



AccuROAM™

WiFi Roaming



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1. Introduction

As technology has evolved and progressed within the telecommunications marketplace a noticeable recent trend has been that the pace of development in handset technology has significantly exceeded the level of innovation in network services. For example, while only a few years ago most devices were limited to simple messaging and ring tone features as extensions of basic voice call capabilities, today it is difficult to find a handset that does not offer a high resolution colour screen, a digital video camera and an advanced media player. In fact, advances in device technology have led to a blurring of the differences between mobile phones, PDAs and laptop computers.

The next technology component that will become ubiquitous across all mobile handsets will be WiFi connectivity. In fact, many WiFi capable mobile phones are already available, such as Apple's iPhone. Devices like this, and equivalent handsets that use Microsoft Windows Mobile or Symbian platforms, represent both a threat and an opportunity for network operators.

At first glance, the threat appears to be significant. WiFi hotspots are not difficult to find in urban areas and many cities are now rolling out free metropolitan WiFi networks. Telephony applications such as Skype are already available for OS X and Windows Mobile. The implication of this for network operators is not simply related to the decline of voice revenues, which is already a well-understood trend, but is also related to the erosion of the customer relationship. The migration of intelligence from the core network towards Internet applications at the end points relegates network operators to the role of a simple utility.

The urgent need for network operators then is to ensure that the innovation within their network service domain, keeps pace with the device lead trends. In doing so, the rapid churn of mobile phones among the user base towards WiFi capable handsets can also represent an opportunity to retain the role of a service provider rather than a utility. For example, while it is possible for end users to run Internet telephony applications on dual

mode handsets, this does not in fact represent the kind of integrated and holistic service experience that the mass market demands.



Fig 1. The Dual Mode Apple iPhone

The 3GPP and 3GPP2 have recognised the need for network operators to provide such a convergent service and have defined the Voice Call Continuity (VCC) specifications. The VCC standards describe how calls can be seamlessly handed over between the mobile network and WiFi domains

and Accuris Networks has provided the world's first-to-market VCC implementation within the AccuROAM product.

Importantly though, the heritage of the AccuROAM platform as a mature roaming gateway product allows simple call handover to be extended with many additional features. For example, all of the services that end users know and expect to be available from their traditional mobile phone, such as messaging and call forwarding, can be seamlessly made available as the dual mode handset 'roams' onto a WiFi hotspot.

This is a fundamentally different approach to a more basic implementation of the VCC specifications, where voice traffic is simply routed to the most appropriate network domain. Furthermore, since mobile telephony technologies have been designed to provide for roaming between different networks and have been operating as such for years, AccuROAM represents a trusted and low risk architecture for enabling a comprehensive WiFi based service, while sweating existing assets in the network.

The opportunity then for network operators is to keep pace with device driven market demand and increase profitability by providing more high value services in this space.

2. AccuROAM Fixed Mobile Convergence

The AccuROAM platform is not simply a VCC product but rather, it is a universal Fixed Mobile Convergence system. This means that the functionality provided not only addresses the core requirement of voice call handover but also all of the surround capabilities that are necessary to launch a commercial service towards the end user market. Accuris Networks is uniquely well placed to understand and deliver against these requirements, based on over 10 years experience in deploying and supporting roaming gateway platforms.

AccuROAM was first deployed in 1996 for the Atlanta Olympics, to provide for roaming between GSM and AMPS domains for T-Mobile and GTE. Since then a wide range of deployments have been made to provide for CDMA and GSM roaming and more recently, support for the VCC specifications has been added to enable roaming onto a WiFi domain.

