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Access-Network-Identifier Option in DHCP
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Abstract

This document specifies the format and mechanism that is to be used for encoding access network identifiers in DHCPv4 and DHCPv6 messages by defining new access network identifier options and sub-options.

Requirements Language

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].

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on April 4, 2013.

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1. Introduction

Access network identification of a network device has a range of application. The local mobility anchor in a Proxy Mobile IPv6 domain is able to provide access network and access operator specific handling or policing of the mobile node traffic using information about the access network to which the mobile node is attached.

This document specifies Dynamic Host Configuration Protocol v4 (DHCPv4) [RFC2131] and Dynamic Host Configuration Protocol v6 (DHCPv6) [RFC3315] options for access network identification that is added by Client or Relay agent in the DHCPv4 or DHCPv6 messages towards the Server.

Dynamic Host Configuration Protocol (DHCP) client or DHCP relay agent aware of the access network and access operator add this information in the DHCP messages. DHCP relay agent or DHCP server in the mobile access gateway can pass this information towards local mobility anchor either via Proxy Mobile IPv6 signaling or by relaying the DHCP messages to DHCP entity within the local mobility anchor.

2. Motivation

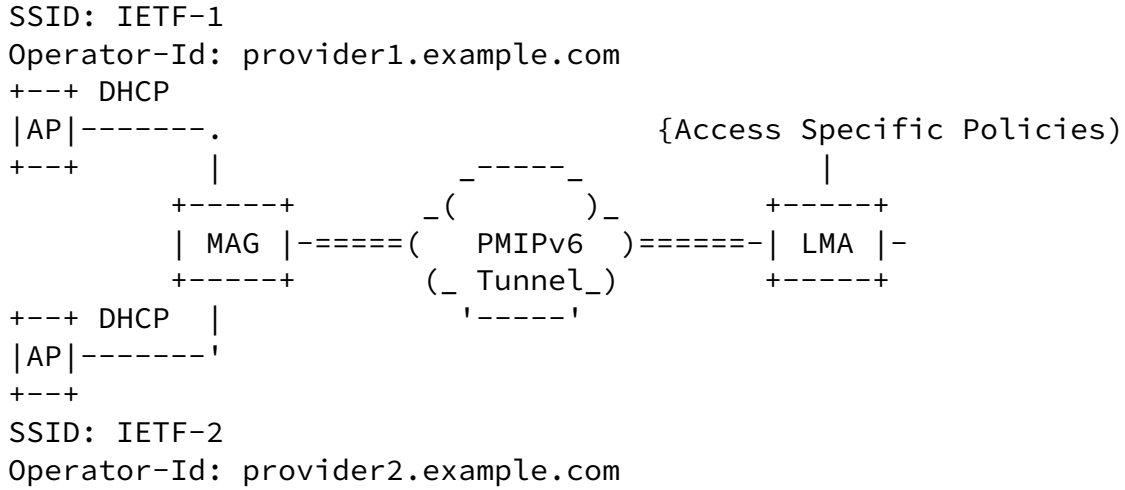
Proxy mobile IPv6 [RFC5213] can be used for supporting network-based mobility management in various type of network deployments. The network architectures, such as Service provider Wi-Fi access aggregation or, WLAN integrated mobile packet core are examples where Proxy Mobile IPv6 is a component of the overall architecture. Some of these architectures require the ability of the local mobility anchor (LMA) [RFC5213] to provide differentiated services and policing of traffic to the mobile nodes based on the access network to which they are attached. Policy systems in mobility architectures such as PCC [TS23203] and ANDSF [TS23402] in 3GPP system allow configuration of policy rules with conditions based on the access network information. For example, the service treatment for the

mobile node's traffic may be different when they are attached to a access network owned by the home operator than when owned by a roaming partner. The service treatment can also be different based on the configured Service Set Identifiers (SSID) in case of IEEE 802.11 based access networks. Other examples of services include the operator's ability to apply tariff based on the location.

