Log Management with Monasca

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Outline

1. Introduction
2. Architecture
3. What's New?
4. Demo

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INTRODUCTION

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Logs in OpenStack

Component	Service	# log files
Ceilometer	Telemetry	8
Cinder	Block Storage	5
Glance	Images	2
Heat	Orchestration	3
Horizon	Dashboard	7
Keystone	Identity	1
Neutron	Networking	6
Nova	Compute	8
Swift	Object Storage	3
MongoDB, openvswitch, syslog	Supporting services / components	5
etc.	etc.	etc.

Multiple vendors offer logging solutions as add-ons (most based on Elasticsearch)

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Motivation

- Our mission: replace vendor-specific solutions with a standardized OpenStack project
- Logging-as-a-Service: provide same functionality to OpenStack users
  - API (RESTful)
  - Isolation from underlying transport and technology (Kafka)
  - Authentication / Multi-tenancy
  - Role based access control to centralized logging
  - Input validation

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Technologies

ELK Stack

- **Elasticsearch**: search engine
- **Logstash**: collection, parsing and transformation
  - Alternatives: Beaver, Fluentd
- **Kibana**: graph dashboard
- Competitive to proprietary solutions, such as *Splunk*

Monasca

- Monitoring-as-a-Service
- Highly performant, scalable and fault-tolerant
- **Kafka**: high-throughput distributed messaging queue

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Monitoring and Logging

- Related topics: both metrics and logs...
  - ... indicate the health status of your infrastructure and services
  - ... let you analyze the root cause of an error
- Functional (and nonfunctional) extension to ELK:
  - Multi-tenancy: Logging-as-a-Service
  - Performance/scalability
  - Alarms
- Correlation of metrics and logs (and OpenStack notifications)

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Main Contributors

ARCHITECTURE

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Metrics Monitoring Overview

- Monitoring-as-a-Service
  - First class RESTfull API for monitoring
  - Authentication and multi-tenancy
- Highly performant, scalable and fault-tolerant
- Micro-services message bus architecture provides flexibility, extensibility and load-balancing
- Built on Apache Kafka, Apache Storm, InfluxDB and the latest real-time streaming and big data infrastructure.
- Metrics storage, retrieval, thresholding and notifications
- Real-time stream processing in progress

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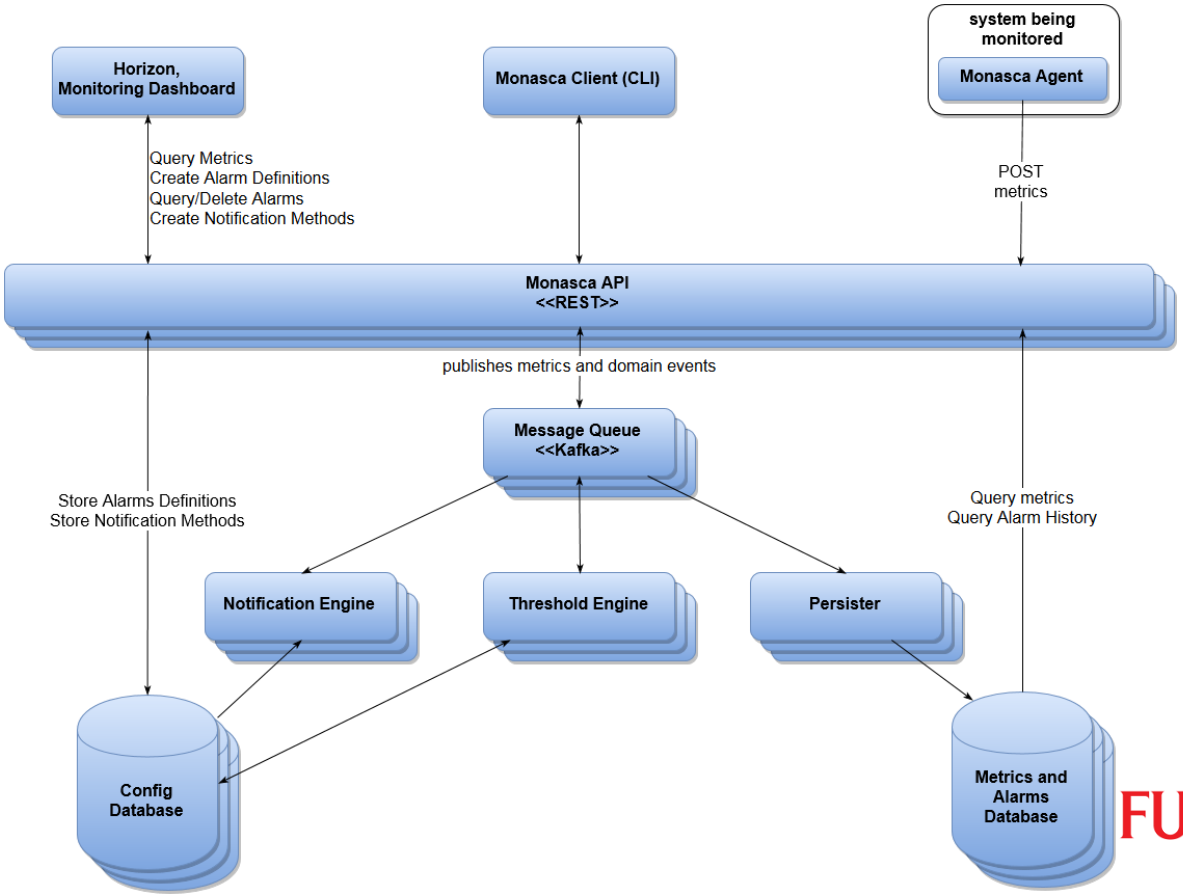
Metrics Architecture



