Extending Kea with Hooks

29 June 2016

Logistics

- Webinar is scheduled for 1 hour
- Webinar will contain slides, code walkthrough and videos demonstrating hooks in action.
- This session will be recorded and posted at https://www.isc.org/mission/webinars/
- Participants are muted to improve audio quality for everyone.
- We want questions! Please enter into the WebEx Q&A tab
  - We will try to answer questions at the end of the presentation.

Presenters

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DHCP Software Engineer

ISC

Previous Webinar

08 June 2016

Webinar: Getting Started with Kea
Eddy Winstead

Recording available at:
https://www.isc.org/mission/webinars/

What hooks are?

- Dynamically loaded libraries
- Customize your server to do anything you need in your deployment
- Have unrestricted access to the server data structures and functions
- Written by ISC, you or other users
- Written in C++
- Implement/use well defined and documented API

Terminology

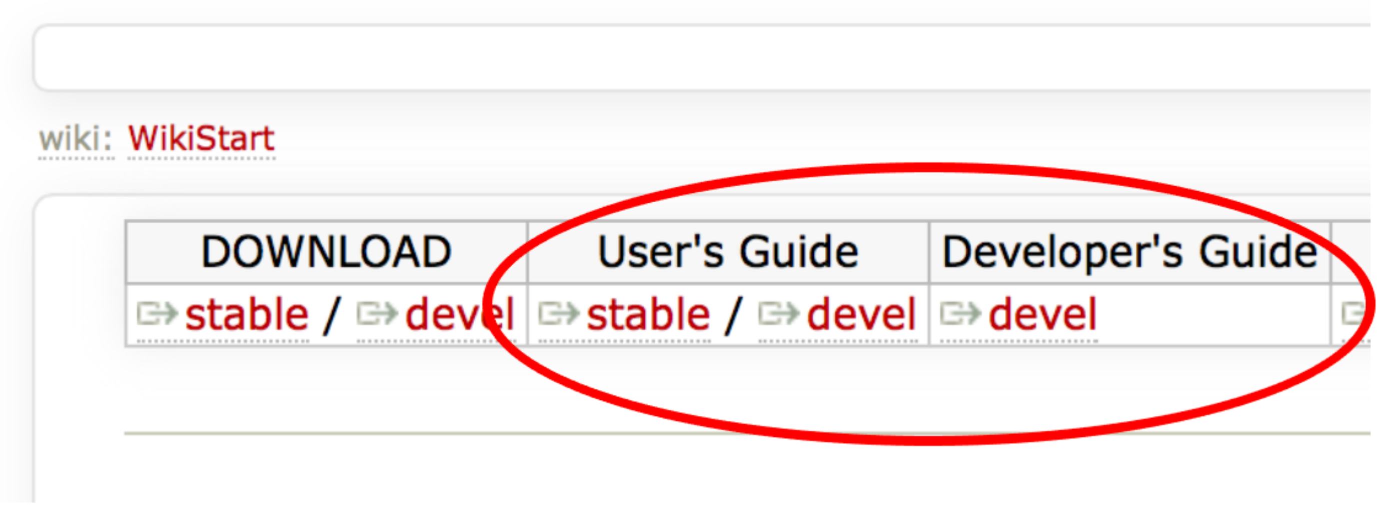
- Hook Point:
  - A place within Kea code where specific callout is invoked.
- Callout:
  - A function within hook library, invoked by the server at specific hook point.
- Hook Library:
  - A dynamically loaded library implementing selected callouts.

Documentation

- Kea User's Guide (How to **use** Hooks):
  - http://kea.isc.org/docs/kea-guide.html#hooks-libraries
- Kea Developer's Guide (How to **write** hooks):
  - http://git.kea.isc.org/~tester/kea/doxygen/df/d46/hooksdgDevelopersGuide.html

Documentation (cont.)

