Closing The Loop for Effective Network Operations Management: Cisco Prime Assurance Manager

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Executive Summary

Networks have never been more critical to the smooth flow of IT operations than they are today. Making sure networks are both available and performing expectations is an absolute essential. Networking pros have long turned to management tools and technology to help them with this, starting with solutions that are used to deploy their networks and then often turning to a completely separate set of tools that are used for monitoring them. But many are reevaluating such separation and looking for solutions that can bring together these two sets of capabilities and a fully integrated manner, adding performance and availability monitoring on top of device and network element management. Such integration represents a path towards responsible, reliable assurance of the network's role and function in serving the organization. This ENTERPRISE MANAGEMENT ASSOCIATES® (EMA™) paper reviews Prime Assurance Manager, a new integrated monitoring solution offered by Cisco Systems, and assesses the ways in which it can be used to achieve true network assurance.

Evolution of Network Management: The Drive for Comprehensive Solutions

In today's world of dynamic, virtualized, cloud-oriented IT, it seems that there are few constants except change. This is certainly the case in the upper layers of the stack, and all the while the network is expected to be rock solid, high-performing, and absolutely 100% optimized so that the New World order of agile IT can be delivered to expectations. And so the gauntlet is laid at the feet of networking professionals to do everything within their power to remove risk and ensure performance within the network. Much of this work takes place in planning and architecture; however, the true test comes when plans are put into action and live production operations are underway.

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EMA research indicates that raised expectations, in part driven by cloud and virtualization and the frenetic pace of change they enable, are causing a resurgence in demand for better integration within the network management tier. Though not everyone expects to find a silver bullet, multi-function "unified" network management platforms are most preferred as a network management tools architecture and strategy.

Such integration and consolidation can happen in multiple ways, but one of the most promising involves bringing together what have previously been the separate worlds of element management and network management. This applies to both the configuration/provisioning aspect of operations as well as sustained monitoring. The better job network management tools do at bringing precise, detailed element-level features and controls directly into top-down and cross-domain operational workflows, the less effort is required by operations staff to get new infrastructure and services up and running quickly and to keep them operating smoothly. Along the way, accuracy of efforts is improved as less manual effort is required to transition between tools during normal task processes, eliminating a key source of errors and improving the likelihood of getting it right the first time.

These efficiencies can quickly be translated into better responsiveness to business needs, faster restoration of disrupted services, lower incident and problem rates, and improved opportunities for proactively ensuring that the network – the essential delivery infrastructure for all IT services – plays

its essential role without interruption. In this sense, traditional network monitoring practices, which are largely reactive in nature, can and must be transformed into network assurance practices, by bringing together availability, performance, and change history data across the network and element levels, and empowering engineers, managers, and operators to meet the high standards to which the network is being held.

An excellent example of how an integrated network assurance approach can be of benefit is the challenge in dealing with converging service technologies, such as the way that voice, video, and application data must all share a common IP-based network delivery infrastructure. In such settings, specific network design/configuration accommodations are required to make sure that voice and live, interactive video conferencing traffic, which is highly sensitive to latency and packet loss, is delivered with sufficient priority to ensure adequate end user quality of experience. Other traffic types, such as streaming video, file transfers, web applications, etc., will commonly be traveling across the same network links at the same time. Integrated network assurance approaches deliver a holistic view of all such "netizens" so that operators can quickly recognize all simultaneous activity, recognize adverse influences and interactions between applications, isolate likely root causes, and make informed decisions about courses of corrective action. Further, close integration with device provisioning and configuration functions shortens the time required to make necessary adjustments to restore service levels following an interruption or degradation.

Cisco's Next Generation Solution: Prime Network Management

Cisco Systems is so well known for its networking solutions that few realize the company has been working diligently over the past several years to build and offer an advanced suite of network and service management solutions. Cisco's Network Management Technology Group has brought forth a next generation of management tools under the Cisco Prime banner which have been completely redesigned, fully integrated, and fully modernized.

Cisco has brought forth a next generation of management tools under the Cisco Prime banner.

The objective of the Cisco Prime initiative is to empower networking professionals to more effectively manage both their networks as well as the services that those networks are intended to deliver. Further, Cisco has sought to take full advantage by the advanced capabilities offered by their network infrastructure solutions, allowing those who adopt and deploy the technology to capture its full value as easily and efficiently as possible. This approach starts with a foundation of common network management technologies, layers in features that leverage advanced Cisco capabilities and capitalizes on Cisco's unparalleled technical knowledge base, and ultimately delivers expansive visibility coupled with rapid access to relevant controls.

