White Paper

Cisco Prime for Mobility: Advanced Management for the Next-Generation Mobile Internet

What You Will Learn

Today's mobile network is nearly unrecognizable compared with that of a decade ago. Huge increases in traffic volumes and subscribers, diverse devices, and rich media applications are all bringing significant revenues to mobile operators. But this growth has been accompanied by high costs and rising complexity associated with managing the mobile Internet. Currently disparate legacy and newer network management tools from different vendors handle various network segments. These point products are noncollaborative, are limited in their scale of operations, and are often unable to consistently support quality of service (QoS) levels demanded by customers. This white paper provides an overview of the management challenges facing mobile operators using current management solutions. It then presents the features and benefits of Cisco Prime™ for Mobility, a suite of management applications that directly addresses those challenges. Cisco Prime for Mobility is a highly scalable and cost-effective end-to-end management suite that spans the entire mobile network topology - from the cell tower to the radio access network (RAN) backhaul to a terabit Evolved Packet Core (EPC) on the Cisco® ASR 5000. It is an advanced management solution that provides a holistic view of the mobile network, dependable service assurance, simplified administration, and faster service provisioning for devices and technologies. Service providers can benefit from rapid time to market for new service offerings.

Challenge: Managing Mobile Networks Has Become Complex, Costly, and Inefficient

Mobile operators are struggling to keep up with growing traffic volumes, to handle the corresponding complexity within core and transport networks, to provide workarounds due to limits on RAN densification and spectrum scarcity, and to support a myriad of different devices and ever-evolving and demanding applications. Growth and change are everywhere. Mobile data traffic is forecast to increase 18-fold between 2011 and 2016 to 10.8 exabytes per month by 2016, according to the Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2011-2016. The number of mobile devices in use by 2016 will be triple the world's population. These sophisticated devices will require high-bandwidth, low-latency connections for rich media applications. Outages and poor service are unacceptable. Customers expect swift and sure provisioning and fast troubleshooting to address any issues that arise.

Back-end systems to manage provisioning must also evolve to meet changing demands. Complex systems must be simpler to use; scalable across enterprise, consumer, and converged fixed and mobile networks; and provide faster time to market. This is an area where mobile networks currently are faltering. Legacy management tools in core and transport networks have proliferated over time in answer to specific needs and due to the integration of technologies through acquisitions. These point products in separate siloes do not collaborate with each other. The result is lower efficiency and growing operational costs as network administrators grapple with very challenging, complex, and nonstandard management environments.

According to a research report by Analysis Mason in February 2012, “Increasing network complexity, more exacting subscriber demands, and strong competition are all driving demand for management systems to provide greater quality and efficiencies in network design, implementation, and assurance. Service assurance processes are most critical in improving customer experience to help prevent and resolve service-affecting issues. With greater automation in design, fulfillment…services eliminating manual intervention should also increase reliability.”

These management systems must encompass new service design, fulfillment, and configuration validation. At stake for operators is nothing less than their ability to grow and thrive. Efficient, cost-effective management of today’s mobile network affects an operator’s ability to grow market share and revenue, compete against other operators, provide a better customer experience, increase customer loyalty, monetize new and existing services, and improve return on investment (ROI).

Requirements for Next-Generation Mobile Network Management

An integrated, comprehensive management solution for next-generation mobile networks should include:

- **Detailed, unified network view:** A management platform for mobile networks should deliver an end-to-end view, integrating all network segments from the cell sites to the RAN backhaul, Long-Term Evolution (LTE) EPC, data center, and the Next-Generation Network (NGN). This results in a more efficient management environment and savings in capital and operational expenditures (CapEx and OpEx).
- **Speedy provisioning for new services:** A management solution should be able to quickly provision standard and complex services that may need to traverse enterprise, consumer, and converged fixed/mobile networks. Speeding service delivery with rapid provisioning further enhances operational efficiencies, which save operators time and lower their costs, and shortens time to market, adding to customer satisfaction.
- **Faster problem resolution:** The ability to integrate multiple workflows that are now separate, from problem diagnosis to the execution of tasks to mitigate the problem, can help enable the rapid resolution of network issues. Customers have low tolerance for poor service from their network provider. Integrated workflows, instead of disparate operational tasks from multiple tools, reduce the time to problem resolution and enhance the customer experience, decreasing customer churn.
- **Operational scalability:** An operational solution should be able to scale across the RAN backhaul and LTE EPC. Manual approaches do not scale as bandwidth requirements and service offerings grow but preintegrated management components and end-to-end workflows do scale, providing the agility operators need as market dynamics evolve and change.
- **Simplified integration with third-party operations support systems (OSSs) and business support systems (BSSs):** A solution for mobile network management should provide easy integration with popular OSSs and BSSs. Complex, manual integration can be tremendously time-consuming and expensive, so smooth, fast integration capabilities are an important feature.

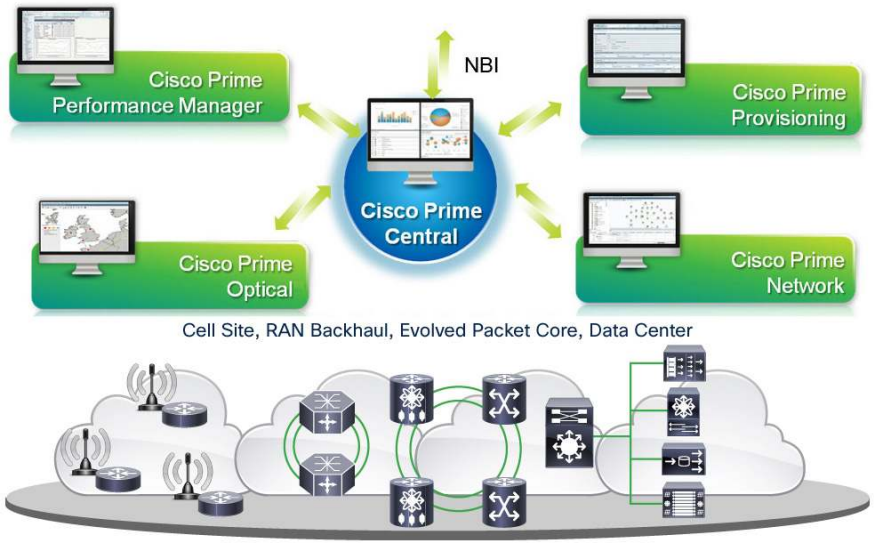
A centralized, comprehensive mobile network management solution should provide consistent control and management of the entire mobile network spanning all network tiers. It should also be able to ease the migrations mobile operators are making to third-generation (3G) and fourth-generation (4G) LTE networks.

