

Manage Your Network Infrastructure for Optimal Application Performance

Essentials for Application-Aware Network Performance Management

An ENTERPRISE MANAGEMENT ASSOCIATES® (EMA™) White Paper
Prepared for CA Technologies

September 2013



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Executive Summary

The days when network managers could simply be concerned with interoperability and uptime are long past, and the focus has turned towards recognizing and eliminating performance degradations. This demand has also elevated and coalesced specifically around gaining a direct understanding of how applications and services – the life's blood of IT-enabled organizations – are performing from the network perspective. Management products that address these objectives are known as Application-aware Network Performance Management (ANPM) solutions, and are increasingly becoming essential tooling for enterprise network management and operations teams. This ENTERPRISE MANAGEMENT ASSOCIATES® (EMA) white paper examines the drive behind and requirements for ANPM solutions, so that network engineers, managers, and operators can recognize, characterize, troubleshoot, and communicate details of how applications and services perform as they transit the network.

Introduction

Network management as a whole has long been a mature discipline, particularly when it comes to understanding health and availability of network elements and devices. Network Performance Management (NPM) is, on the other hand, a relatively newer phenomenon, though it too has been around for a considerable period of time. The newest emerging aspect of NPM best practices is application awareness, built into and on top of infrastructure-centric network performance management. As IT operations teams make the transition from tactical firefighters to strategic, proactive assurance, one of the most important unifying themes has been widespread awareness of IT user experience. And what IT users experience most directly is not the network – it is the applications and services that the network delivers. Building awareness of applications and services has thus become one of the most important evolutionary expansions of network engineering and operations disciplines today.

Starting with the advent of RMON solutions over twenty years ago, network management technologists recognized that valuable application performance insights were available from the network perspective, if you knew where and how to look for them. And while RMON itself has not directly survived as a commonplace, independent technology (it relied heavily on network elements gathering and forwarding large volumes of performance metrics), the idea of putting the health and operation of the network in context with the payloads being delivered has become an indispensable aspect of responsible management practices. To answer this call, Application-aware Network Performance Management (ANPM) solutions have arisen and evolved, and now represent a thriving community of tools and technologies designed to serve this precise purpose.

Application Awareness in Network Performance Management

Today's ANPM solutions are many and varied. Independent software vendors deliver some, network equipment vendors deliver others, and yet more are elements of large multipart integrated suites offered by the largest management solutions providers. The data source techniques being used to deliver application awareness are similarly varied, though essentially clustered around four key technical mechanisms:

1. *Packet inspection:* This technique is perhaps the most comprehensive, delivering visibility by looking into packet headers as well as deeper into packet contents, even including payloads, in order to recognize and track applications and services.

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- ② *Flow record analysis:* These are session/flow summary records issued by network infrastructure elements (or passive monitoring devices) that provide information regarding who is using the network, what application is being used, and how well that application or service has been delivered. The most well known of these are NetFlow and sFlow, though many variants exist (i.e. J-Flow, cflow, NetStream) as well as an emerging standard, IPFIX.
- ③ *Synthetic agents:* These are software elements that generate test traffic in a variety of patterns to assess both availability and performance of specific applications or services, either from the end user's viewpoint or from key test points around the delivery infrastructure, and measure detailed aspects of a simulated user's experience.
- ④ *Log file analysis:* Valuable application-oriented activity insights can be found in syslog and similar data files, which capture activities and events from various systems and devices within the network infrastructure.

As with any performance management solution, vast quantities of metrics and measurements are gathered from one or more of these sources, and assembled for use by operations, engineering, and support professionals. This gathered data must be processed, organized, and interpreted, and the resulting information presented in ways that facilitate rapid, intuitive analysis, and cross-team collaboration. A solid solution not only puts network operations and engineering professionals in a position to effectively troubleshoot application performance issues, it can also transform their entire approach to designing, operating, monitoring, and managing the network infrastructure.

