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DHCP Options for Broadcast and Multicast Control Servers
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Abstract

This document defines new options for Broadcast and Multicast Service controller discovery in an IP network. Broadcast service is being developed for 3rd generation (3G) cellular telephone networks. Users of the service interact with a controller in the network via the Mobile Node (MN) to derive information required to receive broadcast

service. Dynamic Host Configuration Protocol can be used to configure the MN to access a particular controller. This document defines the related options and option codes.

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1. Motivation

Dynamic Host Configuration Protocol [[RFC2131](#)] and [[RFC3315](#)] can be used to configure various non-IP address type of parameters. These parameters are required for normal operation of various services that are offered over an IP network.

Broadcast and multicast service (BCMCS) is one such service that is currently being standardized in various mobile wireless standard bodies such as 3GPP, 3GPP2 and OMA. A description of the BCMCS, for example, in 3GPP2 can be found in [[BCMCS](#)].

While DHCP offers necessary mechanisms for device configuration, it lacks the information elements required to configure a mobile device to support BCMCS. This memo defines the extensions needed for DHCP to provide necessary configuration information to a mobile device in a BCMCS network.

DHCP is being used in 3GPP2, for example, to assist with the discovery of the BCMCS Controller in a mobile operator's IP network. The BCMCS includes a controller component that is responsible for managing the service via interaction with the MN and other network entities.

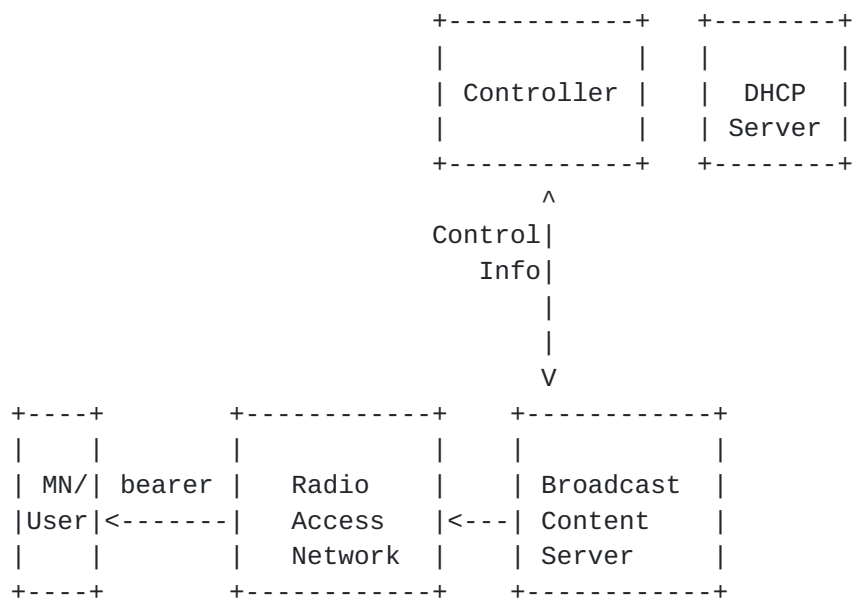
An overview of the 3GPP2 BCMCS architecture is given in the next section. It provides enough information to understand the basics of the 3GPP2 BCMCS operation. Readers are encouraged to find a more detailed description in [[BCMCS](#)].

As described in [[BCMCS](#)], the MNs are required to know the IPv4 or the IPv6 address of the controller entity so that they can download all the necessary information about a desired broadcast program. In a roaming environment static configuration of the controller's IP address becomes unrealistic. Therefore, DHCP is considered to be a method to dynamically configure the MNs with the IP address or the fully qualified domain name of the controller in the 3G cellular telephone networks.

In order to allow the MNs to discover the broadcast controllers, the DHCP clients request for appropriate option codes from the DHCP server using Parameter Request List option. The DHCP servers need to return the corresponding configuration options that carry either broadcast and multicast service controller's IP address or fully qualified domain name based on configuration. This document defines the necessary options and option codes.

