Cloud, Big Data, Analytics and Diagnostics Chart the Future of Application Performance Management (APM)

An ENTERPRISE MANAGEMENT ASSOCIATES® (EMA™) White Paper
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Introduction

This ENTERPRISE MANAGEMENT ASSOCIATES® (EMA™) white paper discusses the challenges of managing applications in highly dynamic application environments, such as those that are heavily virtualized and those running on public and private Clouds. Modern enterprise applications are engineered for agility and frequently deployed over scalable, elastic IT infrastructures. The benefits of virtualization, public/private cloud, and hybrid deployments can include flexibility, efficiency, and business enablement; however, these benefits come at a price.

Multiple factors, such as varying workload requirements, public cloud performance variability, and “just in time” provisioning introduce risks to quality of service. Performance and availability can be compromised, particularly when IT organizations lack Application Performance Management (APM) solutions designed to support dynamic infrastructures.

IBM SmartCloud Application Performance Management (SmartCloud APM) is engineered to support dynamic, complex, and mission critical applications, regardless of their execution environment. This EMA paper details the reasons why it is important for today’s management toolsets to support cloud and similar dynamic infrastructures, and highlights IBM’s answer to the challenges of building service assurance into complex application ecosystems.

Modern Applications: A Wealth of Architecture, Infrastructure, and Deployment Alternatives

Today, more than 75% of medium- to enterprise-sized companies are developing and hosting custom applications. Many use multiple languages, with almost 80% using J2EE or other Java-based languages and more than 75% using .NET (see Figure 1). Often, both Java and .NET are combined to create componentized applications, and almost 35% of companies have deployed “hybrid” applications spanning on-premise and public cloud.

![Figure 1: Java and .NET Adoption](image-url)
Modern applications are diverse, integrated, and abstracted. Virtualization, for example, abstracts software-based virtual servers from underlying hardware. Clustering and load-balancing technologies abstract software execution from dependencies on specific hardware. And public cloud abstracts entire IT environments from the data center.

While heterogeneity has become a watchword in terms of building these environments, managing this heterogeneity has become a key challenge. The majority of today’s transactions span multiple platforms and delivery mechanisms. It is common, for example, to leverage Microsoft’s .NET framework for the user-facing portion of a transaction and J2EE to access back-office data. The problem is further compounded as transactions increasingly span on-premise and cloud.

For most companies, the net result is an interconnected web of complex technologies that interact to deliver end-to-end applications. Often, these applications are the very lifeblood of the business. Financial services and manufacturing companies, for example, tell EMA that the cost of downtime can be in the millions of dollars per hour. And while the complexity of these applications means that they are “at risk” for performance and availability issues, they also introduce management challenges that demand an increasingly intelligent breed of management solutions.

This “risk factor” is also driving a new breed of buyer. While IT Operations has traditionally been the primary buyer for enterprise management products, the growth of the “mission critical” application has made Director-level IT executives and CIOs the primary drivers behind application management tools purchases. In addition, a growing percentage of purchases are originating with Line Of Business (LOB) buyers, as the business takes a more “hands on” approach to application service assurance.

Tracking the end-user experience across diverse, distributed environments goes far beyond the capabilities of silo management solutions. It is no longer possible to diagnose application problems by consulting the mainframe console or the network tool. Leading-edge APM toolsets incorporate a full line of analytics to automate deep-dive diagnostics, rolling baselines, predictive capabilities, visibility to infrastructure and integration points, and discovery. Log analytics, focusing on unstructured versus traditional structured data, are becoming increasingly important as sources of application insight, since distributed environments generate high volumes of log data. Finally, prospective buyers are seeking these capabilities in products with flexible deployment models and licensing options.

The Impact of Dynamic IT Environments

Dynamic change and “Big Data” are two key factors impacting APM that deserve particular attention. Both increase the complexity of managing application environments, but in different ways.

Changes to production environments are the source of a significant number of application-related problems. For companies with well-developed change processes, change accounts for between 20% and 40% of such problems. For companies with less structured approaches, those numbers can rise to 60%–80%.

At the same time, near real-time dynamic change is becoming increasingly commonplace in modern data centers and takes a variety of forms. Technologies such as cloud bursting and VMware vMotion live server migrations are evolutionary offshoots of virtualization. Companies using these technologies find
that application topologies are no longer fixed but can change during real time execution. VMotions shift application workloads between physical servers. Cloud bursting enables new virtualized workloads to be spun up “in the cloud.” Both technologies offer solutions for balancing and/or normalizing workloads to improve application performance; however, they also introduce monumental APM-related challenges because execution environments are fluid versus fixed, making troubleshooting more difficult.