EMA's focus in assessing ANPM solutions has been most concerned with three core use cases, which generally account for the vast majority of the purchase and deployment of such products:

- ① *Troubleshooting:* This is perhaps the heart and soul of ANPM solutions. Product users consistently cite the capability available within such products to reveal precisely who is using network resources and for what purposes as a core value received. Primarily a reactive function, ANPM solutions can and regularly do save network teams significant spans of precious time in getting to the bottom of subtle, complex degradations quickly and efficiently.
- ② *Sustained Monitoring:* Most ANPM solutions have the capability to be deployed in configurations that collect performance measurements and metrics on a regular, ongoing basis, presenting live views of activity while assembling a historical database record of performance over time. A more advanced aspect of monitoring involves turning on the ability of ANPM solutions to generate performance alerts and alarms, and often to add those event feeds into broader operations views and dashboards.
- ③ *Capacity Planning:* The usage and activity details available with ANPM solutions are directly relevant to the research and justification processes around network planning – particularly for critical, constrained, high-cost connections such as WAN links.

Other use cases certainly exist for ANPM solutions, but are not a part of this particular research effort. Supplemental use cases that EMA encounters most commonly during general research and inquiry activities are security monitoring and usage accounting/charge-back.

Requirements and Comparative Criteria for ANPM Solutions

EMA regularly reviews and publishes landscape analyses of ANPM solutions available in the market place via its EMA Radar Reports for ANPM. EMA has constructed a comparative model for this

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purpose that covers product architecture, product feature, resource intensity (cost, administration), and vendor strength. Following is a discussion of the solution architecture, features, and resource efficiency objectives and requirements used in EMA's analyses. This list can serve as a guide to organizations considering ANPM solutions.

ANPM Solution Architecture & Integration Criteria

Following are the criteria that EMA uses in evaluating alternative methods and approaches used in designing and architecting ANPM solutions, as well as capabilities offered for integrating those solutions with other management platforms and systems:

- *Design:* As mentioned above, there are several basic approaches to monitoring application performance from the network perspective. An ANPM solution may be broad or narrow in this regard, and may be designed to be more or less real-time. It may also go beyond application-specific metrics to collect other collateral and supportive data. These aggregate design points establish the scope and depth of application performance data that can be processed and delivered by an ANPM solution.
- *Scalability:* The basic need for any ANPM solution to support collection and storage of large volumes of performance metrics goes without saying; however, solution scope in terms of throughput capacity as well as distributed coverage are also important points for consideration.
- *Breadth of environments and applications supported:* While smaller managed environments may be well standardized and simple, most infrastructures have at least some mix of LAN and WAN technologies in play. The same can typically be said regarding the number and type of applications that may be present and are expected to be visible via an ANPM solution. In general, the broader the better, so that barriers to coverage and visibility are minimized, recognizing of course that there exists a mainstream of network and application technologies that must, at minimum, be supported.
- *Integration and interoperability:* While some ANPM solutions will come tightly integrated into a multifunction, multi-capacity suite of management tools, many will not. Consequently it is very important that ANPM solutions be able to integrate and interoperate with products and technologies from other vendors that fulfill complementary functions. Of particular interest are integrations between ANPM solutions and event/fault management systems, service management systems, and CMDB/CMS solutions. Also of interest is whether or not open APIs are available for integration with any other IT or non-IT applications.

ANPM Functionality Criteria

Following are the primary evaluation criteria that EMA utilizes in comparative analyses of features within ANPM products and solutions:

- *Application discovery/recognition:* If a network performance management solution is to be application-aware, one of the most important aspects of that solution is the way in which it identifies those applications. Important in this category is having a range of choices and options, so that the many different (sometimes subtle) and unique identifiers of various types of applications can be accommodated.
- *Metrics and measurement:* Performance management systems generally gather a wide range and large volume of performance metrics. Presented in this category are those that are most important for characterizing application activity from the network perspective. Most helpful are both network-level as well as application-level metrics including activity, response times, and errors.