Cisco's Prime product initiative represents substantial evolutionary thinking and advancement versus the prior portfolio of management tools. In particular, a standard user interface has been applied across every element in the suite, eliminating learning curves and the need to change approaches when moving from one set of functions to the next. Further, all consoles and dashboards have been redesigned to reflect a task-oriented paradigm, focusing on Design, Deployment, and Operations activities. The result is that consoles can now support multiple Prime products in a truly seamless manner, to the point that it becomes nearly impossible to tell where one product's features end and the next picks up.

Cisco now offers a suite of Prime management solutions for Service Providers and another for Enterprises. The Cisco Prime for Enterprise portfolio currently spans the following products/areas:

Cisco Prime Infrastructure: Lifecycle management of converged wired and wireless networks.

- Cisco Prime Network Control System (NCS): Provides converged user and access management, complete wireless lifecycle management, and integrated configuration of branch office routers.
- Cisco Prime LAN Management Solution (LMS): Delivers simplified deployment and administrative management of Cisco Borderless Networks.

Cisco Prime Assurance: Visibility across architectures for collection, analysis, and troubleshooting of performance, application, and end user wired and wireless sessions.

- Cisco Prime Assurance Manager: Aggregates real-time information across multiple networks to deliver application-aware network performance visibility and troubleshooting.
- Cisco Prime Network Analysis Module (NAM): Provides packet and NetFlow-based network and application performance visibility, analysis, and troubleshooting.

Cisco Prime Collaboration: Integrated lifecycle management to support converged voice, video, and collaboration experience.

- Cisco Prime Collaboration Manager (CM): Monitors and provides troubleshooting for telepresence sessions and media paths in real time.
- Cisco Prime Unified Communications Manager Suite: Automates provisioning, proactively diagnoses problems, and provides advanced statistics analysis and consolidated reporting and views for the Cisco Unified Communications environment.

In early 2012, Cisco added Prime Assurance Manager to the Prime Assurance portion of the solution suite. Cisco Systems network management solutions have long-standing, well-established roots focused on configuration and design of networks, complemented by troubleshooting and optimization. Cisco Prime Assurance Manager complements those capabilities with a set of tightly integrated features designed to provide essential operations monitoring support across distributed Cisco-based networking infrastructures.

Cisco Prime Assurance Manager: Scope and Capabilities

Cisco has developed and introduced Prime Assurance Manager with one essential goal in mind – to provide end-to-end operational monitoring visibility, spanning data center to and through the branch, as a means for facilitating efficient operations and proactively protecting network-delivered applications and services. This includes the collection and analysis of network availability, network performance, application performance, and end user experience data across both wired and wireless environments, coupled with troubleshooting and reporting features.

Cisco developed and introduced Prime Assurance Manager to provide end-to-end operational monitoring visibility, spanning data center to and through the branch.

To become a part of the Cisco Prime portfolio, each product must follow a set of architectural guidelines. The solution must be complementary to other elements within the Cisco Prime Network Management portfolio and integrate seamlessly with features of other products, so that operators can use a single navigational interface for either the monitoring/troubleshooting capabilities or the configuration/control

features of other Prime products, such as Prime NCS or Prime LMS. Further, the user interface must adhere to the task-oriented Design/Deploy/Operate structure introduced with earlier Prime portfolio products. In the case of Prime Assurance Manager, the vast majority of features fall into the "Operate" realm. More to this latter point, Prime Assurance Manager leverages exactly the same approach for work efficiency as other Prime products, such as templates for applying common monitoring profiles and Flexible NetFlow definitions, as well as site and group definitions for logical collections of devices and systems under management.

Leveraging Intelligent Instrumentation

With these guidelines in place, the core objective of Prime Assurance Manager could be fully addressed. As the old saying goes, you can't manage what you can't measure. Cisco Prime Assurance Manager is the first Cisco product designed to enable management of live production operations by collecting together measurements across the full, vast array of intelligent, embedded instrumentation available within advanced Cisco Systems networks. Following are the key sources of data that Prime Assurance Manager leverages:

- Medianet – This family of IOS features for video traffic monitoring and management includes both Performance Monitor (Perf-mon), which can be used to gather quality and activity metrics and export them to management systems via NetFlow V9 or SNMP, and Mediatrace, a diagnostic feature that can be invoked for troubleshooting performance issues and incidents.
- NetFlow/NBAR – Another IOS feature, NetFlow is a de facto industry standard for capturing performance and usage information regarding application and service activity on the network. NBAR (Network-Based Application Recognition) complements NetFlow by leveraging deep packet inspection to more granularly recognize and define application instances and types. Cisco Prime Assurance Manager taps into this data either directly or via the Cisco Prime NAM. Importantly, Cisco Prime Assurance Manager supports and facilities the use of flexible data templates available with the latest version of NetFlow, known as Flexible NetFlow (FNF).
- SNMP – Long the staple of network management, Simple Network Management Protocol, or SNMP, is used to harvest health and utilization metrics from network nodes as well as provide as standard means for devices to send notifications to management systems asynchronously, in the form of "traps." In the case of Prime Assurance Manager, SNMP is used to gather performance metrics across a wide range of standard and Cisco-specific MIBs (Management Information Bases), as well as for key feature sets such as NBAR. Cisco Prime Assurance Manager supports SNMP v2c and v3.
- Packet analysis – Perhaps the most precise source of visibility in the network, particularly for deep troubleshooting of difficult issues and 100% accurate identification of applications, comes from direct inspection of network packets. Within the Cisco Prime portfolio, these capabilities are provided by the Cisco Prime NAM; however, data from the NAM can also be harvested for presentation and analysis within Cisco Prime Assurance Manager.
- Cisco Performance Agent (PA) – This IOS feature is available on Cisco routing platforms, and uses a combination of technologies, such as NBAR and packet inspection, to collect and export traffic statistics, performance analytics, and WAN optimization metrics using NetFlow V9 format. Cisco Prime Assurance Manager accesses data coming from Performance Agents via the Cisco NAM.

- Cisco Application Visibility & Control (AVC) – This is an integrated set of IOS features supported by the Cisco ASR and ISR platforms which uses deep packet inspection to recognize applications (NBAR2) and couples that together with PA (for response time) and modular QoS controls to deliver a model-based performance optimization capability. Cisco Prime Assurance Manager collects data from AVC via Flexible NetFlow and/or the Cisco Prime NAM.
- WAAS/WAE Flow Agents – WAN optimization solutions from Cisco Systems include agents for sending detailed information on application flows and optimization impact to the Cisco Prime NAM, which in turn provides the data to Cisco Prime Assurance Manager for display and analysis alongside other application-oriented operational data.
- Events – asynchronous events coming from the managed infrastructure are the first and foremost source of insights that monitoring systems use to understand operational state and the onset of issues and problems. Cisco Prime Assurance Manager gathers events coming in the form of syslog and SNMP traps.

Collectively, these data sources represent a full cross-section of the monitoring data for assessing operational availability and health of the network, together with essential insights into the applications and services that are being delivered. Importantly, Cisco Prime Assurance Manager goes beyond simply collecting this data. The solution also enables network managers to easily configure all such data sources, whether or not Cisco Prime Infrastructure tools are present, thus removing one of the major obstacles to capturing their value. Further, the solution integrates, normalizes, and correlates these datasets, so that their true value is compounded by allowing them to be connected and related, revealing insights into the greater whole of the delivery infrastructure.

Covering the Full Scope of Assurance Functions

One of the greatest technical challenges facing a network monitoring solution is the efficient organization and presentation of what can often be daunting volumes of data, particularly in the form of performance metrics and event streams. In the ideal case, all such data is brought together, organized, and related in ways that allow easy navigation of information and facilitated analysis as a part of natural reactive or proactive monitoring and troubleshooting workflows. This is very much the case with Cisco Prime Assurance Manager, with its overriding focus on making network monitoring smooth and efficient. Cisco Prime Assurance Manager includes five major categories of functions that combine to cover the significant majority of monitoring requirements for Cisco networks. Each is described in detail below.

Prime Assurance Manager's overriding focus is on making network monitoring smooth and efficient.

