



Alcatel 5620 SAM

Service Aware Manager | Release 2.1

GENERAL INFORMATION



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Preface

Alcatel recognizes that today's world-class service providers and its customers require excellence in service delivery. In the IP world, routers must deliver better than best-effort Internet access and must provide customer assurance tools that outperform those developed for enterprise networks.

As world networks evolve towards a user-centric broadband network model, Alcatel can facilitate the migration by combining its carrier-class networking experience with solutions that:

- help service providers implement cost-effective, MPLS-enabled Ethernet solutions
- deliver triple play capability, providing voice, video and data services across the same connection
- optimize service delivery using integrated management solutions to deliver the services that customers demand

MPLS-enabled Ethernet services

More enterprises are increasing their use of high-bandwidth applications, and are interconnecting LANs and data centres within a metro area. At the same time, these businesses are under constant pressure to cut expenses. To address these market dynamics, service providers are looking to Ethernet as the technology of choice.

The 5620 Service Aware Manager (5620 SAM) software applications support the MPLS-enabled, service-oriented architecture that is required to deliver innovative Ethernet services. The 5620 SAM offers service resiliency, provides service-oriented QoS capabilities, supports seamless service interworking, and reduces operational expenses.

Triple play solution

Today, customers demanding an expanded range of service offerings also want simplicity and convenience in the delivery of those services. The 5620 SAM supports the triple play solution that addresses these complex demands by offering voice, video and data services from a single telecommunications service provider, over a common, shared infrastructure.

The triple play provides more convenience and value for the consumer, thus increasing revenue and customer loyalty. Thanks to major advances in video compression and common IP standards, triple play services are now offered across a range of smaller pipes, from Digital Subscriber Line (DSL) technologies to broadband wireless.

What the 5620 SAM delivers

The 5620 SAM software applications provide an integrated management solution. Since its introduction, more than 40 customers have chosen to strengthen their services with the management capabilities of the 5620 SAM.

The 5620 SAM manages the nodes that deliver cutting edge Layer 2 and Layer 3 services, and provides the network management platform tools to manage OPEX and CAPEX economically, while quickly enabling revenue-generating services.

The 5620 SAM provides integrated functionality combined with a service-oriented architecture that offers:

- a carrier -grade management suite
- superior OAM troubleshooting tools to pre-test services, manage faults, and provide quick responses to customer inquiries
- rapid service activation to start your customers' traffic flowing
- the creation of differentiated services with managed SLAs
- template-based policy management to pinpoint QoS and traffic flow controls
- easy-to-use GUI management tools for operators to reduce OPEX
- flexible management solutions for small networks with a limited hardware footprint to large networks with multi-technology, multi-service deployments
- reliable and growth-oriented choice of platforms, including complementary OSS integration into multivendor networks

The following chapters describe how the 5620 SAM implements these key functions.

- Chapter 1—IP innovation: Services management
- Chapter 2—Reliable platforms for growth
- Chapter 3—Selling and managing customer services
- Chapter 5—Networking made easy
- Chapter 4—Managing network CAPEX and OPEX
- Chapter 6—Integrated fault management and OAM
- Chapter 7—Securing your IP network edge
- Chapter 8—Open interfaces and OSS integration
- Appendix A—Standards compliance
- Appendix B—Associated documents

Contents

1 IP innovation: Services management	1
What is service routing	2
What is the 5620 SAM.....	2
Ease of service configuration	4
Multiple device support	8
Internet Enhanced Service (IES).....	9
IP Virtual Private Network (IP VPN)	10
Virtual Leased Line (VLL).....	11
Virtual Private LAN Service (VPLS)	13
Virtual LAN (VLAN)	14
Multicast technology and the triple play solution.....	16
2 Reliable platforms for growth.....	19
Management architecture	19
Supported deployment sizes.....	23
3 Selling and managing customer services	25

Creating services made easy	26
Service templates	26
Managing subscribers and services	27
Policies and QoS	29
Accounting and performance monitoring using statistics	37
4 Networking made easy	41
Routing protocol and signaling support and implementation	41
MPLS and LSPs	46
Multicast routing	48
Bridging on Telco devices.....	49
5 Managing network CAPEX and OPEX.....	51
Implementation of functionality	52
Configuration management.....	53
Viewing and managing inventories	58
Topology management.....	60
Resynchronization with network elements	61
End-to-end, integrated management solutions	62
6 Integrated fault management, OAM, and service mirroring	65
Intelligent alarm fault management	66
Service assurance with diagnostics	68
Service mirroring.....	72
7 Securing your IP network edge	75
Security end-to-end	76

8	Open interfaces and OSS integration	81
	The Alcatel difference.....	81
	Alcatel connected partner program	82
	Alcatel professional services	87
	How the XML open interface works.....	87
A	Associated documents	89
	Glossary.....	91
	Index.....	113

Contents



IP innovation: Services management

The Alcatel 5620 SAM is designed to manage the equipment that delivers Layer 2 and Layer 3 VPN and IP/MPLS-based services to customers. An easy-to-use GUI implements all key FCAPS functionality to help reduce OPEX and increase operational efficiencies. The software simplifies the configuration and management of key services, such as VPLS and IP VPNs (also known as VPRNs).

Key benefits for customers:

- higher bandwidth capabilities
- differentiated service loads
- outsourced service management

Key benefits for service providers:

- OSS integration support for flow-through process automation
- QoS and policy configuration across the network
- subscriber-associated service management

1. IP innovation: Services management

What is service routing

Traditional IP routers offer best-effort Internet service, interoperable routing protocols, and interface-based billing. A service router enables enhanced Internet services, scalable routing protocols, and service-based billing. Compare the capabilities of service routers with traditional IP routers in Table 1.

Table 1: Traditional IP routers versus the 5620 SAM managed router solution

Capability	Traditional IP routers	5620 SAM-managed service routers
Provisioning	Allow you to provision one port at a time using a CLI, which is a time-consuming process prone to configuration errors.	Allow you to provision per-service with per-service QoS. Simple template-based provisioning allows rapid service deployment on a large scale. Allow you to quickly configure parameters using operator-friendly sequential GUIs, or templates that you can set once and apply often for services with similar configurations.
Troubleshooting	Allow you to troubleshoot the interface using limited Telnet and CLI methods such as ping and traceroute.	Allow you to troubleshoot the service using the 5620 SAM, determine how packets will get to the destination and whether the: <ul style="list-style-type: none">• service is reachable end to end• service tunnel is reachable end to end• MPLS LSP unidirectional tunnels are working in both directions• configurations match end to end
Billing	Allow you to bill by interface.	Allow you to collect and bill for multiple customers and services on the same interface, yet specify differentiated policies for each of those customers and services.

