Achieving Top Performance and User Experience with Next Generation Services and Applications

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CA WILY TECHNOLOGY

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Executive Summary

Challenge

Traditionally, Communications Service Providers (CSPs) have relied on high end, carrier-grade, specialized hardware/software bundles to deliver a small, selective set of services. Today, CSPs are building much broader diversity of services, targeting highly segmented markets, and must deliver at much lower costs. With the industry's adoption of commodity hardware, IP-based protocols, and IT-like technologies, the role of standards-based software platforms has increased dramatically. Collectively these technologies enable a standard, repeatable way of building and deploying service applications, which has led to the advent of Service Delivery Platforms (SDPs). With the new architectures, applications, protocols and programming languages comes a new challenge: the need for new ways to monitor and manage the quality of service of the systems serving business needs.

Opportunity

While new revenue and subscriber retention depend on software-based value-added services, CSPs are not competing on the new features alone. Rapid time-to-market, quick reaction to new requirements and business conditions, and top customer experience with the new services are becoming the key factors for CSP success. Any incremental improvement in the performance and availability of software-based services or applications results in a significant improvement in revenues, reduced customer churn, and improved reputation in the market. Service assurance and customer experience management functions are increasingly becoming critical to CSP overall success. In the new converged environments, traditional network-based service assurance solutions only show part of the picture. They lack visibility into the application-level metrics and vital signs that contribute into the overall quality of service and end user experience.

Benefits

New service assurance solutions must include real-time, always-on Application Performance Management (APM) function. CA Wily Technology provides APM for converged service delivery platforms, subscriber services, business processes and related OSS/BSS functions. Built on the proven CA Wily Introscope® platform, CA Wily solution is capable of deep monitoring of real user transactions in real time with very little overhead in production environments. By providing end-to-end visibility into customer transactions in real time, CA Wily's solution ensures monitoring and delivery of SLAs, proactive monitoring of Key Performance Indicators (KPI), and successful customer experience in the increasingly complex, next generation of network-based service-oriented platforms and applications. It delivers risk management of new service creation and deployment, onboarding of 3rd party vendors, problem prevention and detection, and incident handling and analysis.

SECTION 1

The Need for APM in Communication Services

The telecommunications industry is undergoing major changes both in the way business is done, as well as in the infrastructure that supports the services provided by the business. These changes call for new type of service assurance solutions based on Application Performance Management technology (APM).

The Rise of Software

The communications services infrastructure is in the midst of a transformation from a proprietary, homogenous, circuit based, hardware centric telecommunications infrastructure to an open, heterogeneous, IP based, software centric one. The industry is in an evolution to NGN architectures and an important part of this transformation is the adoption of standard protocols and interfaces such as IP, SIP, Diameter and Parlay. Collectively these technologies enable a standard, repeatable way of building and deploying service applications, and this in turn has led to the advent of Service Delivery Platforms (SDPs).

With software-based SDPs, service silos (i.e., each service requiring its own stack of specific service components) are being replaced with a convergent platform utilizing common, reusable components to rapidly build and deliver rich value-added services. A CSP is no longer limited to the number and types of services it can offer, both home-grown and those of 3rd party vendors.

However, while these changes bring about many benefits, they also Introduce their own unique challenges. With new architectures, applications, protocols and programming languages comes the need for new tools and ways to monitor and manage the quality of service of the systems serving the business need. The dramatic growth of new services further aggravates the management problem—more services to manage, with more boundaries and interdependencies.

Increasingly, innovative CSPs find themselves not being able to effectively monitor all the contributing components of their quality of service and the end user experience. When a problem is detected, especially retroactively, the 'blame game' of which department is at fault starts. Problem management of the blame game escalates rapidly. Additionally, the real time nature of the CSP business requires it to be able to quickly and proactively maintain the highest levels of performance and reliability which, though once the sole burden of hardware, is increasingly becoming shouldered by software.

