

DHC Working Group
Internet-Draft
Intended status: Standards Track
Expires: March 8, 2019

Y. Cui
L. Sun
Tsinghua University
I. Farrer
S. Zechlin
Deutsche Telekom AG
Z. He
Tsinghua University
September 4, 2018

**YANG Data Model for DHCPv6 Configuration
draft-ietf-dhc-dhcpv6-yang-07**

Abstract

This document describes a YANG data model [[RFC6020](#)] for the configuration and management of DHCPv6 servers, relays, and clients.

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 [[RFC2119](#)].

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <https://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on March 8, 2019.

Copyright Notice

Copyright (c) 2018 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

Table of Contents

1.	Introduction	2
1.1.	Terminology	3
2.	DHCPv6 Tree Diagram	3
2.1.	DHCPv6 Server Tree Diagrams	3
2.2.	DHCPv6 Relay Tree Diagrams	16
2.3.	DHCPv6 Client Tree Diagrams	20
3.	DHCPv6 YANG Model	27
3.1.	DHCPv6 Server YANG Model	27
3.2.	DHCPv6 Relay YANG Model	47
3.3.	DHCPv6 Client YANG Model	57
3.4.	DHCPv6 Options YANG Model	65
3.5.	DHCPv6 Types YANG Model	94
4.	Security Considerations (TBD)	99
5.	IANA Considerations (TBD)	99
6.	Acknowledgements	99
7.	Contributors	99
8.	References	100
8.1.	Normative References	100
8.2.	Informative References	100
	Authors' Addresses	102

[1.](#) Introduction

DHCPv6 [[RFC3315](#)] is widely used for supplying configuration and other relevant parameters to clients in IPv6 networks. This document defines a DHCPv6 YANG data model, containing sub-modules for the configuration and management of DHCPv6 servers, relays and clients. A single YANG model covering all of these elements provides an operator with a common interface for the management of the entire DHCPv6 deployment in their network.

Since the publication of the original DHCPv6 specification, there have been a large number of additional documents that update the protocol's operation, add new functions and define new options. The YANG model described in this document incorporates all relevant

changes. A full list of the documents which have been considered in the development of this model is included in [Appendix A](#).

IF - Comment - Does anyone have this list?

It is worth noting that as DHCPv6 is itself a device configuration protocol, it is not the intention of this document to replace the configuration of DHCPv6 options and parameters using the DHCPv6 protocol with the configuration of DHCPv6 options using NETCONF/YANG. The DHCPv6 client model is intended for the configuration of the DHCPv6 client function and also for obtaining read-only state data from the client which has been learnt via the normal DHCPv6 message flow. This gives an operator a better method for managing DHCPv6 clients and simplifies troubleshooting.

1.1. Terminology

The reader should be familiar with the terms defined in DHCPv6 [\[RFC3315\]](#) and other relevant documents.

The DHCPv6 tree diagrams provide a concise representation of a YANG module to help the reader understand the module structure.

A simplified graphical representation of the data model is provided in this document. For a description of the symbols in these diagrams, please refer to [\[I-D.ietf-netmod-yang-tree-diagrams\]](#).

2. DHCPv6 Tree Diagram

2.1. DHCPv6 Server Tree Diagrams

module: ietf-dhcpv6-server

```

+--rw server!
  +--rw server-config
    | +--rw serv-attributes
    | | +--rw duid
    | | | +--rw type-code?                               uint16
    | | | +--rw (duid-type)?
    | | |   +--:(duid-llt)
    | | |     | +--rw duid-llt-hardware-type?           uint16
    | | |     | +--rw duid-llt-time?                     yang:timeticks
    | | |     | +--rw duid-llt-link-layer-addr?          yang:mac-address
    | | |   +--:(duid-en)
    | | |     | +--rw duid-en-enterprise-number?         uint32
    | | |     | +--rw duid-en-identifier?                 string
    | | |   +--:(duid-ll)
    | | |     | +--rw duid-ll-hardware-type?             uint16
    | | |     | +--rw duid-ll-link-layer-addr?           yang:mac-address

```



```

| | | +--:(duid-uuid)
| | | | +--rw uuid? yang:uuid
| | | +--:(duid-unknown)
| | | | +--rw data? binary
| | +--rw name? string
| | +--rw description? string
| | +--rw ipv6-address* inet:ipv6-address
| | +--rw interfaces-config* if:interface-ref
| | +--rw lease-storage
| | | +--rw (storage-type)?
| | | | +--:(memfile)
| | | | | +--rw memfile-name? string
| | | | | +--rw memfile-lfc-interval? uint64
| | | | +--:(mysql)
| | | | | +--rw mysql-name? string
| | | | | +--rw mysql-host? string
| | | | | +--rw mysql-password? string
| | | | | +--rw mysql-port? uint8
| | | | | +--rw mysql-lfc-interval? uint64
| | | | | +--rw mysql-connect-timeout? uint64
| | | | +--:(postgresql)
| | | | | +--rw postgresql-name? string
| | | | | +--rw postgresql-host? string
| | | | | +--rw postgresql-password? string
| | | | | +--rw postgresql-port? uint8
| | | | | +--rw postgresql-lfc-interval? uint64
| | | | | +--rw postgresql-connect-timeout? uint64
| | | | +--:(cassandra)
| | | | | +--rw cassandra-name? string
| | | | | +--rw cassandra-contact-points? string
| | | | | +--rw cassandra-password? string
| | | | | +--rw cassandra-lfc-interval? uint64
| | | | | +--rw cassandra-connect-timeout? uint64
| | +--rw vendor-info
| | | +--rw ent-num uint32
| | | +--rw data* string
| +--rw option-sets
| | +--rw option-set* [option-set-id]
| | | +--rw option-set-id uint32
| | | +--rw server-unicast-option! {server-unicast-op}?
| | | | +--rw server-address? inet:ipv6-address
| | | +--rw sip-server-domain-name-list-option! {sip-server-domain-
name-list-op}?
| | | | +--rw sip-serv-domain-name string
| | | +--rw sip-server-address-list-option! {sip-server-address-list-
op}?
| | | | +--rw sip-server* [sip-serv-id]
| | | | | +--rw sip-serv-id uint8

```

```
| | |      +--rw sip-serv-addr      inet:ipv6-address
| | |      +--rw dns-servers-option! {dns-servers-op}?
```

```

| | | +--rw dns-server* [dns-serv-id]
| | | | +--rw dns-serv-id      uint8
| | | | +--rw dns-serv-addr    inet:ipv6-address
| | | +--rw domain-searchlist-option! {domain-searchlist-op}?
| | | | +--rw domain-searchlist* [domain-searchlist-id]
| | | | | +--rw domain-searchlist-id      uint8
| | | | | +--rw domain-search-list-entry  string
| | | +--rw nis-config-option! {nis-config-op}?
| | | | +--rw nis-server* [nis-serv-id]
| | | | | +--rw nis-serv-id      uint8
| | | | | +--rw nis-serv-addr    inet:ipv6-address
| | | +--rw nis-plus-config-option! {nis-plus-config-op}?
| | | | +--rw nis-plus-server* [nis-plus-serv-id]
| | | | | +--rw nis-plus-serv-id      uint8
| | | | | +--rw nis-plus-serv-addr    inet:ipv6-address
| | | +--rw nis-domain-name-option! {nis-domain-name-op}?
| | | | +--rw nis-domain-name?      string
| | | +--rw nis-plus-domain-name-option! {nis-plus-domain-name-op}?
| | | | +--rw nis-plus-domain-name?  string
| | | +--rw sntp-server-option! {sntp-server-op}?
| | | | +--rw sntp-server* [sntp-serv-id]
| | | | | +--rw sntp-serv-id      uint8
| | | | | +--rw sntp-serv-addr    inet:ipv6-address
| | | +--rw info-refresh-time-option! {info-refresh-time-op}?
| | | | +--rw info-refresh-time    yang:timeticks
| | | +--rw client-fqdn-option! {client-fqdn-op}?
| | | | +--rw server-initiate-update  boolean
| | | | +--rw client-initiate-update  boolean
| | | | +--rw modify-name-from-cli    boolean
| | | +--rw posix-timezone-option! {posix-timezone-op}?
| | | | +--rw tz-posix      string
| | | +--rw tzdb-timezone-option! {tzdb-timezone-op}?
| | | | +--rw tz-database    string
| | | +--rw ntp-server-option! {ntp-server-op}?
| | | | +--rw ntp-server* [ntp-serv-id]
| | | | | +--rw ntp-serv-id      uint8
| | | | | +--rw (ntp-time-source-suboption)?
| | | | | | +--:(server-address)
| | | | | | | +--rw ntp-serv-addr-suboption*      inet:ipv6-
address
| | | | | | | +--:(server-multicast-address)
| | | | | | | | +--rw ntp-serv-mul-addr-suboption*  inet:ipv6-
address
| | | | | | | +--:(server-fqdn)
| | | | | | | | +--rw ntp-serv-fqdn-suboption*      string
| | | +--rw boot-file-url-option! {boot-file-url-op}?
| | | | +--rw boot-file* [boot-file-id]
| | | | | +--rw boot-file-id      uint8

```

			+-rw suitable-arch-type*	uint16
			+-rw suitable-net-if*	uint32

```

| | | +--rw boot-file-url          string
| | +---rw boot-file-param-option! {boot-file-param-op}?
| | | +--rw boot-file-paras* [para-id]
| | | | +--rw para-id            uint8
| | | | +--rw parameter          string
| | +---rw aftr-name-option! {aftr-name-op}?
| | | +--rw tunnel-endpoint-name  string
| | +---rw kbr-default-name-option! {kbr-default-name-op}?
| | | +--rw default-realm-name    string
| | +---rw kbr-kdc-option! {kbr-kdc-op}?
| | | +--rw kdc-info* [kdc-id]
| | | | +--rw kdc-id              uint8
| | | | +--rw priority            uint16
| | | | +--rw weight              uint16
| | | | +--rw transport-type      uint8
| | | | +--rw port-number         uint16
| | | | +--rw kdc-ipv6-addr       inet:ipv6-address
| | | | +--rw realm-name          string
| | +---rw sol-max-rt-option! {sol-max-rt-op}?
| | | +--rw sol-max-rt-value      yang:timeticks
| | +---rw inf-max-rt-option! {inf-max-rt-op}?
| | | +--rw inf-max-rt-value      yang:timeticks
| | +---rw addr-selection-option! {addr-selection-op}?
| | | +--rw a-bit-set             boolean
| | | +--rw p-bit-set             boolean
| | | +--rw policy-table* [policy-id]
| | | | +--rw policy-id           uint8
| | | | +--rw label               uint8
| | | | +--rw precedence          uint8
| | | | +--rw prefix-len          uint8
| | | | +--rw prefix              inet:ipv6-prefix
| | +---rw pcp-server-option! {pcp-server-op}?
| | | +--rw pcp-server* [pcp-serv-id]
| | | | +--rw pcp-serv-id         uint8
| | | | +--rw pcp-serv-addr       inet:ipv6-address
| | +---rw s46-rule-option! {s46-rule-op}?
| | | +--rw s46-rule* [rule-id]
| | | | +--rw rule-id             uint8
| | | | +--rw rule-type           enumeration
| | | | +--rw prefix4-len         uint8
| | | | +--rw ipv4-prefix         inet:ipv4-prefix
| | | | +--rw prefix6-len         uint8
| | | | +--rw ipv6-prefix         inet:ipv6-prefix
| | | | +--rw port-parameter
| | | | | +--rw offset            uint8
| | | | | +--rw psid-len          uint8
| | | | | +--rw psid              uint16
| | +---rw s46-br-option! {s46-br-op}?

```



```

| | | +--rw br* [br-id]
| | | | +--rw br-id          uint8
| | | | +--rw br-ipv6-addr   inet:ipv6-address
| | | +--rw s46-dmr-option! {s46-dmr-op}?
| | | | +--rw dmr* [dmr-id]
| | | | | +--rw dmr-id          uint8
| | | | | +--rw dmr-prefix-len  uint8
| | | | | +--rw dmr-ipv6-prefix inet:ipv6-prefix
| | | +--rw s46-v4-v6-binding-option! {s46-v4-v6-binding-op}?
| | | | +--rw ce* [ce-id]
| | | | | +--rw ce-id          uint8
| | | | | +--rw ipv4-addr      inet:ipv4-address
| | | | | +--rw bind-prefix6-len uint8
| | | | | +--rw bind-ipv6-prefix inet:ipv6-prefix
| | | | | +--rw port-parameter
| | | | | | +--rw offset      uint8
| | | | | | +--rw psid-len    uint8
| | | | | | +--rw psid        uint16
| | | +--rw operator-option-ipv6-address! {operator-op-ipv6-address}?
| | | | +--rw operator-ipv6-addr* [operator-ipv6-addr-id]
| | | | | +--rw operator-ipv6-addr-id  uint8
| | | | | +--rw operator-ipv6-addr     inet:ipv6-address
| | | +--rw operator-option-single-flag! {operator-op-single-flag}?
| | | | +--rw flag* [flag-id]
| | | | | +--rw flag-id      uint8
| | | | | +--rw flag-value   boolean
| | | +--rw operator-option-ipv6-prefix! {operator-op-ipv6-prefix}?
| | | | +--rw operator-ipv6-prefix* [operator-ipv6-prefix-id]
| | | | | +--rw operator-ipv6-prefix-id  uint8
| | | | | +--rw operator-ipv6-prefix6-len uint8
| | | | | +--rw operator-ipv6-prefix     inet:ipv6-prefix
| | | +--rw operator-option-int32! {operator-op-int32}?
| | | | +--rw int32val* [int32val-id]
| | | | | +--rw int32val-id  uint8
| | | | | +--rw int32val     uint32
| | | +--rw operator-option-int16! {operator-op-int16}?
| | | | +--rw int16val* [int16val-id]
| | | | | +--rw int16val-id  uint8
| | | | | +--rw int16val     uint16
| | | +--rw operator-option-int8! {operator-op-int8}?
| | | | +--rw int8val* [int8val-id]
| | | | | +--rw int8val-id   uint8
| | | | | +--rw int8val     uint8
| | | +--rw operator-option-uri! {operator-op-uri}?
| | | | +--rw uri* [uri-id]
| | | | | +--rw uri-id      uint8
| | | | | +--rw uri        string
| | | +--rw operator-option-textstring! {operator-op-textstring}?

```



```

| | | +--rw textstring* [textstring-id]
| | |   +--rw textstring-id    uint8
| | |   +--rw textstring      string
| | | +--rw operator-option-var-data! {operator-op-var-data}?
| | |   +--rw int32val* [var-data-id]
| | |   +--rw var-data-id    uint8
| | |   +--rw var-data      binary
| | | +--rw operator-option-dns-wire! {operator-op-dns-wire}?
| | |   +--rw operator-option-dns-wire* [operator-option-dns-wire-id]
| | |   +--rw operator-option-dns-wire-id    uint8
| | |   +--rw operator-option-dns-wire      binary
| | +--rw network-ranges
| |   +--rw option-set-id?    -> /server/server-config/option-sets/option-
set/option-set-id
| |   +--rw network-range* [network-range-id]
| |     +--rw network-range-id    uint32
| |     +--rw network-description  string
| |     +--rw network-prefix      inet:ipv6-prefix
| |     +--rw option-set-id?      -> /server/server-config/option-
sets/option-set/option-set-id
| |     +--rw address-pools
| |       +--rw address-pool* [pool-id]
| |         +--rw pool-id          uint32
| |         +--rw pool-prefix      inet:ipv6-prefix
| |         +--rw start-address    inet:ipv6-address-no-zone
| |         +--rw end-address      inet:ipv6-address-no-zone
| |         +--rw valid-lifetime   yang:timeticks
| |         +--rw renew-time       yang:timeticks
| |         +--rw rebind-time      yang:timeticks
| |         +--rw preferred-lifetime yang:timeticks
| |         +--rw rapid-commit     boolean
| |         +--rw client-class?    string
| |         +--rw max-address-count threshold
| |         +--rw option-set-id    -> /server/server-config/
option-sets/option-set/option-set-id
| |       +--rw pd-pools
| |         +--rw pd-pool* [pool-id]
| |           +--rw pool-id          uint32
| |           +--rw prefix            inet:ipv6-prefix
| |           +--rw prefix-length     uint8
| |           +--rw valid-lifetime    yang:timeticks
| |           +--rw renew-time        yang:timeticks
| |           +--rw rebind-time       yang:timeticks
| |           +--rw preferred-lifetime yang:timeticks
| |           +--rw rapid-commit      boolean
| |           +--rw client-class?     string
| |           +--rw max-pd-space-utilization threshold
| |           +--rw option-set-id     -> /server/server-config/

```

```
option-sets/option-set/option-set-id
| |      +--rw host-reservations
| |      +--rw host-reservation* [cli-id]
| |      +--rw cli-id
uint32
```

```

    | | +--rw (client-identifier)?
    | | | +--:(duid)
    | | | +--rw type-code? uint16
    | | | +--rw (duid-type)?
    | | | | +--:(duid-llt)
    | | | | +--rw duid-llt-hardware-type? uint16
    | | | | +--rw duid-llt-time?
yang:timeticks
    | | | +--rw duid-llt-link-layer-addr? yang:mac-
address
    | | | +--:(duid-en)
    | | | | +--rw duid-en-enterprise-number? uint32
    | | | | +--rw duid-en-identifier? string
    | | | | +--:(duid-ll)
    | | | | +--rw duid-ll-hardware-type? uint16
    | | | | +--rw duid-ll-link-layer-addr? yang:mac-
address
    | | | +--:(duid-uuid)
    | | | | +--rw uuid? yang:uuid
    | | | +--:(duid-unknown)
    | | | | +--rw data? binary
    | | | | +--:(hw-address)
    | | | | +--rw hardware-address? yang:mac-
address
    | | +--rw reserv-addr* inet:ipv6-
address
    | | +--rw prefix-reservation* [reserv-prefix-id]
    | | | +--rw reserv-prefix-id uint32
    | | | +--rw reserv-prefix inet:ipv6-prefix
    | | | +--rw reserv-prefix-len uint8
    | | +--rw hostname? string
    | | +--rw option-set-id? -> /server/
server-config/option-sets/option-set/option-set-id
    | +--rw relay-opaque-paras
    | | +--rw relays* [relay-name]
    | | | +--rw relay-name string
    | | | +--rw interface-info* [if-name]
    | | | | +--rw if-name string
    | | | | +--rw interface-id string
    | | | +--rw subscribers* [subscriber]
    | | | | +--rw subscriber uint32
    | | | | +--rw subscriber-id string
    | | | +--rw remote-host* [ent-num]
    | | | | +--rw ent-num uint32
    | | | | +--rw remote-id string
    | +--rw rsoo-enabled-options
    | | +--rw rsoo-enabled-option* [option-code]
    | | | +--rw option-code uint16

