ISC KEA Performance

Wlodek Wencel, QA engineer
Eddy Winstead, Sr. Sales Engineer

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https://www.isc.org

Webinar will be recorded

Recording will be posted ~ couple days, on ISC's Youtube channel and on https://www.isc.org/presentations/

Questions - enter in Q&A or Chat panel, we will address these at the end

Webinar agenda

- When might you need higher performance?
- Previous performance tests
- Test set-up, methodology
- Results
- Plans for future testing
- Q&A

How much performance do you need?

Kea is not performance-constrained in most scenarios.

For example:

- 86,400 clients require only *2 LPS*
- assumptions: 24 hour lease duration, 12 hour renewal = 86400 DORA in 24 hours

of course, the renewals *won't* be evenly spaced

Who might need more performance?

- Unusually high number of clients requesting at once - e.g. rebooting scenario
- Unusually short lease - e.g. public wifi
- Database backends slow performance in general, so more performance there is good

Implementing Multithreading

Developing in 1.7 development branch

- Partially complete in 1.7.6
- Still working on mt support for hooks
- Releasing as 1.8 stable version when complete
- Aiming for 1.8 release in summer 2020
- This test measures impact of multithreading vs single threading

Kea Performance Baseline

Published performance results from Kea 1.4 - 1.5

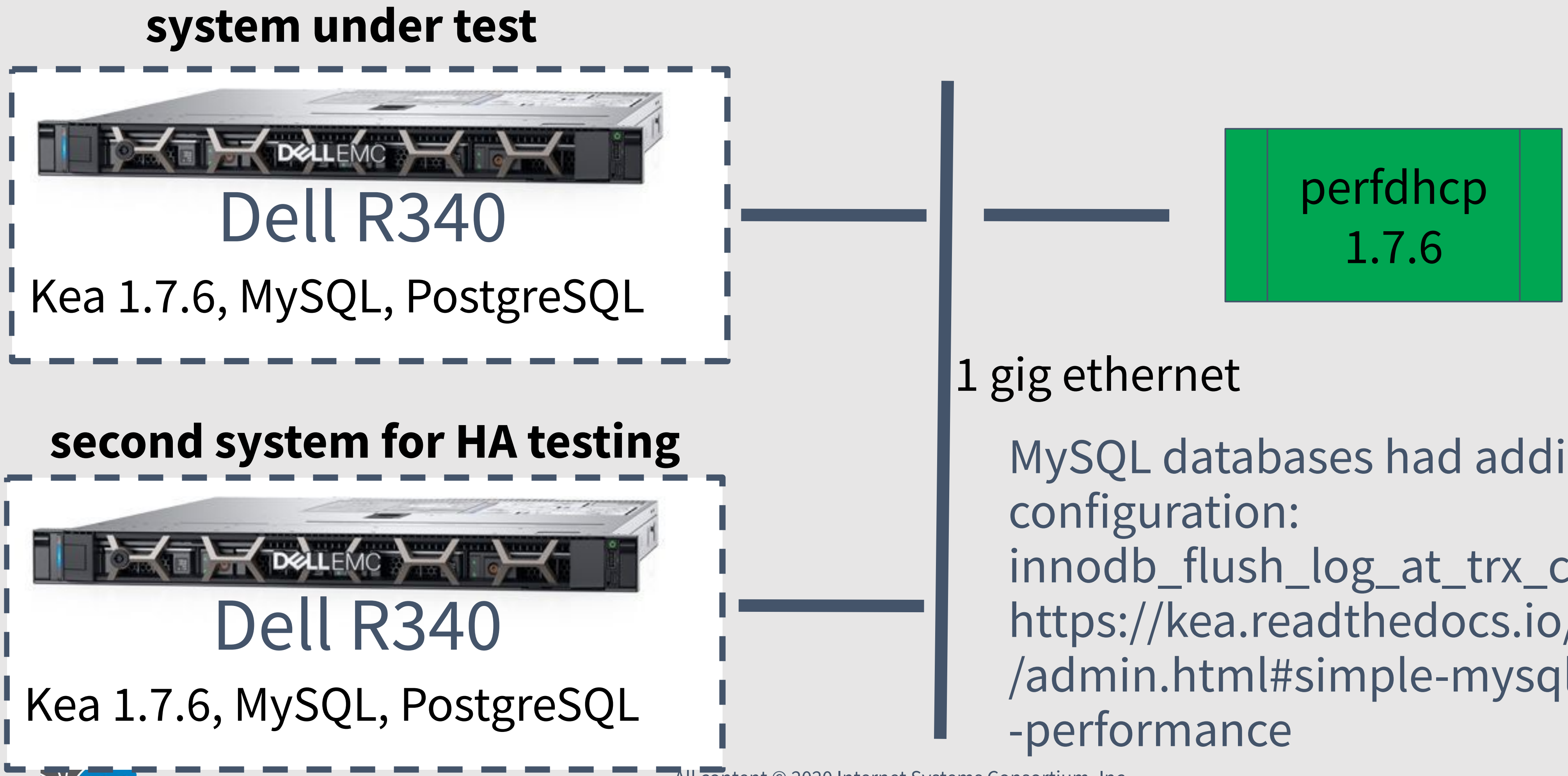
https://kb.isc.org/docs/kea-performance-tests-140-vs-150