The Acceleration of Business

On the business side, the pace of business is increasing as well as the demand for strong Service Level Agreement (SLA) support. The breadth of a typical CSP's service offering has increased dramatically, as well as geographical reach. These factors are resulting in an increased customer base and subscription level. Any downtime means loss of revenue, damaged reputation, and increased customer churn.

The competitive climate mandates the ability to integrate and deploy new services rapidly, sometimes having a complete life cycle of just weeks. Increasing demands for service from the customer base has seen the once standard telco availability requirement of "five 9s" increase to "six 9s". Problems must be identified, triaged, diagnosed and rectified before they start affecting end users. This indicates the mandatory requirement for both real-time APM and pro-active problem identification and rectification.

The legacy services such as basic voice and voice mail have become commoditized. SMS/MMS has clearly become main stream. CSPs are putting high hopes on the new value added services based on content (ring tones, music, wallpaper), streaming media (video, IPTV), location based services (using GPS) and miscellaneous services such as push-to-talk, gaming, dating, traffic information, etc. The availability and performance of the underlying applications, as well as of the core Call Session Control Function (CSCFs) based on NGN, are important issues to CSPs. They are seeing an increasing portion of revenues and revenue growth coming from many of these software applications. Every percentage improvement in the performance of service software applications usually infers even greater percentage improvement in revenues. Thus, performance management of these applications is increasingly becoming critical to the CSPs.

The uptake of successful services can be rapid, almost viral. As many operators are opening their interfaces for 3rd party content, such monitoring helps ensuring proper revenue sharing, auditing real-time bandwidth usage and policies fulfillment, and avoiding fines due to SLA violations.

A similar transformation is taking place on the BSS side of CSP's environment. Previously used internally, billing, order management, CRM and support systems are now exposed to the end users 24x7 through self-service. Today, customers expect round-the-clock availability. A transition is happening here as well: self-services depend on web servers, portals, security and messaging software, some of which wasn't even designed to handle the availability and performance requirements of telecommunication companies.

The Need for New Type of Service Assurance Solutions

In the old days network and element management tools provided all that was needed to assure the high quality of service delivery. With mostly network-based services, all we needed to know was if all network elements were healthy, if the bandwidth was fully utilized, and if all faults and errors were detected. End users were getting their service directly from dedicated network elements, and therefore it was easy to understand the user experience from the metrics collected from the network itself.

Now CSPs need to manage transactions running through layers of applications and interfaces and to derive the real customer experience out of it. Today, CSPs are less competing on features; they are mostly fighting for the same customer in a highly disloyal environment. If there is a problem, CSPs need to detect and analyze it before customers start calling or leaving.

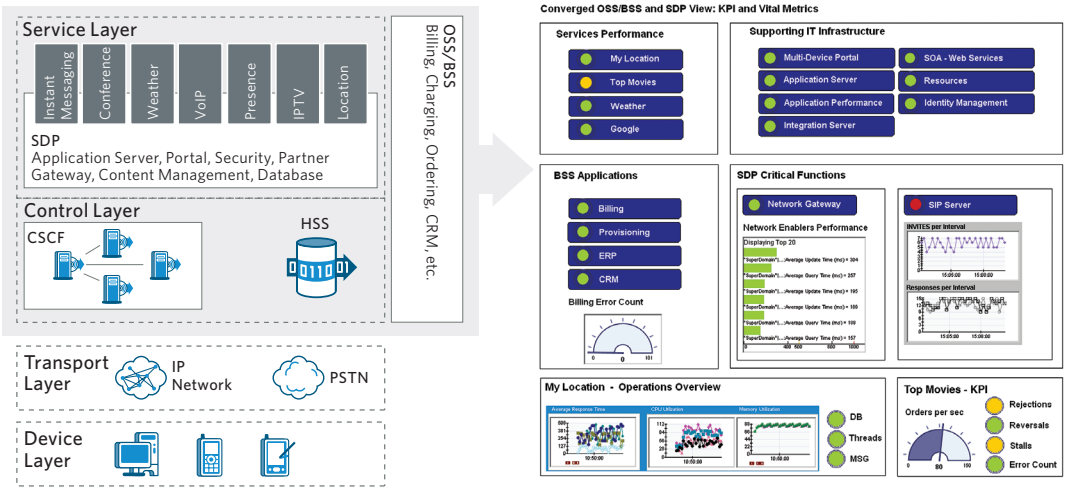
The progressive, forward-looking CSPs are finding that;

1. Service assurance needs to be upgraded to include real-time proactive application performance management solutions;
2. For end user-facing environments and OSS/BSS applications, it's essential to get deep visibility into the presentation layer, the OSS/BSS applications and IT infrastructure, and all the way to the edge of the network.