The PMIPv6 extension as specified in [I-D.ietf-netext-access-network-option] defines PMIPv6 options to carry access network identifiers in PMIPv6 signaling from Mobile Access Gateway (MAG) to LMA. MAG can learn this information from DHCP options as inserted by DHCP client or Relay agent before MAG.

If MAG relays DHCP messages to LMA as specified in [RFC5844] this information can be inserted by MAG towards LMA in the forwarded DHCP messages.

Figure 1 illustrates an example Proxy Mobile IPv6 deployment where Access Points (AP) inserts access network identifiers in DHCP messages. The mobile access gateway learns this information over DHCP and delivers the information elements related to the access network to the local mobility anchor over Proxy Mobile IPv6 signaling messages. In this example, the additional information could comprise the SSID of the used IEEE 802.11 network and the identities of the operators running the IEEE 802.11 access network infrastructure.



Access Networks attached to MAG

3. Terminology

All the DHCP related terms used in this document to be interpreted as defined in the Dynamic Host Configuration Protocol v4 (DHCPv4) [RFC2131] and Dynamic Host Configuration Protocol v6 (DHCPv6) [RFC3315] specifications. DHCP refers to both DHCPv4 and DHCPv6 messages and entities throughout this document.

All the mobility related terms used in this document are to be interpreted as defined in the Proxy Mobile IPv6 specifications [RFC5213] and [RFC5844]. Additionally, this document uses the following abbreviations:

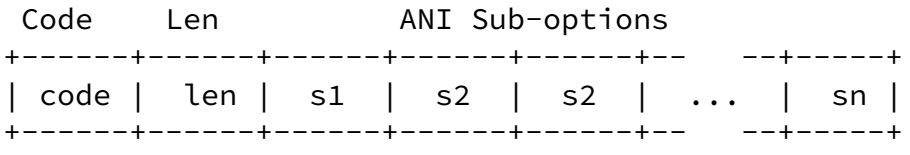
Service Set Identifier Service Set Identifier (SSID) identifies the name of the IEEE 802.11 network. SSID differentiates from one network to the other.

Vendor ID The Vendor ID is the SMI Network Management Private Enterprise Code of the IANA-maintained Private Enterprise Numbers registry [SMI].

4. DHCPv4 Access-Network-Identifier Option

Access network identifier option carries information to identify the access network to which the client is attached to. This information includes access technology type, network identifier and access network operator identifiers.

The format of the DHCPv4 Access-Network-Identifier option is shown below.

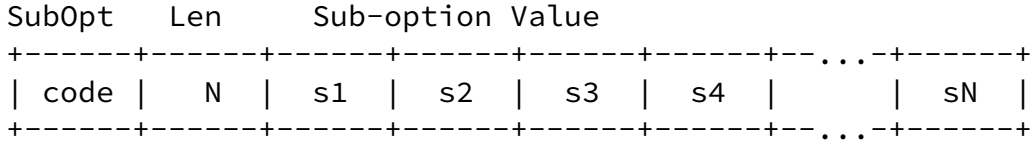


code: 8-bit code carrying Access Network Identifier sub-options,

If added by relay agent: Relay Agent Information Option (82)
If added by client: OPTION_ACCESS_NETWORK_ID (TBD1)

len: 8 bit indicating total length of the included suboptions.

ANU Sub-options: The ANI Sub-options consists of a sequence of SubOpt/Length/Value tuples for each sub-option, encoded in the following manner:



ANI Sub-options are defined in following sections.

4.1. DHCPv4 Access-Network-Identifier Sub-options

Access network identifier information will be defined in multiple sub-options. The initial assignment of DHCP access network identifier Sub-options is as follows:

Sub-option Code	Sub-Option Description
TBD5	Access-Network-Type Sub-option
TBD6	Network-Identifier Sub-option
TBD7	Operator-Identifier Sub-option

5. DHCPv6 Access-Network-Identifier options

The Access Network Identifier option defined here will be added by DHCPv6 client in upstream DHCPv6 messages or by the Relay in Relay-forward messages.

