Alcatel-Lucent 5650 Control Plane Assurance Manager

Alcatel·Lucent

Extending IP/MPLS Management with Integrated Control Plane Management and Visibility

Overview

A significant portion of service failures, provisioning problems and troubleshooting delays can be directly attributed to control plane mis-configuration, undetected routing topology changes and the lack of simple tools that could be used to understand the control plane's impact on services. These operational inefficiencies lead to a number of business problems for service providers.

They make it difficult to provide more consistent service delivery quality. They impact the ability to offer stricter service level agreements (SLAs) that can differentiate service offerings. And they make it impossible to cost-effectively scale Internet protocol/multi-protocol label switching (IP/MPLS) operations because network operators must rely on scarce IP routing experts to manually resolve Layer 2 and 3 service and MPLS infrastructure provisioning problems caused by the routing plane.

The Alcatel-Lucent 5650 Control Plane Assurance Manager (CPAM) closes this gap in IP/MPLS management. It offers real-time control plane visualization, proactive control plane surveillance, configuration validation, and control plane diagnosis. In addition, by seamlessly integrating with the Alcatel-Lucent 5620 Service Aware Manager (SAM), the 5650 CPAM provides simplified diagnosis and intuitive visualization of the relationship between services, the MPLS infrastructure and the routing plane.

Solving Control Plane Operational Issues with the 5650 CPAM

Service providers offering business critical services and delivery sensitive residential applications such as video can't afford to let their customers down. Their reputation for consistent service delivery quality and adherence to SLAs is crucial. Since IP and MPLS provide the control plane technology that allows services to be rerouted around failures, leaving this critical technology unsupervised and manually operated can lead to unintended SLA violations. In addition, relying on scarce IP routing experts to provision and troubleshoot the MPLS infrastructure and services is not efficient for mainstream operations.

The Alcatel-Lucent 5650 CPAM offers routing architects and network operators an effective tool that can be used to isolate and resolve control plane problems, and understand the impact of control plane changes on services [Table 1].

The 5650 CPAM delivers this functionality based on real-time control plane information provided by the Alcatel-Lucent 7701 Control Plane Assurance Appliance (CPAA). The 7701 CPAA is a route listening and route processing hardware device that non-intrusively participates in routing plane signaling. It is based on Alcatel-Lucent's proven and evolving service router operating system (SR-OS).

Table 1. Solving Service Provider Issues with the 5650 CPAM

CUSTOMER ISSUE	HOW THE 5650 CPAM ADDRESSES THE ISSUE	BENEFITS
Error-prone and time-consuming manual verification of control plane configuration and topology	Graphical control plane topology validation and diagnosis	Accelerates verification and troubleshooting of the control plane and reduces service MTTR and ability to offer stricter SLAs
Services are sometimes impacted by routing changes that are invisible to network operations	Proactive control plane surveillance and instant visualization of control plane, IP and MPLS path changes 5620 SAM SLA monitoring integrated with 5650 CPAM MPLS tunnel monitoring for instant impact analysis of tunnel changes on service delivery	Proactive control plane change detection and impact analysis enables service providers to offer stricter service SLAs
Lack of simple control plane tools integrated with service and network views impede network operators from resolving service/MPLS provisioning fall-outs and service failures related to the control plane; operators must rely on highly-paid and scarce IP routing resources	Simple graphical representation of the control plane topology and diagnosis tools 5620 SAM service (Layer 2 and 3), MPLS tunnel and OAM trace overlay on the 5650 CPAM control plane topology view	Enables the service provider to cost-effectively scale operations by enabling network operators to understand the relationship between service/tunnels and the control plane in order to resolve provisioning issues, without the help of scarce IP experts

Re-Defining IP/MPLS Management

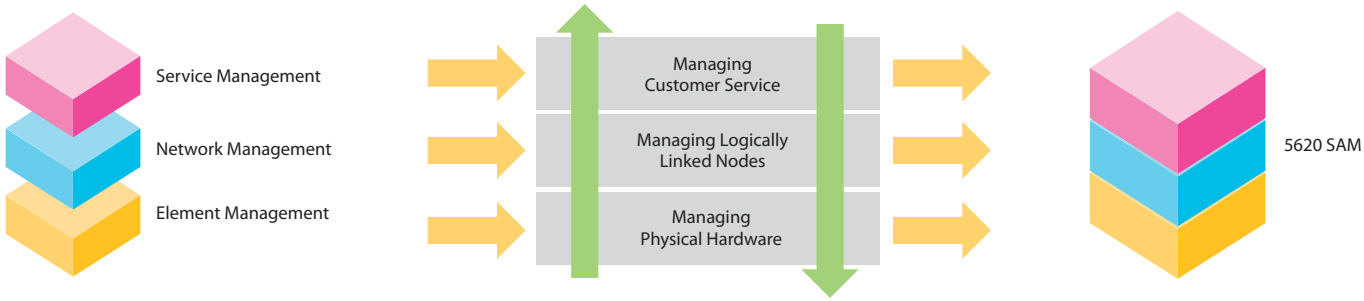
While IP/MPLS control plane protocols are crucial to enabling unprecedented cost-effectiveness for rerouting around failures, the majority of today's management applications from other equipment vendors do not concern themselves with monitoring the operational state of the control plane, providing topology visualization or validating its configuration. The reason for this management gap is historical.

