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Why Machine Learning for Enterprise IT Operations

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Introduction

The world of computing is changing before our eyes. Industries that had a consistent and predictable business model for generations are being turned upside down. In the digital economy, a seamless customer experience is critical. Whether a retailer is exploring new innovative online selling strategies or a bank is determining how to anticipate customer needs for new services – a high performing and scalable IT ecosystem is key to success. At the end of the day, as an IT leader, you need to help your business anticipate opportunities, drive growth and proactively prevent threats to your company's revenue.

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In this era of digital transformation, leading organizations have recognized the strategic role of the mainframe in providing high business value through efficient transaction processing and high-volume access to critical enterprise data. These organizations are leveraging the mainframe in new ways as part of their modern IT environment to provide new services and experiances to customers. To achieve this, they are focused on three major initiatives:

- Connectivity and management between the modern mainframe and the hybrid cloud environment,
- Managing mainframe operations with the assistance of machine learning,
- Applying machine learning and analytics at the source of data

Connectivity

The notion of the connected mainframe is gaining traction in an era dominated by the need for agile and modular applications and services. The modern mainframe has been transformed through the native integration of open source infrastructure including the Linux operating system, the Java language, and analytics platforms such as Hadoop and Spark. In addition, a new generation of Application Programming Interfaces (APIs) is providing seamless integration between mainframe workloads and hybrid cloud and mobile environments.

The evolution of the mainframe into a more open platform has enabled it to become an integral part of the hybrid IT environment. With API management, for example, you can seamlessly connect mainframe transactions with mobile applications that are easy for customers to use. When you combine the backbone of mainframe scalability, reliability, and security with emerging DevOps tools, containers and microservices, the ability to transform your environment takes shape.

As an IT leader, your ability to help drive the business forward depends on providing a high-performing and continuously available environment. To be successful these hybrid environments that connect mainframes with both public and private clouds must be managed with operational sophistication. Emerging machine learning analytics are becoming the facility that makes this complex ecosystem manageable and predictable.

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Leveraging Machine Learning for Operational Simplicity

While it is becoming essential to create a connective ecosystem between the mainframe and the hybrid IT infrastructure, it is imperative that there are streamlined techniques for managing the combination of workloads and capabilities. The reality is that experienced mainframe operational experts are retiring and new IT operators do not have the experience in managing the mainframe, let alone the complexities of hybrid IT.

The primary technique for understanding the operational integrity of the mainframe is for operations specialists to analyze large amounts of log data. This takes time and requires sophisticated knowledge of the numerous mainframe subsystems to track down an issue. As the most experienced mainframe professionals leave the workforce, it is becoming increasingly difficult to find new employees with the right level of skills. The most viable answer to proactively address this growing skills gap is to provide a software environment that abstracts the complexity of managing the mainframe so that administrators can quickly find the cause of problems and stop potential failures before they become problematic. You should consider taking advantage of emerging machine learning and automation techniques that enable less experienced IT staff to proficiently monitor and manage your mainframe operations.

An operational environment based on machine learning and embedded intelligence proactively learns from pattern analysis and provides the ability to automatically or manually take remedial actions before performance issues arise.

Applying Machine Learning at the Source of Data

Machine learning on the mainframe is enabling leading organizations to leverage large amounts of mainframe data that is often underutilized. One important factor is that it is now possible to execute the advanced analytics close to where the data resides.

Mainframe transactional data can provides rich intelligence for unlocking insights into customer requirements and future expectations. The ability to detect patterns and anomalies in this data is a valuable tool for organizations across all industries that are trying to keep ahead of competition or simply increase operational efficiency. It is more efficient and more secure not to move data but to bring the analytics to the mainframe transactional data. Thus, when data security and real-time analytics is important, the best way to apply machine learning to mainframe transactional data is to execute the analytics on the mainframe platform itself. If security and real-time speed are not critical factors, for example when performing simple forensic historical analytics, offloading mainframe data to distributed or cloud resources is an alternative approach to federate insights.