Option Code	Option Descrption
TBD2	Access-Network-Type option
TBD3	Network-Identifier option
TBD4	Operator-Identifier option

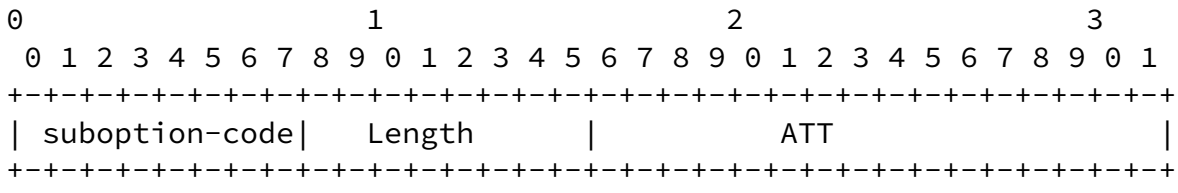
6. DHCPv4 and DHCPv6 Access-Network-Identifier Options

This section defines DHCPv4 suboption and DHCPv6 options for access network identification.

6.1. Access-Network-Type option

This option is used for exchanging the type of the access technology by which the client is attached to the network. There can only be a single instance of this specific option in any DHCPv6 message or single instance of this specific sub-option in DHCPv4 OPTION_ACCESS_NETWORK_ID or Relay Agent information option. Its format is as follows:

DHCPv4:

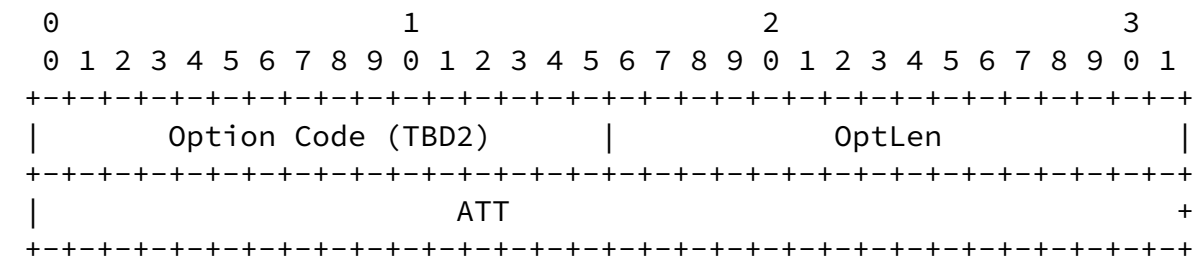


suboption-code: 8-bit code, it should be set to value of (TBD5),

indicating that its a Access-Network-Type sub-option

Length: 8-bit unsigned integer indicating the length of this suboption in octets, excluding the suboption-code and length fields. This field MUST be set to 2.

DHCPv6:



option-code: 16-bit code OPTION_ANI_ATT (TBD2)
option-length: 16-bit unsigned integer indicating length in octets of this option

Common format applicable to DHCPv4 and DHCPv6:
Access Technology Type (ATT)

An 16-bit field that specifies the access technology through which the client is connected to the access link.

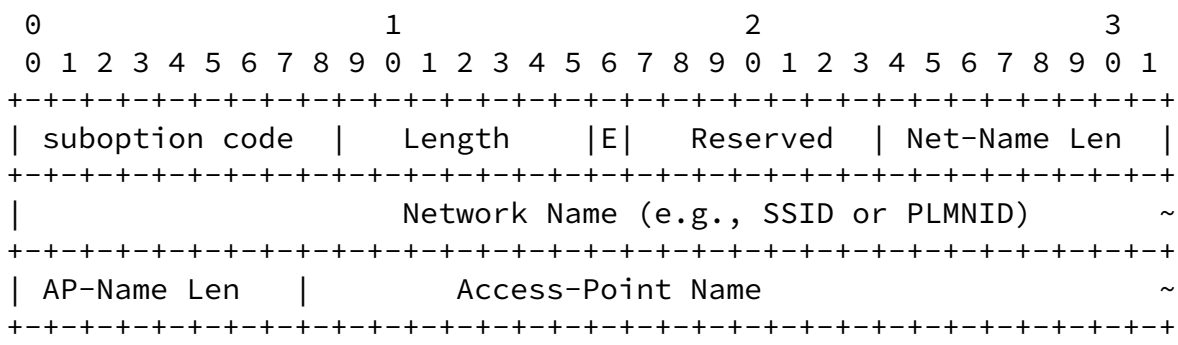
The values is as populated from the IANA name space Access Technology Type Option type values as requested in [RFC5213]

