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Vincent Zimmer
Intel Corporation
Dave Thaler
Microsoft

DHCPv6 Remote Boot Options
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Abstract

This document describes a means by which to support network boot of a bare-metal platform utilizing a pre-boot execution environment, such as the Unified Extensible Firmware Interface [UEFI22]. The problem being addressed is that the PXE [PXE21] and UEFI Specifications [UEFI22] only describe how to ascertain boot configuration options using DHCPv4 [RFC2131], not for DHCPv6 [RFC3315]. Similarly, iSCSI boot [RFC4173] does not specify how to discover boot device information in an DHCPv6 environment. This document will describe

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how to ascertain this boot information in an IPv6 environment
utilizing options in the DHCPv6 hand-off [[RFC3315](#)].

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[1.](#) Introduction

Many hosts today have the ability to boot an Operating System image (or "boot file") that is located on a server in the network. To do so, the host must begin with some functionality just sufficient to be able to get on the network and retrieve the boot file. As indicated in Figure 1, it is desirable to obtain from DHCP the information needed to locate the boot file, so that by the time the host is able to communicate on the network, it can immediately begin downloading the boot file.

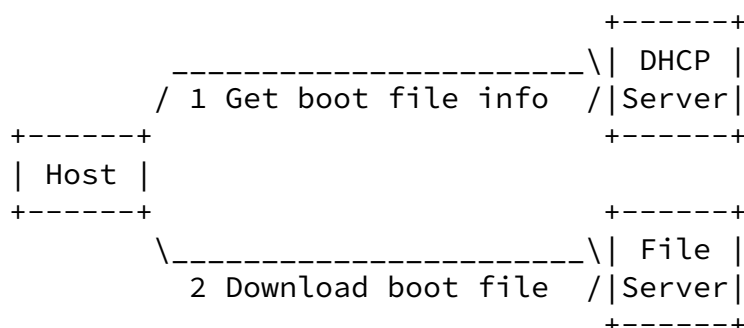


Figure 1: Network Boot Sequence

Two methods for downloading a boot file are specified today.

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- o iSCSI: [\[RFC2132\]](#) specifies a DHCPv4 option for retrieving boot file information and [\[RFC4173\]](#) specifies how to download the boot file.
- o TFTP: [\[RFC2132\]](#) and [\[RFC4578\]](#) specify DHCPv4 options for retrieving boot file information and [\[RFC1350\]](#) specifies how to download the boot file.

The problem with both is that while the methods for downloading the boot files can work over either IPv4 or IPv6, the boot file info can only be obtained over DHCPv4. As a result, they do not support a network that only provides IPv6, nor do they support IPv6-only devices. To address this gap, this document specifies DHCPv6 options that provide parity with the DHCPv4 options.

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 [\[RFC2119\]](#).

[2. DHCPv6 Options](#)

[2.1. Root Path Option](#)

The Root Path option specifies the path-name that contains the client's root disk. The path is formatted as a character string consisting of characters from the NVT ASCII character set.

This option provides parity with the Root Path Option defined for DHCPv4 in [\[RFC2132\] section 3.19](#).

```

      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_ROOT_PATH          |          option-len          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
.
.          root-disk-pathname (variable length)          .
.
```

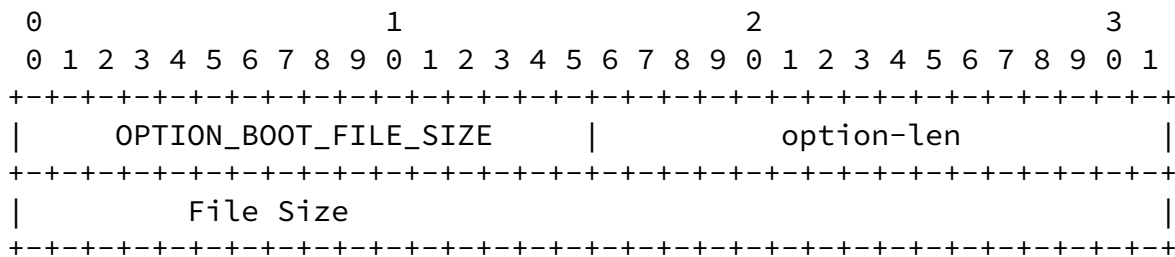

option-code	OPTION_NEXT_SERVER_ADDRESS (TBD3).
option-len	16
Next Server Address	The IPv6 address or IPv4-mapped address of the next server

2.3. Boot File Size Option

This option specifies the length in 512-octet blocks of the default boot image for the client. The file length is specified as a 32-bit integer.