```

```
|      +---rw description    string
+---ro server-state
  +---ro network-ranges
    |  +---ro network-range* [network-range-id]
    |  +---ro network-range-id    uint32
    |  +---ro address-pools
```

```

|      | +--ro address-pool* [pool-id]
|      | | +--ro pool-id          uint32
|      | | +--ro total-address-count    uint64
|      | | +--ro allocated-address-conut  uint64
|      | +--ro binding-info* [cli-id]
|      |   +--ro cli-id      uint32
|      |   +--ro duid
|      |     | +--ro type-code?          uint16
|      |     | +--ro (duid-type)?
|      |     |   +--:(duid-llt)
|      |     |     | +--ro duid-llt-hardware-type?  uint16
|      |     |     | +--ro duid-llt-time?          yang:timeticks
|      |     |     | +--ro duid-llt-link-layer-addr? yang:mac-
address
|      |     |   +--:(duid-en)
|      |     |     | +--ro duid-en-enterprise-number?  uint32
|      |     |     | +--ro duid-en-identifier?        string
|      |     |   +--:(duid-ll)
|      |     |     | +--ro duid-ll-hardware-type?      uint16
|      |     |     | +--ro duid-ll-link-layer-addr?    yang:mac-
address
|      |     |   +--:(duid-uuid)
|      |     |     | +--ro uuid?                    yang:uuid
|      |     |   +--:(duid-unknown)
|      |     |     | +--ro data?                    binary
|      |   +--ro cli-ia* [iaid]
|      |     +--ro ia-type      string
|      |     +--ro iaid        uint32
|      |     +--ro cli-addr*    inet:ipv6-address
|      |     +--ro pool-id     uint32
|      +--ro pd-pools
|      | +--ro prefix-pool* [pool-id]
|      | | +--ro pool-id          uint32
|      | | +--ro pd-space-utilization  threshold
|      | +--ro binding-info* [cli-id]
|      |   +--ro cli-id      uint32
|      |   +--ro duid
|      |     | +--ro type-code?          uint16
|      |     | +--ro (duid-type)?
|      |     |   +--:(duid-llt)
|      |     |     | +--ro duid-llt-hardware-type?  uint16
|      |     |     | +--ro duid-llt-time?          yang:timeticks
|      |     |     | +--ro duid-llt-link-layer-addr? yang:mac-
address
|      |     |   +--:(duid-en)
|      |     |     | +--ro duid-en-enterprise-number?  uint32
|      |     |     | +--ro duid-en-identifier?        string
|      |     |   +--:(duid-ll)

```

					+-ro duid-ll-hardware-type?	uint16
address					+-ro duid-ll-link-layer-addr?	yang:mac-
					+-:(duid-uuid)	

```

|         |         |         | +--ro uuid?                               yang:uuid
|         |         |         | +--:(duid-unknown)
|         |         |         | +--ro data?                               binary
|         |         |         | +--ro cli-iapd* [iaid]
|         |         |         | +--ro iaid                               uint32
|         |         |         | +--ro cli-prefix*                       inet:ipv6-prefix
|         |         |         | +--ro cli-prefix-len*                   uint8
|         |         |         | +--ro pool-id                           uint32
|         |         |         | +--ro host-reservations
|         |         |         | +--ro binding-info* [cli-id]
|         |         |         | +--ro cli-id                             uint32
|         |         |         | +--ro duid
|         |         |         | | +--ro type-code?                       uint16
|         |         |         | | +--ro (duid-type)?
|         |         |         | | +--:(duid-llt)
|         |         |         | | | +--ro duid-llt-hardware-type?        uint16
|         |         |         | | | +--ro duid-llt-time?                 yang:timeticks
|         |         |         | | | +--ro duid-llt-link-layer-addr?      yang:mac-
address
|         |         |         | +--:(duid-en)
|         |         |         | | +--ro duid-en-enterprise-number?        uint32
|         |         |         | | +--ro duid-en-identifier?               string
|         |         |         | +--:(duid-ll)
|         |         |         | | +--ro duid-ll-hardware-type?            uint16
|         |         |         | | +--ro duid-ll-link-layer-addr?          yang:mac-
address
|         |         |         | +--:(duid-uuid)
|         |         |         | | +--ro uuid?                             yang:uuid
|         |         |         | +--:(duid-unknown)
|         |         |         | +--ro data?                               binary
|         |         |         | +--ro cli-ia* [iaid]
|         |         |         | | +--ro ia-type                          string
|         |         |         | | +--ro iaid                             uint32
|         |         |         | | +--ro cli-addr*                       inet:ipv6-address
|         |         |         | +--ro cli-iapd* [iaid]
|         |         |         | +--ro iaid                               uint32
|         |         |         | +--ro cli-prefix*                       inet:ipv6-prefix
|         |         |         | +--ro cli-prefix-len*                   uint8
+--ro packet-stats
  +--ro solicit-count              uint32
  +--ro request-count              uint32
  +--ro renew-count                uint32
  +--ro rebind-count               uint32
  +--ro decline-count              uint32
  +--ro release-count              uint32
  +--ro info-req-count             uint32
  +--ro advertise-count            uint32
  +--ro confirm-count              uint32

```

+-ro reply-count	uint32
+-ro reconfigure-count	uint32

```

+--ro relay-forward-count    uint32
+--ro relay-reply-count      uint32

```

notifications:

+---n notifications

+--ro dhcpv6-server-event

+--ro address-pool-running-out

```

| +--ro total-address-count    uint64
| +--ro max-address-count      uint64
| +--ro allocated-address-conut uint64
| +--ro duid
| | +--ro type-code?           uint16
| | +--ro (duid-type)?
| |   +--:(duid-llt)
| |     | +--ro duid-llt-hardware-type?  uint16
| |     | +--ro duid-llt-time?           yang:timeticks
| |     | +--ro duid-llt-link-layer-addr? yang:mac-address
| |     +--:(duid-en)
| |       | +--ro duid-en-enterprise-number? uint32
| |       | +--ro duid-en-identifier?       string
| |       +--:(duid-ll)
| |         | +--ro duid-ll-hardware-type?  uint16
| |         | +--ro duid-ll-link-layer-addr? yang:mac-address
| |         +--:(duid-uuid)
| |           | +--ro uuid?                 yang:uuid
| |           +--:(duid-unknown)
| |             +--ro data?                 binary
| +--ro serv-name?               string
| +--ro pool-name                string
+--ro pd-pool-running-out
| +--ro max-pd-space-utilization threshold
| +--ro pd-space-utilization      threshold
| +--ro duid
| | +--ro type-code?           uint16
| | +--ro (duid-type)?
| |   +--:(duid-llt)
| |     | +--ro duid-llt-hardware-type?  uint16
| |     | +--ro duid-llt-time?           yang:timeticks
| |     | +--ro duid-llt-link-layer-addr? yang:mac-address
| |     +--:(duid-en)
| |       | +--ro duid-en-enterprise-number? uint32
| |       | +--ro duid-en-identifier?       string
| |       +--:(duid-ll)
| |         | +--ro duid-ll-hardware-type?  uint16
| |         | +--ro duid-ll-link-layer-addr? yang:mac-address
| |         +--:(duid-uuid)
| |           | +--ro uuid?                 yang:uuid
| |           +--:(duid-unknown)

```



```

| |      +--ro data?                               binary
| +--ro serv-name?                                string
| +--ro pool-name                                string
+--ro invalid-client-detected
  +--ro duid
    | +--ro type-code?                             uint16
    | +--ro (duid-type)?
    |   +--:(duid-llt)
    |     | +--ro duid-llt-hardware-type?          uint16
    |     | +--ro duid-llt-time?                  yang:timeticks
    |     | +--ro duid-llt-link-layer-addr?       yang:mac-address
    |     +--:(duid-en)
    |       | +--ro duid-en-enterprise-number?    uint32
    |       | +--ro duid-en-identifier?           string
    |       +--:(duid-ll)
    |         | +--ro duid-ll-hardware-type?       uint16
    |         | +--ro duid-ll-link-layer-addr?     yang:mac-address
    |         +--:(duid-uuid)
    |           | +--ro uuid?                      yang:uuid
    |           +--:(duid-unknown)
    |             +--ro data?                      binary
  +--ro description?  string

```

Figure 1: DHCPv6 Data Model Structure

Introduction of important nodes:

- o server-config: This container contains the configuration data of a server.
- o serv-attributes: This container contains basic attributes of a DHCPv6 server such as DUID, server name and so on. Some optional functions that can be provided by the server is also included.
- o duid: Each server and client has only one DUID (DHCP Unique Identifier). The DUID here identifies a unique DHCPv6 server for clients. DUID consists of a two-octet type field and an arbitrary length (no more than 128 bytes) content field. Currently there are four defined types of DUIDs in [[RFC3315](#)] and [[RFC6355](#)] - DUID-LLT, DUID-EN, DUID-LL and DUID-UUID. DUID-Unknown represents those unconventional DUIDs.
- o lease-storage: The server can store lease data in different repositories, whether in a CSV file for smaller deployments or in a database for larger deployments.

- o operator-option-ipv6-address, operator-option-single-flag, operator-option-ipv6-prefix, operator-option-int32, operator-option-int16, operator-option-int8, operator-option-uri, operator-option-textstring, operator-option-var-data, operator-option-dns-wire: are generic option formats described in [\[RFC7227\]](#).
- o interfaces-config: A leaf list to denote which one or more interfaces the server should listen on. The default value is to listen on all the interfaces. This node is also used to set a unicast address for the server to listen with a specific interface. For example, if the server is being configured to listen on a unicast address assigned to a specific interface, the format "eth1/2001:db8::1" can be used.
- o option-sets: DHCPv6 employs various options to carry additional information and parameters in DHCP messages. This container defines all the possible options that need to be configured at the server side. The relevant RFCs that define those options include: [\[RFC3315\]](#), [\[RFC3319\]](#), [\[RFC3646\]](#), [\[RFC3898\]](#), [\[RFC4242\]](#), [\[RFC4704\]](#), [\[RFC4833\]](#), [\[RFC5908\]](#), [\[RFC5970\]](#), [\[RFC4075\]](#), [\[RFC6334\]](#), [\[RFC6784\]](#), [\[RFC7078\]](#), [\[RFC7083\]](#), [\[RFC7291\]](#), [\[RFC7598\]](#).
- o option-set: A server may allow different option sets to be configured for different conditions (i.e. different networks, clients and etc). This "option-set" list enables various sets of options being defined and configured in a single server. Different sets are distinguished by the key called "option-set-id". All the possible options discussed above are defined in the list and each option is corresponding to a container. Since all the options in the list are optional, each container in this list has a 'presence' statement to indicate whether this option (container) will be included in the current option set or not. In addition, each container also has a 'if-feature' statement to indicate whether the server supports this option (container).
- o network-ranges: This model supports a hierarchy to achieve dynamic configuration. That is to say we could configure the server at different levels through this model. The top level is a global level which is defined as the container "network-ranges". The following levels are defined as sub-containers under it. The "network-ranges" contains the parameters (e.g. option-sets) that would be allocated to all the clients served by this server
- o network-range: Under the "network-ranges" container, a "network-range" list is defined to configure the server at a network level which is also considered as the second level. Different network are identified by the key "network-range-id". This is because a

server may have different configuration parameters (e.g. option sets) for different networks.

- o address-pools: Under the "network-range" list, a container describes the DHCPv6 server's address pools for a specific network is defined. This container supports the server to be configured at a pool level.
- o address-pool: A DHCPv6 server can be configured with several address pools for a specific network. This list defines such address pools which are distinguish by the key called "pool-id".
- o rapid-commit: Setting the value to '1' represents the address/prefix pool support the Solicit-Reply message exchange. '0' means the server will simply ignore the Rapid Commit option in Solicit message.
- o client-class: If this is instantiated, the address/pd pool will only serve the clients belonging to this class.
- o max-address-count: Maximum count of addresses that can be allocated in this pool. This value may be less than count of total addresses in this pool.
- o prefix-pools: If a server supports prefix delegation function, this container under the "network-range" list will be valid to define the delegating router's prefix pools for a specific network. This container also supports the server to be configured at a pool level.
- o prefix-pool: Similar to server's address pools, a delegating router can also be configured with multiple prefix pools specified by a list called "prefix-pool".
- o max-pd-space-utilization: Maximum utilization of pd space in this pool
- o host-reservations: This container allows the server to make reservations at host level.
- o host-reservation: This list allows the server to reserve addresses, prefixes, hostname and options for different clients. A server may reserve multiple addresses and prefixes for a single client.
- o relay-opaque-paras: This container contains some opaque values in Relay Agent options that need to be configured on the server side

only for value match. Such Relay Agent options include Interface-Id option, Remote-Id option and Subscriber-Id option.

- o rsoo-enabled-options: [RFC6422] requires that the server SHOULD have an administrator-configurable list of RS00-enabled options. This container include a list called "rsoo-enabled-option" to allow new RS00-enabled options to be defined at the server side.
- o server-state: This container includes the state data of a server.
- o binding-info: A list records a static binding information for each DHCPv6 client that has already been assigned IPv6 addresses/ prefixes that are dynamically allocated and reserved in advance.
- o packet-stats: A container presents the packet statistics related to the DHCPv6 server.

Information about notifications:

- o address/pd-pool-running-out: raised when the address/prefix pool is going to run out. A threshold for utilization ratio of the pool (max-address-count/max-pd-space utilization) has been defined in the server feature so that it will notify the administrator when the utilization ratio reaches the threshold, and such threshold is a settable parameter.
- o invalid-client-detected: raised when the server has found a client which can be regarded as a potential attacker. Some description could also be included.

2.2. DHCPv6 Relay Tree Diagrams

```
module: ietf-dhcpv6-relay
  +--rw relay!
    +--rw relay-config
      | +--rw relay-attributes
      | | +--rw name?          string
      | | +--rw description?   string
      | | +--rw dest-addrs*    inet:ipv6-address
      | | +--rw subscribers* [subscriber]
      | | | +--rw subscriber    uint8
      | | | +--rw subscriber-id string
      | | +--rw remote-host* [ent-num]
      | | | +--rw ent-num       uint32
      | | | +--rw remote-id     string
      | | +--rw vendor-info
      | | | +--rw ent-num       uint32
      | | | +--rw data*         string
```



```

| +--rw rsoo-option-sets
| | +--rw option-set* [option-set-id]
| |   +--rw option-set-id          uint32
| |   +--rw erp-local-domain-name-option!
| |     {erp-local-domain-name-op}?
| |     +--rw erp-for-client* [cli-id]
| |       +--rw cli-id            uint32
| |       +--rw duid
| |         +--rw type-code?      uint16
| |         +--rw (duid-type)?
| |           +--:(duid-llt)
| |             +--rw duid-llt-hardware-type?  uint16
| |             +--rw duid-llt-time?          yang:timeticks
| |             +--rw duid-llt-link-layer-addr?
| |               yang:mac-address
| |           +--:(duid-en)
| |             +--rw duid-en-enterprise-number?  uint32
| |             +--rw duid-en-identifier?        string
| |           +--:(duid-ll)
| |             +--rw duid-ll-hardware-type?      uint16
| |             +--rw duid-ll-link-layer-addr?
| |               yang:mac-address
| |           +--:(duid-uuid)
| |             +--rw uuid?                      yang:uuid
| |           +--:(duid-unknown)
| |             +--rw data?                      binary
| |   +--rw erp-name      string
| +--rw relay-if* [if-name]
|   +--rw if-name          if:interface-ref
|   +--rw interface-id?    string
|   +--rw ipv6-address?    inet:ipv6-address
|   +--rw rsoo-option-set-id?
-> /relay/relay-config/rsoo-option-sets/option-set/option-set-id
|   +--rw next-entity* [dest-addr]
|     +--rw dest-addr      inet:ipv6-address
|     +--rw available      boolean
|     +--rw multicast      boolean
|     +--rw server         boolean
+--ro relay-state
+--ro relay-if* [if-name]
| +--ro if-name          string
| +--ro pd-route* [pd-route-id]
| | +--ro pd-route-id      uint8
| | +--ro requesting-router-id  uint32
| | +--ro delegating-router-id  uint32
| | +--ro next-router      inet:ipv6-address
| | +--ro last-router      inet:ipv6-address
| +--ro next-entity* [dest-addr]

```



```

|   +--ro dest-addr      inet:ipv6-address
|   +--ro packet-stats
|       +--ro solicit-rvd-count      uint32
|       +--ro request-rvd-count      uint32
|       +--ro renew-rvd-count        uint32
|       +--ro rebind-rvd-count        uint32
|       +--ro decline-rvd-count      uint32
|       +--ro release-rvd-count      uint32
|       +--ro info-req-rvd-count     uint32
|       +--ro relay-for-rvd-count    uint32
|       +--ro relay-rep-rvd-count    uint32
|       +--ro packet-to-cli-count    uint32
|       +--ro adver-sent-count       uint32
|       +--ro confirm-sent-count     uint32
|       +--ro reply-sent-count       uint32
|       +--ro reconfig-sent-count    uint32
|       +--ro relay-for-sent-count    uint32
|       +--ro relay-rep-sent-count    uint32
+--ro relay-stats
    +--ro cli-packet-rvd-count      uint32
    +--ro relay-for-rvd-count       uint32
    +--ro relay-rep-rvd-count       uint32
    +--ro packet-to-cli-count       uint32
    +--ro relay-for-sent-count       uint32
    +--ro relay-rep-sent-count       uint32
    +--ro discarded-packet-count    uint32

```

notifications:

```

+--n notifications
  +--ro dhcpv6-relay-event
    +--ro topo-changed
      +--ro relay-if-name      string
      +--ro first-hop          boolean
      +--ro last-entity-addr   inet:ipv6-address

```

Introduction of important nodes:

- o relay-config: This container contains the configuration data of the relay.
- o relay-attributes: A container describes some basic attributes of the relay agent including some relay agent specific options data that need to be configured previously. Such options include Remote-Id option and Subscriber-Id option.
- o dest-addrs: Each DHCPv6 relay agent may be configured with a list of destination addresses. This node defines such a list of IPv6

addresses that may include unicast addresses, multicast addresses or other addresses.

