Digital Transformation with IoT

Industry Solutions Guide to Data-Driven IoT

CLOUDERA

Convergence of IoT, Big Data, and Machine Learning

The growing emphasis on digital transformation is encouraging more organizations to adopt initiatives driven by the Internet of Things (IoT).

While such initiatives enable enterprises to enhance customer experiences, create new business channels, or acquire new partner ecosystems, gaining the insights to realize these benefits can prove to be challenging. Enterprises intend to quickly gather and analyze data and from the devices powering their business. However, the sheer volume of data that these devices generate, the variety of data that comes in, and the velocity in which data is collected creates its own set of challenges in terms of storage, processing power, and analytics for such enterprises.

The growth of IoT adoption has been exponential across all industries, but organizations within each industry face a unique set of challenges along this journey. Enterprises leveraging all the big data generated from IoT devices in their machine learning models are able to use prescriptive and predictive analytics to make well-informed decisions.

In this eBook, we will discuss the challenges of implementing data-driven IoT, and solutions for addressing the challenges across multiple industries.

More than 24.9 billion connections will be established by the end of 2024 according to Machina Research global market forecasts, generating more and more real-time data about the monitored devices and equipment as well as the environment in which they exist.

Source: IoT Data and Analytics: A New Landscape Emerges, Gartner, March 2017

Manufacturing

To stay competitive, manufacturing firms are looking for new ways to speed production times, improve product quality, and reduce costly periods of downtime.

CHALLENGE

Manufacturing firms need to quickly diagnose and troubleshoot decreases in production rates and product quality, but the task is difficult when the cause is not easily pinpointed. This, combined with the need to predict and address potential machine faults and quality issues before they cause problems, can be hard to achieve without the proper technology.

SOLUTION

Factories equipped with smart sensors throughout the manufacturing process allow production managers to remotely monitor equipment and process performance. These sensors collect data on machine health and productivity that is then aggregated and compared to previous data to diagnose and address problems before they even occur. Predictive maintenance and process optimization reduce bottlenecks and dips in production, as well as the costs associated with quality non-conformance. Data captured by sensors enable companies to understand where problems commonly occur and preemptively address these pitfalls when designing new processes and building new machinery.

IoT devices can also streamline supply chain operations within a manufacturing facility. Radio-Frequency Identification (RFID) tags were used previously to track the movement of goods within a factory floor or beyond. Today, manufacturers are leveraging more advanced monitoring sensors and machine learning technologies within a supply chain to track quality of goods, automate the visual inspection of goods, or for customized manufacturing for individual partners.

An estimated $70 billion will be spent by global manufacturers on IoT solutions in 2020.

Source: The IoT in Manufacturing, BI Intelligence, 2016

Utilities

Utility operators must find new ways to improve reliability and forecasting, increase operational efficiency, reduce environmental impact, and improve customer service.

CHALLENGE

Energy and utility companies around the globe face significant changes that require them to transform how they conduct business. They must continue to deliver safe, dependable, and affordable energy to their customers. Additionally, they need to manage the pressures associated with increasingly stringent regulatory requirements, aging assets, rising demand for alternative energy sources, and management and analysis of new volumes and velocities of smart meter data.

SOLUTION

Smart meters measure energy consumption and utility companies can leverage that information to implement energy demand management systems, minimizing wasted energy, saving customer costs, and reducing environmental impact.

Within an Automated Metering Infrastructure (AMI), smart meters collect energy usage data and analyze it in real time to better understand usage patterns and predict spikes in energy demand. Similar to predictive maintenance in manufacturing, smart meters can alert utility companies of outages or disruptions in the system that could potentially cause outages. This allows companies to address smaller problems in the system before they have a larger impact on their customers.

15%

The global installed base of smart meters will increase by 15% per year, from 2015 to 2020.

Source: The Internet of Things: Examining How the IoT Will Affect The World, BI Intelligence, 2016

Healthcare

Developing new treatments or improving existing ones require large upfront investments of both time and money for healthcare providers and researchers. With new IoT technologies in healthcare, new disease prevention and wellness approaches are easier to attain.

CHALLENGE

Doctors and healthcare providers need a faster, more efficient system for diagnosing patients, as the time patients spend in healthcare facilities increases healthcare costs and reduces patient comfort. Additionally, with value-based healthcare, there is a renewed focus on managing health and wellness vs. managing sickness.

SOLUTION

Internet-connected devices that monitor blood pressure, heart rate, cholesterol, and other vitals allow doctors to quickly aggregate and compare current and past patient data to monitor changes in their health. By correlating symptom data with machine learning models built into the IoT/wearable devices, doctors can more easily identify and predict critical symptoms based on data from previous patients. Data can be passed along to healthcare providers to compare with large clusters of patient data to pinpoint early signs of disease and better determine how and when diseases and health conditions should be treated.