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- *Virtualization/cloud:* Mixed environments of physical, virtual, and cloud infrastructure are fast becoming the norm rather than the exception. Important here is how well an ANPM solution has been adapted to extend into and include monitoring of virtual networks and traffic within internally or externally hosted virtual server/compute infrastructures.
- *Capacity planning:* One of the many uses of application-aware data is reality-based planning, whereby capacity monitoring and changes to network capacity are informed decisions made in the full context of understanding how the network resources are actually being used in production. In particular, recognizing the influence of individual and groups of applications and the contributions they make is paramount for reducing both infrastructure cost as well as operational risk. Important capabilities here include the ability to provide trending reports, predict exhaustion, and directly or indirectly support “what-if” scenario analysis.
- *Alerting/alarming:* When things go wrong, and performance problems are recognized, it is essential that operations personnel be notified of the situation. It is also important not to set off lights and sirens too often – today’s interconnected and interdependent IT infrastructures already generate enough event and alert chatter, without even considering what might be added via performance monitoring. Basic performance alerts and alarms need to recognize short-term and long-term patterns, as well as include as much information as possible to assist subsequent investigation and diagnosis.
- *Analytics/advanced analysis:* The leading edge of management technologies apply automated, intelligent analysis to the data collected by all monitoring systems, including ANPM. Such capabilities should include the capability to deliver better early recognition of performance problems and support for complex infrastructures via advanced time-aware modeling of behavior and correlation of related metrics.
- *Troubleshooting:* Whether reacting to a performance problem reported by the help desk or proactively investigating a growing issue that has not yet been recognized by the end-user community, rapid and efficient troubleshooting is perhaps one of the most important objectives of network management and operations. For ANPM solutions, integrated access across a broad range of types of data, facilitated workflows, and intuitively presented data best facilitates troubleshooting.
- *Active controls:* Beyond monitoring and analysis, some ANPM solutions will deliver the ability to take direct actions in response to existing or potential performance issues. The extent of active controls can be quite broad, ranging from intrinsic, direct capabilities to scripting to triggering actions within other management tools.
- *Security and user management:* ANPM solution will have visibility into detailed user activity and potentially proprietary/private data, and thus must provide access controls. While this does not constitute security management per se, ANPM solutions are often able to recognize potential security events – some solutions will be designed or optimized for this parallel purpose while others will not.
- *Ease of use:* Navigating, consuming, and sharing the insights gained from an ANPM solution can be difficult or easy, depending on solution design. Important here are the ways in which an ANPM solution facilitates information presentation and collaboration via consoles and reports.

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ANPM Resource Efficiency Criteria

EMA's full criteria for resource efficiency spans two topical areas – deployment and administration, and cost advantage. Analyzing the licensing cost of the ANPM solution is a highly subjective process, due to variations in pricing, packaging, and discounting, and this is beyond the scope of this paper. Deployment and administration, however, is much more objective. Following are the three primary areas of criteria that EMA uses for assessing ANPM solutions to determine deployment and administrative differences.

- *Ease of Deployment:* This includes a number of measures meant to indicate how easy or difficult it is to put a particular ANPM solution into the production environment and begin to draw value from it for operational purposes. Generally, it includes three related areas. First, implementation cost includes the time to deploy and receive initial and complete value, as well as the percentage of solution cost that is typically required for professional deployment services. Second, training required to reach basic and advanced levels of proficiency should be understood, as well as the availability of certification programs. Finally, deployment impact should be assessed, to understand whether or not the solution requires network downtime or maintenance windows for deployment and/or subsequent patching and upgrades.
- *Support and Services:* An important part of any management solution is the facilities made available by the technology supplier to support initial rollout as well as ongoing production use. First, the variety of customer support offerings and methods for reporting product issues should be understood, as well as the presence of organized user community groups, which can act as a powerful supplemental resource to technology users. Second, the availability of as well as the expected requirements to utilize professional services during ongoing use of the solution should be clarified.
- *Ease of Administration:* Once an ANPM solution has been deployed, focus turns towards ongoing configuration and administration, to ensure that the system remains fully functional and that the maximum value can be achieved. Expected administrative personnel resources should be understood, as well as the options for maintaining monitoring coverage during patches and upgrades. Also, the willingness and ability of the supplying vendor to support test environments at lesser or no license cost will be important for those shops that require pre-deployment shake-downs of new or upgraded technologies (including management tools) before rolling them out into the production environment.