Cisco Prime for Mobility

Cisco Prime for Mobility delivers the above features and benefits and more. The suite of integrated products constitute a highly scalable, cost-effective, centralized management platform that allows mobile operators to manage the lifecycle of services - from provisioning to the most demanding service assurance and performance management requirements - end to end across all network segments. Tightly aligned with the Cisco Mobile Internet network architecture, Cisco Prime for Mobility supports a wide array of world-class Cisco mobility solutions.

With Cisco Prime for Mobility, Figure 1, operators get an end-to-end, highly scalable, and extremely cost-effective solution for managing the next-generation mobile network.

Figure 1. The Cisco Prime for Mobility Suite



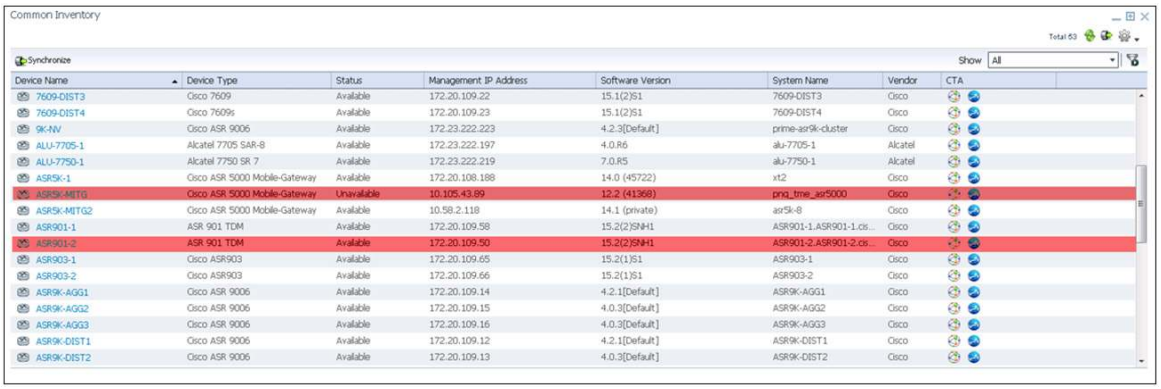
Features include:

- A unified and granular network view with centralized troubleshooting and performance monitoring
- Faster provisioning based on extensive automation
- The rapid resolution of service issues based on topology-guided troubleshooting and automatic root-cause identification combined with actionable performance metrics
- Operational scalability through automation combined with unified access control of the network and integrated operator workflows
- Simplified integration with a standards-based northbound interface (NBI)

Descriptions of the individual products within Cisco Prime for Mobility that together enable the end-to-end operational scalability operators require, a lower total cost of ownership (TCO) for mobile network management, and dependable service assurance and QoS follow.

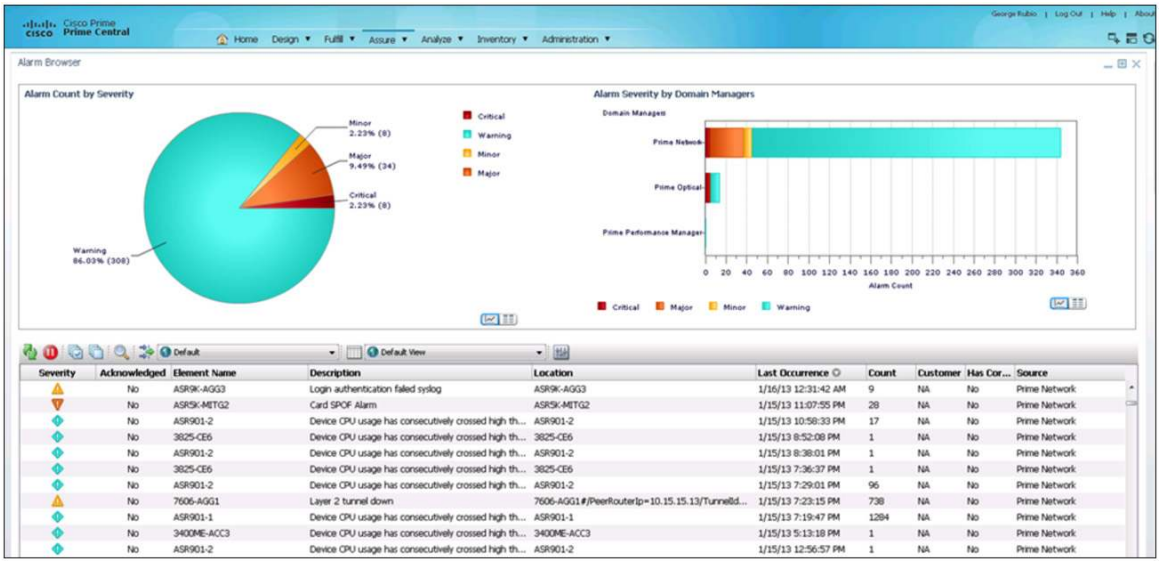
Cisco Prime Central solves the complex and time-consuming challenge faced by operators of maintaining and utilizing a wide array of separate management tools, each with its own interface. Instead, it provides one centralized interface with an inventory view of all components that span the mobile network, Figure 2. Cisco Prime Central provides the capability for operators to navigate further into each device from a single portal for more detailed information, eliminating the overhead from manual operation of point systems from disparate management applications.

