BROADCOM®

Service-Driven Autonomous Remediation

Running Self-healing Operations for Breakthrough Scale and Efficiency

Table of Contents

BROADCOM®

Executive Summary

Across industries and geographies, a business' success is increasingly defined by the quality of its digital interactions. While managing IT operations so they deliver optimized service levels and user experiences is vital, it's also increasingly challenging given the increasingly complex, dynamic, and hybrid nature of today's IT environments. To contend with these realities, organizations need to establish service-driven, autonomous remediation capabilities. This white paper examines the need for these capabilities and the key requirements for establishing them effectively.

The Criticality, and Difficulty, of Optimizing Service Levels and the User's Experience

Criticality of optimized service levels

In virtually every industry and market, personal interactions continue to be supplanted by the digital. Now, applications are where battles for customer loyalty can be won or lost. In the digital economy, it is increasingly application quality that separates market victors from laggards.

For today's businesses, there's a premium on delivering optimized user experiences—all the time and every time. For the IT operations teams responsible for supporting these digital experiences, the stakes continue to grow:

- **Downtime is costly**. For each hour of downtime, organizations lose between US$140,000 and $2.5 million.[1] Plus, downtime happens a lot. In fact, on average, enterprises lose almost $22 million a year due to downtime.[2]

- **Slow is the new downtime**. Services don't need to be down for it to cost a business. For an increasingly demanding and impatient user population, if performance is slow, the service may as well be down—and they will go elsewhere. Now, 53 percent of mobile site viewers will abandon a page if it takes longer than three seconds to load.[3]

> "Enterprises lose almost US$22 million a year due to downtime."

> "Fifty-three percent of mobile site viewers will abandon a page if it takes longer than three seconds to load."

Increasing complexity and scale

While optimizing service levels is critical, it seems to be getting more challenging to do every day. Following are two key reasons:

- **Complexity**. Most enterprise-class business services now rely not only on traditional systems, including on-premises mainframes and distributed systems, but on a plethora of new, dynamic technologies, such as containers, cloud delivery models, virtual and software-defined components, and more.

1 David Gewirtz, ZDNet, "The astonishing hidden and personal costs of IT downtime (and how predictive analyt-ics might help)," May 30, 2017, https://www.zdnet.com/article/the-astonishing-hidden-and-personal-costs-of-it-downtime-and-how-predictive-analytics-might-help/

2 Vincent Bier, "Overages and Outages? Solving the Problem of Unplanned Downtime," May 2017

3 Google Data, Global, anonymized Google Analytics data from a sample of Web sites opted into sharing benchmark data, March 2016

BROADCOM

- **Scale**. The volume, variety, and velocity of data that needs to be managed, correlated, and analyzed continues to grow dramatically. In the wake of initiatives like multi-cloud deployments, microservices development, and Internet of Things (IoT) implementations, teams continue to see explosive growth in the operational data being generated. Ultimately, internal team members simply can't keep pace.

Reactive, disjointed tools fuel more complexity

Exacerbating matters is that, as IT teams looked to manage their increasingly diverse environments, they've had to continue to add more point monitoring tools and automation capabilities to the mix. These disjointed tool sets compound the complexity and challenges:

- **Point monitoring tools result in reactive issue identification and alert fatigue**. Working with dozens of tools, teams struggle with hundreds of thousands of alerts that feature a high rate of inaccuracy and redundancy. Lacking unified visibility that spans their hybrid environments, staff have to take too long to inspect various systems and domains in order to identify the root cause of issues. As a result, customer experience suffers while triage calls run for hours.

> "Working with dozens of tools, teams struggle with hundreds of thousands of alerts that feature a high rate of inaccuracy and redundancy."

- **Point automation capabilities don't scale or work in complex environments**. When organizations employ limited automation that is connected to domain-specific tools, they encounter a number of challenges. First, with these one-to-one integrations they can't easily automate complex workflows that span multiple technology platforms and domains. Second, these integrations don't work well in most cases. For example, an alert from a server monitoring tool can trigger server-related remediation, while the actual issue may stem from a network device.

Fragmented toolchains stifling site reliability engineering (SRE) approaches

While SRE approaches have been around for some time, the adoption of these approaches has become more widespread in recent years. Many organizations looking to adopt SRE models have started by employing loosely connected toolchains. These heterogeneous tools have made it difficult to manage the infrastructure efficiently and to expedite problem solving. As a result, these teams have confronted a couple key challenges:

- **Reducing operations toil**. To capitalize on SRE approaches, it is essential to reduce toil. Toil is the kind of manual, repetitive, and mundane work that provides little value to operations. Given the growing complexity and pace of change in IT environments and the corresponding proliferation in tools, the amount of toil teams have to contend with is poised to increase exponentially.