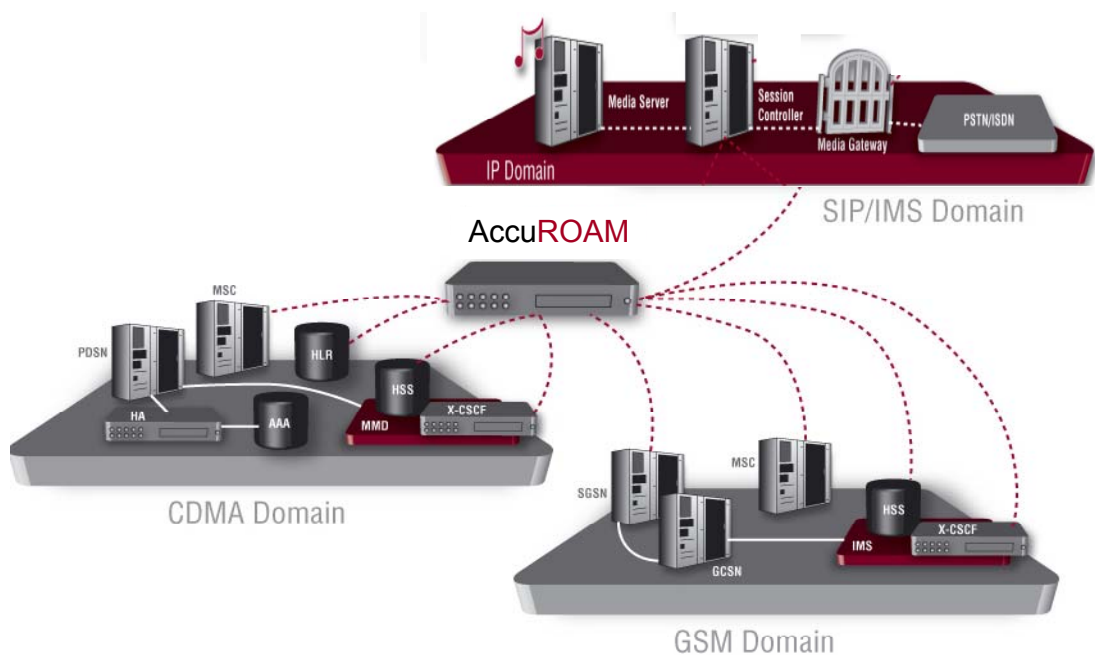


Fig 2. AccuROAM Connecting Networks

This deployment validation of the AccuROAM product provides for the support of a wide range of important features on the platform, which are beyond the scope of the VCC specifications. In addition to extensive interfaces towards network management systems, operational support systems and billing systems, the following capabilities are also provided:

- 3GPP AAA Server for I-WLAN inter working
- Proxy VLR, HLR and MSC nodes
- Messaging Application Server

These capabilities are based on the functionality that has consistently provided total convergence across disparate access networks for many

years. This field-tested feature set has demonstrably supported the end user experience that subscribers will expect and pay for, including:

- Seamless authentication and registration so that a single identity can be preserved
- Persistence of a full service profile across heterogeneous access networks so that messaging and settings such as call forwarding parameters are applied while WiFi connected

