Firehose: a Unified Message Bus for Infra Services

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May 11, 2017

https://github.com/mtreinish/firehose/tree/boston-summit

OpenStack Infrastructure

Imagine a big, complicated diagram here.

Firehose

- An MQTT broker for the OpenStack community infrastructure
- Has anonymous, read-only access via MQTT on 1883/tcp
- SSL/TLS MQTT also available on 8883/tcp
- Websockets supported (but temporarily disabled)

MQTT

- Pub/sub messaging protocol
- Formerly MQ Telemetry Transport
- ISO/IEC PRF 20922
- Protocol dates back to 1999
- Lightweight design, low bandwidth

MQTT Topics

- Topics are generated dynamically
- Topics are heirarchical
- Support wildcarding

Topic Examples

sensors/*HOSTNAME*/temperature/*HDD_NAME*

- sensors/sinanju/temperature/nvme0n1p1
- sensors/+/temperature/+
- sensors/sinanju/temperature/+
- sensors/sinanju/#

QoS

- **0**: The broker/client will deliver the message once, with no confirmation.
- **1**: The broker/client will deliver the message at least once, with confirmation required.
- **2**: The broker/client will deliver the message exactly once by using a four step handshake.

MQTT Brokers

- Centralized broker
- Many different options: https://github.com/mqtt/mqtt.github.io/wiki/servers

MQTT Clients

- Bindings for most languages
- https://github.com/mqtt/mqtt.github.io/wiki/libraries
-