- **Ensuring true site reliability**. Mean time to resolution (MTTR) measures how long it takes to fix a problem, either through a workaround, a rollback, or another action. Reducing MTTR has a significant impact on the overall customer experience. However, with fragmented tools and visibility, SREs struggle to improve this critical metric.

BROADCOM

The Requirements: Service-Driven, Autonomous Remediation

To contend with all the challenges outlined above, IT teams and SREs can't simply try to do the same things better. To ensure their complex, hybrid, interrelated, and highly dynamic environments deliver an optimized user experience, operations teams have to achieve fundamental breakthroughs in scale and efficiency.

It's no longer enough to just react a little faster when issues arise. Teams must gain the visibility needed to identify potential issues—and address them before they affect service levels. To contend with the explosive growth in data, complexity, and user demands, IT teams and SREs need to adopt an artificial intelligence for IT operations (AIOps) solution that provides service-driven, autonomous remediation.

With these solutions, teams can leverage machine-learning-based algorithms to predict potential issues that could affect service levels, perform automated root cause analysis, receive recommended actions, and quickly run effective remediation across diverse, hybrid environments. The following sections examine the three key requirements for establishing these capabilities.

Predictive identification of potential risks to services

Leveraging traditional, reactive monitoring tools and approaches, IT teams lack the insights needed to effectively predict issues before a business service or application is disrupted. Given the criticality of delivering a phenomenal user experience, these teams need an AIOps solution that offers algorithmic- or machine-learning-based insights for detecting abnormal behaviors and predicting potential issues.

It is also essential that AIOps solutions offer capabilities for mapping issues to associated services, so IT teams can intelligently prioritize troubleshooting and remediation efforts based on which issues will have the biggest potential business impact. For example, if two issues arise and administrators can see that one is affecting a payroll service that isn't being run currently, and another is hitting an e-commerce service that runs 24/7 and accounts for the bulk of the company's revenues, they can prioritize their efforts accordingly.

Figure 1. To manage their complex, dynamic environments, today's IT teams need algorithmic- or machinelearning-based insights for detecting abnormal behaviors and predicting potential issues.
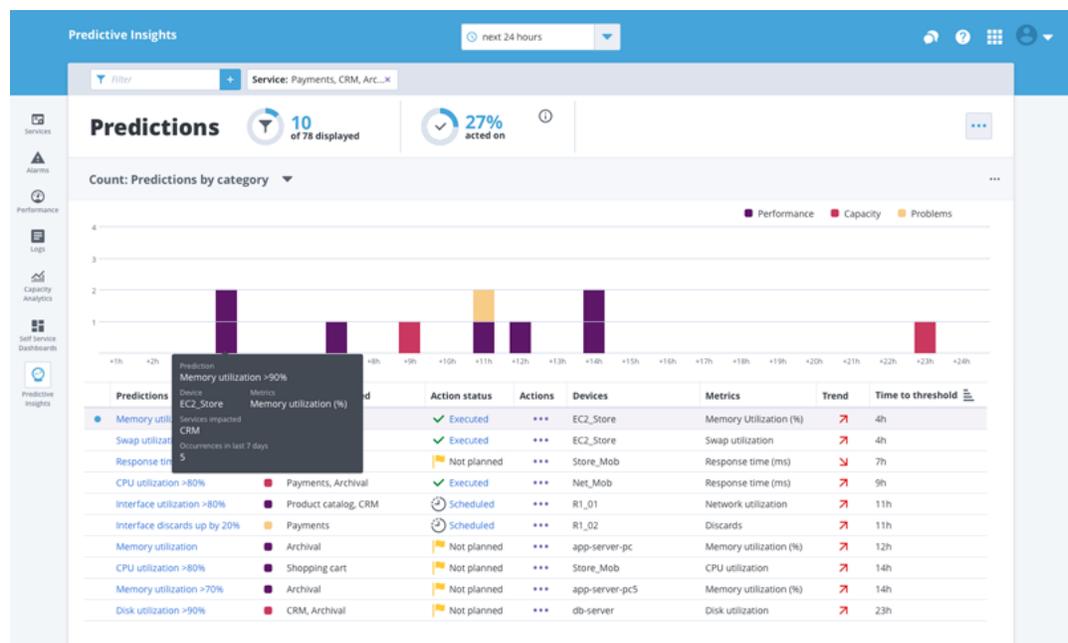
Figure 2. To enable operators to effectively prioritize remediation efforts, it's critical that AIOps solutions provide visibility for mapping issues to associated services.

