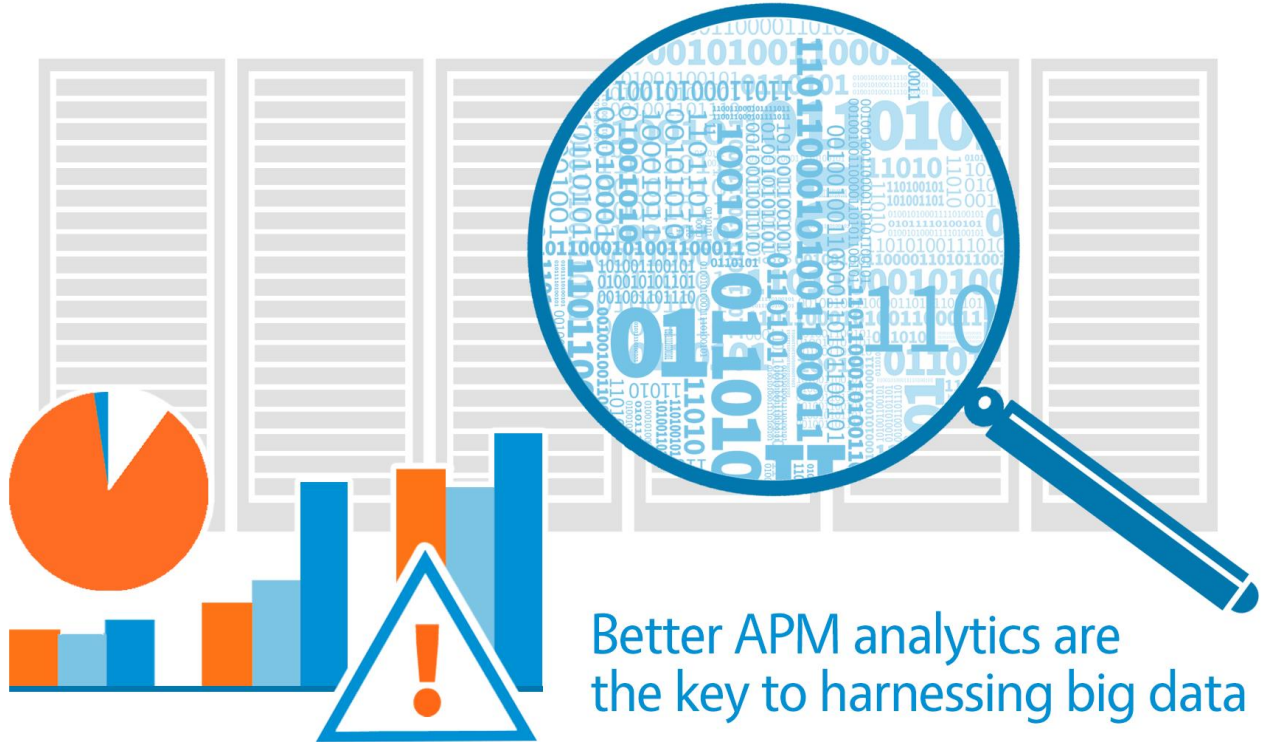


All the data in the world is no good if you can't see its meaning

Is your application performance data growing out of control?



Better APM analytics are the key to harnessing big data

SUMMARY

IT is under pressure to deliver fast and reliable application performance and satisfying customer experiences on complex, dynamic, and mission-critical applications. Today's applications are multi-platform, multi-tier, and span physical, virtual, and hybrid cloud environments. Monitoring these new Web, cloud, and mobile apps for customers and staff add to an already burdened IT workload. The manual processes and legacy application- and transactional-monitoring tools of the past can't keep up with the complexity of mission-critical applications. They don't give IT staff the support they need to identify and solve problems quickly or deliver on performance goals.

To keep up with complex, dynamic, and interconnected applications, analysts and administrators need application performance management (APM) tools with advanced analytic capabilities. These modern tools are designed to better anticipate potential problems, solve problems quickly, keep downtime to a minimum, and support IT in delivering the quality of service that mission-critical applications demand.

BIG STAKES: MANY APPLICATIONS, MANY PLATFORMS, MANY PROBLEMS

Large organizations have dozens or perhaps hundreds of applications running on a variety of platforms, ranging from mail applications, order-entry systems, HR systems, to development stacks. These applications may be on physical servers, VMs, or a combination of both. They may exist on new private, public, or hybrid cloud platforms – or on legacy, siloed environments. Modern organizations must support applications on a range of devices including notebooks, tablets, and phones.

A comprehensive APM solution for such an organization must measure how well each application performs on all those different platforms. It must measure constantly, extracting multiple data points per application per minute from multiple points of view. Ideally, it follows transactions from the user's device through all the physical, virtual, and cloud components, and then back to the user. A tool that captures all these data points, in terms of end-user experience monitoring and performance monitoring on all the servers, storage, and other components a transaction touches, is the ideal tool. Collecting all that data and making it visible and available to IT staff is what an APM solution does. Making sense of all of that data so that IT can use it is what the analytics does.

Data quantities and data explosion

Most organizations already run traditional APM or other monitoring products to collect data and pinpoint problems. In fact, they're likely running multiple such products. Sixty-eight percent of respondents in one survey reported using more than three different application and transaction management tools to track performance.¹ These tools send out warnings and error messages by the hundreds or thousands, every day. You've asked them to, defining and setting dozens (or hundreds) of thresholds for acceptable performance that the tools monitor faithfully. These messages tell you when processor performance peaks over 80 percent, when any Web page takes more than a second to load, when a disk drive hits capacity, and so on. The more you wish to monitor, the more thresholds you set in your APM or transaction management tools, and the more errors they report. This leads to mailboxes full of unsorted error reports. Assigned staff members sort the critical errors from the merely annoying, from the "it's over a threshold, but it's not a problem" errors, to the "it's not really a bug, it's a feature" reports.

