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R. Pazhyannur
S. Speicher
S. Gundavelli
Cisco
J. Korhonen
Broadcom
J. Kaippallimalil
Huawei
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**Extensions to the PMIPv6 Access Network Identifier Option
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Abstract

Access Network Identifier (ANI) Mobility option was introduced in [RFC6757] enabling a MAG to convey information like network identifier, geo-location, operator-identifier. This specification extends Access Network Identifier mobility option with sub-options to carry Civic Location and MAG Group Identifier. This specification also defines a ANI update timer sub-option that informs the LMA when (and how often) the ANI will be updated.

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[1.](#) Introduction

[RFC6757] introduced the Access Network Identifier (ANI) mobility Option. This enabled a MAG to provide the Network Identifier, Geo-Location, and Operator-Identifier sub options. When the access network is WLAN, the Network Identifier sub option may contain SSID, and BSSID of the Access Point (AP), the Geo-Location may contain the latitude/longitude of the AP, and the Operator-Identifier may contain the realm of the operator managing the WLAN. The MAG sends the above information is sent to the LMA. The LMA may use this information to determine access network specific policies (in terms of QoS, DPI, etc). Further, the LMA may make this information available to location based applications.

While the above mentioned sub-options provide a rich set of information, in this document we describe the need for extending the ANI sub options, especially relevant for WLAN deployments. In many deployments (especially indoor AP deployments), it is difficult to provide Geo-spatial coordinates of APs. However, for many location

based applications the civic location is sufficient. This motivates the need for a ANI civic-location sub-option. In many deployments, operators tend to create groups of APs into "AP-Groups". These groups have a group identifier. The group-identifier is used a proxy for coarse location (such as floor of a building, or a small building). The group identifier may also be used to provide a common policy (e.g., QoS, charging, DPI) for all APs in that group. This specification provides a sub-option for the MAG to convey a group-identifier to the LMA. (The provisioning of the group-identifier is outside the scope of this specification and is typically done via a configuration mechanism such as CLI (Command line Interface), CAPWAP [[RFC5416](#)], etc. This document also provides a new sub-option that determines how often the MAG will update the ANI. In typical deployments, it is expected that the MAG will update the ANI as soon as it changes. This is certainly true when the MAG is co-located with the AP. When a client roams from one AP to another AP, the MAG on the roamed AP will provide the new ANI (for example the network identifier and Geo-location of the new AP). However, if the MAG is co-located with an Access Controller (also known as Wireless LAN Controller), then a client roaming from one AP to another AP may not necessarily require an ANI update. This leads to stale ANI information at the LMA. To cover both cases, ANI is always fresh, ANI may be stale, we introduce a new ANI Update Timer option. This enables the MAG to inform the LMA when and how often the MAG will update the ANI. The MAG sends an ANI update only if the ANI Update Timer has expired and the ANI values have changed since the last ANI update. Consequently, this enables the LMA to determine whether i the ANI is stale or not and when to expect an update. The LMA can use ANI update Timer option to set the maximum frequency at which it wants to receive ANI updates. This may be particularly useful in environments where a MAG covers a large number of Wi-Fi APs and there is high client mobility between the APs (for example in a stadium Wi-Fi deployment).

[RFC6757] provides ANI sub-options to carry geo-location information. In this document we provide additional sub-options to carry civic-location, and AP-Group identifier. This documents also defines an ANI sub-option to enable a MAG to communicate how often the MAG will update the ANI information.

2. Conventions and Terminology

2.1. Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

2.2. Terminology

All the mobility related terms used in this document are to be interpreted as defined in [[RFC5213](#)] and [[RFC5844](#)].

3. Protocol Extension

3.1. Civic-Location Sub-Option

The Civic-Location is a mobility sub-option carried in the Access Network Identifier option defined in [[RFC6757](#)]. This sub-option carries the Civic Location information of the mobile node as known to the MAG. The format of this option is defined below.

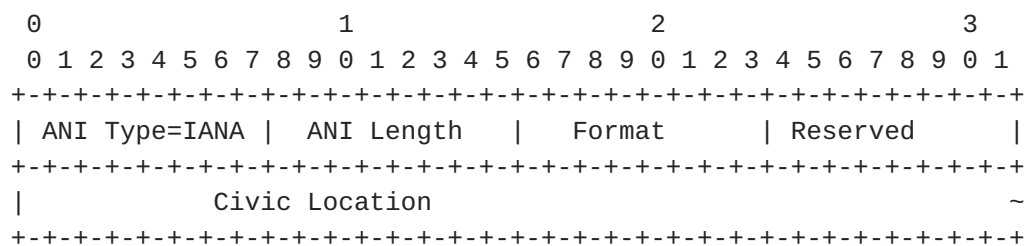


Figure 1: Network-Identifier Sub-option

ANI Type: <IANA-1>

ANI Length: Total length of this sub option in octets, excluding the ANI Type and ANI length fields.

