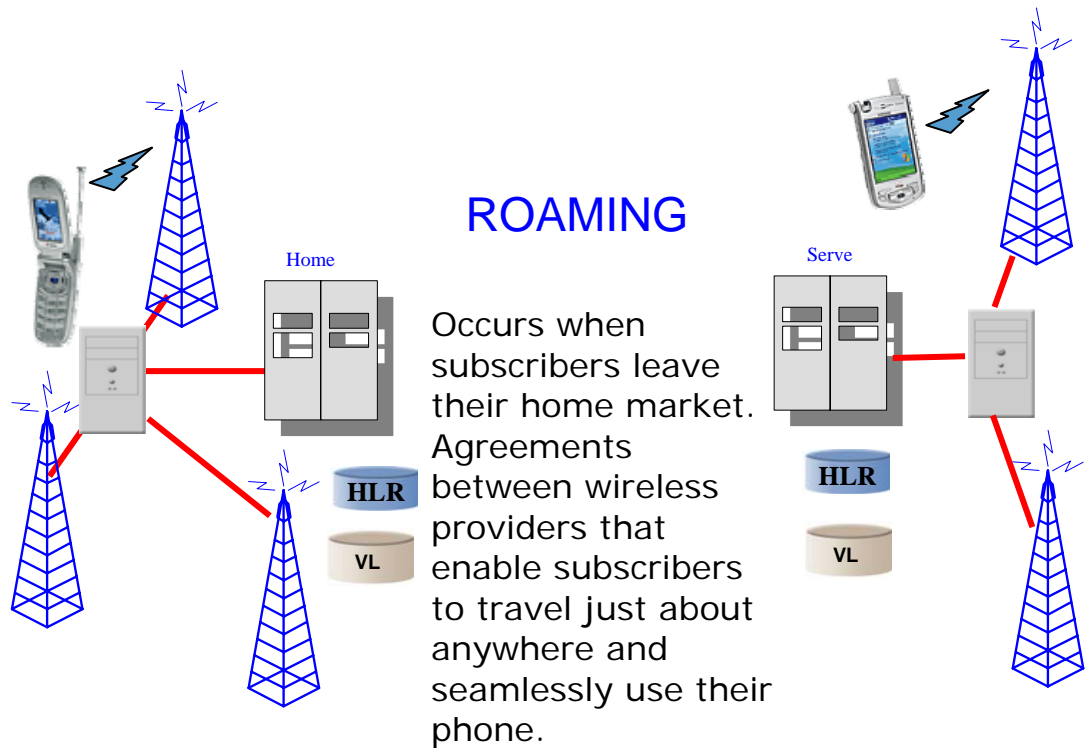# M E M O R A N D U M

TO: Mr. Jim Bugel, AT&T

FROM: David Robinson, Syniverse Technologies

RE: Wireless Roaming Services for Emergency Medical Facilities

DATE: December 13, 2007

Automatic wireless roaming offers the convenience of a single number, a single bill and, theoretically at least, a single handset with worldwide access to some 192 countries and territories. Wireless customers in an emergency demand seamless use of their wireless devices wherever they may be. Automatic roaming is an important communications cability in the time of an emergency.

Some of the challenges? Wireless devices have become loaded with features; subscribers are fast learning to personalize their interface and their services, both for efficiency and credibility. Subscribers want to replicate that chosen 'home environment' wherever they may be--and therein lays the operator challenge.

Figure 1: Roaming Definition

ROAMING

Occurs when subscribers leave their home market. Agreements between wireless providers that enable subscribers to travel just about anywhere and seamlessly use their phone.

Keeping today's emergency medical personnel connected during an emergency requires more than providing basic availability of service while roaming--it's about seamlessly transferring the capability of the services they know and use at home to when they are abroad.

Extending roaming services for both voice and data should be a key focus of the Joint Advisory Committee. Operators can bilaterally negotiate and execute roaming agreements for both voice and data. The wireless industry should recognize the importance and marketing of roaming services in an emergency. This interoperability between disparate networks is important as we consider communications during an emergency. The operators can demonstrate that the days of technology for technology's sake have been replaced by the desire to provide services relevant to customer needs in the time of an emergency.