The first successful, large scale, IP-based networks were deployed to support residential high speed Internet (HSI) connectivity. This high volume, low cost, best-effort service did not warrant the need for sophisticated management software to track service SLAs. Aside from an emphasis on using IT methods to flexibly provision subscribers, IP operations for this type of network relied on low value element management systems (EMS) to configure and monitor basic infrastructure.

But the advent of mission critical business services and service delivery sensitive subscriber services such as video — all riding over an IP/MPLS infrastructure — has changed service providers' management needs. Simplifying service provisioning, reducing MTTR and assuring a high quality of service has become paramount.

Alcatel-Lucent responded to this need by introducing comprehensive element, network and service management in one platform — the Alcatel-Lucent 5620 Service Aware Manager [Figure 2].

Figure 2. Alcatel-Lucent 5620 SAM Provides Element, Network and Service Management in ONE platform



The 5620 SAM allows operators to focus on managing services. It intelligently correlates corresponding network objects and the effect of their status on service delivery. This service management model provides multi-technology and multi-layer service provisioning, service alarm management, service/customer impact analysis, auto-generated service test suite and service mediation (service statistics, alarms, inventory and provisioning) for operation support systems (OSS).

By fully integrating the 5650 CPAM's control plane management capability with the 5620 SAM's leading element, network and service management, Alcatel-Lucent offers a next generation management model that meets service provider's expectation of a carrier class IP/MPLS management solution.

To take carrier class network and service management to the next level, service providers need the ability to pro-actively manage the intelligent protocols that make routing decisions that are invisible to the management plane.

With the addition of the 5650 CPAM, Alcatel-Lucent closes that remaining management gap by offering proactive control plane surveillance, validation, diagnosis and seamless integration with the 5620 SAM's comprehensive service and MPLS infrastructure management tools.

Industry's First Integrated Service and Control Plane Management Solution

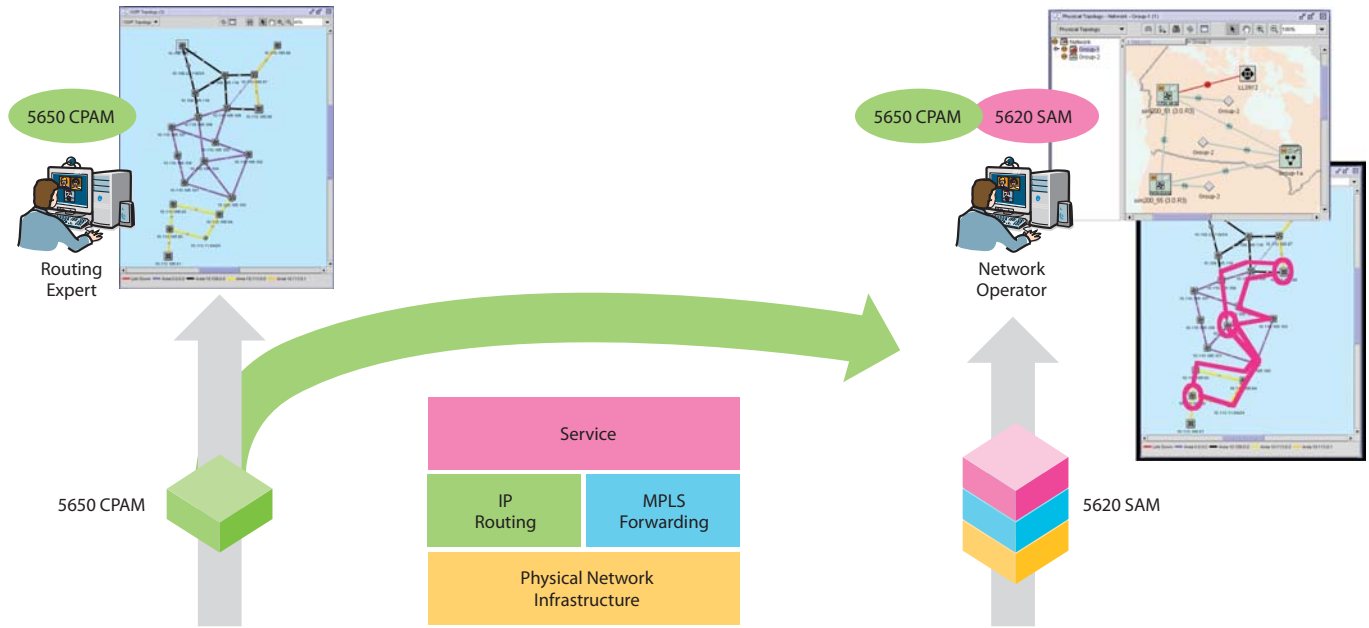
The Alcatel-Lucent 5650 CPAM revolutionizes IP/MPLS management. It is the industry's first off-the-shelf equipment vendor solution that enables network operators to overlay Layer 2 and 3 services, MPLS tunnels, and OAM traces on the control plane topology map. By doing this, it allows network operators to visualize multiple layers in one simple integrated view, which enables them to understand the relationship between these layers and their effect on each other.

