OpenStack HA - reliability and scalability

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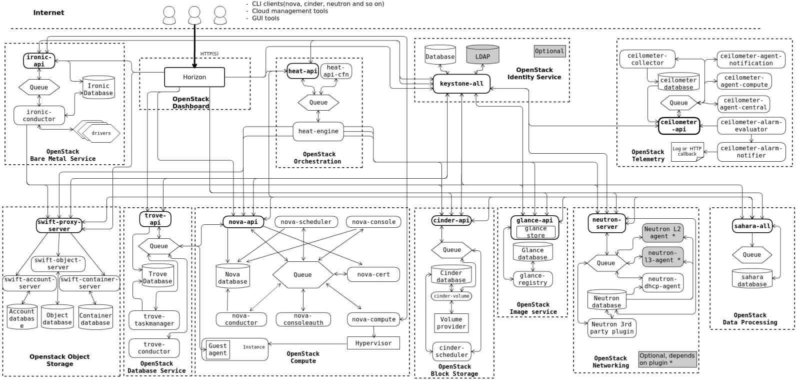
Introduction

High availability

High availability is a characteristic of a system, which aims to ensure an agreed level of operational performance for a higher than normal period.
There are three principles of system design in high availability engineering:

1. Elimination of single points of failure.
2. Reliable crossover.
3. Detection of failures as they occur.

OpenStack Architecture



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- Block storage (Ceph, . . .)
- *Virtualized networking layer*

Shared services

Database

- Typically - Galera cluster (it's magic!).
- Running on 3, 5, 7, . . . nodes for quorum.
- OpenStack is battle-tested on Galera.

Message Queue

- Clustered RabbitMQ.
- Againg running on 3, 5, 7, . . . nodes for quorum.
- Erlang's internal database (Mnesia) is responsible for keeping state consistent.
- Running RabbitMQ, especially in HA, is considered non-trivial.

Object store

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Object store

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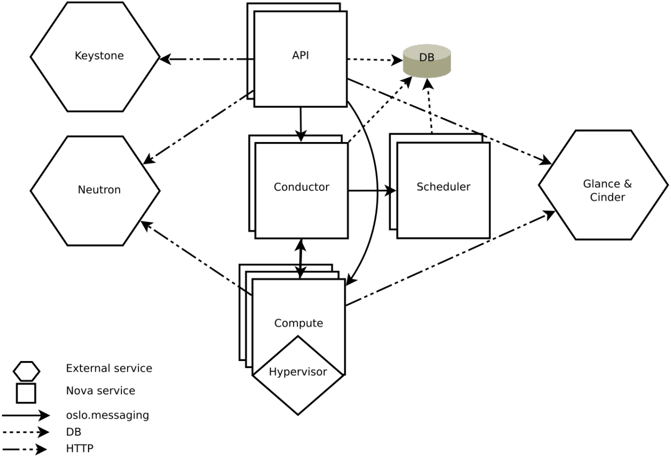
- Swift
  - Runs a "ring", which is basically a consistent hash ring.
  - You need to make sure to configure Swift to replicate objects.

OpenStack services

Nova architecture



OpenStack services types

- Communication
  - REST API services (nova-api, cinder-api, glance-api, Keystone)
  - Message-queue bound services (**nova-conductor**, nova-compute, **cinder-volume**)

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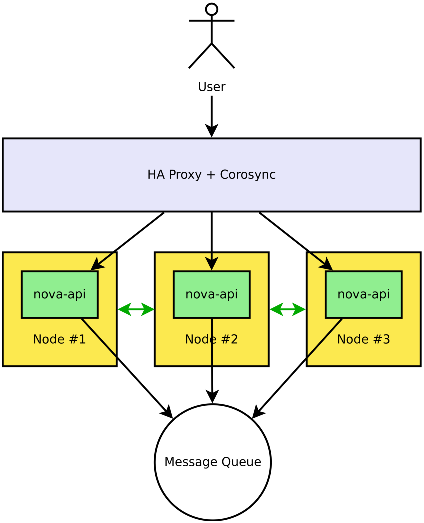
- Statefullness
  - Stateless, *shared state* (nova-api, **nova-conductor**)
  - Stateful (**cinder-volume**, nova-compute)

REST API services

- Keystone is run on Apache, rest are either standalone Python services or both.
- You're supposed to run them behind HAProxy.

HAProxy + REST API



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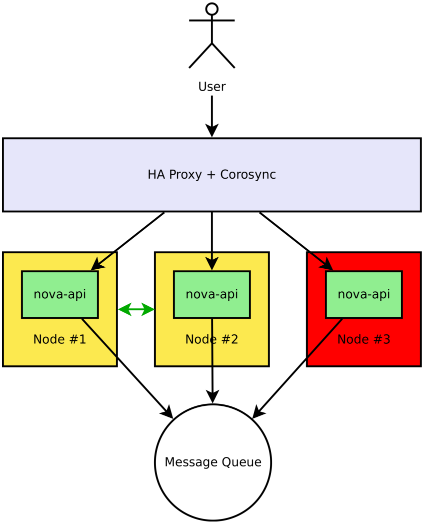
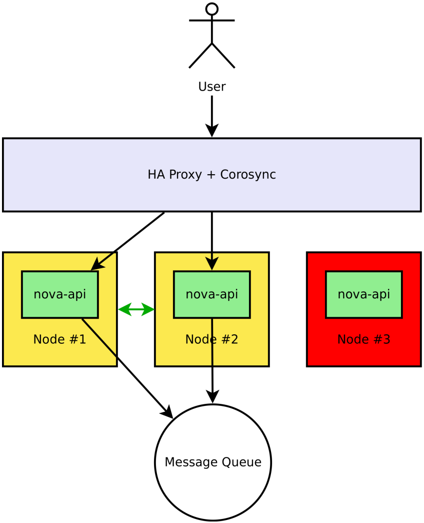


HAProxy + REST API



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  - . . . so you'll need some cluster management software like Pacemaker to monitor and keep it running. . .
  - . . . and some fencing software to protect from split-brains and zombie services.

Pacemaker 101

- Distributed cluster management software
- Features include:
  - awareness of other applications in the stack
  - a shared quorum implementation and calculation
  - data integrity through fencing
  - automated recovery of instances to ensure capacity
- Configurable and extendable through OCF (*Open Cluster Framework*) agents/scripts.
- Pacemaker is rather heavy, so OpenStack projects are aiming to get as many services A/A capable.

Fencing

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- In case of non-responding application we don't know if it's dead or a network partition occurred.
- To make sure that we won't have two A/P service instances running, we need to fence the node where dead service instance resides on.
- Software solution: STONITH - *Shoot The Other Node In The Head*.
  - UPS (Uninterruptible Power Supply)
  - PDU (Power Distribution Unit)
  - Blade power control devices
  - Lights-out devices
- Be aware - this complicates the system even more!

Neutron HA

- Get’s better and better with each release.
- TODO.

Resources and further help

- OpenStack High Availability Guide
- Mirantis OpenStack 7.0 Reference Architecture (might be a little outdated)
- Pacemaker documentation
- #openstack-ha IRC channel (freenode)

Thank you!

https://github.com/dulek/openstack-meetup-wroclaw-ha

remind me to switch to next slide for Q&A

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