodology is applicable to many cases, not only to one specific service, technology and company.

I. INTRODUCTION

Fast developing mobile telecommunications business puts pressure on fast service and product development. Services have to be as mobile as their users and fulfil various user needs. Furthermore, companies have to ensure that the most valuable and potentially successful service ideas are elaborated further on the costly path of development by managing the project according to well-established criteria [1][2].

Compared to the conventional service development process [3], the development process of mobile data services is unique and requires understanding of mobile technologies and their limitations, the special mobile telecommunications business structure and the hectic, fast-developing business environment. Due to the highly increasing complexity of new telecommunications services and the requirement to come onto the market within a short time, new methods, techniques and tools covering the whole service development process are needed [4].

This paper introduces a novel method for enhancing the service development process [5] and in particularly the assessment of service concepts. The technology experts are provided with guidelines and checklists to support them in taking into account all necessary constraints and possibilities during the design work. Service development involves other expertise viewpoints such as user needs and business, however, the focus of this paper is the technology viewpoint.

Section 2 studies the most essential technology boundaries to the service development. In Section 3, we combine the technology know-how to the service development process and introduce the guidelines for service development. Concluding remarks are provided in Section 5.

II. TECHNOLOGY BOUNDARIES

Networks themselves set boundaries for services. It does not matter how good your idea of a service is if the service can not be implemented by the current or emerging technology. Global System for Mobile Communication (GSM), General Packet Radio Service (GPRS), Enhanced Data rates for GSM Evolution (EDGE) and Universal Mobile Telecommunications System (UMTS) will be the basis for future mobile networks and thus also a future service platform on European market. GSM already has a large footprint all over the world and offers reliable but slow data connections. New technologies will bring quite extensive enhancements to the data rates and service opportunities.

Mobile services and their relation to the networks can be presented with a four-field model (see Fig. 1). The horizontal axis illustrates how high data rate is needed in order to perform the wished service at desired

way and the vertical axis divides services by their nature of urgency.

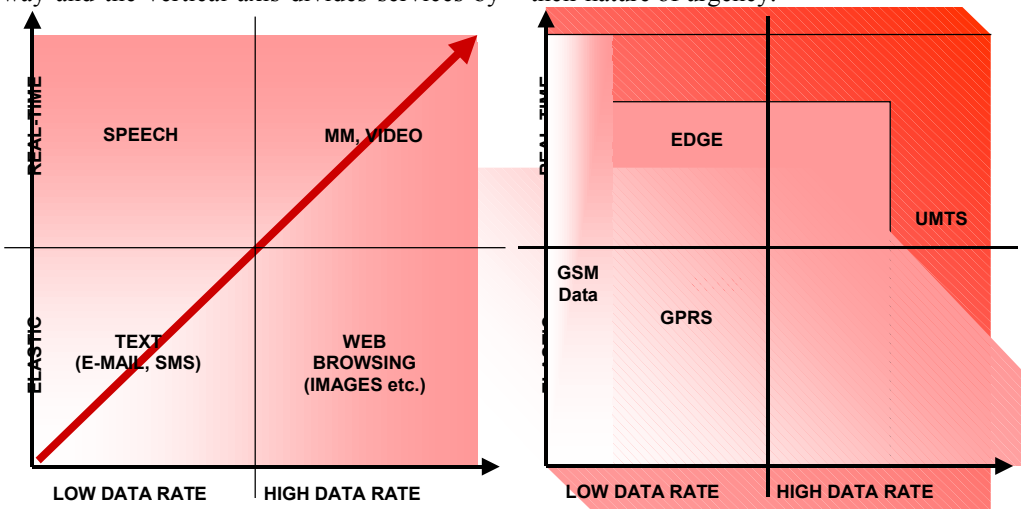

Fig. 1 Services features by applications and platforms

The latter axis also indicates how strong the quality of service (QoS) requirements for different services are. The categorisation of services can be based on their tolerance to delays and losses in the network. Real-time services are often interactive by their nature and do not accept any delays or drops. On the contrary error tolerance is much higher with elastic services. Thus, the QoS follows real-time/elastic axis. The right-hand figure roughly illustrates what platforms are suitable for different services and vice versa.

