



Next-Gen DHCP

N3K Expert Webinar Series

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Housekeeping

- Timing, Schedule, Q&A Session
- Online Etiquette (microphones, distracting activities)
- Recording and Privacy



First of all

	Today's Webinar
	ISC Webinar Series
	ISC Hands-on Training

Kea DHCP

- Modern **Open Source** DHCPv4 and DHCPv6 Server
- **Options** can be configured at usual Levels
 - Global, Class, Subnet, Pool, Reservation
 - Includes vendor-specific and custom Options
- **Modular** Design with optional **Database Backend**
- Management **API** (JSON, REST)
- **Extension Libraries** to the Core Kea System (Hooks)
- Configuration Files defined in extended **JSON** Format
- Officially supported on various **Linux** Platforms¹
- Various **High-Availability** Capabilities

¹<https://kea.readthedocs.io/en/latest/arm/intro.html#supported-platforms>

Kea DHCP Modules¹

<code>keactrl</code>	start, stop, configure and report Status of Kea
<code>kea-dhcp4</code>	DHCPv4 Server Process
<code>kea-dhcp6</code>	DHCPv6 Server Process
<code>kea-dhcp-ddns</code>	DHCP dynamic DNS Process
<code>kea-admin</code>	Tool for Database Backend Maintenance
<code>kea-lfc</code>	provides persistent Storage for memfile Database Backend
<code>kea-ctrl-agent</code>	RESTful Control Interface for Management
<code>kea-netconf</code>	YANG/NETCONF Interface
<code>kea-shell</code>	connect to Control Agent
<code>perfdhcp</code>	DHCP Benchmarking Tool

¹<https://kea.readthedocs.io/en/latest/arm/intro.html#kea-software>

Kea DHCP Configuration¹

<code>keactrl.conf</code>	keactrl Script (not in JSON)
<code>kea-dhcp4.conf</code>	Kea DHCPv4 Server
<code>kea-dhcp6.conf</code>	Kea DHCPv6 Server
<code>kea-dhcp-ddns.conf</code>	Kea dynamic DNS Updater
<code>kea-ctrl-agent.conf</code>	Kea Control Agent

¹<https://kea.readthedocs.io/en/latest/arm/quickstart.html>

Kea Control Plane

- Start, stop, configure & report Status with `keactrl` (or `systemctl`)
- `keactrl.conf` enables and disables Modules (cf. slide [5](#))

```
root@mm-centos7-kea:~# ssh root@10.0.187.239 - 56x32
# Location of Kea configuration files.
kea_dhcp4_config_file=/etc/kea/kea-dhcp4.conf
kea_dhcp6_config_file=/etc/kea/kea-dhcp6.conf
kea_dhcp_ddns_config_file=/etc/kea/kea-dhcp-ddns.conf
kea_ctrl_agent_config_file=/etc/kea/kea-ctrl-agent.conf
kea_netconf_config_file=/etc/kea/kea-netconf.conf

# Location of Kea binaries.
exec_prefix=/usr
dhcp4_srv=/usr/sbin/kea-dhcp4
dhcp6_srv=/usr/sbin/kea-dhcp6
dhcp_ddns_srv=/usr/sbin/kea-dhcp-ddns
ctrl_agent_srv=/usr/sbin/kea-ctrl-agent
netconf_srv=/usr/sbin/kea-netconf

# Start DHCPv4 server?
dhcp4=yes

# Start DHCPv6 server?
dhcp6=yes

# Start DHCP DDNS server?
dhcp_ddns=no

# Start Control Agent?
ctrl_agent=yes

# Start Netconf?
netconf=no

# Be verbose?
kea_verbose=no
```