What is the 5620 SAM

The 5620 SAM portfolio creates a service aware management system that provides tightly-integrated, comprehensive Fault, Configuration, Accounting, Performance, and Security (FCAPS) functionality for networks. Service aware management maintains a direct relationship between individual managed

network resources and the services and subscribers using those resources. This provides operators the insight and tools to rapidly determine the impact of network issues on managed services, including:

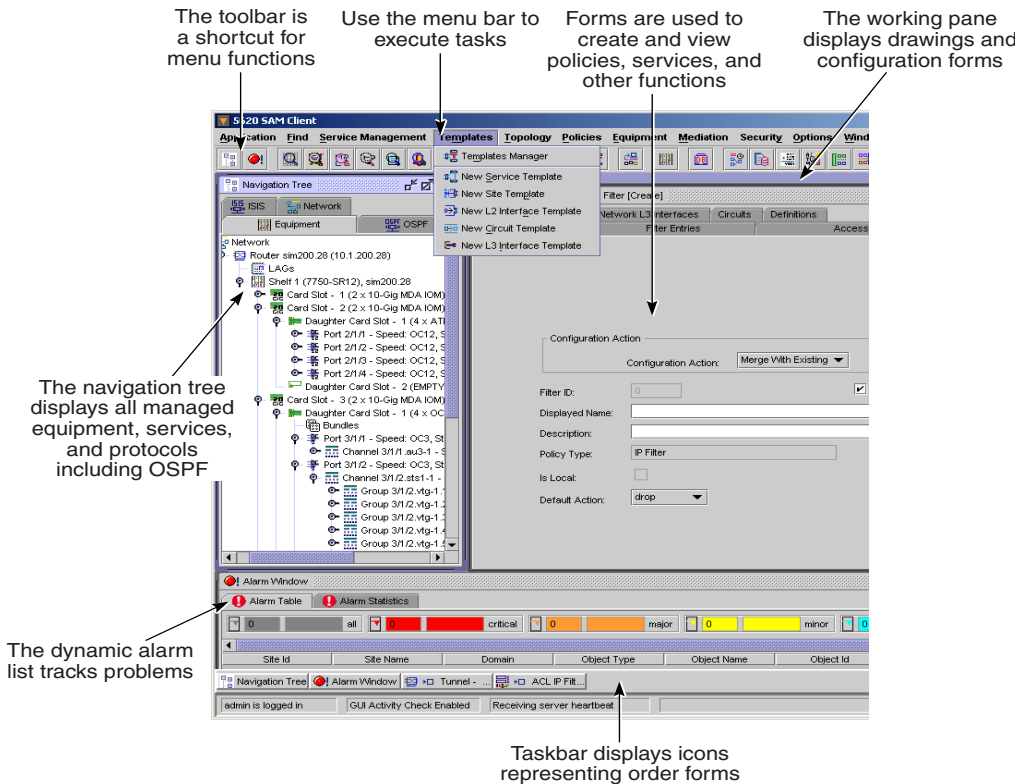
- intelligent alarm management and correlation using per-alarm configuration actions and color-coded active alarms to eliminate duplicate reporting and alarm logs to analyze trends
- reduced provisioning times using point-and-click GUI configuration templates and forms for network IP/MPLS, profiles, and services configuration
- comprehensive set of statistics counters on a per-service or per-port basis to enable operators to accurately measure usage and bill customers for service based on any combination of flat-rate, destination-based, or usage-based models
- real-time retrieval of current or historical performance statistics or service statistics
- simple configuration of services and policies to create differentiated SLAs
- pinpoint security controls for operator access privileges based on individual or group account settings, and controlled access to the router

5620 SAM client GUI

The GUI provides the easy-to-use interface for operators to perform 5620 SAM functions. Figure 1 shows the major GUI components.

1. IP innovation: Services management

Figure 1: GUI components



17184

Ease of service configuration

In five general steps, you can deploy complex services.

1. Commission the network devices.
2. Configure the core IP or IP/MPLS network.
3. Configure the relevant QoS, filter, and other policies.

1. IP innovation: Services management

4. Create a subscriber.
5. Configure a service for the subscriber.

Table 2 describes, in more detail, the procedure to set up any service using the 5620 SAM GUI.

Table 2: Configuring services

Task	Subtask	5620 SAM menu option
Hardware configuration	Configure: <ul style="list-style-type: none">• devices• slots• cards• ports• channels	Equipment→Equipment Manager
	Display default shared queue configuration	Policies→Shared Queue Policy Manager
	Configure network queue policies	Policies→Network Queue Policy Manager
Telco configuration	Configure QoS policies for Telco devices	Policies→Telco→Telco Node QoS Level Policy Manager
	Configure access list policies for Telco devices	Policies→Telco→Telco ACL Standard IP Filter Manager
		Policies→Telco→Telco ACL Extended IP Filter Manager
		Policies→Telco→Telco ACL IGMP IP Filter Manager
Policies→Telco→Telco ACL MAC IP Filter Manager		

(1 of 3)

1. IP innovation: Services management

Task	Subtask	5620 SAM menu option
Network configuration	Configure routing	Equipment→Equipment Manager or Select an object from the network navigation tree
	Configure routing policies	Policies→Routing Policy Manager
	Configure network policies	Policies→Network Policy Manager
	Configure MPLS policies	Policies→Admin Group (MPLS) Policy Manager
	Configure LSPs	Topology→MPLS Path Manager Topology→LSP Manager
	Configure 802.1X server authentication policies	Policies→802_1x Policy Manager
	Define traffic parameters for ATM connections.	Policies→ATM QoS Policy Manager
	Configure multicast channels in a ring group	Policies→Multicast Package Policy Manager
	Configure service tunnels	Topology→Service Tunnel Manager
Service-related policy configuration	Configure access ingress policies	Policies→Access Ingress Policy Manager
	Configure access egress policies	Policies→Access Egress Policy Manager
	Configure scheduling policies	Policies→Scheduler Policy Manager
	Configure slope policies	Policies→Slope Policy Manager
	Configure accounting policies	Policies→Accounting Policy Manager and Policies→File Policy Manager
	Configure access list policies	Policies→ACL IP Filter Manager Policies→ACL MAC Filter Manager

(2 of 3)

1. IP innovation: Services management

Task	Subtask	5620 SAM menu option
Subscriber configuration	—	Service Management→Manage Subscribers
Service configuration	Create VLL service Create VPLS Create IES Create IP VPN service Create VLAN service	Service Management→Create Service

(3 of 3)

Figure 2 shows a sample service configuration form using the 5620 SAM client GUI.

Figure 2: Configuring services

The screenshot displays the 'Create Service - Subscriber - Default customer [1]' window. On the left, a 'Steps' sidebar lists seven steps, with '1. Define Service Type' highlighted. The main area, titled 'Define Service Type', contains the following fields:

- Service ID: A text box containing '0' and a checked 'Auto-Assign ID' checkbox.
- Service Name: An empty text box.
- Description: An empty text box.
- Type: A dropdown menu currently set to 'VPLS'.

At the bottom of the window, there are four navigation buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

1. IP innovation: Services management

Multiple device support

The 5620 SAM supports the following devices:

- 7750 SR
- 7450 ESS
- Telco

The 5620 SAM supports different releases of each device. For example, the 5620 SAM can manage a 7750 SR Release 2.1 and an older 2.0 release.

What are the 7750 SR and 7450 ESS

The 7750 SR and 7450 ESS are the industry's first scalable, purpose-built IP/MPLS service nodes. Both are highly integrated products. If one of these nodes is already in the network, the addition of the other, to enhance, expand or add Ethernet services support, will require minimal operational effort by the service provider.