Monitoring dashboards: Most operators using Cisco Prime Assurance Manager will primarily interact with the product via the many dashboards. These dashboards cover a wide range of common views into the monitoring data, and are built using modifiable collections of dashlets to assemble and present the most useful information for each type of monitoring task. Standard dashboards include an overview with "Top N" summaries of current activity, an incident dashboard for alarm monitoring and management, a network performance dashboard focused on device activity/health, and a service performance dashboard highlighting application performance and quality. Another dashboard focuses on applications, including which applications are active, current response times and transactions times, top users, and various KPIs (see example below in Figure 1)

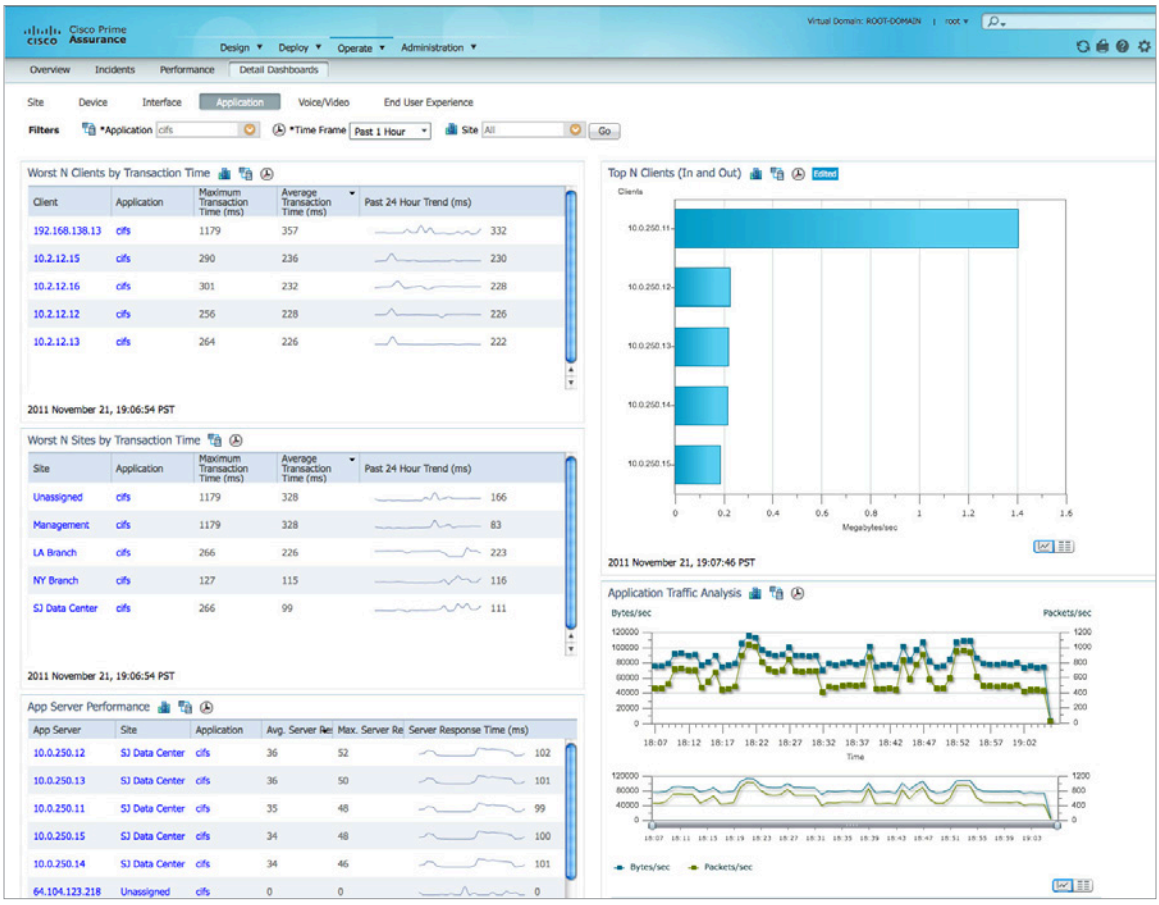

Figure 1. Cisco Prime Assurance Manager Application Dashboard View

Still more dashboards cover device specifics, interface specifics, details on Voice and Video quality/performance, and end-user experience. Dashboards also exist for viewing operational data on a site-by-site basis.

While all of these dashboards and the dashlets that comprise them are configurable, there are two further features that make them much more powerful than just a set of standard monitoring screens. First, they are all linked for context-sensitive cross launching, so as an operator works through the various views it is possible to drill down from one dashboard to the next, continually focusing in on deeper and deeper levels of detail. For example, an issue at a specific site might lead to drilling down to a device-level dashboard for one single device at that site, and then into an interface-level to reveal current state and activity on a particular interface on that device (and at that site). The same approach can be used to isolate and drill into details associated with a particular application or end-user.

The second powerful and differential feature of Cisco Prime Assurance Manager is the integrated Device 360 views. These views bring cross-sections of monitoring data together around a particular managed device, such as alarms, health, configuration changes, and current interface traffic, so that operators can get a rapid "at a glance" systemic view of everything happening with that particular device (see Figure 2).