Additionally, with the use of remote telehealth technology, doctors can diagnose patients with milder symptoms that don't require a hospital visit. Telehealth visits reduce patient costs and caters to those who have difficulties traveling.

An estimated 646 million healthcare devices (excluding fitness trackers and wearable devices) will be connected by 2020.

Source: The Internet of Things 2018, BI Intelligence, 2016

Insurance

Insurance companies are looking for ways to better understand and manage risk in the connected world, as the nature of what they insure is changing. Connected and real-time data provides the ability for an insurance company to move from traditional descriptive analytics to prescriptive analytics.

CHALLENGE

Storm and natural disaster data collected from meteorological agencies, smart homes, buildings, drones, autonomous vehicles, and other emerging technologies is being leveraged by insurance companies to assess potential damage against policy coverage. Unfortunately, this data has previously been collected and analyzed historically and in a very narrow band even though insurance companies need immediate access to this information.

SOLUTION

Immediate access to post-storm information enables insurance companies to get timely and accurate event analysis within hours of an event. Date, time, and details of an event can be obtained through streaming data from open weather data sources to overlay and compare data with policy information, geocoded with location and events. This allows insurers to evaluate the impact on customers and reduce costs by rapidly recovering property for those impacted by natural disasters.

Beyond claims management, real-time streaming sources can also help in providing more accurate insurance quotes for customers. Data acquired from connected cars can provide details on the driving style of the driver and a more accurate measure of driver safety ratings.

An estimated 6.4 billion devices are already connected and 5.5 million new devices are added every day, providing new opportunities to better assess risk, improve loss control, and accelerate premium growth.

Source: 5 Ways The IoT Will Transform The Insurance Industry, Forbes, 2016

Retail

The convenience of online shopping is putting pressure on retail stores to improve the in-store experience and convert a higher percentage of visitors to purchasers. The use of IoT devices has enabled more retailers to create omnichannel customer experiences.

CHALLENGE

Growing customer expectations for "frictionless" commerce, personalized interactions, and consistent brand experiences across all channels are accelerating, leaving traditional retailers struggling to keep up.

SOLUTION

Connecting to customer mobile devices through store-specific applications allows retail organizations to tailor real-time recommendations for customers as they are shopping. The app can then tailor the customer's shopping experience by guiding them to specific aisles based on the products on their list and sending product-specific coupons to the user's mobile device in real time. Beacons and sensors placed inside stores allow retail organizations to track the purchase paths of customers by identifying "hot" and "cold" spots throughout the store.

The data collected from these devices can be leveraged to optimize individual store layouts, display locations, and even plan daily and weekly staffing needs. Devices enabling facial recognition technologies measure customer moods and sentiments, provide an opportunity for a "personal touch," improving customer engagements and enhancing shopper experience.

Real-time tracking of product movement also enables vendors to monitor and replenish inventory almost instantly. For example, IoT devices embedded within refrigerated trucks carrying perishable foods can help in cold chain monitoring by measuring temperature and humidity inside the truck and alert the driver of any abnormal temperature increases.

78%

of retailers believe integrating e-commerce and in-store experiences to create an omnichannel customer experience is important or business-critical.

Source: Reinventing Retail: 2017 Retail Study, Zebra, 2017

Government—Smart Cities

Growing populations combined with the need to develop energy efficient infrastructure pushes public sectors to rethink their traditional city planning methodologies.

CHALLENGE

City planners in rapidly growing cities are pressured to minimize traffic congestion and overcrowding, while building an environmentally friendly infrastructure.

SOLUTION

Cities are placing sensors on utility poles, traffic lights, and buildings to measure when and where traffic congestion most commonly occurs at specific times during the day, week, and month. This data helps city planners determine the optimal placement of new roads, buildings, and public transportation systems, to best accommodate rapid population growth.

The data can also be leveraged to improve emergency evacuation readiness plans. In addition, smart cities are connecting smart cars with traffic light sensors to enable automatic braking and slow down cars to improve pedestrian safety.

Equipping buildings with sensors connected to lighting, heating, and other energy controls can help city planners determine when, and how much energy is used throughout the day. Data collected from these sensors can be aggregated and analyzed to help planners design new energy efficient buildings, avoid wasting excess energy, develop ways to moderate the temperature, and reduce waste in older buildings.

A recent update to 14,000 smart street lights in San Diego translates into an expected per year savings of $2.4 million on electricity costs.

Source: Top 5 trends for Smart Cities in 2018, ITU News, 2017

Automotive

The rise of the connected car has paved way for the more sophisticated autonomous driving features that enhance driver experience, while improving safety for both drivers and pedestrians.

CHALLENGE

The connected car itself has several hundred OEM components that are IoT devices. Manufacturers are trying to build the next-generation autonomous car by learning from the data generated by the hundreds of devices on-board as well as on the road, but machine learning models have been harder to implement and enhance. Drivers are also more drawn to vehicles that will improve their experience with added safety and navigation features.