With their service-oriented architecture and built-in OAM features, the nodes provide efficient and profitable SLA-based services, such as:

- Internet Enhanced Service
- IP Virtual Private Networks (7750 SR only)
- Virtual Leased Lines
- Virtual Private LAN Service
- VLAN Service

Each of the service types can be used to offer the different types of Metro Ethernet solutions.

What does the Telco device provide

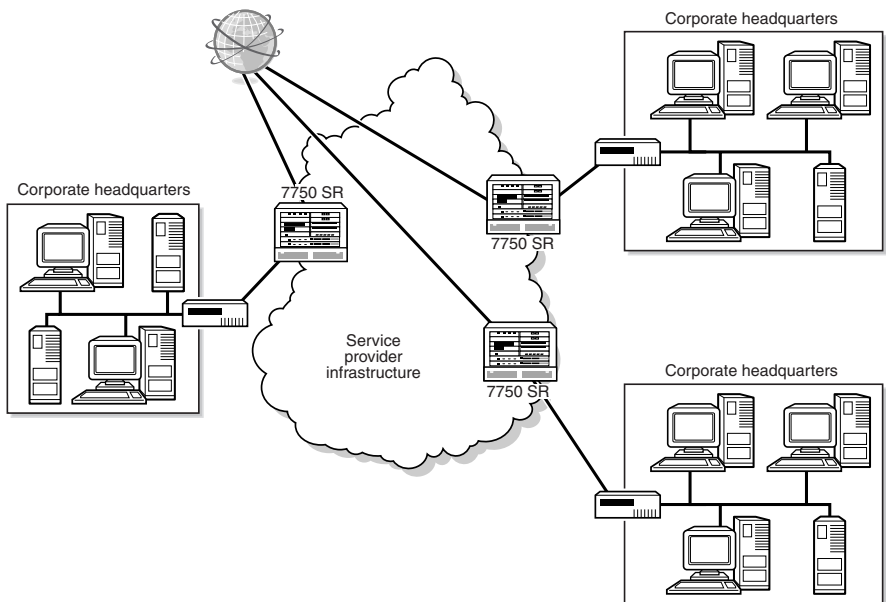
The Telco Ethernet devices provide Ethernet and service-aware Ethernet aggregation across IP/MPLS networks. They are access devices used as managed customer location equipment or multi-tenant unit aggregation. The devices are used in ring groups to distribute L2 VPN, Internet, and broadcast services from VPLS or VLL services on 7450 ESSs across VLANs to subscribers.

Internet Enhanced Service (IES)

IES is a routed connectivity service where the customer communicates with an IP router interface to send and receive Internet traffic. IES supports line-rate and subrate services and a variety of billing models, including usage- and destination-based billing.

Figure 3 shows an example of an IES.

Figure 3: IES



17252

Key benefits of IES

- To the customer, it seems as though there is a direct connection to the Internet.
- The service provider can apply billing, ingress and egress shaping, and policing to the traffic.

1. IP innovation: Services management

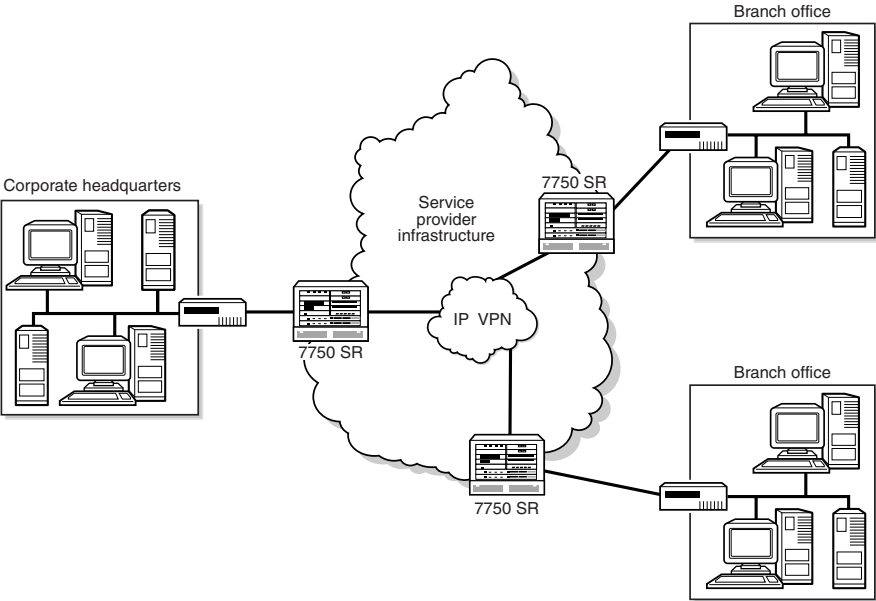
IP Virtual Private Network (IP VPN)

Based on RFC 2547bis, the IP VPN, sometimes called VPRN, is a class of VPN that allows the connection of multiple sites in a routed domain over a provider-managed IP/MPLS network. The managed routers provide virtual routing and forwarding for IP VPNs, and extend the service reach nationally or globally using the IP/MPLS backbone.

Supported IP VPNs include Ethernet, Packet over SONET, and Frame Relay access circuits. This support enables service providers to deliver a flexible range of service options to enterprise customers.

Figure 4 shows an example of an IP VPN.

Figure 4: IP VPN



17253

Key benefits of IP VPN

- To the customer, all sites appear as though they are connected to a single router , with the service provider's edge routers operating as an integrated part of the customer network.
- The service provider may connect multiple customer networks to the same provider edge router to share infrastructure resources.
- Smaller customers can “outsource” the complexity of routing to the service provider.
- It provides better route control and address aggregation.
- This highly scalable service supports, per router, up to 2000 IP VPN customers, 1 000 000 routes, and 2000 BGP peers.
- The service is easily deployed and managed using the 5620 SAM portfolio.

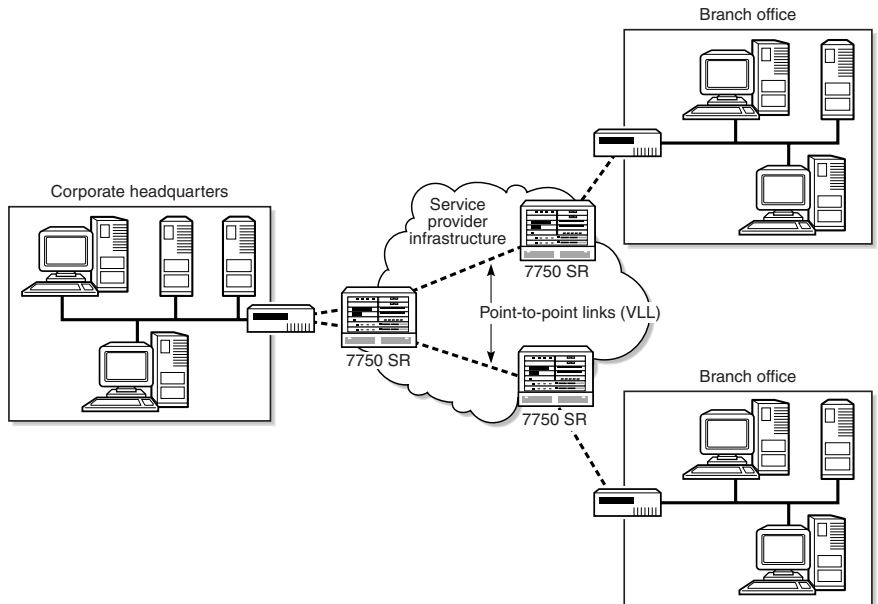
Virtual Leased Line (VLL)

VLL service offers an efficient replacement of traditional private and leased line service, leveraging the statistical multiplexing benefits of a packet-based network. The VLL service offers Ethernet point-to-point connections, where customer data is encapsulated and transported across a service provider's IP/MPLS network.