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Logging Overview

- Built on Elasticsearch, Logstash & Kibana (ELK)
- Leverage proven technologies, architecture & design patterns and code in Monasca
- Value-add to pure ELK:
  - Logging-as-a-Service
  - Greater scalability and performance
  - Alarms on logs: Errors, Warnings

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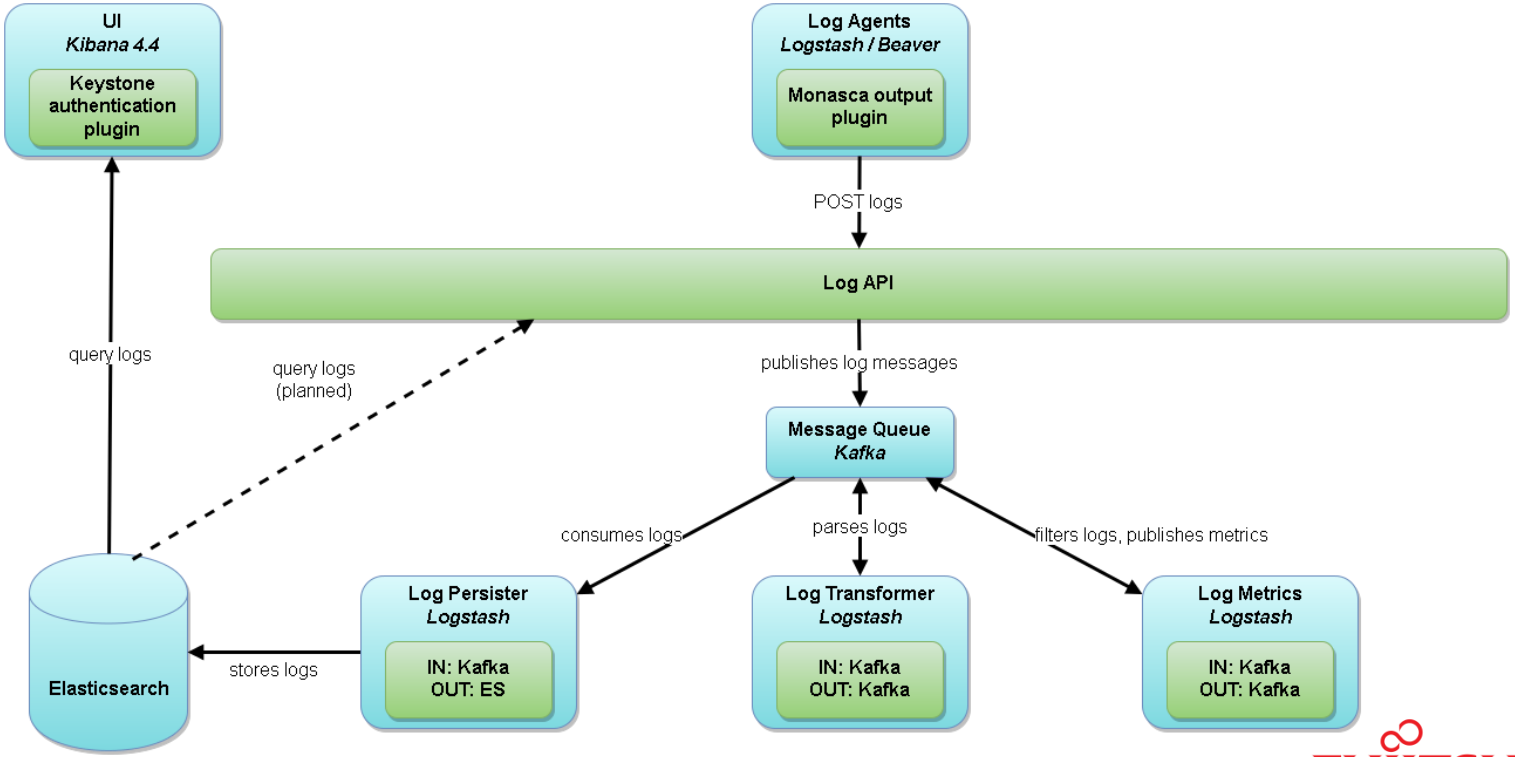
Logging Architecture