The seamless navigation and integration between the 5620 SAM and the 5650 CPAM allows network operators to visualize service paths through the routed network. It also allows service providers to understand path changes through a comparison of historical and current paths.

Service troubleshooting time is further reduced by allowing operators to instantly determine whether a control plane topology change caused a variation in service quality.

By empowering network operators with simple visual tools that automatically track and correlate complex control plane topology, the 5650 CPAM decreases troubleshooting time and reliance on IP routing experts to solve provisioning or customer reported problems. This comprehensive approach, although incremental in nature for Alcatel-Lucent 5620 SAM customers, represents a new foundation for managing IP/MPLS networks. It integrates element, network, and service and control plane management into a single IP/MPLS management solution [Figure 3].

Figure 3. Re-defining IP/MPLS Operations with Integrated Service and Control Plane Management



Leveraging the Market Leading Alcatel-Lucent Service Router Portfolio

By leveraging best-in-class and proven technologies from the Alcatel-Lucent service router portfolio, the comprehensive 5650 CPAM can efficiently be deployed in a service provider's environment without introducing significant risk or cost [Figure 4].

The real-time control plane information is provided to the 5650 CPAM by the Alcatel-Lucent 7701 CPAA, which non-intrusively participates in routing plane signaling. This appliance provides firsthand knowledge of control plane topology and operational status of all routers in the network, including third party routers. In addition, the 7701 CPAA processes user generated requests for real-time path computation that can span multiple areas. All 7701 CPAAs in a network are centrally configured and managed by the 5620 SAM.

The 5650 CPAM is seamlessly integrated with the 5620 SAM to provide in-context navigation from provisioned services, tunnels, label switched paths (LSPs) and historical OAM traces. It re-uses the 5620 SAM physical infrastructure and user interface menus, thereby allowing service providers to leverage their 5620 SAM server platform, database and training investment.

Similarly, the well established 5620 SAM OSS interface is extended to provide a single, common northbound interface for both products. This approach reduces the complexity associated with introducing a new application in a service provider's network environment.

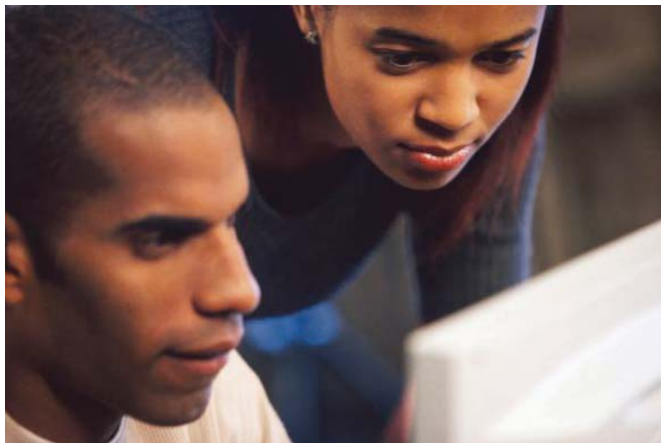
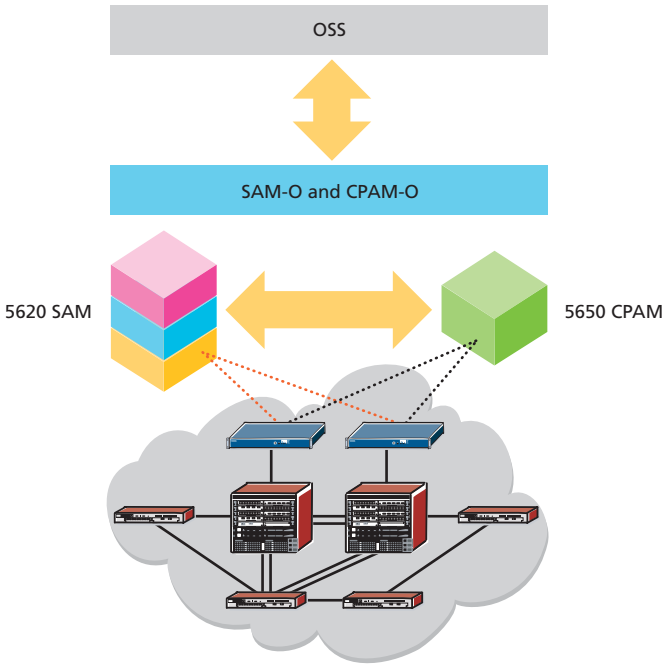