The Firehose

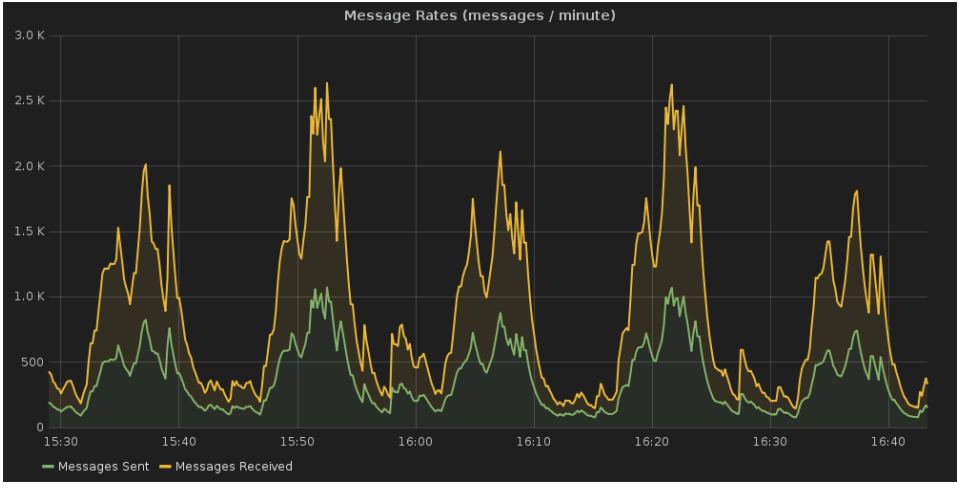
Mosquitto

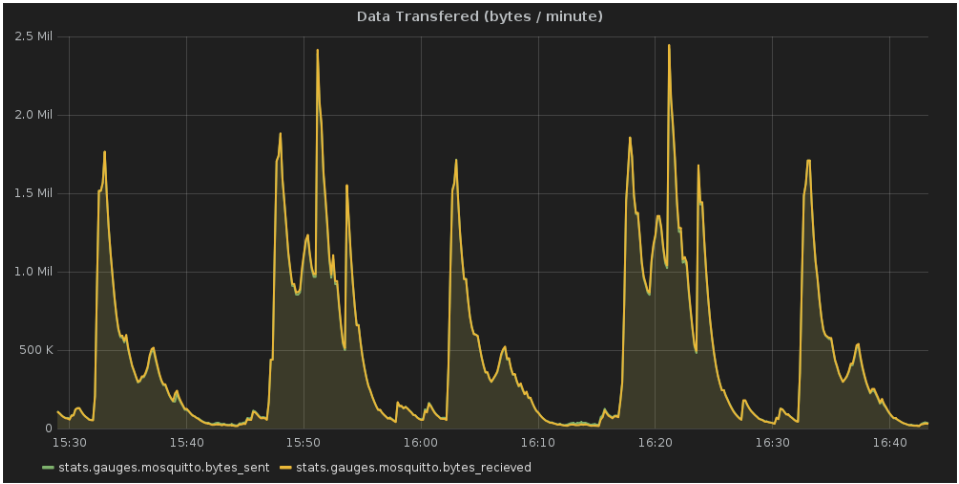
- MQTT broker implemented in C

Services Using the Firehose

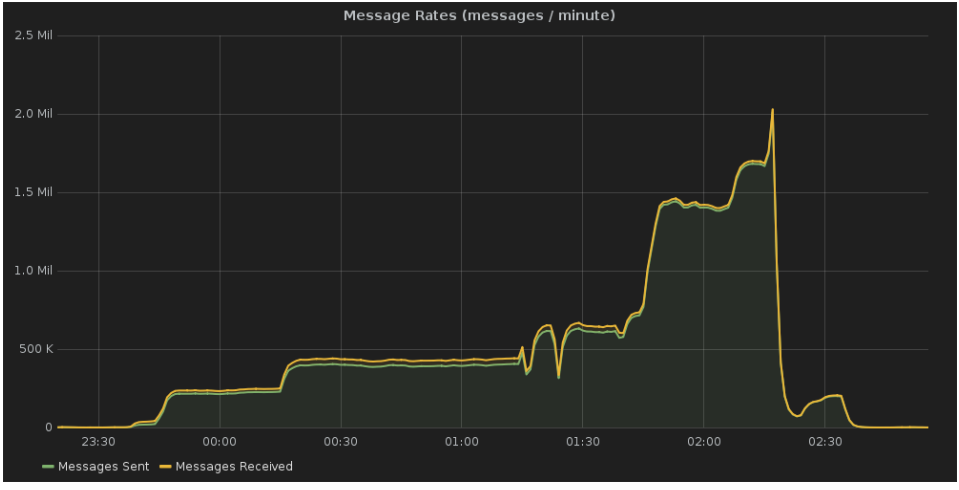
Service	Base Topic	Source of Messages
Ansible	ansible	Ansible MQTT Callback Plugin
Gerrit	gerrit	germqtt
Launchpad	launchpad	lpmqtt
Subunit Gearman Worker	gearman-subunit	subunit-gearman-worker

Typical Firehose Load

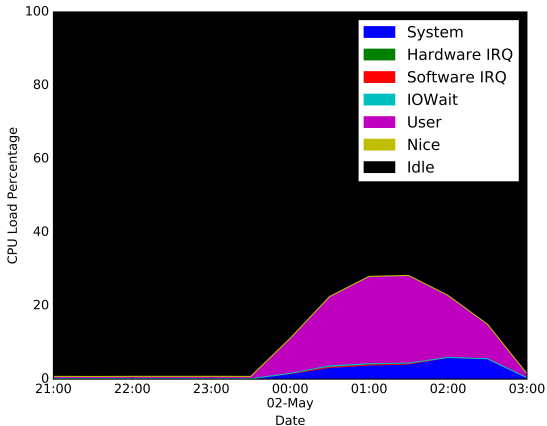



Data Transfered (bytes / minute)
2.5 Mil
2.0 Mil
1.5 Mil
1.0 Mil
500 K
0
15:30
15:40
15:50
16:00
16:10
16:20
16:30
16:40
stats.gauges.mosquitto.bytes_sent
stats.gauges.mosquitto.bytes_recieved