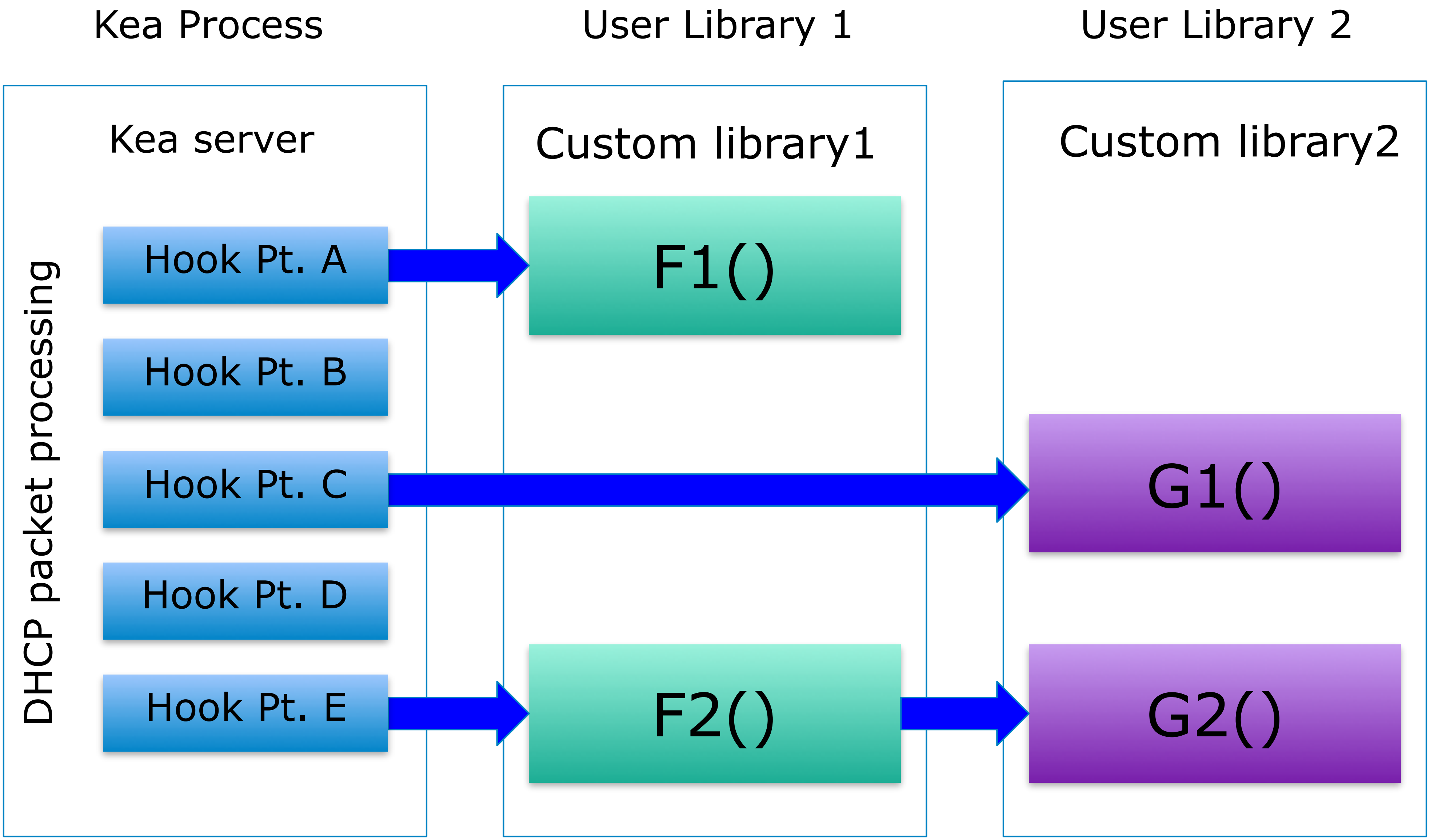
http://kea.isc.org/



wiki: WikiStart

DOWNLOAD	User's Guide	Developer's Guide
stable / devel	stable / devel	devel

Processing with Hooks



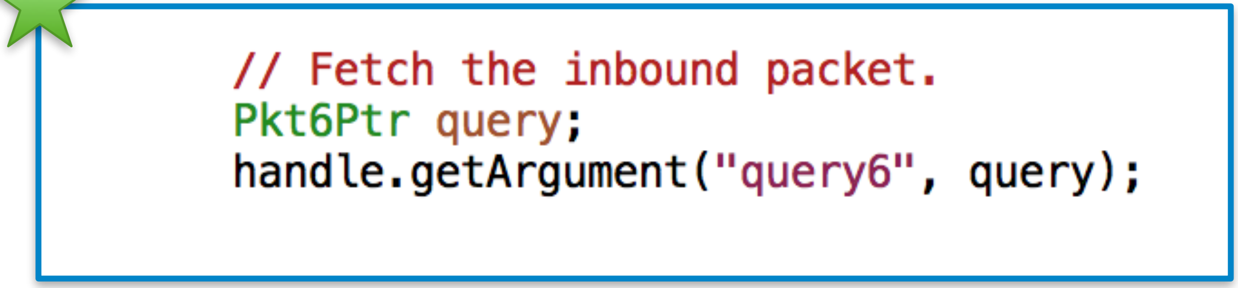
DHCPv6 Server Hooks

- buffer6_receive - after receiving data on interface
- **pkt6_receive** - after parsing DHCP message
- **subnet6_select** - after selecting a subnet
- lease6_select - when lease has been selected
- lease6_renew - during lease renewal
- lease6_decline - during declining a lease
- lease6_release - during releasing a lease
- **pkt6_send** - before creating wire format of response