- o `rs00-options-sets`: DHCPv6 relay agent could provide some information that would be useful to DHCPv6 client. Since relay agent cannot provide options directly to the client, [\[RFC6422\]](#) defines RS00-enabled options to propose options for the server to send to the client. This container models such RS00-enabled options.
- o `option-set`: This list under the "rs00-option-sets" container is similar to the that defined in server module. It allows the relay to implement several sets of RS00-enabled options for different interfaces. The list only include the EAP Re-authentication Protocol (ERP) Local Domain Name DHCPv6 Option defined in [\[RFC6440\]](#), since it is the only one RS00-enabled options accepted by IANA so far.
- o `relay-if`: A relay agent may have several interfaces, we should provide a way to configure and manage parameters on the interface-level. A list that describes specific interfaces and their corresponding parameters is employed to fulfil the configuration. Here we use a string called "if-name" as the key of list.
- o `relay-state`: This container contains the configuration data of the relay.
- o `pd-route`: A sub-container of "relay-if" which describes the route for delegated prefixes into the provider edge router.
- o `next-entity`: This node defines a list that is used to describe the next hop entity of this relay agent. Different entities are distinguished by their addresses.
- o `packet-stats`: A container shows packet state information of a specific data communication.
- o `relay-stats`: The "relay-stats" container records and presents the overall packet statistics of the relay agent.

Information about notifications:

- o `topo-changed`: raised when the topology of the relay agent is changed.

2.3. DHCPv6 Client Tree Diagrams

module: ietf-dhcpv6-client

```

  +--rw client!
    +--rw client-config
      | +--rw duid
      | | +--rw type-code?                uint16
      | | +--rw (duid-type)?
      | |   +--:(duid-llt)
      | |   | +--rw duid-llt-hardware-type?    uint16
      | |   | +--rw duid-llt-time?            yang:timeticks
      | |   | +--rw duid-llt-link-layer-addr?  yang:mac-address
      | |   +--:(duid-en)
      | |   | +--rw duid-en-enterprise-number? uint32
      | |   | +--rw duid-en-identifier?        string
      | |   +--:(duid-ll)
      | |   | +--rw duid-ll-hardware-type?     uint16
      | |   | +--rw duid-ll-link-layer-addr?   yang:mac-address
      | |   +--:(duid-uuid)
      | |   | +--rw uuid?                      yang:uuid
      | |   +--:(duid-unknown)
      | |   +--rw data?                        binary
      +--rw client-if* [if-name]
      | +--rw if-name                      if:interface-ref
      | +--rw cli-id                       uint32
      | +--rw pd-function                   boolean
      | +--rw rapid-commit                  boolean
      +--rw client-configured-options
      | +--rw new-or-standard-cli-option* [option-code]
      | | +--rw option-code                uint16
      | | +--rw option-name                 string
      | | +--rw option-description          string
      | | +--rw option-reference?           string
      | | +--rw option-value                string
      +--rw option-request-option! {option-request-op}?
      | +--rw oro-option* [option-code]
      | | +--rw option-code                uint16
      | | +--rw description                 string
      +--rw user-class-option! {user-class-op}?
      | +--rw user-class* [user-class-id]
      | | +--rw user-class-id              uint8
      | | +--rw user-class-data             string
      +--rw vendor-class-option! {vendor-class-op}?
      | +--rw enterprise-number             uint32
      | +--rw vendor-class* [vendor-class-id]
      | | +--rw vendor-class-id            uint8
      | | +--rw vendor-class-data           string
      +--rw client-fqdn-option! {client-fqdn-op}?

```



```

|         | +--rw fqdn                string
|         | +--rw server-initiate-update  boolean
|         | +--rw client-initiate-update  boolean
|         +--rw client-arch-type-option! {client-arch-type-op}?
|         | +--rw architecture-types* [type-id]
|         |     +--rw type-id            uint16
|         |     +--rw most-preferred      boolean
|         +--rw client-network-interface-identifier-option!
|             {client-network-interface-identifier-op}?
|         | +--rw type            uint8
|         | +--rw major            uint8
|         | +--rw minor            uint8
|         +--rw kbr-principal-name-option! {kbr-principal-name-op}?
|         | +--rw principle-name* [principle-name-id]
|         |     +--rw principle-name-id    uint8
|         |     +--rw name-type            int32
|         |     +--rw name-string          string
|         +--rw kbr-realm-name-option! {kbr-realm-name-op}?
|         | +--rw realm-name            string
|         +--rw client-link-layer-addr-option!
|             {client-link-layer-addr-op}?
|         +--rw link-layer-type        uint16
|         +--rw link-layer-addr        string
+--ro client-state
+--ro if-other-paras
| +--ro server-unicast-option! {server-unicast-op}?
| | +--ro server-address?  inet:ipv6-address
| +--ro sip-server-domain-name-list-option!
|     {sip-server-domain-name-list-op}?
| | +--ro sip-serv-domain-name    string
| +--ro sip-server-address-list-option!
|     {sip-server-address-list-op}?
| | +--ro sip-server* [sip-serv-id]
| | | +--ro sip-serv-id        uint8
| | | +--ro sip-serv-addr      inet:ipv6-address
| +--ro dns-servers-option! {dns-servers-op}?
| | +--ro dns-server* [dns-serv-id]
| | | +--ro dns-serv-id        uint8
| | | +--ro dns-serv-addr      inet:ipv6-address
| +--ro domain-searchlist-option! {domain-searchlist-op}?
| | +--ro domain-searchlist* [domain-searchlist-id]
| | | +--ro domain-searchlist-id    uint8
| | | +--ro domain-search-list-entry  string
| +--ro nis-config-option! {nis-config-op}?
| | +--ro nis-server* [nis-serv-id]
| | | +--ro nis-serv-id        uint8
| | | +--ro nis-serv-addr      inet:ipv6-address
| +--ro nis-plus-config-option! {nis-plus-config-op}?

```



```

| | +--ro nis-plus-server* [nis-plus-serv-id]
| |   +--ro nis-plus-serv-id      uint8
| |   +--ro nis-plus-serv-addr    inet:ipv6-address
| +--ro nis-domain-name-option! {nis-domain-name-op}?
| |   +--ro nis-domain-name?     string
| +--ro nis-plus-domain-name-option! {nis-plus-domain-name-op}?
| |   +--ro nis-plus-domain-name? string
| +--ro sntp-server-option! {sntp-server-op}?
| |   +--ro sntp-server* [sntp-serv-id]
| |     +--ro sntp-serv-id      uint8
| |     +--ro sntp-serv-addr    inet:ipv6-address
| +--ro info-refresh-time-option! {info-refresh-time-op}?
| |   +--ro info-refresh-time    yang:timeticks
| +--ro client-fqdn-option! {client-fqdn-op}?
| |   +--ro server-initiate-update boolean
| |   +--ro client-initiate-update boolean
| |   +--ro modify-name-from-cli  boolean
| +--ro posix-timezone-option! {posix-timezone-op}?
| |   +--ro tz-posix            string
| +--ro tzdb-timezone-option! {tzdb-timezone-op}?
| |   +--ro tz-database          string
| +--ro ntp-server-option! {ntp-server-op}?
| |   +--ro ntp-server* [ntp-serv-id]
| |     +--ro ntp-serv-id          uint8
| |     +--ro (ntp-time-source-suboption)?
| |       +--:(server-address)
| |         +--ro ntp-serv-addr-suboption* inet:ipv6-address
| |         +--:(server-multicast-address)
| |         +--ro ntp-serv-mul-addr-suboption*
| |           inet:ipv6-address
| |       +--:(server-fqdn)
| |         +--ro ntp-serv-fqdn-suboption* string
| +--ro boot-file-url-option! {boot-file-url-op}?
| |   +--ro boot-file* [boot-file-id]
| |     +--ro boot-file-id      uint8
| |     +--ro suitable-arch-type* uint16
| |     +--ro suitable-net-if*   uint32
| |     +--ro boot-file-url      string
| +--ro boot-file-param-option! {boot-file-param-op}?
| |   +--ro boot-file-paras* [para-id]
| |     +--ro para-id          uint8
| |     +--ro parameter        string
| +--ro aftr-name-option! {aftr-name-op}?
| |   +--ro tunnel-endpoint-name string
| +--ro kbr-default-name-option! {kbr-default-name-op}?
| |   +--ro default-realm-name  string
| +--ro kbr-kdc-option! {kbr-kdc-op}?
| |   +--ro kdc-info* [kdc-id]

```



```

| |      +--ro kdc-id          uint8
| |      +--ro priority        uint16
| |      +--ro weight          uint16
| |      +--ro transport-type  uint8
| |      +--ro port-number     uint16
| |      +--ro kdc-ipv6-addr   inet:ipv6-address
| |      +--ro realm-name      string
| +--ro sol-max-rt-option! {sol-max-rt-op}?
| |   +--ro sol-max-rt-value   yang:timeticks
| +--ro inf-max-rt-option! {inf-max-rt-op}?
| |   +--ro inf-max-rt-value   yang:timeticks
| +--ro addr-selection-option! {addr-selection-op}?
| |   +--ro a-bit-set          boolean
| |   +--ro p-bit-set          boolean
| |   +--ro policy-table* [policy-id]
| |       +--ro policy-id      uint8
| |       +--ro label          uint8
| |       +--ro precedence     uint8
| |       +--ro prefix-len     uint8
| |       +--ro prefix         inet:ipv6-prefix
| +--ro pcg-server-option! {pcg-server-op}?
| |   +--ro pcg-server* [pcg-serv-id]
| |       +--ro pcg-serv-id     uint8
| |       +--ro pcg-serv-addr   inet:ipv6-address
| +--ro s46-rule-option! {s46-rule-op}?
| |   +--ro s46-rule* [rule-id]
| |       +--ro rule-id        uint8
| |       +--ro rule-type      enumeration
| |       +--ro prefix4-len    uint8
| |       +--ro ipv4-prefix     inet:ipv4-prefix
| |       +--ro prefix6-len    uint8
| |       +--ro ipv6-prefix     inet:ipv6-prefix
| |       +--ro port-parameter
| |           +--ro offset      uint8
| |           +--ro psid-len    uint8
| |           +--ro psid        uint16
| +--ro s46-br-option! {s46-br-op}?
| |   +--ro br* [br-id]
| |       +--ro br-id          uint8
| |       +--ro br-ipv6-addr   inet:ipv6-address
| +--ro s46-dmr-option! {s46-dmr-op}?
| |   +--ro dmr* [dmr-id]
| |       +--ro dmr-id         uint8
| |       +--ro dmr-prefix-len uint8
| |       +--ro dmr-ipv6-prefix inet:ipv6-prefix
| +--ro s46-v4-v6-binding-option! {s46-v4-v6-binding-op}?
| |   +--ro ce* [ce-id]
| |       +--ro ce-id          uint8

```



```

|         +--ro ipv4-addr          inet:ipv4-address
|         +--ro bind-prefix6-len   uint8
|         +--ro bind-ipv6-prefix   inet:ipv6-prefix
|         +--ro port-parameter
|             +--ro offset          uint8
|             +--ro psid-len        uint8
|             +--ro psid            uint16
+--ro packet-stats
    +--ro solicit-count             uint32
    +--ro request-count             uint32
    +--ro renew-count               uint32
    +--ro rebind-count              uint32
    +--ro decline-count             uint32
    +--ro release-count             uint32
    +--ro info-req-count            uint32
    +--ro advertise-count           uint32
    +--ro confirm-count             uint32
    +--ro reply-count               uint32
    +--ro reconfigure-count         uint32

```

notifications:

```

+---n notifications
  +--ro dhcpv6-client-event
    +--ro ia-lease-event
      | +--ro event-type      enumeration
      | +--ro duid
      | | +--ro type-code?      uint16
      | | +--ro (duid-type)?
      | |   +--:(duid-llt)
      | |     | +--ro duid-llt-hardware-type?  uint16
      | |     | +--ro duid-llt-time?           yang:timeticks
      | |     | +--ro duid-llt-link-layer-addr? yang:mac-address
      | |     +--:(duid-en)
      | |       | +--ro duid-en-enterprise-number? uint32
      | |       | +--ro duid-en-identifier?        string
      | |       +--:(duid-ll)
      | |         | +--ro duid-ll-hardware-type?  uint16
      | |         | +--ro duid-ll-link-layer-addr? yang:mac-address
      | |         +--:(duid-uuid)
      | |           | +--ro uuid?                 yang:uuid
      | |           +--:(duid-unknown)
      | |             +--ro data?                  binary
      | +--ro ia-id            uint32
      | +--ro serv-name?       string
      | +--ro description?     string
    +--ro invalid-ia-detected
      | +--ro duid
      | | +--ro type-code?      uint16

```



```

| | +--ro (duid-type)?
| |   +--:(duid-llt)
| |     | +--ro duid-llt-hardware-type?      uint16
| |     | +--ro duid-llt-time?                yang:timeticks
| |     | +--ro duid-llt-link-layer-addr?     yang:mac-address
| |   +--:(duid-en)
| |     | +--ro duid-en-enterprise-number?    uint32
| |     | +--ro duid-en-identifier?           string
| |   +--:(duid-ll)
| |     | +--ro duid-ll-hardware-type?        uint16
| |     | +--ro duid-ll-link-layer-addr?      yang:mac-address
| |   +--:(duid-uuid)
| |     | +--ro uuid?                          yang:uuid
| |   +--:(duid-unknown)
| |     +--ro data?                            binary
| +--ro cli-duid      uint32
| +--ro iaid          uint32
| +--ro serv-name?    string
| +--ro description?  string
+--ro retransmission-failed
| +--ro duid
| | +--ro type-code?                uint16
| | +--ro (duid-type)?
| |   +--:(duid-llt)
| |     | +--ro duid-llt-hardware-type?      uint16
| |     | +--ro duid-llt-time?                yang:timeticks
| |     | +--ro duid-llt-link-layer-addr?     yang:mac-address
| |   +--:(duid-en)
| |     | +--ro duid-en-enterprise-number?    uint32
| |     | +--ro duid-en-identifier?           string
| |   +--:(duid-ll)
| |     | +--ro duid-ll-hardware-type?        uint16
| |     | +--ro duid-ll-link-layer-addr?      yang:mac-address
| |   +--:(duid-uuid)
| |     | +--ro uuid?                          yang:uuid
| |   +--:(duid-unknown)
| |     +--ro data?                            binary
| +--ro description    enumeration
+--ro failed-status-turn-up
  +--ro duid
  | +--ro type-code?                uint16
  | +--ro (duid-type)?
  |   +--:(duid-llt)
  |     | +--ro duid-llt-hardware-type?      uint16
  |     | +--ro duid-llt-time?                yang:timeticks
  |     | +--ro duid-llt-link-layer-addr?     yang:mac-address
  |   +--:(duid-en)
  |     | +--ro duid-en-enterprise-number?    uint32

```



```

|      | +--ro duid-en-identifier?      string
|      +---:(duid-ll)
|      | +--ro duid-ll-hardware-type?   uint16
|      | +--ro duid-ll-link-layer-addr? yang:mac-address
|      +---:(duid-uuid)
|      | +--ro uuid?                    yang:uuid
|      +---:(duid-unknown)
|      +--ro data?                      binary
+--ro status-code      enumeration

```

Introduction of important nodes:

- o client-config: This container includes the configuration data of the client.
- o duid: Each server and client has only one DUID (DHCP Unique Identifier). The DUID here will be carried in the Client ID option to identify a specific DHCPv6 client. This leaf are same as the "duid" leaf in "dhcpv6-server" feature.
- o client-if: A client may have several interfaces, it is more reasonable to configure and manage parameters on the interface-level. The list defines a specific client interface and its data. Different interfaces are distinguished by the "ifName" key which is a configurable string value.
- o pd-function: Whether the client can act as a requesting router to request prefixes using prefix delegation ([\[RFC3633\]](#)).
- o rapid-commit: '1' indicates a client can initiate a Solicit-Reply message exchange by adding a Rapid Commit option in Solicit message. '0' means the client is not allowed to add a Rapid Commit option to request addresses in a two-message exchange pattern.
- o client-configured-options: Similar to the server, the client also need to configure some options to fulfil some desired functions. This container include all the potential options that need to be configured at the client side. The relevant RFCs that define those options include: [\[RFC3315\]](#), [\[RFC4704\]](#), [\[RFC5970\]](#), [\[RFC6784\]](#), [\[RFC6939\]](#).
- o option-request-option: This container provide a way to configure the list of options that the client will request in its ORO option.
- o client-state: This container includes the state data of the client.

- o if-other-paras: A client can obtain extra configuration data other than address and prefix information through DHCPv6 options. This container describes such data the client was configured through DHCPv6. The potential configuration data may include DNS server parameters, SIP server parameters and etc.
- o packet-stats: A container records all the packet status information of a specific interface.

Information about notifications:

- o ia-lease-event: raised when the client was allocated a new IA from the server or it renew/rebind/release its current IA.
- o invalid-ia-detected: raised when the identity association of the client can be proved to be invalid. Possible condition includes duplicated address, illegal address, etc.
- o retransmission-failed: raised when the retransmission mechanism defined in [[RFC3315](#)] is failed.
- o failed-status-turn-up: raised when the client receives a message includes an unsuccessful Status Code option.

