

# VALUE PROPOSITION OF CONTEXT AWARE MOBILE TECHNOLOGIES

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## ABSTRACT

The advent of the Internet and mobile communications has played a great part in redefining the way people communicate in the last decade. In their own distinct ways, each has completely changed the whole nature of availability, communication and accessibility to abundant information. One of the visions for the future of telecommunication is for conventional services such as voice call to be integrated with data services like e-mail, web and instant messaging. As all these new technologies evolve, more and more efforts will be made to integrate new devices and services. New markets for services and devices will be created in this converged environment. Services become personalised when they are tailored to the context and adapted to changing situation. Context aware network system is designed to allow for customisation and application creation while at the same time ensuring that application operation is compatible not just with the preferences of the individual user but with the expressed preferences of the enterprise or those which own the networks. This kind of information and communications technology and mobile services together form one of the most promising business fields in the near future. The value propositions of proposed Context Aware Service Platform (CASP) are discussed. This paper serves as a foundation for further studies in investigating context aware mobile technologies exploitation opportunities.

**Keyword:** communications, converged environment, context aware, value propositions

## INTRODUCTION

The development of hybrid mobile devices is bringing significant impact on the next generation of mobile services that can be rolled out by mobile operators. Fixed-mobile convergence (FMC) is presently one of the strongest trends in telecommunications (Cellular News, 2006). With the recent advances in mobile computing technology and the penetration of wireless networks, the nature of the services proposed to the users is moving towards mobile and context-aware services (Floch, Hallsteinsen, Lie, & Myrhaug, 2001).

Figure 1 shows that the demand for hybrid mobile devices will increase drastically in the next few years. In a converged world, an extended personalisation concept is required. Mass customisation to cater for the needs of each individual enables one-to-one effective marketing (Nokia, 1999). The aspects covered include user preferences, location, time, network, and terminal have to be integrated and the relationship between these aspects must be taken into consideration to design business models. Next-generation handsets are capable of a combination of services available on Personal Digital Assistant (PDA), mobile phone, radio, television, and even remote control.

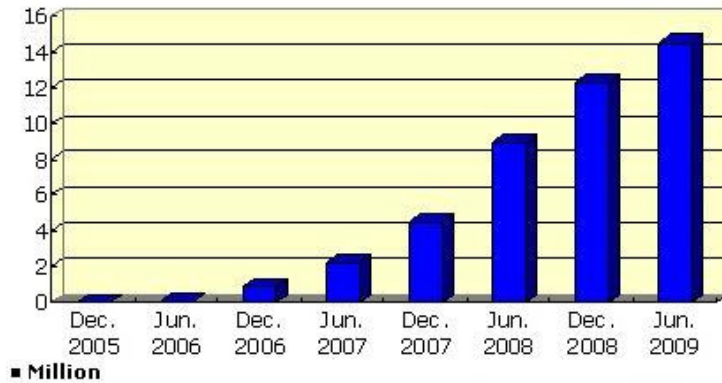


Figure 1: 3G + Wi-Fi Convergence Terminal Subscriber Forecast (Cellular News, 2006)

When multimedia becomes inevitable, the need for guaranteeing certain levels of Quality of Service (QoS) becomes imminent. In mobile environment where users on the move tend to change networks more frequently, QoS guarantees will lead to the need for dynamic personalisation (e.g. content tailoring) on network and service level. On top of this, the optimisation of content for a given geographical market is a necessity for making any application a success (Travish & Smorodinsky, 2002). This means that personalisation can be achieved by offering location-dependent information to users on the move.

This study looks into seamless access, based on flexible forms of collaboration, interactions with anybody, anytime and anywhere; awareness of (anticipating on) changing contexts including time, locations, personal domains, and tasks, as well as organisational structures and processes. This paper responds to the challenge to realise more flexible, adaptive and context aware (in terms of location, time, language, culture, and personal needs) forms of collaborative work. Exploiting new business enabler such as context awareness will contribute to this potential.

## BACKGROUND

Fixed-line subscriber growth is projected to lag behind cellular growth for the next few years. Figure 2 shows the forecast of the global distribution of mobile communication and broadband wireless access. This means that subscribers increasingly require access to mobile services on the move. As a result, adaptation and content tailoring to specific individual and current environment is one of the key enablers driving the adoption.

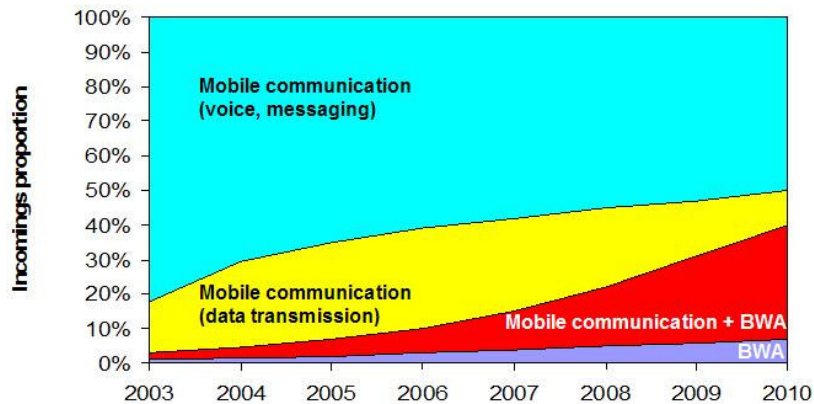


Figure 2: Forecast of the Distribution from the Services of the Mobile Communication and Broadband Wireless Access in the World (Skorodumov, 2005)