Figure 5 shows an example of an VLL service.

1. IP innovation: Services management

Figure 5: VLL service



Key benefits of Ethernet VLL

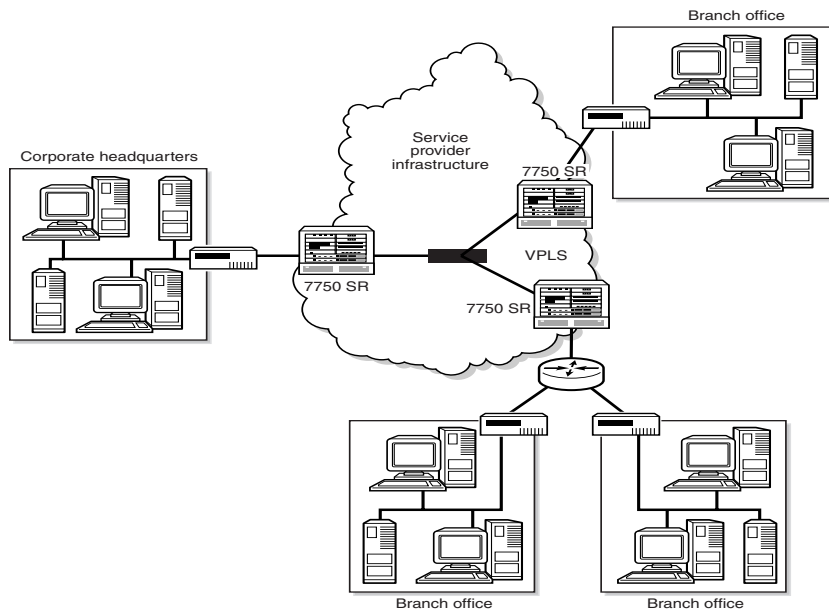
- To the customer, it seems as though a private or leased line exists between the two locations.
- The service provider can offer managed SLAs with the service and apply billing, ingress and egress shaping, and policing to all traffic.
- Each 7750 SR system supports up to 64 000 VLLs, and all of them are managed from the same 5620 SAM platform.
- The VLL service is fully transparent to Layer 3 data and protocols.
- The VLL service has locally significant VLAN tagging.
- The service is easily deployed and managed using the 5620 SAM portfolio.

Virtual Private LAN Service (VPLS)

VPLS is a class of VPN that allows the connection of multiple sites in a single, bridged domain over a service provider's IP/MPLS network. This market-leading service allows customer sites to be in the same LAN, regardless of their location. The simplification of the customer-provider boundary allows enterprise customers to seamlessly integrate their LANs and WANs.

Figure 6 shows an example of an VPLS.

Figure 6: VPLS



17251

1. IP innovation: Services management

Key benefits of VPLS for the service provider's customer

- All sites are connected to a single, switched virtual LAN.
- VPLS is a transparent, protocol-independent, multipoint service.
- The Ethernet LAN-WAN interface reduces equipment complexity, which lowers the cost of ownership; removes the Layer 2 protocol conversion between LAN and WAN; and requires no training on WAN technologies, such as frame relay.
- Customers retain complete control over routing, allowing WAN connectivity with little involvement by the service provider.
- The addition of new sites is easy and requires no reconfiguration at existing sites.

Key benefits of VPLS for the service provider

- The service provider can reuse the IP/MPLS infrastructure to offer multiple services.
- split horizon group management to handle traffic flow
- The service provider can apply billing, ingress and egress shaping, and policing to the traffic, delivering per-service SLAs.
- First-line technicians are not involved with customer routing issues.
- The addition of new sites requires no reconfiguration at existing sites.
- VPLS enables faster service and bandwidth provisioning.
- Each router supports up to 4000 services and 128 000 MAC addresses, and the 5620 SAM manages all the services on multiple routers.
- The VPLS has locally significant VLAN tagging, reducing complexity and management overhead.
- H-VPLS support enables service providers to use either MPLS spokes or stacked VLANs (Q in Q) to delimit and identify different customers
- The service is easily deployed and managed using the 5620 SAM portfolio.

Virtual LAN (VLAN)

A virtual (or logical) LAN is a local area network with a definition that maps workstations on some basis other than geographic location (for example, by department, by user type, or by primary application). The BiNOS Virtual LAN (VLAN) management allows you to change or add workstations and manage load-balancing and bandwidth allocation more easily because it has a physical map of the LAN. The BiNOS keeps track of the VLAN by relating the virtual map of the LAN to the actual physical picture.

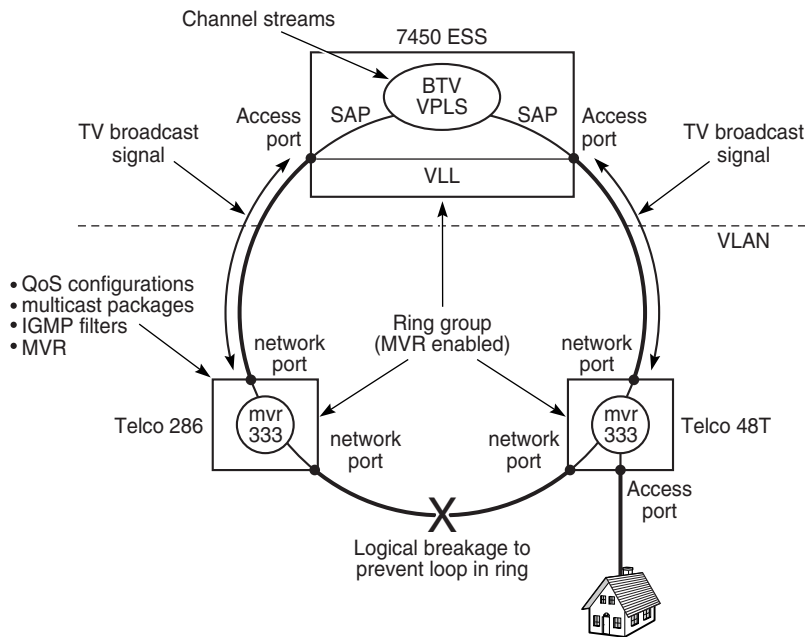
1. IP innovation: Services management

The 5620 SAM supports the creation of VLAN services using Telco devices configured as provider edge devices.