0: Reserved ("Reserved")
1: Virtual ("Logical Network Interface")
2: PPP ("Point-to-Point Protocol")
3: IEEE 802.3 ("Ethernet")
4: IEEE 802.11a/b/g ("Wireless LAN")
5: IEEE 802.16e ("WIMAX")

6.2. Network-Identifier option

This option can be used for carrying the name of the access network (e.g., a SSID in case of IEEE 802.11 Access Network, or PLMN Identifier [TS23003] in case of 3GPP access), to which the client is attached. There can only be a single instance of this specific option in any DHCPv6 message or single instance of this specific sub-option in DHCPv4 OPTION_ACCESS_NETWORK_ID or Relay Agent information option. The format of this option is defined below.

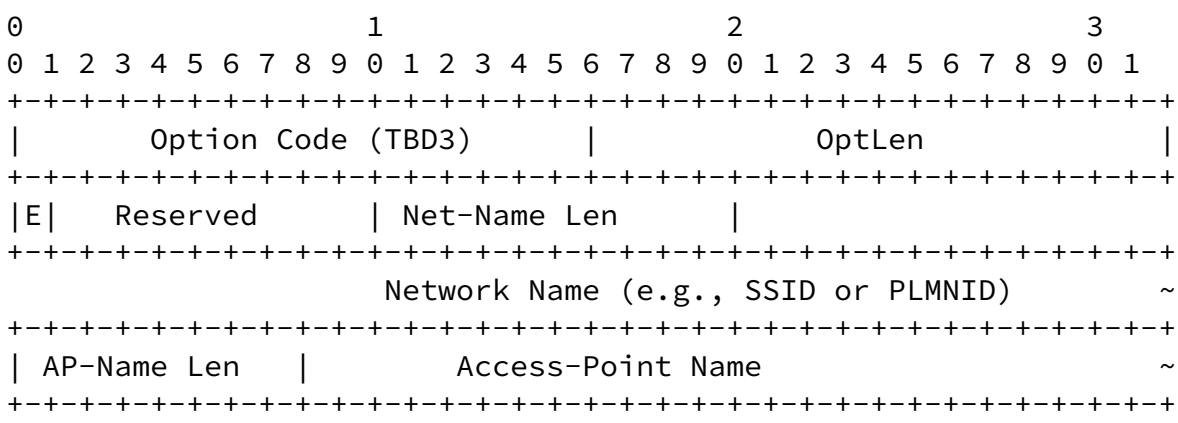
DHCPv4:



suboption code: 8-bit code, it should be set to value of (TBD6), indicating that its a Network-Identifier sub-option

Length: 8-bit indicating Total length of this sub option, excluding the suboption code and length fields. The value can be in the range of 2 to 32 octets.

DHCPv6:



option-code: 16-bit code OPTION_ANI_NETWORK_ID (TBD3)
option-length: 16-bit unsigned integer indicating length

in octets of this option.The value can be in the range of 2 to 32 octets.

Common format applicable to DHCPv4 and DHCPv6:

'E'-bit: 1-bit flag for representing the encoding of the following name field. MUST be set to zero (0) if the network name is encoded using 8-bit octets or to one (1) if the network name is encoded using UTF-8.

Reserved: 7 bits MUST be set to zero when sending and ignored when received.

Net-Name Length: 8-bit field for representing the length of the network name to be followed.

Network Name: The name of the access network to which the client is attached. The type of the network-name is dependent on the Access Technology to which the mobile node is attached. If its 802.11 access, the network-name is the SSID of the network. If the access network is 3GPP access, the network-name is the PLMN Identifier of the network. If the access network is 3GPP2 access, the network-name is the Access Network Identifier [ANI].

