

Towards Adaptable services

Isabelle Demeure
*Ecole Nationale Supérieure des
Télécommunications, France*
IST-ANWIRE
E-mail: isabelle.demeure@enst.fr

1. Introduction

With the development and deployment of wireless networks substantial evolution is observed in the area of telecommunication service provision. Users will soon expect to have access to a wide variety of personalized, context-aware services at any time, from any place, and from any terminal device. In this context, mobility of users, devices and software components can occur, leading to changes in the environment of these entities. Moreover, services can be highly dynamic, with users requiring support for novel tasks and demanding the ability to change requirements on the fly. Consequently, **adaptation** is required from the service provision system.

We define a **service** as a set of functions and facilities (related to applications, telecommunications facilities, contents, products, etc) offered to a user by a provider, according to an implicit or explicit service agreement [SPW02]. Examples of services are mobile banking services and mobile entertainment services.

A software is said to be **adaptive** if it can change its behaviour to accommodate a change in its requirements or its operating environment.

The support of adaptive service provision in mobile wireless environments is one of the focuses of the ANWIRE Network of Excellence, for “reconfigurability and always on connectivity”. We take the opportunity of this workshop to make a first presentation of the adaptable service task force (task force 4) progress. The remainder of the presentation addresses in turn each of the following questions: why adapt ? Adapt to what ? when to adapt ? who is in charge of adaptation ? How to adapt ?

1 Why adapt?

To answer the “why adapt?” question, we are in the process of defining a number of driving scenarios such as the following one:

Philip is sitting in his office, in front of his PC connected to the enterprise wired LAN, watching a videoconference broadcast live.

He realizes that he is going to miss his train if he does not leave the office now. So he switches on his pocket PC; the service is “transferred” to his pocket PC and adapted to the terminal; Philip can continue watching the conference through a connection established on the enterprise wireless LAN. Since the available bandwidth is reduced, the service automatically shapes and adapts the video flows.

As Philip is leaving the building he loses the Wireless LAN connection. It is automatically relayed by a GPRS connection. Philip realizes that since he is walking and mostly listening to the videoconference, he should not be paying for the highest video QoS. So he requests a lower level of video QoS.

When he enters the train station and sits down he notices that his battery level is low. So he asks the service to adopt a mode in which it consumes less energy (eg black and white video, less frames per second).

2 Adaptable to what ?

There are many parameters that may change in the context of a service and to which the service may have to adapt.

We distinguish : adaptability in service provision and operation and adaptability in the service introduction / deployment / management.

2.1 Service provision

Possible evolving parameters are:

- user preference (QoS requirements-privacy, security, performance),
- location, context awareness, presence, ambient information,
- heterogeneous terminal, network, OS, middleware, programming language,
- varying resources, varying resource needs, (network bandwidth, power supply, CPU and memory)

2.2 Service introduction, deployment, management

The requirements in terms of adaptability here are:

- Evolutions of services provided by several network operators and service providers must be made easy.

- Need for easy, reliable and secure service discovery, insertion, dynamic service deployment (service brokers).
- Identification of optimal service configuration, and distribution based on contextual information.

3 When to adapt?

Service adaptation may take place at different times during the service life cycle:

- design time : software designer must anticipate adaptation decisions and strategies.
- deployment time : software “administrator” adapts the service to the execution environment.
- runtime : software dynamically adapts to change.

4 Who is in charge of adaptation ?

Several “components” of the overall architecture can be in charge of adaptation:

- the support system (e.g., network capabilities, execution environment, middleware).
- the service.
- cooperation between support system and service.

Also, business models may involve several actors such as service providers and network operators who cooperate to implement service adaptation.

5 How to adapt ?

There are many enabling technologies for software adaptation:

- Formalism to describe services, environments, profiles, preferences.
- Software engineering methodologies and tools for creation and management of adaptive services.
- Support for modular, component based service design and execution: appropriate middleware solutions and software engineering technics for « Componentized » services.
- Mechanisms for implementation of adaptation policies, and identification of appropriate adaptation strategy in each context.
- Interaction with charging / billing.
- Support for non functional properties : QoS, security, system stability, performance.

6 Conclusion and future work

We have presented here a first attempt at capturing the implications of service adaptation. The task force 4 members are currently working at:

- Establishing a bibliography of the field (draft available on the anwire portal <http://www.anwire.org>).
- Identifying a complete set of driving scenarios.
- Identifying a generic architecture for adaptable service support.

7 References

[SPW02] Stewart,J.(ed), Pitt,L., Winskel,M., Williams,R., Graham,I., Aguiar,J., Correia,L.M., Hunt,B., Mouldsley,T., Paint,F., Svaet,S., Michael,B., Burr,A., Eskedal,T.G., Yin,V. and Stimming,C., “**Flows Scenarios and Definition of Services**”, IST-FLOWS Project Deliverable D6, European Commission IST Office, Brussels, Belgium, Dec. 2002.

This work has been produced in the framework of the project “ANWIRE” (www.anwire.org), which is funded by the European Community under the contract IST-2001-38835. I am grateful to all task force 4 participants whose contributions have inspired parts of this abstract.