There's no shortage of this data, which means your staff must spend even more time taking deep dives into your growing data pool to try to solve the critical problems.

¹ <http://www.cioinsight.com/c/a/Latest-News/Application-Management-Hinders-IT-Operations-Report-876209/#sthash.S3t8W25d.dpuf>

“There’s enough data to solve most problems, but also enough to drown in before an error can be fixed.”

They have millions of data points to choose from because, even faster than it’s reporting errors, your faithful APM program collects current data and retains historical data for error diagnosis. This data is deep and wide and out of control. There’s enough data to solve most problems, but also enough to drown in before an error can be fixed.

It’s no wonder that many problems take weeks, even months to solve – one recent survey noted that nearly 31 percent of issues take more than a month to solve.² While some of those problems may not need to be resolved quickly, others definitely do. And if they aren’t solved, there are consequences—often big ones. A malfunctioning application can hurt worker productivity, lose customer transactions, create dissatisfied customers, get you in trouble with regulators, or take you out of compliance with SLAs. If the only consequence of a problem is that it’s eating into IT staff time, you’re lucky.

Your current arsenal of fire-fighting tools isn’t enough to contain the blazes. Threshold-based APMs are great tools, but not enough for today’s multi-platform, multi-site application environments.

How did we get here?

APM data can be too much of a good thing. You’ve been running APM tools for a long time, so you have vast amounts of monitoring data on hand. Over 80 percent of the respondents in one survey reported that their metric data collection had grown 300 percent or more in the last four years alone. Monitoring tools have created not just databases, but a big data problem.³

The performance data you collect on your application infrastructures is growing as you collect more data using more metrics on more devices, and you collect the data more frequently. One survey seeks to quantify this data explosion:⁴

More devices – Device counts have multiplied in recent years. Twelve percent of respondents in a survey said they now managed very large infrastructures of 50,000 or more elements; 13 percent managed large infrastructures of 10-50 thousand elements, 35 percent managed mid-sized infrastructures of 2-10 thousand managed elements. Only 40 percent ran smaller infrastructures with fewer than 2,000 managed elements.⁵

² Forrester study commissioned by RiverBed: <http://apmdigest.com/forrester-study-highlights-application-performance-challenges>

³ Survey sponsored of IT professionals in the US and UK by Netuitive: <http://apmdigest.com/application-performance-management-big-data-challenge>

⁴ *Ibid.*

⁵ <http://apmdigest.com/application-performance-management-big-data-challenge>

“Another survey also found that multiple tools caused problems, with multiple consoles with no data normalization or time alignment between them, making it impossible to gain a holistic view of problems.”

More metrics – Slightly over half of the respondents (54 percent) collect between 10 and 30 metrics per component, with 72 percent reporting growth in this number over the past decade.⁶

More frequent data – Five minutes was the most common data collection frequency, up from 15 minutes 10 years ago. Nearly a quarter of the respondents collect data every minute or less.⁷

More monitoring tools – One survey pointed to another variable for the data explosion—multiple monitoring tools. Sixty-eight percent of the IT professionals surveyed have invested in more than three distinct application and transaction management tools.⁸ Another survey also found that multiple tools caused problems, with multiple consoles with no data normalization or time alignment between them, making it impossible to gain a holistic view of problems.

Too much data to analyze – Even with multiple tools, many of the survey respondents reported a lack of complete coverage and visibility in their environment.⁹ More metrics and more results-per-metric created big data that Netuitive survey respondents found that they couldn’t analyze effectively with traditional APM tools. Eighty-eight percent of those survey respondents said they were able to analyze less than half the metric data they collected, with 45 percent analyzing less than a quarter.¹⁰

What is the solution?

The solution is better analytics. Traditional APM tools are providing data, but lack capabilities to sift through the data to pinpoint and resolve problems. One recent survey found that the greater complexity of data and lack of analysis tools had an impact on business. Over 75 percent of respondents were dissatisfied with their ability to correlate business, customer experience, and IT metrics. The study found that larger companies, those with 5,000 or more managed elements, were more likely to be

⁶ *Ibid.*

⁷ *Ibid.*

⁸ <http://www.cioinsight.com/c/a/Latest-News/Application-Management-Hinders-IT-Operations-Report-876209/#sthash.S3t8W25d.dpuf>

⁹ Summary: <http://apmdigest.com/forrester-study-highlights-application-performance-challenges>. Sign up here to download full report: http://www.riverbed.com/about/document-repository/Forresters-Ideal-Tool-Set-For-Application-Performance-Management-For-Better-Business-Performance.html?asset_name=Document%20Repository%20-%20Forrester%E2%80%99s%20Ideal%20Tool%20Set%20For%20Application%20Performance%20Management%20For%20B etter%20Business%20Performance&cookie_value=New&action_name=AssetClicked

¹⁰ <http://apmdigest.com/application-performance-management-big-data-challenge>

dissatisfied with their analytics capabilities.¹¹ Respondents of another survey were also dissatisfied: even with their APM monitoring tools, 71 percent of the businesses surveyed still could not pinpoint the source of business-impacting slowdowns.¹² All these surveys point to the same conclusion, one we agree with: **IT needs better APM data analytics to turn the APM data explosion from a problem into IT solutions.**