When encoding the PLMN Identifier, both MNC and MCC codes MUST be 3 digits. If the MNC in use only has 2 digits, then it MUST be preceded with a '0'. Encoding MUST be UTF-8.

AP-Name Length: 8-bit field for representing the length of the access point name to be followed. If the access point name is not carried, this length should be set to zero.

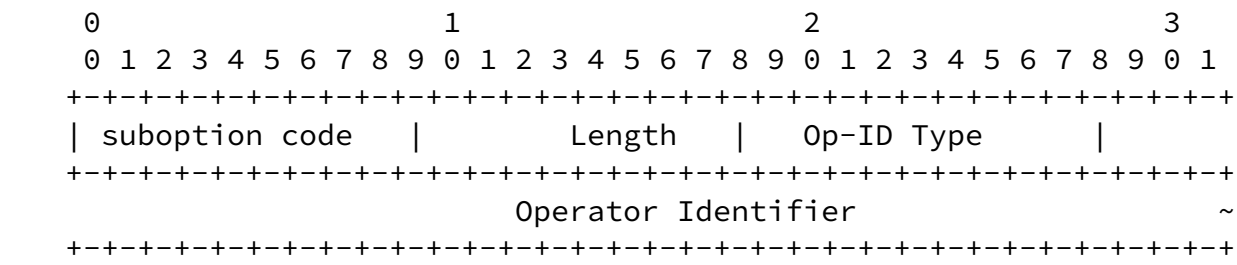
Access-Point Name: The name of the access point (physical device name) to which the client is attached. This is the identifier that uniquely identifies the access point. In some deployments the name can be set to the mac-address of the device. The string is carried in UTF-8 representation.

6.3. Operator-Identifier option

The Operator-Identifier option can be used for carrying the operator identifier of the access network to which the client is attached.There can only be a single instance of this specific option in any DHCPv6 message or single instance of this specific sub-option in DHCPv4 OPTION_ACCESS_NETWORK_ID or Relay Agent information option.

The format of this option is defined below. option. Its format is as follows:

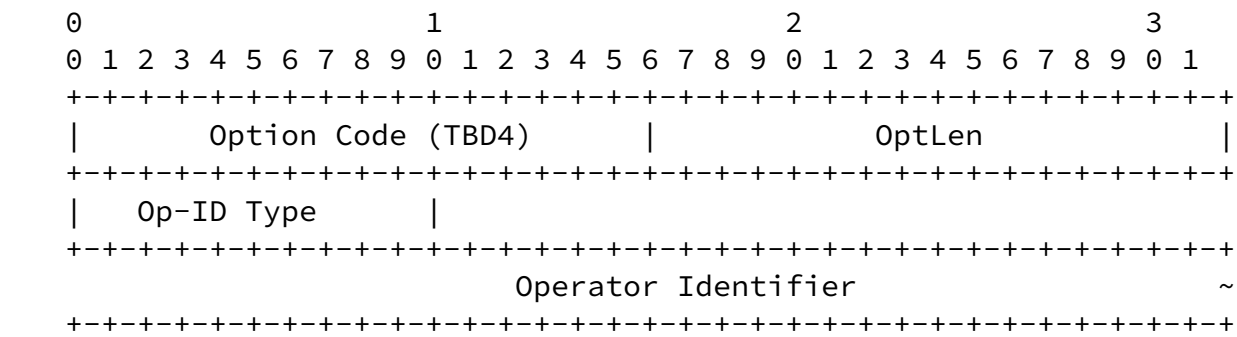
DHCPv4:



suboption code: 8 bit code, It should be set to value of (TBD7), indicating that it is Operator-Identifier sub-option

Length: Total length of this sub option, excluding the suboption code and length fields.

DHCPv6:



option-code: 16-bit code OPTION_ANI_OPERATOR_ID (TBD4)
option-length: 16-bit unsigned integer indicating length in octets of this option.