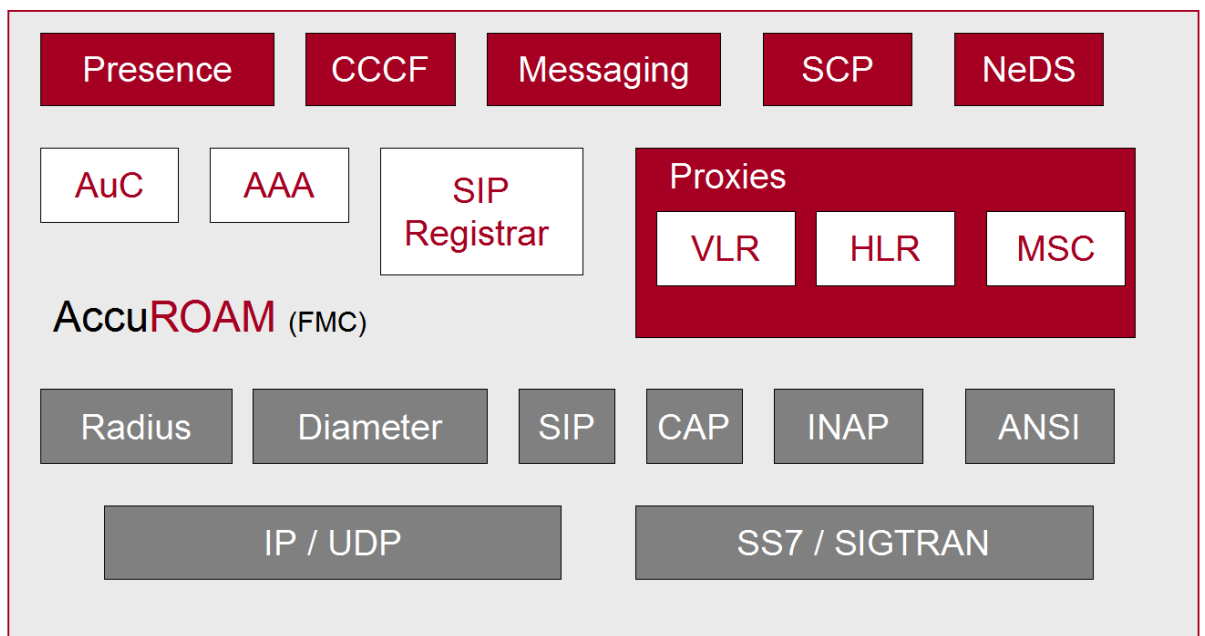


Fig 3. AccuROAM (FMC) Features

The AccuROAM FMC product also provides a full implementation of the nodes described by the VCC specifications, which are the Network Domain Selection (NeDS) component and Call Continuity Control Function (CCCF). However, Accuris believes that the NeDS and CCCF features provide only a small part of a comprehensive Fixed Mobile Convergence service, for roaming between PLMN and fixed WiFi domains.

3. Fixed Mobile Convergence Fundamentals

The 3GPP has defined in the VCC specifications, the mechanisms required to seamlessly handover a call between mobile telephony and WiFi access networks, including the interfaces required towards existing standard reference architectures. However, Accuris believes that this falls a long distance short of the feature set that is required by network operators in order to efficiently roll out a compelling service towards end users.

For example, as with any new technology, it is likely that the use of dual mode handsets to roam onto a WiFi domain will lead to many queries being generated by end users towards Customer Care Centres. In order to minimise the costs of providing the service and to allow end users to have issues addressed rapidly, it is key that the maximum level of automation is applied to this process. Accuris recognises the difference that this can make to the success or otherwise of a new service and as such the AccuROAM FMC platform is provided with extensive user self-care capabilities.

This web based front end can be easily re-skinned by network operators to align with their own branding and existing web portal technologies. The types of configurations that can then be applied by end users themselves, without calling a Customer Care Centre, are:

- Personalising the audio notification that is used within a call to indicate handover between different radio access network types
- The different categories of WiFi hotspot that can be roamed on to (for example, residential, enterprise and public)
- Personalisation of alerts for premium content that may be available (such as IPTV news or sports reports) when roaming into a WiFi hotspot

