WIND™

sas

Light in the Fog: Managing the IoT Analytics Lifecycle

Combining Powerful Edge Computing with Remote Device Management to Optimize IoT Performance

WHEN IT MATTERS, IT RUNS ON WIND RIVER

EXECUTIVE SUMMARY

Every deployment in the Internet of Things (IoT) requires an analytics component to transform data into actionable insights. Typically, that capability has resided in a centralized cloud-based system or data center that receives and analyzes data from edge devices. However, when devices commonly rely on a cellular or similar metered Internet backhaul, it isn't feasible from a cost or performance perspective to send all data to a centralized system. To overcome this challenge, compute power is being pushed to the edge devices themselves, enabling them to more quickly process, analyze, and, in some cases, act upon data they are generating in real time. This creates a challenge: IoT solution developers and operators must manage, maintain, and update analytics models deployed to hundreds or even thousands of devices. Wind River® has teamed with SAS to introduce a solution combining powerful edge-to-enterprise analytics with advanced remote device management to ensure optimal performance over the entire IoT deployment lifecycle.

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FROM THE CLOUD TO THE FOG

Although IoT is in its relative infancy, it has evolved rapidly. As more and more solutions have been developed and deployed, organizations have already undergone a transformation in their thinking about its fundamental architecture. In the original model, cloud-based systems collected and aggregated data from edge devices and sensors and stored it in a data "lake" for analysis over time. Organizations have since realized that it isn't practical or desirable to send all data to the cloud or lock up its value in a long-term repository. In more and more instances, it makes sense to perform some level of analytics and initiate action at the point where and when the data is generated, particularly in large-scale installations where timing of device operations is critical. The ability to drive decision support in a closed loop system at the edge is a key value proposition for IoT initiatives.

As a result, there is a marked interest in pushing compute intelligence to the edge, in what has come to be known as the "fog"—cloud capabilities extended to the edge. The movement of analytics to the fog stands to benefit IoT solution operators in a number of ways, chief among them:

- **Cost:** Internet backhauls—the process of getting data from an edge device to a central repository—are frequently metered, meaning there is an operational expense associated with the collection of data. This expense can be reduced by optimizing the traffic over a metered backhaul rather than transmitting every bit of data generated. Investing a little more in the technology necessary for analytics at the edge can produce significant long-term savings on Internet backhaul costs. A side benefit is that it reduces the contention for bandwidth in more critical usage scenarios.
- **Performance:** Many organizations are increasingly dependent on the speed of IoT operations, which in turn depends on how quickly data can be collected and analyzed and a response returned to the device to initiate the appropriate action. This round-trip from the edge to the enterprise and back results in data latency and lag time that can impede performance. Pushing the initial processing of the data out to the edge can help accelerate and optimize solution performance. Consider, for example, preventive maintenance in an industrial environment. A sensor may detect a problem with a piece of equipment. Depending on the gravity of the problem—say it's a simple matter of a temperature adjustment—edge analytics may be able to diagnose it and initiate corrective action at the source, while simultaneously alerting operators to a potentially more serious problem.

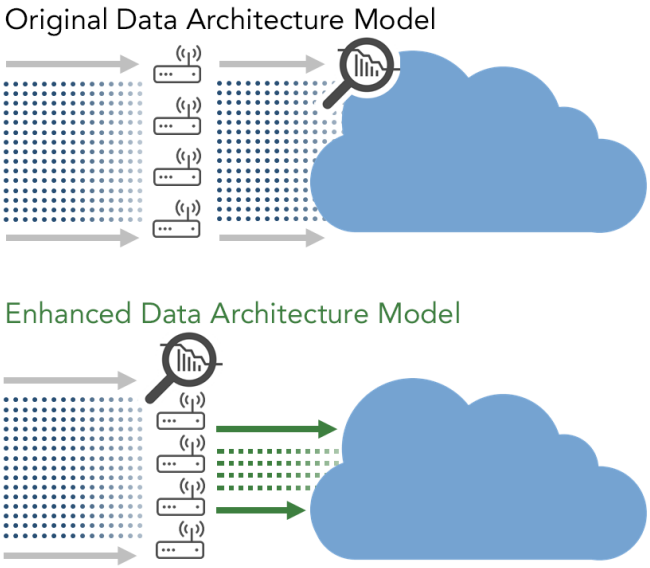

Figure 1. The ability to drive decisions moves to the edge

This is not to suggest by any means that all the necessary analytical power for a smooth-running IoT deployment can or should be migrated to edge devices. Edge devices still lack the processing capacity of cloud servers. Moreover, analysis at the edge has limited context, whereas cloud-based analysis has the benefit of a global context due to a number of edge devices funneling data back to the centralized environment, leading to a richer analysis. Edge and enterprise analytics must work in harmony to realize IoT use cases.

CAPTURING "EVENT STREAMS" IN MOTION

The benefits of edge analytics are clear. Organizations can derive instant value from data in motion, enabling faster and more precise insights, decisions, and action. The challenges are equally clear: the limited capacity of edge devices, the need to integrate seamlessly with data center analytics, and the means to manage edge-to-enterprise interactions and communications at scale.

SAS, a company with a deep history of innovation in analytical software, introduced the SAS Event Stream Processing solution to address these challenges. The solution enables operators to

USE CASE: TRANSPORTATION AND FLEET MANAGEMENT AND PREVENTIVE MAINTENANCE

Most transportation fleets operate on generic maintenance schedules. Vehicles are routinely taken off the road after a specified number of miles, kilometers, or hours for oil changes, inspections, and repairs if needed. Equipment downtime is expensive. Fleet operators could be missing opportunities to cut costs by extending maintenance intervals and optimizing vehicles in service.

