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Analysis and Evaluation of Characteristics of the RaSTA Communication Protocol using ELK

Introduction

Strict normative provisions existing in railway signaling systems requires the standardization of Rail Safe Transport Application (RaSTA), a generic protocol stack, offering safe and redundant communication. To prove the reliability, performance, safety and other characteristics, rigorous testing is conducted which leads to a large number of logs being generated to investigate to obtain behavior.

This leads to an acute need to modernize and optimize the analysis process to evaluate the performance characteristics of the communication protocol. To efficiently achieve and automate the data collection, transformation, analysis and validation process, a pipelined process is established in this thesis with the use of a tool called ELK Stack which collects data, processes it and provides us insights of results collected in real time, which allows to obtain the behavior of the protocol stack in real time.
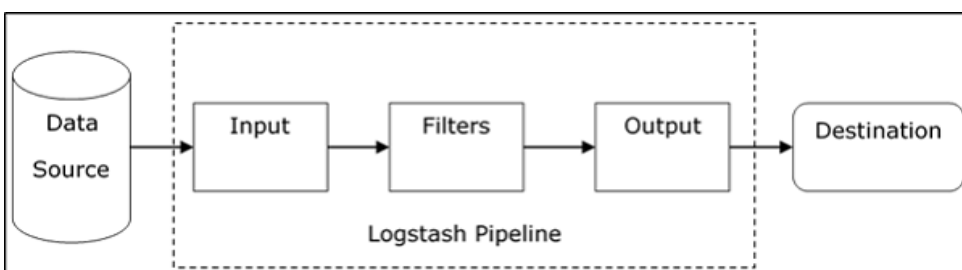

Fig 1: Concept of ELK Implementation [Source : Tutorialspoint]

Fig 2: ELK Pipeline of Data Processing [Source : Deutsche Bahn]

Methodology

- Filebeats, a tool offered by Elastic© is deployed in the target test system and checks for new log files in the specified sources

- Filebeat ships the new log files to Logstash, which consolidates the data, structures and transforms the data based on the filters.

- This data is shipped to Elasticsearch which stores the information received and works as the search engine

- Search queries are passed and meaningful visualizations are provided to understand the data from test results
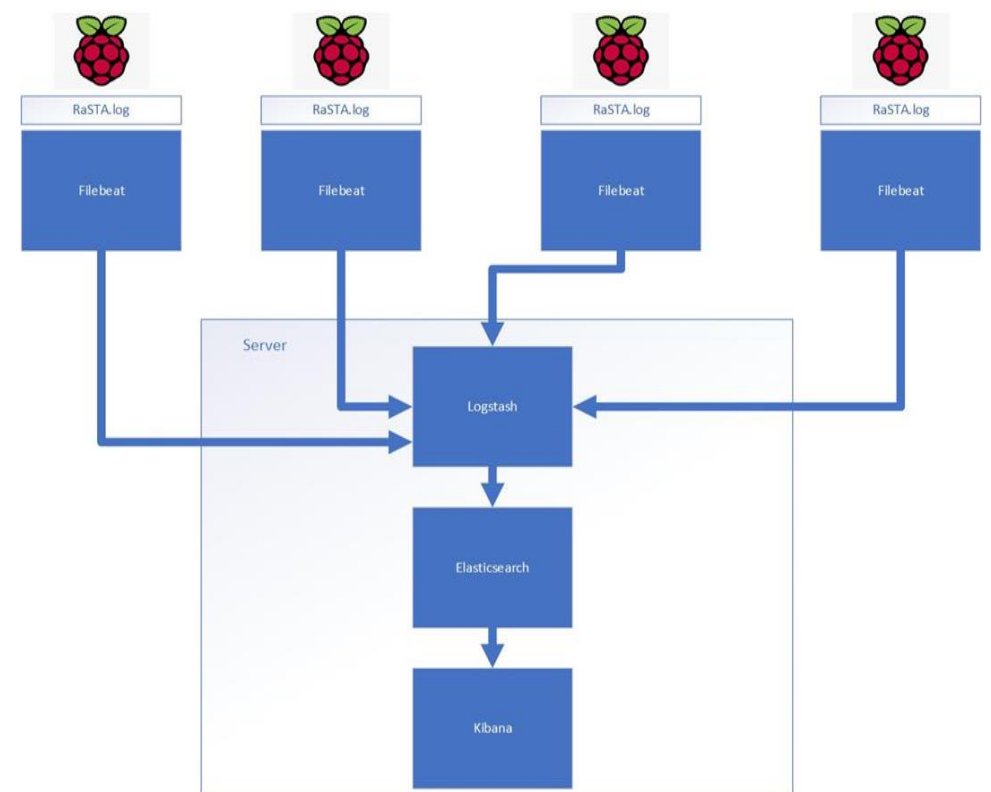
Results

The proposed pipeline was implemented in the test environment eased up the data collection and processing steps and provided the team of engineers at Deutsche Bahn with meaningful insights from the test results which not only increases efficiency in the overall test analysis but also helps in finding sporadical issues and unforecasted issues thus assisting the standardization procedure for the RaSTA Communication Protocol
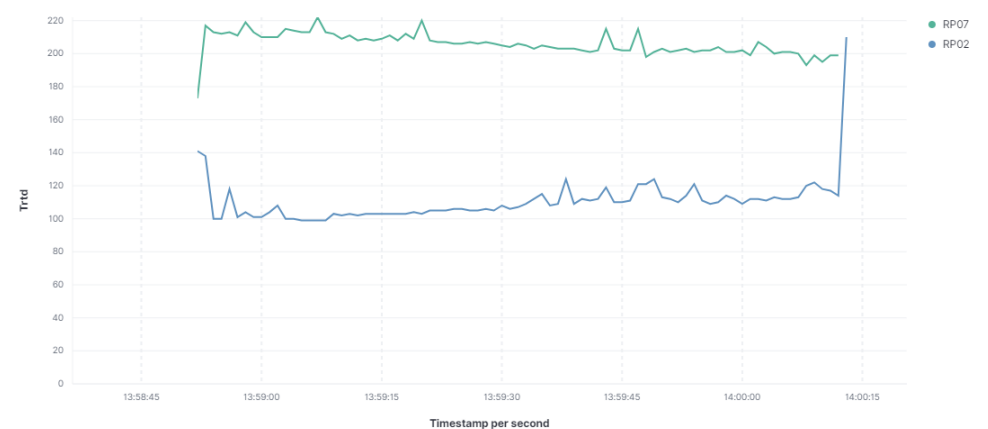

Fig 3: Visualized Data in Kibana Dashboard

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