Figure 2. Common Inventory View of Mobile Platforms



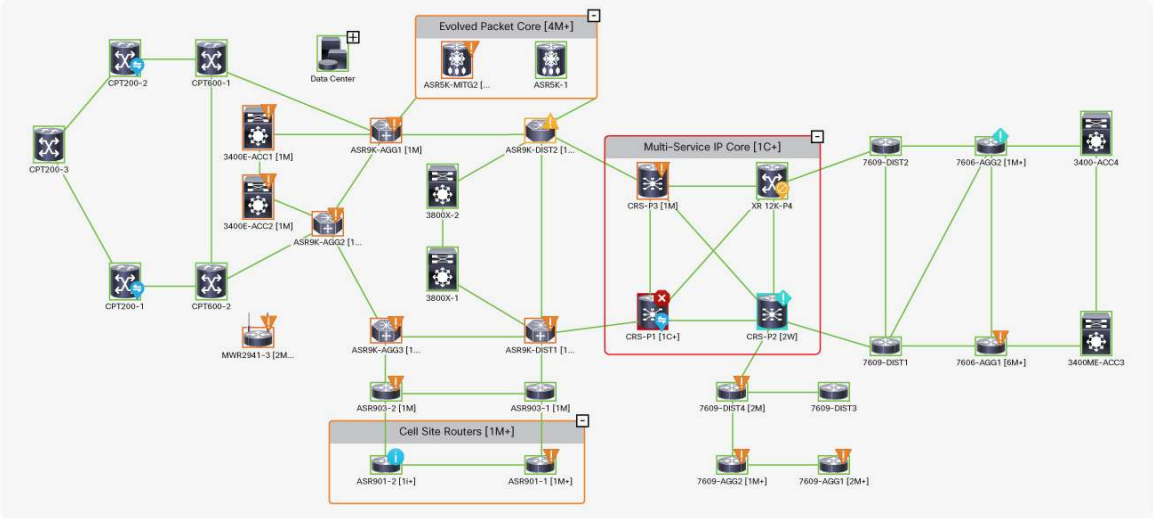
With Cisco Prime Central, key real-time information related to troubleshooting, diagnostics, provisioning, and many other tasks is shown in different data and graphical formats, in seamlessly integrated, networkwide views. In Figure 3, alarms are displayed from multiple sources through a single pane of glass. Operators can obtain more details on any of the alarms by cross-launching the respective domain manager from Cisco Prime Central.

Figure 3. Cisco Prime Central View of Alarms



The centralized end-to-end view of the mobile network, Figure 4, provides access to a wealth of operational data and complex integrated operator workflows across the RAN backhaul and EPC, helping to enable operators to seamlessly and efficiently execute lifecycle tasks, including design, fulfillment, assurance, and analysis. The powerful, integrated management dashboard provides the scalability operators desperately need as their networks expand and change, lowers OpEx by eliminating redundant and overlapping tasks, lowers CapEx by making multiple tools unnecessary, and helps maintain service assurance to avoid customer churn.

Figure 4. Cisco Prime for Mobility Provides End-to-End Views of the Mobile Network



Cisco Prime Provisioning brings automation to service provisioning, configuration, and functional audits from one end of the mobile network to the other, including IP RAN backhaul. The ease of use of its GUI-based, policy-driven workflows can help eliminate the need for staff with advanced degrees or training to use the solution. Additionally, contrast the manual deployment of Layer 2 and Layer 3 VPN provisioning - which involves multiple, time-consuming steps and is therefore error prone - with automated, profile-based provisioning of Cisco Prime Provisioning. Operators can define VPN provisioning parameters in a service policy and then upload the network element configuration to calculate the changes in configuration required, ensuring that the configuration will be successful and will not affect existing configurations. It's easier, faster, and more risk averse.

Here again, operational scale is greatly enhanced through intelligent automation of time-intensive tasks, and many different tools are left behind in favor of one fully integrated environment. TCO is reduced based on the comprehensive reach of the solution and its user friendliness. In addition to automated provisioning, the workflow-based tool within Cisco Prime Provisioning handles service validation and troubleshooting so operations staff can ensure that automated processes have accurately provisioned services to meet customer service level agreements (SLAs).

Figures 5 through 7 show the Service Request Manager of Cisco Prime Provisioning. Using this tool, operators can easily provision a RAN backhaul pseudowire (PWE) Ethernet Virtual Circuit (EVC) service, for example. Using the Service Request Manager, services can be easily added, edited, or removed.