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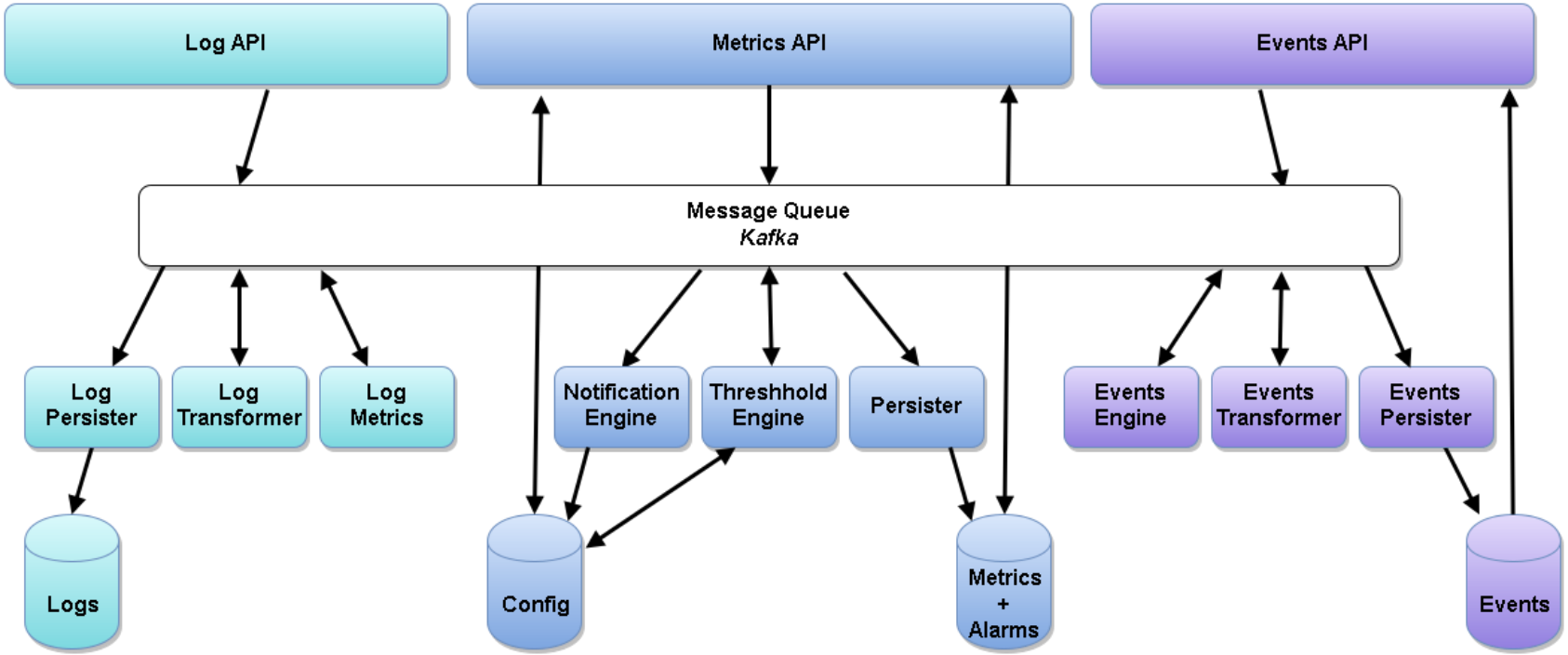
Combined Architecture



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WHAT'S NEW?

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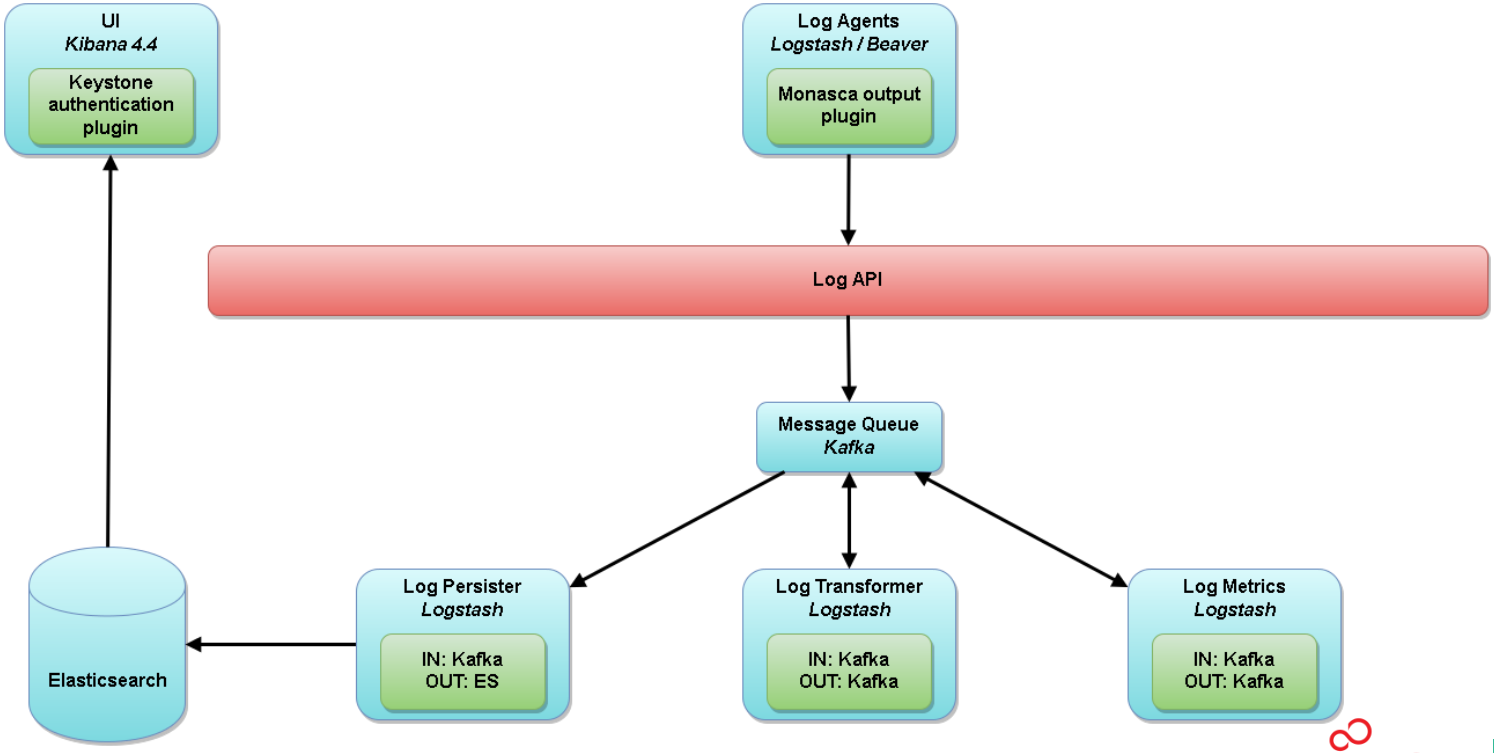
Monasca Log API



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Monasca Log API

- API Version 3
  - Batch support added
  - Global / local / mixed dimensions
    - A dictionary of (key, value) pairs that are used to uniquely identify log messages.
    - Provides additional meta data about logs.
    - Similar to dimensions in metrics.
  - JSON only: Plain-text support dropped
- Python implementation