This option provides parity with the Boot File Size Option defined for DHCPv4 in [\[RFC2132\] section 3.15](#).

The format of the option is:

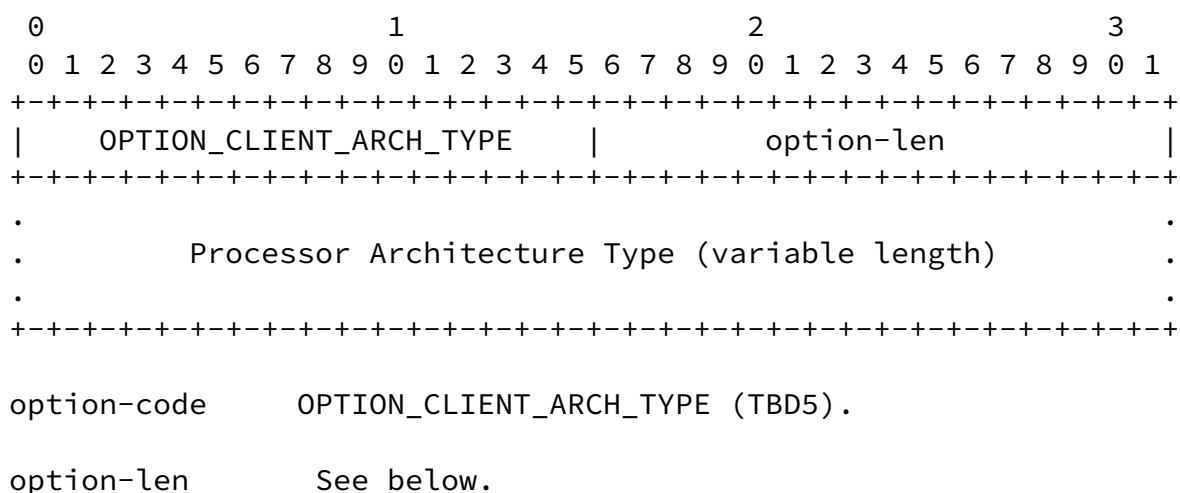


option-code	OPTION_BOOT_FILE_SIZE (TBD4).
option-len	4
File Size	The length in 512-octet blocks of the boot image for the client.

2.4. Client System Architecture Type Option

This option provides parity with the Client System Architecture Type Option defined for DHCPv4 in [\[RFC4578\] section 2.1](#).

The format of the option is:



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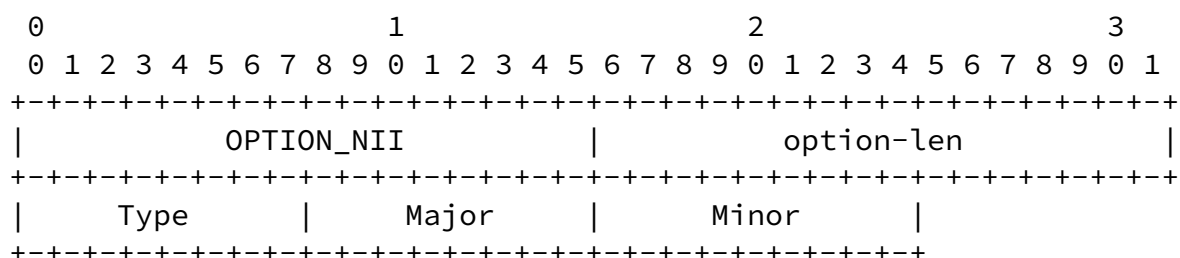
Processor Architecture Type	A list of one or more architecture types, as specified in [RFC4578] section 2.1 .
-----------------------------	---

2.5. Client Network Interface Identifier Option

The Client Network Interface Identifier option is sent by a DHCP client to a DHCP server to provide information about its level of Universal Network Device Interface (UNDI) support.

This option provides parity with the Client Network Interface Identifier Option defined for DHCPv4 in [\[RFC4578\] section 2.2](#).

