



BRNO UNIVERSITY OF TECHNOLOGY

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

FACULTY OF INFORMATION TECHNOLOGY

FAKULTA INFORMAČNÍCH TECHNOLOGIÍ

DEPARTMENT OF INFORMATION SYSTEMS

ÚSTAV INFORMAČNÍCH SYSTÉMŮ

MONITORING THE OPENSTACK SWIFT OBJECT STORE USING BEANSTALK EVENTS

SLEDOVÁNÍ OBJEKTOVÉHO ÚLOŽIŠTĚ OPENSTACK SWIFT POMOCÍ BEANSTALK UDÁLOSTÍ

MASTER'S THESIS

DIPLOMOVÁ PRÁCE

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Master's Thesis Specification



Student: **Vasiljević Nemanja, Bc.**

Programme: Information Technology

Field of study: Information Systems and Databases

study:

Title: **Monitoring the OpenStack Swift Object Store Using Beanstalk Events**

Category: Databases

Assignment:

1. Explore OpenStack Swift object storage, especially its architecture and activities. Study also MinIO object storage. Learn about the object storage OpenIO Software Defined Storage and in which way it uses Beanstalk to monitor and distribute events over the storage.
2. Design a service that will monitor activities in OpenStack Swift and, following the pattern of OpenIO, publish Swift events using the Beanstalk protocol. Consider also the ability to monitor and publish events from MinIO.
3. After consulting with the supervisor, implement the proposed service over OpenStack Swift/MinIO so that compatibility with OpenIO is guaranteed. For verification, also implement a sample client that will be able to subscribe to events using Beanstalk from both OpenIO and OpenStack Swift/MinIO.
4. Test the solution, evaluate and discuss the results. Publish the resulting software as open-source.

Recommended literature:

- Raúl GRACIA-TINEDO, Josep SAMPÉ, Gerard PARÍS, Marc SÁNCHEZ-ARTIGAS, Pedro GARCÍA-LÓPEZ and Yosef MOATTI: Software-defined object storage in multi-tenant environments. *Future Generation Computer Systems*. 99, 54-72, 2019. ISSN 0167-739X. Available at [<https://doi.org/10.1016/j.future.2019.03.020>]
- OpenStack Docs: Object Storage monitoring. The OpenStack project [online]. 2021 [seen 2021-09-29]. Available at [<https://docs.openstack.org/swift/ussuri/admin/objectstorage-monitoring.html>]
- Send notifications on PUT/POST/DELETE requests - swift-specs 0.0.1.dev82 documentation. OpenStack Foundation [online]. 2016 [seen 2021-09-29]. Available at [https://specs.openstack.org/openstack/swift-specs/specs/in_progress/notifications.html]

Requirements for the semestral defence:

- Items 1 and 2 finished and item 3 in progress.

Detailed formal requirements can be found at <https://www.fit.vut.cz/study/theses/>

Supervisor: **Rychlý Marek, RNDr., Ph.D.**

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Abstract

The goal of this thesis is to create software that is able to monitor and publish event notification from Openstack Swift as well as from OpenIO Software Defined Storage (SDS) to Beanstalk queue. This thesis also proposes solution for publishing event notifications from MinIO to Beanstalk queue.

To accomplish this goal, new middleware is proposed that can be run inside pipeline of Proxy Server in OpenStack Swift and as (filter) part of asynchronous service Event-Agent inside OpenIO SDS.

Proposed middleware allows users to specify if they are interested in publishing event notifications for specific objects/containers using metadata. User can specify set of rules involving object properties, such as name (prefix, suffix, substring) and size, and only events satisfying those rules will be published.

The contribution of this thesis is unique software capable of event monitoring from both OpenIO SDS and Openstack Swift.

Abstrakt

Cílem této práce je vytvořit software, který je schopen monitorovat a publikovat notifikace o události z Openstack Swift i z OpenIO Software Defined Storage (SDS) do fronty Beanstalk. Tato práce také navrhuje řešení pro publikování notifikací o událostech z MinIO do fronty Beanstalk.

K dosažení tohoto cíle je navržen nový middleware, který lze spouštět uvnitř pipeline proxy serveru v OpenStack Swift a jako (filtr) součást asynchronní služby Event-Agent uvnitř OpenIO SDS.

Navržený middleware umožňuje uživatelům určit, zda mají zájem o publikování notifikací o události pro konkrétní objekty/kontejnery pomocí metadat. Uživatel může specifikovat sadu pravidel zahrnující vlastnosti objektu, jako je název (prefix, přípona, podřetězec) a velikost, a budou publikovány pouze události splňující tato pravidla.

Přínosem této práce je unikátní software schopný monitorování událostí z OpenIO SDS i Openstack Swift.

Keywords

OpenIO Software Defined Storage, Openstack Swift, MinIO, Beanstalk queue, Event monitoring, Event notification, Amazon S3 event notification, Object storage

Klíčová slova

OpenIO Softwarově definované úložiště, Openstack Swift, MinIO, Beanstalk fronta, Monitorování událostí, Oznámení o událostech, Amazon S3 oznámení o události, Objektové úložiště

Reference

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Monitoring the OpenStack Swift Object Store Using Beanstalk Events

Declaration

Prohlašuji, že jsem tuto bakalářskou práci vypracoval samostatně pod vedením pana X... Další informace mi poskytli... Uvedl jsem všechny literární prameny, publikace a další zdroje, ze kterých jsem čerpal.

.....
Nemanja Vasiljević
December 27, 2021

Acknowledgements

V této sekci je možno uvést poděkování vedoucímu práce a těm, kteří poskytli odbornou pomoc (externí zadavatel, konzultant apod.).

Contents

| | | |
|----------|---|-----------|
| 1 | Introduction | 2 |
| 2 | Background | 4 |
| 2.1 | Object storage | 4 |
| 2.2 | Software-defined storage | 5 |
| 2.3 | Event notifications | 6 |
| 2.3.1 | Amazon S3 event notifications | 7 |
| 2.3.2 | Oracle event notifications | 8 |
| 3 | Object Storages | 10 |
| 3.1 | OpenIO SDS | 11 |
| 3.2 | Openstack Swift | 12 |
| 3.3 | MinIO | 13 |
| 4 | Solution draft | 15 |
| 4.1 | Current state | 16 |
| 4.2 | Middleware for Openstack Swift and OpenIO SDS | 17 |
| 4.3 | Adapter for MinIO | 19 |
| 5 | Implementation, experiments and assessment | 21 |
| 6 | Conclusion | 22 |
| | Bibliography | 23 |

Chapter 1

Introduction

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Chapter 2

Background

2.1 Object storage

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Figure 2.1: TODO figure

2.2 Software-defined storage

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Figure 2.2: TODO figure

2.3 Event notifications

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2.3.1 Amazon S3 event notifications

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Figure 2.3: TODO figure

2.3.2 Oracle event notifications

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Figure 2.4: TODO figure

Chapter 3

Object Storages

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3.1 OpenIO SDS

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Figure 3.1: TODO figure

3.2 Openstack Swift

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Figure 3.2: TODO figure

3.3 MinIO

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Figure 3.3: TODO figure

Chapter 4

Solution draft

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4.1 Current state

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4.2 Middleware for Openstack Swift and OpenIO SDS

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Figure 4.1: TODO figure

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4.3 Adapter for MinIO

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Chapter 5

Implementation, experiments and assessment

Chapter 6

Conclusion

Bibliography