Device 360 views can be quickly and easily invoked from a number of locations throughout the Cisco Prime Assurance Manager system, and can deliver essential rapid feedback that has often been available only by switching between multiple tools or, at best, flipping between multiple windows within a common tool. For instance, the Device 360 can quickly show not only the status of all interfaces on a device, but also the top three applications active on each interface. Fast status info includes device details, CPU and Memory utilization, modules installed, and even a listing of the device's nearest network neighbors, including which interface provides connectivity to those neighbors. Finally, the Device 360 also lists the last configuration change made to the device, so it is possible to understand immediately whether a recent change in configuration must be considered as a possible root cause of problematic behavior.

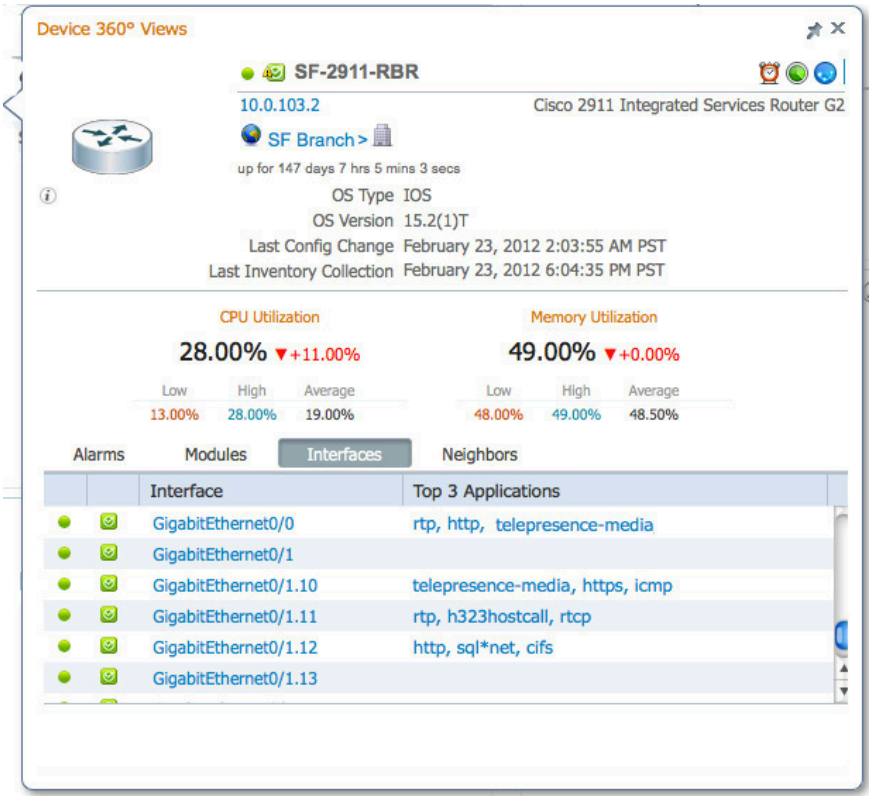

Figure 2. Cisco Prime Assurance Manager Device 360 view.

Alarms and Event Handling: Perhaps one of the most loved (or hated) screens in the operations center is the alarm summary. Commonly a list view showing all of the events and alarms currently active across the monitored network, it acts as the "to do" list for many operators. This functional area has been a mainstay of network management systems for decades. Cisco Prime Assurance Manager provides a fully functional viewing and browsing capability for Alarms, Events, and Syslog entries. Views can be managed to adjust scope from one to many devices or groups of devices, and/or filtering to look for specific types of events or alarms. A summary alarm count by severity is permanently placed in the lower right hand corner of all Prime Assurance Manager Web windows, so these essential details are never far from view.

Beyond simply viewing and managing the list of alerts and events, Cisco Prime Assurance Manager also includes workflow features for assigning responsibility, acknowledging, annotating, and clearing alarms as they are processed and resolved. Such resolution often includes analysis and troubleshooting, and the context-sensitive, cross-launching capabilities with Cisco Prime Assurance Manager, including quick ping, traceroute, and Show commands are indispensible for such purposes.

Finally, the fact that Syslog browsing is included within Prime Assurance Manager is worthy of additional note. EMA research in early 2012 indicated that integrated log file analysis was a top concern among network managers, second only to scalability among most desired features for network management systems. While log file analysis is a deep and disciplined practice in and of itself, including an ability to view network device syslogs directly within the Prime Assurance Manager operations monitoring platform represents important progress in a needed direction.