Automate root cause analysis across domains and technologies

Even with the best predictive tools in place, downtime and performance issues may still arise, whether due to an administrator's configuration error, external service outages, or a host of other causes.

Within many IT organizations, when these performance issues or downtime occur, operators struggle to determine why. While a single issue may be the culprit, large numbers of redundant or false alerts may be generated, making it difficult for administrators to filter through the noise and identify the issue that needs to be addressed. At the same time, when operators see that a particular service is experiencing issues, it may be difficult to determine how or if the issue is affecting business services.

To combat these challenges, operators need timely, targeted insights that can enable fast, automated root cause analysis. To address these requirements, AIOps solutions need to provide machine-learning driven intelligence that can automatically identify the probable root cause. To support this machine learning, these solutions must also offer a topology analytics service that automatically discovers and maps key IT assets and stores topology information in a graphic database. This service needs to consume data and correlate intelligence from multiple architectural layers to effectively determine the probable cause.

Establish comprehensive, intelligent contextual automated remediation

Once an issue has been identified, whether predictively or through automated root cause analysis, IT teams need comprehensive, intelligent capabilities that can automatically recommend and execute the remediation tasks required in a complex, dynamic enterprise environment. To ensure success, AIOps solutions need to have built-in recommendations for well-known, commonly occurring issues. In addition, these solutions should provide scalable, flexible, and easy-to-use automation that can be aligned with fast changing business and technology environments.

AIOps solutions must be able to orchestrate the delivery of services in business, application, and infrastructure layers, across on-premises, cloud, and hybrid environments. Further, this automation should seamlessly support complex, organization-specific processes. For example, an AIOps solution may detect an impending storage issue in an Amazon Web Services EC2 instance and trigger the provision

Figure 3. Once a potential issue has been identified, AIOps solutions can automatically execute the remediation tasks required.
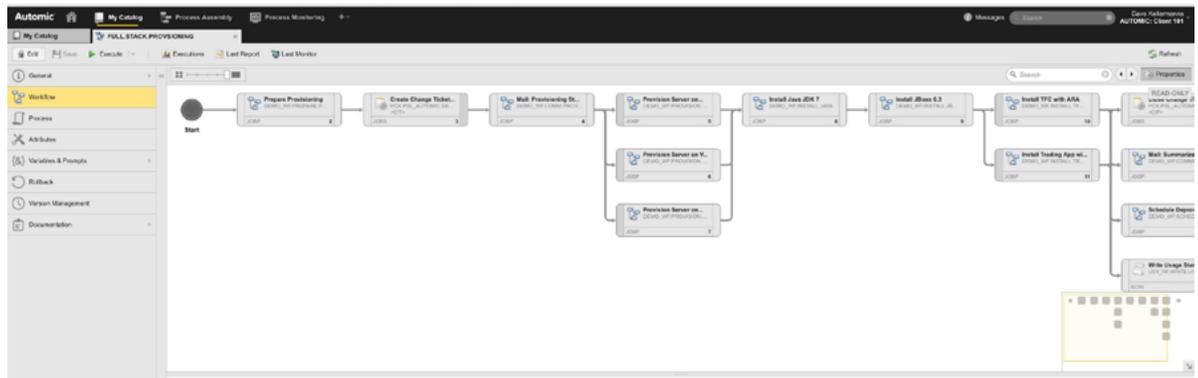
of an additional instance. This server provisioning may need approval, for example from a budgetary, compliance, or business perspective. These types of approval workflows should be easily accommodated. By leveraging these capabilities, IT teams can ensure that service requests aren't just logged—they are acted upon before the end user has a negative experience.

Finally, AIOps solutions should establish a feedback loop that automatically tracks how a system responds to remediation actions. For example, these solutions should automatically monitor the performance impact of an action. As AIOps solutions learn, they will increase their accuracy in mapping the right actions to other similar issues. These solutions should provide completely autonomous remediation and offer teams the ability to apply their expertise to modify actions and to have those modifications remembered and applied for future incidents.