3. DHCPv6 YANG Model

3.1. DHCPv6 Server YANG Model

This module imports typedefs from [[RFC6991](#)], [[RFC7223](#)].

```
<CODE BEGINS> file "ietf-dhcpv6-server.yang"
module ietf-dhcpv6-server {
    yang-version 1.1;
    namespace "urn:ietf:params:xml:ns:yang:ietf-dhcpv6-server";
    prefix "dhcpv6-server";

    import ietf-inet-types {
        prefix inet;
    }

    import ietf-yang-types {
        prefix yang;
    }
    import ietf-dhcpv6-options {
        prefix dhcpv6-options;
    }
    import ietf-dhcpv6-types {
        prefix dhcpv6-types;
    }
}
```



```
import ietf-interfaces {
    prefix if;
}

organization "DHC WG";
contact
    "cuiyong@tsinghua.edu.cn
    lh.sunlinh@gmail.com
    ian.farrer@telekom.de
    sladjana.zechlin@telekom.de
    hezihao9512@gmail.com";

description "This model defines a YANG data model that can be
used to configure and manage a DHCPv6 server.";

revision 2018-09-04 {
    description "";
    reference "I-D: draft-ietf-dhc-dhcpv6-yang";
}

revision 2018-03-04 {
    description "Resolved most issues on the DHC official
github";
    reference "I-D: draft-ietf-dhc-dhcpv6-yang";
}

revision 2017-12-22 {
    description "Resolve most issues on Ian's github.";
    reference "I-D: draft-ietf-dhc-dhcpv6-yang";
}

revision 2017-11-24 {
    description "First version of the separated server specific
    YANG model.";
    reference "I-D: draft-ietf-dhc-dhcpv6-yang";
}

/*
 * Typedef
 */
typedef threshold {
    type union {
        type uint16 {
            range 0..100;
        }
        type enumeration {
            enum "disabled" {
                description "No threshold";
            }
        }
    }
}
```



```

    }
  }
  description "Threshold value in percent";
}

/*
 * Data Nodes
 */
container server {
    presence "Enables the server";
    description "DHCPv6 server portion";

/*
 * Configuration data
 */
container server-config {
    description "This container contains the configuration data
        of a server.";
    container serv-attributes {
        description
            "This container contains basic attributes of a DHCPv6
server
            such as IPv6 address, server name and so on. Some
optional
            functions that can be provided by the server is also
included.";
        container duid {
            description "Sets the DUID of server";
            uses dhcpv6-types:duid;
        }
        leaf name {
            type string;
            description "server's name";
        }
        leaf description {
            type string;
            description "description of the server.";
        }
        leaf-list ipv6-address {
            type inet:ipv6-address;
            description "server's IPv6 address.";
        }
        leaf-list interfaces-config {
            // Note - this should probably be references to
            // entries in the ietf-interfaces model
            type if:interface-ref;
            description "A leaf list to denote which one or more interfaces

```

listen
unicast
interface.

the server should listen on. The default value is to
on all the interfaces. This node is also used to set a
address for the server to listen with a specific

For example, if people want the server to listen on a unicast address with a specific interface, he can use the format like 'eth1/2001:db8::1'.
 'eth1/2001:db8::1'.
 }

```

    container lease-storage {
        description "Indicates how the server
stores the lease";

        choice storage-type {
            description "the type of lease
storage";

            // leaf persist {
            //         type boolean;
            //         mandatory true;
            //         description
"controls whether the new leases and updates to existing leases are
file";
            //         written to the
            // }
            case memfile {
                description "the server
stores lease information in a CSV file";

                leaf memfile-name {
                    type string;
                    description
"specifies an absolute location of the lease file in which new leases
and lease
updates will be recorded";
                }

                leaf memfile-lfc-
interval {
                    type uint64;
                    description
"specifies the interval in seconds, at which the server will perform a
cleanup (LFC)";
                }
            }
        }
        case mysql {
            leaf mysql-name {
                type string;
                description
"type of the database";
            }
            leaf mysql-host {
                type string;

```

```

description "If
the database is located
on a different
system to the DHCPv6 server, the database host name must also be specified.";
}
leaf mysql-password {
    type string;
    description
"the credentials of the account under which the server will access the
database";
}
leaf mysql-port {
    type uint8;
    description "If
the database is located on a different system, the port number may be
specified";
}

```

```
leaf mysql-lfc-interval
{
    type uint64;
    description
"specifies the interval in seconds, at which the server will perform a
cleanup (LFC)";
}
leaf mysql-connect-
timeout {
    type uint64;
    description "If
the database is located on a different system, a longer interval needs to be
specified";
}
}
case postgresql {
    leaf postgresql-name {
        type string;
        description
"type of the database";
    }
    leaf postgresql-host {
        type string;
        description "If
the database is located
on a different
system to the DHCPv6 server, the database host name must also be specified.";
    }
    leaf postgresql-
password {
        type string;
        description
"the credentials of the account under which the server will access the
database";
    }
    leaf postgresql-port {
        type uint8;
        description "If
the database is located on a different system, the port number may be
specified";
    }
    leaf postgresql-lfc-
interval {
        type uint64;
        description
"specifies the interval in seconds, at which the server will perform a
```

```

cleanup (LFC)";

                                                                    lease file
                                                                    }
                                                                    leaf postgresql-
connect-timeout {
                                                                    type uint64;
                                                                    description "If
the database is located on a different system, a longer interval needs to be
specified";
                                                                    }
                                                                    }
                                                                    case cassandra {
                                                                    leaf cassandra-name {
                                                                    type string;
                                                                    description
"type of the database";
                                                                    }
                                                                    leaf cassandra-contact-
points {
                                                                    type string;
                                                                    description
"Cassandra takes a list of comma separated IP addresses to contact the
cluster";
                                                                    }
                                                                    }

```

```

    leaf cassandra-password
    {
        type string;
        description
        "the credentials of the account under which the server will access the
        database";
    }
    leaf cassandra-lfc-
interval {
        type uint64;
        description
        "specifies the interval in seconds, at which the server will perform a
        lease file
        cleanup (LFC)";
    }
    leaf cassandra-connect-
timeout {
        type uint64;
        description "If
        the database is located on a different system, a longer interval needs to be
        specified";
    }
}
}
}
    uses dhcpv6-types:vendor-infor;
}

    container option-sets {
        description "DHCPv6 employs various options to carry additional
        information and parameters in DHCP messages. This container defines
        all the possible options that need to be configured at the server
        side. ";
        list option-set {
            key option-set-id;
            description "A server may allow different option sets
            to be
            configured for different conditions (i.e. different networks,
            clients and etc). This 'option-set' list enables various sets
            of
            options being defined and configured in a single server.
            Different
            sets are distinguished by the key called 'option-set-id'. All
            the
            possible options discussed above are defined in the list and
            each
            option is corresponding to a container. Since all the options
            in

```

the list are optional, each container in this list has a
 'presence'
 statement to indicate whether this option (container) will be
 included in the current option set or not. In addition, each
 container
 also has a 'if-feature' statement to indicate whether the
 server
 supports this option (container).";
 leaf option-set-id {
 type uint32;
 description "option set id";
 }
 uses dhcpv6-options:server-option-definitions;
 uses dhcpv6-options:custom-option-definitions;
 }
 }
 container network-ranges {

description "This model supports a hierarchy to achieve dynamic configuration. That is to say we could configure the server at different levels through this model. The top level is a global level which is defined as the container 'network-ranges'. The following levels are defined as sub-containers under it. The 'network-ranges' contains the parameters (e.g. option-sets) that would be allocated to all the clients served by this server.";

```
leaf option-set-id {
  type leafref {
    path "/server/server-config/option-sets/option-set/option-set-id";
  }
  description
    "The ID field of relevant global option-set to be provisioned
    to clients.";
```

```
}
```

list network-range {

```
  key network-range-id;
  description
    "Under the 'network-ranges' container, a 'network-range' list
    is defined to configure the server at a network level which is
    also considered as the second level. Different network are
    identified by the key 'network-range-id'. This is because a server may have
    different configuration parameters (e.g. option sets) for different
    networks.";
```

```
  leaf network-range-id {
    type uint32;
    mandatory true;
    description "equivalent to subnet id";
  }
  leaf network-description {
    type string;
    mandatory true;
    description "description of the subnet";
  }
  leaf network-prefix {
    type inet:ipv6-prefix;
    mandatory true;
    description "subnet prefix";
```

```

    }
    leaf option-set-id {
type leafref {
    path "/server/server-config/option-sets/option-set/option-set-
id";
}
description "The ID field of relevant option-set to be provisioned
to
clients of this network-range.";
    }

    container address-pools {

```

```
description
"A container that describes the DHCPv6 server's
address pools.";
list address-pool {
    key pool-id;
    description "A DHCPv6 server can be configured with
several address pools. This list defines such address pools
which are distinguished by the key called 'pool-id'.";
    leaf pool-id {
        type uint32;
        mandatory true;
        description "pool id";
    }
    leaf pool-prefix {
        type inet:ipv6-prefix;
        mandatory true;
        description "pool prefix";
    }
    leaf start-address {
        type inet:ipv6-address-no-zone;
        mandatory true;
        description "start address";
    }
    leaf end-address {
        type inet:ipv6-address-no-zone;
        mandatory true;
        description "end address";
    }
}
leaf valid-lifetime {
    type yang:timeticks;
    mandatory true;
    description "valid lifetime for IA";
}
leaf renew-time {
    type yang:timeticks;
    mandatory true;
    description "renew time";
}
leaf rebind-time {
    type yang:timeticks;
    mandatory true;
    description "rebind time";
}
leaf preferred-lifetime {
    type yang:timeticks;
    mandatory true;
    description "preferred lifetime for IA";
}
```



```
leaf rapid-commit {
    type boolean;
    mandatory true;
    description "A boolean value specifies
whether the pool
involving two messages.";
}

leaf client-class {
    type string;
    description
    "If this leaf is specified, this pool will only serve
the clients belonging to this class.";
}

leaf max-address-count {
    type threshold;
    mandatory true;
    description "maximum count of addresses that can
                be allocated in this pool. This value may be
                less than count of total addresses.";
}

leaf option-set-id {
    type leafref {
        path "/server/server-config/option-sets/option-set/
option-set-id";
    }
    mandatory true;
    description "The ID field of relevant option-set to be
                provisioned to clients of this address-pool.";
}

container pd-pools {
    description "If a server supports prefix delegation function, this
                container will be used to define the delegating router's
prefix
                pools.";
    list pd-pool {
        key pool-id;
        description "Similar to server's address pools, a delegating
                router can also be configured with multiple prefix
pools
                specified by a list called 'prefix-pool'.";
        leaf pool-id {
            type uint32;
            mandatory true;
            description "pool id";
        }
    }
}
```

```
}  
leaf prefix {  
    type inet:ipv6-prefix;  
    mandatory true;  
    description "ipv6 prefix";  
}
```

```

    }
    leaf prefix-length {
        type uint8;
        mandatory true;
        description "prefix length";
    }
    leaf valid-lifetime {
        type yang:timeticks;
        mandatory true;
        description "valid lifetime for IA";
    }
    leaf renew-time {
        type yang:timeticks;
        mandatory true;
        description "renew time";
    }
    leaf rebind-time {
        type yang:timeticks;
        mandatory true;
        description "rebind time";
    }
    leaf preferred-lifetime {
        type yang:timeticks;
        mandatory true;
        description "preferred lifetime for IA";
    }
    leaf rapid-commit {
        type boolean;
        mandatory true;
        description "A boolean value specifies
whether the server
involving two messages defined.";
support client-server exchanges
    }
    leaf client-class {
        type string;
        description "client class";
    }
    leaf max-pd-space-utilization {
        type threshold;
        mandatory true;
        description "Maximum utilization of pd space in this pool";
    }
    leaf option-set-id {
        type leafref {
            path "/server/server-config/option-sets/option-
set/option-set-id";
        }
    }

```

```
mandatory true;  
description "The ID field of relevant option-set to be  
provisioned to clients of this prefix-pool.";
```

Cui, et al.

Expires March 8, 2019

[Page 36]

```
    }
  }
}

container host-reservations {
  description
    "This container allows the server to make reservations at host
level.";
  list host-reservation {
    key cli-id;
    description "This list allows the server to reserve addresses,
prefixes, hostname and options for different clients.";
    leaf cli-id {
      type uint32;
      mandatory true;
      description "client id";
    }

    choice client-identifier {
      description "When making reservations, the server needs to
choose a
'hardware
address' are supported.";
      case duid {
        description "DUID";
        uses dhcpv6-types:duid;
      }
      case hw-address {
        description "hardware address";
        leaf hardware-address {
          type yang:mac-address;
          description "MAC address of client";
        }
      }
    }
  }

  leaf-list reserv-addr {
    type inet:ipv6-address;
    description "reserved addr";
  }

  list prefix-reservation {
    key reserv-prefix-id;
    description "reserved prefix reservation";
    leaf reserv-prefix-id {
      type uint32;
      mandatory true;
    }
  }
}
```

```
        description "reserved prefix id";  
    }  
    leaf reserv-prefix {
```

```
        type inet:ipv6-prefix;
        mandatory true;
        description "reserved prefix";
    }
    leaf reserv-prefix-len {
        type uint8;
        mandatory true;
        description "reserved prefix length";
    }
}

leaf hostname {
    type string;
    description "reserved hostname";
}

leaf option-set-id {
    type leafref {
        path "/server/server-config/option-sets/option-set/option-
set-id";
    }
    description "The ID field of relevant option-set to be
provisioned
        in the host reservation.";
}
}
}

}

}

    }

    container relay-opaque-paras {
        description "This container contains some opaque values in Relay Agent
value
            options that need to be configured on the server side only for

            match. Such Relay Agent options include Interface-Id option,
            Remote-Id option and Subscriber-Id option.";
        list relays {
            key relay-name;
            description "relay agents";
            leaf relay-name {
                type string;
                mandatory true;
                description "relay agent name";
            }

            list interface-info {
                key if-name;
                description "interface info";
            }
        }
    }
}
```

```
leaf if-name {  
    type string;  
    mandatory true;
```

```
        description "interface name";
    }
    leaf interface-id {
        type string;
        mandatory true;
        description "interface id";
    }
}
list subscribers {
    key subscriber;
    description "subscribers";
    leaf subscriber {
        type uint32;
        mandatory true;
        description "subscriber";
    }
    leaf subscriber-id {
        type string;
        mandatory true;
        description "subscriber id";
    }
}
list remote-host {
    key ent-num;
    description "remote host";
    leaf ent-num {
        type uint32;
        mandatory true;
        description "enterprise number";
    }
    leaf remote-id {
        type string;
        mandatory true;
        description "remote id";
    }
}
}

container rsoo-enabled-options {
    description "rsoo enabled options";
    list rsoo-enabled-option {
        key option-code;
        description "rsoo enabled option";
        leaf option-code {
            type uint16;
            mandatory true;
            description "option code";
        }
    }
}
```



```

    }
    leaf description {
      type string;
      mandatory true;
      description "description of the option";
    }
  }
}

}

/*
 * State data
 */
container server-state {
  config "false";
  description "states of server";
  container network-ranges {
    description "This model supports a hierarchy to achieve dynamic
configuration.

```

That is to say we could configure the server at different levels through this model. The top level is a global level which is defined as the container 'network-ranges'. The following levels are defined as sub-containers under it.

The 'network-ranges' contains the parameters (e.g. option-sets) that would be allocated to all the clients served by this server.;

```

list network-range {
  key network-range-id;
  description "The ID field of relevant option-set to be
provisioned

```

```

    to clients of this network-range.";
    leaf network-range-id {
      type uint32;
      mandatory true;
      description "equivalent to subnet id";
    }
  }
  container address-pools {
    description "A container that describes the DHCPv6
server's address pools";
    list address-pool {
      key pool-id;
      description "A DHCPv6 server can be configured
with
address pools
several address pools. This list defines such

```

which are distinguished by the key called

```
'pool-id'.");
```

```
leaf pool-id {  
    type uint32;  
    mandatory true;  
    description "pool id";  
}  
  
leaf total-address-count {  
    type uint64;  
    mandatory true;
```

```

        description "count of total
addresses in the pool";
    }
    leaf allocated-address-conut {
        type uint64;
        mandatory true;
        description "count of allocated
addresses in the pool";
    }
}
list binding-info {
    key cli-id;
    description "A list that records a binding
information for each DHCPv6
IPv6 addresses.";
    leaf cli-id {
        type uint32;
        mandatory true;
        description "client id";
    }
    container duid {
        description "Read the DUID";
        uses dhcpv6-types:duid;
    }
    list cli-ia {
        key ia-id;
        description "client IA";
        leaf ia-type {
            type string;
            mandatory true;
            description "IA type";
        }
        leaf ia-id {
            type uint32;
            mandatory true;
            description "IAID";
        }
        leaf-list cli-addr {
            type inet:ipv6-address;
            description "client addr";
        }
        leaf pool-id {
            type uint32;
            mandatory true;
            description "pool id";
        }
    }
}
```

```
    }  
  }  
  container pd-pools {  
    description "If a server supports prefix  
delegation function,
```

Cui, et al.