Measured the gap between memfile and db backends.

NB: KB on performance considerations

https://kb.isc.org/docs/kea-performance-optimization

Testing Set up



system under test

Dell R340

Kea 1.7.6, MySQL, PostgreSQL

second system for HA testing

Dell R340

Kea 1.7.6, MySQL, PostgreSQL

1 gig ethernet

perfdhcp
1.7.6

MySQL databases had additional configuration: innodb_flush_log_at_trx_commit=2 https://kea.readthedocs.io/en/latest/arm/admin.html#simple-mysql-tweak-to-gain-performance

Test Platform details

- Kea servers are running on 2 Dell R340 servers:
  - CPU Intel Xeon E-2146G 3.5GHz 6 cores/12 threads
  - 64GB RAM
  - 3 x SSDs 446GB each in HW RAID-0 configuration (virtual disk size 1338GB)
  - Intel(R) 10GbE 2P X710 Adapter (2 ports)
  - OS - Ubuntu 18.04.4 LTS

Traffic generator

- perfdhcp - open source
- Included in Kea sources
  - enabled with configure time switch (--enable-perfdhcp)
- And in packages (all on Cloudsmith):
  - rpm - isc-kea
  - deb - isc-kea-admin
- Documentation included.

Kea configuration

- One subnet with one large pool
- No host reservations, no client classification, no options
- Functions are enabled by default are still enabled for tests - we use default values
- Lease lifetime is longer than test duration
- Every time starts ‘clean’
- Threads number differ in tests
- Databases are always local

Traffic details

- Just DORA/SARR (no renews, rebinds, releases)
- Each client requests an address once though entire test
- Client request does not include any extra options, only those essential to get an address
- This is not intended to be a ‘realistic’ example of a production scenario.

Test Design

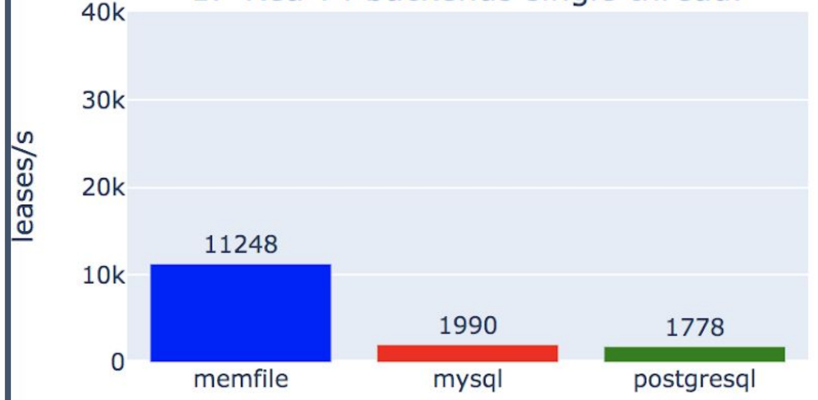
- Measure performance with 2.5% packet ‘drop rate’
- Packet is considered dropped when response is > 2 seconds
- We have two types of results:
    - lease rates (results are the average of middle 7 results of 9 test runs)
    - observing second by second how Kea works

Why 2.5% drop rate?