Multi-NAM Management: The Cisco Prime NAM is a packet inspection and analysis solution that can play an important role in both operational monitoring as well as troubleshooting. In particular, NAMs can deliver details on application traffic mix, application response time, and voice/video session quality when those measures are not available via MediaNet Perf-mon or the Cisco Performance Agent. Also, NAMs can be used to capture and analyze packet traces – a definitive often-necessary approach to troubleshooting subtle and complex performance and interoperability issues.

Cisco Prime Assurance Manager introduces a number of powerful features for elevating Cisco Prime NAMs from what has primarily been a troubleshooting role to become part of a full-functional monitoring and assurance architecture. To start, Prime Assurance Manager provides tools for configuration and administration of multiple NAM instances, such as central software image management, common application classification definitions, common application server address lists, and central coordination/synchronization of NTP (network time protocol) service, which is essential when comparing packet captures coming from multiple instrumentation locations.

Prime Assurance Manager's features elevate Cisco Prime NAM from primary troubleshooting roles to become part of a full monitoring and assurance architecture.

From a monitoring and workflow perspective, Prime Assurance Manager delivers a number of features that take advantage of NAM deployments, turning them into integrated operations instrumentation elements. First, Prime Assurance Manager can be used for centrally coordinating packet captures across multiple NAMs, for detailed end-to-end packet analysis from multiple points along the delivery path. Prime Assurance Manager performance thresholds can also be used to automatically trigger packet captures on one or more NAMs. Prime Assurance Manager automates the selection of authoritative data sources, an important step when calculating response times, so that monitoring data can be de-duplicated and the complexity of data source management can be avoided, unless operators wish to or need to customize such choices. And finally, there are a number of dashlets offered within the Prime Assurance Manager dashboards that can be fed from NAM data sources, including application mix, top applications, response time, MOS scores, voice call statistics, and more.

WAN Optimization Analysis: Recent EMA research has confirmed that WAN Optimization has evolved from being a tactical approach to saving networking costs to a strategic element within network planning and architecture for ensuring networked application performance from the data center to the branch. Cisco Systems offers WAN optimization solutions in the form of its WAAS and WAE solutions to meet these needs. Some of the ongoing challenges with WAN optimization have been developing a

means to plan and maintain rules and policies for getting the best optimizations, maintaining visibility into performance in/through optimized links, and understanding just how effective optimizations that have put in place are on an ongoing basis.

Cisco Prime Assurance Manager includes features that help with all of these challenges. The approach starts with the use of Cisco Prime NAM, which collects flow data directly from Cisco WAAS and WAE deployments via the WAAS/WAE Flow Agent. This data is then forwarded to Cisco Prime Assurance Manager, which presents side-by-side analyses views of precisely which applications are flowing across each link, which have been optimized versus which have not been optimized, and the before and after impact of the optimization controls that have been deployed (see Figure 3).

