MONITORING SYSTEM FOR IT INFRASTRUCTURE AND EPICS CONTROL SYSTEM AT SuperKEKB

S. Sasaki, T. T. Nakamura (KEK, Ibaraki, Japan) M. Hirose (KIS, Tsuchiura, Japan)

Abstract

The monitoring system has been deployed to efficiently monitor IT infrastructure and EPICS control system at SuperKEKB. The system monitors two types of data: metrics and logs. Metrics such as a network traffic and a CPU utilization are monitored with Zabbix. The data stored in Zabbix are visualized on Grafana, which allows us to easily create dashboards and analyze the data. Logs such as text data are monitored with Elastic Stack, which provides log collection, searching, analysis and visualization. We have applied it to monitor broadcast packets in the control network and EPICS control system. In addition, we have developed the EPICS Channel Access client software that sends PV values to Zabbix server and the status of each IOC is monitored with it. We have also developed the Grafana plugin and API gateway to visualize the data from pvAccess RPC servers. Various data such as CSS alarm status data is displayed on it.

Metric Monitoring

- Metrics are collection of a measurement at a certain point in time
- We have monitored the metrics such as a network traffic and a CPU utilization with Zabbix

ZABBIX

- Open-source monitoring software tool
- Integrated multiple features for monitoring

Grafana

- Open-source software tool for data visualization and analysis
- Allows to visualize data from various data storage backend
- We have applied Zabbix plugin to Grafana to visualize the data stored in Zabbix data storage

Log Monitoring

- Log is text messages generated from an operating system or other software
- We adopt Elastic Stack for log data collection, searching, analysis and visualization
- We apply Elastic Stack to monitor broadcast packets and the EPICS control system

EPICS PV Monitoring with Zabbix

- We had several problems on EPICS IOC
- For example, new CA client was rejected due to high CPU utilization or high memory consumption
- To keep IOC healthy, monitoring IOC performance is required
- We have implemented EPICS PV monitoring system with Zabbix for IOC monitoring
- PV values are monitored as metrics and they are managed as well as the metrics for IT infrastructure
- PV values are stored in a buffer in the interval
- Func determines what function is applied to the buffer before sending metric
- We have monitored PVS of CPU utilization, memory usage, number of CA clients and so on provided by DevloStats device support.

Visualize pvAccess RPC Data on Grafana

- We have developed Grafana datasource plugin and HTTP / pvAccess API gateway to visualize arbitrary data on Grafana
- These applications allow to visualize the data from pvAccess RPC servers

System architecture of metric monitoring

System architecture of log monitoring

System architecture of EPICS PV monitoring

System architecture of pvAccess data visualization system for pvAccess RPC data

Grafana dashboard for computer performance metrics

PV search frequencies monitoring with caSnooper

Visualized pvAccess RPC sample data

Table of current CSS alarm data

Arguments as shown below are essential:
- starttime
- endtime
- entity

Optional arguments are also allowed to use

Example usage of zabbix-epics-py

```
$ python zabbix-epics-py
```