CA Technologies ANPM Solution

CA Technologies is a well-established provider of a broad range of solutions for managing IT infrastructure, applications, and services. Within its portfolio are a number of products that are directly applicable to ANPM objectives, including the following:

- CA Performance Management collects and presents device-centric metrics across both SNMP- and non-SNMP-enabled infrastructures.
- CA Network Flow Analysis monitors and reveals details about network traffic flows using NetFlow, JFlow, sFlow and IPFIX records.
- CA Unified Communications Monitor collects and presents special insights needed to understand and troubleshoot IP-based voice and video performance.
- CA Application Delivery Analysis monitors response time for any TCP session between three segments of the session – client, WAN and server – via direct packet collection and analysis.
- CA GigaStor offers high volume, high capacity streaming packet capture for deep and definitive retrospective troubleshooting and analysis of performance issues.

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EMA has reviewed the CA ANPM solution compared to other industry offerings as part of the [EMA Radar for Application-Aware Network Performance Management: Illuminated the Pipes](#) series of reports. This analysis consistently shows the CA solution to be among the very best in the industry in terms of solution impact, which is based upon a composite of architecture, functionality, and integration measures. The most recent edition of the report, published in April 2013, rated the CA solution highest in this regard, noting particular strengths in the breadth and depth of capabilities across the three core ANPM use cases. Also noted was the solution's excellent top end scalability, which benefited directly from design improvements made as part of the CA Infrastructure Management (IM) 2.0 portfolio updates that were released in late 2012.

EMA Analysis

Based on the results of its ongoing research and coverage, EMA believes that the ANPM sector is alive, healthy, and continuing to grow. There are ongoing innovations via new products and new vendors, steadily increased levels of integration between ANPM components and with other management systems, as well as consolidation of suppliers. The other fascinating new dynamic is the trend towards adding product technologies with APM heritage to network-based solutions to cover the ANPM use cases.

Broadly speaking, there are several key conclusions and observations that can be made about the state of ANPM solutions today. First off, troubleshooting use cases remain dominate as the most immediate and acknowledged value for ANPM solutions, followed by capacity planning and then by sustained operations monitoring. Also, given the clear variations in cost, coverage, and completeness, it is EMA's conclusion that practitioners must continue to strongly consider using combinations of packet-based and NetFlow/xFlow-based ANPM technologies to meet their needs.

Based on the trends identified in this study as well as broader sector influences, there are also some conclusions that can be drawn regarding the future of ANPM solutions. First, we find continued evidence that practitioners and the vendors who serve them value integration of ANPM data and viewpoints into broader, service-oriented IT operations and orchestration. In parallel and in support of this trend, progress continues to be made in applying intelligent analytics to the huge volumes of monitoring data that ANPM systems can generate. This will be essential for helping practitioners capture the live monitoring (and, in particular, alerting/alarming) capabilities of ANPM solutions by using advanced pre-processing to correctly identify important performance indicators worthy of bring to the attention of operations, engineering, or planning personnel.

Finally, the remarkable expansion of NetFlow v9 use brings us to the next threshold of instrumentation choice, where it is becoming technologically possible to replace some of the metrics that have been solely available via packet inspection with measurements gathered and transmitted via flow records. EMA believes that continued evolution and adoption of advanced flow record technologies will erode the need for packet-based instrumentation in remote, distributed network settings; however, ANPM use cases in the core networks and datacenters will continue to require packet-based approaches, particularly for true real-time monitoring (i.e. communications, high frequency trading) and forensic reconstruction needs.

About Enterprise Management Associates, Inc.

Founded in 1996, Enterprise Management Associates (EMA) is a leading industry analyst firm that provides deep insight across the full spectrum of IT and data management technologies. EMA analysts leverage a unique combination of practical experience, insight into industry best practices, and in-depth knowledge of current and planned vendor solutions to help its clients achieve their goals. Learn more about EMA research, analysis, and consulting services for enterprise line of business users, IT professionals and IT vendors at www.enterprisemanagement.com or blogs.enterprisemanagement.com. You can also follow EMA on [Twitter](#) or [Facebook](#).

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