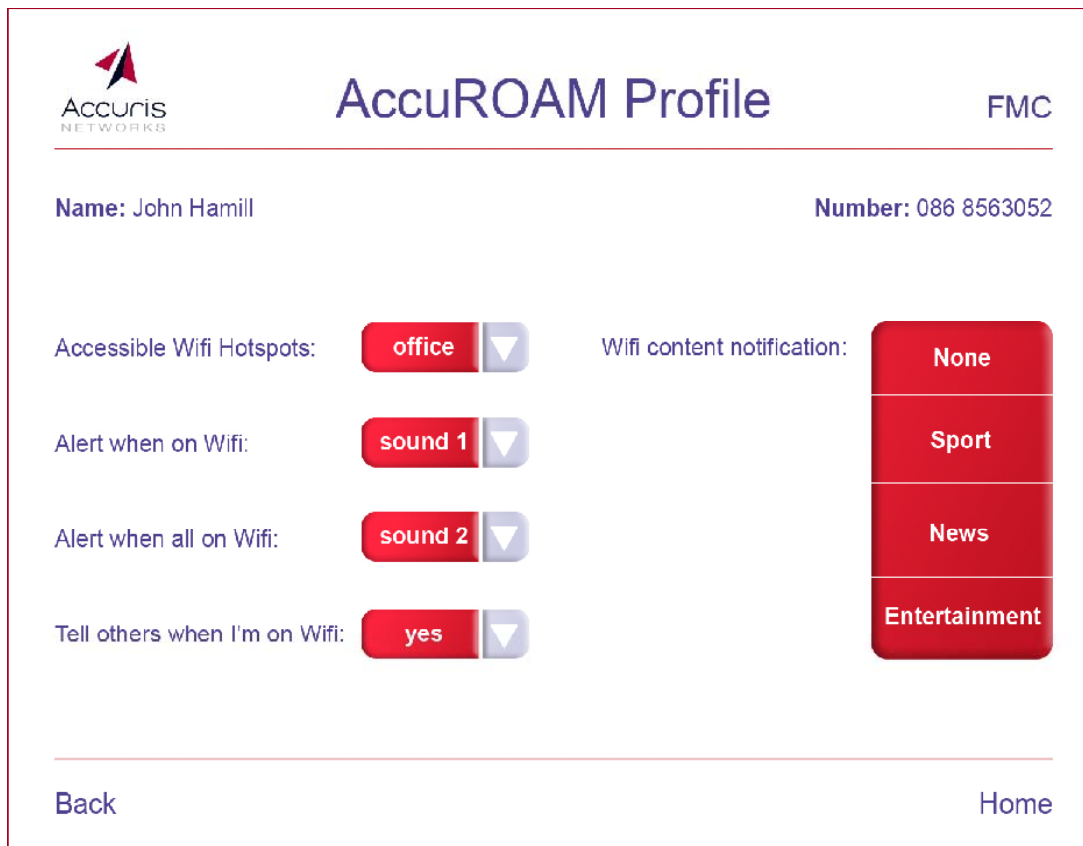


Fig 4: Example of Web Based User Self Care Screen

However, the functionality that is required by network operators in order to launch a successful FMC service is not limited to end user features. For example, even outside of voice call handover, in order to provide alerts of available premium content to users becoming present on a WiFi hotspot, the user must first be authenticated.

Since GSM and CDMA networks provide for differing approaches to user authentication, full GSM and CDMA Authentication Centres have been developed within the AccuROAM platform. Similarly, authentication mechanisms within the I-WLAN domain also differ from that provided in mobile phone networks. Consequently, the AccuROAM FMC product extends the existing Authentication Centre to include a full 3GPP AAA Server for I-WLAN inter-working. The 3GPP and 3GPP2 have defined this node separately from the VCC specifications but it is a fundamental

requirement for a mass market VCC service that an integrated 3GPP AAA Server for I-WLAN inter-working is provided with the solution.

Furthermore, the VCC specifications do not define how supplementary services, such as call forwarding settings should be transported from the HLR and also applied in the WiFi domain. Certainly, few HLR nodes will support the advanced SS7 operations for ad hoc queries of these settings but the AccuROAM legacy as a roaming gateway allows this to be achieved using currently supported and trusted mechanisms within mobile networks. The Proxy VLR component of the system emulates the transfer of the appropriate settings as end users roam between different mobile telephony networks. As such, managing how users roam onto WiFi networks, rather than simply routing calls onto a WiFi network, solves this problem immediately.