VLAN ring groups are used to send traffic across an Ethernet ring using copper or fiber optic connections from the source traffic device, for example, from a 7450 ESS to all devices in the ring. Automatic STP configuration on the Telco devices ensures that there is a constant stream of traffic in either direction. If there are any breaks in the physical links between Telco devices, the traffic is rerouted.

Figure 7 shows a sample VLAN broadcast service configuration.

Figure 7: Sample VLAN configuration for BTV



17814

1. IP innovation: Services management

Key benefits of VLAN

- VLAN management allows you to change or add workstations and manage load-balancing and bandwidth allocation easily.
- The service is easily deployed and managed using the 5620 SAM portfolio.
- VLAN configuration supports the delivery of multicast-based services, including:
 - broadcast television
 - shared Internet access
 - business L2-VPN
 - VoIP

Multicast technology and the triple play solution

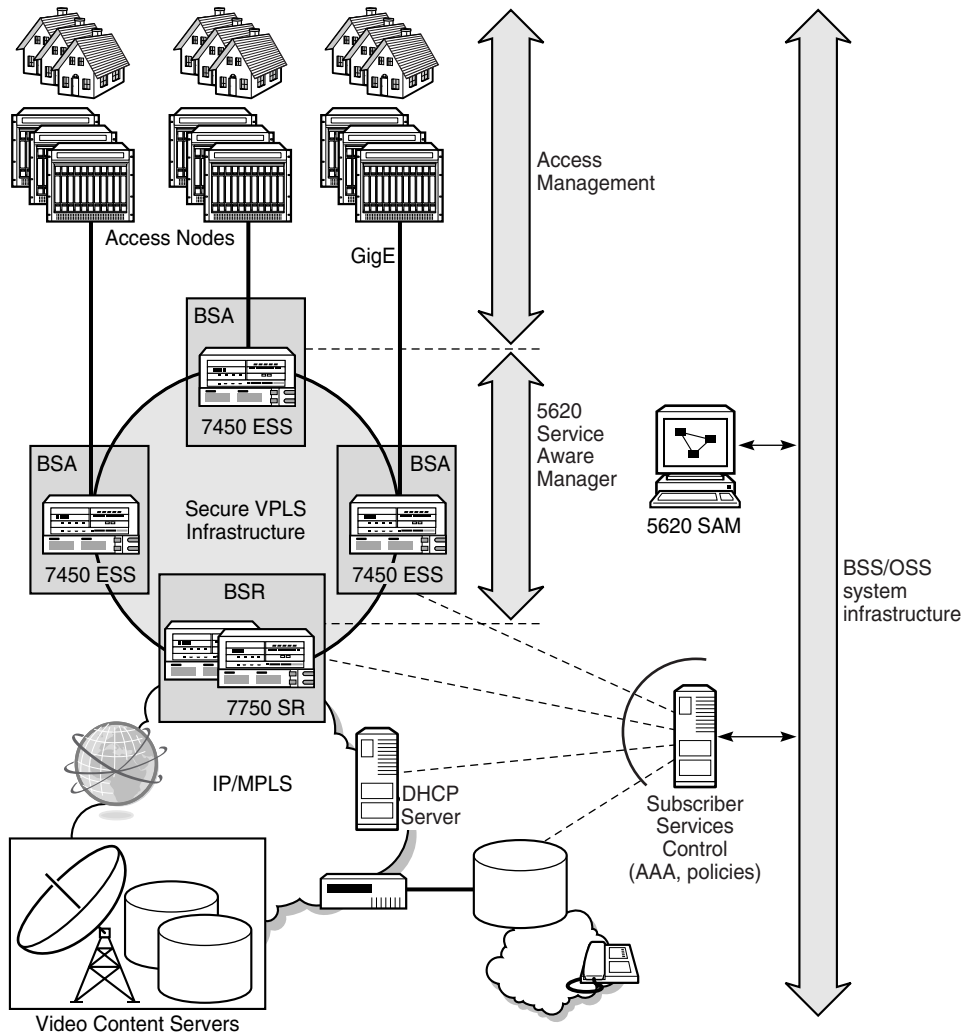
Multicast technology is key to the delivery of voice, video, and data-based information to multiple receivers from a single source. Alcatel's triple play solution relies on the implementation of several 5620 SAM multicast-enabling features, including:

- IP multicast addressing
- multicast routing (PIM)
- dynamic registration (IGMP)

The 5620 SAM enables the provisioning of multicast-based services through an Ethernet aggregation network, as shown in Figure 8. The 5620 SAM assures profitability by providing each service with the required service availability and QoS, by guaranteeing that available bandwidth in the aggregation network is optimally used, and by providing an efficient operational environment to manage the services.

1. IP innovation: Services management

Figure 8: Multicast delivery using the 5620 SAM



BSA = Broadband Service Aggregator
BSR = Broadband Service Router

17816

1. IP innovation: Services management

2

Reliable platforms for growth

Services need management platforms to efficiently scale your business operationally. Build services on cost-effective platforms, and grow the network as sales grow.

Management architecture

The 5620 SAM is designed to run on a number of platforms and operating systems, allowing the service provider to maximize investments in the NOC infrastructure or to invest in a lower-cost infrastructure. For example, the 5620 SAM server can operate on a Sun platform running Solaris 9, and clients can run on Windows PC platforms.