- calculated rate is used later for other, long running tests and:
    - if we use 0% drop rate it would not reveal cumulative /systematic problems
    - flooding is not helpful
- We tested at 1%, 1.5%, and didn’t see enough stability in the results
- With 2.5% drop rate, results were consistent and we thought this is an acceptable drop rate in production.

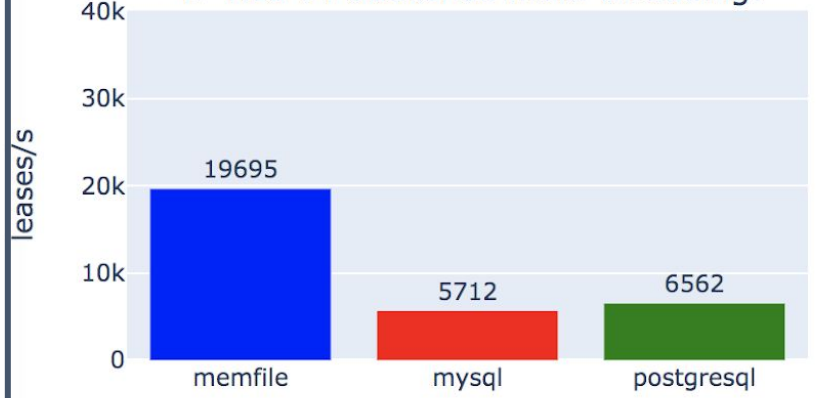
Basic results

1. Kea v4 backends single thread.