Figure 4. Alcatel-Lucent 5650 CPAM Deployment in a Service Provider's Network



Key Features

The Alcatel-Lucent 5650 CPAM routing topology map displays relationships between all reachable routers in the administrative areas, including third party routers. This multi-vendor feature enables operators to unify control plane management under one management model and further simplifies multi-vendor, routed core management.

Proactive Control Plane Surveillance

The Alcatel-Lucent 5650 CPAM provides a number of mechanisms that monitor control plane health.

With proactive control plane surveillance, an alarm generated by the 5650 CPAM alerts operators that the routing plane is undergoing changes that exceed a configurable limit. Operators can navigate to a control plane topology map where all new or deleted IP routes are color coded to help them zero in on the routes affected by the routing updates [Figure 5].

The collected routing events can then be inspected for details about the changes that have occurred. In addition, operators can locate specific routes and LSPs that were affected by the changes and highlight the changes to discover whether the control plane behaved as expected.

The 5650 CPAM also enables specific source destination combinations to be actively monitored for routing changes using the MPLS tunnel and IP route monitoring feature. Should changes be detected, the 5650 CPAM records the new route, which can later be highlighted and compared to the previous (historical) routes.

Control Plane Visualization, Validation and Diagnosis

The Alcatel-Lucent 5650 CPAM graphically displays the entire control plane topology, including routers from third party vendors. It uses different colors for each administrative routing area and different icons to represent different router roles [Figure 6].

Figure 5. Color-Coded Route Changes From Baseline

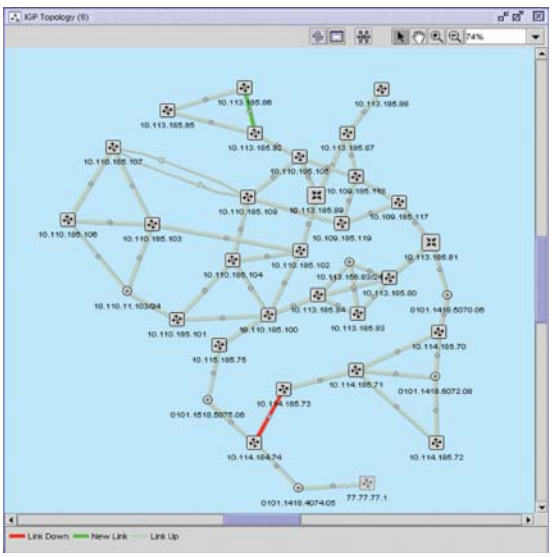


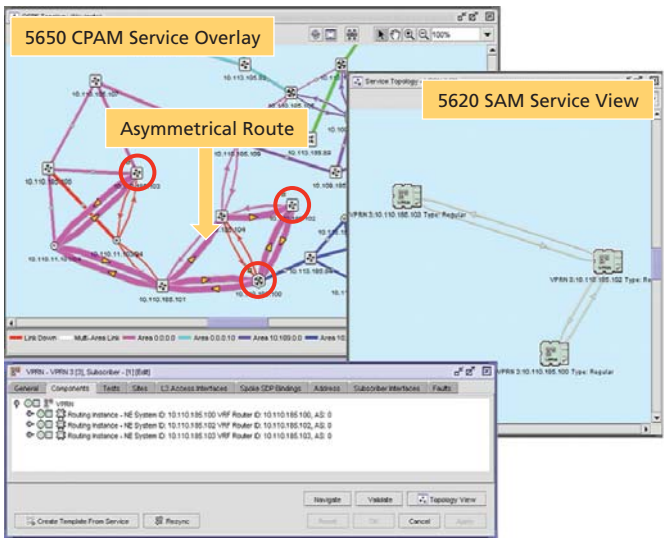
Figure 6. Multi-area OSPF Topology Display

In addition to this intuitive visual topology display, routing architects can trigger various queries that will compute multi-area, end-to-end routes based on real-time routing information. The results are highlighted on the topology maps.

