

RIPE



Kea – modern DHCP server

Open Source and Sustainability

Tomek Mrugalski, ISC
tomasz@isc.org



What is Kea?

And why you may want to use it





If you never heard about Kea...

- Modern DHCPv4 and DHCPv6 server (1.0 in Dec 2015)
- Performance (1000s leases/sec)
- Scalable (millions of devices)
- No restarts after config changes
- Databases (CSV, MySQL, PostgreSQL, Cassandra)
- Hooks (3rd party libraries)
- REST management API
- Linux, BSDs, MacOS, ...
- Open source (MPL2)
- 1.2.0 just released (28 April 2017)





Let's compare!

	ISC DHCP	ISC Kea
Started	Prehistory (1995)	Recent (2011)
Code	Not adding anything big	Active development with tons of new features
Code repository	Internal, tarball published	github
Bug database	Internal, mail external	Public trac
Testing	~30 unit-tests	4000+ unit-tests Memory leak tests (valgrind) 700+ system tests Fuzz testing
Docs	Man pages	User's Guide (100+ pages) Developer's Guide
Logs	Fixed log message	Every possible log entry is documented and described
IPv6 readiness	IPv4 originally, IPv6 added later	IPv4 optional





Why migrate from ISC DHCP?

	ISC DHCP	ISC Kea
Performance	OK (with ramdisk tricks)	Great (many 1000s leases/sec)
Management	OMAPI (custom C interface)	JSON over REST API/http , JSON over Unix socket
Extensibility	Shell scripts (out only), configuration language	JSON everywhere, Hooks (C++), stable API
Configuration	Custom complex syntax (almost programming language)	JSON with optional DB storage for some elements (more to come)
Leases information	Custom	CSV, MySQL, PostgreSQL, Cassandra
Hosts information	Custom config	JSON, MySQL, PostgreSQL





Cool features :: DB

- Leases, host reservations in DB
 - CSV
 - MySQL or PostgreSQL
 - Cassandra*
- SQL data can be modified any time
- All changes applied instantly (no restart)
- Can fiddle with the DB directly or
- Use host commands (1.2) and subnets (1.3)