Benefits

By leveraging advanced AIOps solutions that deliver service-driven, autonomous remediation, IT teams can realize significant benefits:

- **Optimized user experiences**. By harnessing predictive insights and fast, automated remediation, IT teams can prevent issues and minimize the impact of those that do arise. As a result, these teams can be much better equipped to continuously deliver optimized digital experiences to end users and customers.

- **Maximized operational efficiency and staff productivity**. Advanced AIOps solutions can deliver unified intelligence and automation across today's modern, dynamic, and hybrid IT environments. With these capabilities, IT teams can eliminate manual efforts, streamline workflows, enhance collaboration, and establish autonomous operations.

- **Enhanced scalability**. With advanced AIOps solutions, IT teams can wring maximum utility and value from their staff, infrastructures, and services. Consequently, these solutions make it practical for businesses to scale to accommodate the explosive growth in data, environments, and services.

- **Increased site reliability automation**. Enhancing infrastructure monitoring with intelligent recommendations and automated remediation capabilities can help organizations create more resilient production environments, streamlining their SRE initiatives.

BROADCOM

How AIOps from Broadcom Can Help

To meet their charters, today's operations teams need AIOps from Broadcom®. This solution helps users solve complex IT problems—including performance, capacity, and configuration issues—before they have an impact on the business. This solution combines the power of innovative AI, machine learning, and automation.

AIOps from Broadcom normalizes, correlates, and analyzes the rapidly increasing volume and variety of IT operational data across the entire digital delivery chain. Seamlessly spanning cloud to mainframe environments, this solution enables customers to deliver superior user experiences, while speeding innovation and increasing IT efficiency. Broadcom is the only vendor in the market to deliver a solution that combines application, infrastructure, and network monitoring; machine learning analytics; and automated service orchestration.

AIOps from Broadcom delivers the following capabilities and benefits:

- **Comprehensive contextual operational intelligence**. This solution ingests structured and unstructured data from IT performance monitoring tools and combines it in a single, resilient data lake. The solution can ingest data from third-party sources ranging from mainframe to cloud environments, and it offers support for metric, alarm, log, topology, text, and API data.

- **Proactive closed-loop remediation**. AIOps from Broadcom offers predictive analytics to help solve complex IT problems, including in such areas as performance and capacity. With this solution, configuration issues can be detected proactively—before they have an impact on users—and remediated automatically.

- **Vendor-agnostic integrations**. With AIOps from Broadcom, customers can more quickly and easily stream metric, event, log, and topology data to and from any third-party monitoring, management, analytics, and visualization tools. This solution offers support for Splunk, IBM®, Elastic, ServiceNow, Dynatrace, AppDynamics, SolarWinds, Puppet, Chef, Tableau, and more.

- **Pre-packaged algorithms and CA integrations**. Built-in machine-learning-driven algorithms, dashboards, and integrations speed time to value for customers. AIOps from Broadcom integrates with a wide variety of CA products, including **Application Delivery Analysis**, **Automic® Automation**, **DX Application Performance Management**, **DX Infrastructure Manager**, and **DX NetOps**.

- **Contextual automation that fuels reliability**. AIOps from Broadcom offers contextual automation that can seamlessly integrate root-cause alarms with remedial workflows. With the solution, SRE teams can easily automate standard operating procedures that can be reused across environments, reducing operations toil and enabling teams to handle more events.

- **Powerful open source-based engine**. Powered by Automation.ai, a powerful analytics engine that leverages open technologies such as Elasticsearch, Apache Kafka®, and Apache Spark™, this solution scales and allows teams to more easily integrate with third-party business or IT data sources to further enrich the data set.

BROADCOM®

Conclusion

To ensure their complex, hybrid, interrelated, and highly dynamic environments deliver an optimized user experience, operations teams have to achieve fundamental breakthroughs in scale and efficiency. Today, this requires establishing service-driven, autonomous remediation capabilities. By gaining these capabilities, organizations can begin to deliver optimized digital experiences, while realizing the staff productivity and operational scale that are required to contend with the spiraling increase in data, services, and environments.

For more information, visit the **AIOps from Broadcom page**.

About Broadcom
Broadcom Inc. (NASDAQ: AVGO) is a global technology leader that designs, develops and supplies a broad range of semiconductor and infrastructure software solutions. Broadcom's category-leading product portfolio serves critical markets including data center, networking, enterprise software, broadband, wireless, storage and industrial. Our solutions include data center networking and storage, enterprise and mainframe software focused on automation, monitoring and security, smartphone components, telecoms and factory automation. For more information, go to www.broadcom.com.

BROADCOM®