The evolution of applications

Applications are more complex than ever, and change constantly. Buyers are using more mobile devices, and use both Web and app front-ends. Applications are multi-platform, multi-tier, and dynamic. They run on various combinations of physical devices, cloud environments, and on VMs. They have more components in their delivery chain than ever – each may intertwine with an array of Web servers and services, middleware, databases, third-party components, and software platforms. Applications interconnect: for example, your email client may launch an Office app for an attachment, synchronize to cloud storage, connect to collaboration applications, and synchronize with other devices. Your Web browser app may hit multiple disparate APIs simultaneously. It is hard sometimes to see the lines between these types of applications, which makes it difficult for IT to solve problems.

Another issue is the transient nature of both application development efforts and operations and resource management initiatives. Many organizations have evolved the nature of their application development and deployment, using the DevOps model of quick release cycles. Developer teams want to keep applications fresh, current, and ever changing with frequent updates. Operations groups may move resources, balancing the load among clouds instances and cloud providers, and move virtual machines and storage.

Today's application is different than yesterday's, and tomorrow's application will continue to evolve. Older versions of APM and APM analytics solutions haven't kept up with these developments in the application and operations stack, and often require many manual processes. Instead of solving problems proactively, it may take hours or more to identify a problem that's already occurred, learn the relevant data, and pinpoint and implement a solution. This delay leaves users vulnerable to performance problems that affect end-user satisfaction and staff productivity.

So what is the answer? IT needs a solution that includes both advanced APM and APM analytics tools. The answer is finding the appropriate application monitoring toolsets that can **analyze and learn** your big data, not just collect it.

¹¹ *Ibid.*

¹² <http://www.ciinsight.com/c/a/Latest-News/Application-Management-Hinders-IT-Operations-Report-876209/#sthash.S3t8W25d.dpuf>

The shift from infrastructure to applications

Applications have become a central focus for organizations. Well-performing applications bring in revenue, increase customer loyalty and retention, and improve staff productivity. To keep them successful in these areas you need tools that provide a complete view of user experience and application behavior so that you can make sure the applications perform well. Organizations measure the success of organizational units, including IT, by how well they deliver applications and how users experience them.

Approximately two years ago, IT operations shifted from an infrastructure focus toward a more user-and application-centric view. A 2011 report noted this at the time, reporting that 20 percent of the Global 2000 were shifting the emphasis of their IT operations to centrally monitor and manage applications, rather than the infrastructure.¹³ This shift showed not just the organization-wide application focus, but also the undercurrent of applications' shift to the cloud, which aren't well managed by infrastructure-based performance monitoring toolsets.

The transition is still underway. A 2013 survey reported that 65 percent of respondents had or planned to adopt on-premises application monitoring. This was fewer than the numbers for network server and database-performance management tools.¹⁴ Adoption may be lagging older products because early-generation APM tools lack critical features. However, interest is high. Eighty percent of IT decision makers surveyed believed that management tools were important in managing application performance.¹⁵ Both of these surveys suggest that adoption rate will continue to rise.

Complex multi-platform applications

The problem isn't just the explosion in data. Just as IT shifts its focus from an infrastructure-centric point of view to a more application-centric one, innovations have made applications more complex and more difficult to manage.

In the last few years, applications have become more complex, dynamic, distributed, and multi-platform, which make them harder to monitor and makes their data more complex and more difficult to analyze. Data centers have faced huge growth in scale and complexity. Meanwhile, a massive shift to cloud and virtualization technologies have helped make the application the focus of performance analysis, rather than the infrastructure alone.

“Forty-six percent of companies say they have double or tripled the IT components (servers, storage, network, app servers, etc.) they had a decade ago.”

¹³ <http://webperformanceguru.files.wordpress.com/2011/10/gartner-magic-quadrant-for-application-performance-monitoring-sept-2011.pdf>

¹⁴ : <http://www.riverbednews.com/2013/07/forrester-application-performance/>

¹⁵ <http://www.riverbed.com/about/document-repository/Forrester-Think-Youve-Mastered-Application-Performance-Think-Again.html>

“The majority of respondents identified application complexity as the primary cause of performance issues.”

How many applications, running on how many platforms and components make up your business? You have applications on servers in your data center, on public, private, and hybrid clouds, backups on a variety of platforms at other cloud providers, and a disaster recovery site. They can include mainframe servers, application servers, Web servers, appliance servers, and database servers. They may support desktop, server, and storage virtualization, use software-as-a-service, or use multiple network and storage solutions. Your data center is now multi-platform, multi-site, multi-vendor, hybridized, and virtualized. And it’s growing, even into the public cloud space—each time a developer adds another public cloud VM for testing, your virtual data center expands.

A survey last year of IT professionals found that 46 percent of companies say they have double or tripled the IT components (servers, storage, network, app servers, etc.) they had a decade ago. Another 26 percent reported a four or five fold increase over that same period.¹⁶

The interdependencies among the components have grown as well. Any one application may span many of those components and include application servers, database servers, Web servers, and backup servers. Additionally, the application may have components in one or more private or public clouds, count on third-party products, or link with other applications.