Common format applicable to DHCPv4 and DHCPv6:

Operator Identifier (Op-ID) Type: 8-bit unsigned integer indicating the type of the Operator Identifier. Currently the following types are defined:

0 - Reserved.

1 - Vendor ID as a four octet Private Enterprise Number [SMI].

2 - Realm of the operator. Realm names are required to be unique, and are piggybacked on the administration of the DNS namespace. Realms are encoded using a domain name encoding defined in [RFC1035].

Operator Identifier: Up to 253 octets of the operator identifier. The encoding of the identifier depends on the used Operator-ID Type. Numeric values are encoded in network byte order and strings have no terminating '\0' mark.

7. Client Behavior

All hosts or clients MAY include access network identifier options in all the upstream DHCP messages to inform the receiver about the access network it is attached to.

8. Relay Agent Behavior

DHCP Relay Agents MAY include these options before forwarding the DHCP message to provide information about the access network over which DHCP messages from the client is received.

9. Server Behavior

If DHCP Server is unable to understand this option it MUST be ignored. There is no requirement that a server return this option and its data in a downstream DHCP message.

10. IANA Considerations

This document defines DHCPv4 Access Network Identifier option which

requires assignment of DHCPv4 option code TBD1 assigned from "Bootp and DHCP options" registry (http://www.iana.org/assignments/bootp-dhcp-parameters/bootp-dhcp-parameters.xml), as specified in [RFC2939].

IANA is requested to assign Sub-option codes for the following DHCPv4 Sub-options from the "DHCP Relay Agent Sub-Option Codes"

Sub-option Code	Sub-Option Description
TBD5	Access-Network-Type Sub-option
TBD6	Network-Identifier Sub-option
TBD7	Operator-Identifier Sub-option

IANA is requested to assign option codes for the following DHCPv6 options from the "DHCPv6 and DHCPv6 options" registry (http://www.iana.org/assignments/dhcpv6-parameters/dhcpv6-parameters.xml).

Option Code	Descrption
TBD2	OPTION_ANI_ATT
TBD3	OPTION_ANI_NETWORK_ID
TBD4	OPTION_ANI_OPERATOR_ID

10.1. DHCPv4 Access-Network-Identifier Sub-option registry

IANA is required to maintain a new number space of "DHCPv4 Access Network Identifier Sub-options", with the initial sub-options as described in this document TBD5, TBD6, TBD7. IANA assigns future DHCPv4 Access Network Identifier Sub-options with a "IETF Consensus" policy as described in [RFC2434]. Future proposed sub-options are to

be referenced symbolically in the internet-drafts that describe them, and shall be assigned numeric codes by IANA when and if the draft is approved by IESG for Proposed Standard RFC status.

11. Security Considerations

Since there is no privacy protection for DHCP messages, an eavesdropper who can monitor the link between the DHCP server, relay agent and client can discover access network information.

To minimize the unintended exposure of this information, this option SHOULD be included by DHCP entities only when it is configured. Where critical decisions might be based on the value of this option, DHCP authentication as defined in "Authentication for DHCP Messages" [RFC3118] and "Dynamic Host Configuration Protocol for IPv6 (DHCPv6)" [RFC3315] SHOULD be used to protect the integrity of the DHCP options. Link-layer confidentiality and integrity protection may also be employed to reduce the risk of disclosure and tampering.

Security issues related DHCPv6 are described in section 23 of [RFC3315].

12. Acknowledgements

The authors would like to thank Kim Kinnear, Ted Lemon, Gaurav Halwasia for their valuable inputs.

13. Change log

Changes from 00 - 01

- Modified v4 top level option to be either option 82 if added by relay or a new top level option if added by client
- Removed DHCPv6 container option
- Reorganized the options to converge v4 and v6 option descriptions

Changes from 01-02

- Modified v4 DHCP option format to align with the 1 byte code, len

- Corrected typos

14. Normative References

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[RFC5844] Wakikawa, R. and S. Gundavelli, "IPv4 Support for Proxy Mobile IPv6", RFC 5844, May 2010.

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