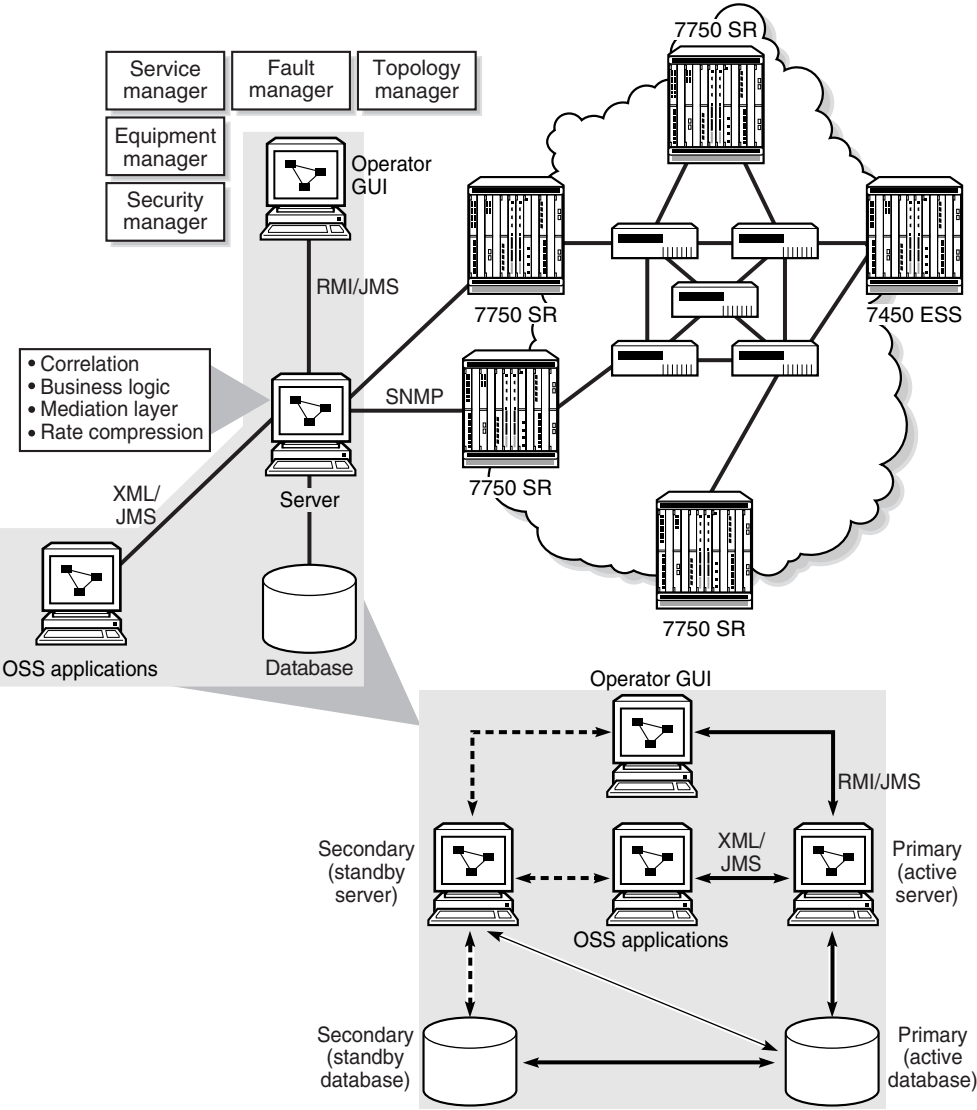
2. Reliable platforms for growth

The 5620 SAM was designed to reliably handle large-scale, high-bandwidth service delivery. The easy-to-install system uses an object-oriented, distributed architecture that allows:

- improved scaling
- a higher transaction load
- load balancing
- redundancy of components to ensure management availability
- in-band and out-of-band management configuration for management redundancy to protect against link failures
- scheduled management IP address pings to test reachability
- easy-to-install APIs that support OSS components using an JMS/XML interface
- ease-of-integration with the 5620 NM, Release 7.0 or later, to provide end-to-end management
- interworking support for other network management applications including the 1354 BM and HP OpenView NNM
- multiple upgrade scenarios

Figure 9 shows the 5620 SAM management architecture.

Figure 9: 5620 SAM management architecture



17815

2. Reliable platforms for growth

Redundancy

Redundancy between the 5620 SAM applications provides continuity of management even when the hardware or software of one or more 5620 SAM components fails. Redundancy also provides:

- disaster recovery capabilities
- in-service upgrade scenarios
- maximum database protection
- GUI monitoring of redundancy status
- automatic server reconnection from database switchover

5620 SAM components

Each piece in the architecture operates on a separate server or server cluster. This improves scaling and introduces load balancing, which improves performance. For example, the 5620 SAM can process up to 1000 SNMP traps a second and an operator can save a complex VLL service configuration in less than two seconds. Table 3 lists the management architecture components, and how each component is designed to provide robust network management.

Table 3: 5620 SAM components

Component	Use	Advantages
5620 SAM database	Stores data using a tailored, embedded Oracle database. Redundancy offers automatic failover from primary to standby database.	Separate database tier architecture improves transaction rates. Warm redundancy provides data security in the event of a database failure.

(1 of 2)

2. Reliable platforms for growth

Component	Use	Advantages
5620 SAM server	<p>Correlates data and provides rules and associations between subscribers, services, equipment, and faults.</p> <p>Business logic provides a rules engine and correlation function.</p> <p>Mediation layer provides multiple interfaces to the managed routers.</p> <p>Information model to map to the database.</p>	<p>Multiple interfaces, such as SNMP and Telnet, to the managed network.</p> <p>Provides the XML interface and tools to integrate OSS applications in a multivendor management environment.</p> <p>Implements rules and correlation to ensure changes to services configuration and alarms are updated to all necessary components of the managed network.</p> <p>Warm redundancy provides data security in the event of a failure.</p>
5620 SAM client	<p>Java-based operator GUI that allows operators to provision, manage, and monitor services in a secure environment.</p>	<p>Full suite of management applications are accessible from any network management console.</p> <p>Operator requests are validated before being submitted to the 5620 SAM database by the 5620 SAM server.</p>

(2 of 2)

Supported deployment sizes

The platform flexibility allows the 5620 SAM to support large-scale deployments:

- 250 000 services
- 30 simultaneous operational clients
- 10 000 outstanding alarms
- 1000 I/O slots that contain up to 2000 MDAs and 30 000 ports
- 20 000 network interfaces, 30 000 LSPs, and 60 000 service tunnels (SDPs)
- 1 000 000 circuits
- 4000 VLAN IDs per access port
- unlimited statistics files, user and performance logs, and alarm history record databases, assuming adequate storage is available

Planning expertise is available from Alcatel. The *5620 SAM Planning Guide* specifies deployment considerations.

2. Reliable platforms for growth

3

Selling and managing customer services

The 5620 SAM portfolio—especially the 5620 SAM-P provisioning tools and the 5620 SAM-A service assurance tools—provides an easy-to-use GUI that facilitates the rapid deployment of services. The key benefits to the service provider and the customer are:

- improved communication between the customer care organization and the operations staff
- simplified QoS configuration to offer the exact services customers need to create differentiated services with managed SLAs
- increased operator confidence in handing over fully operational services, that meet agreed to parameters, to the customer
- increased customer confidence and satisfaction by giving operators the tools to review services quickly if problems are detected

3. Selling and managing customer services

Creating services made easy

The advantages of the 5620 SAM-P module include:

- end-to-end service configuration using an easy-to-follow sequence of configuration forms
- configuration of VLL, VPLS, IES, and VPRN services using templates
- listing hardware and software utilization statistics on a per-service basis
- creation of policies, which specify the classification, policing, shaping, and marking of traffic for multiple services
- tightly integrated fault management that correlates equipment problems with the services that use the equipment
- tightly integrated OAM tools
- changing a single service component (such as a service) rather than multiple ports on multiple devices
- separating tunnel configurations and transport from the services that they carry

Service templates

Templates simplify service creation by reducing the number of steps required to create a service because generic service templates can be preconfigured, removing repetitive entry of data for each new service. With the 5620 SAM-A, you can use templates to configure VLL, VPLS, IES, and VPRN services.

Service template functionality provides an economical division of resource allocation: experienced operators can be involved in template creation, and less-skilled operators can be tasked with service-provisioning template requirements.