PostgreSQL



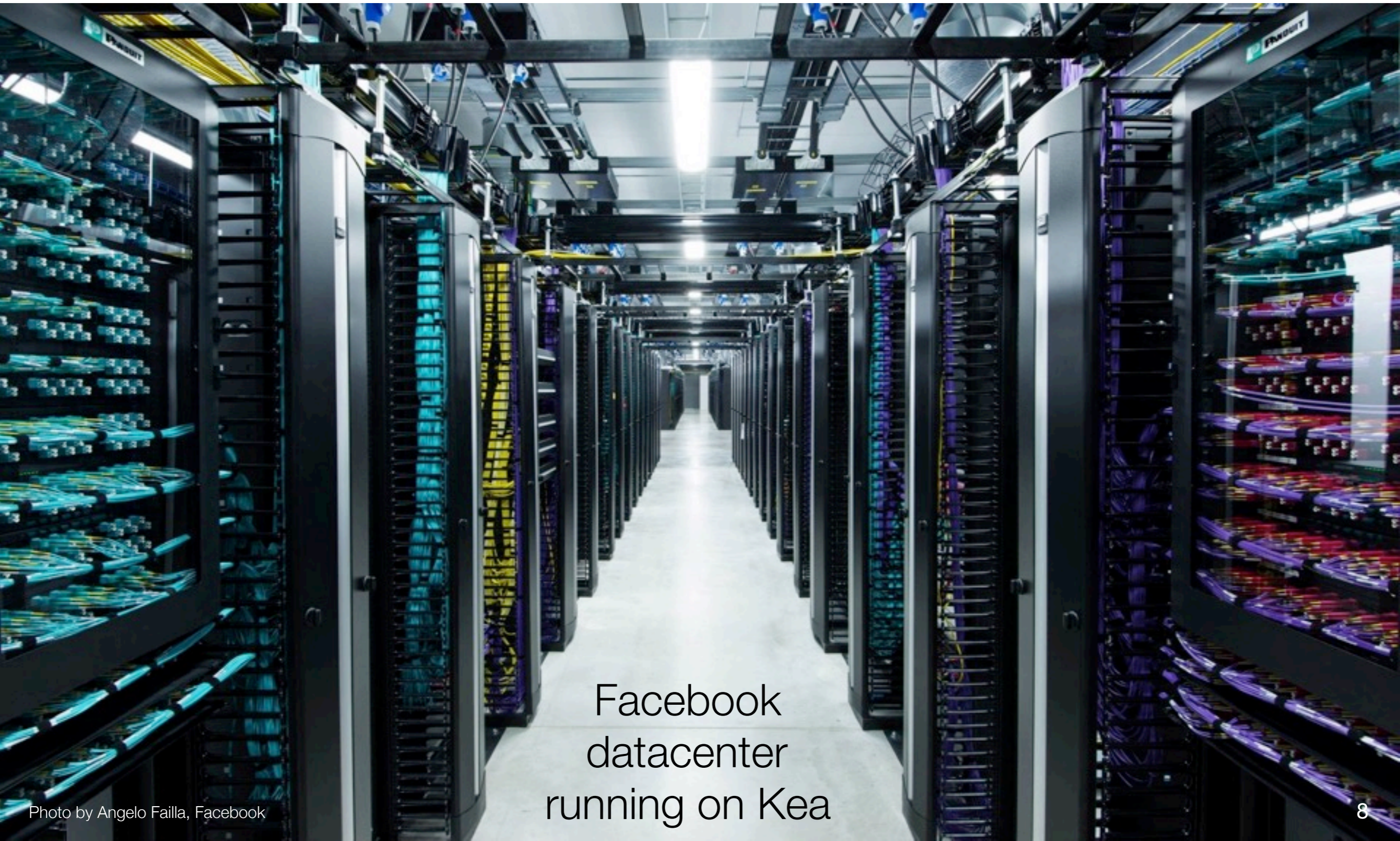


Cool features :: REST

- Command Channel (Unix socket, since 0.9.2)
- REST interface (http, since 1.2.0)
- JSON commands, JSON responses
 - kea-shell provided (python 2.x, 3.x example)
 - Trivial to use from any JSON/http capable env
- Commands:
 - config-get, config-set, config-test, config-write
 - reservation-get, reservation-add, reservation-del*
 - statistic-get, statistic-reset, statistic-get-all, statistic-reset-all, ...
 - leases-reclaim, list-commands, shutdown, version-get, build-report
- More to come every release



Cool features :: Hooks



Facebook
datacenter
running on Kea



Kea Roadmap

- REST interface
- Rewritten configuration handling
- Commands (config-set/get/test/write)

1.2
(Apr 2017)

Host Commands
Flexible Identifier

- Shared subnets
- Security for REST interface
- Lease commands
- ...

1.3
(Oct 2017)

Subnet Commands

- Multi-core support
- Better High Availability/Redundancy
- DB improvements
- **YOUR FEATURE HERE**

1.4
(spring 2018)

Open source

Premium

TBD



Open Source and Sustainability

How to properly fund OS?





Commercial quality software

- A small team (2 full time, with 2 more contributing) of experienced engineers
- A real, independent QA
 - 4000+ unit-tests, 700+ system tests
 - Run on ~20 systems
 - Valgrind, Coverity scan, other static analyzers
- Proper designs
 - Written Requirements, Designs, Implementation, Testing
- Very well documented
 - User's Guide (100+ pages, ~40 example configs)
 - Developer's Guide (code is well commented, all params documented)



Funding so far

- In development since 2011
- Had several custom development contracts
- Two sponsors (Comcast and Mozilla, thanks!)
- Very few support customers
- Sporadic personal contributions (thanks!)

But...

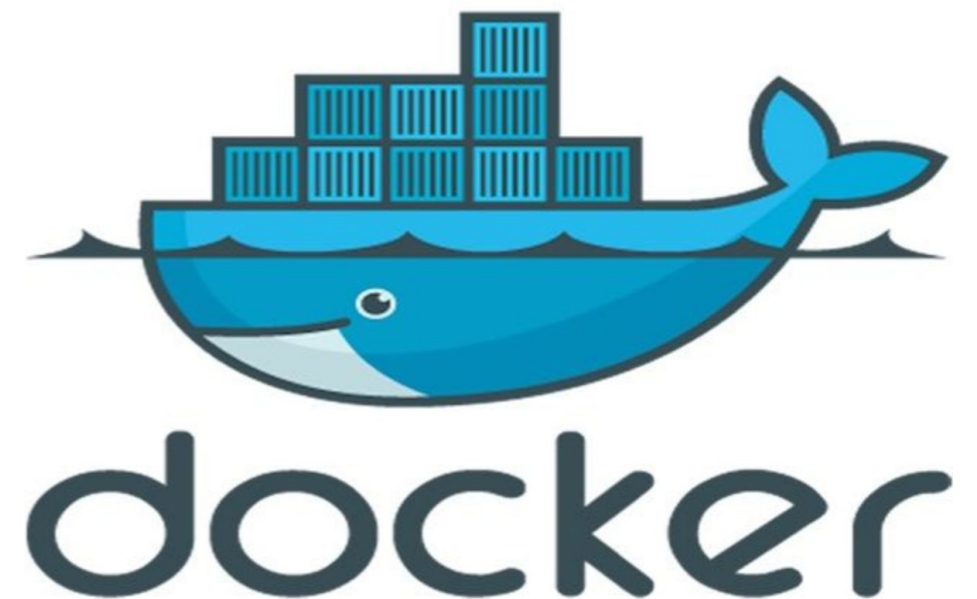
Most of the work was
internally funded by ISC





