SOLUTION BRIEF

Predictive Maintenance with Nutanix KPS and SAS Event Stream Processing

Streamline AI development and deployment at the edge and in the cloud with best-of-breed technology from Nutanix and SAS

MARKET BACKGROUND

Smart machines have evolved such that they can warn their operators before they break down. Advanced predictive maintenance (PdM) enabled by extensive sensor integration and machine learning (ML) techniques is one of the most sought-after benefits of automating traditional manufacturing and industrial practices using modern smart technology (Industry 4.0).

This fourth industrial revolution is further accelerated by the plummeting costs of data storage and transformational increase in network bandwidth made possible by 5G technology. This means it is now easier and cheaper than ever to collect data streams from machine-control systems and sensors. This data, combined with the application of advanced analytics and machine learning (ML), is fueling new levels of industrial productivity.

Furthermore, Edge-to-Cloud architecture adoption for predictive maintenance solutions is expected to grow as a result of their benefits, which include maintenance of generated data, clearer understanding of behavioral machine performance data, cost-effectiveness, scalability, and effective management of deployed solutions.

While many organizations are still in the early stages of the journey to predictive maintenance, early adopters have progressed to a stage where they're realizing substantial benefits. A successful journey typically begins with condition monitoring of machines and other assets before progressing to condition-based maintenance and full predictive maintenance.

MACHINE CONDITION MONITORING (MCM)

MCM is the process of analyzing signals from connected assets to identify signals that have exceeded threshold levels that can lead to unplanned downtime. Machine Condition Monitoring (MCM) is a foundational enabler for alternative CBM/ PdM approaches. While there are numerous condition-monitoring options such as Thermography, Oil analysis, Corrosion monitoring and Ultrasound, Vibration Monitoring is the most pervasive today.

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CONDITION-BASED MAINTENANCE (CBM)

A condition-based maintenance approach takes advantage of MCM techniques to monitor the actual condition of an asset to detect that an anomalous state exists and that maintenance resources should be used to investigate and remediate any issues before a breakdown occurs.

For a CBM approach to be effective, the time between the earliest identification of an equipment failure and the actual breakdown occurrence needs to be sufficient enough for maintenance to intervene and take corrective actions. An effective MCM and CBM capability can serve as a foundation to a Predictive Maintenance (PdM) strategy.

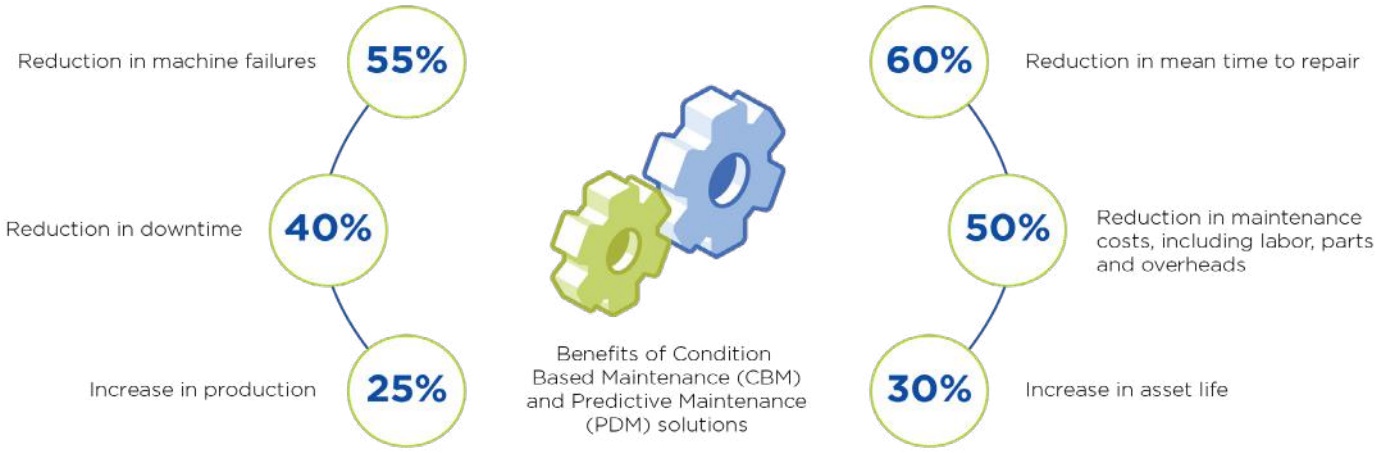
PREDICTIVE MAINENANCE (PDM)