Applications have a lot of moving parts. A 2012 survey of IT executives found that 64 percent of responding organizations managed seven or more distinct technologies within their application systems, with virtual environments and cloud-based applications adding even more complexity.¹⁷ It’s simple: **Interdependency adds complexity.**

Application complexity understandably contributes to performance issues. In a recent survey, the majority of respondents identified application complexity as the primary cause of performance issues (51 percent).¹⁸

Intangible and tangible costs of problems

The costs of application performance problems extend beyond the obvious and can be separated into three main areas: the IT costs of solving the problem, lost productivity and business, and customer satisfaction.

¹⁶ <http://apmdigest.com/application-performance-management-big-data-challenge>

¹⁷ <http://www.cioinsight.com/c/a/Latest-News/Application-Management-Hinders-IT-Operations-Report-876209/#sthash.S3t8W25d.dpuf>

¹⁸ Forrester study commissioned by RiverBed: <http://apmdigest.com/forrester-study-highlights-application-performance-challenges>

The high cost of problem solving

Infrastructure and application performance problems devour huge amounts IT staff time, which consumes IT budgets. Individual problems take a long time to repair with manual process and traditional tools. Most respondents to one recent survey of IT professionals reported taking an average of 60 minutes to repair each performance issue.¹⁹ The majority of respondents to another survey reported that it took more than 24 hours to resolve a quarter or more of their problems. Almost a third of those respondents reported that some problems took a month or more to resolve.²⁰ These costs reflect the complexity of the applications these groups are dealing with.

Add the staff costs of all the infrastructure and application problems and you get a significant part of the IT budget. Most IT operations groups in one survey reported spending from 10 to 30 percent of their resources fixing infrastructure and application issues.²¹ Another reported that a full 72 percent of respondents' IT budgets was spent operating and maintaining existing IT services.²²

In addition to staff costs, you may spend money for unnecessary upgrades, not knowing where the true problem lies. You can remedy or hide many performance problems such as high WAN traffic, or an overactive VM with costly infrastructure upgrades. If instead you could dig down into the performance issues and find the root cause of the problem, you could avoid those costs and instead choose a less expensive and quicker solution, such as offloading work to underutilized resources or giving a mission-critical application the priority it needs.

The IT dream is to identify and resolve problems before they affect end-users or while the effect is still minimal. This entails identifying potential problems, finding a solution, and reacting quickly. One study found that only 16 percent of organizations are able to proactively prevent performance issues for 80 percent or more of performance incidents.²³ The cost of failure is high.

Mission-critical impacts

IT leans on APM solutions to help with key applications, but can be burdened if these solutions can't help deliver on application performance objectives. Application problems that result in failures to meet SLA requirements or regulatory requirements may trigger fines and penalties, reduce your bottom line, or even endanger the financial health of end users.

¹⁹ TRAC Research study reported in APMdigest: <http://apmdigest.com/it-performance-monitoring-in-2013>

²⁰ Forrester study commissioned by RiverBed: <http://apmdigest.com/forrester-study-highlights-application-performance-challenges>

²¹ Summary of Forrester study: <http://apmdigest.com/forrester-study-highlights-application-performance-challenges>

²² http://spectrum.trac-research.com/2013APM/?section=market_context

²³ http://spectrum.trac-research.com/2013APM/?section=market_context

A recent survey found that enterprises deploy application management solutions most often to improve performance and user experience for mission-critical applications. It identified email, line of business, document management, database applications, and customer relations management (CRM) applications as the top five of these applications. The stakes are especially high for these applications, which need deliver top performance around the clock in order for the business to run smoothly and deliver quality service to customers.²⁴

Highly regulated industry verticals, such as healthcare, energy, and banking also frequently deploy application management systems to protect high-stakes, mission-critical applications specific to their industry. For healthcare applications such as electronic patient record apps and prescription-management systems, the stakes include the quality of patient care. Other regulated verticals are affected as well. An energy company recently estimated its downtime costs at up to \$1 million an hour in operational costs, with a single minute of downtime costing more than \$16,000.²⁵

Loss of productivity and revenue

If customers or end users can't access applications or if applications underperform, your customers and end users lose efficiency, which leads to lost productivity and sales, and ultimately lost revenue.

A recent survey found that 30 percent of respondents identify productivity loss for business users as the major consequence of application performance issues.²⁶ Staff rely on applications to do their work and need constant and secure access to their email, office suite, the enterprise VPN, browsers, chat, social networks, and other applications. They require predictable and fast responses from each of these applications not just at work, but at home and on the road as well. They lose productivity if these applications have problems or they can't access them. Lost staff productivity comes at a high dollar value. One study last year put the cost to organizations of downtime for critical applications at an average of \$138,000 per hour.²⁷ Another estimated that organizations lose \$72,000 per minute of unplanned network downtime.²⁸

Businesses that rely on a direct outward facing customer interface could benefit from advanced analytics APM. Data from a 2011 study suggests that an e-commerce site

²⁴ "Achieving top performance for business critical enterprise applications", Aberdeen Group, March 2013.

<http://www.aberdeen.com/Aberdeen-Library/8415/RB-application-performance-management.aspx>

²⁵ <http://www.forbes.com/sites/netapp/2013/10/07/whats-it-downtime-cost/>

²⁶ Forrester study commissioned by RiverBed: <http://apmdigest.com/forrester-study-highlights-application-performance-challenges>

²⁷ <http://blogs.aberdeen.com/it-infrastructure/ahhahaha-stayin-alive-just-virtualize/>

²⁸ http://spectrum.trac-research.com/2013APM/?section=market_context

with \$100,000 in revenue per day could lose \$2.5 million in sales every year with an added 1-second delay per page.²⁹

Proper APM tools can also aid the productivity of your development teams. You lose productivity and snappy release schedules when developers, testers, and operations staff lack tools to assess app performance, debug problems, and move application releases smoothly from development to deployment. One study found that applications management tools improve programmer productivity more than 20 percent.³⁰

The costs of failures escalate when IT can't solve them quickly – customers go to your competitor, employees aren't able to do their jobs, and IT costs rise, among other consequences. One study of IT reported user productivity loss as the major consequence of application performance issues.³¹ Thirty percent of IT professionals responding to the survey named that as their top concern.

