# HCL DEFINES AND BUILDS A PREDICTIVE MAINTENANCE PROGRAM FOR A US MEDICAL TECHNOLOGY COMPANY

## Customer Profile

The customer is a medical technology company that manufactures and sells medical devices, instrument systems, and reagents. Founded in 1897, the customer has more than 40,000 associates across 50 countries who work in close collaboration with customers and partners to help enhance outcomes, lower healthcare delivery costs, increase efficiencies, improve healthcare safety and expand access to health. It has partnered with organizations around the world to address some of the most challenging global health issues.

## Customer Challenges

Since the customer had large-scale manufacturing facilities, low uptime had direct impact on revenues. They also reported low employee productivity and high degree of informal/tribal knowledge in processes that were stuck with the experienced employees.

Following are the challenges faced by the customer in maintaining high uptime, leading to revenue loss and high operational cost:

### HIGH MAINTENANCE COST:

The maintenance process of their production-critical machinery was reactive in nature. They had no formal channels to store the historical maintenance data. This led to increased maintenance cost.

### UNTIMELY DIAGNOSIS OF PRODUCTION-CRITICAL MACHINERY:

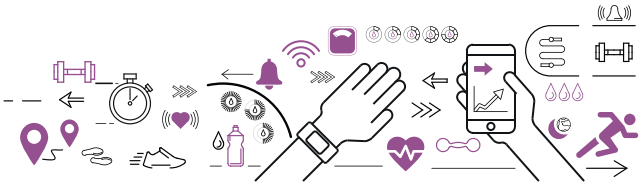
The customer's maintenance department found it challenging to successfully diagnose (or predict) situations, where the machinery needed maintenance, based on their informal/tribal knowledge.

### LOW UPTIME LEADING TO REVENUE LOSS:

The printer & packaging systems were part of a critical and complicated machinery in their factory setup. Since the facility was producing the units in high volume, low uptime had direct impact on revenues.

The customer wanted to enable optimal maintenance program to reduce loss in productivity due to "over-maintenance". In addition to this, they were trying to identify and fix "under-performing" equipment in optimal time.

## Our Solution



HCL brought in strong business understanding coupled with deep technical expertise to work with the customer to understand the pain points and offered workaround. HCL conducted site visit to understand the scope of problem.

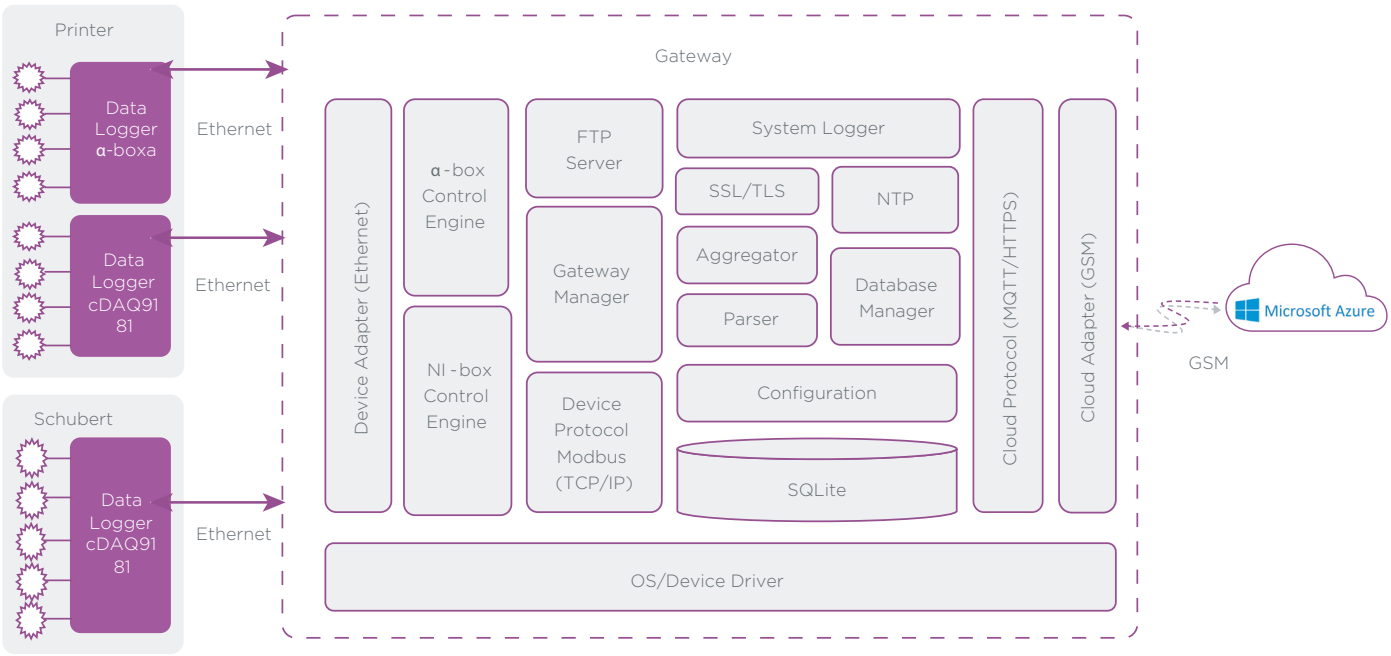
HCL approached with its **Define, Build & Run** services to address customer needs. Business challenges faced by the customer led to the implementation of Automation, Condition Monitoring & Alerts along with Predictive Maintenance Solution.