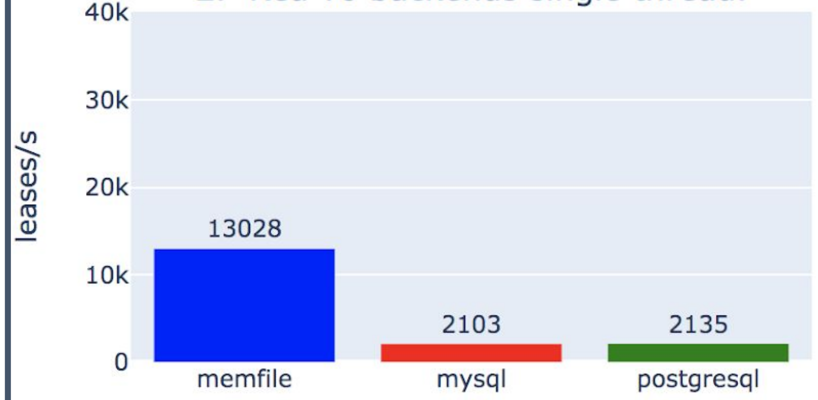


DHCPv4

4. Kea v4 backends multi threading.

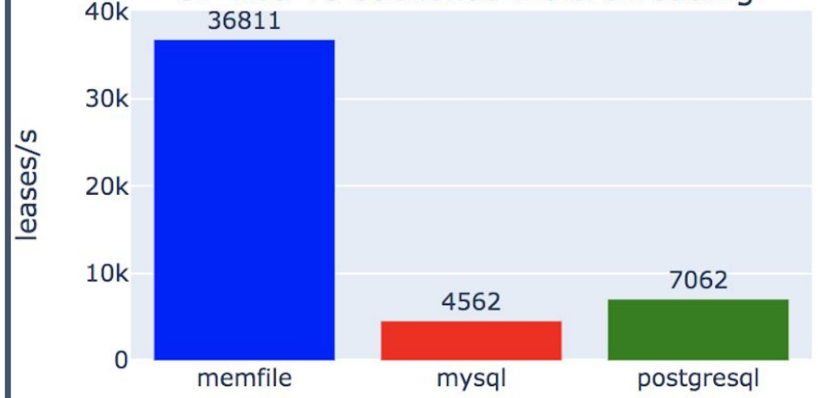


2. Kea v6 backends single thread.

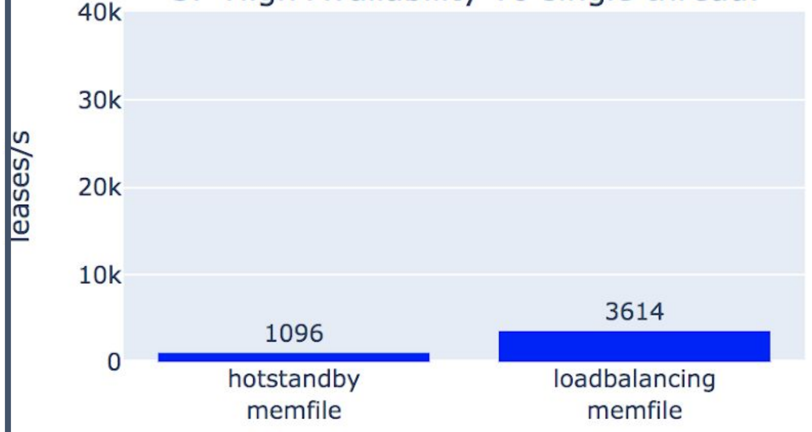


DHCPv6

5. Kea v6 backends multi threading.

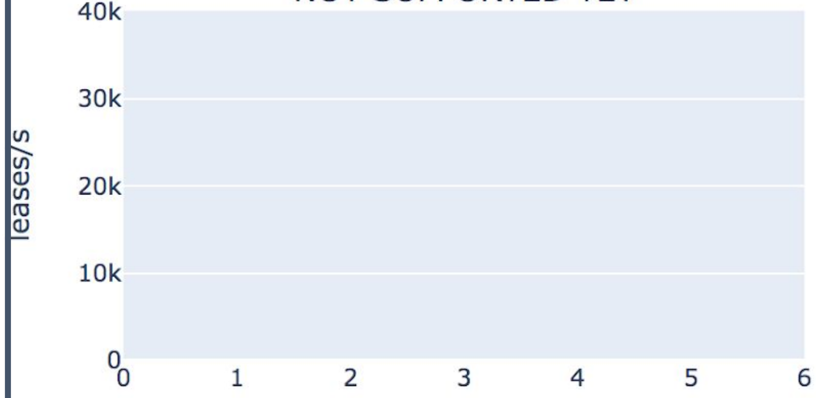


3. High Availability v6 single thread.



DHCPv6 w/HA

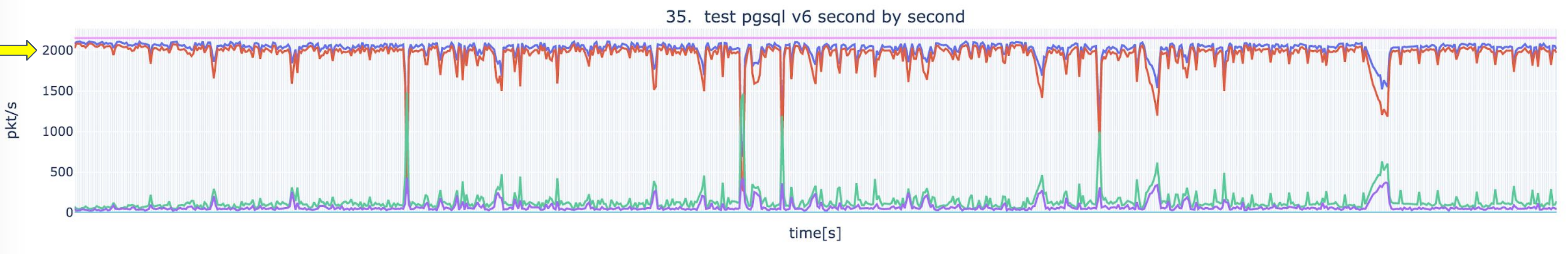
6. High Availability multi threading NOT SUPPORTED YET