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Monasca Log API Specification

POST /v3.0/logs

Headers

- X-Auth-Token (string, required)
- Content-Type (string, required)

Response

- 204 No Content

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Example Payload – Global Dimensions

```
{
  "dimensions": {
      "hostname":"devstack",
      "service":"compute",
      "component":"nova-api",
      "path":"/var/log/nova/nova-api.log"
  },
  "logs":[
    { "message":"msg1" },
    { "message":"msg2" }
  ]
}
```

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Example Payload – Local Dimensions

```
{
  "logs":[
    { "message":"msg1",
      "dimensions": {
          "hostname":"devstack",
          "service":"compute",
          "component":"nova-api",
          "path":"/var/log/nova/nova-api.log" } },
    { "message":"msg2",
      "dimensions": {
          "hostname":"devstack",
          "service":"monitoring",
          "component":"monasca-api",
          "path":"/var/log/monasca/monasca-api.log" } }
  ]
}
```

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Example Payload – Mixed Dimensions

```
{ "dimensions": {
      "hostname":"devstack",
      "service":"monitoring",
      "component":"monasca-api" }
  "logs":[
    { "message":"msg1",
      "dimensions": {
          "service":"compute",
          "component":"nova-api",
          "path":"/var/log/mysql.log" } },
    { "message":"msg2",
      "dimensions": {
          "path":"/var/log/monasca/monasca-api.log" } }
  ]
}
```

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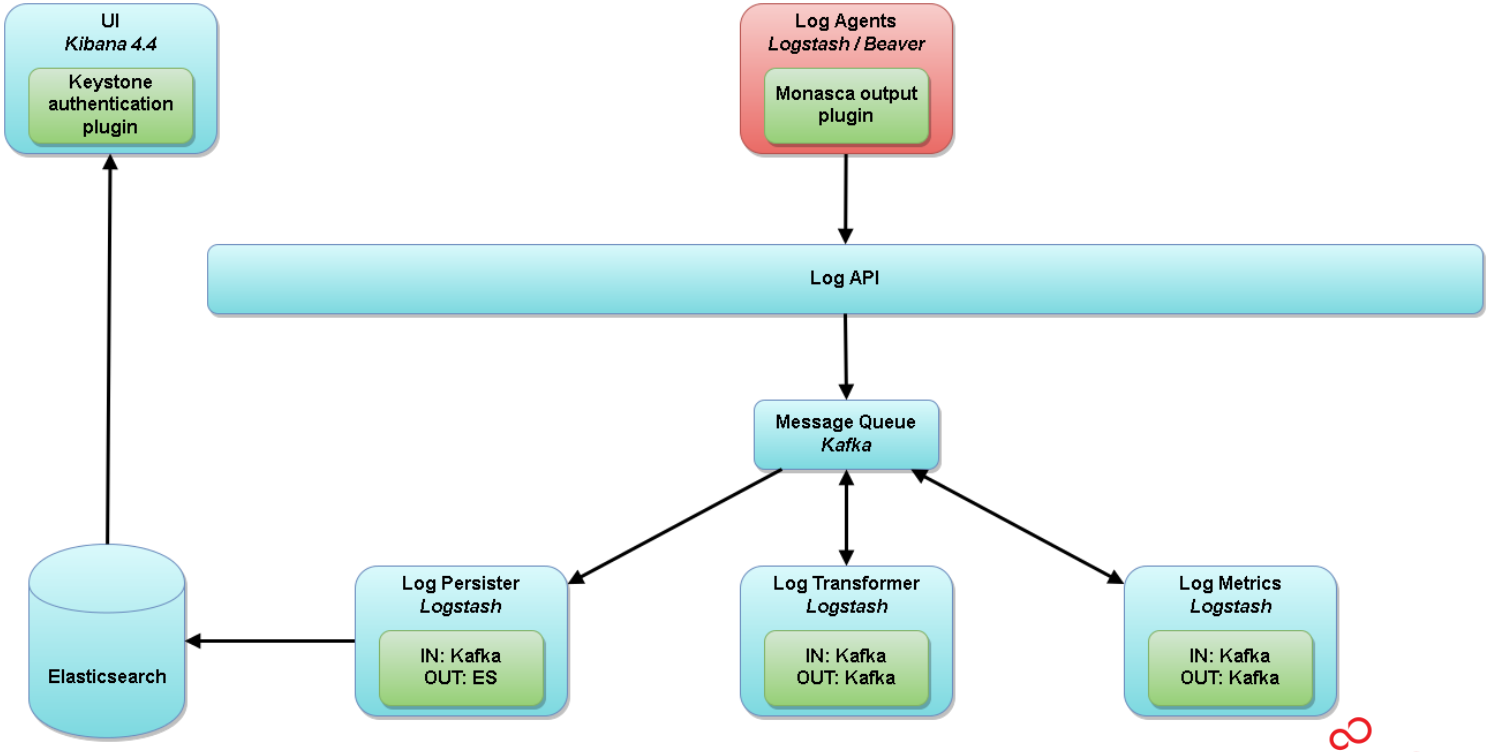
Agents



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Agents

- Logstash
  - https://github.com/FujitsuEnablingSoftwareTechnologyGmbH/logstash-output-monasca_log_api
  - https://rubygems.org/gems/logstash-output-monasca_log_api
- Beaver
  - URL will follow

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Agents Capabilities

- Support for Log API v3
- Configurable batching
  - Maximum batch size
  - Maximum elapsed time
- Keystone authentication
- Caching of auth tokens