This “complexity” is also responsible for the growth of “Big Operational Data.” Every infrastructure component generates its own metrics in the form of logs, traps, etc. Software components generate metrics as well, typically in the form of instrumentation messaging and logs. The collective structured and unstructured data generated by enterprise-sized operational environments can be in the terabytes of data per day. Many traditional APM solutions simply can’t keep up with this level of scale.

The combination of dynamic change and Big Operational Data also increases the difficulty of modeling and tracking application dependencies. Discovery and topology modeling are key elements supporting troubleshooting and root cause analysis; however, high rates of change combined with high volumes of machine data make real-time modeling a challenge for many APM solutions. Those that weren’t designed to handle data at scale may not be able to analyze real time changes quickly enough to “keep up.”

IBM SmartCloud APM and Dynamic IT Environments

IBM SmartCloud APM incorporates targeted functionality that addresses the challenges of managing modern, dynamic IT environments. The solution covers five key capability areas: discovery, end user experience, transaction tracking, enterprise diagnostics and analytics. It is delivered as a single, seamlessly integrated solution leveraging a common foundation to monitor and manage the IT infrastructure underlying applications AND support application availability and performance.

SmartCloud APM features quick and easy deployment options, providing customers with rapid time to value and fast Return On Investment (ROI). It combines monitoring and lightweight discovery with alerting and reporting on availability and performance of transactions, applications, and underlying infrastructure.

Infrastructure monitoring delivers performance, availability, alerting and reporting for foundational technology such as servers, databases and networks. End User Experience (EUE) monitoring and transaction tracking extend the value proposition to application-level monitoring. This combination builds a foundation for maintenance, proactive management, and troubleshooting performance and availability at the service delivery layer.

A key value proposition for companies using IBM WebSphere is SmartCloud APM’s visibility to WebSphere Application Server (WAS), WebSphere portal, and WebSphere extended products. Middleware is, of course, a key component of today’s massively integrated application ecosystems. For this reason, APM solutions that lack middleware visibility have “blind spots” at the touch points (integrations) between execution components. IBM SmartCloud APM restores this visibility with seamlessly integrated WebSphere-specific coverage.

SmartCloud APM’s discovery capabilities are essential for modeling links between the infrastructure and application (service) layers. They combine lightweight, standards-based discovery with analysis of transaction flows between components, providing both top down and bottom up views of
transaction execution. They also build and maintain a “living topology” of application flow to trace the path of each transaction and deliver deep dive diagnostics when necessary. Without such a topology, application troubleshooting is essentially a process of trial and error.

Discovery and topology mapping are key requirements for monitoring cloud and other dynamic environments as well, since transactions paths can vary based on load balancing, clustering, and similar factors. SmartCloud APM delivers an automated, “always accurate” view of application execution that includes:

- Detection of new systems requiring monitoring or management
- Analysis of system-to-application dependencies and of application-to-application interrelationships
- Problem prioritization based on the importance of the application to the business
- Real-time, root-cause analysis

IBM SmartCloud APM automatically correlates and analyzes application and system resource data to rapidly identify, isolate and resolve application bottlenecks. Built-in interactive reporting (with common dashboards across the entire IBM SmartCloud APM line) spans real-time and historical operational data for support and trending purposes, and traps and alerts proactively advise IT personnel of potentially troublesome situations before they impact end users. Policy-based management speeds the configuration of new managed resources, while seamless integration provides end-to-end management across distributed and mainframe applications and platforms.

Two Recent Additions to the IBM SmartCloud APM Family of Products: IBM SmartCloud Analytics and IBM SmartCloud Monitoring - Application Insight

IBM continues to add innovative solutions to its APM product line based on industry evolution and customer requests. IBM SmartCloud Analytics and IBM SmartCloud Monitoring - Application Insight are two recent additions that offer distinctive APM-related features:

IBM SmartCloud Analytics - Log Analysis

“Root cause analysis used to average 45 minutes. Now it takes only five minutes. And if there is a problem, the appropriate IT administrator is automatically alerted and can take care of it in a much more proactive manner. This has helped us achieve nearly 100 percent availability (up from 90% previously).”

~ Syed Asif Shah, Chief Information Officer, Central Depository Company of Pakistan. CDC handles the electronic settlement of transactions carried out at the country’s three stock exchanges.

IBM SmartCloud Analytics is a new, integrated analytics platform that complements the existing solutions in the IBM SmartCloud portfolio (see Figure 2). IBM has made significant investments in analytics capabilities in recent years, and this new solution actively builds on those investments to solve complex problems in modern application environments.
IBM SmartCloud Analytics – Log Analysis

Collects large volumes of obscure unstructured data and transforms it through analytics into actionable intelligence.

IBM SmartCloud Analytics - Log Analysis provides a single dashboard supporting analysis of Big Data from unstructured log files. While traditional APM solutions gather data points from agents, protocols, etc., log data has traditionally been under-analyzed because of its size, distributed nature, and lack of structure. Analysis of unstructured data requires parsing, searching, and similar analysis techniques which aren't as relevant to analysis of structured metrics and messages.

