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DHCP Options for Broadcast and Multicast Control Servers
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Abstract

This document defines new options to discover the Broadcast and Multicast Service (BCMCS) controller in an IP network. BCMCS 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 and multicast 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 being standardized in various mobile wireless standard bodies such as 3GPP2, OMA, and 3GPP. A description of the BCMCS as defined in 3GPP2 can be found in [[BCMCS](#)].

While DHCP already defines many options for device configuration, no option exists for configuring a mobile device to use BCMCS. This memo defines extensions for both DHCPv4 and DHCPv6 so that DHCP can be used to provide necessary configuration information to a mobile device about the BCMCS controllers.

DHCP is being used in 3GPP2, to assist mobile nodes (MN) 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. In this document we will call this a BCMCS controller.

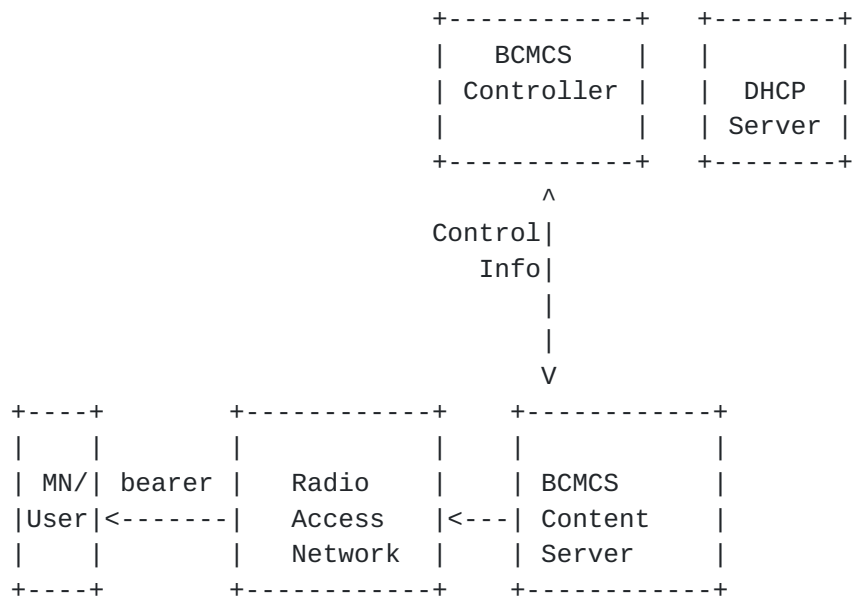
An overview of the 3GPP2 BCMCS architecture is given in the next section. It provides enough information to understand the basics of the 3GPP2 BCMCS operation. Readers are encouraged to find a more detailed description in [[BCMCS](#)].

As described in [[BCMCS](#)], the MNs are required to know the IPv4 or the IPv6 address of the BCMCS controller entity so that they can download all the necessary information about a desired broadcast and/or a multicast program. In a roaming environment static configuration of the BCMCS 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 BCMCS controller in the 3G cellular telephone networks.

In order to allow the MNs to discover the BCMCS controllers, the MNs request the 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 BCMCS 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 a basic 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 BCMCS 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 BCMCS Controller while downloading the relevant program security related information (such as encryption key). These interactions may happen via HTTP and XML as defined in [\[BCMCS\]](#). There may be more than one BCMCS controller in the network. The MN should discover the appropriate BCMCS 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 & Multicast Service Controller Options

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

4.1 Broadcast & Multicast Service Controller Domain Name list for DHCPv4

The general format of the BCMCS Controller Domain list option for DHCPv4 is as follows:

```

      Code  Len  FQDN(s) of BCMCS Controller
+-----+-----+-----+-----+-----+-----+-----+
| TBD1|  n  |  s1 |  s2 |  s3 |  s4 | s5 |  ...
+-----+-----+-----+-----+-----+-----+-----+

```

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 BCMCS 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 DHCPv4 server to indicate the BCMCS controllers in the wireless access provider's network.