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Defining Machine Learning and Operational Intelligence

Machine learning is a computer science discipline that provides a sophisticated set of algorithms that continually improve the accuracy of models. With machine learning it is possible to learn from massive amounts of data and enhance the ability to predict outcomes. There are a variety of algorithms that learn and improve their performance based on exposure to patterns in data rather than by explicit programming. In essence, a machine learning system is designed based on best practices and expected behavior of systems. Rather than simply programming a system to detect a known problem in an operational system, a machine learning system begins with the operational data and when humans take action or even override a recommended action, the system learns. In the case of a mainframe system, the machine learning model understands how the mainframe functions and what type of data it creates. A machine learning system relies on ingesting massive amounts of data. As the system collects more data, it is able to refine its data models to create more accurate outcomes. A machine learning system contrasts with a traditional solution where programmers must make assumptions at the onset and where a system doesn't evolve.

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The Evolving Role of Enterprise IT

As IT transforms itself into a service organization for the digitally disruptive business, different silos of IT are finding that they must collaborate in order to survive. Therefore, there is more focus on managing the complex hybrid computing environment. Now that it is accepted that the mainframe is the focal point for scaling and securing critical data and transactions, it is vital that there is a predictable way to manage the environment from an operational IT perspective. It is not practical to assume that the operations team will have the knowledge or capacity to be able to continue managing this connected ecosystem in a reactive, manual fashion. To be successful, operations leaders are turning to machine learning tools in order to move quickly and ensure a successful and transparent customer experience.

Benefits of Applying Machine Learning to Enterprise IT Operations

The opportunity to manage complex mainframe environments more easily and more efficiently is the result of combining the machine learning algorithms with mainframe data. In addition, the machine learning environment has the benefit of advancing well beyond what the expert mainframe operations team currently knows. This is especially important as new applications are created and mainframe data is integrated with emerging systems.

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The five most important benefits of applying machine learning to enterprise IT operations are:

1. **Proactively manage.** By embedding intelligence the system is able to detect abnormal patterns that can lead to outages and other potential issues.
2. **Remediate faster.** Analysts and administrators can quickly find the root cause of problems. Rather than sifting through large amounts of application and system data, machine learning can help identify the triggers that cause a problem.
3. **Improve productivity.** A machine learning environment learns from historical data and behavior patterns to more accurately detect performance anomalies and automate routine corrective tasks. This helps elevate the proficiency of more junior team members and enables your experts to focus on the most critical problems.
4. **Collaborate efficiently.** A unified machine learning environment that brings together disparate analytic data from multiple sources provides increased insight to help your team work together more efficiently to isolate and resolve issues.
5. **Improve application performance.** By applying machine learning to mainframe operations, you can increase application performance and reduce latency and downtime.

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CA's Approach to Machine Learning for Mainframe Operations

As the transaction velocity and volume of mainframe data continues to grow exponentially – no amount of throwing people at the problem is going to allow you to keep up, so applying data science and automation is key.

CA has worked with clients to create an operational intelligence engine that provides a pragmatic approach to predictive learning on the mainframe. Data science algorithms are used to identify consistent, coherent and recurrent patterns in data. Once the algorithm identifies these patterns, it's able to autonomously identify causality – i.e. relationships within data that flag when future issues are likely to occur. This is a key evolutionary step toward predicting the future.

The solution currently relies on two important machine learning algorithms (EWMA and KDE) to give mainframe operations teams the ability to proactively manage complex environments. The significance of the two underlying algorithms are as follows:

The EWMA algorithm allows organizations to quickly gain value by comparing volatility on multiple time-scales to identify any changes

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in a system's behavior. It provides immediate proactive alerting rather than reactive alerts based on dashboards and pre-set static thresholds. Furthermore, false positives are reduced as more data is consumed.

The KDE algorithm further refines the predictive capabilities of a system. The algorithm allows the system to give administrators predictions with historical context so that proactive measures can be taken. After the system processes more and more data, its predictions improve and false positives continue to decrease.

The intelligence engine is a software appliance built using Docker, enabling it to be easily ported across Linux on z Systems, distributed or cloud platforms. This deployment flexibility allows businesses to run mainframe operational analytics on the most appropriate platform, depending on security, real-time speed and cost factors.

Predictive analytics and operational intelligence is still a very nascent market. CA's approach is providing customers with a competitive advantage because it provides a real-time analytics engine embedded into enterprise monitoring and management software.

