Network Syslog Analysis with DeCorus

Bruno Wassermann, David Ohana, Elliot K. Kolodner, Michal Malka, Eran Raichstein, Ronen Schaffer, Robert Shahla, Moshik Hershcovitch
IBM Research Haifa

Motivation
Fast detection of failures in the network infrastructure of a modern cloud service provider.

Scale
~10,000 network-devices in a single DC.
Reliability team supports up to 100 DCs.

Data
Network device syslogs: Up to 1 billion of text-based syslog events in various formats per day.

Current State
Matching each log event to a DB of handcrafted regex-based rules. Does not cover new types of errors; produces too many alerts; requires a lot of maintenance.

DeCorus: Detection and Correlation of Unusual Signals

DeCorus is a general purpose streaming pipeline for online, hierarchical, unsupervised anomaly-detection and root-cause analysis. We apply it on network-device syslogs.

Log-Template Mining

Header Extraction: time, host, severity, event-code, etc ..

Log templates are extracted from event textual content using DRAIN3 clustering algorithm.

Output:
Thousands of unique log templates.

Conversion to Time Series

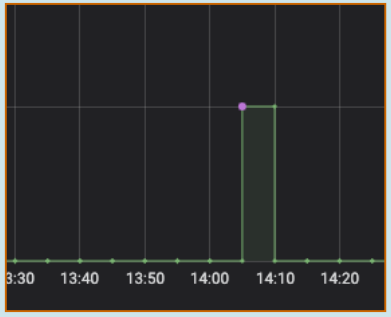
Counting occurrences of each template per network device per 5-minute time interval.

Output:
Up to 100K of unique time-series (signals).

Univariate Anomaly Detection

Detecting anomalies in each time series independently.

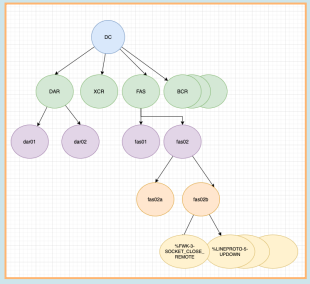
Output:
Anomaly score per signal per time-interval.



Multivariate Anomaly Detection

Home-grown, topology-based algorithm for scoring anomaly level of the data centre.

Output:
Anomaly scores per DC & network device; significant anomaly dimensions.



Alerting, Visualisation, Root-Cause Analysis