Mobility is about moving around. Figure 3 shows that different kinds of entities such as persons, computers, information or programs may move around. The mobile entities may communicate and access services ubiquitously or, in the contrary, services may be adapted to various characteristics of the mobility space such as the physical location (Floch et al., 2001). In the past, user movement has often implied interruption of service. With the advent of pocket size computers and wireless communication, services can be accessed without interruption while the entity using the services is moving (Floch et al., 2001).

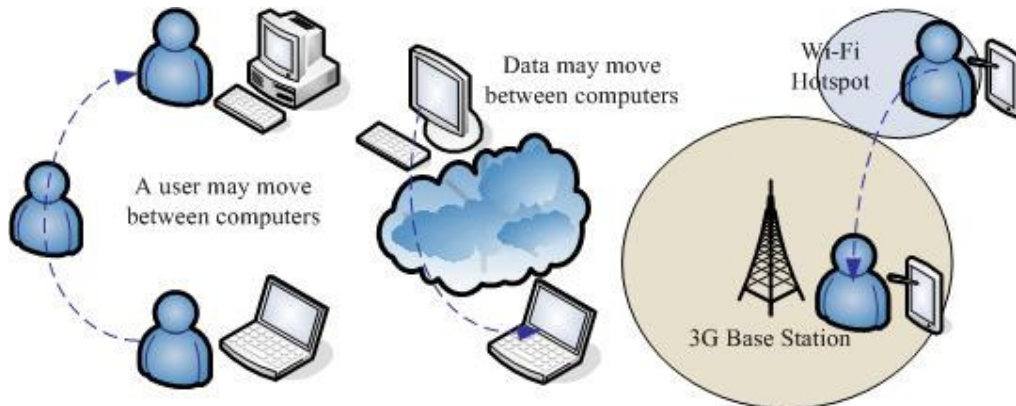


Figure 3: Mobility

Services become personalised when they are tailored in context of the situation and adaptable to the changing environment. The context in this sense consists of many aspects, such as the needs, preferences, history, and behaviour of the user, location-related aspects (e.g. physical coordinates and velocity); technical aspects such as network bandwidth as well as device capabilities, and so forth.

The context will consist of the following categories:

- User-related category, typically consisting of user preferences, user history, user interest, user role, user priorities
- Mobility and location-related category, typically embedding physical coordinates, velocity, direction of movement, ambient conditions (indoor, outdoors, temperature, humidity, etc.)
- Network and terminal characteristics, such as bandwidth, graphic capabilities, screen size, etc.
- Non-user-related information, e.g. which contains content-related preferences (such as presentation format, encoding, etc.)
- Service-related information, e.g. describing what the service delivers, pricing information, service requirements on network and terminal, etc.

The basic principle of adaptability is simple. When the environment changes, the application changes to suit the requirements of a user. Services should adapt dynamically by using automated learning capability.

## VALUE PROPOSITIONS

Seeing the increasing need for personal communication device which can connect to any type of network – mobile networks, IP networks or even public switched telephone network (PSTN) – and that supports all voice and text-based communication services, BT seeks to develop a Context Aware Service Platform (CASP). The primary function of the platform is to facilitate acquisition, translation and representation of context information in a structured

and extensible form, in order to enable the development and enhancement of functionality of network resource, personalised according to individual's needs. The secondary function of the platform is to facilitate rapid development and deployment of services and applications through a defined framework which can maintain interoperability between different services and domains.

The *CASP* platform consists of the following elements:

- Context capture: acquisition of sensors (environmental sensors, functional sensors etc.)
- Context inference: transformation context information into knowledge that could be used
- Service profile: profile definition of deployed services to allow provision of services to match users' needs