Predictive Maintenance relies on advanced statistical methods in addition to machine learning (ML) to dynamically define the condition of an equipment or an asset. A prediction model forecasts when maintenance needs to occur for a given piece of equipment to prevent a failure.

One of the biggest differences between PdM and CBM is that PdM predicts future breakdowns with a probability whereas CBM aim's to prevent a breakdown by alerting with sufficient enough time for a remediation to take place.

BENEFITS OF CONDITIONING BASED MAINTENANCE AND PREDICTIVE MAINTENANCE SOLUTIONS

Using insights from CBM and PdM solutions, companies can tailor schedules to real performance, reduce downtime and avoid unnecessary expenditures. Studies indicate that enterprises are able to achieve significant benefits after implementing PdM solutions at the factory floor.



SAS EVENT STREAM PROCESSING (ESP)

SAS Event Stream Processing (ESP) plays a vital role in handling MCM data. It can detect events of interest and trigger appropriate action, along with pinpointing complex patterns in real-time, by monitoring aggregated information, cleansing and validating sensor data, and operationalizing analytical techniques that enable CBM and PdM strategies.

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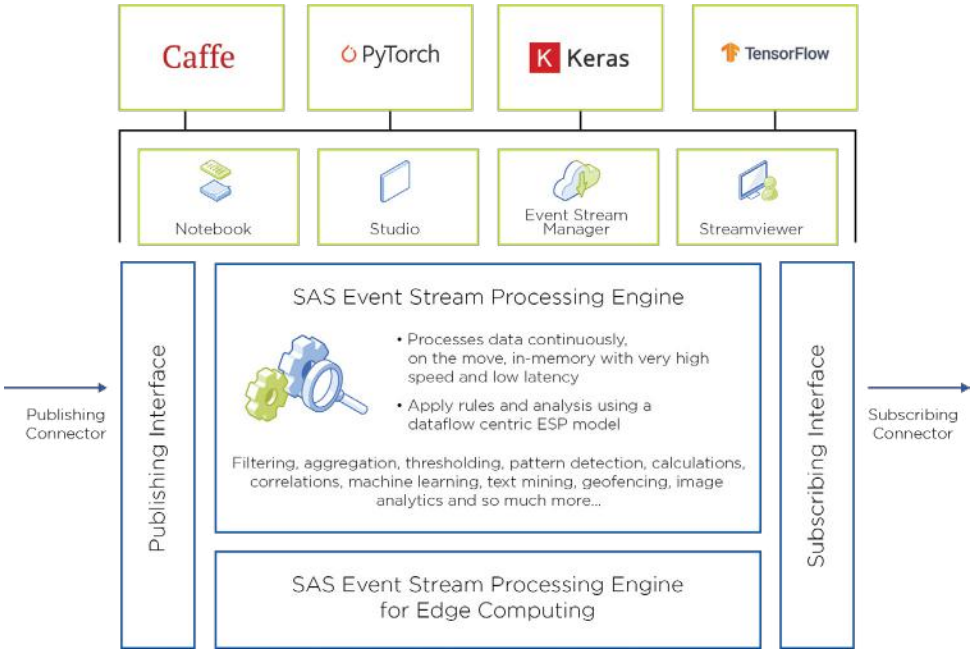
Streaming data, combined with analytics, reveals patterns that empowers real-time decisions. Advanced analytics and mathematical algorithms are developed using rich histories of stored data that can be encoded into data streams, enabling continuous scoring of streaming data.



SAS EVENT STREAM PROCESSING COMPONENTS

SAS offers a portfolio of capabilities for delivering streaming analytics both in the cloud and at the edge.

