OpenStack Heat

Brief Overview

About me

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Agenda

What is Heat

Why is it required

Architecture

Example with a simple template

Open edX use case

What is Heat

Heat provides a mechanism for orchestrating OpenStack resources through the use of modular templates.

What is Orchestration?

"Orchestration" is the "automated arrangement, coordination, and management of complex computer systems" (wikipedia)

Why

It was born to counterpart the CloudFormation API for Amazon Web Services.

For deployments of infrastructures predictably and repeatedly

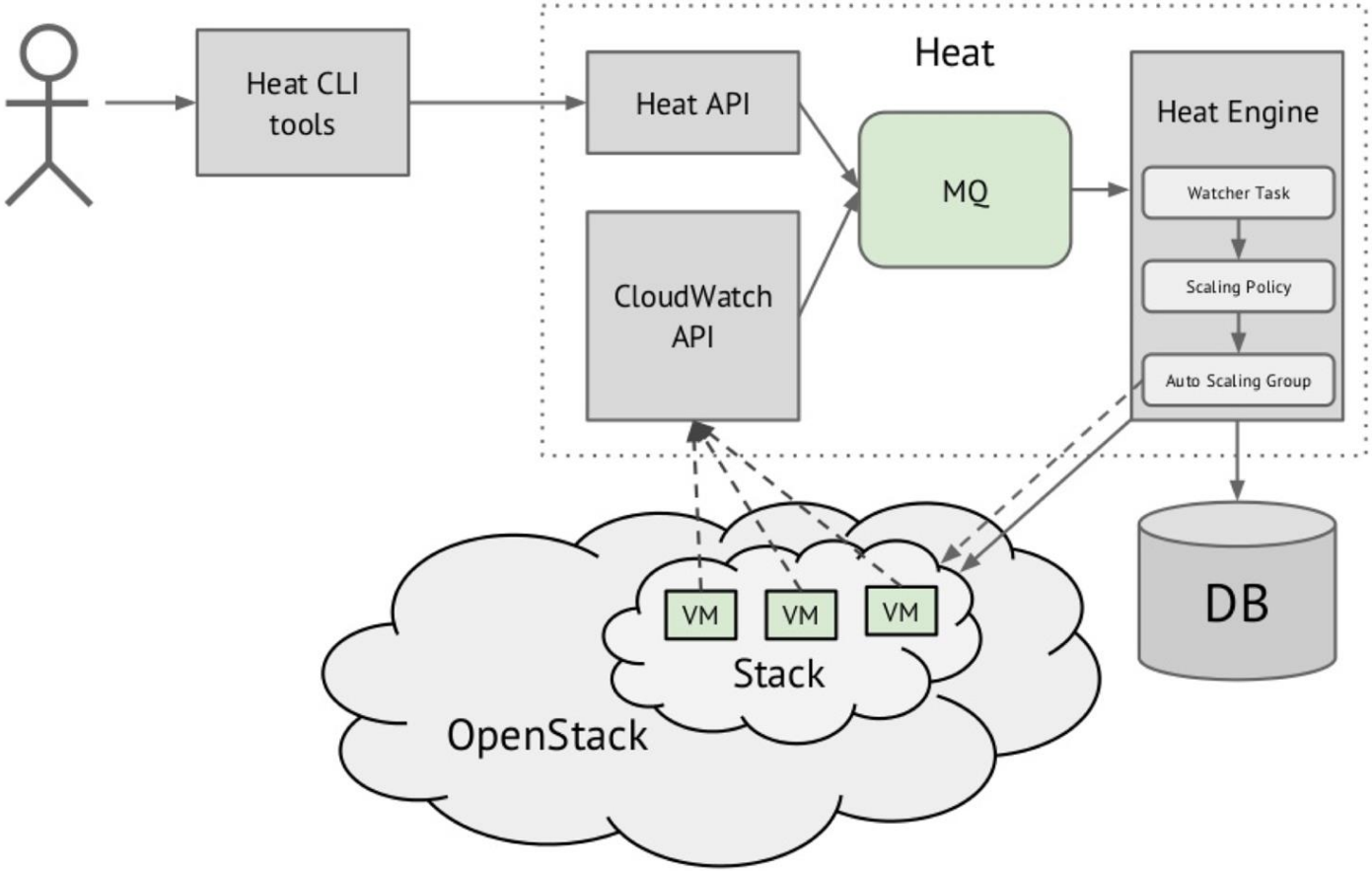
Provides

- High Availability
- Auto scaling
- Deployment of nested stacks

Architecture Overview

Heat consists of several components:

heat-api -- provide the REST API.
heat-api-cfn -- provides AWS EC2 CloudFormation API
heat-engine -- does all orchestration work