The format of the option is:

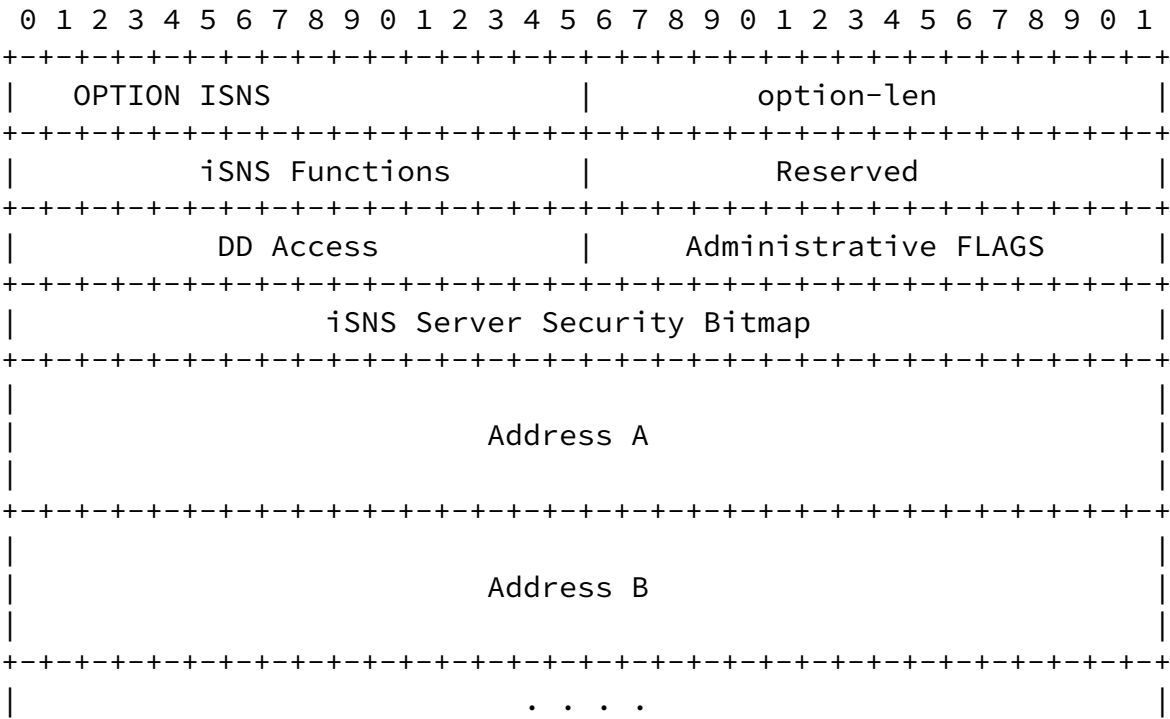


option-code	OPTION_NII (TBD6).
option-len	3
Type	As specified in [RFC4578] section 2.2.
Major	As specified in [RFC4578] section 2.2.
Minor	As specified in [RFC4578] section 2.2.

2.6. iSNS Option

As specified in [\[RFC4173\] section 6](#), iSCSI boot requires either iSNS or SLP support.

This option provides parity with the iSNS Option defined for DHCPv4 in [\[RFC4174\] section 2](#).



```
|           Additional Secondary iSNS Servers           |
|               . . . .                                |
+---+---+---+---+---+---+---+---+---+---+---+---+---+
```

option-code	OPTION_ISNS (TBD7)
option-len	2
iSNS Functions	As specified in [RFC4174] section 2 .
Reserved	MUST be set to zero
DD Access	As specified in [RFC4174] section 2 .
Administrative FLAGS	As specified in [RFC4174] section 2 .
iSNS Server Security Bitmap	As specified in [RFC4174] section 2 .
Address A	As specified in [RFC4174] section 2 , except that it contains an IPv6 address
Address B	As specified in [RFC4174] section 2 , except that it contains an IPv6 address
Additional Secondary iSNS Servers	As specified in [RFC4174] section 2 , except that it contains IPv6 addresses