Expires March 8, 2019

[Page 41]

```

        this container will be used to define
the delegating
        router's prefix pools.";
        list prefix-pool {
key pool-id;
description "Similar to server's address pools, a delegating
        router can also be configured with multiple prefix
pools
        specified by a list called 'prefix-pool'.";
leaf pool-id {
    type uint32;
    mandatory true;
    description "pool id";
}
leaf pd-space-utilization {
    type threshold;
    mandatory true;
    description "current PD space utilization";
}
        }
        list binding-info {
            key cli-id;
            description "A list records a binding
information for each DHCPv6
            client that has already been
            allocated IPv6 prefixes.";
            leaf cli-id {
                type uint32;
                mandatory true;
                description "client
id";
            }
            container duid {
                description "Reads the
                DUID";
                uses dhcpv6-types:duid;
            }
            list cli-iapd {
                key iaaid;
                description "client
                IAPD";
                leaf iaaid {
                    type uint32;
                    mandatory true;
                    description
                    "IAID";
                }
            }
            leaf-list cli-prefix {

```

prefix;		type inet:ipv6-
"client ipv6 prefix";		description
		}
len {		leaf-list cli-prefix-
		type uint8;
"client prefix length";		description
		}
		leaf pool-id {

```

    type uint32;
    mandatory true;
    description
"pool id";
    }
}

    container host-reservations {
    description "This container provides host reservations in the host
level.";
        list binding-info {
        key cli-id;
        description
        "A list records a binding information
        client that has already been allocated
        by host reservations.";
        leaf cli-id {
            type uint32;
            mandatory true;
            description "client id";
        }
        container duid {
            description "Reads the DUID";
            uses dhcpv6-types:duid;
        }
        list cli-ia {
        key ia-id;
        description "client IA";
        leaf ia-type {
            type string;
            mandatory true;
            description "IA type, IA_NA or
IA_TA";
        }
        leaf ia-id {
            type uint32;
            mandatory true;
            description "IAID";
        }
        leaf-list cli-addr {
            type inet:ipv6-address;
            description "client addr";
        }
    }
}

```

```
list cli-iapd {  
    key iaid;  
    description "client IAPD";  
    leaf iaid {
```

```

        type uint32;
        mandatory true;
        description "IAID";
    }
    leaf-list cli-prefix {
        type inet:ipv6-prefix;
        description "client
ipv6 prefix";
    }
    leaf-list cli-prefix-len {
        type uint8;
        description "client
prefix length";
    }
}

}

}

}

}

container packet-stats {
    description "A container presents the packet statistics related
to
        the DHCPv6 server.";
    leaf solicit-count {
        type uint32;
        mandatory true;
        description "solicit counter";
    }
    leaf request-count {
        type uint32;
        mandatory true;
        description "request counter";
    }
    leaf renew-count {
        type uint32;
        mandatory true;
        description "renew counter";
    }
    leaf rebind-count {
        type uint32;
        mandatory true;
        description "rebind counter";
    }
    leaf decline-count {
        type uint32;
        mandatory true;
    }
}

```

```
description "decline count";  
}  
leaf release-count {
```

```
        type uint32;
        mandatory true;
        description "release counter";
    }
    leaf info-req-count {
        type uint32;
        mandatory true;
        description "information request counter";
    }
    leaf advertise-count {
        type uint32;
        mandatory true;
        description "advertise counter";
    }
    leaf confirm-count {
        type uint32;
        mandatory true;
        description "confirm counter";
    }
    leaf reply-count {
        type uint32;
        mandatory true;
        description "reply counter";
    }
    leaf reconfigure-count {
        type uint32;
        mandatory true;
        description "reconfigure
counter";
    }
    leaf relay-forward-count {
        type uint32;
        mandatory true;
        description "relay forward counter";
    }
    leaf relay-reply-count {
        type uint32;
        mandatory true;
        description "relay reply counter";
    }
}
}
}

/*
 * Notifications
 */
```

notification notifications {

Cui, et al.

Expires March 8, 2019

[Page 45]

```
    description "dhcpv6 server notification module";
container dhcpv6-server-event {
  description "dhcpv6 server event";
  container address-pool-running-out {
    description "raised when the address pool is going to
      run out. A threshold for utilization ratio of the pool has
      been defined in the server feature so that it will notify the
      administrator when the utilization ratio reaches the
      threshold, and such threshold is a settable parameter";
  leaf total-address-count {
    type uint64;
    mandatory true;
    description "count of total addresses in the pool";
  }
  leaf max-address-count {
    type uint64;
    mandatory true;
    description "maximum count of addresses that can be allocated
      in the pool. This value may be less than count of total
      addresses";
  }
  leaf allocated-address-count {
    type uint64;
    mandatory true;
    description "count of allocated addresses in the pool";
  }
  container duid {
    description "server duid";
    uses dhcpv6-types:duid;
  }
  leaf serv-name {
    type string;
    description "server name";
  }
  leaf pool-name {
    type string;
    mandatory true;
    description "pool name";
  }
  container pd-pool-running-out {
    description "raised when the address/prefix pool is going to
      run out. A threshold for utilization ratio of the pool has
      been defined in the server feature so that it will notify the
      administrator when the utilization ratio reaches the
      threshold, and such threshold is a settable parameter";
    leaf max-pd-space-utilization {
      type threshold;
    }
  }
}
```



```

        mandatory true;
        description "maximum pd space utilization";
    }
    leaf pd-space-utilization {
        type threshold;
        mandatory true;
        description "current pd space utilization";
    }
    container duid {
        description "Sets the DUID";
        uses dhcpv6-types:duid;
    }
    leaf serv-name {
        type string;
        description "server name";
    }
    leaf pool-name {
        type string;
        mandatory true;
        description "pool name";
    }
    }
    container invalid-client-detected {
        description "raised when the server has found a client which
        can be regarded as a potential attacker. Some description
        could also be included.";
    }
    container duid {
        description "Sets the DUID";
        uses dhcpv6-types:duid;
    }
    leaf description {
        type string;
        description "description of the event";
    }
    }
    }
}
<CODE ENDS>

```

3.2. DHCPv6 Relay YANG Model

This module imports typedefs from [[RFC6991](#)], [[RFC7223](#)].

```

<CODE BEGINS> file "ietf-dhcpv6-relay.yang"
module ietf-dhcpv6-relay {
    yang-version 1.1;
    namespace "urn:ietf:params:xml:ns:yang:ietf-dhcpv6-relay";

```



```
prefix "dhcpv6-relay";

import ietf-inet-types {
  prefix inet;
}
import ietf-dhcpv6-options {
  prefix dhcpv6-options;
}
import ietf-dhcpv6-types {
  prefix dhcpv6-types;
}
import ietf-interfaces {
  prefix if;
}

organization
  "IETF DHC (Dynamic Host Configuration) Working group";

contact
  "cuiyong@tsinghua.edu.cn
  lh.sunlinh@gmail.com
  ian.farrer@telekom.de
  sladjana.zechlin@telekom.de
  hezihao9512@gmail.com";

description
  "This model defines a YANG data model that can be
  used to configure and manage a DHCPv6 relay.";

  revision 2018-09-04 {
    description "";
    reference "I-D: draft-ietf-dhc-dhcpv6-yang";
  }

  revision 2018-03-04 {
    description "Resolved most issues on the DHC official
    github";
    reference "I-D: draft-ietf-dhc-dhcpv6-yang";
  }

  revision 2017-12-22 {
    description
      "Resolve most issues on Ian's github.";
    reference
      "I-D: draft-ietf-dhc-dhcpv6-yang";
  }

  revision 2017-11-24 {
```



```
    description
      "First version of the separated relay specific
      YANG model.";
    reference
      "I-D: draft-ietf-dhc-dhcpv6-yang";
  }

/*
 * Data Nodes
 */

container relay {
  presence
    "Enables the relay";
  description
    "DHCPv6 relay portion";

  container relay-config {
    description
      "This container contains the configuration data
      of the relay.";
    container relay-attributes {
      description
        "A container describes some basic attributes of the relay
        agent including some relay agent specific options data that
        need to be configured previously.
        Such options include Remote-Id option and Subscriber-Id
        option.";
      leaf name {
        type string;
        description
          "Relay agent name";
      }
      leaf description {
        type string;
        description
          "Textual description of the relay agent";
      }
    }
    leaf-list dest-addr {
      type inet:ipv6-address;
      description
        "Each DHCPv6 relay agent may be configured with a list
        of destination addresses.
        This node defines such a list of IPv6 addresses that
        may include unicast addresses, multicast addresses or
        other addresses.";
    }
  }
  list subscribers {
```



```
    key subscriber;
    description
        "Subscribers";
    leaf subscriber {
        type uint8;
        mandatory true;
        description
            "Subscriber";
    }
    leaf subscriber-id {
        type string;
        mandatory true;
        description
            "Subscriber id";
    }
}
list remote-host {
    key ent-num;
    description
        "Remote host";
    leaf ent-num {
        type uint32;
        mandatory true;
        description
            "Enterprise number";
    }
    leaf remote-id {
        type string;
        mandatory true;
        description
            "Remote id";
    }
}
uses dhcpv6-types:vendor-infor;
}

container rs00-option-sets {
    description
        "DHCPv6 relay agent could provide some information that would
        be useful to DHCPv6 client.
        Since relay agent cannot provide options directly to the
        client, RS00-enabled options are defined to propose options
        for the server to send to the client.
        This container models such RS00-enabled options.";
    reference
        "RFC6422";
    list option-set {
        key option-set-id;
```



```
    description
      "This list under the 'rsoo-option-sets' container is similar
      to the that defined in server module.
      It allows the relay to implement several sets of RS00-enabled
      options for different interfaces.
      The list only includes the EAP Re-authentication Protocol
      (ERP) Local Domain Name DHCPv6 Option defined in RFC6440,
      since it is the only one RS00-enabled options accepted by
      IANA so far.";
    leaf option-set-id {
      type uint32;
      description "Option set id";
    }
    uses dhcpv6-options:relay-supplied-option-definitions;
  }
}

list relay-if {
  // if - This should reference an entry in ietf-interfaces
  key if-name;
  description
    "A relay agent may have several interfaces, we should provide
    a way to configure and manage parameters on the interface-level.
    A list that describes specific interfaces and their corresponding
    parameters is employed to fulfil the configuration. Here we use
    a string called 'if-name' as the key of list.";
  leaf if-name {
    type if:interface-ref;
    mandatory true;
    description
      "Interface name";
  }
  leaf interface-id {
    type string;
    description
      "Interface id";
  }
}

/*
leaf enable {
  type boolean;
  mandatory true;
  description "whether this interface is enabled";
}
*/

leaf ipv6-address {
  type inet:ipv6-address;
```



```
        description
            "IPv6 address for this interface";
    }

    leaf rsoo-option-set-id {
        type leafref {
            path "/relay/relay-config/rsoo-option-sets/option-set/option-set-
id";
        }
        description "Configured Relay Supplied Option set";
    }

    list next-entity {
        key dest-addr;
        description
            "This node defines a list that is used to describe the
            next hop entity of this relay distinguished by their
            addresses.";
        leaf dest-addr {
            type inet:ipv6-address;
            mandatory true;
            description
                "Destination addr";
        }
        leaf available {
            type boolean;
            mandatory true;
            description
                "Whether the next entity is available or not";
        }
        leaf multicast {
            type boolean;
            mandatory true;
            description
                "Whether the address is multicast or not";
        }
        leaf server {
            type boolean;
            mandatory true;
            description
                "Whether the next entity is a server";
        }
    }
}

container relay-state {
```

```
config "false";
```

Cui, et al.

Expires March 8, 2019

[Page 52]

```
description
  "State data of relay";
list relay-if {
  key if-name;
  description
    "A relay agent may have several interfaces, we should provide
    a way to configure and manage parameters on the interface-level.
    A list that describes specific interfaces and their corresponding
    parameters is employed to fulfil the configuration. Here we use
    a string called 'if-name' as the key of list.";
  leaf if-name {
    type string;
    mandatory true;
    description
      "Interface name";
  }
  list pd-route {
    // if - need to look at if/how we model these. If they are
    // going to be modelled, then they should be ro state
    // entries (we're not trying to configure routes here)
    key pd-route-id;
    description "pd route";
    leaf pd-route-id {
      type uint8;
      mandatory true;
      description
        "PD route id";
    }
    leaf requesting-router-id {
      type uint32;
      mandatory true;
      description
        "Requesting router id";
    }
    leaf delegating-router-id {
      type uint32;
      mandatory true;
      description
        "Delegating router id";
    }
    leaf next-router {
      type inet:ipv6-address;
      mandatory true;
      description
        "Next router";
    }
    leaf last-router {
      type inet:ipv6-address;
```



```
        mandatory true;
        description
            "Previous router";
    }
}
list next-entity {
    key dest-addr;
    description "This node defines a list that is used to
        describe the next hop entity of this relay agent.
        Different entities are distinguished by their
        addresses.";
    leaf dest-addr {
        type inet:ipv6-address;
        mandatory true;
        description "destination addr";
    }
    container packet-stats {
        description "packet statistics";
        leaf solicit-rvd-count {
            type uint32;
            mandatory true;
            description "solicit received counter";
        }
        leaf request-rvd-count {
            type uint32;
            mandatory true;
            description "request received counter";
        }
        leaf renew-rvd-count {
            type uint32;
            mandatory true;
            description "renew received counter";
        }
        leaf rebind-rvd-count {
            type uint32;
            mandatory true;
            description "rebind received counter";
        }
        leaf decline-rvd-count {
            type uint32;
            mandatory true;
            description "decline received counter";
        }
        leaf release-rvd-count {
            type uint32;
            mandatory true;
            description "release received counter";
        }
    }
}
```



```
leaf info-req-rvd-count {
    type uint32;
    mandatory true;
    description "information request counter";
}
leaf relay-for-rvd-count {
    type uint32;
    mandatory true;
    description "relay forward received counter";
}
leaf relay-rep-rvd-count {
    type uint32;
    mandatory true;
    description "relay reply received counter";
}
leaf packet-to-cli-count {
    type uint32;
    mandatory true;
    description "packet to client counter";
}
leaf adver-sent-count {
    type uint32;
    mandatory true;
    description "advertisement sent counter";
}
leaf confirm-sent-count {
    type uint32;
    mandatory true;
    description "confirm sent counter";
}
leaf reply-sent-count {
    type uint32;
    mandatory true;
    description "reply sent counter";
}
leaf reconfig-sent-count {
    type uint32;
    mandatory true;
    description "reconfigure sent counter";
}
leaf relay-for-sent-count {
    type uint32;
    mandatory true;
    description "relay forward sent counter";
}
leaf relay-rep-sent-count {
    type uint32;
    mandatory true;
```



```
        description "relay reply sent counter";
    }
}
}
}
container relay-stats {
    config "false";
    description
        "Relay statistics";
    leaf cli-packet-rvd-count {
        type uint32;
        mandatory true;
        description
            "Client packet received counter";
    }
    leaf relay-for-rvd-count {
        type uint32;
        mandatory true;
        description
            "Relay forward received counter";
    }
    leaf relay-rep-rvd-count {
        type uint32;
        mandatory true;
        description
            "Relay reply received counter";
    }
    leaf packet-to-cli-count {
        type uint32;
        mandatory true;
        description
            "Packet to client counter";
    }
    leaf relay-for-sent-count {
        type uint32;
        mandatory true;
        description
            "Relay forward sent counter";
    }
    leaf relay-rep-sent-count {
        type uint32;
        mandatory true;
        description
            "Relay reply sent counter";
    }
    leaf discarded-packet-count {
        type uint32;
        mandatory true;
```



```

        description
            "Discarded packet counter";
    }
}
}
}

/*
 * Notifications
 */

notification notifications {
    description "DHCPv6 relay notification module";
    container dhcpv6-relay-event {
        description
            "DHCPv6 relay event";
        container topo-changed {
            description
                "Raised when the topology of the relay agent is changed.";
            leaf relay-if-name {
                type string;
                mandatory true;
                description
                    "Relay interface name";
            }
            leaf first-hop {
                type boolean;
                mandatory true;
                description
                    "First hop";
            }
            leaf last-entity-addr {
                type inet:ipv6-address;
                mandatory true;
                description
                    "Last entity address";
            }
        }
    }
}
}

<CODE ENDS>