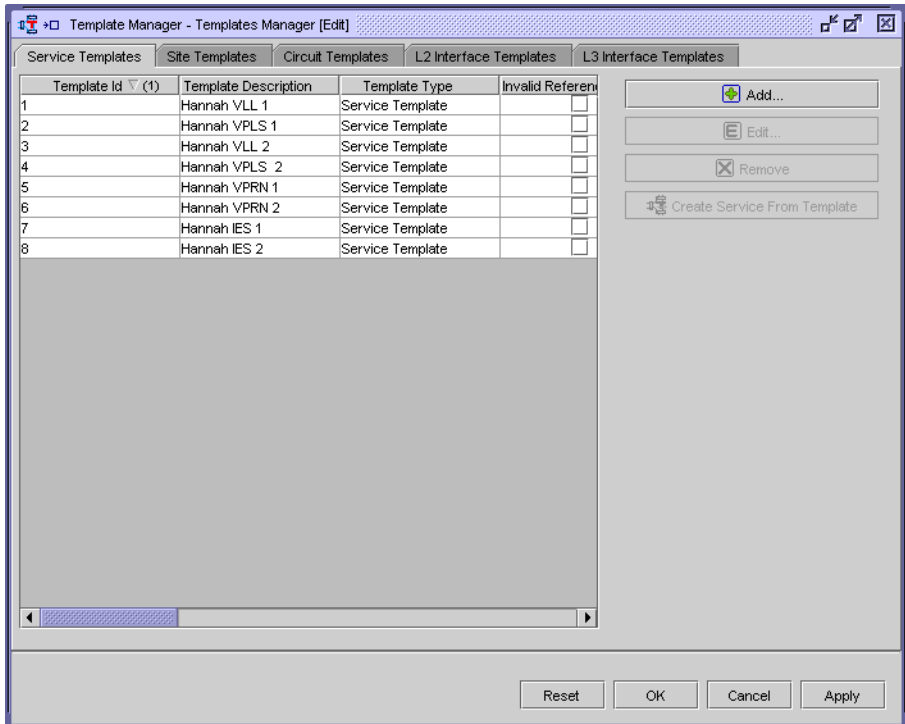
Operators can use the 5620 SAM-A service templates to:

- create a new service template
- create a service template using an existing template
- create a service template from an existing service
- create a service site template (all services)
- create an L2 access interface template (VLL,VPLS) within the service template
- create an L3 access interface template (IES, VPRN) within the service template
- allow support for overriding template values in a service instance

3. Selling and managing customer services

You can create, modify, or delete service templates using the Template Manager form, as shown in Figure 10.

Figure 10: Template Manager form

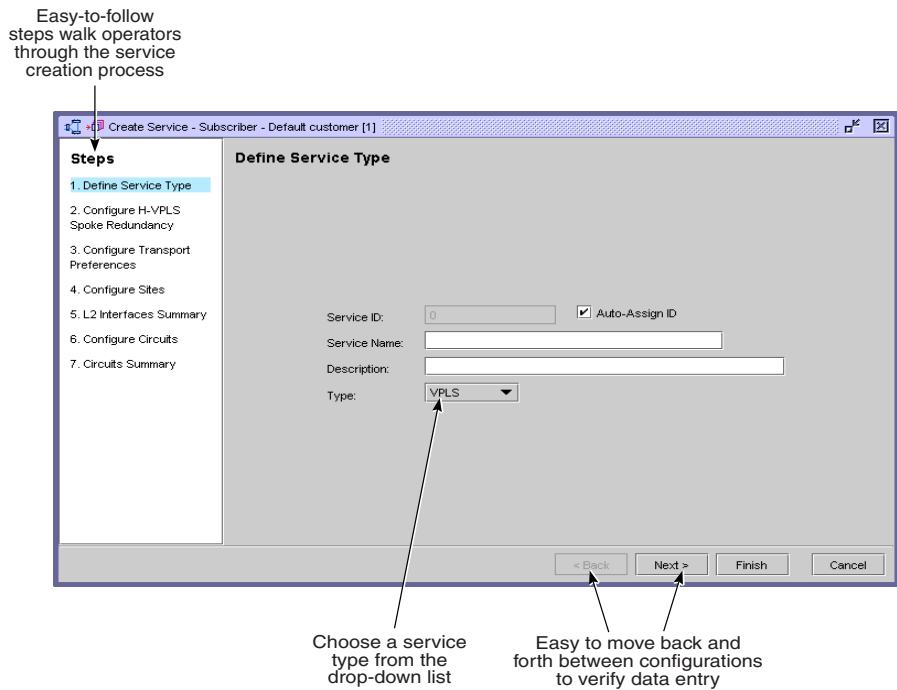


Managing subscribers and services

Figure 11 shows the components of the easy-to-use, configuration form-based 5620 SAM service configuration form.

3. Selling and managing customer services

Figure 11: Service configuration form



17244

The 5620 SAM allows you to easily manage subscribers and, using the subscriber ID, associate subscribers with a service.

From the 5620 SAM-A Browse Services form, you can view a selected service and the associated subscriber, as well as monitor the service's status, resources, alarms, and statistics. Figure 12 shows the information that is displayed for a VPLS.

3. Selling and managing customer services

Figure 12: VPLS form

View all the equipment used to enable the service

Check faults and run diagnostics for selected service

Service - VPLS service-5 [5] [Edit]

General Transport Forwarding Control Sites L2 Interfaces Circuits Maintenance Faults

Subscriber

Subscriber ID: 1 Subscriber Name: Default customer View ...

Service ID: 5

Service Name: VPLS service-5

Description: N/A

Type: VPLS

H-VPLS Spoke Redundancy

Management-VPLS (M-VPLS): false

Remove Topology View

Copy... Create Template From Service Resync Reset OK Cancel Apply

17243

Policies and QoS

The 5620 SAM-P supports the creation of rules that govern how network traffic is handled and prioritized. These rules are called policies. There are four types of policies:

- service management
- routing management
- network management
- Telco management

3. Selling and managing customer services

Service management policies specify how service traffic is handled by network resources such as interfaces, ports, cards, and circuits. These policies can be used by multiple resources on multiple services. Examples of service management policies include access ingress, access egress, and network policies.

Routing management policies specify routing configuration according to specifically defined parameters. There are two routing management policies; routing policies and MPLS administrative group policies.

Service and routing management policies are globally and seamlessly distributed to routers when they are used by resources on the router. They can also be manually distributed to routers. Policy configurations can also be changed locally when you configure a network resource, for example, during service configuration or modification.

Network management policies specify how the 5620 SAM communicates with network resources, handles alarms, manages statistics used for billing, and stores information. Examples of network management policies include alarm, mediation, and accounting policies.

The 5620 SAM-P supports the creation and modification of policies using configuration forms. For example, Figure 13 shows an Access Ingress Policy creation form.

3. Selling and managing customer services

Figure 13: Access Ingress Policy creation form

Access Ingress Policy, Global Policy [Create]

MAC Match Criteria Definitions Access L2 Interfaces L3 Interfaces Relations

General Queues Forwarding Classes Dot1p Dscp Precedence IP Match Criteria

Configuration Action

Configuration Action: Merge With Existing ▼

ID: 0 Auto-Assign ID

Displayed Name:

Description:

Properties

Default FC: be ▼ Priority: low ▼

Default Sub FC: Clear

Reset OK Cancel Apply

Table 4 describes in more detail the available policy types.