Customer satisfaction suffers

Applications are the face of business for many customers. Customers learn about the organization through applications, contact it via applications, and use applications to buy from it. A key measure of business success, individual business unit success, and IT success, is how well the business delivers applications to users. If all is not well in the application world, the organization suffers. Most of the organizations responding to one survey reported that over half of their performance issues had an impact on end-users. This intangible damage is often significant to the long-term health of companies.

First-generation application performance monitoring

Confusion in the APM market

There is no industry standard for what an APM tool is. Gartner identifies the components as end-user experience monitoring, application runtime architecture, user-defined transaction profiling, deep-dive monitoring, and analytics.³²

The APM offerings from different vendors aren't directly comparable, which may cause confusion for those looking to make a purchase. Trac Research recently studied the vendors offering application performance monitoring and application performance management and found that few offered full end-to-end APM, instead specializing in subsets of APM tool capabilities such as code-level solutions, end user experience monitoring, network performance monitoring, APM analytics, cloud

²⁹ 2011 data; <http://apmdigest.com/how-loading-time-affects-your-bottom-line>

³⁰ <http://www.asg.com/Solutions/Applications-Management/Application-Understanding-and-APM.aspx>

³¹ <http://www.riverbed.com/about/document-repository/Forrester-Think-Youve-Mastered-Application-Performance-Think-Again.html>

³² <http://innetworktech.com/wp-content/uploads/2012/08/2012-Magic-Quadrant-for-Application-Performance-Monitoring.pdf>

performance, and virtualization management. Other vendors focused on the needs of specific industry verticals, such as healthcare.³³

The limits of first-generation APM tools

Even just a few years ago, you could get good value from an APM tool that tracked application metrics across the server, storage, and network resources in your data center. These tools compared collected data to thresholds you set, and reported whenever metrics escaped those thresholds. It was fine that these tools didn't capture information on virtualized or cloud infrastructures because you used the APM tools for mission-critical applications that were not yet on VMs or in the cloud. Now that you've virtualized these apps or placed them in the cloud, many tools can't keep up.

Traditional APM systems presented IT with the dual problem of creating too much data with the potential for data gaps. These tools monitored and analyzed data on thousands of performance metrics on applications, transactions, and infrastructure components. It kept the data over time so you could analyze performance over time. But now this data volume turns into a **big data** problem – there is too much data for IT staff to reasonably understand and analyze manually, and the first-generation APM toolset may not have analytical capabilities.

Long mean time to repair

Mean time to repair (MTTR) is a measure of how long it takes on average to solve a problem from the time the problem occurs. It includes time to detect the problem, figure out a solution to the problem, test the solution in the test environment, and implement the solution in production. For some problems, the MTTR never gets a value because the problem defies solution or repeatedly drops to the bottom of the list of things to solve. We've already discussed the long repair time for problems in applications not monitored by advanced APM solutions with analytics, and the resulting issues: higher IT costs, lost revenue and productivity, and reduced customer satisfaction.

Tricky problem triage

Traditional wisdom says you determine the potential impact of problems and allocate resources based on the severity. This front-end triage can use time that you could spend fixing problems. If an end-user reports a problem, the triage team has to measure the severity and compare its severity to that of all other problems on the triage list. Triage determines the order to solve problems based on evaluation of how expensive the problem is in terms of user productivity and satisfaction effects, revenue potential, and SLA and regulatory impact, among other considerations. If the traditional APM solution reports the problem, it may do some basic triage, but leaves a lot of the

³³ <http://www.new.trac-research.com/blog/2013/11/05/five-areas-shaping-the-application-performance-management-market-in-2014/>

research work to IT. Solutions with analytics can successfully diagnose impacts and remove this burden from IT staff.

Benefits of next-generation APM tools with analytics

Advanced APM tools with analytics

Today's IT department needs APM tools that offer full views of application and transaction performance and of user experience. IT needs advanced APM analytics tools with sophisticated capabilities to make sense of the data and help identify, prioritize, and solve problems. IT needs tools that take the initiative of understanding the data without having to have it defined for them. These tools should be quick to setup, quick to provide value, and take over manual processes. IT needs tools to help solve problems quickly, keep downtime minimal, and deliver the quality of service that mission-critical applications demand. These tools should provide performance improvements and cut down the cost of application performance management.

Even with good APM tools, companies need the ability to analyze the resulting data. Without analytics in the solution, IT must spend huge amounts of time reactively diagnosing performance problems without being able to solve problems before they hurt user experience.

APM analytics tools can harness all that data to help identify emerging problems, point to their root cause, and provide supplementary data to help triage the problem. You want an APM analytics solution that helps with triage so that you can deploy your resources where they'll do the most good, solving the significant problems first.