Figure 5. Cisco Prime Provisioning for RAN Backhaul PWE EVC Service

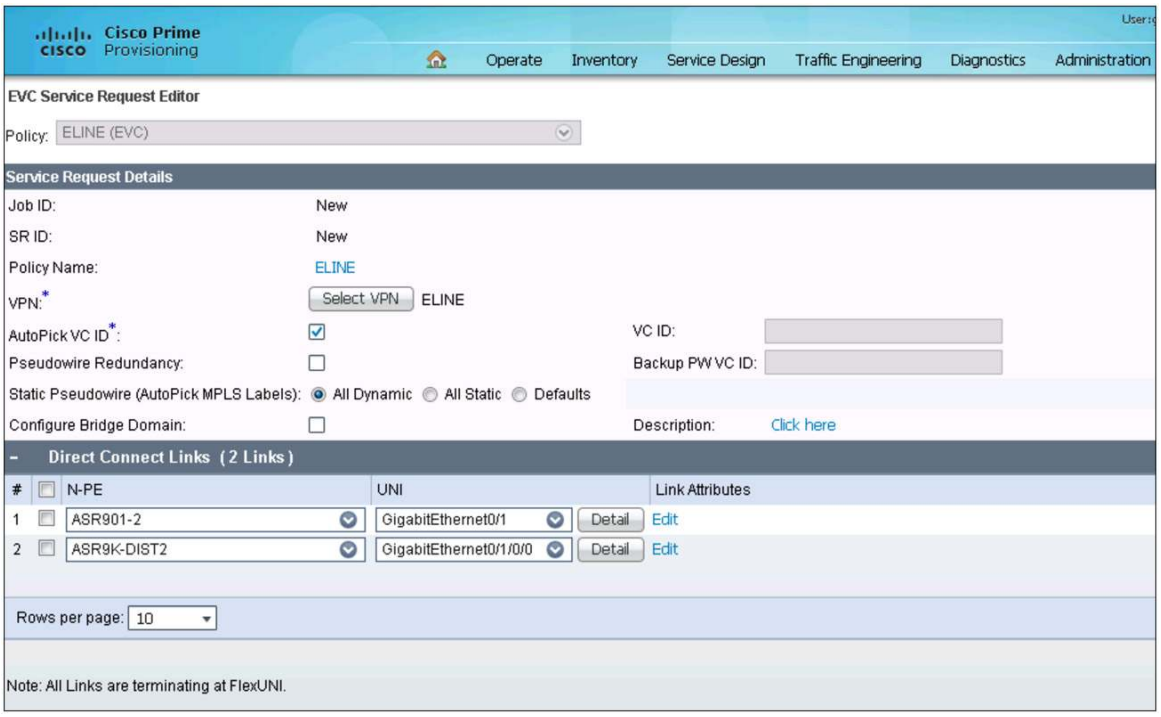


Figure 6. ASR 901 Provisioning Details

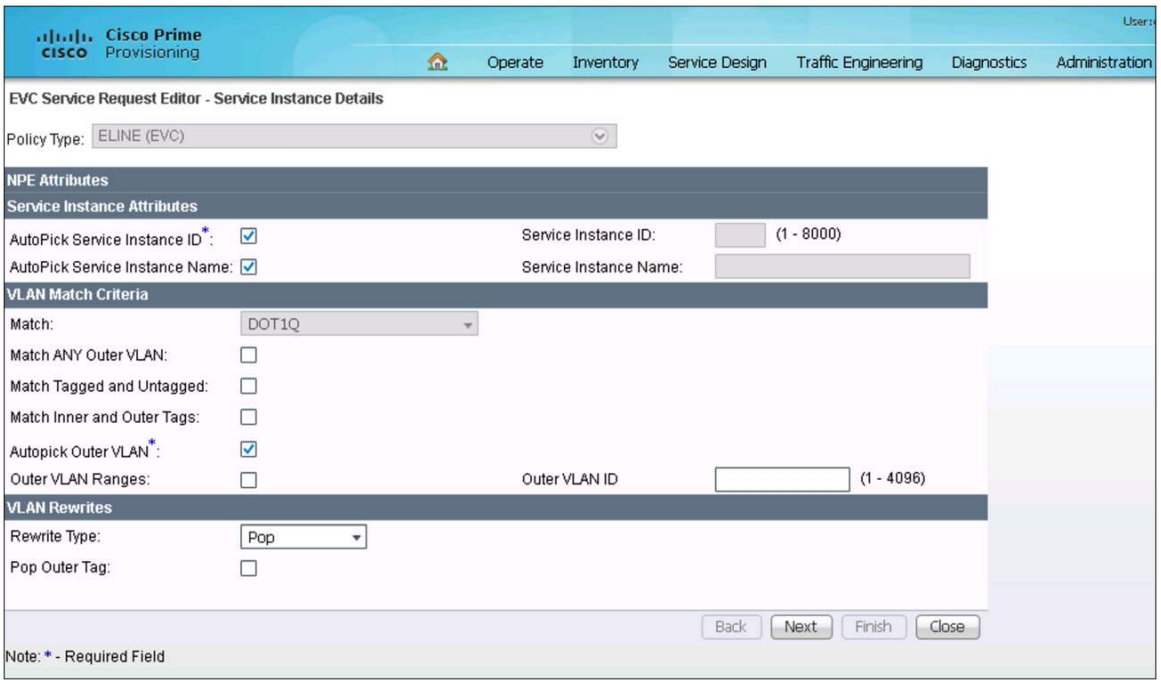
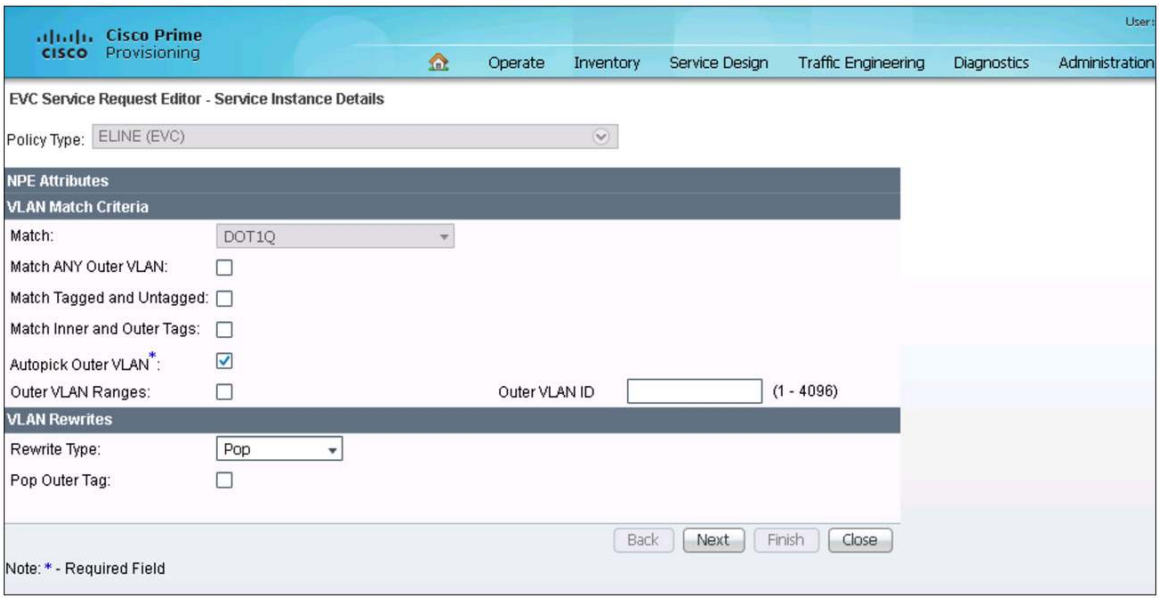