FIGURE 1

Next Generation services need new management approach.

MANAGING NEXT GENERATION SERVICES



Areas of Applicability

OPERATIONAL APM

The operations side of a CSP is responsible for the actual communications services delivery and thus has the clearest need for a service assurance function. An IMS architecture defines three management planes: transport, control and service. Within the control plane resides the core CSCF and user profile database, Home Subscriber Server (HSS), and within the service level reside the value added services. Business transactions are overlaid over functional transactions such as SIP traffic flows between the CSCF and applications. Visibility of these transactions is key to understanding the performance and health of the operational systems and preventing problems, and in diagnosing any problems that do occur.

From a use case perspective, the user of a CSP service interacts with either another user, or with an application. These interactions occur as transactions over several systems and can involve several protocols and applications. In the past, there was a division of labor to monitor these transactions; use protocol analyzers for protocol (network) flows, and application profilers for application traces, and then somehow correlate the two. This is a tedious, time consuming and error prone methodology. A significant improvement is to tap into the transaction flow end-to-end with a common toolset providing visibility into key areas such as SIP message processing within the CSCFs, HSS, and applications.

USER CASE 1: DIAGNOSTICS OF A SERVICE OUTAGE

Service outages can be quickly detected, analyzed, and corrected through deep diagnostics and transaction tracing before the majority of customers suffer.

When a critical revenue-generating service experiences a sudden performance problem, an executive responsible for the service can get a high-level alarm once certain Key Performance Indicators (KPIs) are violated; for example, lets Imagine that "place order" transactions have an unusually high number of errors or slow performance. "Place order" transactions may fail because the database is reaching its capacity so searches for customer information are slow and timing out. If the transaction involves a 3rd party content provider there may be a problem with the partner gateway, or even a licensing issue. If an operation on a network element is required, a Parlay interface to that element may be reporting errors. In all of these cases, real-time deep visibility into different layers of software can help quickly detect, troubleshoot, and resolve the problem.

USE CASE 2: DETECTION OF NEW SUBSCRIBER ACTIVATION FAILURES

Delayed activation of a new subscriber delays revenues from that customer, and can even cause a loss of a customer. Such a situation can occur if a subscriber is signed up within the BSS but is not provisioned in the OSS. Often the CSP is first made aware of the problem when the new customer reports a complaint; for example, a customer complains of not being able to place a call though their VoIP terminal device that has not been properly configured.

The use of a real-time APM solution can diagnose this problem. One method would be to investigate for failed SIP REGISTRAR transactions, which indicate that a client was unable to register their device for access to the network. Once found, this transaction which traverses asynchronously through the operational system, can be traced to the point of failure, which in this case would be the HSS failing to authenticate the user as the user profile was not configured in it (as one possibility).

USE CASE 3: DETECTION OF OVERLOADED SERVICES

An overloaded service means that one or more users are unable to use a service. In a pay per use environment, this equates to an impact on revenue. Often such occurrences are known to the CSP only when (and if) a disgruntled customer reports the problem. Being proactive is important as surveys have shown that a customer experiencing this frustration often switches to another service provider.

The use of an APM solution can reduce or eliminate this problem. One way to enable this is to monitor SIP errors. If a called SIP endpoint is unable to respond to a call request (i.e., is overloaded), the calling terminal is sent the "480 Service Not Available" error code. A spike in the issuance of these errors from service endpoints indicates an overloaded service case. Other detection criteria include stalls or time-outs of SIP INVITE messages, or an increase in SIP "503 Service unavailable" errors. Provided there is visibility into SIP transactions, these situations can be detected and the afflicted service identified.