- buffer6_send - after creating wire format of response
- lease6_expire - when lease is found expired
- lease6_recover - when declined lease is no longer declined

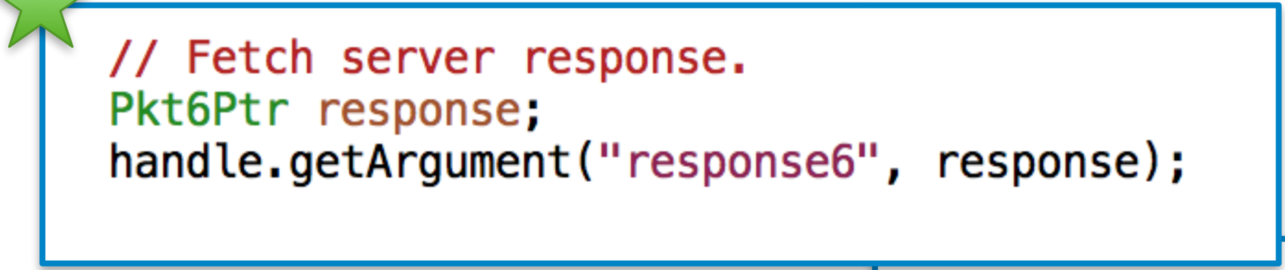
Access to Parameters in Callouts

- A reference to „CalloutHandle" object is passed to each callout.
- CalloutHandle provides access to „context" and arguments.
- At each hook point, the callouts receive well known set of arguments/objects.
- Objects to be retrieved or modified are accessed using well known names provided as strings.
- The Kea Developer's Guide specifies arguments for each hook point.