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Logstash Agent Config (input)

```
input {
   file {
      path => "/var/log/keystone/*.log"
      add_field => { "dimensions" => { "service" => "keystone"
                                       "component" => "keystone-all" } }
   }
   file {
      path => "/var/log/monasca/api/monasca-api.log"
      add_field => { "dimensions" => { "service" => "monitoring"
                                       "component" => "monasca-api" } }
 } }
```

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Logstash Agent Config (output)

```
output {
   monasca_log_api {
      monasca_log_api => "http://192.168.10.4:8074"
      monasca_log_api_version => "v3.0"
      keystone_api => "http://192.168.10.5:5000/v3"
      project_name => "demo"
      username => "demo"
      password => "secretadmin"
      domain_id => "default"
      dimensions => ["hostname:devstack"]
      num_of_logs => 100
      elapsed_time_sec => 600
      max_data_size_kb => 5120 } }
```

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Performance Analysis

- Log performance benchmark:
  - https://github.com/hpcloud-mon/monasca-perf/blob/master/monasca_perf/log_perf.py
- Performance:
  - 18K log messages/sec
    - Note, current 100 compute node deployment of OpenStack generates around 500 log messages/sec.
  - 100 log messages per/request
- System:
  - MacBook Retina, 1st generation
- Command:
  - gunicorn -w 4 --worker-connections=2000 --backlog=1000 --paste etc/monasca/log-api-config.ini
- Memcache needs to be enabled for Keystone middleware auth token caching:
  - See https://review.openstack.org/#/c/274351/ for a discussion

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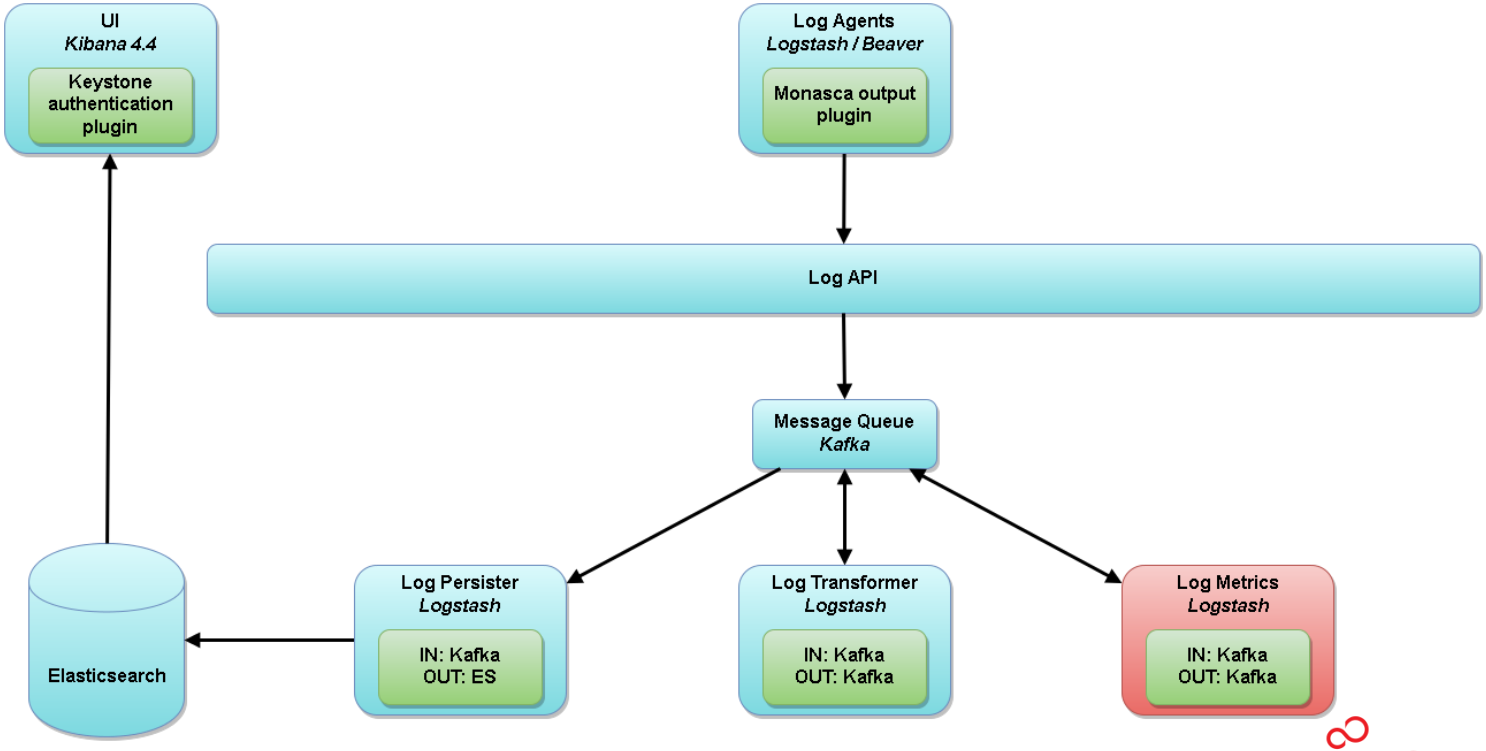
Monasca Log Metrics



