



## **Predictive Analytics for Preventing Data Center Failures**

### **Failures can be catastrophic for data centers**

This year on a Monday morning Delta Airlines' operation came to a standstill. Passengers check-in to the flights in London Heathrow were told that the flight check-in systems were not operational. The story was same across the globe during that time. Not only did this cause tremendous financial loss to Delta, it caused immense damage to Delta's brand. It turned out that the reason behind this outage was the failure of a critical power supply equipment, which caused a surge to the transformer and loss of power. The critical systems did not switch over to back up power. In other words, a power surge caused by single malfunctioning unit brought Delta's operation to a halt. One can find similar incidents caused by malfunctioning equipment across industries. Not only are data centers vulnerable due to sudden failure of equipment, so are other critical infrastructure such as electricity grids, utilities, airports etc.

### **Root Cause Analysis of every incident leads to better analysis and predictive capabilities**

Failures such as the one in Delta, leads to root cause analysis and instituting capabilities to predict such failures. The progress of machine learning and analytics has made it possible to tap the vast amount of data from sensors, equipment, factories and machines not only to monitor the health of the equipment but also to predict when something is likely to malfunction or fail. With the advent of huge data availability, a predictive and prescriptive analytics platform is an inseparable part of



any analytics software. It is crucial to understand the possibility of future events to take precautionary measure and prevent unwanted situation, hence cutting the operational and maintenance cost. Data Center Infrastructure Management (DCIM) software, which monitors critical data center equipment, is also starting to utilize analytics capabilities to predict failures. At configuration stage, DCIM is mapped with the critical relationships and dependencies between all the assets, applications and business units in the data center. This makes it possible to identify cascading impacts of an impending failure. Over a period of time, data patterns evolve which lend themselves to modern predictive and prescriptive analytics. Predictive analytics gives the data center team enough time to take measures to either avoid or reduce the impact of the failure when it happens.

It is imperative for data centers to keep uptime of the equipment to the maximum. This reduces the possibility of data center downtime. The various equipment in the data center such as UPS, PDUs, PACs are monitored by DCIM with real time alerts if critical parameters cross thresholds. The streaming data from devices as well as alerts and faults reports can be correlated by analytics to pin point root causes of failures as well as predict device failures. These aid immensely in streamlining data center operations.

### **Proposed model based on root cause analysis, correlation of devices**

The following are the broad contours of the model to characterize failures and assign probability of device failures based on alarms:



- A computing unit, Fault Engine, which leverages the log-data from all concerned devices available in the device chain and employs a Markov Process based Failure Model to predict whether the failure is permanent or transient hence raising alarm with proper severity.
- The Engine identifies the root cause devices in a situation of failure. It assigns probability to devices to be a probable root cause hence narrows down the search space for the DC management team.
- The Engine is capable of identifying communities of correlated devices based on the correlated failures. The Fault Engine employs all the conditional probabilities given all other devices from the historical data to identify the correlation between devices based on their correlated failures.

### **What will be the benefits from the proposed solution?**

Delta's outage and similar outages across critical infrastructure have reinforced the need to predict failure before it happens. Hence, businesses are turning to predictive analytics to better understand equipment failure pattern so that they can take necessary steps to prevent outage.

- The predictive analytics platform will help customer to continuously monitor all the devices, to take precautionary actions based on the output probability, which will save huge operating cost of recovering from the acute failure scenario.



- Alarm module is one of the most critical modules in DCIM. Correlated Alarm system will help customer to identify correlated devices which will lead to a guided search for actual root cause of the failure.
- The prediction for the severity of the failure will give warning for the DC management team to understand the cause of failure beforehand and take informed decision before it worsens.
- Overall, the automated predictive analytics platform will help the customers to analyze alarms, root causes and take meaningful actions based on probabilistic model of failure.