III. Service Development Guidelines

We propose a framework for service concept development (see Fig. 2) targeted in particular to mobile communication.

A. Concept Generation

The concept generation part of the framework consists of idea generation and concept development (see Fig. 2). Carefully collected ideas have to be converted into detailed service concepts that include all the information needed for a proper evaluation. Some of the service ideas can easily be dropped at this stage if they do not meet the company's overall strategies and capabilities. In the idea generation and selection phase, experts of computing or telecommunication are not necessarily needed, since it is often carried out by people with skills in sales, marketing and other business functions [6] or user study experts.

According to our approach the service concept presented as a service scenario [7]. It is a small story about a user that needs some services in a described situation and place. The incidents described in the story have a concrete character as they include details such as time and named existing places. The scenarios include details such as aim of the service, data to be communicated, desired quality level, and service/usage environment. Additional information of e.g. estimated service user base, i.e., penetration, security needs, and service usage duration is advantageous.

The actual concept development part of the process is the core of the technology evaluation. The technology experts construct technology models out of the chosen scenarios. They extract the involved parties, needed servers, transmission paths, changed data, etc. While doing this they discover alternatives on the technology solutions and express

them as explicit models technology models.

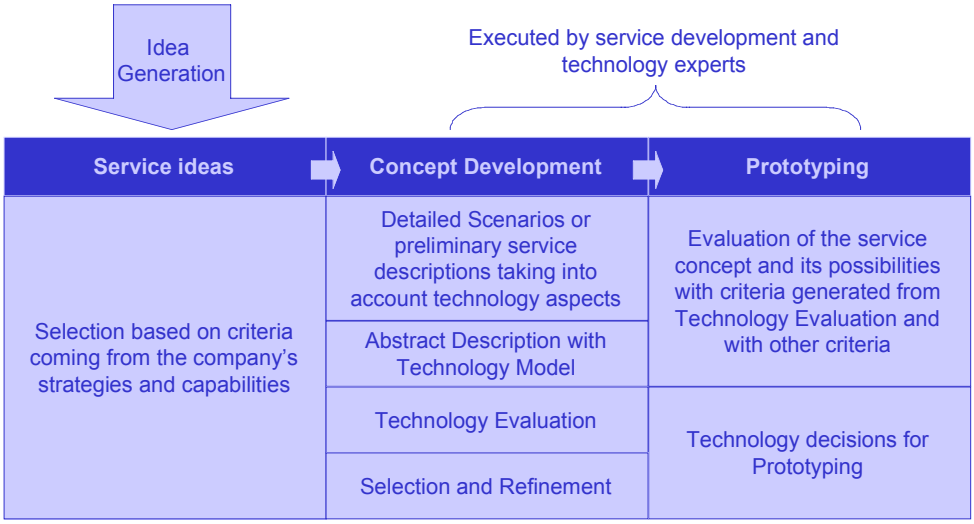

Fig. 2 Framework for service concept development and evaluation

Thus they achieve a description of the initial technological solution alternatives and are able to evaluate them. Without the modelling phase, the technology designers would have difficulty in recording the rationale for their evaluation and furthermore in communicating it to the other designers.

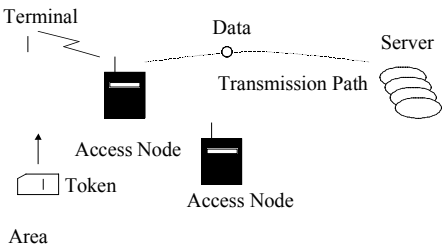

Fig. 3 Technology Model

Technology models consist of the service architecture elements needed in implementing the service (see Fig. 3). These service architecture elements are terminals, data, interfaces (access), servers, and other relevant factors, e.g., mediators. When the model introduced in Figure 3 is connected to some certain service scenario, the elements are named more specifically, e.g., area: urban, data: e-mail, etc. The elements can be a base for a computer application for service development. Technology evaluation is based on the scenarios and technology models.