Advanced APM analytics work to offload problem analysis from IT staff, lower MTTR for problems, and avoid the end-user dissatisfaction and other costs of lingering problems. It should provide solutions based on both transaction and end-user perspectives:

- Transaction: APM should continue look at applications from the transactions point of view, but should track those transactions across the entire physical, virtual, and cloud infrastructure so that IT has the data it needs to find the root cause of problems.
- End user: It should also include data on how well the application performs for end-users. This would include not just traditional measures such as Web page responsiveness, but also information of interest to marketing and managers such as abandoned transactions, response to ads and promotions, and customer retention rates.

Detecting anomalies

A key technology for the new generation of APM is anomaly detection. With first-generation APM, IT needed to set up the APM by defining behavior goals using thresholds and writing rules for alerts. The APM solution would collect the data so that it could respond to the thresholds and alerts, invoking a manual triaging process by IT staff. These manual steps were time-consuming and had to be repeated frequently as the applications changed. The advanced APM toolset is less IT-directed and more self-directed. Rather than IT learning and defining expected behavior, the advanced APM tool find relationships among the metrics to identify normal behavior and then to watch ongoing performance for anomalies. It is constantly reanalyzing and mining the data to refine its expectations of normal. It can process far more data than can IT staff and find more sophisticated relationships among the data than can IT. It should trim the amount of time it takes IT to set up and run the tool compared to previous generations. It should also do a better job of finding the root cause of application performance problems and solve them quickly and proactively.

Weakness in some approaches to APM analytics

Traditional APM tools haven't been able to keep up with cloud and virtualization, which means that many major performance problems go unsolved. In late 2012, Information Week published a gloomy analysis of APM utilization, declaring that the dynamic nature of virtualized and cloud environments rendered most installed APM systems useless.³⁴

Somewhat less harsh is the 2013 survey by TRAC Research in which IT organizations reported that their performance visibility into user experience and application availability dropped after they implemented public or private clouds or desktop or server virtualization projects. The biggest drop they reported was a 61 percent average decline in performance visibility into user experience after public cloud projects.³⁵

Virtualization and cloud environments have been blind spots for traditional APM, making it hard for IT to use these tools to diagnose, analyze, and repair performance problems for virtualized and cloud applications.

Traditional APM solutions measure performance of physical servers, storage, and networks using performance indicators such as CPU and memory utilization. You need different metrics for virtual and cloud environments. In virtual and cloud environments, you need to track metrics such as hypervisor CPU usage in the VM and guest OS layers.

³⁴ http://reports.informationweek.com/abstract/1/9375/Application-Performance-Optimization/Research:-The-Next-Wave-In-APM.html?cid=pub_analyt_iwk_20130904

³⁵ TRAC Research study reported in APMdigest: <http://apmdigest.com/it-performance-monitoring-in-2013>

IT teams need to troubleshoot performance problems across physical, virtual, mainframe, mobile, and cloud infrastructure environments. They need an APM tool and APM analytics that can see into all those environments, their networks, and infrastructures, and can provide visibility into the relationships among components to detect problems quickly and reduce MTTR.

The misfit between traditional APM and cloud solutions is only now emerging as a big problem, because only recently have we seen many mission-critical applications move to the cloud. One study points to the increased importance of APM analytics. It found that organizations spend more time identifying the root cause of performance issues than on repairing the problems.³⁶

That survey also pointed out that some APMs have blind spots. Surveyed organizations reported that Web browsers and VMs were the top two blind spots for monitoring application performance.³⁷ Mainframes, user devices, public Internet, and application components followed.³⁸

POWERFUL APPLICATION PERFORMANCE MONITORING ANALYTICS FEATURES

Gartner defines APM analytics as “the marshaling of a variety of techniques (including behavior learning engines, complex-event processing (CEP) platforms, log analysis and multidimensional database analysis) to discover meaningful and actionable patterns in the typically large datasets generated by [APM].”³⁹

Prerequisite – Advanced APM data availability

Advanced APM analytics are able to track performance problems and results through the network, into the cloud, deep into VMs, over the Web, and down to the end user platform – but only if the collected data is available. Advanced APM analytics relies on comprehensive data from advanced APM including application performance, transaction performance, SLA compliance, and end-user experience across a multi-platform delivery model. If an APM tool isn’t able to collect data across multiple platforms, your analytics solution won’t have the data it needs to identify and triage problems and point out their root causes.

Advanced APM data collection should be built into the entire application lifecycle and infrastructure stack, from development to testing to production, so that

³⁶ <http://apmdigest.com/it-performance-monitoring-in-2013>

³⁷ <http://apmdigest.com/it-performance-monitoring-in-2013>

³⁸ <http://apmdigest.com/it-performance-monitoring-in-2013>

³⁹ <http://innetworktech.com/wp-content/uploads/2012/08/2012-Magic-Quadrant-for-Application-Performance-Monitoring.pdf>

issues such as code, configuration, and scale errors can be caught early and fixed before they hit production and affect users.

Provide multi-dimensional analytics engines

Traditional APM tools kept to the data center, tracking performance on server, storage, and network hardware. Advanced APM analytics goes outside the bounds of the data center, and combines measurements from multiple dimensions. APM analytics combines application, infrastructure, cloud, network, VM, and user-experience monitoring into a single solution with an application focus.

Transactions are distinct. One transaction might follow one execution path and set of resources, while another similar transaction may, moments later, follow another code path or use different resources, touching different back-end servers, routers, VMs, even cloud providers. An advanced APM analytics solution needs to measure performance and track transactions throughout the entire application delivery chain including servers, storage, middleware, backend systems, databases, third-party services and platforms. Your APM needs to keep up, so if something goes wrong, your APM analytics tool can pinpoint the exact transaction affected, follow its path, and pinpoint its failure.