Basic Kea DHCPv6 configuration (kea-dhcp6.conf)

```
myPro:Next-Gen_DHCP andreas$ cat kea-dhcp6.conf
{ "Dhcp6": {
  "valid-lifetime": 4000, "renew-timer": 1000, "rebind-timer": 2000, "preferred-lifetime": 3000,
  "interfaces-config": { "interfaces": [ "eth0/2001:db8:cafe::547" ] },
  "lease-database": {
    "type": "memfile",
    "persist": true,
    "name": "/var/lib/kea/dhcp6.leases" },
  "subnet6": [ {
    "subnet": "2001:db8:1::/64",
    "pools": [ {
      "pool": "2001:db8:1::100-200",
      "option-data": [ {
        "name": "domain-search",
        "data": ["example.com", "example.net"]
      } ] ] } ],
    "loggers": [
      {
        "name": "kea-dhcp6",
        "output_options": [ { "output": "/var/log/kea/kea-dhcp6.log" } ],
        "severity": "INFO"
        "debuglevel": 0
      } ] ] } }
myPro:Next-Gen_DHCP andreas$
```


Kea DHCP Reservations

- Can be defined on a **global and Subnet Level**
- Can be **in-pool** or **out-of-pool**
- Client Leases based on
 - Hardware Address (**MAC**),
 - Unique ID (**DUID**),
 - Relay (DHCPv4),
 - Client ID (DHCPv4) or
 - Flex ID¹

```
"subnet6": [ {  
    "subnet": "2001:db8:1::/64",  
    "option-data": [ {  
        "name": "domain-search",  
        "data": ["example.com", "example.net"]  
    } ],  
    "reservations": [ {  
        "duid": "01:02:03:04:05:0A:0B:0C:0D:0E",  
        "ip-addresses": [ "2001:db8:1::250" ]  
        "hostname": "alice-laptop"  
    } ] } ],
```

¹Paid Support Contract

Kea DHCP Hooks



- **Extend basic Functions** via Hook Libraries
- Reduce Complexity and Attack Surface by **loading only needed Functions**
- **Open Source, 3rd Party** and **Premium** Hooks (ISC Support Subscription¹)

¹Paid Support Contract

Kea DHCP Hook Libraries (Open Source)¹

BOOTP

add BOOTP Support, as defined in RFC 1497

Flexible Option

compute Option Values instead of static configured Values

High Availability

Load-Balancing (active-active) or Hot-Standby (active-passive)

Lease Commands

provide unified Interface to manipulate Leases (memfile, MySQL, PostgreSQL)

*SQL Config. Backend

Database as Repository for Kea Configuration

Run Script

run external Scripts for specific packet-processing Hook Points

Statistics Commands

retrieve accurate DHCP Lease Statistics (e.g. shared lease database)

User Check

"known" or "registered" Users are assigned to unrestricted Subnets

¹<https://kea.readthedocs.io/en/latest/arm/hooks.html#available-hook-libraries>

Kea DHCP Hook Libraries (Paid Support Contract)¹

Class Commands	add, update, delete & fetch Client Classes without Restart
Backend Commands	manage Configuration Information in a Database
DDNS Tuning	custom Behaviours related to dynamic DNS Updates on a per-client Basis
Flexible ID	define Expression for Combination of Options & Fields to identify a Client
Forensic Logging	detailed Logging of Lease Assignments & Renewals in a Set of Files
GSS-TSIG	add Support of GSS-TSIG to <code>kea-dhcp-ddns</code> to sign DNS Updates
Host Cache	cache Responses from other Hosts like Database Backends (e.g. RADIUS)
Host Commands	add, query & delete Host Reservations without Restart
Leasequery	add Leasequery Support, as defined in RFC 4388 & 5007
Limits	limit Response Rate per Client Class or per Subnet for <code>kea-dhcp4</code> & <code>kea-dhcp6</code>
RADIUS	interact with RADIUS Servers using Access and Accounting Mechanisms
RBAC	role-based Access Control Filtering of Commands for <code>kea-ctrl-agent</code>
Subnet Commands	add, update, delete & fetch Subnets without Restart

¹<https://kea.readthedocs.io/en/latest/arm/hooks.html#available-hook-libraries>

Kea Database Support

- Store Information & Configuration in **Database Backend** like
 - Lease Information,
 - Subnet and Option Definitions or
 - Global, Subnet and Pool Options
- **Easy Access** to Information & Configuration (e.g. via Scripts)
- High-Availability Capabilities through **Database Redundancy**
- Various supported Backends¹ (Memfile, MySQL, PostgreSQL)
- Database Backend Maintenance with `kea-admin` (cf. slide [5](#))
- Multiple Kea Instances use `server-tag` to share same Backend