Business APM

CSPs are increasingly turning to customer self-service (CSS) channels to manage the increased number of customers. The availability and reliability of these applications is vital to customer happiness.

USE CASE 4: CUSTOMER SELF SERVICE

CSPs are increasing the use of web-based applications (as the most common CSS channel today) to provide customers with all kinds of services, enabling both increased revenues via subscription of new or additional services and cost savings via reduced costs for customer care. CSS transactions can be complex as they span several systems from the customer to the back end functions. Maintaining the transaction rate is important to maintaining revenues, increasing throughput correspondingly increases potential revenues.

A business transaction-aware real-time APM toolset that can monitor end-to-end CSS transactions as they occur gives the business owner, in this case Customer Care, visibility into the success of catering to customer needs. Identifying and eliminating the cause of defective transactions raises transaction volumes and increases customer satisfaction. The output metrics of real-time transactions monitoring also contributes to revenue assurance.

Doing More with APM Data

The need to monitor key performance indicators in order to ascertain whether business services were being delivered effectively and timely is only one important value that APM can bring. Knowing that a problem exists is often not enough; quick remedy is key.

We need to process the collected data to determine service state and to determine what corrective actions need to be taken in order to return to a stable state and where possible, take those corrective actions. This introduces the need for proactive APM that: (a) allows definition of specific events of concern and management actions, (b) provides alerts for these events, and (c) enables automated agents to trigger a pre-described remedy.

USE CASE 5: DYNAMIC BUSINESS SUBSCRIPTION MANAGEMENT

John Doe, a Next Generation service entrepreneur, enters the business with a bandwidth-dependent application. John's CSP provides an applications hosting service on their SDP platform and is tiered (Gold/Silver/Bronze) and priced according to resources subscribed to.

For John's application, each user incurs more bandwidth. John decides to start his offering on the Service Provider's basic hosting plan (Bronze) which offers 1GB transfer per month and one server CPU. If successful, his service will require more bandwidth in time and more CPU power, and thus he will have to continually monitor to see when he has to upgrade his service. Such an action will be beneficial to both John, and his hosting provider.

Within the monitored data are metrics that reflect transactions rates (for example, user subscriptions or purchase orders) as well as CPU and bandwidth usage. An event trigger could be written to detect when historical trends show the need for the next service band. If the hosting service provided a customer self service interface (say via Web Services), then the triggered script could additionally issue the upgrade request, updating the contractual obligations between the CSP and the hosted service provider. In a dynamic (pay as you go) scenario John's application could request resource increases and decreases as well.

SECTION 2

Application Performance Management Overview

APM is an essential element of any mission-critical application environment that provides insight into the total end-to-end customer experience. APM monitors the transaction and collects critical real-time information required to proactively address developing problems before they impact the customer. It supplies both the operations staff and business owner with information to support the decision-making process to improve the performance and availability of the application environment and therefore Improve overall customer experience.

Application performance problems are frequently related to infrastructure issues of resource availability or capacity such as database, back-end systems, CPU utilization, memory availability and bandwidth. Monitoring these components as the transaction executes provides visibility into the overall health of the application.

Interested Parties for APM

In general, there are two groups of users interested in the information provided by APM tools: technical operations staff and business process owner. Each has a different expertise level and require a different view into the common issue of performance management. While both groups are ultimately concerned about the application performance and availability without a common language and reference point, problem identification and resolution can be difficult.

Business owners are interested in APM as it pertains to the availability and performance of revenue generating services and Service Level Agreements (SLAs) as they relate to the business process. They view activity in terms of business transactions the transaction volume, failure rate, and user impact.

Technical, or operations, users are frequently focused on the availability and performance of an individual component as it pertains to the design and efficiency of the code and resources needed to provide the services. They view activity in terms of object instantiations, procedure calls, method invocations, stack traces, database request statements, processing power and memory utilization, etc. Technical users are generally expected to use APM tools to get to the bottom of the problem, and find the most efficient way to resolve it.