Quantify real-user experience

For customer or staff-facing applications, superior end-user experience is the mission. With all these components, there is a lot that can go wrong (or right) that affects end-user experience, so it's important that your APM analytics can assess the situation. Advanced APM analytics should be able to assess the experience of real users with the application and the application's success in delivering customer satisfaction. This means that advanced APM needs to assess application performance from the point of view of the application and the transaction, but also look at the application from the end user's point of view.

End-user experience APM measures user satisfaction and its effect on business results by analyzing transaction size, revenue, shopping cart or page abandonment, and other indicators. This data can help triage of problems and in making business decisions based on customer-experience facts. It can help staff move a revenue-related problem to the top of the bug list to fix, or a slowdown on a little-used Web page down to the bottom.

Harness the data in close to real time

Real-time monitoring generates big data – it requires real-time analytics to sort, analyze, and make inferences from that data. The ideal is to catch problems before users notice them. For that, you need timely data and quick analysis, so that you can react. You want to bypass a malfunctioning component before it becomes a bottleneck, add additional VMs to handle unexpected traffic before users abandon slow-loading

pages, or expand the size of a database file before it stops processing purchases. You can bump a malfunctioning third-party ad off a Web page, nudge application priority to give a revenue-producing application more throughput, and otherwise manage the application delivery pipeline so that each customer has a great experience accessing your mission-critical applications.

Real-time analytics also has to do triage, to sort through the real-time monitoring data and point out what's important. You don't want to know about frequent but unimportant events, but you may care about both frequent and rare critical events. You might not care about a 30 percent burst in some metric, but you may want to know that a driver update resulted in a small but steady uptick in that same metric. You'd like the analytics tool to ignore the first (or mark it as of low interest) but highlight the second.

Assures safe updates and changes

Another role of APM analytics is to provide safer change management. Code changes can come quickly. With DevOps and Agile methodologies and their focus on continuous delivery, code changes move into testing and production quickly. Your APM tool needs to provide real-time peeks into a changing code base so you know which code version transactions passed through, but also so you can measure the impact of code changes.

APM analytics isn't just for spotting problems. It's for measuring the effectiveness of solutions. It can help you verify that your data center and services have the expected positive effect. You don't want to add servers, increase your VM count, add cloud instances and find later that the changes diminished performance or user experience. Analytics can point out if a change improves (or cuts) performance or SLA compliance and by how much. You can use the data to justify the improvement, pointing to the revenue increase that a million dollar server investment brought for example. On the other hand, you can use the data to quickly fix any problems that arise in consequence of the upgrade. Analytics help your change management, your reaction time and perhaps your job security.

Solve problems quickly

APM analytics saves IT time and effort by quickly finding the root cause of performance problems. It can identify problems proactively based on variations from normal behavior that its anomaly detector identifies. The tool, not IT staff, does the grunt work of digging through hundreds of thousands or millions of pieces of data to analyze patterns and identify problems and their causes so that IT can quickly fix the problem. APM analytics then needs to help IT verify the effectiveness of the fix in testing and finally in production. One study found that organizations that deployed advanced APM tools and analytics saw 10 times faster problem isolation and an average reduction

“One study found that organizations that deployed advanced APM tools and analytics saw 10 times faster problem isolation and an average reduction of 27 percent in MTTR.”

of 27 percent in MTTR.⁴⁰ Research shows that IT spends more time identifying the root cause of application performance issues or slowdowns than on repairing the problems.⁴¹

POTENTIAL USE CASES FOR ADVANCED APM ANALYTICS

Many potential use cases exist for advanced APM analytics solutions. Below we list just a few.

- **Web site monitoring:** APM Analytics could prove to be invaluable in providing end-user experience tracking and monitoring availability and performance of an application's Web site. It could analyze end-user transactions in real time, looking at how long it takes to process purchases, display pages, and open links.
- **Cloud infrastructure monitoring:** Traditional APM tools focused on the physical compute devices data center. Advanced APM analytics tools need to follow applications out of the data center including into the public, private, and hybrid cloud infrastructures. An effective APM analytics tool needs to be able to measure performance across a variety of cloud providers, hypervisors, and management interfaces.
- **Enterprise IT performance:** As we noted earlier, all enterprises use a variety of applications that drive their business ranging from HR applications, development applications, order-entry systems, and so on. An ideal APM analytics solution can be an asset to a large enterprise.
- **SLA compliance:** When you have certain SLAs to meet with your end-users or customers, an APM analytics solution is critical to show you where you are in danger of slipping out of the SLA boundaries.

WHAT TO LOOK FOR IN AN APPLICATION PERFORMANCE MONITORING ANALYTICS SOLUTION

You want some of the same things in an analytics tool that you do in a new team member – you want analytic skills, organizational ability, and a quick time-to-value, among others.

Self-learning and pattern matching

With earlier versions of APM analytics, you had to spend significant time during installation teaching the APM tool about the applications. You'd identify metrics and values and the tool would report if the application ever exceeded that set value. With advanced APM analytics, instead of you learning the application, deciding which metrics

⁴⁰ <http://apmdigest.com/10-business-benefits-of-apm-application-performance-management>

⁴¹ http://spectrum.trac-research.com/2013APM/?section=market_context

to track, and then “teaching” them to the APM tool, you install the APM then let it sort through the data it has collected. It looks for the patterns of normal behavior, and compares future behavior to those baseline patterns. When it finds problems, it alerts you to developing issues, and highlights the metrics and events.