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 DHCPv4 message as specified in [\[RFC3396\]](#).

An example case when two controller domain names, example.com and example.net are returned will be:

```

+-----+-----+-----+-----+-----+-----+-----+-----+
|TBD1| 26 | 7  | 'e'| 'x'| 'a'| 'm'| 'p'| 'l'| 'e'| 3 |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 'c'| 'o'| 'm'| 0 | 'e'| 'x'| 'a'| 'm'| 'p'| 'l'| 'e'|
+-----+-----+-----+-----+-----+-----+-----+-----+

```



```

+---+---+---+---+---+---+
| 3 | 'n' | 'e' | 't' | 0 | 7 |
+---+---+---+---+---+---+

```

4.2 Broadcast & Multicast Service Controller Domain Name List Option for DHCPv6

The semantics and content of the DHCPv6 encoding of this option is exactly the same as the encoding described in the previous section, other than necessary differences between the way options are encoded in DHCPv4 and DHCPv6.

Specifically, the DHCPv6 option for the BCMCS Control Server Domain Names has the following format:

```

      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          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          BCMCS Control Server Domain Name List          |
|                                     ...                                     |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

option-code: OPTION_BCMCS_SERVER_D (TBD2).

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

BCMCS Control Server Domain Name List: Identical content as in [Section 4.1](#)

4.3 Broadcast & Multicast Service Controller IPv4 address option for DHCPv4

The Length byte (Len) is followed by a list of IPv4 addresses indicating BCMCS controller IPv4 addresses. The BCMCS controllers MUST be listed in order of preference. Its minimum length is 4, and the length MUST be a multiple of 4. The DHCPv4 option for this encoding has the following format:

Code	Len	Address 1				Address 2		
TBD3	n	a1	a2	a3	a4	a1	...	

4.4 Broadcast & Multicast Service Controller IPv6 Address Option for DHCPv6

This DHCPv6 option MUST carry one or more 128-bit IPv6 address(es) of the BCMCS Controller in a operator's network.

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_A										option-length																													
BCMCS Control server-1 address (IPv6 address)																																							
BCMCS Control server-2 address (IPv6 address)																																							
...																																							

option-code: OPTION_BCMCS_SERVER_A (TBD4).

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

4.5 Consideration for Client Operation

For DHCPv6, a client MAY request either or both of the BCMCS 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 BCMCS Controller Domain Name List and IPv6 Address options, it SHOULD use the Domain Name List option. In this case, the client MAY use the BCMCS Controller IPv6 Address option only if the servers in the BCMCS Controller Domain Name List

can not be resolved or reached.

4.6 Consideration for Server Operation

A server MAY send a client either the BCMCS Controller Domain Name List Option or the BCMCS 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 BCMCS Controller Domain Name List option.

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

If a client requests for the BCMCS 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 DNS name(s) MUST be concatenated and encoded using the technique described in [section 3.3](#) of "Domain Names - Implementation And Specification" [[RFC1035](#)]. DNS name compression MUST NOT be used.

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 BCMCS 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 & Multicast service may be diverted to a rogue BCMCS controller.

6. IANA Considerations

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

1. The BCMCS Controller Domain Name list ([section 4.1](#)) has been assigned a value of TBD1 from the DHCPv4 option space.
2. The BCMCS Controller Domain Name list ([section 4.2](#)) has been assigned a value of TBD2 from the DHCPv6 option space, and a name of OPTION_BCMCS_SERVER_D.
3. The BCMCS Controller IPv4 address option ([section 4.3](#)) has been assigned a value of TBD3 from the DHCPv4 option space.
4. The BCMCS Controller IPv6 address option ([section 4.4](#)) has been assigned a value of TBD4 from the DHCPv6 option space, and a name of OPTION_BCMCS_SERVER_A.

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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