This Proxy VLR component is another feature of the AccuROAM FMC product, which can demonstrably lead to greater opportunity for the success of the service within the mass market. Experience from very many previous projects has illustrated that while end users may or may not accept an increased charge for a new service, they will certainly not accept an additional charge for a diminution in their service experience. For this reason, Accuris believes that a key requirement of any WiFi based FMC service should be that all supplementary voice and messaging user experiences are preserved while WiFi connected.

Another real business benefit of a WiFi FMC solution that inherits functionality from a roaming gateway product, relates to provisioning. Network operators typically create matrices of their service offerings to describe which combinations of applications can be provided together towards an individual end user (the classic example of a conflict is the difficulty in provisioning Pre Paid subscribers within a VPN). Adding a new service into such a matrix requires some detailed planning. For example, consider an end-user that is not attached to the mobile telephony network but has a strong WiFi connection (this may be a business user in a basement office, a residential user in a rural area or simply a user that has switched off the GSM module within their dual mode device).

In this case there may be a supplementary service to route calls terminating at detached subscribers towards a voicemail platform. However, in the same case a FMC service may require that this call is routed into the WiFi domain. The AccuROAM product can deal with this situation gracefully, using a trusted mechanism within mobile networks to present the end user as roaming onto a foreign network rather than simply being unavailable. However, without this roaming gateway technology the situation is more problematic with different vendor MSC and HLR platforms behaving differently in this kind of service conflict scenario.

This rationalisation of the provisioning strategy required to implement VCC based FMC services is important for two reasons. Clearly, the installation and commissioning of the new platforms and operational processes becomes much more low risk and low cost as the provisioning tasks become less complex. The more significant impact on the business case though will be made by the addressable market defined for the application itself. The opportunity for the service to be successful in the market will be maximised when the number of end users that can subscribe to the service is maximised. As such, removing conflicts with existing services that have already been provisioned for large parts of the user base is a key consideration.

4. Conclusion

The availability of both WiFi access points and also WiFi capabilities within mobile handsets is rapidly increasing. The technology within these handsets is also progressing rapidly such that many devices run equivalent operating systems to those used by PCs. With the threat posed by Internet telephony applications like Skype then becoming increasingly relevant for both mobile and fixed line access networks, operators urgently need to embrace this evolution in the market.

The VCC specifications will allow carriers to offer compelling new FMC applications, which can turn the WiFi threat into a revenue opportunity. More importantly though, a comprehensive portfolio of FMC services will allow for the retention of customer ownership and defend against the migration of intelligence towards network end points. Viewed from this perspective it is clear that carriers cannot afford to get their FMC strategy wrong or to take a minimalist approach to retaining service logic in the core network.

Consequently, VCC is not enough and a more comprehensive approach to the FMC space is required. Accuris Networks is uniquely well placed to provide this broader and more comprehensive perspective, based on more than a decade of experience in supporting roaming gateway products within live networks. A heritage in the roaming gateway space brings many tangible business benefits for network operators deploying this kind of technology:

- the automatic persistence of messaging and supplementary service features while roaming to a foreign network, in this case WiFi, makes the service much more intuitive to end users
- the simplification of provisioning the service against existing network triggers, substantially reduces the cost to deploy the system and can significantly expand the addressable market for the application
- the surround capabilities of a mature product, such as extensive user self care features, can substantially enhance the user

experience and the opportunity to personalise, as well as reducing the costs of operating the service

- field tested products supporting existing roaming scenarios provide for a total end-to-end solution based on a comprehensive understanding of the requirements, including authentication and single identity management

Accuris Networks is bringing the power and dependability of trusted mobile telephony technologies to the emerging FMC space, including VCC based voice call handover for WiFi hotspots. The AccuROAM product has a proven ability to provide highly profitable services in a rapidly changing marketplace of disparate network technologies, and it is the natural choice for network operators seeking to secure incremental revenue streams from FMC applications.

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