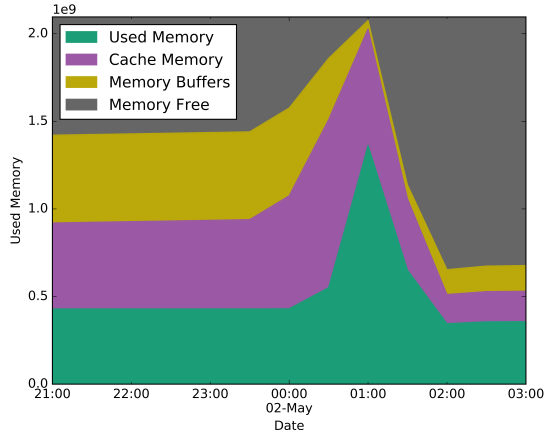
The limits of scaling



CPU Usage:



Memory Usage:



Using Firehose

Example mosquitto client subscriber command line (provided in a mosquitto-clients package on many distros):

```
mosquitto_sub -h firehose.openstack.org --topic '#'
```

Listen for all Nova Comments in python

- **CLI:**
  mosquitto_sub -h firehose.openstack.org --topic gerrit/openstack/nova/comment-added
- **Python:**

```
import paho.mqtt.client as mqtt


def on_connect(client, userdata, flags, rc):
    print("Connected with result code " + str(rc))
    client.subscribe('gerrit/openstack/nova/comment-added')

def on_message(client, userdata, msg):
    print(msg.topic+" "+str(msg.payload))

# Create a websockets client
client = mqtt.Client()
client.on_connect = on_connect
client.on_message = on_message

# Connect to the firehose
client.connect('firehose.openstack.org', port=1883)
# Listen forever
client.loop_forever()
```

Listen for all ansible tasks on health.openstack.org

- **ruby:**

```
require 'rubygems'
require 'mqtt'

client = MQTT::Client.new
client.host = 'firehose.openstack.org'
client.port = 1883
client.connect()
client.subscribe('ansible/playbook/+/task/health.openstack.
  org/#')

client.get do |topic,message|
    puts message
    end
```

- **go:**

```
package main
import (
  "fmt"
  MQTT "github.com/eclipse/paho.mqtt.golang"
  "os"
  "strconv"
  "time"
)
func onMessageReceived(client MQTT.Client, msg MQTT.Message) {
    fmt.Printf("TOPIC: %s\n", msg.Topic())
    fmt.Printf("MSG: %s\n", msg.Payload())
}
func main() {
    hostname, _ := os.Hostname()
    opts := &MQTT.ClientOptions{
        ClientID: hostname+strconv.Itoa(time.Now().Second()),
    }
    opts.AddBroker("tcp://firehose.openstack.org:1883")
    opts.OnConnect = func(c MQTT.Client) {
        if token := c.Subscribe("ansible/playbook/+/task/health.openstack.org/#", 0,
     onMessageReceived); token.Wait() && token.Error() != nil {
            fmt.Println(token.Error())
            os.Exit(1)
        }
    }
    client := MQTT.NewClient(opts)
    if token := client.Connect(); token.Wait() && token.Error() != nil {
        panic(token.Error())
    }
    for {
        time.Sleep(1 * time.Second)
    }
}
```

Potential Applications for Firehose

- 3rd Party CI Operators
- Desktop Notifications
- Intra Service communication

Future Plans

- Add germqtt subscription support to:
  - Zuul v3+
- Add more publishers:
  - Nodepool daemons
  - Zuul v3+
  - (your favorite service here)

Where to get more information

- openstack-infra ML openstack-infra@lists.openstack.org
- #openstack-infra on Freenode
- http://docs.openstack.org/infra/system-config/firehose.html
- https://docs.openstack.org/infra/system-config/firehose_schema.html
- http://specs.openstack.org/openstack-infra/infra-specs/specs/firehose.html
- http://mqtt.org/
- https://mosquitto.org/