End to End tracing in Ceph

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Project Overview

Ceph - Existing Tracing - Blkin

Distributed Storage System

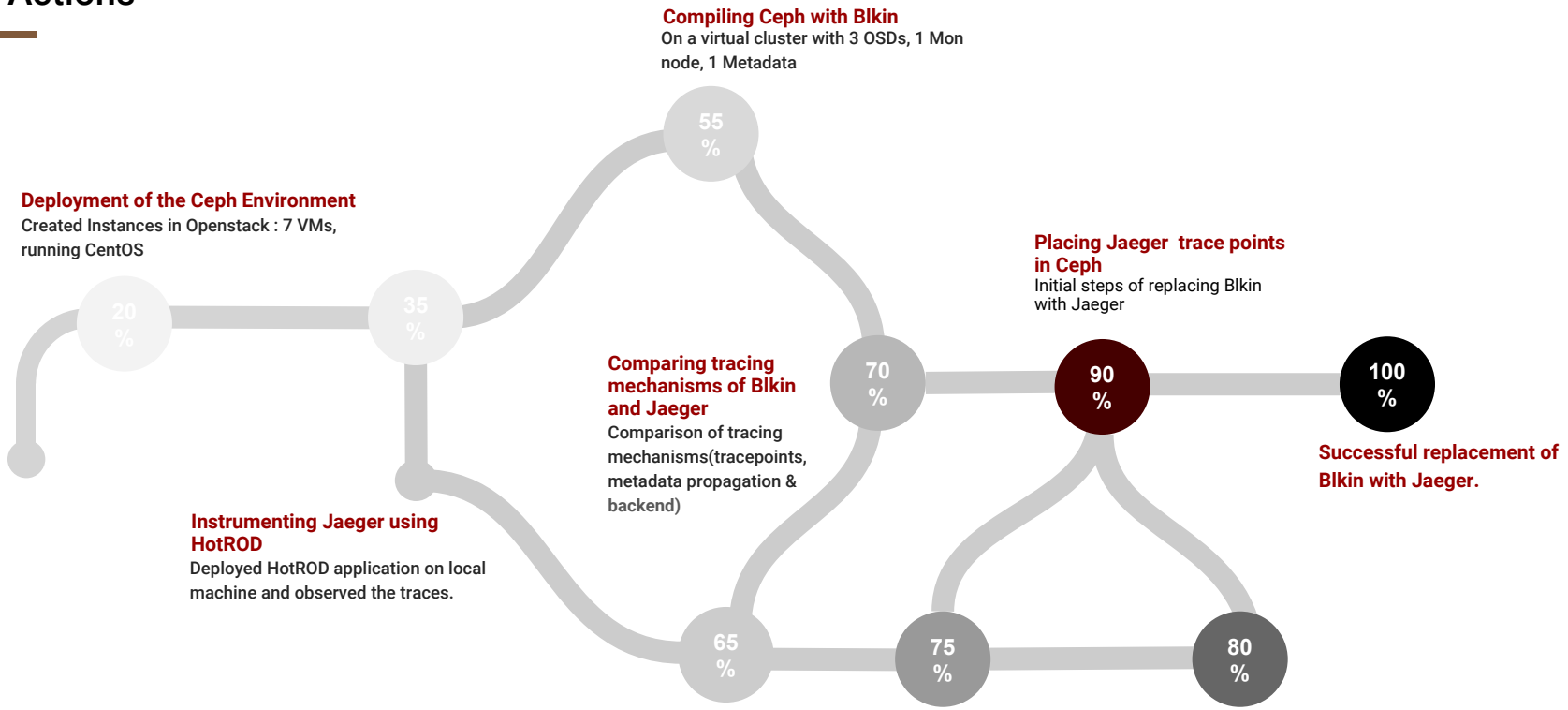
Uber - Tracing - Jaeger

Distributed Tracing System - Always on, End-to-End

Ceph - Tracing - Jaeger

Distributed Storage System + Distributed Tracing System

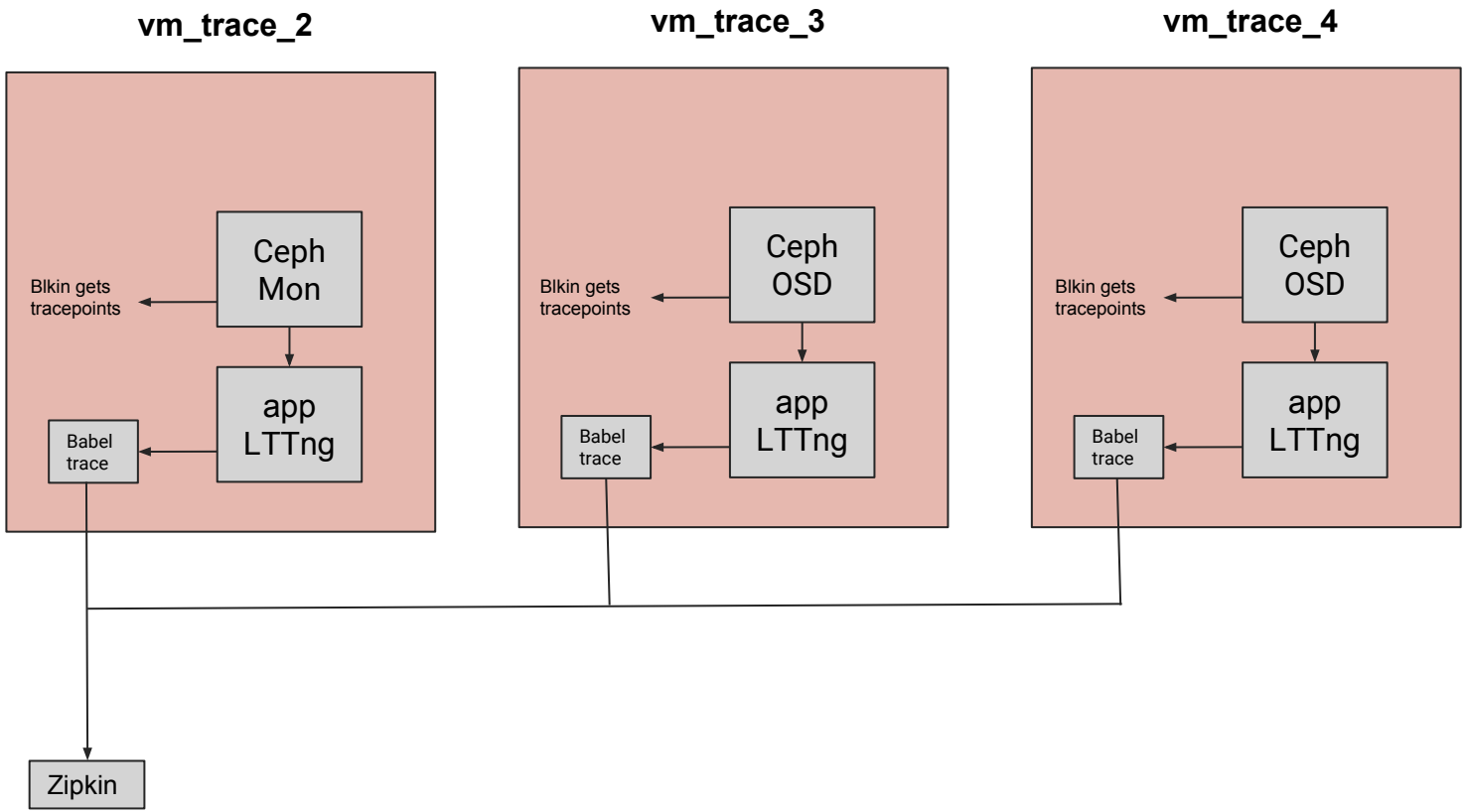
Key Actions


Compiling Ceph with Blkin
On a virtual cluster with 3 OSDs, 1 Mon node, 1 Metadata
55 %
Deployment of the Ceph Environment
Created Instances in Openstack : 7 VMs, running CentOS
20 %
35 %
Placing Jaeger trace points in Ceph
Initial steps of replacing Blkin with Jaeger
Comparing tracing mechanisms of Blkin and Jaeger
Comparison of tracing mechanisms(tracepoints, metadata propagation & backend)
70 %
90 %
100 %
Successful replacement of Blkin with Jaeger.
Instrumenting Jaeger using HotROD
Deployed HotROD application on local machine and observed the traces.
65 %
75 %
80 %
Exploring HOTROD example
Deployed HotROD on two VMs in MOC in order to visualize the traces using Jaeger
Deploy Jaeger on a Distributed Client Server Application
Instrumenting Jaeger on a simple testbed application similar to Ceph
Deploy Jaeger on a Distributed Client Server Application
Instrumenting Jaeger on a simple C++ Application

Ceph

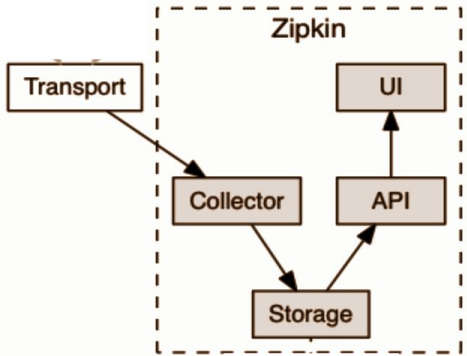
- Visualizing Traces generated using Blkin
- Reading Ceph and Blkin Code