Format: This specifies the encoding format of the Civic location. Two values are defined in this specification.

0: This value denotes Binary Encoding. The location format is based on the encoding format defined in [Section 3.1 of \[RFC4776\]](#), whereby the first 3 octets are not put into the Civic Location field (i.e., the code for the DHCP option, the length of the DHCP option, and the 'what' element are not included).

1: This value denotes XML Encoding. This is specified in the Presence Information Data Format Location Object [[RFC5139](#)].

Civic Location: This field will contain the Civic Location. The format (encoding) type is specified in the format field of this sub option. Note that the length shall not exceed 252 bytes.

3.2. MAG Group-Id Sub-Option

The MAG Group Identifier is a mobility sub-option carried in the Access Network Identifier option defined in [RFC6757]. The MAG Group Identifier identifies the group affiliation of the MAG within that Proxy Mobile IPv6 domain. When the MAG is configured with a group identifier, the MAG may send its group-id in the PBU. (The configuration of this group identifier is outside the scope of this specification. The usage of the group identifier by the LMA is left to implementation.) The format of this option is defined below.

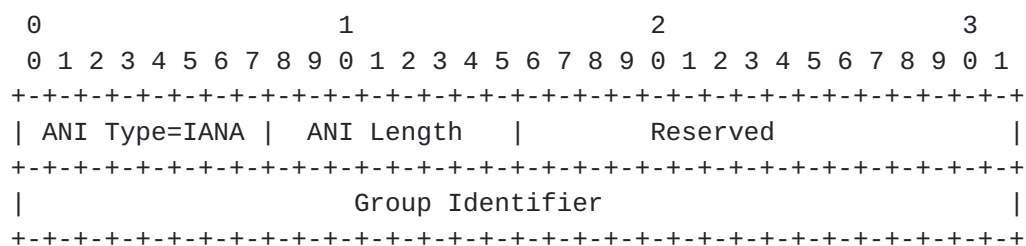


Figure 2: MAG Group-Identifier Sub-option

ANI Type: <IANA-2>

ANI Length: Total length of this sub option in octets, excluding the ANI Type and ANI length fields. The value is always 6.

Reserved: MUST be set to zero when sending and ignored when received.

Group Identifier:

3.3. ANI Update-Timer Sub-Option

The ANI Update Timer is a mobility sub-option carried in the ANI option defined in [RFC6757]. [Section 4](#) describes how the MAG and LMA may use this sub option.

- o The conceptual Binding Update List entry data structure maintained by the mobile access gateway, described in [Section 6.1 of \[RFC5213\]](#), MUST be extended to store the access-network-related information elements associated with the current session. Specifically, the following parameters MUST be defined:
- * Civic Location
 - * MAG Group-Id
 - * ANI Update-Timer
- o ANI Update Timer Considerations: The MAG sets the update timer when it sends a PBU with the ANI Update Timer sub option. When the update-timer expires, if the ANI options have changed, the MAG sends an PBU with update ANI. if the ANI options have not

changed, the MAG does not send a PBU. It sends an PBU with updated ANI values only when the ANI changes. The Update timer is reset when the PBU is sent. When the Update-Timer Sub option is carried in a PBU, it is considered as a proposed value for the update-timer. When the Update-Timer sub option is carried in a PBA, then it is considered as an accepted value for the update-timer. If the MAG does not receive a update-timer sub option in PBA (in response to sending the sub-option in the PBU), then MAG behavior with respect to updating the ANI values is left to implementation choices.