Provisioning Roaming Services

Roaming service can be provided through a variety of technical and contractual arrangements. **Automatic roaming** means that the roaming subscriber is able to originate or terminate a call or data session without taking any action other than turning on the device. This form of roaming requires a contractual agreement between the home and roamed-on ("host") systems. Before a subscriber can complete an originating call or data session under an automatic roaming arrangement, the host system first identifies the subscriber's home carrier by means of the subscriber's telephone number or other unique identifier, verifies that it has an agreement with that carrier, and queries the carrier to verify that the subscriber's account is current (and in some instances to obtain other information about the subscriber, such as her preferred service features). To provide automatic terminating service, the host system typically sends a signal to the home carrier as soon as the subscriber enters its service area with the phone turned on so that the home system will know where to direct calls. Although many roaming agreements between carriers allow for automatic originating and terminating access, others involve a form of manual terminating service whereby the subscriber must make an affirmative act to register with the host system, such as punching in a code, before she can receive calls.

The basic technical requirement for either manual or automatic roaming is that the subscriber has a handset or device that is technically capable of accessing the **host system**. Unless subscribers are willing to carry two telephones, therefore, roaming between cellular and other CMRS services will require subscribers to use handsets that are dual band and perhaps dual mode as well.

Furthermore, in order for the switches or "hot spots" of systems using different technologies to communicate most efficiently when providing automatic roaming, new protocol conversion standards may in some

instances need to be devised. Neither originating nor terminating roaming requires direct interconnection of carriers' switches.   Interconnection does appear to be necessary, however, if carriers desire to allow their customers to continue calls in progress when they enter another carrier's service area. Such interconnection may be technically and administratively complex.

Mobility Management Services

Standards have been developed that enable mobility. An application protocol has been defined to support mobility management. The Mobile Application Part (MAP) works with the signaling network to generate SS7 Transaction (TCAP) messages to support the transfer of mobile subscriber information from one cellular network to another.   The two predominate MAP protocols are ANSI 41 and GSM MAP.

ANSI 41 is a North American standard that enables mobility management by defining intersystem operation of wireless network elements.   The following is the ANSI 41 network reference model. GSM air interfaces utilize a slightly different MAP protocol, but the network reference model is nearly identical.

Figure 2: ANSI 41 wireless network reference model.
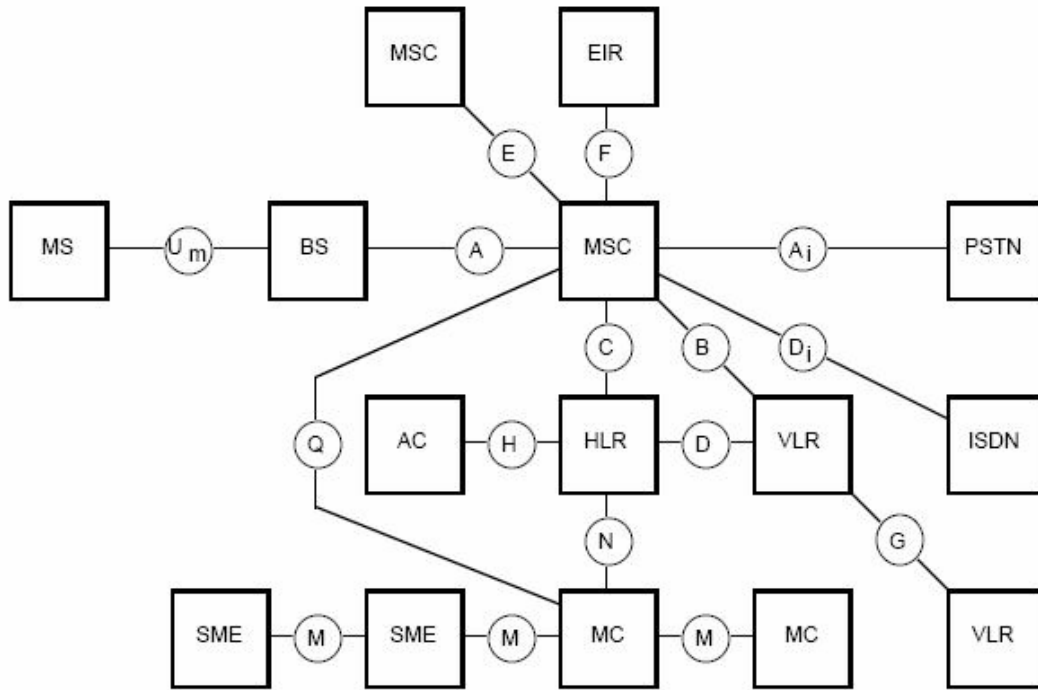
Source: Telecommunications Industry Association
AC = Authentication Center
BS = Base Station
EIR = Equipment identity register
HLR = Home Location register
ISDN = integrated services digital network
MS = message center
MSC = mobile switching center
SME = short message entity
VLR = visitor location register