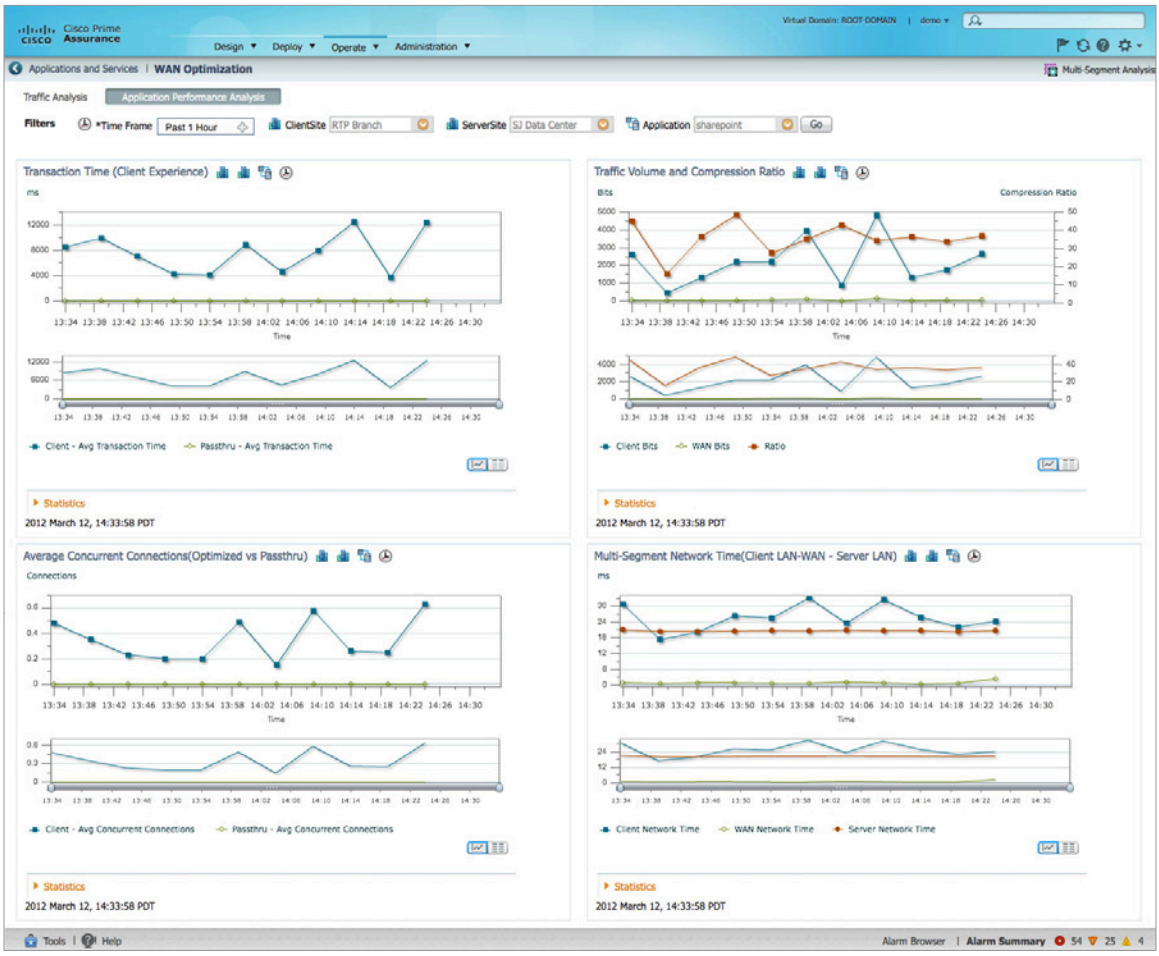

Figure 3. Cisco Prime Assurance Manager WAN Optimization Analysis view.

This flow of monitoring data delivers real-time visibility across all optimized segments, regardless of whether or not other instrumentation (such as NetFlow or a NAM) is present. It also allows for ongoing monitoring and tuning of optimization controls, providing immediate feedback when controls are modified or updated. Finally, this visibility means that the role that WAN optimization plays in end-to-end delivery can be added to problem isolation and root-cause analysis workflows.

Reporting: While the many and varied dashboards and dashlets within Cisco Prime Assurance Manager deliver abundant operational visibility, it is only possible to present a limited number of data points in this way. A fully functional network operations management solution must also provide reporting for off-line analysis and collaborative data sharing beyond the core operations team. Cisco Prime Assurance Manager includes three primary types of reports to support these needs: Device, Performance, and Raw NetFlow.

- **Device reports** are focused on details of activity, availability, and health of network nodes. They include common templates for viewing items such as CPU utilization, device inventory, interface utilization, port attributes, VPN status, licensing by device or license type, and more. Site filters can be applied for adding focus as needed.
- **Performance reports** look more broadly across the activity of both network and application layers. Common templates here include threshold violations, application response, interface errors, voice/video quality, WAN traffic analysis, environment/temperature, and end-user experiences. Site filters can be used for these reports as well.
- **Raw NetFlow reports** allow detailed analysis of each constituent flow record, as well as sorting by content or source, for deep forensic analysis.

Cisco Prime Assurance Manager includes the ability to run any report on an *ad hoc* / as needed or a regularly scheduled, recurring basis. Exporting is supported for CSV and PDF formats for sharing beyond primary browser outputs. Report templates can also be added, modified, and saved to adapt to the needs of any individual organization or reader audience.