Evolution of APM

APM's capabilities have evolved significantly from early days, when custom code was inserted into an application in a non standard way by programmers to log diagnostics information at execution time. At the time when software infrastructure and business code were blended together, and no standards prevailed, these efforts had to be repeated for every new application or platform.

Runtime impact was a huge issue as the addition of this diagnostic code in the transaction path added overhead and negatively impacted performance. Another disadvantage is that performance data was collected at run time and typically processed post collection. While this provided post-event insight into failures and poor performance after the end-user had experienced a problem, it did not support proactive problem avoidance. The introduction of a client-server programming model with standard infrastructure services like database access,

solved some of the issues by providing limited performance monitoring functions as a part of standard platform. New problems, however, came up: since business logic now resided on both client and server, the resulting performance was hard to correlate. And business code itself still had to be instrumented at time of development. Trying to debug an end to end problem was difficult at best due to different tools, metric names, etc.

The introduction of application servers brought code and framework standardization and the ability to auto-instrument code. Industry's adoption of standard IP-based object oriented platforms like J2EE and .NET helped to improve APM through built-in instrumentation of the leading software infrastructure platforms, and automatic discovery and instrumentation of components of the applications deployed on of these platforms.

However, major breakthrough in APM occurred when the ability to view performance data in terms of business transactions was introduced. Now business owners could get a real-time view into the execution of critical transactions and correlate that with the behavior of an application and the end user experience. APM tools that were capable of supporting both views—business and technical—gave the added benefit of providing a common language and reference for both groups to communicate effectively.

Reactive and Proactive APM

The purpose of advanced APM tools is to collect essential data to report not only on current problems, but also to predict and warn on potential pending problems or trends. To date, however, any proactive measures typically required operator (human) intervention to assess what the impact will be, and initiate remedial actions. This approach results in late problem detection (often through end user complaints) and long resolution time. The ultimate goal of proactive APM is to prevent problems, or detect and fix them before the problems affect the end user.

APM Tool Requirements

APM tools must meet several requirements to be effective. A primary requirement is that any tool that collects performance data from a running system must have as little as possible impact on the system itself while providing enough data to accurately reflect on the real transactions execution in a production environment. Ideally, the APM tool's overhead should be as minimal and as non-intrusiveness as possible. On the other hand, APM tools should run in a production system 24x7, collecting detailed real production data to be used immediately in the event of a production problem and must also provide in-production (run time) views of the health of the monitored system.

The APM tools should be easy to use. A user's time should be spent in understanding and diagnosing performance issues, not fighting with the tools to get them to produce the information or visibility needed to determine the cause of a problem.

The APM tools must provide real-time monitoring of real data and transactions. This requirement is based on the key differences between the legacy network-based services, and the software-based next generation services. With physical networks, their topology, possible faults, and disruptive factors are well known at design time, and it is easy to develop probes to test each area of the architecture. The majority of traditional network-based service assurance tools use probes and synthetic transactions sent at pre-defined intervals of time. At the network level, all transactions and data types are also well known in advance, which allows the probes to effectively provide the performance and fault information. With

software, the number of permutations increases exponentially due to multiplicity of possible business logic paths, user interactions, changing resource capacity, and bugs introduced with new or upgraded applications, making it hard to impossible to adequately provide the real performance and customer experience information based on synthetic transactions. Also, the real time requirement comes from the fact that human user sessions can span over longer periods of time than hardware-based one, making it essential to know the performance at each step of the process. Testing at certain periods of time has a high potential of missing some important events and conditions that may contribute into the resulting quality of service.

It is still important, however, to be able to generate automatic load of "typical" transactions in situations when the real traffic is low, or during test cycles.

The APM tool should be deep and very specific in its visibility; however it should be easily customizable for different roles within an organization and cater to different users. The best practice is to offer each user a customized view. Personalized user profiles—triggered on user login—could support customized dashboards that present data that is meaningful for each specific user. For example, a support person debugging a dropped call would be interested in examining SIP transactions and inquiring the health of SIP proxies, registrars, etc., whereas the business owner of a service would be interested in knowing that application's health, transaction rates, and the number of logins per user type, etc.

