Indium Software spearheads IoT driven Predictive Analytics & Equipment Failure Monitoring software suite development for Oil & Gas Industry

60% of the world's oil production runs through Electrical Submersible Pumps (ESP). (Presley, 2013)

It has been estimated that just a 1% improvement in ESP performance world-wide would provide over a half-million additional barrels of oil per day. (Presley, 2013)

Situation

The client is a Big Data Strategy Consultant, who serves a startup that operates in the IoT driven Analytics space. The startup's solution currently targets to provide equipment failure prevention insights in the upstream Oil industry.

Top Oil & Gas players are investing billions in IoT to realize higher asset uptime, failure protection and increased operational efficiency. IoT enables O&G firms to track, monitor, manage and resolve asset issues from a centralized remote collaboration center, at near-real time. The startup envisions to develop an end-to-end IoT driven Predictive Analytics & Equipment failure monitoring software suite that is scalable, configurable, modular, secure, and Cloud, Web & Mobile friendly.

The client chose Indium Software for its prior successful engagements with Big Data Analytics startups, flexible engagement models, and on-demand access to a pool of Top Data Science, Big Data Infrastructure and Analytics talent. Indium Software was commissioned to spearhead the software suite development, based on the solution architecture designed by the client. The software suite development (until current project phase) involves the below:

- ESP sensor data ingestion from time-series database to NoSQL database.
- Statistical model to predict Time to failure (TTF) of any device/equipment, from near real-time data.
- Automated system to send mobile push notification to all stakeholders about predicted failure events.
- User Interface (UI) to monitor and manage the entire process.

Solution

The software suite was developed from scratch in multiple phases. We are nearing phase 3 completion, and phase 4 is scheduled to start from April 2016.

Phase 1
- ESP sensor data ingestion from time-series PI Historian database to Oracle NoSQL 3.0.5 database using PI JDBC 1.0.
- Schedule data ingestion jobs in Quartz 2.2.1.
- Program Shapelet model in R 3.1.1, to predict Time to Failure (TTF) of any device/equipment. Shapelet has been chosen over Random forest & Logistic regression for its – a) Scalable approach to identify patterns in real-time from very large datasets, b) Ability to study only patterns that lead to failure and predict lead Time to Failure (TTF), which helps on-field engineers to prevent downtime.

Phase 2
- Enhance Oracle NoSQL data model to support data ingestion from both equipments – ESP and GLC.
- Enhance statistical model to support multithreading and process data from at least 30 ESP sensor tags.

Phase 3
- Develop User Interface to monitor & manage all processes using HTML 5, jQuery 2.1.1, and Web services (using Apache Spring). Host UI on Tomcat server 7.
- Enable mobile push notification of predicted Time to Failure (TTF) using Apache Kafka Queue 0.8.2.2 message broker system.
- Build UI with HTML 5, jQuery 2.1.1, and embed Drools 6.3.0 business rule engine. The UI should allow users to add custom rules to be processed by Drools.

Technologies Used
PI JDBC 1.0, Oracle NoSQL 3.0.5, Quartz 2.2.1, Shapelets time-series classification algorithm, R 3.1.1, Apache Spring, Apache Tomcat 7, HTML 5, jQuery 2.1.1, Apache Kafka 0.8.2.2, Drools 6.3.0

Duration
9 months (ongoing)

Resources
1 Big Data Analytics Lead
1 Data Scientist
1 Sr. Java Developer
1 Sr. R Developer

Engagement Model
Offshore

Result

Indium Software has been awarded phase 4 of the project, which focuses on cloud integration and data visualization. The major benefits realized by the startup till date are:

- Faster Time-to-market of the Minimum Viable Product (MVP), at a lower cost.
- New business opportunities in Oil & Gas industry and in other industries.
- An Enterprise software company has expressed interest to partner with the startup. Relevant software & online services from the potential partner would be integrated with the software suite developed.

About Indium Software

Indium Software is a Big Data Technology Consulting and Professional Services company. Indium Software focuses exclusively on Global Enterprises and help them leverage Big Data through Strategic Consulting, Technology Selection, Design & Architecture and Implementation of the solution. With offices in the U.S and India, Indium Software offers Flexible Engagement Models and Comprehensive Solution Approach to help customers leverage Big Data

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