Figure 7. ASR 9000 Provisioning Details



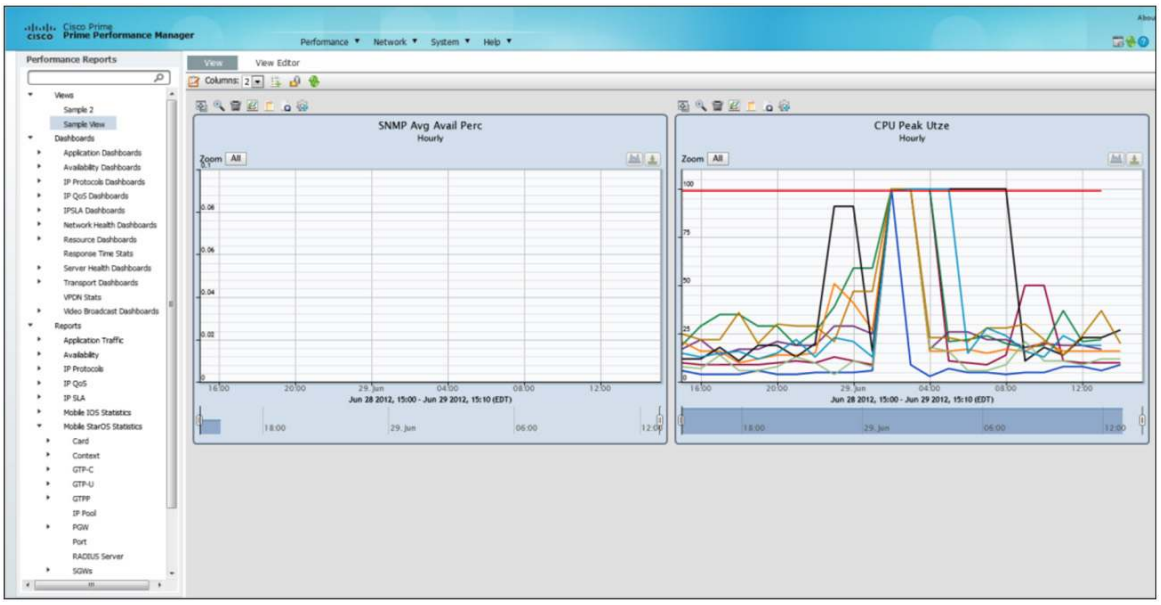
With **Cisco Prime Performance Manager**, mobile operators can understand in real-time the performance of network devices deployed across their network infrastructure, including core, aggregation, and access networks. A mobile network cannot scale effectively and provide service assurance if the performance of existing devices can't be clearly identified. With accurate information on the performance of both Cisco and third-party devices, the performance and reliability issues monitored by Cisco Prime Performance Manager combined with the fault monitoring and topology troubleshooting capabilities of Cisco Prime Network allow for the identification of problems long before they affect the services enjoyed by subscribers.

Along with root-problem identification and service performance metrics, the solution helps operators back up service assurance claims in their operational best practices. Cisco Prime Performance Manager supports thousands of prepackaged reports that are easily extensible, giving operators many options for what metrics they wish to track and how they wish to report their network performance.

A very popular feature of Cisco Prime Performance Manager is the ability to provide user-defined views of the network, Figure 8. These views can be made available to customers for the services they have purchased.

For example, if a small Telco owns some fiber in the ground, they may sell some capacity to a big wireless service provider to backhaul traffic from their cell towers to the mobile switching centers. Through user-defined views, the small Telco can offer their wireless customer access to data that are specific to their network segment only. This window into the many performance metrics on a customer's network segment can bolster the credibility of operator guarantees in SLAs and help inspire greater confidence in the relationship.

Figure 8. Example of Cisco Prime Performance Manager Portal View for Customers



Another important feature of Cisco Prime Performance Manager is threshold-crossing alerts (TCAs). This is a programmable feature, as shown in Figures 9 and 10, based on rules and policies. When a key performance indicator (KPI) has risen or fallen to a particular level, the operator is notified or scripts are automatically executed in response to the alert.