An additional benefit of using roles-based views based on a common terminology is that it can serve as a unifying language between business and technical parties.

Due to the dynamic nature of technology and business, the tools should be extensible so that new capabilities can be added to the system. A common framework would eliminate the need for additional training as the new extensions reuse the existing methodologies.

In larger deployments, the ability to integrate with other management tools (e.g., IT and network management) to support a complete and holistic view adds value and the additional capability of being customizable and embeddable into a system environment furthers increases overall solution value. A documented API and SDK provided with the advanced APM tools allow integrating them with the broader service assurance solutions as well as building them into custom applications. This feature is critical for Network Equipment Manufacturers (NEMs) and Independent Software Vendors (ISVs) who are increasingly using standards-based software platforms to offer next-generation service delivery solutions. For them, a built-in APM function provides critical competitive advantage through deep visibility into previously hidden areas of service performance and availability, ability to track SLAs, and additional input for service assurance function.

The data accessed by APM tools can be of a sensitive nature. In such cases the tools should provide access security, at a minimum limiting the access to authorized users only. Finally, the tools should be able to automate or perform the mundane or time consuming steps and thus expedite the time taken to diagnose or predict the occurrence of an issue. In particular, a capability like automatic root-cause analysis of an issue is key to a quick recovery.

SECTION 3

Next Generation APM Solution from CA Wily

Solution Overview

CA Wily Technology (a division of CA, NASDAQ: CA) is the market-leading provider of Application Performance Management (APM) solutions. CA Wily provides performance management software for converged service delivery platforms, subscriber services, business processes and related OSS/BSS. By providing end-to-end visibility into customer transactions in real time, CA Wily's products enable operators to successfully manage health and availability of their critical applications, services, and software infrastructure. CA Wily's solutions ensure monitoring and delivery of SLAs, problem detection and incident handling, and successful customer experience in the increasingly complex, next generation of network-based service-oriented platforms and applications. 20 out of 30 Tier-1 telco operators worldwide, and total over 120 in 26 countries, are CA Wily's customers today. CA Wily APM solution is based on two key products: CA Wily Introscope®, and CA Wily Customer Experience Manager. CA Wily Communications Service Provider Extension (CSPE) extends CA Wily Introscope into the next generation service delivery environments of the modern CSPs.

CA Wily Communications Service Provider Extension CSPE Features and Benefits

CA Wily CSPE is designed to be embedded into next generation solutions from NEMs and ISVs to enable deep visibility into the service execution and delivery processes and interfaces, and to ensure the top performance and availability of the overall system.