Ceph


vm_trace_2
vm_trace_3
vm_trace_4
Blkin gets tracepoints
Ceph Mon
app LTTng
Babel trace
Blkin gets tracepoints
Ceph OSD
app LTTng
Babel trace
Blkin gets tracepoints
Ceph OSD
app LTTng
Babel trace
Zipkin

Working of Zipkin

Img src: zipkin.io Zipkin Architecture



Babeltrace:

Convert traces to json format and send to Zipkin

Zipkin:

- Collects and combines traces
- Put in Storage
- API initiates reading from storage and sends it to Web UI

Our Attempts

1. Having Zipkin on VM : firefox problems, babeltrace problems
2. Having Zipkin and Babeltrace on our local laptop
3. Working on Ubuntu ...

Questions

Reading Ceph and Blkin code and gathering specific information:

1. Within Ceph code, which parts are responsible to talk to Blkin?
2. What information from Blkin is passed to Ceph
3. How are they being stored in Ceph
4. How does Blkin use the LTTng backend
5. How does Blkin relate to LTTng

Jaeger Code Understanding

- Go Structure
- C++ and how to work with it

Challenges

- Originally we decided to proceed with the GoLang version of Jaeger.
- Decision to test Jaeger tracing on a sample distributed chat application written in GoLang.
- Recent realization that Jaeger has a C++ implementation so we will now test tracing on a C++ distributed chat application.
- Currently working on making the chat application distributed.
- Once, we have the traces on the sample chat application, we will have an idea of what to expect when tracing Ceph with Jaeger

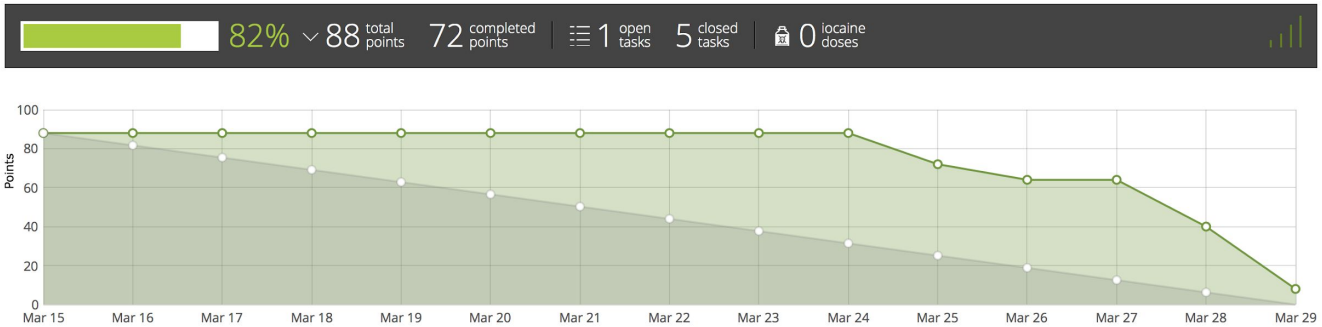
User Stories

Sprint 4(Current)

- As a product developer, I would like to Deploy a GO language distributed application on 2 VMs, add trace points, and visualize the traces so that I have an understanding of instrumenting jaeger on a simple distributed application similar to Ceph
- As a product owner, i would like to Understand the architecture of Blkin to identify the tracing mechanism (tracepoints, metadata propagation, backend) and compare with Jaeger
- As a product developer, I would like to carry out the Initial steps in replacement of Blkin with jaeger so that I take my first important step towards my end goal

Sprint 5(Next)

- As a product developer, I would like to instrument jaeger on a simple client server C++ Application so that I can understand the mechanism to employ jaeger on a distributed application like Ceph
- As a product developer, by understanding the Blkin code, I would like to answer several questions related to the tracing in Blkin so that I can draw parallels between Blkin and Jaeger and replace Blkin with Jaeger
- As a product developer, i would like to visualize traces using Zipkin so that i can gather an interesting visualization of the traces
- As a product developer, I would like to start instrumenting Jaeger on Ceph so that I can reach towards my end Goal



References

[1] https://lttng.org/docs/v2.10/#doc-whats-new

[2] Red Hat, Inc. (2017) Ceph homepage. [Online]. Available: https://ceph.com

[3] Red Hat, Inc. (2016) Tracing Ceph With BlkKin Ceph Documentation. [Online]. Available: http://docs.ceph.com/docs/master/dev/blkin/

[4] Zipkin Architecture (2018) Retrieved from https://zipkin.io/pages/architecture.html

Thank You!