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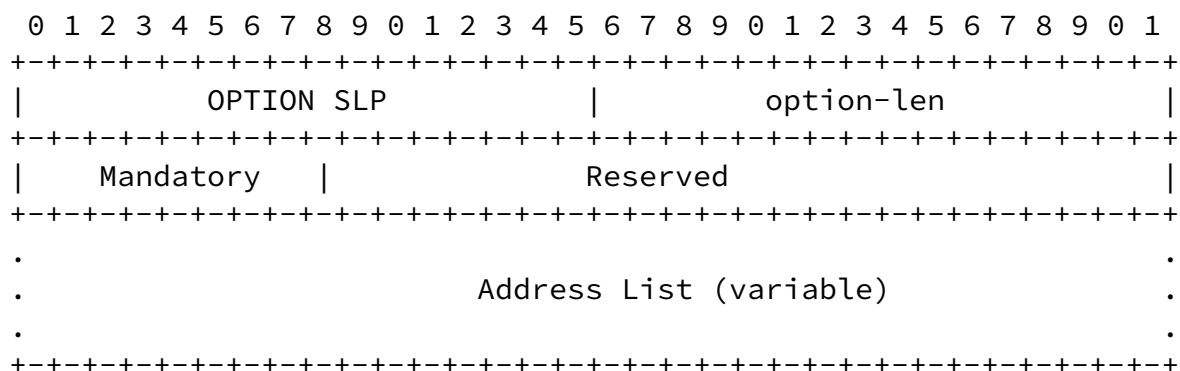
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2.7. SLP Directory Agent Option

As specified in [\[RFC4173\] section 6](#), iSCSI boot requires either iSNS or SLP support.

This option provides parity with the SLP Directory Agent Option defined for DHCPv4 in [\[RFC2610\]](#) section 3.

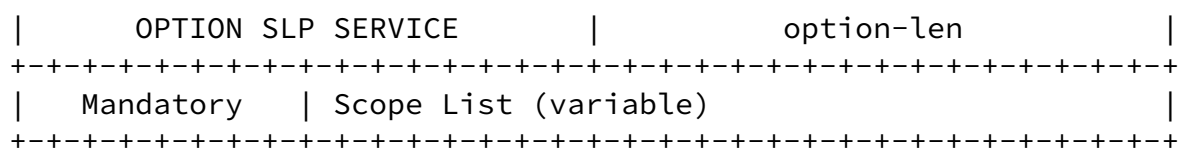
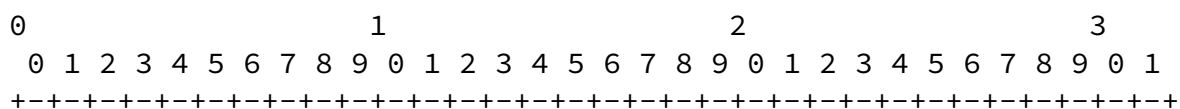
3



2.8. SLP Service Scope Option

As specified in [\[RFC4173\] section 6](#), iSCSI boot requires either iSNS or SLP support.

This option provides parity with the SLP Directory Agent Option defined for DHCPv4 in [\[RFC2610\] section 4](#).



option-code OPTION_SLP_SERVICE (TBD8)

option-len 2

Scope List As specified in [\[RFC2610\] section 4](#)

3. Security Considerations

If an adversary manages to modify the response from a DHCP server or insert its own response, a host could be led to contact a rogue file server, resulting in an attacker being able to run arbitrary code on

the host. Consequently, a practical way to verify loaded boot images is to make sure that each host verifies the boot file to be executed using a mechanism of their choice.

In addition, some options contain information about a client's system architecture and may be of use to potential attackers.

See the security considerations in [\[RFC3315\]](#), [\[RFC4173\]](#), and [\[RFC4578\]](#) for more discussion. This document introduces no new concerns beyond the ones covered therein for IPv4.

[4.](#) IANA Considerations

This document introduces a new IANA registry for processor architecture types. The name of this registry shall be "Processor Architecture Type". Registry entries consist of a 16-bit integer recorded in decimal format, and a descriptive name. The initial values of this registry can be found in [\[RFC4578\] section 2.1](#).

The assignment policy for values shall be Expert Review, and any requests for values must supply the descriptive name for the processor architecture type.

[5.](#) Acknowledgments

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- [UEFI22] Unified Extensible Firmware Interface Specification, Version 2.2, September 2008, <http://www.uefi.org>

[6.2](#). Informative References

Author's Addresses

Vincent Zimmer

Intel
DP2-420
2800 Center Drive
DuPont, WA 98327

Phone: +1 253 371 5667
Email: vincent.zimmer@intel.com

Dave Thaler
Microsoft
One Microsoft Way
Redmond, WA 98052

Phone: +1 425 703-8835
Email: dthaler@microsoft.com

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