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Case Study: How a Financial Services Company Uses Machine Learning to Solve IT Operations and Management Challenges

A large, global insurance company has been a longtime mainframe customer. The organization uses the mainframe to support transactional and data workloads across eight separate lines of business. The company's mainframe applications have incorporated decades' worth of valuable business logic.

The company has two pressure points. First, as the company has built new services the mainframe environment has grown more complex. Second, the company's IT team needs to be able to support a variety of new business initiatives because of competitive pressure. The demands on the mainframe are therefore exploding. For example, business teams now want to connect mainframe applications and mainframe data to new cloud-based and mobile services. In short, the company wanted to leverage their valuable mainframe data.

Like many similar enterprises, there was also growing pressure to restrain costs. Despite the increasing demand, operational budgets have not increased. "I could no longer pay more people to watch our systems; there were just too many monitoring points as we expanded the use of the mainframe," explained the company's Director of Mainframe Capacity, Performance and Automation. Furthermore, "mainframe downtime is never an option."

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IT management knew that their only option was to optimize how the mainframe was managed. One of the most important imperatives was to find a way to correlate data from multiple sources for real-time prediction and increased insights into the behavior of the mainframe systems. Leveraging a machine learning based solution would allow the operations team to proactively respond to potential problems while also making sure that the mainframe could support new initiatives.

The insurance company worked with CA to incorporate machine learning and operational intelligence into the way they managed their mainframe environment. This new approach streamlined the ability to spot potential problems without requiring manual intervention. The director noted, "This approach enables me to avoid having to have experienced employees wasting their time monitoring reports for potential problems." The company evaluated a number of operational analytics offerings. The director said "CA's approach is way ahead of other analytics engines which are not real time and not embedded into enterprise management monitoring systems."

"Because people aren't tied up looking for needles in a haystack, they are available to apply their expertise to solutions"

The machine learning engine ingests a variety of system and log data from disparate sources to discern how their specific mainframe operates. "Within the first few weeks after we began the implementation, the monitoring platform began to recognize what's normal and what's not," the operations director said. The system learns to detect performance anomalies and is therefore able to alert operations to address a problem.

The system has helped improve uptime, reduced mean time to repair (MTTR) and has helped operations leaders make better use of resources. "Because people aren't tied up looking for needles in a haystack, they are available to apply their expertise to solutions," the director noted. Machine learning now provides everyone on the team with a standard basis for both context and decision-making. The machine learning platform understands the variability and is able to identify and correlate historical patterns, and anticipate the way workloads need to be managed.

Conclusion

Digital transformation can only be successful if there is a consistent and predictable way to satisfy the needs of customers. Let's get right to the point. The mainframe provides the enterprise scale and reliability required to run mission critical apps with speed, consistency, trust, and security. But it is not feasible to assume that the mainframe can be managed in isolation. In the highly connected digital world, the mainframe must be treated as an integral part of the hybrid IT ecosystem.

The many fundamental changes to the mainframe have significantly transformed its role as a true digital enabler. Today the mainframe has native open source infrastructure from the operating system (Linux) to advanced analytic services

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(Spark), and languages (Java). As an open platform, the mainframe can play a central role with the most important emerging technologies that support digital transformations.

Many leading companies interviewed by Hurwitz & Associates are using machine learning on mainframe in combination with these emerging technologies to create a connected enterprise and support digital transformation:

Modularity in code and deployment using microservices and containers. Teams can create reusable services and portable code that can be leveraged to quickly create new applications or move applications across environments.

Internal and third-party APIs are helping organizations integrate the mainframe into their overall digital transformation strategy. APIs are instrumental in allowing the mainframe to seamlessly connect with new mobile and cloud applications and data sources.

Mobile applications are the deployment model of choice for a vast majority of customers. However, to be effective and safe, these applications must be combined with the transactional and business services managed on the mainframe.

Machine learning and operational intelligence can transform mainframe management into a strategic weapon for your business success. A machine learning environment will adapt, learn and optimize your operations through automation, enabling you to focus on creating solutions and addressing innovative approaches that will digitally transform your company for the future.

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