The Personal Distributed Environment

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Intelligent service provision across communications networks has received much attention in recent years. In particular, user customisation of services is recognised as a key component in service delivery on current and future platforms. Customized Applications for Mobile Enhanced Logic (CAMEL) has evolved as a significant enabling technology for GSM systems. For UMTS networks, the Virtual Home Environment (VHE) extends and builds upon technologies such as CAMEL and others. The VHE concept is designed to permit portability of a Personal Service Environment across networks *and* terminals. Thus, the VHE is designed to allow foreign cellular networks to emulate the behaviour of a user's home cellular network.

More recently, attention has shifted to service provision across a greater range of access technologies than cellular alone. The Personal Distributed Environment (PDE) [1] embraces a user-centric view of multi-modal communication: cellular, WLAN, DxB. With the rapid adoption of smartphones, and wireless-enabled laptops, etc., the PDE concept is based upon the inherent assumption that in future the user will control a range of communication/processing devices located variously within his/her household, workplace, vehicle, and on his/her person. Each device will have its own distinct characteristics and capabilities: video screen, codecs, and interfaces. The PDE concept recognises that the user's devices will generally reside in physically separate sub-networks, as shown in Figure 1.

A related area, Ambient Networking is focussing on opportunistic connectivity of a multitude of processing devices. Like Ambient Networking, PDE research is examining issues of ubiquitous service provision over heterogeneous networks, and intelligent location/context enabled services. However, the PDE research is focussed around a user-centric approach of creating the equivalent of a personal Virtual Private Network (VPN) between the user's devices and using the VPN for service delivery.

A distributed user-centric network, such as the PDE, will require a management entity to supervise many aspects of its operation including session set-up & tear down, service and feature discovery, authorisation, authentication & billing: the Device Management Entity (DME).

For PDE terminated sessions, the Session Initiation Protocol (SIP) [2] is used to facilitate connection establishment. The DME maintains a topology database of the devices that comprise the PDE, allied to this is an equipment register that stores records of each PDE device's capabilities and characteristics. The incoming session is then directed to the appropriate device depending on: suitability to support the session, appropriateness of access technology, and proximity to user. The paper will highlight the use of IETF presence protocols in the maintenance of the topology database [3 – 6].

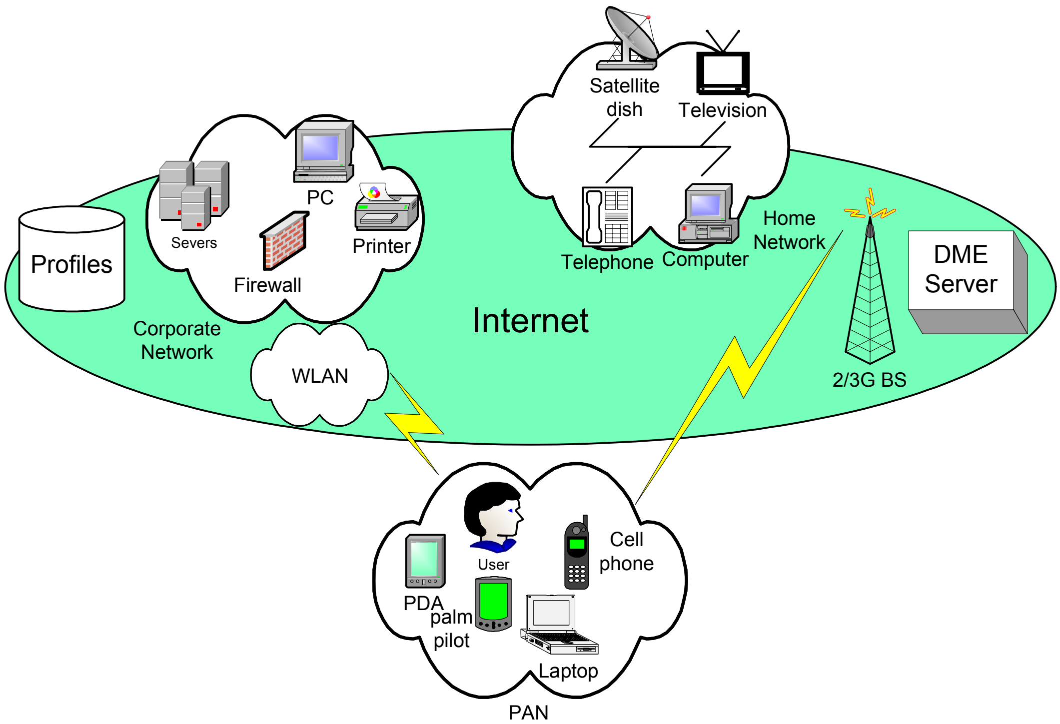

Figure 1 : PDE Sub-networks

For PDE originated sessions, the originating device must utilise the preferred access technology. Consider a multi-modal device (cellular & WLAN enabled), the device is required to select the most appropriate access technology to support the QoS requirements of the service in a cost-efficient fashion for the user. This may entail a negotiation process with a variety of access network operators. Consequently, bearer service negotiation across heterogeneous networks is central to session support within the PDE. Given that each of the access network types will be able to provide a range of bearer services, each with their own QoS characteristics, multimedia service provision over different access networks becomes a distinct possibility. The rationale is to exploit the best characteristics of each access network, and combine them in such a fashion as to permit support for services in a more efficient fashion than networks operating in isolation: synergistic service delivery. Such a rationale requires dynamic real-time bearer negotiation across heterogeneous network types and this is enabled via a concept known as the Digital Marketplace (DMP) [7 – 8]. This publication will examine some of the key issues that are being investigated such as to bring the PDE concept into realisation.

A multi-faceted security architecture is being developed within the PDE work area. Authentication is required between the PDE and service provider/network operators. This places a requirement on the PDE security architecture to permit each of the constituent PDE device’s to be authenticated in a consistent manner. Thus the user can be billed by a network operator irrespective of which of his/her terminals is used to support a session. Synergistic service delivery is one of the main objectives of the MVCE Core 3 work programme. This entails accessing services via a wide range of access networks. In some cases a single service may be delivered over more than one access network. The PDE may be configured to permit only a sub-set of services to be accessed via specific access technology. For example, the PDE may be configured to permit large scale data downloads via WLAN only. Thus authorisation is required to permit access to 3rd party services from the PDE, and authorisation is not just restricted to particular device but also to the choice of interface on those devices. The PAN section of the PDE may encounter foreign nodes that provide additional services. A hybrid Trusted Third Party – web of trust, trust model has been devised to facilitate interaction with such devices. This approach enables the PDE to determine if the foreign node has a good or bad reputation. The paper will provide an overview of these issues and present the associated security architecture that has been proposed to solve them.

References

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