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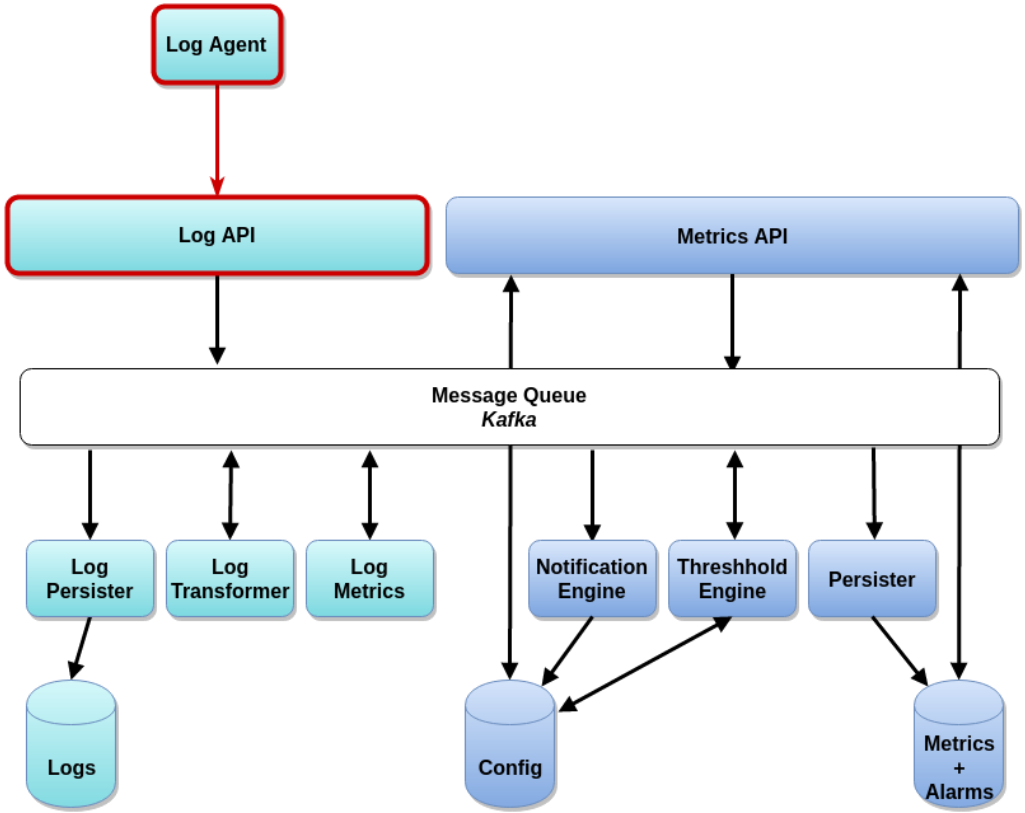
Monasca Log Metrics



1. Log Agent sends log messages to the Monasca Log API

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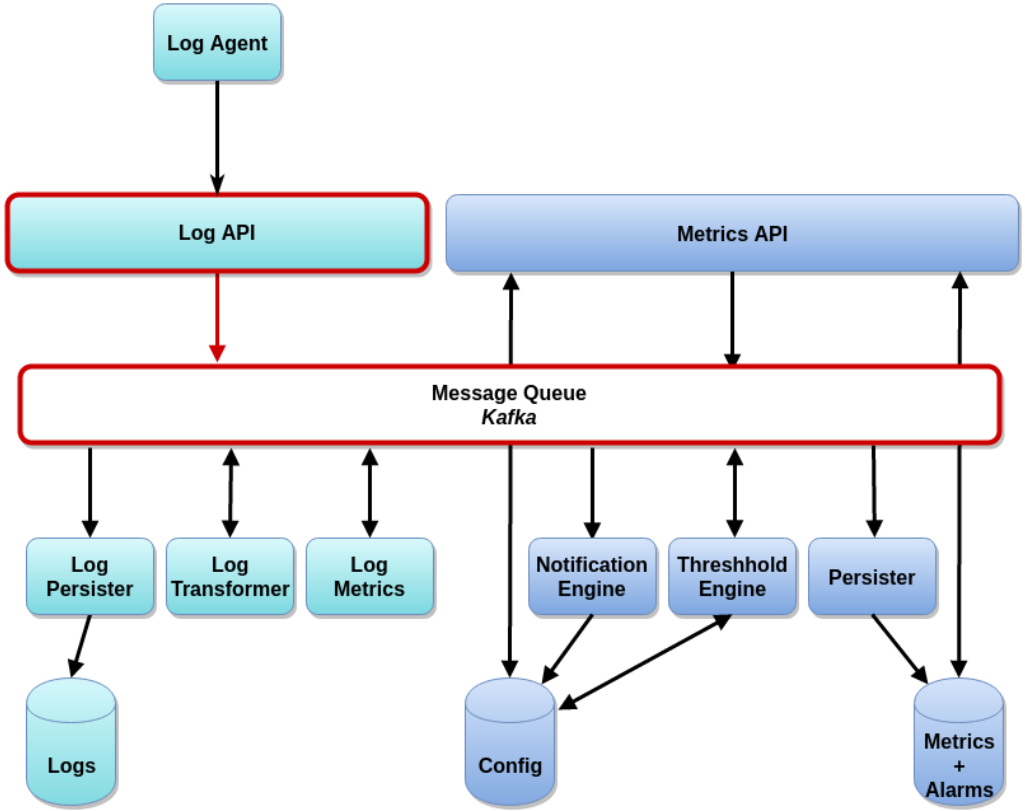
Monasca Log Metrics