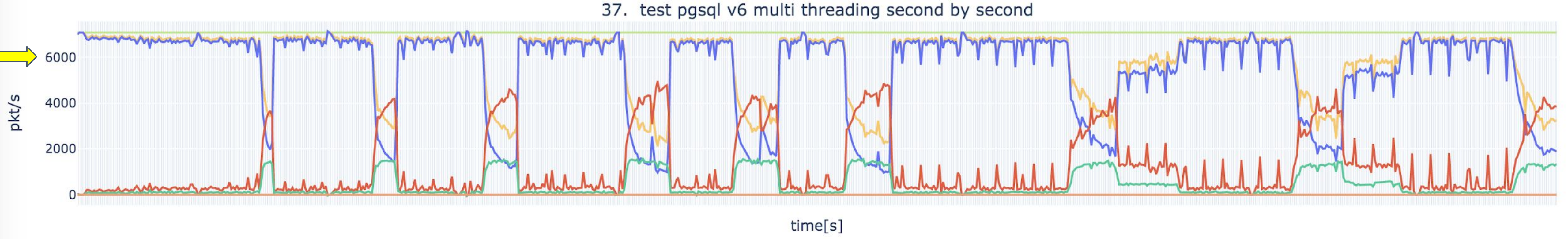


Observations

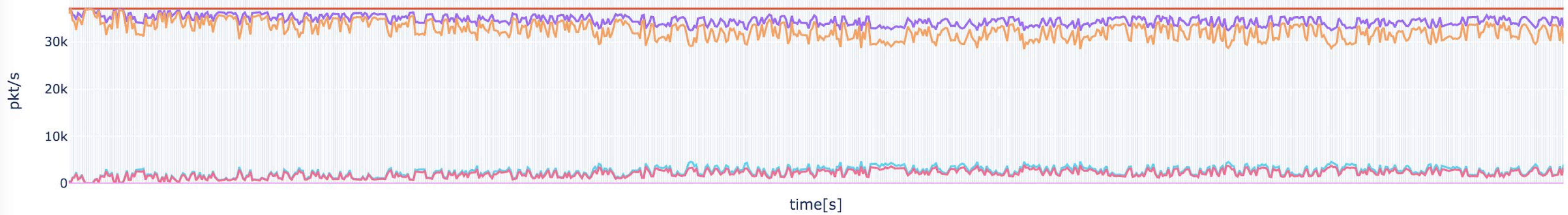
- Performance improved 190 - 350%
- Used thread number = 4 for memfile
- Used thread number = 6 for PostgreSQL
- Used thread number = 12 for MySQL
- DHCPv6 is much faster - to be investigated
- HA with multithreading support in 1.7.8
- Hyperthreading may affect performance