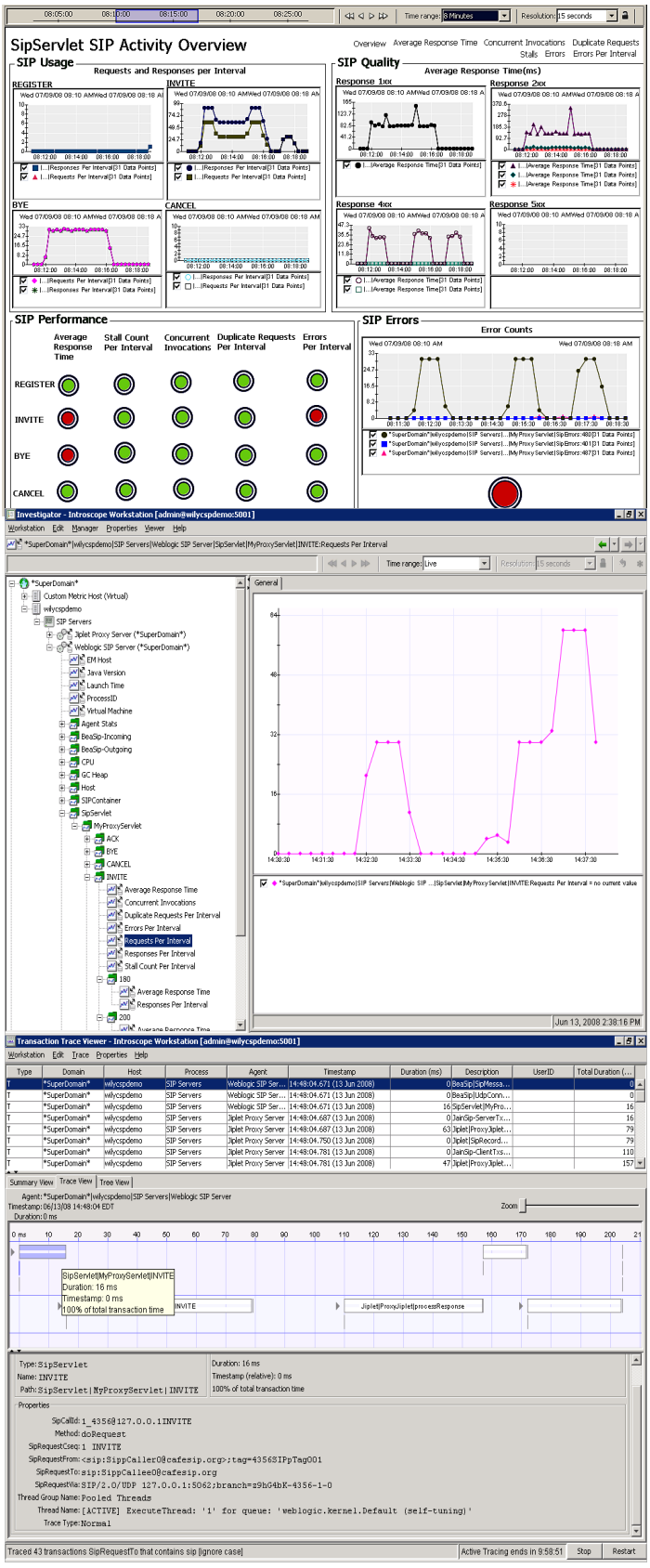
Built on the proven Introscope platform, CSPE is capable of deep monitoring of real user transactions in real time with very little overhead in production environments. It provides deep real-time monitoring of asynchronous fast-running transactions across multiple components, the underlying Java-based software infrastructure, the operating system, and the related back-end resources and OSS/BSS. Designed as a customizable component of 3rd party next generation service delivery solutions, CA Wily CSPE delivers risk management of new service creation and deployment, proactive monitoring of Key Performance Indicators (KPI), and rapid problem detection and analysis.

Complete with an SDK and a library of documented APIs, an out-of-the box reference implementation for the Session Initiation Protocol (SIP), and a comprehensive development guide with best practices and code samples, CSPE is ideally suited to be customized for a broad range of solutions. With CSPE, NEMs and ISVs can:

- Build deep visibility into service delivery and related OSS/BSS functions
- Create fully-integrated dashboards, reports, and alarms
- Extend the existing network management tools into application software layers

FIGURE 2

Examples of SIP transactions monitoring dashboards built with CSPE.



SECTION 4

Conclusion

As CSPs are increasingly using standards-based software for new applications and services, managing performance, availability, and the overall customer experience is becoming a new challenge. New application performance management tools, when used proactively as part of SDP and OSS/BSS architectures, can ensure high quality of service, low costs, and top customer satisfaction, ultimately making operators successful in this new environment.

The key requirements for Application Performance Management are:

DEEP DIAGNOSTICS AND VISIBILITY into the execution environment (portal, partner gateway, Java or .NET application server, SIP/JSLEE, Web Services and SOA), to network interfaces (Parlay and Parlay/X). Trace individual user transaction as it touches different components and systems, and correlate it with other events to understand the root cause of a problem.

CONTINUOUS MONITORING OF REAL TRANSACTIONS, REAL DATA to catch early symptoms as they happen. With probing, those symptoms may fall between the intervals and not manifest themselves with synthetic transactions. Probing still makes sense when real transactions are few and rare, but it will not tell you how the system behaves under real load. All data needs to be monitored for deep analysis, not just a few data points though synthetic transactions.