Figure 9. Cisco Prime Performance Manager Y.1731 Reports

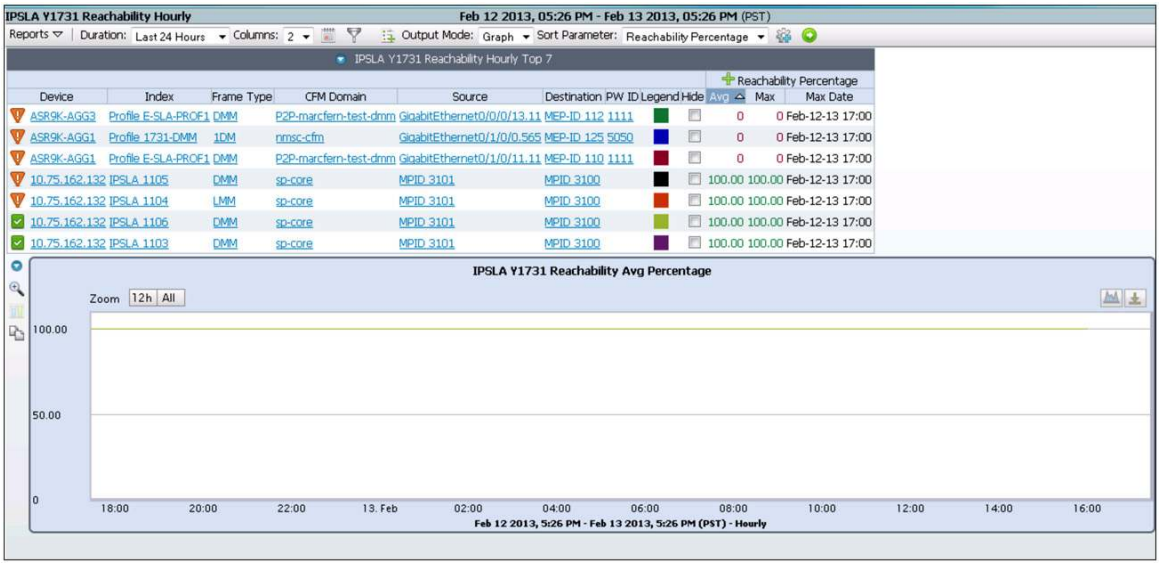
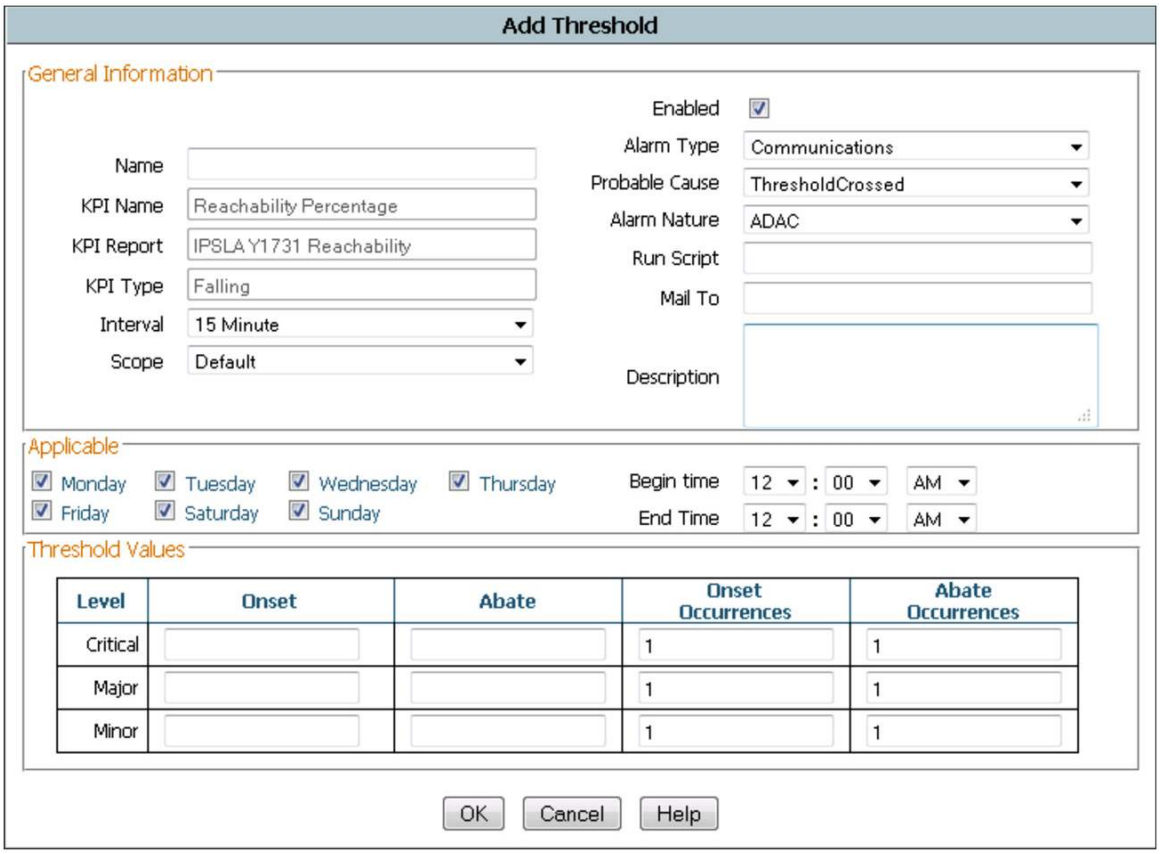


Figure 10. Cisco Prime Performance Manager Y.1731 Threshold Configuration



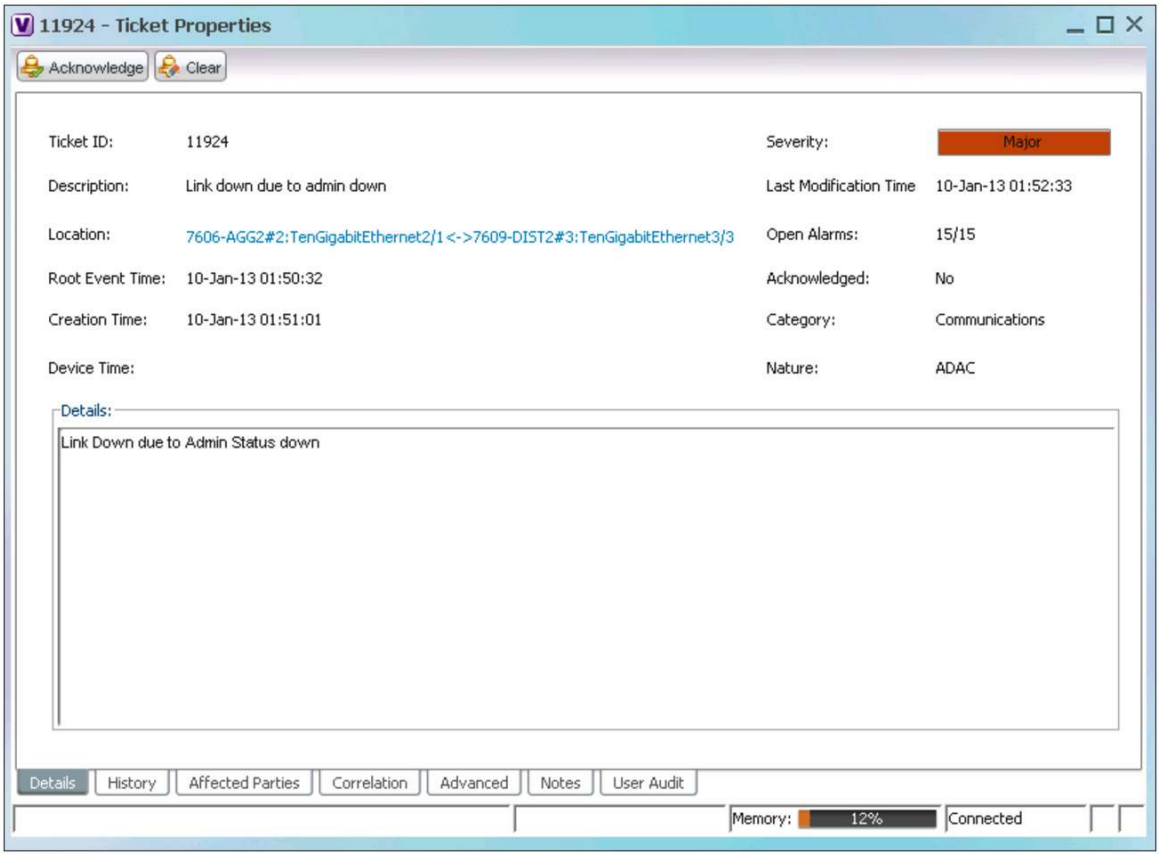
Another challenge that operators face is managing the convergence of optical and IP networks and the migration to all-packet transport networks. This has special significance in management of mobile backhaul, where demand for mobile data is forecast to grow backhaul capacity at a compound annual growth rate (CAGR) of 58 percent between 2011 and 2016, according to a 2012 study by iGR. Adapting the RAN to handle traffic using traditional time division multiplexing (TDM) and Synchronous Digital Hierarchy (SDH) methods is expensive and complex and, as the volume of traffic grows over the next few years, it simply won't be able to scale sufficiently. To fully realize the benefits of new technologies like LTE and small cell, operators must address the fundamental challenge of unclogging the RAN backhaul, adding capacity cost-effectively by utilizing the greater efficiencies of IP-based networking technologies. Yet optical TDM-based backhaul infrastructure won't go away right away, and operators must be able to efficiently and cost-effectively manage the optical domain alongside IP-based, Carrier Ethernet equipment. This is the focus of Cisco Unified RAN backhaul.