Funding Idea #1:: Kea 1.2.0 Docker

- Docker image with Kea + MySQL pre-configured
- Easy to deploy
- An experiment





Funding Idea #2 :: Premium features

- Kea is and will remain open source (MPL2, 478KLOC)
 - Provides support for hook libraries (~Apache module)
 - API is open (3rd party hook libs appearing now)
- Premium (EULA, 6.8KLOC)
 - Additional extra features
 - targeted for large deployments
 - A way to convince people to sign support contract
 - Yes, support contract = \$

isc.org/blogs/funding-kea/





Existing & Planned Hooks

1.2

- **User_chk** – example access control (open source)
- **Forensic Logging** – detailed audit trail for legal purposes
- **Flexible Identifier** – identify hosts by expression, e.g. `concat(relay4[2].hex, relay4[6].hex)`
- **Host Commands** – query, add and delete host reservations using REST interface

1.3

- **Subnet management** (add, get, update, delete)
- **Extra lease commands** (add, get, update, delete)

Open source

Premium





Hook Example

Flexible Identifier

How to identify hosts:

Open source

- MAC, duid, circuit-id, client-id

Premium

- Almost anything could be used (35 different expressions)
- Options (client, relay, vendor)
- Fixed fields
- Concat, substring
- Meta-data (interface name, src/dst IP, ...)

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol
1	0.000000	10.254.139.1	10.253.181.250	DHCP

```

Message type: Boot Request (1)
Hardware type: Ethernet (0x01)
Hardware address length: 6
Hops: 1
Transaction ID: 0x21fc01f8
Seconds elapsed: 0
  ▶ Bootp flags: 0x0000 (Unicast)
  Client IP address: 0.0.0.0
  Your (client) IP address: 0.0.0.0
  Next server IP address: 0.0.0.0
  Relay agent IP address: 10.254.139.1
  Client MAC address: ArrisGro_29:97:d0 (74:56:12:29:97:d0)
  Client hardware address padding: 00000000000000000000
  Server host name not given
  Boot file name not given
  Magic cookie: DHCP
  ▶ Option: (53) DHCP Message Type (Discover)
  ▶ Option: (60) Vendor class identifier
  ▶ Option: (0) Padding
  ▶ Option: (61) Client identifier
  ▶ Option: (125) V-I Vendor-specific Information
  ▶ Option: (43) Vendor-Specific Information (CableLabs)
  ▶ Option: (55) Parameter Request List
  ▶ Option: (82) Agent Information Option
    Length: 25
    ▶ Option 82 Suboption: (1) Agent Circuit ID
    ▶ Option 82 Suboption: (2) Agent Remote ID
    ▶ Option 82 Suboption: (9) Vendor-Specific Information
  ▶ Option: (255) End
  
```

01b0	00	25	01	01	26	02	00	40	27	01	01	2b	82	02	03	45	%.&..@'..+...E
01c0	43	4d	03	03	45	43	4d	04	18	33	34	34	37	35	38	30	CM..ECM. .3447580
01d0	33	33	36	30	39	30	37	32	35	30	31	30	31	32	30	31	33609072 50101201
01e0	35	05	03	35	2e	30	06	1d	53	42	5f	4b	4f	4d	4f	44	5..5.0.. SB_KOMOD
01f0	4f	2d	31	2e	30	2e	36	2e	31	30	2d	53	43	4d	30	30	0-1.0.6. 10-SCM00
0200	2d	4e	4f	53	48	07	1c	50	53	50	55	2d	42	6f	6f	74	-NOSH..P SPU-Boot
0210	28	32	35	43	4c	4b	29	20	31	2e	30	2e	31	32	2e	31	(25CLK) 1.0.12.1
0220	38	6d	33	08	06	30	30	32	30	34	30	09	06	53	42	36	8m3..002 040..SB6

Bootp/Dhcp option type (bootp.option.type), 132 bytes

concat(relay4[1].hex, relay4[2].hex)





Funding Idea #3 :: Kittiwake GUI

- Web interface using REST
- Focusing on typical ops first:
 - Monitor pool utilization
 - Add/delete host reservations
- Distribution/Licensing TBD
 - Freemium?
 - Paid app?
 - Extra benefit for customers?
- 1.0 planned in Autumn 2017
- Get in touch! We'll be looking for beta testers/your requirements