SOLUTION

In a connected car, internet-connected vehicle diagnostic systems such as tire pressure and oil leak monitoring inform the driver of upcoming maintenance needed to preemptively address any issues or routine maintenance needed based on mileage accrual. With autonomous car features, on-road safety becomes even more important given that IoT devices are working together to provide a superior driving experience without driver intervention, until needed.

The use of IoT technologies, such as visual sensors and road mapping models in cars, has allowed autonomous cars to detect the external environment and navigate without driver intervention. Control systems equipped with machine learning capabilities within autonomous cars are able to learn how to distinguish between different cars on the road, obey road signs, and navigate through different cities.

Recent accidents with autonomous cars only reiterate the fact that such machine learning models are far from being perfect and that more data from the onboard IoT devices can improve and enhance the models.

78%

An estimated 78% of cars shipped globally will be built with hardware that connects to the internet by 2020.

Source: The Transformation of the Automobile, BI Intelligence, 2016

Your IoT Strategy

Many organizations have long known the benefits of IoT but have felt that IoT solutions are too complex for them to implement.

However, with the right solution and support, implementing IoT is easier than expected and can be a critical component of your digital transformation. Implementing the right IoT solution requires more than evaluating solution features.

To successfully implement an IoT strategy, start by understanding your use case and how IoT can help fulfill your requirements, along with a clear data management path to support your use case. Organizations must be clear on how their IoT solution can turn streams of device data into valuable actionable insights.

When combined with machine learning and big data solutions, the value of an IoT implementation grows exponentially. Collecting and processing real-time streaming data gives organizations the power to react immediately to events, analyze data for future research, and optimize their processes to avoid commonly occurring challenges.

The capabilities brought forth with IoT, big data, and machine learning power research for the medical industry, streamline the planning of energy efficient buildings and infrastructure, cater to specific customer needs in retail shopping centers, and even drive innovation for autonomous vehicles.

Regardless of industry, IoT has a place in every organization undergoing a digital transformation.

50%

of decision-makers in IT, services, utilities, and manufacturing have either deployed IoT, or will deploy it in the next 12-24 months.

Assess your IoT data readiness with our comprehensive guide. Download today.

Source: 451 Research Data Management of Things 2017; Voice of the Enterprise (VotE): Internet of Things, Budgets and Outlook 2016; 451 Research; 2017

IoT Data Management Made Easy

Cloudera Dataflow (CDF) enables IoT implementations within an organization as an end-to-end platform that collects, curates, analyzes, and acts on IoT streaming data in real time, from the edge to inside the enterprise. CDF makes IoT data management easy with the following capabilities:

CLOUDERA EDGE MANAGEMENT

Cloudera Edge Management (CEM) is made up of edge agents and an edge management hub. It manages, controls and monitors edge agents to collect data from edge devices and push intelligence back to the edge. CEM allows you to develop, deploy, run and monitor edge flow apps on thousands of edge devices. Edge Flow Manager (EFM) is an agent management hub that supports a graphical flow-based programming model to develop, deploy & monitor edge flows on thousands of MiNiFi agents. EFM can also push and execute ML models at the edge to do avoid costly roundtrips between the edge and the cloud.

CLOUDERA FLOW MANAGEMENT

Cloudera Flow Management (CFM) is a no-code data ingestion and integration engine powered by Apache NiFi. CFM offers 300+ processors out-of-the-box to integrate with scores of data sources on-premises as well as on the cloud. CFM allows you to do data transformations, enrichment and setup content routing rules with drag-and-drop ease.

CLOUDERA STREAM PROCESSING

Cloudera Stream Processing (CSP) enables stream processing capabilities with Apache Kafka to a scale of millions of IoT messages per second. CSP also supports advanced messaging, schema management and analytics capabilities with its support for Schema Registry and Kafka Streams as well.

CLOUDERA STREAMING ANALYTICS

Cloudera Streaming Analytics (CSA) offers a choice of multiple streaming analytic solutions like Kafka Streams, Spark Structured Streaming, Apache Storm, Streaming Analytics Manager etc. These engines help with pattern matching, complex event processing, windowing etc to generate real-time insights from IoT streams.

CDF's powerful IoT data management capabilities give organizations the power they need to maintain a competitive advantage through digital transformation using IoT.

Learn More

Start capitalizing on the value of IoT.
Visit cloudera.com/CDF

About Cloudera

At Cloudera, we believe that data can make what is impossible today, possible tomorrow. We empower people to transform complex data into clear and actionable insights. Cloudera delivers an enterprise data cloud for any data, anywhere, from the Edge to AI. Powered by the relentless innovation of the open source community, Cloudera advances digital transformation for the world's largest enterprises. Learn more at cloudera.com

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