Internet Engineering Task Force
Internet-Draft
Intended status: Standards Track
Expires: June 18, 2011

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December 15, 2010

Definition of the UUID-based DHCPv6 Unique Identifier (DUID-UUID) draft-ietf-dhc-duid-uuid-01

Abstract

This document defines a new DHCPv6 Unique Identifier (DUID) type, called DUID-UUID. DUID-UUIDs are derived from the already standardized UUID format. DUID-UUID makes it possible for devices to use UUIDs to identify themselves to DHC servers and vice versa. UUIDs are globally unique and readily available on many systems, making them convenient identifiers to leverage within DHCP.

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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1. Introduction

In DHCPv6, clients identify themselves to servers via DHCP Unique Identifiers (DUIDs) [RFC3315]. DUIDs are identifiers that DHCP servers treat as opaque objects with no internal structure. DUIDs are intended to be globally unique, with no two devices using the same DUID. Three DUIDs types have been defined previously:

DUID-LLT - the Link-Layer address of one of the device's network interfaces, concatenated with a timestamp

DUID-EN - an Enterprise Number plus additional information specific to the enterprise

DUID-LL - the Link-Layer address of one of the device's network interfaces

The intention of DUIDs is that they remain constant over time, so that they can be used as permanent identifiers for a device. In the case of DUID-LLTs, they are intended to be generated once, and then stored in stable storage and reused from that point forward.

In DHCPv4, all clients identify themselves to servers via the MAC address of the interface on which the DHCP packet is sent. The MAC address identifier generally remains constant across machine restarts, installation of new operating system releases, changes in hardware configuration such as addition or removal of storage devices, etc. While the MAC address will change if the network interface is replaced, this is a relatively uncommon event.

In contrast, the DUID-LLT and DUID-LL identifiers that a given device may use are less likely to remain constant on some types of devices and deployments. Specifically, when a machine goes through a multi-step boot process, it may first load a simple boot loader, followed by a one or more secondary loaders before the eventual desired target system is loaded. In IPv4, all steps of a multi-step boot processes that invoke DHCP are guaranteed to use the same MAC identifier during each stage. In contrast, with DHCPv6, it is more difficult to ensure or arrange that each boot stage uses the same identifier. First, there are multiple DUID types, and different stages might choose to use different formats. Second, even if the different stages used DUID-LL or DUID-LLT, on devices with multiple interfaces, there is no way to guarantee that the same interface (and hence DUID) will be selected. Finally, in the case of DUID-LLT, even if the same interface were chosen, there is no guarantee that each stage would use the same timestamp value. While a DUID-EN could be defined and used, such usage would be proprietary by definition.

This document defines a new DUID type, based on the Universally Unique IDentifier (UUID) [RFC4122]. UUIDs are already used in practice and serve as an existing identifier that could be leveraged by DHCP. For example, x86 based systems ship with an embedded UUID in firmware that could be accessed for this purpose.

Although DUIDs are new to DHCPv6, the idea of identifying clients via a UUID is not. DHCPv4 defines a Client Machine Identifier Option (option 97) that can contain a UUID [RFC4578].

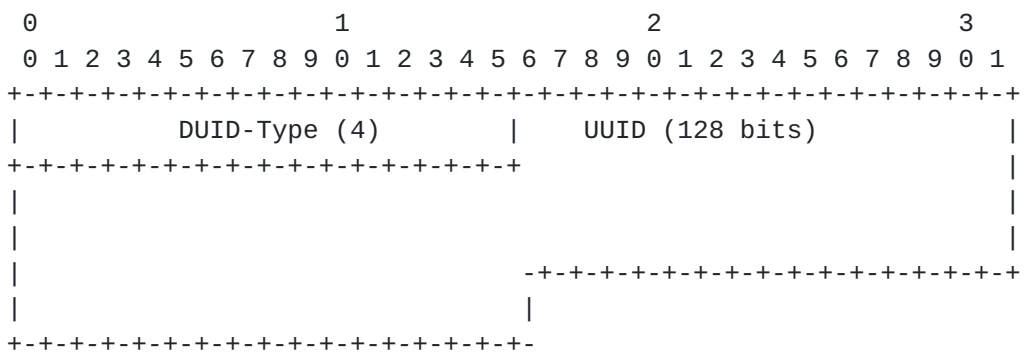
Although many UUIDs are in use today, not all UUIDs meet the requirements of the DHCP protocol (see Section 9 of [RFC3315]). DHCP UUIDs should be persistant across system restarts, across system reconfiguration events, system software and operating system upgrades or reinstallation, and be easily available to any part of the boot process that requires access to the DHCP UUID. For example, UUIDs used in Microsoft's Component Object Module (COM), and for labeling partitions in filesystems, are likely not appropriate as they may not be accessible to firmware boot loaders, and can change over time.

Implementations of this specification must use a DUID that is persistent across system restart and reconfiguration events, and that is available to all DHCP protocol agents that may need to identify themselves. For instance, a DUID that is part of the system firmware, or managed by the system firmware, would satisfy this requirement.

It should be noted that use of a DUID-UUID will not by itself solve all the problems motivating this document. Given the availablility of a suitable DUID-UUID, implementations will still need to take steps to ensure that all boot stages use the same DUID-UUID as appropriate. Given that DHCP has already defined multiple DUID types, the question of which of several DUIDs to select from already exists and is not a new problem.

2. DUID-UUID Format

The DUID-UUID is carried within Client Identifier or Server Identifier options. It has the following format:



DUID-UUID format. .

Figure 1

DUID-Type - DUID-UUID (4) - (16 bits)

UUID - An RFC4122 UUID (128 bits)

3. Acknowledgements

This document was inspired by a discussion on the DHC mailing list in November, 2009 on the topic of netboot for IPv6. Specifically, some scenarios were described where it was difficult to do something in DHCPv6 that had worked well in DHCPv4.

4. IANA Considerations

IANA has assigned the value 4 for use by the DHCPv6 DUID-UUID type. [TO BE REMOVED UPON PUBLICATION: IANA should update the registry entry for the DUID-UUID DUID-Type and mark the assignment permanent.]

5. Security Considerations

DHCP traffic is sent in the clear. An eavesdroppper could see DHCP traffic and obtain the UUID for a particular machine. This may raise some privacy issues.

6. References

6.1. Normative References

[RFC3315] Droms, R., Bound, J., Volz, B., Lemon, T., Perkins, C., and M. Carney, "Dynamic Host Configuration Protocol for

IPv6 (DHCPv6)", RFC 3315, July 2003.

[RFC4122] Leach, P., Mealling, M., and R. Salz, "A Universally Unique IDentifier (UUID) URN Namespace", RFC 4122, July 2005.

6.2. Informative References

[RFC4578] Johnston, M. and S. Venaas, "Dynamic Host Configuration Protocol (DHCP) Options for the Intel Preboot eXecution Environment (PXE)", RFC 4578, November 2006.

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