As a part of this engagement, HCL came up with a Sensor Selection framework to identify suitable sensors that can help capture relevant machine details and can be retrofitted on to the identified machines. This machinery included printer used for printing calibrations on syringes and the packaging system. The solution also provided real-time storage and visualization of data from sensors retrofitted on machine parts. We leveraged our strong manufacturing domain expertise and data science knowledge to come up with the Predictive Modelling Algorithm based on the data collected from the sensors and inputs gathered from maintenance operator, using Interactive UI Dashboard. Machine Learning experiments were performed to detect anomalies in the high-dimensional sensor data.

### HCL Data Science team performed various activities which included:

- Exploratory Data Analysis to evaluate correlation/relationship between various predictor variables and target output
- Used Data Analytics Expertise to:
  - Establish the hypothesis based on data pattern and relation;
  - Build supervised and unsupervised models (SVM, PCA, Neural Network, and RF);
  - Perform cluster analysis for the parameters if needed, such as K-means clustering
- Built machine learning models to predict potential problems/anomalies related to production-critical machines

Data science team used K-mean Clustering Algorithm to identify different clusters for various fault types and the classification model using labelled data to predict faults in the production-critical machines.




The database and dashboard aspects of solution are scalable enough to accommodate large number of users as well as devices.

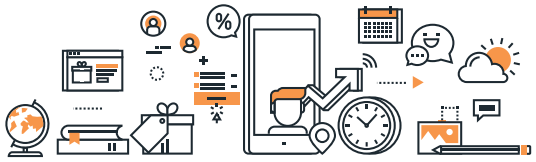
The device to cloud communication happens using security tokens, which ensures secure device authentication. The authentication process has time limit associated with it, which helps in granting time bound access. Transport Layer Security (TLS) protocol is being used for secure communication between device and cloud. Various access control policies have also been defined to protect data from unauthorized access. Transparent Data Encryption (TDE) technology has ensured database encryption and data protection.

The solution also involves edge computing aspect, which is being performed on the data collected from speed sensors mounted on the printing machine at Data Logger level. Digital signal processing techniques using transforms (Hilbert, Fourier) are used for on-edge “Bearing Analysis”. It helped in analysing on-the-fly complex data and come up with the derived prediction variables such as “mechanical stress” & “mechanical damage” on the bearing. This analysis helped the customer to predict the health of the bearing, adding reliability to the prediction model, so that subsequent action (replacement, maintenance) could be taken.