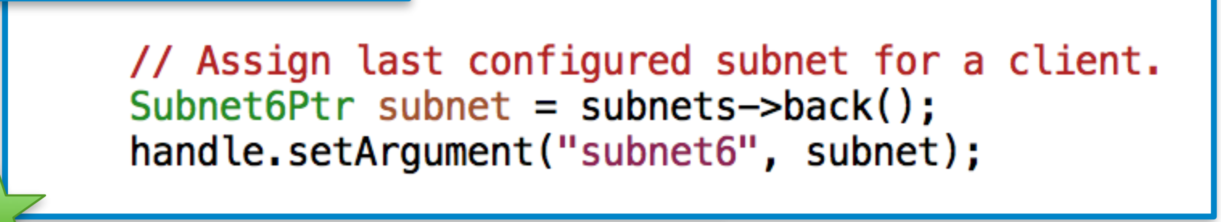
Examples: Access Parameters



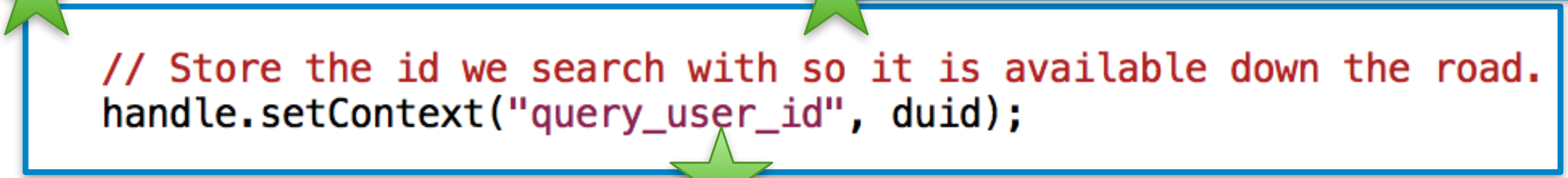
```
// Fetch the inbound packet.
Pkt6Ptr query;
handle.getArgument("query6", query);
```



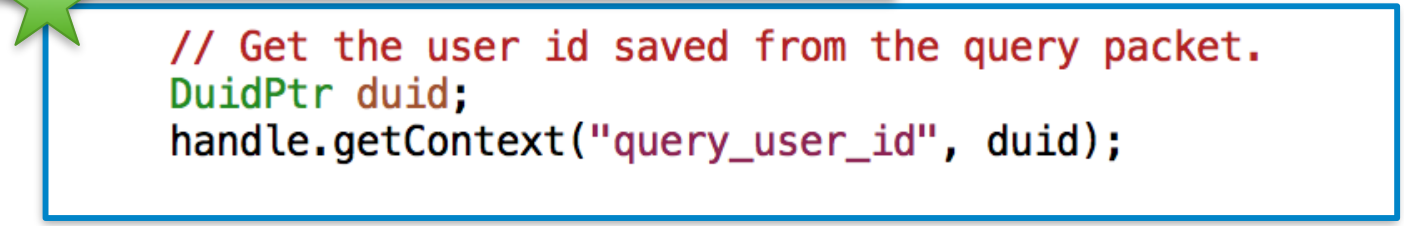
```
// Fetch server response.
Pkt6Ptr response;
handle.getArgument("response6", response);
```



```
// Assign last configured subnet for a client.
Subnet6Ptr subnet = subnets->back();
handle.setArgument("subnet6", subnet);
```



```
// Store the id we search with so it is available down the road.
handle.setContext("query_user_id", duid);
```



```
// Get the user id saved from the query packet.
DuidPtr duid;
handle.getContext("query_user_id", duid);
```

The Next Step Status

- Callout returns status code to indicate what the server's next step should be:
  - NEXT_STEP_CONTINUE - continue processing
  - NEXT_STEP_SKIP - skip next processing step (Developer's Guide contains detailed explanation for each defined hook point)
  - NEXT_STEP_DROP - drop the packet