For troubleshooting MPLS protocols, the 5650 CPAM provides superimposed MPLS and IP protocol peering. This helps operators detect incomplete MPLS or IP peering that affect the MPLS protocol's operation.

The 5650 CPAM also includes a powerful control plane configuration search engine that detects and highlights traffic engineering configurations that deviate from standard implementations (e.g. different traffic engineering parameters, incomplete peering, available bandwidth configuration, etc.)

Figure 7. Expanding the Alcatel-Lucent 5620 SAM Service Topology View with Underlying Control Plane Topology



5620 SAM Layer 2 and 3 Service, MPLS Tunnels and OAM Trace Overlays

The virtual private routed network (VPRN), virtual private line service (VPLS), virtual private wire service (VPWS) composite services, MPLS tunnels and LSPs provisioned (active and alternate paths) in the 5620 SAM can be highlighted over the 5650 CPAM control plane map. This feature allows operators to understand the path used to traverse the network, the number of hops along the path, whether the forward/return paths follow the same route and view all provisioned alternate paths for a given LSP [Figure 7].

Should the 5620 SAM SLA monitoring feature report service quality degradation, a network operator can extract the OAM trace results for the corresponding MPLS tunnel (path) from the 5620 SAM and verify if the path was recently changed. Any changes are graphically highlighted over the control plane topology map to provide a visual comparison between previous and current paths, which might account for the sudden change in service quality.

While provisioning network infrastructure or services, network operators now have visualization and diagnostic tools at their fingertips that allow them to identify what is causing provisioning fall-outs. For example, should an LSP fail to become operational, the network operator can verify that all IP and MPLS protocols are operational, and use path computations with different parameters to identify whether the lack of available bandwidth is causing the problem.

In short, whether solving provisioning fall-outs, service failures or proactively detecting control plane issues, the Alcatel-Lucent 5650 CPAM offers a range of features that enable routing architects and network operators to link service and control plane management and simplify IP/MPLS operations [Table 2].

Table 2. Alcatel-Lucent 5650 CPAM Solves Control Plane Issues

5650 CPAM FEATURE	PROACTIVE CONTROL PLANE SURVEILLANCE	VISUAL VALIDATION AND DIAGNOSIS	TROUBLESHOOTING SERVICES & TUNNELS FOR OPERATORS
Multi-Area, Color Coded Graphical Topology Views		x	x
Superimposed MPLS and IGP Views		x	x
Multi-vendor IP Topology Display		x	x
MPLS Tunnel & IP Route Monitoring	x		x
Real-time Topology Tracking from Baseline	x		x
Routing Event Browser	x	x	x
Threshold Crossing Alarms on Routing Events	x		x
SPF, Equal Cost Route, Forward Reverse Highlights		x	x
MPLS Tunnel and IP Route Highlight		x	x
Incomplete IGP, LDP, RSVP Perrring Detection		x	x
Control Plane Parameter Search/Highlight		x	x
VPRN, VPLS, VPWS, Composite Service Highight			x
MPLS Tunnel, LSP and Protection Path Highlight			x
Service and MPLS Tunnel OAM Trace Highlight	x		x

Innovative IP/MPLS Management with Alcatel-Lucent

Alcatel-Lucent believes that operational efficiency has a critical impact on a service provider's success with the deployment of new revenue generating services, such as business virtual private networks (VPNS) and triple play residential services over an IP/MPLS network.

For this reason, Alcatel-Lucent continues to develop innovative network management tools and processes. This ongoing innovation allows Alcatel-Lucent to offer a comprehensive portfolio of management applications that enable service providers to improve and scale their operations, reduce time-to-market and differentiate their service offerings.

The 5650 CPAM enables proactive monitoring, intuitive diagnosis and simple routing design validation. But it is its seamless integration with the Alcatel-Lucent service aware management portfolio that truly elevates this solution as the new standard for carrier class IP/MPLS management.

Service providers understand that adopting IP/MPLS as the technology of choice requires them to develop an operational capability that will support their growth. Alcatel-Lucent has a long tradition of excellence in network management and leadership in carrier Ethernet solutions, and continues to set the network and service management bar far beyond basic element management systems.

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