```

3.3. DHCPv6 Client YANG Model

This module imports typedefs from [\[RFC6991\]](#), [\[RFC7223\]](#).

```
<CODE BEGINS> file "ietf-dhcpv6-client.yang"
```



```
module ietf-dhcpv6-client {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-dhcpv6-client";
  prefix "dhcpv6-client";

  import ietf-dhcpv6-options {
    prefix dhcpv6-options;
  }
  import ietf-dhcpv6-types {
    prefix dhcpv6-types;
  }
  import ietf-interfaces {
    prefix if;
  }

  organization "DHC WG";
  contact
    "cuiyong@tsinghua.edu.cn
     wangh13@mails.tsinghua.edu.cn
     lh.sunlinh@gmail.com
     ian.farrer@telekom.de
     sladjana.zechlin@telekom.de
     hezihao9512@gmail.com ";

  description "This model defines a YANG data model that can be
    used to configure and manage a DHCPv6 client.";

  revision 2018-09-04 {
    description "";
    reference "I-D: draft-ietf-dhc-dhcpv6-yang";
  }

  revision 2018-03-04 {
    description "Resolved most issues on the DHC official
      github";
    reference "I-D: draft-ietf-dhc-dhcpv6-yang";
  }

  revision 2017-12-22 {
    description "Resolve most issues on Ian's github.";
    reference "I-D: draft-ietf-dhc-dhcpv6-yang";
  }

  revision 2017-11-24 {
    description "First version of the separated client specific
      YANG model.";
    reference "I-D: draft-ietf-dhc-dhcpv6-yang";
  }
}
```



```
/*
 * Data Nodes
 */

container client {
  presence "Enables the client";
  description "dhcpv6 client portion";

  container client-config {
    description "configuration tree of client";
    container duid {
      description "Sets the DUID";
      uses dhcpv6-types:duid;
    }
    list client-if {
      key if-name;
      description "A client may have several interfaces, it is more
reasonable to
defines      configure and manage parameters on the interface-level. The list
defines      specific client interfaces and their data. Different interfaces are
distinguished by the key which is a configurable string value.";
      leaf if-name {
        type if:interface-ref;
        mandatory true;
        description "interface name";
      }

      leaf cli-id {
        type uint32;
        mandatory true;
        description "client id";
      }

      /*
      leaf description {
        type string;
        description "description of the client interface";
      }
      */

      leaf pd-function {
        type boolean;
        mandatory true;
        description "Whether the client can act as a requesting router
to request prefixes using prefix delegation ([RFC3633]).";
      }
      leaf rapid-commit {
```

```
type boolean;  
mandatory true;
```

```
    description "'1' indicates a client can initiate a Solicit-Reply
message
    exchange by adding a Rapid Commit option in Solicit message. '0'
means
    the client is not allowed to add a Rapid Commit option to request
    addresses in a two-message exchange pattern.";
}

/*
container mo-tab {
    description "The management tab label indicates the operation mode of
the
    DHCPv6 client.
    'm'=1 and 'o'=1 indicate the client will use DHCPv6 to obtain all
the configuration
    data.
    'm'=1 and 'o'=0 are a meaningless combination.
    'm'=0 and 'o'=1 indicate the client will use stateless DHCPv6 to
obtain configuration
    data apart from addresses/prefixes data.
    'm'=0 and 'o'=0 represent the client will not use DHCPv6 but use
SLAAC to
    achieve configuration.";

    // if - not sure about the intended use here as it seems
    // to be redefining what will be received in the PIO. Is
    // the intention to be whether they PIO options will be
    // obeyed as received or overridden?
    leaf m-tab {
        type boolean;
        mandatory true;
        description "m tab";
    }
    leaf o-tab {
        type boolean;
        mandatory true;
        description "o tab";
    }
}
*/

container client-configured-options {
    description "client configured options";
    uses dhcpv6-options:client-option-definitions;
}
}
```

```
container client-state {  
  config "false";  
  description "state tree of client";  
  container if-other-paras {  
    description "A client can obtain extra configuration  
      data other than address and prefix information through
```

```
        DHCPv6. This container describes such data the client
        was configured. The potential configuration data may
        include DNS server addresses, SIP server domain names, etc.";
        uses dhcpv6-options:server-option-definitions;
    }
    container packet-stats {
        config "false";
        description "A container records
            all the packet status information
            of a specific interface.";
        leaf solicit-count {
            type uint32;
            mandatory true;
            description "solicit counter";
        }
        leaf request-count {
            type uint32;
            mandatory true;
            description "request counter";
        }
        leaf renew-count {
            type uint32;
            mandatory true;
            description "renew counter";
        }
        leaf rebind-count {
            type uint32;
            mandatory true;
            description "rebind counter";
        }
        leaf decline-count {
            type uint32;
            mandatory true;
            description "decline counter";
        }
        leaf release-count {
            type uint32;
            mandatory true;
            description "release counter";
        }
        leaf info-req-count {
            type uint32;
            mandatory true;
            description "information request counter";
        }
        leaf advertise-count {
            type uint32;
            mandatory true;
```



```
        description "advertise counter";
    }
    leaf confirm-count {
        type uint32;
        mandatory true;
        description "confirm counter";
    }
    leaf reply-count {
        type uint32;
        mandatory true;
        description "reply counter";
    }
    leaf reconfigure-count {
        type uint32;
        mandatory true;
        description "reconfigure counter";
    }
}

}

}

/*
 * Notifications
 */

notification notifications {
    description "dhcpv6 client notification module";
    container dhcpv6-client-event {
        description "dhcpv6 client event";

        container ia-lease-event {
            description "raised when the client was allocated
                a new IA from the server or it renew/rebind/release
                its current IA";
            leaf event-type {
                type enumeration {
                    enum "allocation" {
                        description "allocate";
                    }
                    enum "rebind" {
                        description "rebind";
                    }
                    enum "renew" {
                        description "renew";
                    }
                    enum "release" {
                        description "release";
                    }
                }
            }
        }
    }
}
```



```
    }
  }
  mandatory true;
  description "event type";
}
container duid {
  description "Sets the DUID";
  uses dhcpv6-types:duid;
}
leaf iaid {
  type uint32;
  mandatory true;
  description "IAID";
}
leaf serv-name {
  type string;
  description "server name";
}
leaf description {
  type string;
  description "description of event";
}
}

container invalid-ia-detected {
  description "raised when the identity association of the
    client can be proved to be invalid. Possible condition
    includes duplicated address, illegal address, etc.";
  container duid {
    description "Sets the DUID";
    uses dhcpv6-types:duid;
  }
  leaf cli-duid {
    type uint32;
    mandatory true;
    description "duid of client";
  }
  leaf iaid {
    type uint32;
    mandatory true;
    description "IAID";
  }
  leaf serv-name {
    type string;
    description "server name";
  }
  leaf description {
    type string;
```



```
        description "description of the event";
    }
}

container retransmission-failed {
    description "raised when the retransmission mechanism defined
        in [RFC3315] is failed.";
    container duid {
        description "Sets the DUID";
        uses dhcpv6-types:duid;
    }
    leaf description {
        type enumeration {
            enum "MRC failed" {
                description "MRC failed";
            }
            enum "MRD failed" {
                description "MRD failed";
            }
        }
        mandatory true;
        description "description of failure";
    }
}

container failed-status-turn-up {
    description "raised when the client receives a message includes
        an unsuccessful Status Code option.";
    container duid {
        description "Sets the DUID";
        uses dhcpv6-types:duid;
    }
    leaf status-code {
        type enumeration {
            enum "1" {
                description "UnspecFail";
            }
            enum "2" {
                description "NoAddrAvail";
            }
            enum "3" {
                description "NoBinding";
            }
            enum "4" {
                description "NotOnLink";
            }
            enum "5" {
                description "UseMulticast";
            }
        }
    }
}
```



```
    }
  }
  mandatory true;
  description "employed status code";
}
}
```

<CODE ENDS>

3.4. DHCPv6 Options YANG Model

This module imports typedefs from [[RFC6991](#)], [[RFC7223](#)].

```
<CODE BEGINS> file "ietf-dhcpv6-options.yang"
module ietf-dhcpv6-options {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-dhcpv6-options";
  prefix "dhcpv6-options";

  import ietf-inet-types {
    prefix inet;
  }
  import ietf-yang-types {
    prefix yang;
  }
  import ietf-dhcpv6-types {
    prefix dhcpv6-types;
  }

  organization "DHC WG";
  contact
    "cuiyong@tsinghua.edu.cn
     wangh13@mails.tsinghua.edu.cn
     lh.sunlinh@gmail.com
     ian.farrer@telekom.de
     sladjana.zechlin@telekom.de
     hezihao9512@gmail.com";

  description "This model defines a YANG data model that can be
    used to configure DHCPv6 options.";

  revision 2018-09-04 {
    description "";
    reference "I-D: draft-ietf-dhc-dhcpv6-yang";
  }
}
```



```
revision 2018-03-04 {
  description "Resolved most issues on the DHC official
  github";
  reference "I-D: draft-ietf-dhc-dhcpv6-yang";
}

revision 2017-12-22 {
  description "Resolve most issues on Ian's github.";
  reference "I-D: draft-ietf-dhc-dhcpv6-yang";
}

revision 2017-11-24 {
  description "First version of the separated DHCPv6 options
  YANG model.";
  reference "I-D: draft-ietf-dhc-dhcpv6-yang";
}

/*
 * Features
 */

// features for server options
  feature server-unicast-op {
    description "Support for Server Unicast option";
  }
  feature sip-server-domain-name-list-op {
    description "Support for SIP Server Domain Name List option";
  }
  feature sip-server-address-list-op {
    description "Support for SIP Server Address List option";
  }
feature dns-servers-op {
  description "Support for DNS Servers Option";
}

  feature domain-searchlist-op {
    description "Support for Domain Search List Option";
  }
  feature nis-config-op {
    description "Support for Network Information Service (NIS)
    Servers option";
  }
  feature nis-plus-config-op {
    description "Support for Network Information Service V2 (NIS+)
    Servers option";
  }
  feature nis-domain-name-op {
    description "Support for Network Information Service (NIS)
    Domain Name option";
```



```
}
feature nis-plus-domain-name-op {
    description "Support for Network Information Service V2 (NIS+)
        Server option";
}
feature sntp-server-op {
    description "Support for Simple Network Protocol Configuration
        (SNTP) Servers option";
}
feature info-refresh-time-op {
    description "Support for Information Refresh Time option";
}
feature client-fqdn-op {
    description "Support for Client FQDN option";
}
feature posix-timezone-op {
    description "Support for New POIX Timezone option";
}
feature tzdb-timezone-op {
    description "Support for New TZDB Timezone option";
}
feature ntp-server-op {
    description "Support for Network Time Protocol (NTP)
        Server option";
}
feature boot-file-url-op {
    description "Support for Boot File URL option";
}
feature boot-file-param-op {
    description "Support for Boot File Parameters option";
}
feature aftr-name-op {
    description "Support for Address Family Transition
        Router (AFTR) option";
}
feature kbr-default-name-op {
    description "Support for Kerberos Default Name
        Option";
}
feature kbr-kdc-op {
    description "Support for Kerberos KDC option";
}
feature sol-max-rt-op {
    description "Support for SOL_MAX_RT option";
}
feature inf-max-rt-op {
    description "Support for INF_MAX_RT option";
}
```



```
feature addr-selection-op {
    description "Support for Address Selection option";
}
feature pcp-server-op {
    description "Support for Port Control Protocol (PCP)
        option";
}
feature s46-rule-op {
    description "Support for S46 Rule option";
}
feature s46-br-op {
    description "Support for S46 Border Relay (BR) option";
}
feature s46-dmr-op {
    description "Support for S46 Default Mapping Rule
        (DMR) option";
}
feature s46-v4-v6-binding-op {
    description "Support for S46 IPv4/IPv6 Address
        Bind option";
}

// features for relay-supplied options
feature erp-local-domain-name-op {
    description "Support for ERP Local Domain Name option";
}

// features for client options
feature option-request-op {
    description "Support for Option Request option";
}
feature rapid-commit-op {
    description "Support for Rapid Commit option";
}
feature user-class-op {
    description "Support for User Class option";
}
feature vendor-class-op {
    description "Support for Vendor Class option";
}
feature client-arch-type-op {
    description "Support for Client System Architecture
        Type option";
}
feature client-network-interface-identifier-op {
    description "Support for Client Network Interface
        Identifier option";
}
```



```
feature kbr-principal-name-op {
    description "Support for Kerberos Principal
                Name option";
}
feature kbr-realm-name-op {
    description "Support Kerberos Realm Name option";
}
feature client-link-layer-addr-op {
    description "Support for Client Link-Layer Address
                Option";
}

// features for custom options
feature operator-op-ipv6-address {
    description "Support for Option with IPv6 Addresses";
}
feature operator-op-single-flag {
    description "Support for Option with Single Flag";
}
feature operator-op-ipv6-prefix {
    description "Support for Option with IPv6 Prefix";
}
feature operator-op-int32 {
    description "Support for Opion with 32-bit
                Integer Value";
}
feature operator-op-int16 {
    description "Support for Opion with 16-bit Integer Value";
}
feature operator-op-int8 {
    description "Support for Opion with 8-bit Integer Value";
}
feature operator-op-uri {
    description "Support for Opion with URI";
}
feature operator-op-textstring {
    description "Support for Opion with Text String";
}
feature operator-op-var-data {
    description "Support for Opion with Variable-Length Data";
}
feature operator-op-dns-wire {
    description "Support for Opion with DNS Wire
                Format Domain Name List";
}

/*
 * Groupings
```



```
*/
```

```
grouping server-option-definitions {
  description "Contains definitions for options configured on the
    DHCPv6 server which will be supplied to clients.";

  container server-unicast-option {
    if-feature server-unicast-op;
    presence "Enable this option";
    description "OPTION_UNICAST (12) Server Unicast Option";
    reference "RFC3315: Dynamic Host Configuration Protocol for
      IPv6 (DHCPv6)";
    leaf server-address {
      type inet:ipv6-address;
      description "server ipv6 address";
    }
  }

  container sip-server-domain-name-list-option {
    if-feature sip-server-domain-name-list-op;
    presence "Enable this option";
    description "OPTION_SIP_SERVER_D (21) SIP Servers Domain Name List";
    reference "RFC3319: Dynamic Host Configuration Protocol
      (DHCPv6) Options for Session Initiation Protocol (SIP) Servers";
    leaf sip-serv-domain-name {
      type string;
      mandatory true;
      description "sip server domain name";
    }
  }

  container sip-server-address-list-option {
    if-feature sip-server-address-list-op;
    presence "Enable this option";
    description "OPTION_SIP_SERVER_A (22) SIP Servers IPv6 Address List";
    reference "RFC3319: Dynamic Host Configuration Protocol (DHCPv6)
      Options for Session Initiation Protocol (SIP) Servers";
    list sip-server {
      key sip-serv-id;
      description "sip server info";
      leaf sip-serv-id {
        type uint8;
        mandatory true;
        description "sip server id";
      }
      leaf sip-serv-addr {
        type inet:ipv6-address;
        mandatory true;
      }
    }
  }
}
```



```
        description "sip server addr";
    }
}
}
```

```
container dns-servers-option {
    if-feature dns-servers-op;
    presence "Enable this option";
    description "OPTION_DNS_SERVERS (23) DNS recursive Name Server option";
    reference "RFC3646: DNS Configuration options for Dynamic Host
```

Configuration

```
    Protocol for IPv6 (DHCPv6)";
    list dns-server {
        key dns-serv-id;
        description "dns server info";
        leaf dns-serv-id {
            type uint8;
            mandatory true;
            description "DNS server list entry ID.";
        }
        leaf dns-serv-addr {
            type inet:ipv6-address;
            mandatory true;
            description "DNS server address.";
        }
    }
}
}
```

```
container domain-searchlist-option {
    if-feature domain-searchlist-op;
    presence "Enable this option";
    description "OPTION_DOMAIN_LIST (24) Domain Search List Option";
    reference "RFC3646: DNS Configuration options for Dynamic
        Host Configuration Protocol for IPv6 (DHCPv6)";
    list domain-searchlist {
        key domain-searchlist-id;
        description "dns server info";
        leaf domain-searchlist-id {
            type uint8;
            mandatory true;
            description "Domain seachlist entry ID.";
        }
        leaf domain-search-list-entry {
            type string;
            mandatory true;
            description "Domain search list entry.";
        }
    }
}
```

}

Cui, et al.

Expires March 8, 2019

[Page 71]

```
container nis-config-option {
  if-feature nis-config-op;
  presence "Enable this option";
  description "OPTION_NIS_SERVERS (27) Network Information Service (NIS)
    Servers Option.";
  reference "RFC3898: Network Information Service (NIS) Configuration
    Options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6)";
  list nis-server {
    key nis-serv-id;
    description "nis server info";
    leaf nis-serv-id {
      type uint8;
      mandatory true;
      description "nis server id";
    }
    leaf nis-serv-addr {
      type inet:ipv6-address;
      mandatory true;
      description "nis server addr";
    }
  }
}
```

```
container nis-plus-config-option {
  if-feature nis-plus-config-op;
  presence "Enable this option";
  description "OPTION_NISP_SERVERS (28): Network Information Service V2
    (NIS+) Servers Option.";
  reference "RFC3989: Network Information Service (NIS) Configuration
    Options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6)";
  list nis-plus-server {
    key nis-plus-serv-id;
    description "NIS+ server information.";
    leaf nis-plus-serv-id {
      type uint8;
      mandatory true;
      description "nisp server id";
    }
    leaf nis-plus-serv-addr {
      type inet:ipv6-address;
      mandatory true;
      description "nisp server addr";
    }
  }
}
```

```
container nis-domain-name-option {
  if-feature nis-domain-name-op;
```



```
presence "Enable this option";
description "OPTION_NIS_DOMAIN_NAME (29) Network Information
  Service (NIS) Domain Name Option";
reference "RFC3989: Network Information Service (NIS)
  Configuration Options for Dynamic Host Configuration Protocol
  for IPv6 (DHCPv6)";
leaf nis-domain-name {
  type string;
  description "The Network Information Service (NIS) Domain Name
    option is used by the server to convey client's NIS Domain Name
    info to the client.";
}
}

container nis-plus-domain-name-option {
  if-feature nis-plus-domain-name-op;
  presence "Enable this option";
  description "OPTION_NISP_DOMAIN_NAME (30) Network Information
    Service V2 (NIS+) Domain Name Option";
  reference "RFC3989: Network Information Service (NIS)
    Configuration Options for Dynamic Host Configuration Protocol
    for IPv6 (DHCPv6)";
  leaf nis-plus-domain-name {
    type string;
    description "The Network Information Service V2 (NIS+) Domain Name
      option is used by the server to convey client's NIS+ Domain Name
      info to the client.";
  }
}

container sntp-server-option {
  if-feature sntp-server-op;
  presence "Enable this option";
  description "OPTION_SNTP_SERVERS (31) Simple Network Time Protocol
    (SNTP) Servers Option";
  reference "RFC4075: Simple Network Time Protocol (SNTP) Configuration
    Option for DHCPv6";
  list sntp-server {
    key sntp-serv-id;
    description "sntp server info";
    leaf sntp-serv-id {
      type uint8;
      mandatory true;
      description "sntp server id";
    }
    leaf sntp-serv-addr {
      type inet:ipv6-address;
    }
  }
}
```



```
        mandatory true;
        description "sntp server addr";
    }
}
}

container info-refresh-time-option {
    if-feature info-refresh-time-op;
    presence "Enable this option";
    description "OPTION_INFORMATION_REFRESH_TIME (32) Information Refresh
        Time option.";
    reference "RFC4242: Information Refresh Time Option for Dynamic Host
        Configuration Protocol for IPv6 (DHCPv6";
    leaf info-refresh-time {
        type yang:timeticks;
        mandatory true;
        description "The refresh time.";
    }
}

container client-fqdn-option {
    if-feature client-fqdn-op;
    presence "Enable this option";
    description "OPTION_CLIENT_FQDN (39) DHCPv6 Client FQDN Option";
    reference "RFC4704: The Dynamic Host Configuration Protocol for IPv6
        (DHCPv6) Client Fully Qualified Domain Name (FQDN) Option";
    leaf server-initiate-update {
        type boolean;
        mandatory true;
        description "server initiate";
    }
    leaf client-initiate-update {
        type boolean;
        mandatory true;
        description "client initiate";
    }
    leaf modify-name-from-cli {
        type boolean;
        mandatory true;
        description "modify by client";
    }
}

container posix-timezone-option {
    if-feature posix-timezone-op;
    presence "Enable this option";
    description "OPTION_NEW_POSIX_TIMEZONE (41) Posix Timezone option";
    reference "RFC4833: Timezone Options for DHCP";
```



```
    leaf tz-posix {
        type string;
        mandatory true;
        description "TZ Posix IEEE 1003.1 String";
    }
}

container tzdb-timezone-option {
    if-feature tzdb-timezone-op;
    presence "Enable this option";
    description "OPTION_NEW_TZDB_TIMEZONE (42) Timezone Database option";
    reference "RFC4822: Timezone Options for DHCP";
    leaf tz-database {
        type string;
        mandatory true;
        description "Reference to the TZ Database";
    }
}

container ntp-server-option {
    //This option looks like it needs work to correctly model the
    //option as defined in the RFC.

    // Zihao - Re-modelled so it only contains one time source suboption

    if-feature ntp-server-op;
    presence "Enable this option";
    description "OPTION_NTP_SERVER (56) NTP Server Option for DHCPv6";
    reference "RFC5908: Network Time Protocol (NTP) Server Option for
        DHCPv6";
    list ntp-server {
        key ntp-serv-id;
        description "ntp server info";
        leaf ntp-serv-id {
            type uint8;
            mandatory true;
            description "NTP server id";
        }
    }
    choice ntp-time-source-suboption {
        description "Select a NTP time source suboption.";
        case server-address {
            leaf-list ntp-serv-addr-suboption {
                type inet:ipv6-address;
                description "NTP server addr";
            }
        }
        case server-multicast-address {
            leaf-list ntp-serv-mul-addr-suboption {
```



```

        type inet:ipv6-address;
        description "NTP server multicast addr";
    }
    }
    case server-fqdn {
        leaf-list ntp-serv-fqdn-suboption {
            type string;
            description "NTP server fqdn";
        }
    }
}
}

container boot-file-url-option {
    if-feature boot-file-url-op;
    presence "Enable this option";
    description "OPT_BOOTFILE_URL (59) Boot File URL Option";
    reference "RFC5970: DHCPv6 Options for Network Boot";
    list boot-file {
        key boot-file-id;
        description "boot file info";
        leaf boot-file-id {
            type uint8;
            mandatory true;
            description "boot file id";
        }
    }
    leaf-list suitable-arch-type {
        type uint16;
        description "architecture type";
    }
    leaf-list suitable-net-if {
        type uint32;
        description "network interface";
    }
    leaf boot-file-url {
        type string;
        mandatory true;
        description "url for boot file";
    }
}

container boot-file-param-option {
    if-feature boot-file-param-op;
    presence "Enable this option";
    description "OPT_BOOTFILE_PARAM (60) Boot File Parameters
Option";