Views and perspectives

End-user experience

Monitoring with end-user experience in mind is an important facet of the APM conversation. Typical monitoring includes standard measures on page load times, error counts, and other basic measures of how well pages deliver to users, but these may not provide the depth needed to pinpoint potential issues that affect your customers. APM with analytics allows the support organization to monitor the environment more in depth with the end user’s perspective in mind. Are there certain pages with loading issues because of an unexpected shift in customer demand? Do more users follow one path through opening pages versus another path? Should you focus on and optimize your mobile application front-end or your PC device application front-end? These are all end-user-focused questions that a successful APM and analytics solution could help to answer.

Horizontal and vertical

The ideal APM analytics solution collects and analyzes data from across your environment from side to side, or horizontally. For example, all hypervisors, cloud environments, and network infrastructure types should be measured. The tool should also have the capabilities to dig deep vertically and see deep into a certain segment of the application topology.

Streamlined end-user experience

Out-of-box experience and dashboard capabilities

Most of the earlier generation APM tools were complex to install, set up, and use. Only IT staff with deep knowledge of important indicators for the monitored applications and set policies and rules for good behavior could complete setup. The tools compared performance against these indicators. The tools then may have required constant tuning to update the indicators as applications and infrastructures changed. This onboarding process was a costly and painful one for organizations.

A recent study found that 73 percent of organizations reported that time-to-value is the key selection criteria for APM solutions. That shows more tool intelligence and more automation aren’t just nice options, but are necessary features.⁴²

⁴² <http://apmdigest.com/it-performance-monitoring-in-2013>

An advanced APM analytic tool should be easy to use and immediately useful. Once started up, it should look through already collected APM data and start monitoring real time data to discover applications and their baseline patterns. It should then start hunting for anomalies, suggest triage status, and get you started solving problems. It should provide immediate value after a short install.

Alerting and reporting

Dashboards provide real time analysis for quick decision making. The tool should come installed with pre-configured dashboards, but also allow for customization of new dashboards for specific monitoring roles. Dashboards should show the state of key status indicators such as response time, application errors, overview, and highlight problems in performance and capacity.

While dashboards show real-time analysis data, reports show trends over the last few days or weeks. They can show responses to events such as application updates or infrastructure expansion. APM analytics tools should include built-in report templates that you can customize.

Features such as pre-constructed and customized reports and dashboards let not just IT but also application managers and Web and application developers view problems. It should provide tools so you can do your own analysis and dig deep into the big data database to track root causes and solutions.

Intelligence

Earlier generation tools relied on rule and threshold based analytics, where IT entered rules that the tools compared to performance. Modern APM analytics tools advance from that static definition of performance, which couldn't necessarily keep up with applications rate of change or the scale of available data. Instead, advanced APM tools figure out normal application behavior and adjust that definition over time. The tool keeps up with application change, while still giving IT the flexibility of adding their own intelligence on top of the solution's.

Advanced APM tools offload analysis from IT staff to the monitoring software, which unlike even the most capable IT staff, can process hundreds of thousands of indicators a minute to look for trends, interconnections, patterns, and problems.

Self-learning and anomaly detection

The Advanced APM analytics tools should be self-learning, studying real-time data, setting baselines, and keeping current behavior to those baselines. It should adjust baselines over time as applications evolve. It should learn what's normal and then point out deviations from the normal. It should be able to give each anomaly a triage score based on its severity and impact so IT can prioritize its work fixing problems.

Advanced statistical capabilities, pattern matching, heat maps

These tools use multivariate analysis and other statistical capabilities to discern patterns in big data. It spots anomalies in current behavior patterns and uses dashboards to display heat maps or other triage indicators that point IT to the problems it needs to solve now.

Triage and remediation

You need analysis, but you also need remediation capabilities and assistance. If your analysis tool is just spewing out error messages, it's not helping. Even if it is sorting them into red, green, and yellow priority groupings, it's not helping enough. You need a finer level of triage, one that points you to key problems as they occur and helps you with root cause analysis and problem solving.

Thresholds, latency, and response time metrics, the bread and butter of traditional APM, are still a valid way to identify errors in modern applications, but can lack the depth and understanding that an advanced APM analytics tool brings to the table, with its more sophisticated algorithms and anomaly detection.

CONCLUSION

Without advanced APM analytics solutions, IT staff must monitor, manipulate, and analyze data on thousands of performance metrics and tens of thousands or more transactions for each application to keep things running. The best and brightest of your IT staff are overburdened with this understandably challenging exercise. The evolution in application complexity, the number of diverse platforms, and the onset of the huge datasets all contribute to a big data problem. IT staff have enormous databases of multiple performance and transaction monitoring tools, but have no way of analyzing the data.

More advanced APM analytics solutions are the key solution to this problem. These tools can bring new points of view, and measure not just transaction performance and component performance, but also end-user performance. These tools take advantage of modern server's ability to process huge amounts of data in close to real time and use advanced statistical techniques to make sense of the data. Analytics solutions present IT with actionable intelligence on application performance problems. This gives IT a step up to solve problems proactively before they affect end-users and enables a faster MTTR for critical problems on mission-critical applications than ever before.

The ideal modern APM analytics solution reduces the frequency and severity of downtime, effectively triages and allows automated remediation capabilities, ensures SLA compliance, enables superior user experience, installs and is managed easily, all with the ultimate goal of increased revenue for your organization.

ABOUT PRINCIPLED TECHNOLOGIES



Principled Technologies, Inc.
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