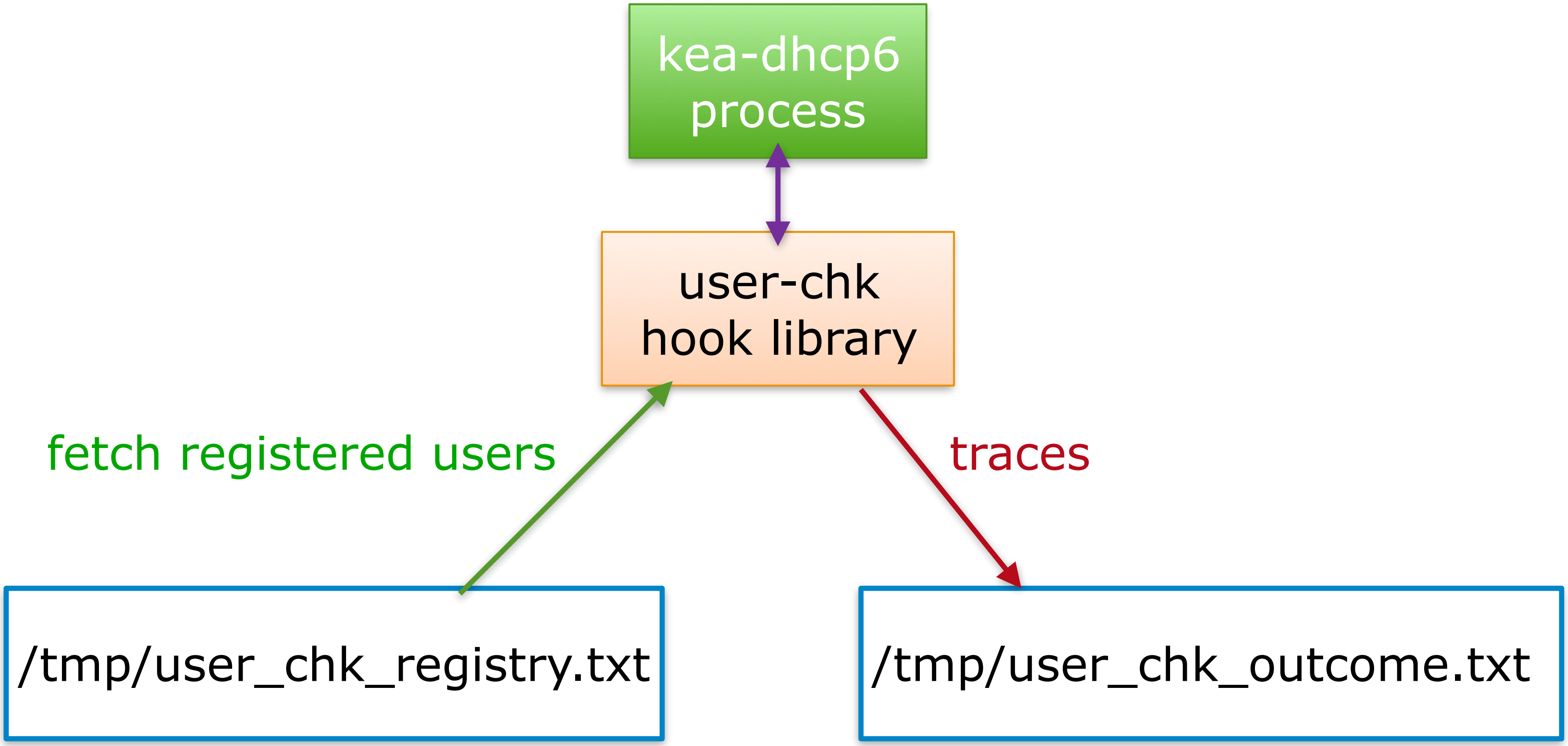
Hooks Supplied with Kea

- Standard hook libraries are shipped with Kea code: <kea-sources>/src/hooks/dhcp/
- There is currently one hook library shipped with Kea sources: user_chk
- We'll use user_chk library to demonstrate how to implement hook library.

The „user_chk” Library

- Use external source of information to recognize registered and unregistered DHCP clients.
- Select different subnets for registered and unregistered clients.
- Create outcome file containing traces from subnet and address assignment.

The „user_chk” Library



kea-dhcp6 process

user-chk hook library

fetch registered users

traces

/tmp/user_chk_registry.txt

/tmp/user_chk_outcome.txt

Note 1: Both files must exist prior to loading the library!

Look into the code #1

- We will now look into the implementation of the pkt6_receive and the subnet6_select callouts.

Video 1

- Create „registry” and „outcome” files required by the user_chk library.
- Start the server.
- Client obtains address from the unprivileged subnet 3000::/64 because the client is not registered.
- Register the client. The Client should be assigned an address from the privileged subnet 2001:db8:1::/64.

Look into the code #2

- We will now look into the code of the pkt6_send callout.

Video 2

- Client is renewing its lease.
- Hook library overrides the bootfile option with the value specified in the registry file.
- The value in the registry is modified, the server should respond with a different value.
- The client is removed from the registry file and the server should respond with the default value specified in the configuration.

Look into the code #3

- We will see how easy it is to replace the „registration” with MySQL database.

Video 3

- Client renews and obtains the boot file option with the value of /tmp/v6bootfile.
- MySQL database contains a registration entry for the client and specifies the bootfile value /tmp/bootfile-from-mysql
- Introducing modification to the code to use MySQL database rather than the file.
- The bootfile value from MySQL is used.