Interstandard Roaming

Interstandard roaming services enables CDMA-based operators to extend their roaming footprint to include non-CDMA networks – specifically GSM. There are solutions for signaling interoperability between GSM-MAP and ANSI-41, wireless data roaming (1X to GPRS), billing conversions (TAP or CIBER), and operations support.

The basic value proposition for interstandard roaming services:

- Allows wireless subscribers to receive service from a foreign network that is incompatible with their home network.

- Enables calls and messages to be delivered to roaming subscribers seamlessly - as if they were roaming on a compatible network.

- Permits charges associated with any usage on the foreign network to be billed by the home operator

These same basic value propositions can be applied between cellular and other technologies and is the foundation for developments in roaming services.

WI-FI OR WIRELESS LOCAL AREA NETWORK (WLAN) ROAMING

Many health care facilities have implemented Wi-Fi and or WLAN service offerings enabling wireless high-speed data connections. Wi-Fi networks support roaming and Wi-FI/WLAN subscribers can use SIM-based authentication methods utilizing a GSM-MAP gateway with SIM-based authentication. Wi-Fi roaming solutions simplify message routing and secure

access management with roaming partners with AAA Broker Services.   In addition, this solution can provide billing support services – rating, translation and conversion to support multiple wholesale billing options

Network Diagram:
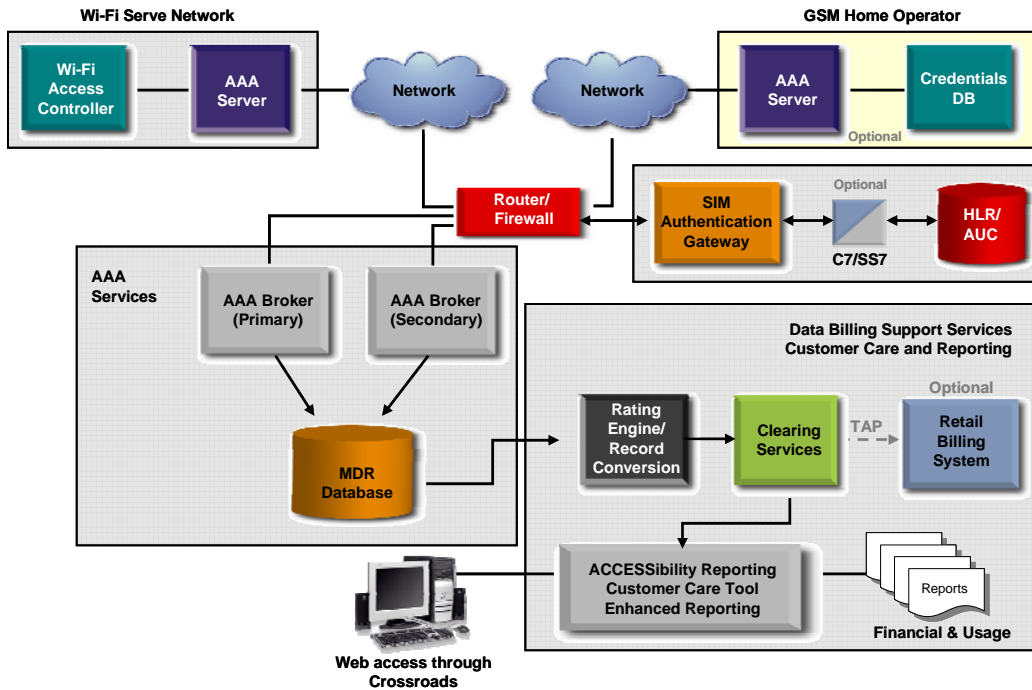
Conclusion

The ability of wireless devices to find network services and features in the time of emergency is important and automatic roaming should be considered a critical communications cability for Emergency Medical and Public Heath Care Facilities.