```

reference "[RFC5970](#): DHCPv6 Options for Network Boot";

```
list boot-file-paras {
  key para-id;
  description "boot file parameters";
  leaf para-id {
    type uint8;
    mandatory true;
    description "parameter id";
  }
  leaf parameter {
    type string;
    mandatory true;
    description "parameter value";
  }
}

container aftr-name-option {
  if-feature aftr-name-op;
  presence "Enable this option";
  description "OPTION_AFTR_NAME (64) AFTR-Name DHCPv6 Option";
  reference "RFC6334: Dynamic Host Configuration Protocol for IPv6
(DHCPv6) Option for Dual-Stack Lite";
  leaf tunnel-endpoint-name {
    type string;
    mandatory true;
    description "aftr name";
  }
}

container kbr-default-name-option {
  if-feature kbr-default-name-op;
  presence "Enable this option";
  description "OPTION_KRB_DEFAULT_REALM_NAME (77) Kerberos Default Realm
Name Option";
  reference "RFC6784: Kerberos Options for DHCPv6";
  leaf default-realm-name {
    type string;
    mandatory true;
    description "default realm name";
  }
}

container kbr-kdc-option {
  if-feature kbr-kdc-op;
  presence "Enable this option";
  description "OPTION_KRB_KDC (78) Kerberos KDB Option";
  reference "RFC6784: Kerberos Options for DHCPv6";
  list kdc-info {
```

key kdc-id;

Cui, et al.

Expires March 8, 2019

[Page 77]

```
    description "kdc info";
    leaf kdc-id {
        type uint8;
        mandatory true;
        description "kdc id";
    }
    leaf priority {
        type uint16;
        mandatory true;
        description "priority";
    }
    leaf weight {
        type uint16;
        mandatory true;
        description "weight";
    }
    leaf transport-type {
        type uint8;
        mandatory true;
        description "transport type";
    }
    leaf port-number {
        type uint16;
        mandatory true;
        description "port number";
    }
    leaf kdc-ipv6-addr {
        type inet:ipv6-address;
        mandatory true;
        description "kdc ipv6 addr";
    }
    leaf realm-name {
        type string;
        mandatory true;
        description "realm name";
    }
}

container sol-max-rt-option {
    if-feature sol-max-rt-op;
    presence "Enable this option";
    description "OPTION_SOL_MAX_RT (82) sol max rt option";
    reference "RFC7083: Modification to Default Values of
        SOL_MAX_RT and INF_MAX_RT";
    leaf sol-max-rt-value {
        type yang:timeticks;
        mandatory true;
    }
}
```



```
        description "sol max rt value";
    }
}

container inf-max-rt-option {
    if-feature inf-max-rt-op;
    presence "Enable this option";
    description "OPTION_INF_MAX_RT (83) inf max rt option";
    reference "RFC7083: Modification to Default Values of
        SOL_MAX_RT and INF_MAX_RT";
    leaf inf-max-rt-value {
        type yang:timeticks;
        mandatory true;
        description "inf max rt value";
    }
}

container addr-selection-option {
    if-feature addr-selection-op;
    presence "Enable this option";
    description "OPTION_ADDRSEL (84) and OPTION_ADDRSEL_TABLE (85)";
    reference "RFC7078: Distributing Address Selection Policy Using
        DHCPv6";
    // if - Needs checking to see if this matches the RFC - there
    // are two options here.
    // Zihao - I think this matches RFC7078
    leaf a-bit-set {
        type boolean;
        mandatory true;
        description "a bit";
    }
    leaf p-bit-set {
        type boolean;
        mandatory true;
        description "p bit";
    }
}

list policy-table {
    key policy-id;
    description "policy table";
    leaf policy-id {
        type uint8;
        mandatory true;
        description "policy id";
    }
    leaf label {
        type uint8;
        mandatory true;
        description "label";
    }
}
```



```
    }
    leaf precedence {
        type uint8;
        mandatory true;
        description "precedence";
    }
    leaf prefix-len {
        type uint8;
        mandatory true;
        description "prefix length";
    }
    leaf prefix {
        type inet:ipv6-prefix;
        mandatory true;
        description "prefix";
    }
}
}
```

```
container pcg-server-option {
    if-feature pcg-server-op;
    presence "Enable this option";
    description "OPTION_V6_PCG_SERVER (86) pcg server option";
    reference "RFC7291: DHCP Options for the Port Control
        Protocol (PCP)";
    list pcg-server {
        key pcg-serv-id;
        description "pcg server info";
        leaf pcg-serv-id {
            type uint8;
            mandatory true;
            description "pcg server id";
        }
        leaf pcg-serv-addr {
            type inet:ipv6-address;
            mandatory true;
            description "pcg server addr";
        }
    }
}
}
```

```
container s46-rule-option {
    if-feature s46-rule-op;
    presence "Enable this option";
    description "OPTION_S46_RULE (89) S46 rule option";
    reference "RFC7598: DHCPv6 Options for Configuration of
        Softwire Address and Port-Mapped Clients";
    list s46-rule {
```



```
    key rule-id;
    description "s46 rule";
    leaf rule-id {
        type uint8;
        mandatory true;
        description "rule id";
    }
    leaf rule-type {
        type enumeration {
            enum "BMR" {
                description "BMR";
            }
            enum "FMR" {
                description "FMR";
            }
        }
        mandatory true;
        description "rule type";
    }
    leaf prefix4-len {
        type uint8;
        mandatory true;
        description "ipv4 prefix length";
    }
    leaf ipv4-prefix {
        type inet:ipv4-prefix;
        mandatory true;
        description "ipv4 prefix";
    }
    leaf prefix6-len {
        type uint8;
        mandatory true;
        description "ipv6 prefix length";
    }
    leaf ipv6-prefix {
        type inet:ipv6-prefix;
        mandatory true;
        description "ipv6 prefix";
    }
    uses dhcpv6-types:portset-para;
}

container s46-br-option {
    if-feature s46-br-op;
    presence "Enable this option";
    description "OPTION_S46_BR (90) S46 BR Option";
    reference "RFC7598: DHCPv6 Options for Configuration of
```



```
    Software Address and Port-Mapped Clients";
list br {
    key br-id;
    description "br info";
    leaf br-id {
        type uint8;
        mandatory true;
        description "br id";
    }
    leaf br-ipv6-addr {
        type inet:ipv6-address;
        mandatory true;
        description "br ipv6 addr";
    }
}
}

container s46-dmr-option {
    if-feature s46-dmr-op;
    presence "Enable this option";
    description "OPTION_S46_DMR (91) S46 DMR Option";
    reference "RFC7598: DHCPv6 Options for Configuration of
        Software Address and Port-Mapped Clients";
    list dmr {
        key dmr-id;
        description "dmr info";
        leaf dmr-id {
            type uint8;
            mandatory true;
            description "dmr id";
        }
        leaf dmr-prefix-len {
            type uint8;
            mandatory true;
            description "dmr prefix length";
        }
        leaf dmr-ipv6-prefix {
            type inet:ipv6-prefix;
            mandatory true;
            description "dmr ipv6 prefix";
        }
    }
}

container s46-v4-v6-binding-option {
    if-feature s46-v4-v6-binding-op;
    presence "Enable this option";
    description "OPTION_S46_V4V6BIND (92) S46 IPv4/IPv6 Address
```



```
    Binding option";
reference "RFC7598: DHCPv6 Options for Configuration of
    Software Address and Port-Mapped Clients";
list ce {
    key ce-id;
    description "ce info";
    leaf ce-id {
        type uint8;
        mandatory true;
        description "ce id";
    }
    leaf ipv4-addr {
        type inet:ipv4-address;
        mandatory true;
        description "ce ipv4 addr";
    }
    leaf bind-prefix6-len {
        type uint8;
        mandatory true;
        description "bind ipv6 prefix
            length";
    }
    leaf bind-ipv6-prefix {
        type inet:ipv6-address;
        mandatory true;
        description "bind ipv6 prefix";
    }
    uses dhcpv6-types:portset-para;
}
}

//if - NB - The list of options needs to be updated.

grouping relay-supplied-option-definitions {
    // if - The structure here needs to be checked and probably reworked.
    description "OPTION_RS00 (66) Relay-Supplied Options option";
    reference "RFC6422: Relay-Supplied DHCP Options";
    container erp-local-domain-name-option {
        if-feature erp-local-domain-name-op;
        presence "Enable this option";
        description "OPTION_ERP_LOCAL_DOMAIN_NAME (65) DHCPv6 ERP Local
            Domain Name Option";
        reference "RFC6440: The EAP Re-authentication Protocol (ERP)
            Local Domain Name DHCPv6 Option";
        list erp-for-client {
            key cli-id;
```



```
    description "erp for client";
    leaf cli-id {
        type uint32;
        mandatory true;
        description "client id";
    }
    container duid {
        description "Sets the DUID";
        // uses duid;
        // if - Maybe DUID definition needs to be moved to this module.
        uses dhcpv6-types:duid;
    }
    leaf erp-name {
        type string;
        mandatory true;
        description "erp name";
    }
}
}
}

grouping client-option-definitions {
    description "Contains definitions for options configured on the
        DHCPv6 client which will be sent to the server.";

    list new-or-standard-cli-option {
        key option-code;
        description "new or standard client option";
        leaf option-code {
            type uint16;
            mandatory true;
            description "option code";
        }
        leaf option-name {
            type string;
            mandatory true;
            description "option name";
        }
        leaf option-description {
            type string;
            mandatory true;
            description "description of client
                option";
        }
        leaf option-reference {
            type string;
            description "the reference of option";
        }
    }
}
```



```
    leaf option-value {
      type string;
      mandatory true;
      description "the option value";
    }
  }

  container option-request-option {
    if-feature option-request-op;
    presence "Enable this option";
    description "OPTION_ORO (6) Option Request Option";
    reference "RFC3315: Dynamic Host Configuration Protocol for
    IPv6 (DHCPv6)";
    list oro-option {
      key option-code;
      description "oro option";
      leaf option-code {
        type uint16;
        mandatory true;
        description "option code";
      }
      leaf description {
        type string;
        mandatory true;
        description "description of oro
        options";
      }
    }
  }

  container user-class-option {
    if-feature user-class-op;
    presence "Enable this option";
    description "OPTION_USER_CLASS (15) User Class Option";
    reference "RFC3315: Dynamic Host Configuration Protocol
    for IPv6 (DHCPv6)";
    list user-class {
      key user-class-id;
      description "user class";
      leaf user-class-id {
        type uint8;
        mandatory true;
        description "user class id";
      }
      leaf user-class-data {
        type string;
        mandatory true;
        description "The information contained in the data area
```



```
        of this option is contained in one or more opaque
        fields that represent the user class or classes of
        which the client is a member. ";
    }
}

container vendor-class-option {
    if-feature vendor-class-op;
    presence "Enable this option";
    description "OPTION_VENDOR_CLASS (16) Vendor Class Option";
    reference "RFC3315: Dynamic Host Configuration Protocol
        for IPv6 (DHCPv6)";
    leaf enterprise-number {
        type uint32;
        mandatory true;
        description "enterprise number";
    }
    list vendor-class {
        key vendor-class-id;
        description "vendor class";
        leaf vendor-class-id {
            type uint8;
            mandatory true;
            description "vendor class id";
        }
        leaf vendor-class-data {
            type string;
            mandatory true;
            description "The vendor-class-data is composed of a series of
                separate items, each of which describes some characteristic
                of the client's hardware configuration. Examples of
                vendor-class-data instances might include the version of the
                operating system the client is running or the amount of memory
                installed on the client.";
        }
    }
}

container client-fqdn-option {
    if-feature client-fqdn-op;
    presence "Enable this option";
    description "OPTION_CLIENT_FQDN (39) The Dynamic Host
        Configuration Protocol for IPv6 (DHCPv6) Client Fully
        Qualified Domain Name (FQDN) Option";
    reference "RFC4704: The Dynamic Host Configuration Protocol
        for IPv6 (DHCPv6) Client Fully Qualified Domain Name (FQDN)
        Option";
```



```
    leaf fqdn {
        type string;
        mandatory true;
        description "fqdn";
    }
    leaf server-initiate-update {
        type boolean;
        mandatory true;
        description "whether server initiate";
    }
    leaf client-initiate-update {
        type boolean;
        mandatory true;
        description "whether client initiate";
    }
}

container client-arch-type-option {
    if-feature client-arch-type-op;
    presence "Enable this option";
    description "OPTION_CLIENT_ARCH_TYPE (61) Client System
        Architecture Type Option";
    reference "RFC5970: DHCPv6 Options for Network Boot";
    list architecture-types {
        key type-id;
        description "architecture types";
        leaf type-id {
            type uint16;
            mandatory true;
            description "type id";
        }
        leaf most-preferred {
            type boolean;
            mandatory true;
            description "most preferred flag";
        }
    }
}

container client-network-interface-identifier-option {
    if-feature client-network-interface-identifier-op;
    presence "Enable this option";
    description "OPTION_NII (62) Client Network Interface
        Identifier Option";
    reference "RFC5970: DHCPv6 Options for Network Boot";
    leaf type {
        type uint8;
        mandatory true;
    }
}
```



```
        description "type";
    }
    leaf major {
        type uint8;
        mandatory true;
        description "major";
    }
    leaf minor {
        type uint8;
        mandatory true;
        description "minor";
    }
}

container kbr-principal-name-option {
    if-feature kbr-principal-name-op;
    presence "Enable this option";
    description "OPTION_KRB_PRINCIPAL_NAME (75) Kerberos
        Principal Name Option";
    reference "RFC6784: Kerberos Options for DHCPv6";
    list principle-name {
        key principle-name-id;
        description "principle name";
        leaf principle-name-id {
            type uint8;
            mandatory true;
            description "principle name id";
        }
        leaf name-type {
            type int32;
            mandatory true;
            description "This field specifies the type of name that
follows.";
        }
        leaf name-string {
            type string;
            mandatory true;
            description "This field encodes a sequence of components that
form
                                a name, each component encoded as a KerberoString";
        }
    }
}

container kbr-realm-name-option {
    if-feature kbr-realm-name-op;
    presence "Enable this option";
    description "OPTION_KRB_REALM_NAME (76) Kerberos Realm Name Option";
```

```
reference "RFC6784: Kerberos Options for DHCPv6";  
leaf realm-name {
```

```
        type string;
        mandatory true;
        description "realm name";
    }
}

container client-link-layer-addr-option {
    if-feature client-link-layer-addr-op;
    presence "Enable this option";
    description "OPTION_CLIENT_LINKLAYER_ADDR (79) DHCPv6 Client
        Link-Layer Address Option";
    reference "RFC6939: Client Link-Layer Address Option in
        DHCPv6";
    leaf link-layer-type {
        type uint16;
        mandatory true;
        description "Client link-layer address type. The link-layer
            type MUST be a valid hardware type assigned by the IANA,
            as described in [RFC0826]";
    }
    leaf link-layer-addr {
        type string;
        mandatory true;
        description "Client link-layer address";
    }
}

grouping custom-option-definitions {
    description "operator customized options";

    container operator-option-ipv6-address {
        if-feature operator-op-ipv6-address;
        presence "Enable this option";
        description "operator ipv6 address option";
        reference "RFC7227: Guidelines for Creating New DHCPv6 Options";
        list operator-ipv6-addr {
            key operator-ipv6-addr-id;
            description "operator ipv6 address info";
            leaf operator-ipv6-addr-id {
                type uint8;
                mandatory true;
                description "operator ipv6 address id";
            }
            leaf operator-ipv6-addr {
                type inet:ipv6-address;
            }
        }
    }
}
```



```
        mandatory true;
        description "operator ipv6 address id";
    }
}
}

container operator-option-single-flag {
    if-feature operator-op-single-flag;
    presence "Enable this option";
    description "operator single flag";
    reference "RFC7227: Guidelines for Creating New DHCPv6
        Options";
    list flag {
        key flag-id;
        description "operator single flag info";
        leaf flag-id {
            type uint8;
            mandatory true;
            description "operator single flag id";
        }
        leaf flag-value{
            type boolean;
            mandatory true;
            description "operator single flag value";
        }
    }
}

container operator-option-ipv6-prefix {
    if-feature operator-op-ipv6-prefix;
    presence "Enable this option";
    description "operator ipv6 prefix option";
    reference "RFC7227: Guidelines for Creating New DHCPv6
        Options";
    list operator-ipv6-prefix {
        key operator-ipv6-prefix-id;
        description "operator ipv6 prefix info";
        leaf operator-ipv6-prefix-id {
            type uint8;
            mandatory true;
            description "operator ipv6 prefix id";
        }
        leaf operator-ipv6-prefix6-len {
            type uint8;
            mandatory true;
            description "operator ipv6 prefix length";
        }
        leaf operator-ipv6-prefix {
```



```
        type inet:ipv6-prefix;
        mandatory true;
        description "operator ipv6 prefix";
    }
}

container operator-option-int32 {
    if-feature operator-op-int32;
    presence "Enable this option";
    description "operator integer 32 option";
    reference "RFC7227: Guidelines for Creating New DHCPv6
        Options";
    list int32val {
        key int32val-id;
        description "operator integer 32 info";
        leaf int32val-id {
            type uint8;
            mandatory true;
            description "operator integer 32 id";
        }
        leaf int32val {
            type uint32;
            mandatory true;
            description "operator integer 32 value";
        }
    }
}

container operator-option-int16 {
    if-feature operator-op-int16;
    presence "Enable this option";
    description "operator integer 16 option";
    reference "RFC7227: Guidelines for Creating New DHCPv6
        Options";
    list int16val {
        key int16val-id;
        description "operator integer 16 info";
        leaf int16val-id {
            type uint8;
            mandatory true;
            description "operator integer 16 id";
        }
        leaf int16val {
            type uint16;
            mandatory true;
            description "operator integer 16 value";
        }
    }
}
```



```
    }
  }

  container operator-option-int8 {
    if-feature operator-op-int8;
    presence "Enable this option";
    description "operator integer 8 option";
    reference "RFC7227: Guidelines for Creating New DHCPv6 Options";
    list int8val {
      key int8val-id;
      description "operator integer 8 info";
      leaf int8val-id {
        type uint8;
        mandatory true;
        description "operator integer 8 id";
      }
      leaf int8val {
        type uint8;
        mandatory true;
        description "operator integer 8 value";
      }
    }
  }

  container operator-option-uri {
    if-feature operator-op-uri;
    presence "Enable this option";
    description "operator uri option";
    reference "RFC7227: Guidelines for Creating New DHCPv6 Options";
    list uri {
      key uri-id;
      description "operator uri info";
      leaf uri-id {
        type uint8;
        mandatory true;
        description "operator uri id";
      }
      leaf uri {
        type string;
        mandatory true;
        description "operator uri value";
      }
    }
  }

  container operator-option-textstring {
    if-feature operator-op-textstring;
```



```
presence "Enable this option";
description "operator itext string option";
reference "RFC7227: Guidelines for Creating New DHCPv6 Options";
list textstring{
  key textstring-id;
  description "operator text string info";
  leaf textstring-id {
    type uint8;
    mandatory true;
    description "operator text string id";
  }
  leaf textstring {
    type string;
    mandatory true;
    description "operator text string value";
  }
}

container operator-option-var-data {
  if-feature operator-op-var-data;
  presence "Enable this option";
  description "operator variable length data option";
  reference "RFC7227: Guidelines for Creating New DHCPv6 Options";
  list int32val {
    key var-data-id;
    description "operator ivariable length data info";
    leaf var-data-id {
      type uint8;
      mandatory true;
      description "operator variable length id";
    }
    leaf var-data {
      type binary;
      mandatory true;
      description "operator variable length value";
    }
  }
}

container operator-option-dns-wire {
  if-feature operator-op-dns-wire;
  presence "Enable this option";
  description "operator dns wire format domain name list option";
  reference "RFC7227: Guidelines for Creating New DHCPv6 Options";
  list operator-option-dns-wire {
    key operator-option-dns-wire-id;
```



```
        description "operator dns wire format info";
        leaf operator-option-dns-wire-id {
            type uint8;
            mandatory true;
            description "operator dns wire format id";
        }
        leaf operator-option-dns-wire{
            type binary;
            mandatory true;
            description "operator dns wire format value";
        }
    }
}
```