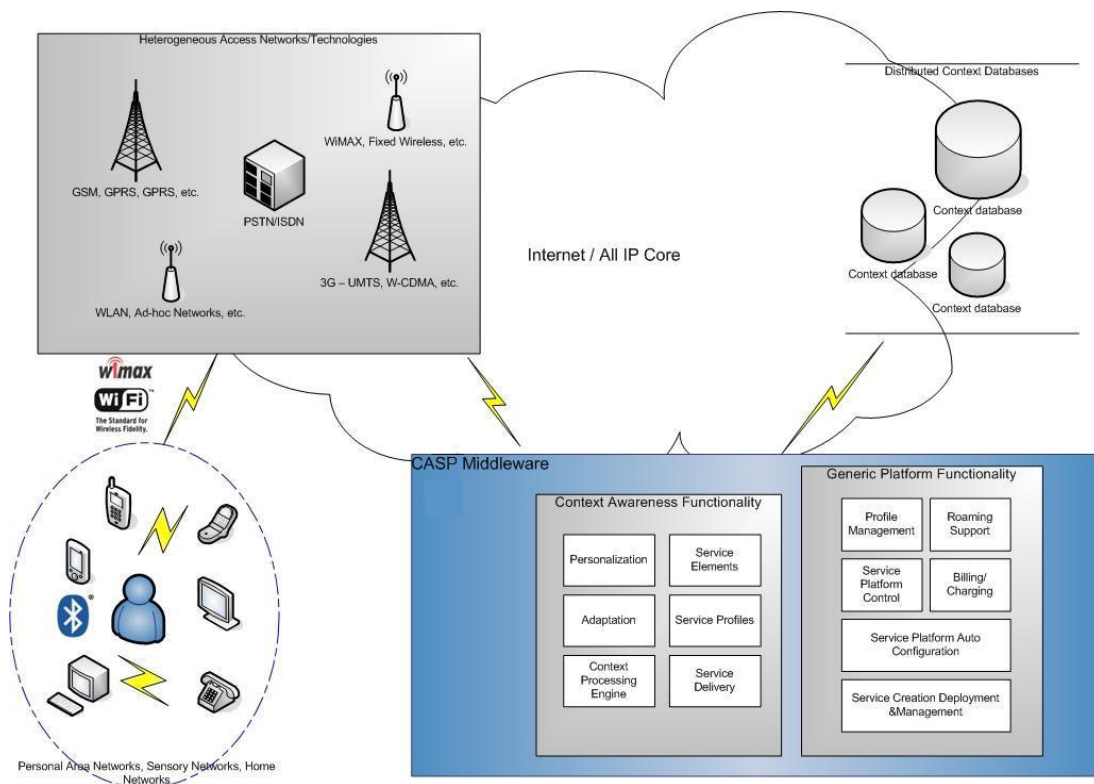


Figure 4: High Level Architecture

Figure 4 shows a high level architecture design detailing how a multitude of peripherals in the individual's environment are being monitored by agents and elements within the platform, which allow the services or applications to be adapted based on the situational context of the individual.

### Salient Features of the Proposed Product

In June 2004, NTT DoCoMo, BT and a number of other incumbent operators from around the world formed the Fixed-Mobile Convergence Alliance (FMCA) with the goal of developing common technology standards and low cost devices for integrated fixed-mobile services. The *CASP* middleware described is the interpretation and one of BT's visions for the development of a converged platform.

The research activities of *CASP* focus on a number of features:

- *User-centred operability*

One important requirement for heterogeneous network environment is the ability to instantaneously optimise services for individual users without the need for them to perform any annoying operations. *CASP* aims to provide transparent connectivity between users with devices and surrounding communication resources. It is able to recognise users' situations and environmental information automatically.

- *Ease of service provisioning*  
The proposed platform and generic framework guidelines in respect to security, data integrity, non-repudiation, registration, subscription, and QoS for all services will be made available. It offers standard interfaces for all services which enable easier access to a less complex network, with common operation and management, maintenance and training, as well as a common environment for services development and delivery.
- *Interoperability of shared services*  
The proposed platform provides a common specification for services to guarantee the interoperability between shared services in the communication networks. Specific context information with respect to specific aspects characterising a service or entity can be expressed in XML-based instance document.
- *Unified identity*  
In a true seamless access communication world, every user or communication object is represented by a unified identity. Session initiation protocol (SIP) address (e.g. simon@bt.com) can be used to uniquely identify user or communication object even when it moves across different networks or between different devices. By having identity management, it simplifies mobility management, security management and unified user profile management.
- *Dynamic user interface (UI) on shared device*  
Through the proposed platform, user can have a shared device which can connect and interact with the ubiquitous communication objects nearby. Each networked object or entity such as cameras, scanners, printers, video players and so forth, can be represented by different UI based on its own dynamic profile and thus can react intelligently to events in the communication space.
- *Context enabled adaptive service*  
The heterogeneity of the converged networks, in terms of network capacity and terminal capabilities, is expected to cause unpredictable changes of network condition. The traditional QoS mechanisms, which do not take the presence of mobility and seamless connectivity into consideration, are not sufficient to guarantee a stable service. Thus, the use of adaptive services being able to change their settings to adapt to the available network resources is a must. *CASP* enables dynamic selection of the settings used by multimedia services and applications during a multimedia session based on the context of the surrounding environments.

## CONCLUSION

Some of the challenges in the past decade including convergent services suffering from lack of definition, unclear market demand, technology integration challenges, incompatible organisational structures, regulatory constraints and inadequate supply of devices. Players seeking to capitalise on opportunities with converged solutions need to focus on addressing the market segment which is likely to be the most receptive to converged solutions, such as business users on the move as well as the youth. This paper

summarises the need for context aware mobile services, the description of the proposed product and its benefit.

The proposed *CASP* will enable ease of developing, deploying, and maintaining context aware services and applications through the use of a structured framework and dynamic definition of domain ontologies to promote growth of the knowledge plane. Future services and applications would be more aware of variables which could affect how an individual would communicate. With such a platform in place, boundaries for creation of adaptable services and applications are limitless.

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