24X7 MANAGEMENT OF PRODUCTION ENVIRONMENTS with little or no impact on the managed environment itself. There are ways to optimize metrics collection so overall additional load on the system is minimal.

ROLE-BASED CUSTOMIZABLE REPORTING gives different roles within your organization the appropriate view of the environment relevant to their function (business managers, NOC and IT administrators, or QA and software engineers).

CA Wily offers a real-time APM solution fitting the above-stated requirements. It is based on the proven CA Wily Intorscope monitoring tools used by 20 out of 30 Tier-1 CSPs world-wide, and by over 120 operators in 26 countries. The solution delivers risk management of new service creation and deployment, proactive monitoring of KPI, and rapid problem detection and analysis.

About The Authors

Vadim Rosenberg Vadim Rosenberg, Vice President, Marketing, Global Telecommunications at CA, Inc., is a veteran of marketing complex enterprise software technology. In his current role, Vadim leads telecommunications vertical within CA's industries group. Vadim is responsible for all aspects of CA marketing strategy and execution for telecommunications, including evangelism, sales and channel enablement, business case development, as well as in-account support of strategic business opportunities worldwide. Before joining CA in 2006, Vadim was responsible for global sales support for Oracle's Fusion Middleware products for telecommunications. Vadim was also the product marketing manager for BEA WebLogic Server and oversaw several major product launches and marketing initiatives. Previously, he was a senior engineer at Tandem Computer (now HP), where he built fault-tolerant transactions processing and mission-critical messaging systems.

Sean Gomez is Principal Product Manager for Telecommunications at CA Wily Technology. In his current role, Sean is responsible for all aspects of CA Wily product strategy and execution for the telecommunications industry: product planning and roadmap, product definition, business case and solutions development, as well as support for strategic business opportunities worldwide.

Sean has almost two decades of industry experience in telecommunications and IT infrastructure and has held product management, product marketing, technical marketing, business development, professional services, and engineering positions in areas including VoIP, data networking, network management, collaboration, systems integration and broadband wireless. As a senior product manager at Mitel, he led the development of open standards based Voice/Video over IP hardware and software products. As a senior product manager at Alcatel he defined broadband wireless access products. As a senior engineer at Newbridge Networks, he architected network management systems, management protocols and a lightweight kernel and OS used in several products. Sean has a Bachelor of Computer Science degree with a minor in electrical engineering, has authored several white papers and has presented at several industry events.

About CA Wily Technology

CA Wily Technology is the market-leading provider of enterprise application performance management solutions. For Telecommunication industry, CA Wily provides performance management software for standards-based service delivery platforms, subscriber services, business processes and related OSS/BSS infrastructure to help IT and network operations staff at telecommunications companies increase the availability and the performance of their applications and services, improve customer satisfaction, lower costs and assure revenue.

Through end-to-end visibility into customer transactions in real time, CA Wily's products enable organizations to successfully manage the health and availability of their critical applications and infrastructure. This means better customer service, more stable revenue streams, and higher it productivity.

To find out more about CA Wily Communications Service Provider Extension (CSPE) or other CA Wily's telecommunications offerings, email wily-telco-info@ca.com or visit **www.wilytech.com/solutions/industry/telecommunication.html**

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CA, one of the world's largest information technology (IT) management software companies, unifies and simplifies the management of enterprise-wide IT for greater business results. Our vision, tools and expertise help customers manage risk, improve service, manage costs and align their IT investments with their business needs.

CA Wily Technology is the market-leading provider of Enterprise Application Management solutions. By delivering end-to-end visibility into customer transactions in real time, products from CA Wily Technology enable companies to successfully manage the health and availability of their critical web applications and infrastructure. CA's collaborative management approach allows enterprises to rapidly detect and diagnose application slowdowns and failures, and better assess the impact of application performance on business success. This means better customer service, more stable revenue streams, and higher IT productivity.

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