Kea + pgsql, single and multithreading

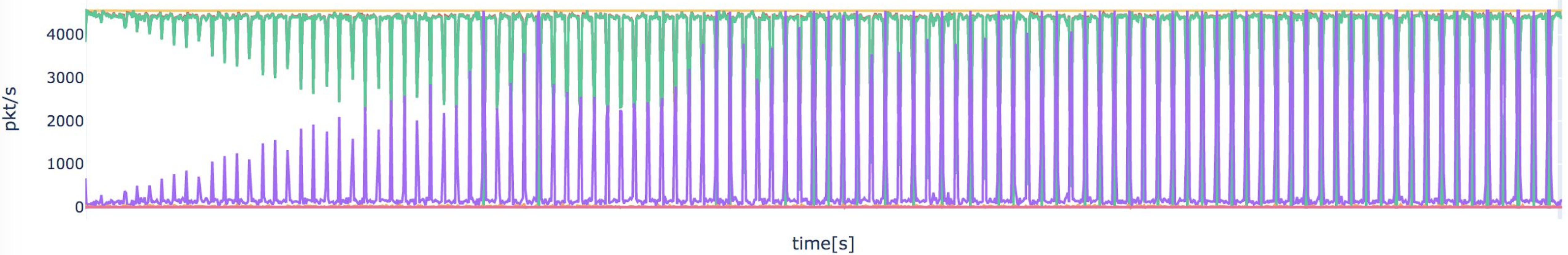




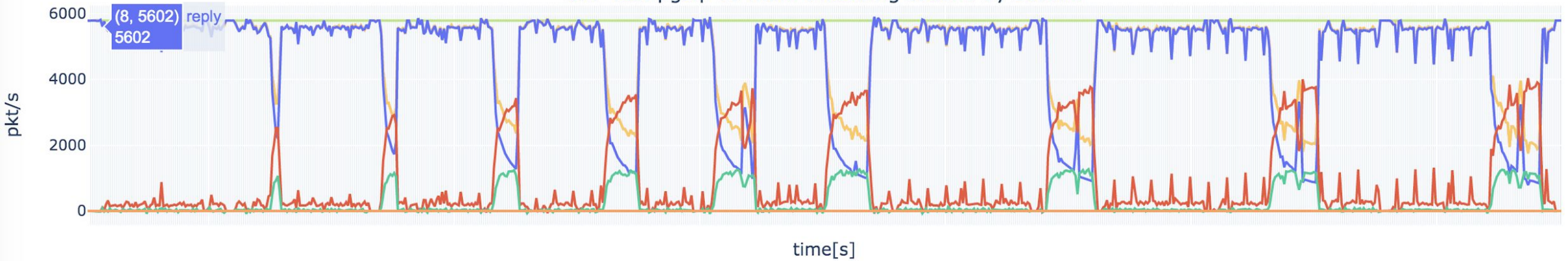
29. test memfile multi threading v6 second by second



33. test mysql v6 multi threading second by second



37. test pgsql v6 multi threading second by second

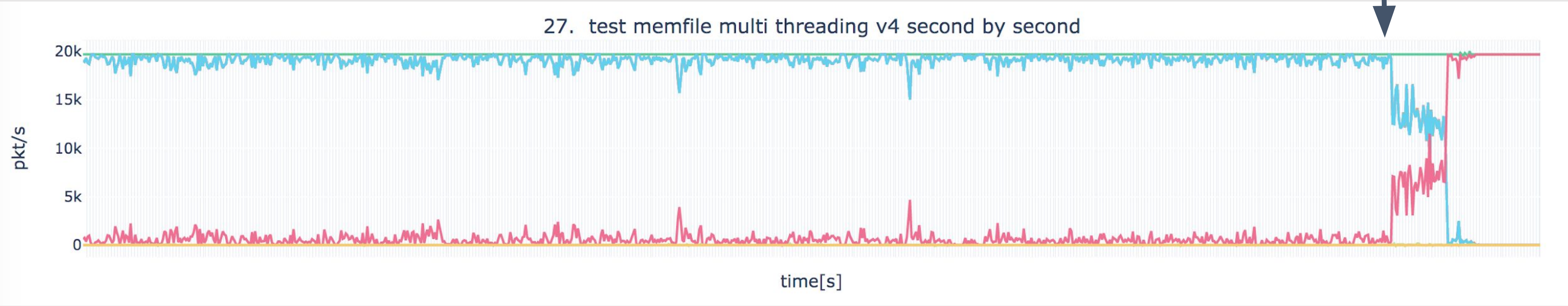


Observations

- As Kea is faster, it exposes the performance limits of the db backends - with multithreading, we have multiple db connections
- Pauses in response are due to database writes, and it’s duration and affect to kea differ
- Database tuning should be useful here - we did not attempt that in this test.

What happens when pool utilization is too high?

Pool utilization reached 96% here



Interactive report

- html file with all of these results is attached to the kb article

Also includes

- results history (multiple runs with multiple versions)
- stability when Kea combined with db backend.
- more details
  - min, max, average delay

This test is still running....

- Current results can be found at our Jenkins page:
- https://jenkins.isc.org/job/kea-1.7/job/performance/KeaPerformanceReport/
- New test runs are triggered with code commits, and since this is testing the master branch, performance may change slightly from one run to the next.

Questions for future testing

- How does host reservation affect performance?
- How does client classification affect performance?
- How do huge number of subnets/pools affect performance?
- How does hyperthreading affect Kea performance?
- Experimenting with database tuning
- ‘Avalanche’ scenarios
- More realistic test scenarios

Tips and tricks for testing Kea by yourself

- Our configuration files included in KB article
- perfdhcp commands with corresponding config

Q&A

Thank you!

- Full results at: https://www.isc.org/kea-performance/
- KB article on this test: https://kb.isc.org/docs/kea-performance-tests-17-multithreading
- Software downloads: https://www.isc.org/download or https://downloads.isc.org
- Packages at: https://cloudsmith.io/~isc/repos/kea-1-7/packages/
- Presentations: https://www.isc.org/presentations
- Main GitLab: https://gitlab.isc.org