2. Request authenticated with Keystone and log messages assigned tenant/project ID.

3. Log messages published to Kafka.

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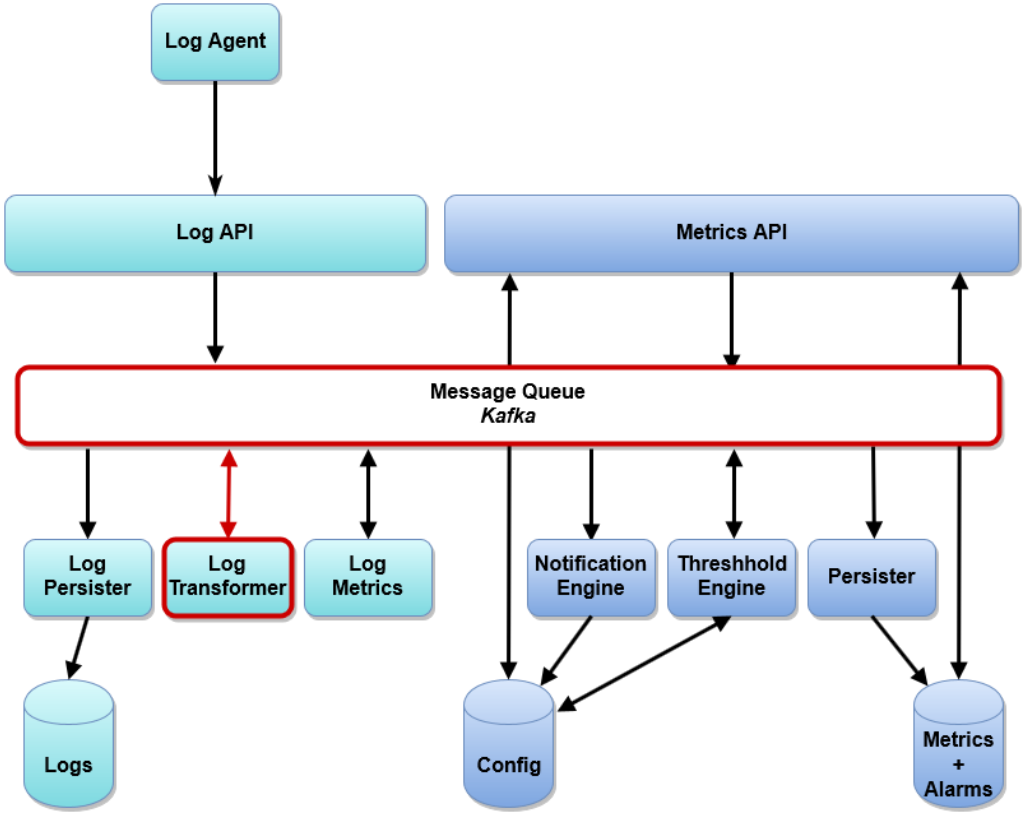
Monasca Log Metrics



4. Log Transformer micro-service consumes log messages.

5. Log Transformer micro-service normalizes the log message and parses log_level.

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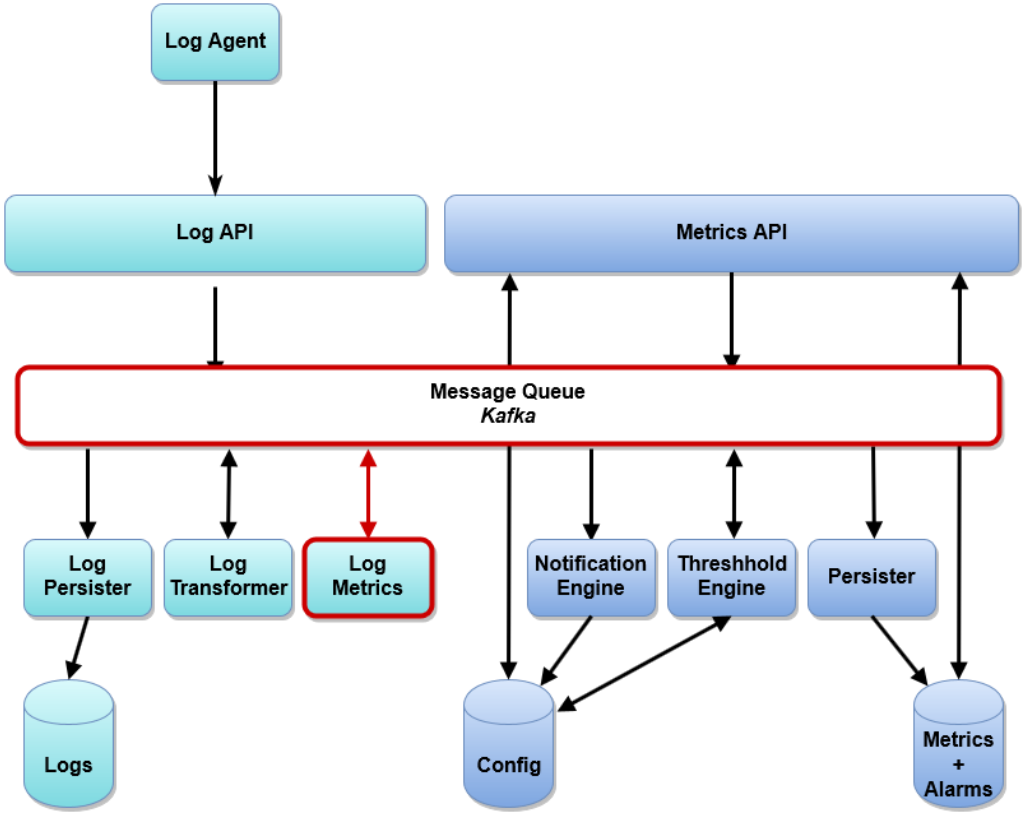
Monasca Log Metrics