Cisco Prime Optical helps ease this transition by simplifying management of the optical domain through the ability to use a GUI-based interface for provisioning of optical circuits and the fault, performance, and configuration management of TDM and SDH technologies. Its integration with Cisco Prime Central and Cisco Prime Network for IP RAN backhaul, along with the other applications in the Cisco Prime for Mobility suite, provides the ability to efficiently configure, provision, and manage both optical and IP domains with much greater ease.

Once again, operational scale and lower TCO are prominent benefits of this component of the Cisco Prime for Mobility suite that relies on automation and ease of use to support both legacy and next-generation infrastructure and services. With detailed topology maps that allow navigation to details on optical devices, Cisco Prime Optical helps operators to efficiently execute end-to-end circuit creation and manage every point within the converged optical network.

Complementary to Cisco Prime Optical is **Cisco Prime Network**, Figure 11, which provides a simplified and automated approach to network device discovery, configuration, and change management as well as fault monitoring and troubleshooting for the packet and IP domain.

Figure 11. Cisco Prime Network Alarm with Correlation



Proactive service assurance is a reality with the introduction of integrated workflows across the RAN backhaul and LTE EPC. These workflows include topology-guided troubleshooting, including virtual connectivity discovery, root-cause identification, and alarm reduction through topology-based correlation and de-duplication. The result of this level of integration and automation for device management is lower TCO, greater operational scale, and higher customer satisfaction and loyalty as service disruptions are minimized and dealt with swiftly and proactively.

Additional savings are possible with Cisco Prime for Mobility through avoidance of complex integration processes associated with OSSs/BSSs and other third-party management applications. Cisco Prime Central provides a standards-based NBI based on TM Forum standards and MTOSI 2.0 standards-based APIs for easy integration with inventory systems. All other components of the Cisco Prime for Mobility suite also provide these interfaces.

Additional Features of the Cisco Prime for Mobility Suite

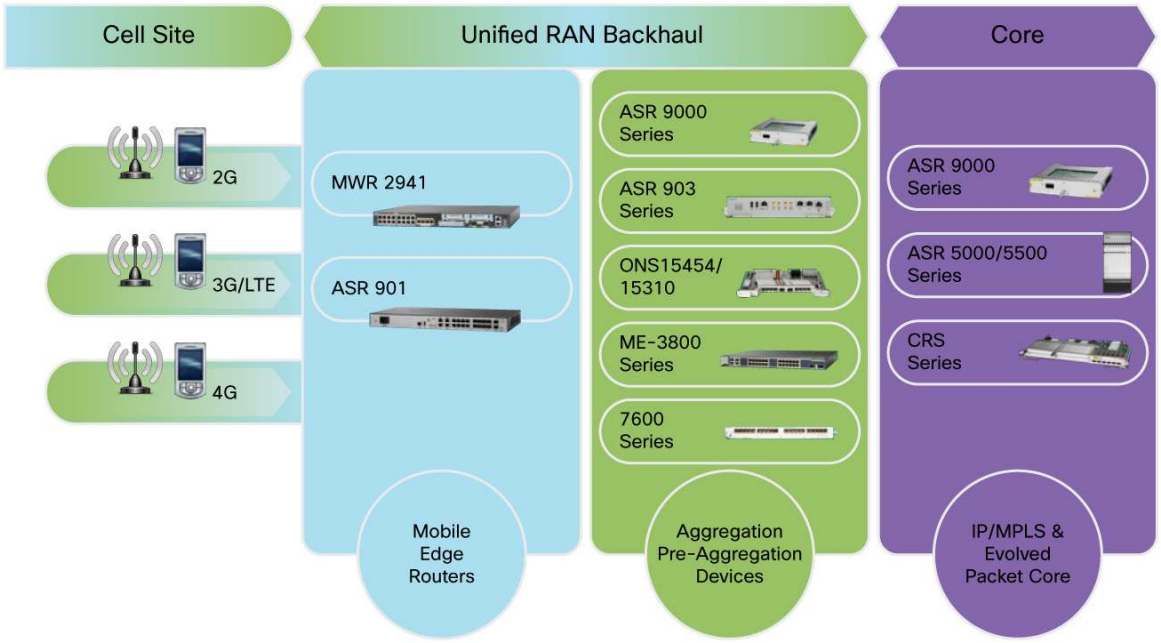
Cisco Prime for Mobility provides integration with Cisco InTracer, a powerful tool that provides critical and real-time session, application, and network information by using the high performance data collection capabilities of the Cisco ASR 5000 and ASR 5500. The solution introduces real-time streaming analytics, enabling administrators to take action in real-time (for example, to implement policy changes based on analysis of data). In fault management, Cisco Prime for Mobility has the ability to identify the fault nature, type, and probable cause and to provide recommended actions.

