

MUSIC

Scope

Today most people use a mobile device of some sort, whereby many new mobile services are emerging and an increasingly diverse set of devices such as PDAs, smart phones, GPS, etc., are appearing on the market. As the public becomes accustomed to the use of mobile services, expectations about what services should be available, where they should be available and how well they should perform has become more topical and demanding. However, the current range of mobile devices and the type of infrastructures available have heightened the complexity and technical challenges to match public expectations head on. Software Engineers must deal with many configuration, operational and maintenance issues and provide technology that can dynamically, securely and automatically adapt to satisfy public expectations in different scenarios and varying computing environments. Music (Mobile USers In Ubiquitous Computing Environments) is a technology driven project, which aims to provide an open source software development framework that makes it technically and commercially feasible for the wider IT industry to develop innovative mobile applications, which are:

- context-aware – i.e. understand “context” in the widest sense, including user changing availability of computing and communications facilities and in doing so is capable of exploiting the knowledge of external operating conditions,
- self-adapting - i.e. able to dynamically adapt functionality and internal implementation mechanisms in response to changes in context in order to maintain important extra-functional properties (e.g. usability, availability, security, dependability, etc.), and is a requirement for more and more software systems, including mobile applications,
- inherently distributed in nature and may involve direct interactions between multiple users.

Advances

To address the technical challenges and promote the development and widespread deployment of innovative mobile applications, Music (<http://www.ist-music.eu/>) will:

- Carry out research to produce a conceptual framework for the development of context-aware and self-adaptive mobile applications for mobile and ubiquitous computing environments.
- Develop an open platform and a design methodology for the development of such applications, including notations, distributed system architecture, tools and middleware, which will significantly ease the development and cost of such applications.

- Validate the benefits of the platform by developing and demonstrating a set of trial applications, based of challenging application scenarios, including a mass-market environment.

The project will also develop modeling language extensions and tools, which enable Software Engineers and Designers to specify adaptation capability at design time.

Positioning in global context

Clearly, Music is not the first project to address dynamically adaptive software systems. It is based on, incorporates and extends earlier research work. However, Music stands out since it provides a truly comprehensive solution that addresses adaptation from both the theoretical and practical perspective. In particular, Music builds on results achieved in Madam, an earlier FP6 project (<http://www.intermedia.uio.no/display/madam/Home>) and is positioned as an open source framework that will make it easier to develop new mobile and ubiquitous computing applications and services.

Contribution to standardization and interoperability issues

Music promotes necessary standardization by aligning the work of the project with relevant standards, proposing modifications to existing standards and/or proposing new standards. This includes contribution to the development of the DIS 29500 (Open Office XML) standard, the PAG (Presence and Availability) working group and the OSGi alliance (<http://www.osgi.org>) amongst others. The Music middleware is based on the OSGi framework.

Target users / sectors in business and society

The use of computer-based information and communication services by people on the move is hindered by the lack of services truly usable on handheld devices in mobile settings. Music aims to remove this obstacle by providing technology that has the potential to dramatically ease the development and use of computer-based services in mobile settings and advance the development and usage provision of mobile communication technology. As a result, Music will impact several sectors in the economy including:

- Service providers (i.e. public and commercial) will be better able to reach and satisfy their users and see an increased market for their products.
- By adopting Music’s methods and tools, Software Engineers will improve their ability and efficiency in developing context aware and self-adapting software.

- Communication infrastructure operators will see increased traffic and better utilization of resources.
- Manufacturers of handheld devices and vendors will see increased demands for their products.

Overall benefits for business and society

The technology developed in Music has the potential to broaden ubiquitously available applications and services both for business and private use. The adaptation of services will improve the service usability and other service quality properties in mobile settings. Software engineering costs will be reduced. Also, the handling of quality attributes of the application will lead to more dependable solutions, and will improve the trust in the applications. Overall, this will enable increased use of computer-based services in mobile settings, giving service users better support for their tasks when they are moving around.

Examples of use

The Consortium will demonstrate the Music results by developing a number of trial applications in order to assess and determine the impact and the benefits derived. One set of trial applications is related to supporting travellers on public transport in modern cities. The demonstration will be hosted by RATP (<http://www.ratp.com/>) in Paris, France. Application functionality includes travel assistance, entertainment and assistance related to irregular incidents, such as an accident. Sitting on a bus or train or walking through metro / train stations and possibly facing delays or having to change plans for other reasons, travellers will have varying needs for support from their handheld devices and they will experience variations in noise and light conditions as well as in network conditions and consequently in available services and computing resources. Developing applications suitable for use under such conditions clearly require the integration of context awareness and self-adaptation capabilities. Doing this in an adhoc way with conventional development methods and tools is costly and time consuming. Using the Music technology is expected to significantly reduce the necessary effort to achieve the desired context awareness and self-adaptive behavior.

Achievements

The main achievement of the Music project will be the development environment consisting of

- **The Music Methodology**, guiding developers in developing context aware and self-adapting mobile applications and services.
- **The Music Studio**, providing an integrated collection of notations and tools supporting modelling of adaptable software and context dependencies, automatic code generation and analysis, simulation, testing and tuning of adaptation related behaviour.
- **The Music Middleware**, supporting context awareness, automatic adaptation planning and decision making, and dynamic adaptation, based on exploiting software models at runtime.
- **The Music Web site**, supporting development work and building project interest and a growing awareness for the availability of open source software for the development of context aware and self-adapting wireless applications and services.

Music seeks to ensure the continued uptake and evolution of its technology beyond the lifetime of the project by adopting an Open Source strategy, which includes the establishment of an Open Source community during the project lifetime and the use of development methods and tools that are endorsed by the Open Source community. The Consortium comprises of 15 partners including SMEs (e.g. <http://www.sid2u.com/>), industry (e.g. <http://www.hp.com/>), researchers (e.g. <http://www.sintef.no/>) and four universities (e.g. <http://www.uni-kassel.de/>). See the Music web site for further detail.



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