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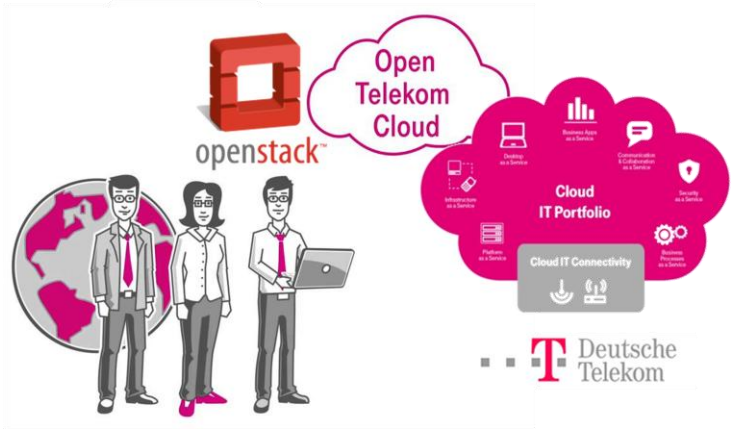
Intelligent Instrumentation for OpenStack

(Internship/MSc Thesis 2016)

OpenStack Cloud OS

OpenStack is a cloud operating system (Cloud OS) for building public and private clouds. It can control pools of compute, storage, and networking recourses located in large data centres. It is supported by major IT players in the world which include IBM, HP, Intel, Huawei, Red Hat, AT&T, and Ericsson.



At Huawei Research we are currently developing the next generation of reliable cloud platforms for Deutsche Telekom. The Open Telekom Cloud[1] engineered by Huawei[2] and operated by T-Systems was launched at CeBIT 2016 and delivers flexible and convenient cloud services.

OpenStack Reliability

Reliability is a measure of the percentage uptime of OpenStack services to customers, considering the downtime due to faults. Many cloud providers are setting a reliability level of 99.95%. This means that if you provision a VM it will be available 99.95% of the time, with a possible downtime of 21.6 minutes per month.

Project Goal: Intelligent Instrumentation for OpenStack

In this master project, we want to increase the reliability of OpenStack by using instrumentation to understand its behaviour. The idea is to modify the source code and insert special messages tagged with unique ids into logs. The ids enable to trace the message flows and allow operators to identify anomalous behaviours. This approach has been successfully followed by **Google Dapper system** and **Berkeley with the Magpie project**.

However, since it is difficult and time-consuming to understand the code to find the right locations for instrumentation, we are looking into new intelligent solutions to discover and suggest instrumentation points. Our approach is the following:

1. Implement the **concept of probe** to discovery noisy traces from logs. The idea is to insert **synthetic probes** in OpenStack client-service requests which will travel down to the logs. The travel paths are identified. Afterwards, the aggregation of paths enables to reconstruct (noise) traces.

2. These noisy **traces need to be cleaned** using noise reduction methods such as outlier detection, smoothing, clustering, filtering, and selective sampling. Once cleaned, the **instrumentation points are discovered** by overlapping traces with raw statement executions.

3. Instrumentation instructions are then **automatically inserted into source code**. This requires an effective approach to manage the original and instrumented source code since OpenStack is an open source, community project with releases every 6 months.

Contact

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[1] https://cloud.telekom.de/en/cloud-infrastructure/open-telekom-cloud/

[2] http://e.huawei.com/uk/products/cloud-computing-dc/cloud-computing/fusionsphere/fusionsphere