Import DHCP configuration		
id:	1	Subnet identifier
interface:		This subnet is selected for DHCP requests received on this interface
reservation-mode:	all	Defines whether in-pool, out of the pool or both types of reservations are supported
renew-timer:	900	Number of seconds since last lease renewal after which the client should renew
rebind-timer:	1800	Number of seconds since last successful lease renewal after which the client should attempt to renew
valid-lifetime:	4000	Lease lifetime

Subnets

Create new reservation

DHCP identifier type

Select type

DHCP identifier

e.g. A0:B1:C2:D3:E4:F5

Hostname

e.g. crane.example.org

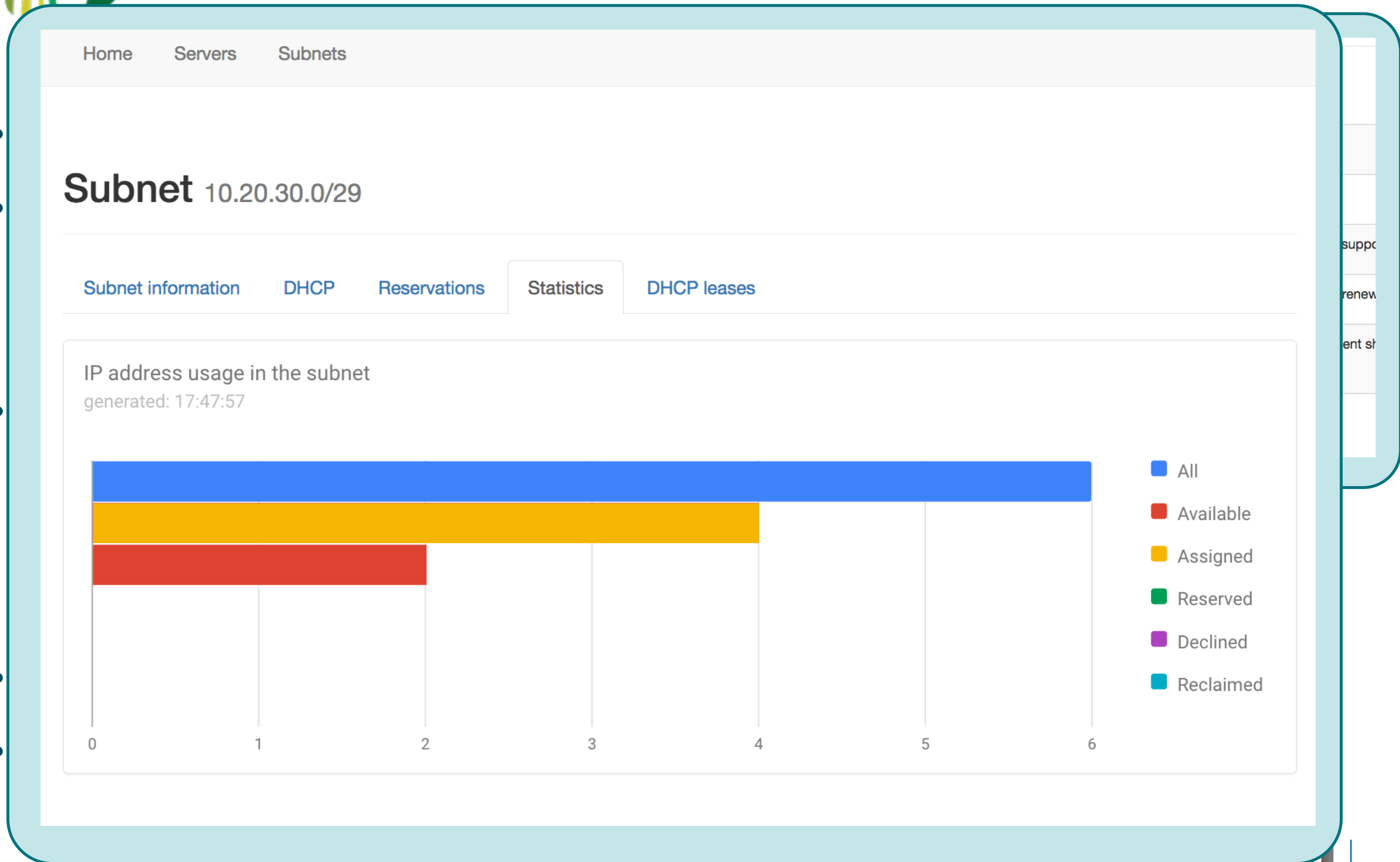
IPv4 address

e.g. 192.0.2.3

Close Save changes



Funding Idea #3 :: Kittiwake GUI





Funding Idea #4:: ISC DHCP to Kea migration

- Migration tool is in development
- ISC DHCP config is complex (80% cases)
- Trials will start soon
- Interested?
 - We're looking for configuration samples
 - Talk to us
- Revenue model TBD



Your thoughts
on those ideas?

Questions?

Suggestions?