The IoT makes preventive maintenance possible. Sensors on vehicles monitor the performance of various components and alert operators when there is an anomaly that warrants inspection. Edge analytics takes the concept of preventive maintenance one step further, enabling on-board devices to perform real-time health diagnostics, identify problems more precisely, and, depending on the severity, initiate corrective action. The accumulated data transmitted from the edge to the data center is used to update analytic models, thus continuously improving the edge devices' diagnostic capabilities. The result is that vehicles spend more time on the road and less time in the shop, generating revenue instead of losing it.

More detailed information on SAS IoT solutions can be found at www.sas.com/iotsolutions.

Detailed information about Device Cloud can be found at www.windriver.com/announces/helix-device-cloud.

capture data in motion and understand events as they occur (also known as "event streams"). Data is analyzed continually as it is received, updating situational intelligence as new events take place. This model captures the business value of information immediately rather than losing it to information lag.

With sub-millisecond response times, SAS® Event Stream Processing analyzes and understands millions of events per second, detecting patterns of interest as they arise. The results show the correct actions to take, what alerts to issue, which data to store, and which events to ignore. The solution uses SAS advanced analytics algorithms and rules to pinpoint event relevance. These algorithms can be trained on data at rest, then deployed on streaming data.

The SAS® Event Stream Processing product helps eliminate the lag time to gain actionable insights from data and initiate responses. To address capacity issues, it can also reduce the data footprint through intelligent data reduction. This is particularly important when data has to be transmitted over wide area networks to the cloud or data center control system. The solution can run both in edge environments and in the data center, allowing data to be analyzed and processed at the edge, then transmitted to the central system for further processing.

IMPLEMENTING SYSTEM-WIDE ANALYTICS UPDATES

With the constant flow of data through and from edge devices, the models that govern SAS® Event Stream Processing analytics should be updated to adapt to new information and insights, with the goal of continually refining and improving overall solution performance. These model updates must then be deployed throughout the IoT network to enhance analytical intelligence at the device level. To accomplish this efficiently requires the means to provision, monitor, and manage thousands of devices remotely and securely, through a single, centralized platform.

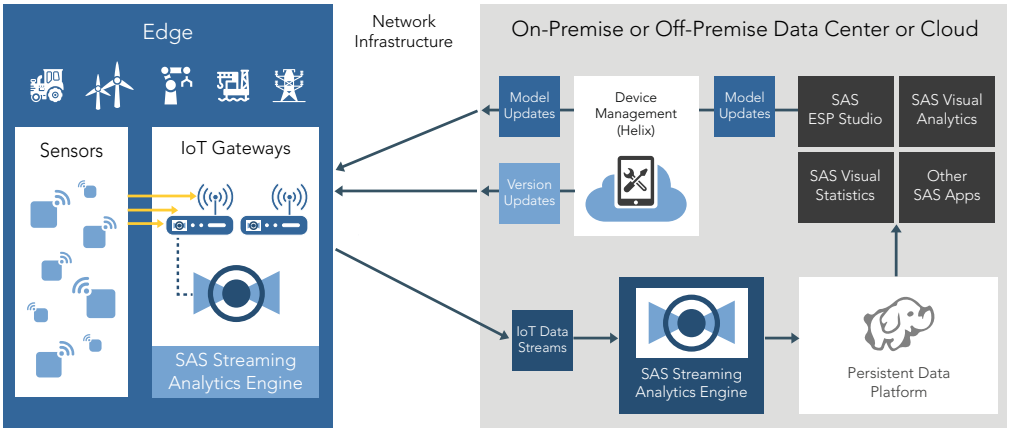

Figure 2. As IoT has matured, architecture models have changed to better leverage data when and where it is generated

Wind River® Helix™ Device Cloud integrates with SAS® Event Stream Processing to provide operators with a platform for managing edge analytics deployments over their entire lifecycle. Device Cloud is a purpose-built IoT platform for device lifecycle management. It enables operators to safely and securely monitor, manage, service, and update devices in the field through a web-based management console. It makes IoT deployments effectively "future proof" by allowing for a steady cadence of new features and continual improvement. Importantly, as a two-way communications platform, it can automatically collect and aggregate data that has been processed at the edge for further analysis at the data center level, then push analytics updates back to edge devices.

The combination of SAS® Event Stream Processing and Device Cloud enables the efficient distribution and sharing of analytics capabilities between edge devices and cloud-based or data center platforms. It reduces data latency and the lag time from data collection to analysis, insight, and action. Through intelligent data reduction and transformation, it optimizes edge-to-enterprise communication while reducing the data payload and the expense of transmission. Ultimately, this integrated approach makes for a more effective overall IoT solution, capable of delivering ever higher levels of performance.

CONCLUSION

The Internet of Things holds the promise of making existing businesses far more efficient operationally, while making possible the creation of whole new types of data-powered business models and revenue sources. Realizing these visions requires a robust analytical capability to derive insights and economic value from the data generated by edge devices and flowing through the system. Increasingly, today's more advanced IoT solutions combine powerful Big Data analytics at the core and agile event-driven analytics at the edge device level. By integrating edge-to-enterprise analytics with advanced device management capabilities, Wind River and SAS can provide a platform to deliver high-performance IoT solutions that will enable enterprise customers to realize more value, more quickly, from their IoT investments.

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Wind River is a global leader in delivering software for the Internet of Things. The company's technology is found in more than 2 billion devices, backed by world-class professional services and customer support. Wind River delivers the software and expertise that enable the innovation and deployment of safe, secure, and reliable intelligent systems.