2. Overview of the 3GPP2 BCMCS Network

The Broadcast and Multicast Service architecture in a 3G cellular telephone network such as 3GPP2 has the following model:



Note that this figure is shown here for broad understanding of how Broadcast and Multicast service works in a 3G cellular telephone network. The network elements except MN/user and the DHCP server are not relevant to the text in this document.

The MN interacts with the Controller to request broadcast/multicast program information from the network (e.g., scheduled time, multicast IP address, port numbers). The MN may also be authenticated by the Controller while downloading the relevant program security related information (such as encryption key). These interactions may happen via HTTP and XML. There may be more than one controller in the network. The MN should discover the appropriate controller to request the relevant program information. For details of Broadcast and Multicast Service operation in 3GPP2, see [[BCMCS](#)]

3. Terminology

The keywords "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](#).

4. Broadcast Service Controller Options

This section defines the configuration option for the controller of the broadcast service.

4.1 Broadcast Service Controller Domain Name list

If the 'enc' byte has a value of 0, the encoding byte is followed by a sequence of labels, encoded according to [Section 3.1 of RFC 1035](#) [[RFC1035](#)].

The option MAY contain multiple domain names, but these domain names SHOULD be used to construct SRV lookups as specified in [[BCMCS](#)], rather than querying for different A records. The client MUST try the records in the order listed, applying the mechanism described in [[BCMCS](#)] for each entry. The client only resolves the subsequent domain names if attempts to contact the first one failed or yielded no common transport protocols between the client and the controller or denote a domain that is administratively prohibited by client's policy.

The use of multiple domain names is not meant to replace the SRV records, but rather to allow a single DHCP server to indicate the broadcast controllers in the wireless access provider's network.

Clients MAY support compression according to the encoding in [Section 4.1.4](#) of "Domain Names - Implementation And Specification [[RFC1035](#)]. Since the domain names are supposed to be different domains, compression will likely have little effect. If the length of the domain list exceeds the maximum permissible length within a single option (254 octets), then the domain list MUST be represented in the DHCP message as specified in [[RFC3396](#)] .

The DHCP option for this encoding has the following format:

Code	Len	enc	FQDN(s) of Broadcast Controller					
-----	-----	-----	-----	-----	-----	-----	-----	-----
TBD	n	0	s1	s2	s3	s4	s5	...
-----	-----	-----	-----	-----	-----	-----	-----	-----

An example case when two controller domain names e.g. bcmc1.example.com, bcmc2.example.com are returned will be:


```

+---+---+---+---+---+---+---+---+---+---+---+---+
|TBD|38 | 5 |'b'|'c'|'m'|'c'|'1'| 8 |'e'|'x'|'a'|'m'|'p'|'l'|'e'|
+---+---+---+---+---+---+---+---+---+---+---+---+
+---+---+---+---+---+---+---+---+---+---+---+---+
| 3 |'c'|'o'|'m'| 5 |'b'|'c'|'m'|'c'|'2'| 8 |'e'|'x'|'a'|'m'|'p'|
+---+---+---+---+---+---+---+---+---+---+---+---+
+---+---+---+---+---+---+---+---+
|'l'|'e'|'l'| 3 |'c'|'o'|'m'|
+---+---+---+---+---+---+---+---+

```

4.2 Broadcast Service Controller Domain Name List Option for DHCPv6

The option length is followed by a sequence of labels, encoded according to [Section 3.1 of RFC 1035](#).

The option MAY contain multiple domain names, but these domain names SHOULD be used to construct SRV lookups as specified in [\[BCMCS\]](#), rather than querying for different A records. The client MUST try the records in the order listed, applying the mechanism described in [\[BCMCS\]](#) for each entry. The client only resolves the subsequent domain names if attempts to contact the first one failed or yielded no common transport protocols between the client and the controller or denote a domain administratively prohibited by client's policy. Use of multiple domain names is not meant to replace the SRV records, but rather to allow a single DHCPv6 server to indicate the broadcast controllers in the access provider's network.

