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APPLICATION BULLETIN

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Mercury 16E Mobility – Seamless Handover

Introduction

Mobility setting allows for the Mercury subscriber station to more optimally handle moving between different base stations. Mercury 16E supports two forms of mobility operation. The subscriber unit supports WiMAX seamless mobility, and a non-seamless nomadic handover.

- Seamless handover is subscriber-initiated based on the received signal levels. The seamless handover requires an ASN-GW server on the backend network to coordinate the handover. The Mercury base station is not currently interoperable with the ASN-GW, and a third party base station must be used with this configuration.

- The nomadic mode uses the subscriber's GPS or received signal information to determine if it should break its current connection and look for another base station.

Scope

This bulletin is intended for applications engineers and end users who wish to understand the WiMAX seamless mobility option in the Mercury 16E platform. The configuration options are discussed, as well as a comparison to nomadic mobility mode.

Terms

- ASN: (Access Service Network)
- ASN-GW: (Access Service Network Gateway) The server on the backend system that acts as a gateway for all wireless devices, routing all their traffic.
- BS: (Base station) End of the wireless link used to connect to the backend network.
- GPS: (Global Positioning System)
- MS: (Mobile Station) The mobile radio.
- SS: (Subscriber Station) The mobile radio, alternate term for MS.
- CPE: (Customer-premises Equipment) The mobile radio, alternate term for MS.
- WiMAX: (Worldwide Interoperability for Microwave Access)

Background

Seamless handover allows a mobile station (MS) to change its current base station with no perceived loss of connectivity. This is done with the support of an ASN-GW that is connected to

all base stations. All IP traffic destined for a MS or originating from a MS is routed through the ASN-GW.

The Mercury 16E MS supports MS-initiated handover. The MS uses a scanning threshold, handover threshold, and a handover hysteresis value. The handover can be based on RSSI or CINR (SNR). When the current connection drops below the scanning threshold, the MS scans for new base stations while maintaining its connection to the current base station. Once the MS current connection value drops below the handover threshold and the scanning has found another base station that has a better signal (at least the hysteresis value better) than the current base station, the MS requests a handover. If accepted, the MS disassociates from the current base station and associates to the new base station. The association is abbreviated to one WiMAX frame using the information gathered in the scanning phase. This allows the MS to switch base stations without a noticeable interruption in data service.

The ASN-GW facilitates the handover by creating an IP tunnel between itself and the MS's connected base station. This tunnel caries all IP traffic between the MS and the backend network. Once a handover is accepted, the ASN-GW moves its IP tunnel from its current base station to the new base station. This allows all equipment on the backend network to be unaware that a handover occurred.

Device authentication is handled differently in the WiMAX seamless handover system. In a conventional Mercury deployment the authentication is negotiated between the base station and the MS, with the base station communicating to the AAA server. If the MS connects to a different base station, it must re-authenticate. To avoid this re-authentication, the ASN-GW performs the negotiation with the MS, and the ASN-GW communicates with the AAA server. This allows the MS to handover with any BS connected to the ASN-GW without re-authenticating.

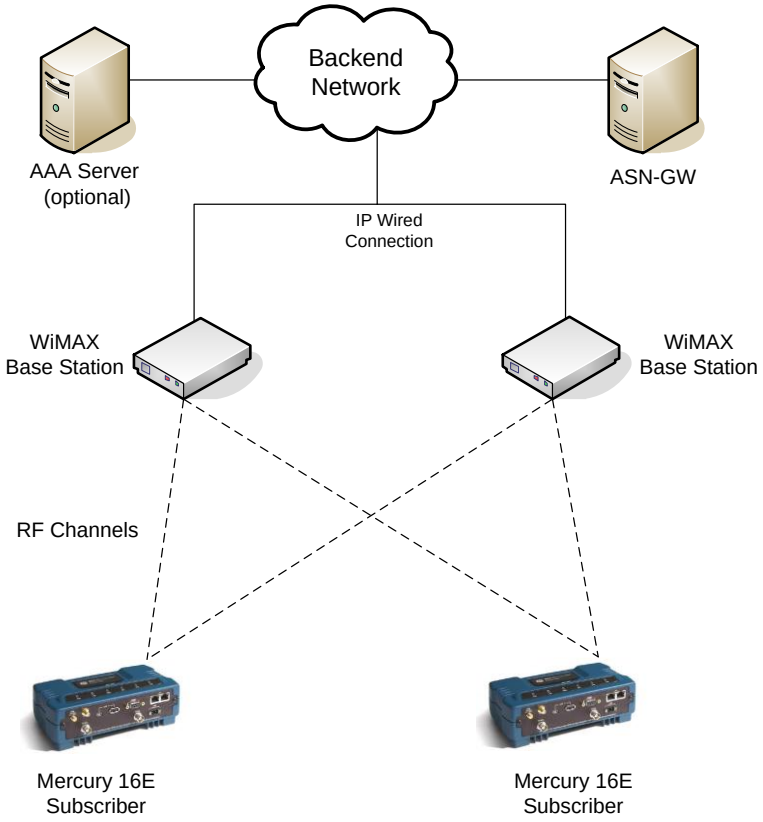

Figure 1 - High level diagram of a seamless handover network.

MS Configuration Options

To enable seamless handover mode in the Mercury16E subscriber, the connection mode must be set to **Multichannel**. Multichannel allows up to seven basestation frequencies to be set in the MS. The MS scans these frequencies and attempts to connect to the best one. All base station frequencies must be preloaded into this list, so that on initial boot the MS knows what frequencies to try for its initial connections.

After the connection mode has been set, under handover settings, seamless handover can be enabled. All other handover parameters, such as the thresholds and hysteresis, are set in the base station and are passed down into the subscriber after initial association.

The Mercury16E base station does not currently support interoperability with an ASN-GW. To use the Mercury16E subscriber in seamless handover mode, it must connect to a third party WiMAX base station that supports seamless handover. Configuring the third party equipment is beyond the scope of this document. Please contact Technical Services for current recommendations.

Comparison to Nomadic Mobility

Both Seamless Handover and Nomadic mobility options allow subscribers to move between base stations in a more intelligent manner than waiting for the current signal to degrade to the point that it drops. The benefits of seamless handover are the switching time is much less, and the radio will not attempt to switch base stations unless a better one is available. Nomadic mode infers there is a better base station based on the thresholds that the user enters and drops link to try to connect to it. It does not scan for and evaluate a new base station before it drops its current one. Also, because much of the negotiation and authentication is done before the current base station is dropped; the handover time is much less than it is in Nomadic mode.

The drawbacks of seamless mode are the significant cost of the backend infrastructure. The ASN-GW is typically only used in carrier grade applications, and it will require a network engineer familiar with their operation to provision it. In contrast, nomadic mobility does not require any special backend hardware or setup, and it provides a better way for mobile subscribers to move between base stations.

End of application bulletin.