ESP engine:

- Low latency, high-throughput runtime capable of executing SAS or open source models
- In-memory high performance processing with milliseconds latency
- Extensible for edge deployments to accommodate lower compute and memory configurations

Pub/Sub Interface for data integration which is critical to support both brownfield and greenfield sites. SAS provides pre-packaged connectors for a host of sources:

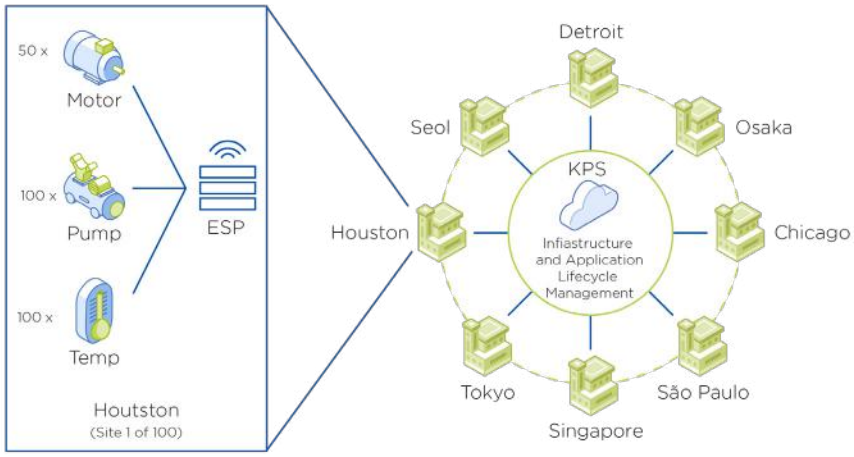
- MQTT, Kafka, OPC-UA/DA, Modus, PI, REST
- BACnet for smart buildings
- Video feeds and images, audio

Client Design Tools that enable the creation, testing, deployment of streaming models:

- Low-code, graphical, drag and drop ESP Studio web client to build and test streaming projects
- A Jupyter notebook with pre-packaged python libraries to support ESP model development and testing
- Event Stream Manager web client provides automation, tracking and monitoring of streaming projects at scale, at the edge or in the cloud
- Support for 3rd party frameworks such as Caffe, PyTorch, Kera and TensorFlow

NUTANIX KARBON PLATFORM SERVICES FOR IOT

Karbon Platform Services (KPS) is a Kubernetes-based multi-cloud Platform-as-a-Service (PaaS) that enables rapid development and deployment of microservices-based applications ranging from simple stateful containerized applications to complex AI, IoT and hybrid applications across any cloud. Karbon Platform Services is well-suited for IoT. It extends the cloud-based Software-as-a-Service (SaaS) application lifecycle management plane and provides advanced AI and Functions-as-a-Service (FaaS) services with KPS Service Domain (OS) software running on a variety of edge hardware. SaaS management provides an end-to-end view that is centrally managed from the cloud through a user-friendly interface for application development and operations. It is capable of easily deploying SAS ESP components and other services to thousands of edge locations using innovative Containers-as-a-Service (CaaS) technology.



NUTANIX KARBON PLATFORM SERVICES FOR IOT COMPONENTS

Cutting-edge Managed Services:

Karbon Platform Services drives rapid development and deployment of applications ranging from simple stateful containerized applications to complex web-scale applications by leveraging simple, open abstraction of rich services.

- Kubernetes applications (Containers-as-a-Service)
- Serverless functions (Functions-as-a-Service)
- Global data pipelines
- Streaming data and message bus (Kafka-aaS, NATS-aaS)
- AI (Tensorflow-aaS, OpenVINO-aaS)
- Ingress controller and service mesh (nginx/traefik-aaS, Istio-aaS)
- App monitoring and alerting (Prometheus-aaS)
- Log Forwarding

THE NUTANIX AND SAS SOLUTION

How does the Nutanix and SAS approach to CBM and PdM work?

Leveraging Nutanix Karbon Platform Services, SAS ESP containerized deployments are executed at the edge alongside the machines generating data and enabling the continuous processing of data, in-memory, at high speed and low latency.