<CODE ENDS>

3.5. DHCPv6 Types YANG Model

This module imports typedefs from [[RFC6991](#)].

```
<CODE BEGINS> file "ietf-dhcpv6-types.yang"
module ietf-dhcpv6-types {
    yang-version 1.1;
    namespace "urn:ietf:params:xml:ns:yang:ietf-dhcpv6-types";
    prefix "dhcpv6-types";

    import ietf-inet-types {
        prefix inet;
    }
    import ietf-yang-types {
        prefix yang;
    }

    organization "DHC WG";
    contact
        "cuiyong@tsinghua.edu.cn
        lh.sunlinh@gmail.com
        ian.farrer@telekom.de
        sladjana.zechlin@telekom.de
        hezihao9512@gmail.com";

    description "This model defines a YANG data model that can be
        used to define some commonly used DHCPv6 types";

    revision 2018-09-04 {
```



```
    description "";
    reference "I-D: draft-ietf-dhc-dhcpv6-yang";
}

revision 2018-01-30 {
    description "Initial revision";
    reference "I-D: draft-ietf-dhc-dhcpv6-yang";
}

/*
 * Grouping
 */
grouping vendor-infor {
    description "Vendor information.";
    container vendor-info {
        description "";
        leaf ent-num {
            type uint32;
            mandatory true;
            description "enterprise number";
        }
        leaf-list data {
            type string;
            description "specific vendor info";
        }
    }
}

grouping duid {
    description
        "Each server and client has only one DUID (DHCP Unique Identifier).
        The DUID here identifies a unique DHCPv6 server for clients. DUID
        consists of a two-octet type field and an arbitrary length (no more
        than 128 bytes) content field. Currently there are four defined types
        of DUIDs in RFC3315 and RFC6355 - DUID-LLT, DUID-EN, DUID-LL and
        DUID-UUID. DUID-Uknown represents those unconventional DUIDs.";
    reference "RFC3315: Section 9 and RFC6355: Section 4";
    leaf type-code {
        type uint16;
        default 65535;
        description "Type code of this DUID";
    }
    choice duid-type {
        default duid-unknown;
        description "Selects the format for the DUID.";
        case duid-llt {
            description "DUID Based on Link-layer Address Plus Time
                (Type 1 - DUID-LLT)";
```



```
reference "RFC3315 Section 9.2";
leaf duid-llt-hardware-type {
    type uint16;
    description "Hardware type as assigned by IANA (RFC826).";
}
leaf duid-llt-time {
    type yang:timeticks;
    description "The time value is the time that the DUID is
generated represented in seconds since midnight (UTC),
January 1, 2000, modulo 2^32.";
}
leaf duid-llt-link-layer-addr {
    type yang:mac-address;
    description "Link-layer address as described in RFC2464";
}
}
case duid-en {
    description "DUID Assigned by Vendor Based on Enterprise Number
(Type 2 - DUID-EN)";
    reference "RFC3315 Section 9.3";
    leaf duid-en-enterprise-number {
        type uint32;
        description "Vendor's registered Private Enterprise Number as
maintained by IANA";
    }
    leaf duid-en-identifier {
        type string;
        description "Identifier, unique to the device that is
using it";
    }
}
case duid-ll {
    description "DUID Based on Link-layer Address (Type 3 - DUID-LL)";
    reference "RFC3315 Section 9.4";
    leaf duid-ll-hardware-type {
        type uint16;
        description "Hardware type as assigned by IANA (RFC826).";
    }
    leaf duid-ll-link-layer-addr {
        type yang:mac-address;
        description "Link-layer address as described in RFC2464";
    }
}
case duid-uuid {
    description "DUID Based on Universally Unique Identifier
(Type 4 - DUID-UUID)";
    reference "RFC6335 Definition of the UUID-Based Unique Identifier";
    leaf uuid {
```



```
        type yang:uuid;
        description "A Universally Unique Identifier in the string
            representation defined in RFC 4122. The canonical
            representation uses lowercase characters";
    }
}
case duid-unknown {
    description "DUID based on free raw bytes";
    leaf data {
        type binary;
        description "The bits to be used as the identifier";
    }
}
}
}

grouping portset-para {
    description "portset parameters";
    container port-parameter {
        description "port parameter";
        leaf offset {
            type uint8;
            mandatory true;
            description "offset in a port set";
        }
        leaf psid-len {
            type uint8;
            mandatory true;
            description "length of a psid";
        }
        leaf psid {
            type uint16;
            mandatory true;
            description "psid value";
        }
    }
}

grouping iaaid {
    description "IA is a construct through which a server and a
        client can identify, group, and manage a set of related IPv6
        addresses. The key of the list is a 4-byte number IAID defined
        in [RFC3315].";
    list identity-association {
        config "false";
        description "IA";
        leaf iaaid {
            type uint32;
```



```
        mandatory true;
        description "IAID";
    }
    leaf ia-type {
        type string;
        mandatory true;
        description "IA type";
    }
    leaf-list ipv6-addr {
        type inet:ipv6-address;
        description "ipv6 address";
    }
    leaf-list ipv6-prefix {
        type inet:ipv6-prefix;
        description "ipv6 prefix";
    }
    leaf-list prefix-length {
        type uint8;
        description "ipv6 prefix length";
    }
    leaf t1-time {
        type yang:timeticks;
        mandatory true;
        description "t1 time";
    }
    leaf t2-time {
        type yang:timeticks;
        mandatory true;
        description "t2 time";
    }
    leaf preferred-lifetime {
        type yang:timeticks;
        mandatory true;
        description "preferred lifetime";
    }
    leaf valid-lifetime {
        type yang:timeticks;
        mandatory true;
        description "valid lifetime";
    }
}
}
}
<CODE ENDS>
```


4. Security Considerations (TBD)

TBD

5. IANA Considerations (TBD)

This document registers the following YANG modules in the "YANG Module Names" registry [[RFC6020](#)].

```
name:          ietf-dhcpv6
namespace:     urn:ietf:params:xml:ns:yang:ietf-dhcpv6
prefix:        dhcpv6
reference:     TBD
```

6. Acknowledgements

The authors would like to thank Qi Sun, Lishan Li, Sladjana Zoric, Tomek Mrugalski, Marcin Siodelski, Bernie Volz and Bing Liu for their valuable comments and contributions to this work.

7. Contributors

The following individuals contributed to this effort:

Hao Wang
Tsinghua University
Beijing 100084
P.R.China
Phone: +86-10-6278-5822
Email: wangh13@mails.tsinghua.edu.cn

Ted Lemon
Nomium, Inc
950 Charter St.
Redwood City, CA 94043
USA
Email: Ted.Lemon@nomium.com

Bernie Volz
Cisco Systems, Inc.
1414 Massachusetts Ave
Boxborough, MA 01719
USA
Email: volz@cisco.com

8. References

8.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
- [RFC3315] Droms, R., Ed., Bound, J., Volz, B., Lemon, T., Perkins, C., and M. Carney, "Dynamic Host Configuration Protocol for IPv6 (DHCPv6)", [RFC 3315](#), DOI 10.17487/RFC3315, July 2003, <<https://www.rfc-editor.org/info/rfc3315>>.
- [RFC3633] Troan, O. and R. Droms, "IPv6 Prefix Options for Dynamic Host Configuration Protocol (DHCP) version 6", [RFC 3633](#), DOI 10.17487/RFC3633, December 2003, <<https://www.rfc-editor.org/info/rfc3633>>.
- [RFC6020] Bjorklund, M., Ed., "YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)", [RFC 6020](#), DOI 10.17487/RFC6020, October 2010, <<https://www.rfc-editor.org/info/rfc6020>>.
- [RFC6087] Bierman, A., "Guidelines for Authors and Reviewers of YANG Data Model Documents", [RFC 6087](#), DOI 10.17487/RFC6087, January 2011, <<https://www.rfc-editor.org/info/rfc6087>>.
- [RFC6355] Narten, T. and J. Johnson, "Definition of the UUID-Based DHCPv6 Unique Identifier (DUID-UUID)", [RFC 6355](#), DOI 10.17487/RFC6355, August 2011, <<https://www.rfc-editor.org/info/rfc6355>>.
- [RFC6991] Schoenwaelder, J., Ed., "Common YANG Data Types", [RFC 6991](#), DOI 10.17487/RFC6991, July 2013, <<https://www.rfc-editor.org/info/rfc6991>>.
- [RFC7223] Bjorklund, M., "A YANG Data Model for Interface Management", [RFC 7223](#), DOI 10.17487/RFC7223, May 2014, <<https://www.rfc-editor.org/info/rfc7223>>.

8.2. Informative References

- [I-D.ietf-netmod-yang-tree-diagrams] Bjorklund, M. and L. Berger, "YANG Tree Diagrams", [draft-ietf-netmod-yang-tree-diagrams-06](#) (work in progress), February 2018.

- [RFC3319] Schulzrinne, H. and B. Volz, "Dynamic Host Configuration Protocol (DHCPv6) Options for Session Initiation Protocol (SIP) Servers", [RFC 3319](#), DOI 10.17487/RFC3319, July 2003, <<https://www.rfc-editor.org/info/rfc3319>>.
- [RFC3646] Droms, R., Ed., "DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6)", [RFC 3646](#), DOI 10.17487/RFC3646, December 2003, <<https://www.rfc-editor.org/info/rfc3646>>.
- [RFC3898] Kalusivalingam, V., "Network Information Service (NIS) Configuration Options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6)", [RFC 3898](#), DOI 10.17487/RFC3898, October 2004, <<https://www.rfc-editor.org/info/rfc3898>>.
- [RFC4075] Kalusivalingam, V., "Simple Network Time Protocol (SNTP) Configuration Option for DHCPv6", [RFC 4075](#), DOI 10.17487/RFC4075, May 2005, <<https://www.rfc-editor.org/info/rfc4075>>.
- [RFC4242] Venaas, S., Chown, T., and B. Volz, "Information Refresh Time Option for Dynamic Host Configuration Protocol for IPv6 (DHCPv6)", [RFC 4242](#), DOI 10.17487/RFC4242, November 2005, <<https://www.rfc-editor.org/info/rfc4242>>.
- [RFC4704] Volz, B., "The Dynamic Host Configuration Protocol for IPv6 (DHCPv6) Client Fully Qualified Domain Name (FQDN) Option", [RFC 4704](#), DOI 10.17487/RFC4704, October 2006, <<https://www.rfc-editor.org/info/rfc4704>>.
- [RFC4833] Lear, E. and P. Eggert, "Timezone Options for DHCP", [RFC 4833](#), DOI 10.17487/RFC4833, April 2007, <<https://www.rfc-editor.org/info/rfc4833>>.
- [RFC5908] Gayraud, R. and B. Lourdelet, "Network Time Protocol (NTP) Server Option for DHCPv6", [RFC 5908](#), DOI 10.17487/RFC5908, June 2010, <<https://www.rfc-editor.org/info/rfc5908>>.
- [RFC5970] Huth, T., Freimann, J., Zimmer, V., and D. Thaler, "DHCPv6 Options for Network Boot", [RFC 5970](#), DOI 10.17487/RFC5970, September 2010, <<https://www.rfc-editor.org/info/rfc5970>>.
- [RFC6334] Hankins, D. and T. Mrugalski, "Dynamic Host Configuration Protocol for IPv6 (DHCPv6) Option for Dual-Stack Lite", [RFC 6334](#), DOI 10.17487/RFC6334, August 2011, <<https://www.rfc-editor.org/info/rfc6334>>.

- [RFC6422] Lemon, T. and Q. Wu, "Relay-Supplied DHCP Options", [RFC 6422](#), DOI 10.17487/RFC6422, December 2011, <<https://www.rfc-editor.org/info/rfc6422>>.
- [RFC6440] Zorn, G., Wu, Q., and Y. Wang, "The EAP Re-authentication Protocol (ERP) Local Domain Name DHCPv6 Option", [RFC 6440](#), DOI 10.17487/RFC6440, December 2011, <<https://www.rfc-editor.org/info/rfc6440>>.
- [RFC6784] Sakane, S. and M. Ishiyama, "Kerberos Options for DHCPv6", [RFC 6784](#), DOI 10.17487/RFC6784, November 2012, <<https://www.rfc-editor.org/info/rfc6784>>.
- [RFC6939] Halwasia, G., Bhandari, S., and W. Dec, "Client Link-Layer Address Option in DHCPv6", [RFC 6939](#), DOI 10.17487/RFC6939, May 2013, <<https://www.rfc-editor.org/info/rfc6939>>.
- [RFC7078] Matsumoto, A., Fujisaki, T., and T. Chown, "Distributing Address Selection Policy Using DHCPv6", [RFC 7078](#), DOI 10.17487/RFC7078, January 2014, <<https://www.rfc-editor.org/info/rfc7078>>.
- [RFC7083] Droms, R., "Modification to Default Values of SOL_MAX_RT and INF_MAX_RT", [RFC 7083](#), DOI 10.17487/RFC7083, November 2013, <<https://www.rfc-editor.org/info/rfc7083>>.
- [RFC7227] Hankins, D., Mrugalski, T., Siodelski, M., Jiang, S., and S. Krishnan, "Guidelines for Creating New DHCPv6 Options", [BCP 187](#), [RFC 7227](#), DOI 10.17487/RFC7227, May 2014, <<https://www.rfc-editor.org/info/rfc7227>>.
- [RFC7291] Boucadair, M., Penno, R., and D. Wing, "DHCP Options for the Port Control Protocol (PCP)", [RFC 7291](#), DOI 10.17487/RFC7291, July 2014, <<https://www.rfc-editor.org/info/rfc7291>>.
- [RFC7598] Mrugalski, T., Troan, O., Farrer, I., Perreault, S., Dec, W., Bao, C., Yeh, L., and X. Deng, "DHCPv6 Options for Configuration of Software Address and Port-Mapped Clients", [RFC 7598](#), DOI 10.17487/RFC7598, July 2015, <<https://www.rfc-editor.org/info/rfc7598>>.

Authors' Addresses

Yong Cui
Tsinghua University
Beijing 100084
P.R.China

Phone: +86-10-6260-3059
Email: cuiyong@tsinghua.edu.cn

Linhui Sun
Tsinghua University
Beijing 100084
P.R.China

Phone: +86-10-6278-5822
Email: lh.sunlinh@gmail.com

Ian Farrer
Deutsche Telekom AG
CTO-ATI, Landgrabenweg 151
Bonn, NRW 53227
Germany

Email: ian.farrer@telekom.de

Sladjana Zechlin
Deutsche Telekom AG
CTO-IPT, Landgrabenweg 151
Bonn, NRW 53227
Germany

Email: sladjana.zechlin@telekom.de

Zihao He
Tsinghua University
Beijing 100084
P.R.China

Phone: +86-10-6278-5822
Email: hezihao9512@gmail.com