Log Analysis capabilities have become more relevant with the growth of Big Operational Data. IBM Research finds that an enterprise running 125 applications on 5000 servers distributed across 2 to 3 data centers generates more than 1.3 terabytes of operational data per day, much of it log-related.

Logs contain a wealth of data supporting APM, security functions, and a wide array of problem resolution-related use cases. While most of it goes unused (due to the size and number of logs in the average IT environment), IT specialists turn to log data, often as a last resort, to assist them in tracing problems relating to a particular user, device, or location. Traditionally, a lack of adequate tooling has made it cumbersome to wade through volumes of data in search of the single nugget that solves a given problem. IBM SmartCloud Analytics - Log Analysis streamlines the process with tools enabling IT specialists to more easily find that “needle in a haystack.”

Early reports from customers are positive and note multiple use cases and outcomes. The product gives them:

- The ability to discern patterns from seemingly unrelated log file messages.
- Visibility to trends and problem symptoms that might not have resulted in a threshold violation – so would otherwise go unnoticed.

Figure 2: IBM SmartCloud Analytics - Log Analysis
• The ability to quickly and easily conduct preliminary root cause problem analysis without having to turn to drill-down diagnostic tools.

• The ability to gather intelligence on components that aren’t being monitored with agents. In this use case, log file analytics are supplemental to traditional monitoring methods and tools.

IBM has also created Insight Packs to help customers get started on the new product. Initially covering IBM WebSphere Application Server and DB2, these packs contain IBM expertise on these technologies, along with a dashboard that allows customization for a specific customer environment.

**IBM SmartCloud Monitoring - Application Insight**

IBM SmartCloud Monitoring - Application Insight is a new product that originated in IBM’s Research labs. It is specifically designed to support the management of application workloads running on public clouds and similar platforms where deployment of traditional APM toolsets is not feasible.

It delivers a subset of IBM’s full monitoring capabilities in a product design ideally suited for cloud monitoring and delivery. The product is built around a set of autonomous agents that do not require continuous access to a central management server. The agents monitor local operating system and web response-time behavior, and store the data locally. They share it “on demand” when a connection is available to a lightweight management node deployed on a Virtual Machine (VM).

Once agents are deployed, no further manual configuration is required as the product is “self-discovering.” Once installed, the management node detects new agents and “discovers” which business application they belong to. Monitoring and dashboard-based reporting begin automatically. Preconfigured metrics reduce requirements for manual configuration, and customers see populated IBM SmartCloud dashboards almost instantly. This level of automation means that the solution is not only easy to deploy, it is also virtually self-maintaining.

The combination of a lightweight solution, ease of installation, ease of use, and minimal ongoing maintenance sets the stage for a new approach to application performance management. In addition, the fact that it is both elastic and expandable makes IBM SmartCloud Monitoring - Application Insight an excellent option for fast growing companies of any size.

IBM SmartCloud APM Differentiators and Value Proposition

(Before purchasing IBM SmartCloud APM), “we were monitoring the bits and pieces of our core services, but we didn’t have the end-to-end visibility for service modeling and tracking SLA performance. It meant more calls, higher MTTR (mean time to repair), and extended outage durations.”

~ Network Monitoring Team manager, city government, major U.S. city

With IBM solutions:

• More than 50 percent reduction in MTTR
• Availability for key services improved 60 - 90 percent
• Transitioned from 4-hour outages on average every three months to no significant outages
• Time savings enables the city to service an additional 7,757 calls monthly.

• Agentless or agent-based monitoring OR a combination of both: While many of today’s vendors deliver performance tools based on either agentless or agent-based monitoring, IBM is one of the few that enables customers to “mix and match” the two. Lightweight, agentless monitoring can be used for less critical applications and systems, while agents can be installed on those that are more mission-critical. Fewer agents mean less system and administrative overhead, and all monitoring reports back to the same integrated console.

• Comprehensive support for heterogeneous hypervisors and other foundational technologies: Larger enterprises have often virtualized across mainframes, Linux, UNIX, and Windows. In addition, most midsized companies have either invested in multi-vendor hypervisors already or will in the future. Management toolsets must be able to address this heterogeneity. At the same time, today’s companies are seeking broader integration between previously siloed technologies, support teams, and business constituencies. IBM continues to build integrations across tools supporting development and operations, monitoring and Service Desk, and IT and business assets. With its breadth of coverage for middleware, architectures such as SOA, and for almost any conceivable business model, IBM’s consolidated value proposition becomes increasingly compelling as businesses grow and diversify.