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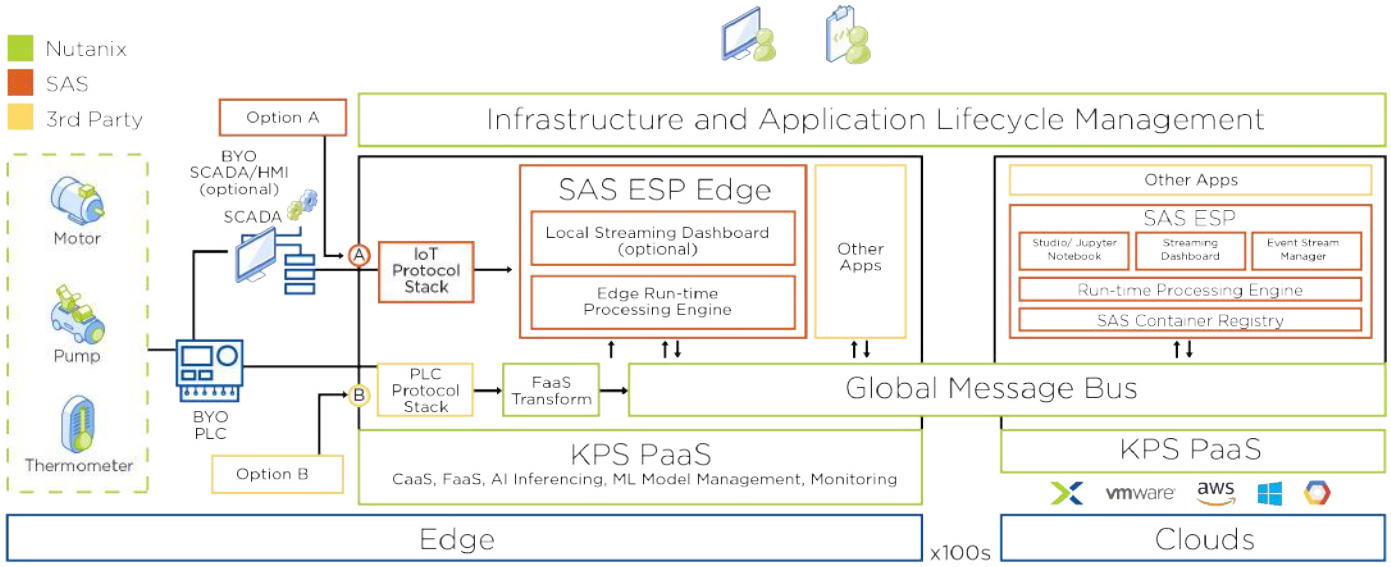
ESP's standard connectors for data sources such as OPC-UA, PI Historian, and MQTT are leveraged before data is filtered, aggregated, and correlated within streams. When direct PLC protocol connectivity is required, KPS for IoT data interfaces are leveraged with integrated 3rd-party protocol drivers. KPS for IoT FaaS based functions are then used to transform data before its delivered to ESP via the local high-speed message bus.



SUCCESSFUL EDGE COMPUTING MANAGEMENT

It becomes challenging for enterprises to manage thousands of devices as the smart factories continue to scale. Consider the fact that one has to manage multiple production lines at several factory floors, each of which is mission-critical. The distributed nature of edge computing can bring along added complexity, more sensors and connected machines, and ultimately a greater management need. Nutanix can fill this vacuum and take on the role of the intermediary between multiple factory floors at different locations. KPS for IoT provides zero-touch setup and management of edge devices, so operators can reduce the risk of IoT security breaches from human error and increase overall management efficiency.

TRANSFORM YOUR ORGANIZATION TODAY

Since most technology providers do not provide out-of-the-box IoT-based MCM/CBM or PdM solutions, enterprises need to design and deploy custom IoT applications by collaborating with external technology providers such as an IoT platform vendor or an independent IoT integrator. SAS Event Stream Processing and Nutanix Karbon Platform Services for IoT enable easy accommodation and analysis of new and existing data streams.

To learn more about how Nutanix and SAS can help your organization, take a look at Karbon Platform Services for IoT and Event Stream Processing. You can quickly experience the simplicity and agility of the solution today.

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