B. Technology Evaluation

The aim of the technology evaluation is to find possible solutions for service implementation and to determine if they altogether exist. In addition, the critical technology related features of the service have to be discovered.

Technology evaluation is done by a group of technology experts. Communication between the experts and also other experts of the user interaction and business areas is extremely important. The results and improvement ideas coming from the evaluation have to be discussed with other members of the whole development team.

Instructions are needed in order to collect comparable answers from the different evaluators. Evaluators need guidance in order to consider the large number of technological aspects systematically in a

logical order. In addition to the guidelines we prepared a form in order to get as good feedback and improvement ideas as possible from the evaluators. Some requirements for the evaluation form are good and usable grading methodology, logical order of the aspects, reusability, and storability. The form should be in electronical form, e.g., an Excel sheet, so that the information can be stored, easily handled, and reused later on.

According to our experiments, guidelines together with a well-prepared evaluation form give the basis for a successful evaluation of services according to the technology boundaries. The evaluation guidelines in Table 1 show how the different technology aspects can be considered.

Table 1. Guidelines for Technology Evaluation

Technology aspect	Instructions	Needed Information
Data rate	Data rate/bandwidth need is to be evaluated per one user. Remember that the data rate can be depended on the needed quality level too.	Data to be communicated
Coverage	Evaluate the coverage need for the service: • National/international • Rural, suburban, urban, local • Indoors/outdoors	Mobility model
Capacity	Evaluate the capacity need by the number of users and their service usage in a limited area (coverage). Usage means the combination of usage time and data rate. Capacity calculation can be based on environment analysis, which includes information of the population and service penetration in a certain area. Evaluate capacity aspects also considering terminals. The need depends highly on the data to be communicated.	Estimated user base in the service area. Environment analysis. Service usage.
QoS	Evaluation of the needed level of quality can be based on simple three classes: low, moderate, high. Remember to give reasons on what basis a certain class was chosen for the service. Consider also what the quality need requires from the system	Estimations and demands for quality of *content* and *network/system*. User tolerance to: • Blocking • Dropping • Noise • Delays
Security	Security requirements depend on the data to be communicated and for example on how the billing is to be executed.	Information of the needed security level, money transactions, etc.

Criteria that should be evaluated before proceeding to the next stage of the process are service requirements for data date, coverage, capacity, terminal capacity, quality of service, and security. In order to be able to better understand the need for quality of service the real-time features of

the service should be considered too. The evaluation contains considerations such as:

- What special requirements the service sets for networks and terminals?
- Which of the requirements are critical (bottle neck) and why?
- Can the service be implemented with current or incoming technologies?
- If not, what should be changed in the scenario in order to be able to implement the service?
- Service implementation alternatives?

First the evaluators consider the different technology aspects and their relation to the service scenario and the technology model. Then they grade the technology aspects by their criticality for fulfilling the features of the service in a feasible level. Since the experts have already gained good understanding of the service while creating the related technology models, answering the questions related to the criteria is straightforward.

After the grading and the service concept reaches a more specific form. The following prototyping phase includes the actual technology decisions. During this phase, the service concept is still forming itself to a more concrete form. In [7], a more in depth description of the service development process with this particular method is introduced.

IV. Conclusions

The proposed methodology for efficient data service development in mobile networks takes into account the fast changing telecommunication technologies. The introduced guidelines cover the early phases of the service development process, however, the results and basics are applicable also to the later phases.

Furthermore, all the information gathered during the development process is stored for further use. If something in the service environment changes, it is easy to come back in the process and to find the new possibilities.

Service development is one of the key processes of a company and requires both human and financial resources. Developing one service idea to the implementation is a costly track and therefore only the best ideas should be left in the end. Practical processes and methods help companies to avoid flops and become more successful.

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