Cisco Prime for Mobility can be deployed on a single server using VMware. Most deployments are on separate servers for each component. Clustered configurations are also supported for greater scalability.

Cisco Platforms Supported by Cisco Prime for Mobility

Cisco Prime for Mobility supports leading Cisco platforms used by mobile operators around the world, Figure 12.

Figure 12. Examples of Cisco Platforms Supported by Cisco Prime for Mobility



These include:

- **Core network:**

  The Cisco ASR 5000 and Cisco ASR 5500 core multimedia services platforms for the EPC are deployed in many of the world's leading mobile operator networks. They deliver the performance needed for high-demand multimedia mobile services, intelligence to enhance the subscriber experience, high availability, and architectural flexibility in a rapidly changing market.

  Cisco ASR 5500 sets a new standard for intelligent performance that redefines the economics of the packet core. It is the first mobile platform designed for terabit performance that scales to tens of millions of sessions.

The Cisco ASR 9000 Series Aggregation Services Routers can serve as the foundational baseline for next-generation Carrier Ethernet networks, providing up to 96 terabits per second (Tbps) per system. The Cisco ASR 9000 system incorporates innovative technologies such as Cisco Network Virtualization (nV) technology, which intelligently blends the edge, aggregation, and access points to simplify operation and accelerate IPv6 services. Two new nV-enabled platforms provide additional flexibility and support to optimize service delivery.

The Cisco CRS-1 Carrier Routing System is the industry's only fully modular and distributed core routing system that enables service providers to deliver a suite of data, voice, and video services over the IP NGN infrastructure. It can scale up to 92 Tbps, powering the first OC-768c/STM-256c IP and dense wavelength-division multiplexing (DWDM) interfaces and supporting up to 1152 40-Gbps line cards of Packet-over-SONET (PoS), WDM, and Ethernet interfaces.

- **Aggregation and preaggregation network:**

  The Cisco ONS 15454 SONET Multiservice Provisioning Platform (MSPP) provides the functions of multiple network elements in a single platform. It supports common interfaces such as DS-1, DS-3, and EC-1 and data solutions including 10/100/1000 Mbps Ethernet solutions with OC-3 through OC-192 optical transport bit rates and integrated DWDM wavelengths.

  The Cisco ONS 15300 Series of SONET/SDH MSPPs are advanced access and aggregation optical platforms that include nonredundant and redundant optical transport options, Gigabit Ethernet, 10/100 Ethernet, DS1, E1, E3, and DS3 services.

  The Cisco 7600 Series is the industry's first carrier-class edge router to offer integrated, high-density Ethernet switching, carrier-class IP/MPLS routing, and 10-Gbps interfaces. It has a high performance, with up to 720 Gbps in a single chassis, or 40 Gbps capacity per slot and a choice of form factors purpose-built for high availability.

  The Cisco ME 3800X Series Carrier Ethernet Switch Router is a converged, full-featured aggregation platform purposely designed for the mobile, business, and residential markets. With low power consumption and high service scale, this 1-rack-unit (1RU) switch router is optimized for small aggregation and remote point-of-presence (POP) applications making it a highly cost-effective option.

  The Cisco ASR 903 Router is a full-featured aggregation platform designed for the cost-effective delivery of converged mobile and business services and is optimized for small aggregation and remote POP applications.

- **Mobile access network:**

  The Cisco MWR 2900 Series Mobile Edge Wireless Routers and ASR 901 are cell-site access gateways designed to optimize, aggregate, and transport mixed-generation RAN traffic and support efficient and cost-effective backhaul of RAN traffic from the cell site over T1, E1, Carrier Ethernet, Multiprotocol Label Switching (MPLS), and IP transport networks.

Summary

Cisco Prime for Mobility provides a centralized, intuitive, and easy-to-use workflow-oriented, end-to-end management solution for mobile operators grappling with the challenges of the next-generation mobile Internet. With Cisco Prime for Mobility, administrators can manage large numbers of devices and services with a single consolidated view supporting both legacy and next-generation equipment as mobile operators continue to transition from legacy 2G to 3G/LTE and 4G networks. Cisco Prime for Mobility is optimized for multivendor networks and it helps enable the swift introduction of new services, fast provisioning, a wide array of tools to improve the customer experience, and an approach and architecture to lower an operator's TCO. While Cisco's competitors are introducing management tools based on partnerships with third-party OSS and BSS vendors, Cisco has applied decades of networking expertise to offer a solution that helps customers protect and extend their existing investments, optimize network operations, and prepare the network for new applications and technologies coming to the Mobile Internet.

About Cisco Prime

The Cisco Prime portfolio of IT and service provider management offerings empowers organizations to more effectively manage their networks and the services they deliver. Built on a service-centered foundation, Cisco Prime supports integrated lifecycle management through an intuitive workflow-oriented user experience, providing A-to-Z management for IP Next-Generation Networks, mobility, video, and managed services.

For More Information

Cisco provides other innovative solutions for mobile service providers. For a comprehensive list of products for service providers, visit: cisco.com/go/prime-sp.

For more information on the preintegrated Cisco Prime for Mobility suite, visit http://www.cisco.com/go/prime-mobility.

Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV Amsterdam,
The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at www.cisco.com/go/offices.

Printed in USA C11-727749-00 04/13