The DHCPv6 option for Broadcast Service Controller Domain Names has the format shown below.

option-code: OPTION_BCMCS_SERVER_D (TBD).

option-length: Length of the 'Broadcast Control Server Domain Name List' field in octets; variable.

```

      0              1              2              3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      OPTION_BCMCS_SERVER_D      |      option-length      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      Broadcast Control Domain Name List      |
|                                     ...                                     |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```


4.3 Broadcast Service Controller IPv4 address option

The encoding byte (enc) is followed by a list of IPv4 addresses indicating broadcast controller IPv4 addresses. The controllers MUST be listed in order of preference. Its minimum length is 5, and the length MUST be a multiple of 4 plus one. The DHCP option for this encoding has the following format:

Code	Len	enc	Address 1				Address 2			
TBD	n	1	a1	a2	a3	a4	a1	a2	a3	a4

4.4 Broadcast Service Controller IPv6 Address Option

This DHCPv6 option MUST carry one or more 128-bit IPv6 address(es) of the Broadcast Service Controller in a operators network.

option-code: OPTION_BCMCS_SERVER_A (TBD).

option-length: Length of the 'Broadcast Control Server IPv6 address' field in octets; variable.

0																1																2																3															
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9																								
OPTION_BCMCS_SERVER_A																option-length																																															
Broadcast Control server-1 address (IPv6 address)																																																															
Broadcast Control server-2 address (IPv6 address)																																																															
...																																																															

4.5 Consideration for Client Operation

For DHCPv6, a client MAY request either or both of the Broadcast Service Controller Domain Name List and the IPv6 Address options in the Options Request Option (ORO) as described in [[RFC3315](#)].

If a client receives both the Broadcast Service Controller Domain Name List and IPv6 Address options, it SHOULD use the Domain Name List option. In this case, the client MAY use the Broadcast Service Controller IPv6 Address option only if the servers in the Broadcast Service Controller Domain Name List can not be resolved or reached.

4.6 Consideration for Server Operation

A server MAY send a client either the Broadcast Service Controller Domain Name List Option or the Broadcast Service Controller IPv6 Address/IPv4 Address options if the server is configured to do so.

In case of DHCPv6, If a client requests both options and the server is configured with both types of information, the server MAY send the client only one of these options if it is configured to do so. In this case the server SHOULD send the Broadcast Service Controller Domain Name List option.

A server configured with the Broadcast Service Controller IPv6 Address information MUST send a client the Broadcast Service Controller IPv6 Address option if that client requested only the Broadcast Service Controller IPv6 address option and not the Broadcast Service Controller Domain Name List option in the ORO [[RFC3315](#)].

If a client requests for the Broadcast Service Controller IPv6 option and the Server is configured only with the Domain Names, the Server MUST return the Domain Names List and vice versa.

The following table summarizes the server's response for DHCPv6:

Client sends in ORO	Domain Name List	IPv6 Address List
Neither option	SHOULD	MAY
Domain Name List	MUST	MAY
IPv6 Address	MAY	MUST
Both options	SHOULD	MAY

5. Security Considerations

The security considerations in the base DHCP spec [[RFC2131](#)] applies. An attacker may change information of the Broadcast Service Controller in packets that are in-transit from DHCP server to the MN, if integrity protection is not in place. In that event, the user of the Broadcast service may be diverted to a rogue broadcast service controller. In the absence of a mutual authentication procedure between MN and the Broadcast controller, the MN may receive wrong or fraudulent information about Broadcast Service.

6. IANA Considerations

The following option codes for Broadcast Service Controller option must be assigned by IANA:

1. Broadcast Service Controller Domain Name list ([section 4.1](#))
2. OPTION_BCMCS_SERVER_D ([section 4.2](#))
3. Broadcast Service Controller IPv4 address option ([section 4.3](#))
4. OPTION_BCMCS_SERVER_A ([section 4.4](#))

The DHCP options should be registered in
<http://www.iana.org/assignments/bootp-dhcp-extensions>

The DHCPv6 options should be registered in
<http://www.iana.org/assignments/dhcpv6-parameters>

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