¹<https://kea.readthedocs.io/en/latest/arm/admin.html#supported-backends>

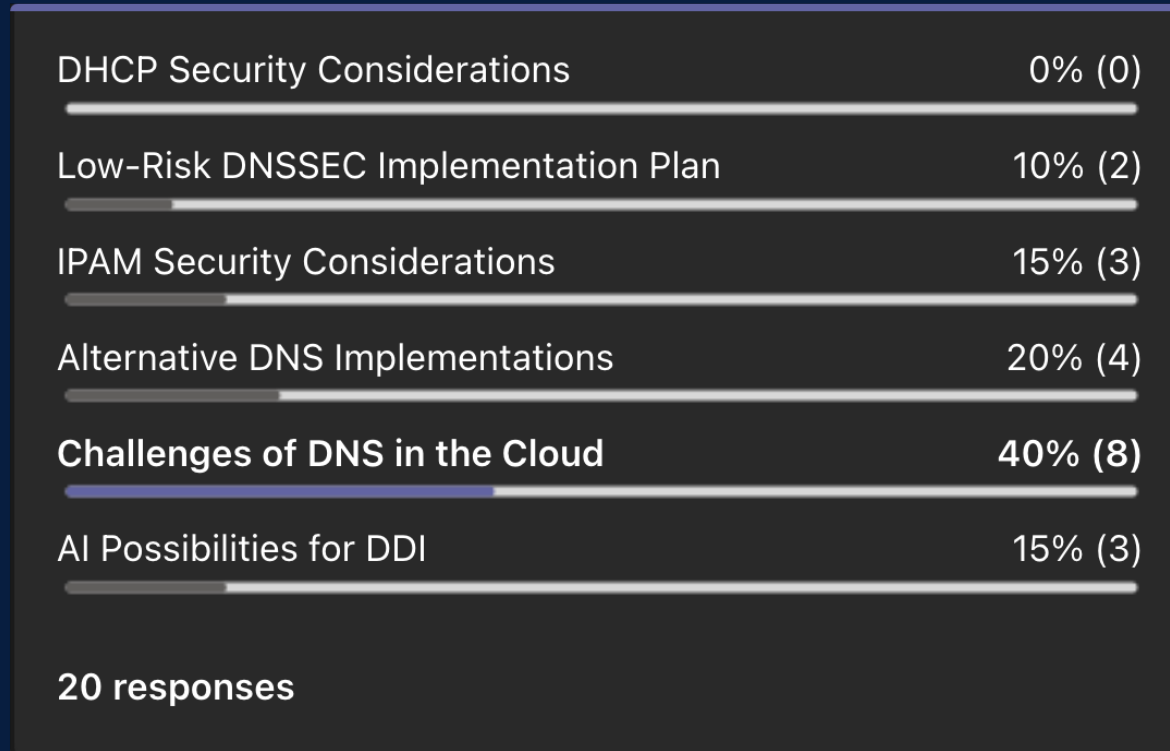
Kea High-Availability Capabilities

- DHCPv6 **Split Pool** & DHCPv6 **Shared Pool**
- **Pure static** DHCPv4 & DHCPv6
- Highly available **shared Database** Backend
- Feature-Rich **High-Availability Hook**

Kea High-Availability Hook

- **Load-Balancing**
 - All Servers active and return Leases
 - HA Protocol detects partner-down and takes over
- **Hot-Standby**
 - All Servers in sync but only one active and returns Leases
 - HA Protocol detects partner-down and takes over
- **Passive-Backup**
 - Active Server sends Lease Database Updates to Number of Backup Servers
 - Backup Servers not an active Part of the HA Setup
 - Backup Servers can be deployed in Addition to other HA Modes

What's next?



Greedy for more?

- ISC **Webinar Series** from 2020¹ and 2023²
- ISC **Training Classes**³
- Kea **Migration Assistant** (KeaMA)⁴

¹<https://www.isc.org/blogs/kea-webinar-series-2020/>

²<https://www.isc.org/blogs/kea-webinar-series-2023/>

³<https://www.isc.org/blogs/2022-training-classes/>

⁴<https://dhcp.isc.org/>



Thank you for your Time.



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