Putting Cisco Prime Assurance Manager to Work

Simply assembling the broad set of functional capabilities detailed above is impressive; however, the real test of a network monitoring system is how well the combination of features can be put to use for real-world tasks and workflows. Since Cisco Prime Assurance Manager adheres to the task-oriented design tenets of the Cisco Prime portfolio, data and views are aligned for efficient and logical navigation and use, coupled with context-sensitive drilldowns that deliver maximum insight with a minimum of effort. Following are a couple of example cases of how Cisco Prime Assurance Manager can be applied:

- Network visibility: Many times, the challenge to understanding what is going on in the network is to first understand just what makes up the network. Cisco Prime Assurance Manager includes both automated discovery and import mechanisms to recognize devices and all related subcomponents of devices, both physical and virtual in nature. This is combined with endpoint site association features so that all network elements and activity can be tied back to a common understanding of that which the network connects – data centers, local campuses, and remote branch sites. Finally, device or port-level groups can be defined for pulling together managed elements that are to be monitored using similar or special policies and profiles. Collectively, these capabilities allow the entire Cisco network to be monitored, end-to-end, across physical and virtual elements and relationships, from a high level, such as via the Overview Dashboard, as well as with great depth around any individual point along the way, such as via Device 360 views.

Prime Assurance Manager leverages the many application-oriented instrumentation options within Cisco Networking Solutions to provide application-aware operations visibility.

- Application visibility: The network exists to serve a purpose, and for the vast majority of organizations that purpose is the delivery of applications or application-based services. The network viewpoint, in fact, provides a unique and powerful perspective on exactly what applications are being delivered and at what levels of quality and performance. But to gain that insight, it is necessary to bring together application-aware metrics and monitoring data and put that information into context with the network itself. Cisco Prime Assurance Manager addresses these needs by leveraging the many application-oriented instrumentation options within Cisco networking solutions, including the Cisco Prime NAM as well as IOS features such as NetFlow, NBAR, Performance Agent, AVC, and Medianet. Configuration of these advanced data sources is facilitated and automated within Cisco Prime Assurance Manager, which then collects, normalizes, and correlates resulting ongoing measurements and metrics. The resulting multi-dimensional data set is made available for direct, top-down monitoring and analysis or for context sensitive insights driven by analysis and troubleshooting flows that start from the bottom up.
- End-user visibility: While the network exists primarily to deliver applications, those who benefit from those applications are the end users of IT services. Again, since the network is the key to delivery, the network viewpoint can provide essential insights into end user experiences, and serves particularly well as the first point of triage when the root cause of user-reported performance issues is not immediately apparent. Here, Cisco Prime Assurance Manager again adds value, by making identification of an end user's location simple, and then offering facilitated options for identifying the path of application delivery and allowing investigative analysis of each hop (and device) along the way. This is further complemented with ability to watch key performance metrics that reflect end-user experience, such as response time and VoIP/video quality, and to set proactive threshold notifications when those metrics stray from acceptable ranges.

As with all other Cisco Prime for Enterprise products, one other major value is present throughout the system. Wherever an operator happens to be working within Prime Assurance Manager, and whatever may be the current focus of analysis, Cisco Prime products feature a help function that links directly to Cisco's extensive and expansive best-practices knowledge base. This puts expert knowledge for managing and optimizing Cisco networks just a few clicks away, delivering the right insights, in the right context, at the right time.

EMA Perspective

Over the years, EMA has regularly documented the need for more effective, integrated network management solutions that can span multiple functional areas. In fact, research released in early 2012 indicates that most practitioners prefer fully unified, tightly integrated tools, when such solutions are available. Cisco has embraced these needs by transforming its lineup of network and device management tools into consistent, connected, efficient enablers which can move network operators towards being able to truly assure networks, for both reliable availability and reliable performance – not just stand them up and then fight the inevitable fires that come along.

Closing The Loop for Effective Network Operations Management: Cisco Prime Assurance Manager

Cisco's new Prime Assurance Manager solution represents a comprehensive set of network assurance capabilities, tightly aligned with balance of Cisco Prime portfolio and backed by the deep experience and knowledge of Cisco Systems. In many ways, it is a capstone to Cisco's Prime Network Management initiative, complementing a long-standing strength in solutions for configuring and administering Cisco networks with application-aware, network-savvy operational monitoring, troubleshooting, and reporting. Cisco Prime Assurance Manager is a new, different, and important character within the overall Cisco management story. It is a natural, evolutionary step forward, and one that represents a real and viable alternative for operating, optimizing, and assuring the many Cisco-centric networks out there among enterprises worldwide.

Prime Assurance Manager represents a comprehensive set of network assurance capabilities backed by the deep experience and knowledge of Cisco Systems.

About Cisco Systems

Cisco (NASDAQ: CSCO) is the worldwide leader in networking that transforms how people connect, communicate and collaborate. Information about Cisco can be found at http://www.cisco.com.

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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