Case Study

Leading EV Charging Station Provider Slashes Maintenance Costs, Improves Customer Satisfaction

Leader in the EV Charging Industry

This FogHorn client is a leading Chinese high-tech organization providing equipment and solutions for the smart grid, alternative energy, energy savings and emission reduction. The company is the 3rd largest EV charger manufacturer and operator in China, with 30,000 chargers sold, and 13,000 self-operating chargers. The company offers an intelligent DC-AC charging system, designed by experts to meet critical market requirements. Key features include an integrated PV solar solution, an energy storage system, high and low voltage power distribution systems, control and protection, and it provides multiple charging modes to electric cars.

The company recognized the opportunity to analyze the large volume of data from each of its 500 charging stations produced daily to improve utilization, anticipate maintenance needs, reduce the number of false alarms, and ensure a high level of customer satisfaction with faster response time.

FogHorn Edge Intelligence Between the Chargers and the Cloud Delivered Immediate Results

The company quickly realized the value of creating an edge intelligence layer with FogHorn to enable a number of improvements to the daily operation of the charging stations. By adding the FogHorn software to Dell servers, they were able to significantly reduce the volume of traffic sent to the cloud, lowering latency and reducing costs and pressure on back-end servers. This approach also improved monitoring granularity and enabled real-time analytics to speed reaction to event occurrences. Finally, it provided new value-added services possibilities such as power reallocation, sleep management, full charge notification and more.

FogHorn: The Power of Edge Analytics and Machine Learning

The company, together with FogHorn, devised a two-level architecture to maximize the functionality, performance, scalability and benefits of the solution. The upper level is comprised of data storage, machine learning (ML), and a user

Challenges

- Extremely high % of false positive alerts for +/- input phase volts
- No anomaly detective vs. historical values
- High cost of maintenance

FogHorn Solution

- FogHorn installed for real-time monitoring of battery condition
- Significant reduction in false positives
- Predictive maintenance reduces cost and downtime
- Improved user experience

Benefits

- Reduced false positive alerts
- Real-time condition monitoring
- Smart, not scheduled maintenance

interface (UI) specifically designed to present the results of the processed edge data. The lower level was architected to support data ingestion and enrichment, such as decoding, filtering and data enrichment and alignment. This level also provides data manipulation and analytics modeling, event generation, data archiving and publishing.

After deploying the FogHorn Lighting Platform in the Dell Servers, the first step was to rapidly ingest critical streaming data, including voltage, current and temperature to achieve real-time sampling of 100% of the data. This was achieved via FogHorn's complex event processing (CEP) engine to align, up-sample, interpolate, populate missing data and pre-process data prior to the execution of machine learning to discover patterns.

This was implemented 100% in FogHorn VEL®, FogHorn's Pythonic, SQL-ish, English reading-like language and platform written specifically for low-footprint, low-latency (milliseconds) advanced edge IIoT analytics. VEL was designed from the ground up to enable not only powerful and highly complex analytic expressions to be executed on streaming data (like a turbo charged dynamically programmable rules engine), but VEL also cleans, filters, normalizes and aligns streaming data to allow any ML or AI models to be executed on the real-time processed metadata.

Multiple ML models were developed to correlate a number of conditions and alerts, including charging time, alarm verification, alarm prediction, charger sleeping strategy and user experience measures. The results and actionable insights were published to an OT-centric dashboard for ease of operator use.

Reducing Alarm False Positives; Estimating Charging Time; Improving Customer Satisfaction

The alarms are generated directly from the chargers, but there were many challenges. Too many false alarms were being generated, the data sampling frequency was happening in 5-minute intervals, and there was no data tied to each alarm. FogHorn's Lightning EdgeML® was deployed, increasing the granularity and frequency of data analysis, and learning the data patterns (e.g. 3 phases of voltage and current). By cross checking the data with the alarms, the false positives were significantly reduced, and only true alarms were sent for backend processing.

Estimating charging time is a key element to maximize battery utilization. By correlating voltage, current and temperature using FogHorn, a much more reliable state of charge (SOC) measure was calculated. For example, voltage is low at the beginning of charging, increases rapidly during charging phase, and remains steady when the battery is nearly full charge. Further, the voltage and current charging curve change when temperature changed.

Using FogHorn to create real-time insights on the batteries and charging stations, the company was able to improve utilization, anticipate maintenance needs, reduce the number of false alarms, and ensure a high level of customer satisfaction with faster response time.

"FogHorn set the tone early in edge intelligence and machine learning for IIoT by shifting the mindset of "cloud first" to "edge first. Now, you can see it extending its leadership position with "edge to cloud" to deliver the most powerful and cost effective approach to edge AI for industrial organizations."

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