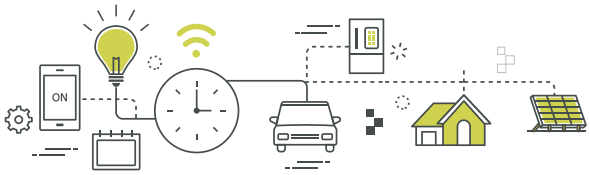
On-edge data storage was done using SQLite for buffering one and an hour of sensor data considering the cellular communication network availability avoiding any data loss issues.

IoT WoRKS™ by HCL Technologies

# Customer Benefits



- 6-8% **increase in Overall Equipment Effectiveness** (OEE)
- 40% **reduction in maintenance cost**
- Creation of Web-based UI dashboard intended for **monitoring and anomaly detection**
- 8-10% **increase in profitability**
- Implemented solution will help the customer enable Optimal Maintenance Program to **reduce loss in productivity** due to "over-maintenance"
- **Reduction in the inventory** of spare parts and tools




# Who Are We?

**IoT WoRKS™** is a dedicated 'Internet of Things Business Unit' from HCL Technologies that enables organizations to create best-in-class solutions by enabling IoT-led transformation. These solutions maximize effectiveness and returns on asset investments by creating efficient processes, new revenue streams and business models that deliver measurable outcomes. Recognized as a market leader in IoT by leading analyst firms, **IoT WoRKS™** continues to strengthen its leadership position in fast-growing global IoT services and consulting market.

We have a differentiated solution portfolio which aims to enable connected workforce, connected products, connected infrastructure, and connected operations for the Next Gen enterprises. With end-to-end IoT services for organizations across the three phases – **Define, Build & Run** – **IoT WoRKS™** helps design enterprise IoT strategy, develop and run the IoT systems for realizing real business value. Solving the eminent challenges in the industry today with research-led approach, **IoT WoRKS™** has launched a platform - **IoT COLLAB™** - the destination for IoT-led business transformation for Next Gen enterprises to co-create transformational IoT roadmap and solutions with the customers.

We continue to develop best-in-class IoT frameworks, wider and more mature solution offerings across key IoT business segments, as well as strengthening the IoT ecosystem play with the right partnerships, and engage customers with innovative business models to drive the phenomenal business transformation opportunity.

IoT WoRKS™ by HCL Technologies

## Our IPs and Accelerators

**DDX**

Accelerator for device IoT-ization

**PANGEA**

Data Analytics platform

**IDEA GATEWAY**

Reference Design for an intelligent device

**PLATFORM ACCELERATION SUITE**

Build next generation cloud services

## When You Start with a Top-rated Value Proposition, the Ratings Follow

**LEADER**

ISG Research Quadrant 2018 on IoT Services, IoT in Healthcare and Connected Cars for US

**ISG**

**WINNER'S CIRCLE**

2016 Blueprint Report on IoT

**HfS**

**LEADER**

Worldwide IoT consulting & System Integration services 2016

**IDC MARKETSCAPE**

**LEADER**

Zinnov Zones 2017 - Global IoT Technology Services consecutively for 2nd year

**ZINNOV**

**LEADER**

IoT Service PEAK Matrix™ Assessment 2017 consecutively for 2nd year

**EVEREST GROUP**

**LEADER**

Early Traction in Key Verticals for IoT WoRKS™ portfolio

**451 Research**

Visit **www.hcltech.com/iot** for more information

To collaborate over a complementary IoT roadmap workshop,
email us at **iotworks@hcl.com**

---

www.hcltech.com

**Hello there! I am an Ideapreneur.** I believe that sustainable business outcomes are driven by relationships nurtured through values like trust, transparency and flexibility. I respect the contract, but believe in going beyond through collaboration, applied innovation and new generation partnership models that put your interest above everything else. Right now 125,000 Ideapreneurs are in a Relationship Beyond the Contract™ with 500 customers in 41 countries. **How can I help you?**

Relationship™ BEYOND THE CONTRACT

HCL

WX-IC3546