• Predictive analytics and self-learning: Every IT organization is seeking to become more proactive in managing business applications; however, few management solutions truly deliver on this requirement. SmartCloud APM “watches” production environments, maintains “rolling baselines,” and develops an understanding of normal operations based on factors such as time of day, day of week, and time of month. Operations personnel are notified BEFORE an application problem can impact users, and deep-dive diagnostics provide the actionable information required to fix the problem.

• End user performance monitoring: SmartCloud APM features a full range of end-user response monitoring including real-user experience and synthetic monitoring. “Deep dive” drill-down enables IT operations personnel to navigate a transaction topology (service model) to facilitate isolation of the problem component.
• Mobile Device support: IBM SmartCloud APM supports a variety of mobile devices.

• Redesigned, Web 2.0-based dashboards: Newly designed dashboards provide simplified drill-down to reveal the source(s) of a problem, while embedded “expert advice” guides users in making a speedy and successful resolution. In addition, IBM has introduced a new, universal dashboard across all IBM APM product offerings. Whether customers invest in the IBM SmartCloud APM Entry Edition (appliance form factor), the on-premise SmartCloud APM solution, or the new SmartCloud Monitoring - Application Insight lightweight cloud APM platform, the dashboard experience will be similar.

• Cost Effective
  ◦ Significant price reductions for non-production use: IBM prices non-production SmartCloud APM licenses at a discounted cost compared to production licenses. This has implications for DevOps, because it makes it possible for the same toolset to be used by developers, testers, deployment, and operations teams. In effect, the tools provide a “common language” that enables technical professionals with diverse skills to collaborate more effectively. This, in turn, promotes more thorough testing, mitigating failed rollouts and version rollbacks.
  ◦ Virtualization and cloud support: SmartCloud APM delivers virtualization-aware resource monitoring to support optimal use of server and virtualization assets.
  ◦ Data analytics: Integrated data warehouse and portfolio-wide common reporting are included at no additional cost.

• Fully integrated across the application/business service lifecycle: One of IBM Software’s unique strengths is the level of integration across the product line. SmartCloud APM can help companies facilitate the transition from siloed teams to seamless integration between development and operations. APM’s value proposition extends across the full lifecycle because it integrates with products supporting development, operations, network management, service desk, and similar key business and technology functional areas.

• Foundation for Business Service Management (BSM): IBM BSM offerings, with SmartCloud APM as a foundational component, provide IT organizations with tools to demonstrate relevance and business value. Business-focused dashboards help Line Of Business (LOB) executives visualize how Key Performance Indicators (KPIs) map to IT services. This helps IT optimize resources to meet business needs and ensures that IT services meet or exceed contracted service levels to address business priorities.

EMA Perspective
Modern distributed applications, by their nature, are complex to manage. They are modular and distributed, network-connected and integrated, SQL and resource intensive. This combination introduces challenges that are only aggravated when virtualization and cloud are added to the mix.

The problem is compounded by a variety of factors. One is that a significant number of companies are still trying to manage today’s complex applications with silo-focused tools. Another is that many of the companies that have already invested in application or transaction management products find that their tools do not translate well when they move to modern dynamic architectures. Yet another widespread challenge is “spotty” coverage—tools cover certain aspects of an application or transaction, but are “blind” to others.
The IBM APM solutions are engineered to address the challenges of modern enterprise applications. IBM continues to invest in these solutions, adding capabilities to address technology advancements on an ongoing basis.

For example, IBM has improved ease of consumption by introducing a variety of form factors and deployment options across the IBM SmartCloud APM line. IBM SmartCloud APM solutions support, in addition to traditional Java implementations, modern languages such as Ruby, PHP, and the .NET family. IBM has also re-vamped the licensing scheme for this solution set.

In addition, IBM continues to introduce new products and innovative product architectures. Both IBM SmartCloud Analytics – Log Analysis and IBM SmartCloud Monitoring – Application Insight were specifically designed to address the evolving requirements imposed by the impact of new technology (such as cloud) on application ecosystems. These products fill major APM-related gaps and should provide assurance to customers and prospects that IBM product investments will continue to maintain value over time. IBM continues to add new capabilities and features to these solutions as well, with additions to IBM SmartCloud Analytics already in development.

Meanwhile, a variety of form-factor options, flexible licensing, and ease-of-use improvements make SmartCloud APM an attractive alternative for smaller companies as well as enterprises. IBM’s intent is to put enterprise-grade management tools within reach of companies of virtually every size—a claim that most competitors cannot match.

Companies feeling the pain of managing modern application environments now have multiple options within the IBM SmartCloud APM portfolio. The breadth of heterogeneous technologies covered by these solutions, including coverage for essential building blocks such as middleware, virtualization, and dynamic scaling, means that products such as these are no longer “nice to haves.” Instead, they are “must haves” for companies running mission-critical applications in dynamic IT environments.

**About IBM**

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