4.2. LMA Considerations

- o The conceptual Binding Cache entry data structure maintained by the local mobility anchor, described in [Section 5.1 of \[RFC5213\]](#), MUST be extended to store the access-network-related information elements associated with the current session. Specifically, the following parameters MUST be defined:
 - * Civic Location
 - * MAG Group-Id
 - * ANI Update-Timer
- o On receiving a Proxy Binding Update message [[RFC5213](#)] from a mobile access gateway with the Access Network Information option, the local mobility anchor must process the option and update the corresponding fields in the Binding Cache entry. If the option is not understood by that LMA implementation, it will skip the option.
- o If the local mobility anchor understands/supports the Access Network Identifier mobility sub-options defined in this specification, then the local mobility anchor MUST echo the Access Network Identifier mobility option with the specific sub-option(s) that it accepted back to the mobile access gateway in a Proxy Binding Acknowledgement. The Access Network Identifier sub-options defined in this specification MUST NOT be altered by the local mobility anchor with the exception of the ANI Update Timer sub-option.
- o ANI Update Timer Considerations: When the LMA receives this sub option, it may choose to change the value of this sub-option in the PBA. For example, if the LMA does not want to receive frequent updates (as indicated by the timer value) it may choose to increase the value. Similarly, if the LMA needs to receive ANI

updates as soon as possible then it may set the value to zero (0) in the PBA.

5. IANA Considerations

This document requires the following IANA action.

- o Action-1: This specification defines a new Access Network Identifier sub-option called Civic Location Sub-option. This mobility sub-option is described in [Section 3.1](#) and this sub-option can be carried in Access Network Identifier mobility option. The type value <IANA-1> for this sub-option needs to be allocated from the registry "Access Network Information (ANI) Sub-Option Type Values". RFC Editor: Please replace <IANA-1> in [Section 3.1](#) with the assigned value, and update this section accordingly.
- o Action-2: This specification defines a new Access Network Identifier sub-option called MAG Group Identifier Sub-option. This mobility sub-option is described in [Section 3.2](#) and this sub-option can be carried in Access Network Identifier mobility option. The type value <IANA-2> for this sub-option needs to be allocated from the registry "Access Network Information (ANI) Sub-Option Type Values". RFC Editor: Please replace <IANA-2> in [Section 3.2](#) with the assigned value, and update this section accordingly.
- o Action-3: This specification defines a new Access Network Identifier sub-option called ANI-Update-Timer Sub-option. This sub-option is described in [Section 3.3](#) and this sub-option can be carried in Access Network Identifier mobility option. The type value <IANA-3> for this sub-option needs to be allocated from the registry "Access Network Information (ANI) Sub-Option Type Values". RFC Editor: Please replace <IANA-3> in [Section 3.3](#) with the assigned value, and update this section accordingly.

6. Security Considerations

The Civic Location and the ANI-Update-Frequency sub-Options defined in this specification are to be carried in the Access Network Identifier option defined in [\[RFC6757\]](#). This sub-option is carried in Proxy Binding Update and Proxy Binding Acknowledgement messages. This sub-option is carried like any other Access Network Identifier sub-option as defined in [\[RFC6757\]](#). Therefore, it inherits from [\[RFC5213\]](#) and [\[RFC6757\]](#), its security guidelines and does not require any additional security considerations.

The Civic Location sub-option carried in the Access Network Information option exposes the civic location of the network to which the mobile node is attached. This information is considered to be very sensitive, so care must be taken to secure the Proxy Mobile IPv6 signaling messages when carrying this sub-option. The base Proxy Mobile IPv6 specification [[RFC5213](#)] specifies the use of IPsec for securing the signaling messages, and those mechanisms can be enabled for protecting this information. Operators can potentially apply IPsec Encapsulating Security Payload (ESP) with confidentiality and integrity protection for protecting the location information.

Access-network-specific information elements that the mobile access gateway sends may have been dynamically learned over DHCP or using other protocols. If proper security mechanisms are not in place, the exchanged information may be potentially compromised with the mobile access gateway sending incorrect access network parameters to the local mobility anchor. This situation may potentially result in incorrect service policy enforcement at the local mobility anchor and impact to other services that depend on this access network information. This threat can be mitigated by ensuring the communication path between the mobile access gateway and the access points is properly secured by the use of IPsec, Transport Layer Security (TLS), or other security protocols.

7. Acknowledgements

TBD

8. References

8.1. Normative References

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Authors' Addresses

Rajesh S. Pazhyannur
Cisco
170 West Tasman Drive
San Jose, CA 95134
USA

Email: rpazhyan@cisco.com

Sebastian Speicher
Cisco
Richtistrasse 7
Wallisellen, Zurich 8304
Switzerland

Email: sespeich@cisco.com

Sri Gundavelli
Cisco
170 West Tasman Drive
San Jose, CA 95134
USA

Email: sgundave@cisco.com

Jouni Korhonen
Broadcom
Porkkalankatu 24
Helsinki FIN-00180
Finland

Email: jouni.nospam@gmail.com

John Kaippallimalil
Huawei
5340 Legacy Drive, Suite 175
Plano, Texas 75024
USA

Email: john.kaippallimalil@huawei.com