Heat CLI tools
Heat
Heat API
CloudWatch API
MQ
Heat Engine
Watcher Task
Scaling Policy
Auto Scaling Group
DB
VM
VM
VM
Stack
OpenStack

Heat Basics

Stack:

A group of connected cloud resources (e.g. VMs, Networks, Volumes etc)

Templates:

Stacks are created from templates

Template Structure

written in "Heat Orchestration Template" (HOT) format.

templates have three sections:

```
# This is required.
heat_template_version: 2013-05-23

parameters:
  # parameters go here

resources:
  # resources go here (this section is required)

outputs:
  # outputs go here
```

Simple Example

simple.yaml template. Assumptions:

An ssh key already configured in Nova (key_name)

An image of some sort in Glance (image)

An available Neutron network (network_id)

Create the stack

```
$ heat stack-create -f simple.yaml \
  -P "image=cirros;key_name=lars;network_id=18fc1b31-9b2c-4b6e-8dea-7e04bfd1eb43" \
  rdo-stack-1

+-----...+-------------+------------------+---------------------+
| id  ...| stack_name   | stack_status       | creation_time       |
+-----...+-------------+------------------+---------------------+
| a1dc...| rdo-stack-1  | CREATE_IN_PROGRESS | 2014-09-04T21:01:59Z |
+-----...+-------------+------------------+---------------------+
```

Verify the stack has been created successfully

```
$ heat stack-list
+-----...+-------------+----------------+----------------------+
| id  ...| stack_name   | stack_status    | creation_time        |
+-----...+-------------+----------------+----------------------+
| a1dc...| rdo-stack-1  | CREATE_COMPLETE | 2014-09-04T21:01:59Z |
+-----...+-------------+----------------+----------------------+
```

To see the resources associated with this stack

```
$ heat resource-list rdo-stack-1
+--------------+-----------------+----------------+---------------------+
| resource_name | resource_type    | resource_status | updated_time        |
+--------------+-----------------+----------------+---------------------+
| my_server     | OS::Nova::Server | CREATE_COMPLETE | 2014-09-04T21:01:59Z |
+--------------+-----------------+----------------+---------------------+
```

To see the outputs associated with this stack

```
$ heat output-list rdo-stack-1
+------------+------------------------------+
| output_key | description                  |
+------------+------------------------------+
| server_ip  | fixed ip assigned to the server |
+------------+------------------------------+
```

We can verify that this did, indeed, create a server

```
$ nova list
+----------...+----------------------------------+--------+------------+-------------+----------------+
| ID       ...| Name                             | Status | Task State | Power State | Networks       |
+----------...+----------------------------------+--------+------------+-------------+----------------+
| cd6f1227-...| rdo-stack-1-my_server-qcep7tfnnlqe | ACTIVE | -          | Running     | net0=10.0.0.29 |
+----------...+----------------------------------+--------+------------+-------------+----------------+
```

Use case with open edX

Open edX is a free and opensource platform originally developed by edX to build and manage learning tools.

Used by institutions all over the world that want to host and manage their own courses/classes online

Open edX and OpenStack

Hastexo gives professional services in technical training, documentation and tutorial managements

Problems:

- Too many students need separate VMs/sandboxes
- Lab environment is too complex to replicate
- Single point of failure if the lab/stack goes down

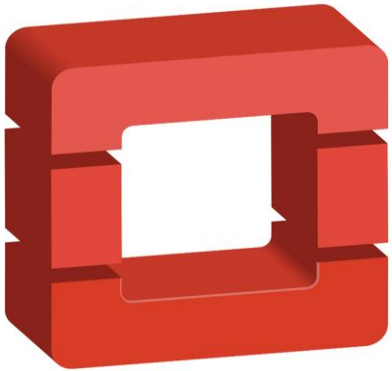
Solution

Use OpenStack Heat

Write a template as complex as you like

Repeat it for as many students as you want

A heat stack



Thank You