6. Log Metrics micro-service filters ERROR, WARNING log messages.

7. Log Metrics publishes metrics message to Kafka metrics topic.

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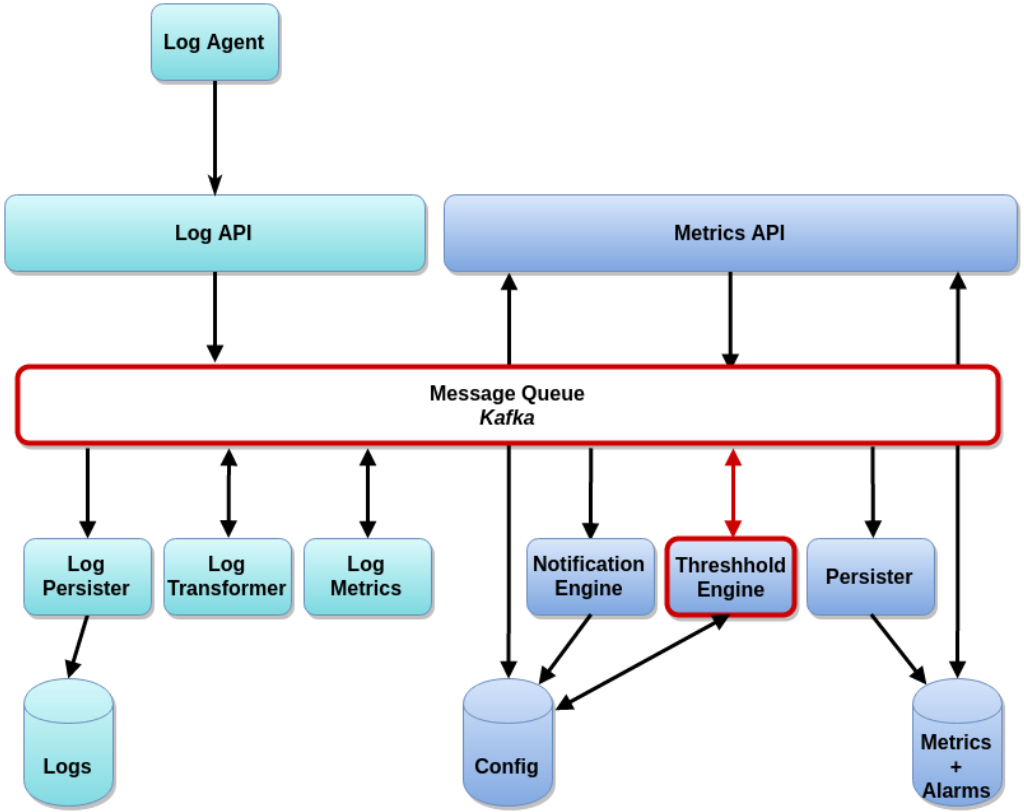
Monasca Log Metrics



8. Metric processed by Monasca Threshold Engine which triggers an alert.

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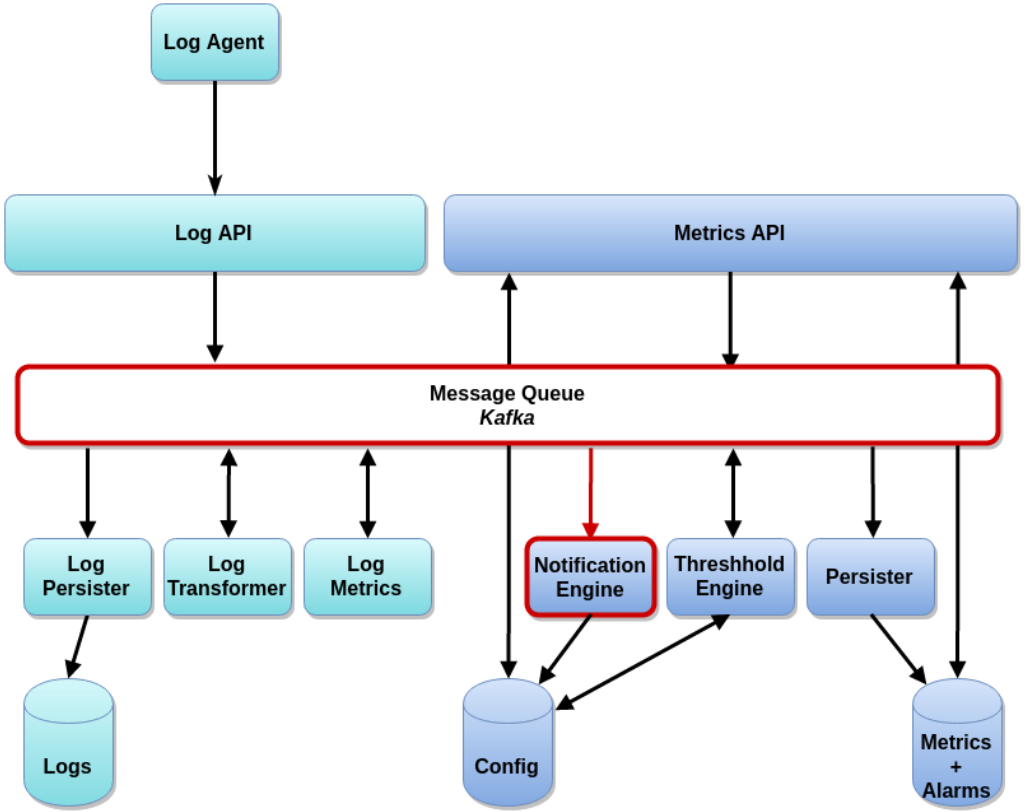
Monasca Log Metrics



9. Notification is sent by the Monasca Notification Engine.

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Other Changes and Updates

- DevStack plugin for Monasca Log API
- Kibana 4.4.x – Keystone authentication plugin
- Elasticsearch, Logstash update, ver. 2.2.0
- Monasca-thresh – support for sporadic/periodic metrics (in development)
  - https://review.openstack.org/#/c/292758/
  - https://review.openstack.org/#/c/292753/

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Congratulations Tomasz!

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DEMO

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Weekly meeting: Wednesdays at 15:00 UTC

IRC: #openstack-meeting-3 on freenode.net

wiki.openstack.org/wiki/Monasca

Monasca Work Sessions

Hilton Austin

Wednesday, 9:00am – 2:30pm

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Thank you!

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