3. Selling and managing customer services

Table 4: Policies

Policy type	Policy	Applied to	Description
Service management	Access Ingress	Access interface	<p>Defines ingress classification, policing, shaping, and marking on the ingress side of the interface.</p> <p>This policy defines ingress service forwarding class queues and map flows to those queues. When an access ingress policy is created, it always has two queues defined that cannot be deleted: one for default unicast traffic and one for default multipoint traffic.</p>
	Access Egress	Access interface	<p>Defines egress classification, policing, shaping, and marking on the egress side of the interface.</p> <p>This policy defines egress service queues and map forwarding class flows to queues. In the simplest access egress policy, all forwarding classes are treated like a single flow and mapped to a single queue.</p>
	Network Policy	Network interface	<p>Defines egress QoS marking and ingress QoS interpretation for traffic on core network IP interfaces.</p> <p>On ingress, a network policy maps incoming DSCP and EXP values to the forwarding class and profile state for traffic received from the core. On egress, the policy maps the forwarding class and profile state to DSCP and EXP values for traffic to be transmitted to the core.</p>
	Slope	Access port (slope only)	<p>Defines RED slopes behavior for the access port, network daughter card, or port. Buffer pools are created to dedicate buffer resources for a set of queues. The buffers for a queue are allocated from a single buffer pool based on the queue's forwarding class.</p>
	Network Queue	Network daughter card Network port	
	Shared Queue	Network daughter card	<p>Defines the distribution of traffic over the core network.</p> <p>A shared queue policy can be applied to daughter cards for optional use by SAPs. The 5620 SAM provides one shared queue policy that cannot be deleted or modified.</p>
	Scheduler	Access ingress interface Access egress interface	<p>Defines hierarchical rate limiting and scheduling to govern queue scheduling.</p> <p>Scheduler policies determine the order in which queues are serviced. All ingress and egress queues operate within the context of a scheduler.</p>
	802_1X	Ethernet ports	Defines the RADIUS server authentication policy for Ethernet ports.

(1 of 3)

3. Selling and managing customer services

Policy type	Policy	Applied to	Description
Service management	ACL IP Filter	Network interface Access interface Circuit	Controls network or access traffic into or out of an interface or circuit based on IP or MAC match criteria. IP and MAC filter policies specify a forward or drop action for packets based on information specified in the match criteria.
	ACL MAC Filter	Access interface Circuit	
	ATM QoS	Access interface	Defines ATM ingress and egress classification, policing, shaping, and marking. The ATM QoS policy specifies settings to customize ATM traffic parameters including service category and shaping.
Network management	Alarm	Alarm logs Alarms	Defines how the network management system handles individual incoming alarms, and how alarm logs are created and stored.
	File	—	Manages file policies related to how data is collected and stored on the router before being transferred to the network management system.
	Accounting	Interfaces Service Circuit	Manages accounting policies related to the specified counters and scheduling of accounting statistics collected from the routers.
	Mediation	5620 SAM	Defines how the network management system communicates with the network.
	Poller	5620 SAM	Defines how the network management system polls the network for updates, and sets per-MIB polling rules.
Routing management	Routing	Routing instance	Manages route policies.
	Admin Group (MPLS) policy manager	MPLS interfaces LSPs LSP paths	Configures MPLS administrative groups and defines the groups to which an MPLS interface, LSP, or LSP path belongs.

(2 of 3)

3. Selling and managing customer services

Policy type	Policy	Applied to	Description
Telco management	Multicast Package	Broadcast TV VLAN services	Defines the set of broadcast channels that are multicast across a ring group in a BTV VLAN.
	Telco Node QoS Level	Telco devices and ports	Defines QoS policies applied to a Telco device.
	Telco ACL Standard IP	Telco devices and ports	Controls network traffic on Telco VLANs based on IP address and subnet mask matching criteria.
	Telco ACL Extended IP	Telco devices and ports	Controls network traffic on Telco VLANs based on several IP matching criteria.
	Telco ACL IGMP	Telco devices and ports	Manages how BTV subscribers access multicast BTV streams.
	Telco ACL MAC	Telco devices and ports	Controls network traffic on Telco VLANs based on MAC matching criteria.

(3 of 3)

QoS includes:

- eight forwarding classes of services, from high priority to best effort
- 8000 ingress and 8000 egress queues per card
- queue buffering per card at an average of 200 ms of ingress and 200 ms of egress buffering at 10 Gb/s
- H-QoS, which provides a common set of virtual schedules to manage bandwidth over a set of customer services

QoS allows IP services to have various forwarding classes. A forwarding class provides network elements with a method to weigh the relative importance of one packet over another in a different forwarding class.

Queues are created for a specific forwarding class to determine how the queue output is scheduled into the switch fabric and the type of parameters that the queue accepts. The packet's forwarding class—along with the in-profile and out-of-profile state—determines how the packet is queued and handled at each hop along its path to a destination egress point. The eight forwarding classes are described in Table 5.

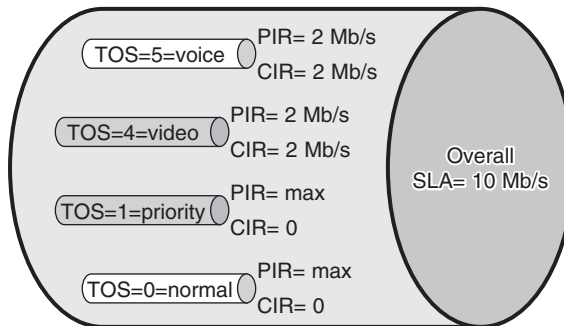
3. Selling and managing customer services

Table 5: Forwarding classes

ID	Name	Class type	Intended for
7	Network Control	High-Priority	Network control traffic
6	High-1		Delay- or jitter-sensitive traffic
5	Expedited		Delay- or jitter-sensitive traffic
4	High-2		Delay- or jitter-sensitive traffic
3	Low-1	Assured	Assured traffic (default for network management traffic)
2	Assured		Assured traffic
1	Low-2	Best-Effort	Best-effort traffic
0	Best-Effort		Best-effort traffic

In Figure 14, the overall SLA is set at 10 Mb/s with varied committed information rates (CIRs) and peak information rates (PIRs) per type of service. When higher priority traffic is below its CIR, the 'spare' bandwidth becomes available and lower priority traffic can burst up to the overall PIR of 10 Mb/s.

Figure 14: Per-service QoS



17274

The 5620 SAM supports H-QoS scheduling mechanisms. H-QoS provides the ability to manage bandwidth across multiple queues from single or multiple access interfaces for customer services.

3. Selling and managing customer services

The building blocks for H-QoS include a series of easy-to-configure policy configuration forms:

- Scheduler policies to define a hierarchy of virtual schedulers that govern queues. Participation in scheduler policies is defined when access interfaces are configured or modified.
- QoS access ingress and egress policies to specify how subscriber traffic is mapped into queues, and specify queue classification, queue parameters and marking.

Figure 15 shows one of the H-QoS configuration steps—the configuration of an access ingress policy. This configuration form specifies the QoS settings and the IP address match criteria that will pass traffic into a specific queue. Queues are defined by a packet's forwarding class. As well, the queue is aligned with a scheduler.

Figure 15: Access ingress policy for H-QoS configuration form

The screenshot shows a configuration window titled "IP Match, Access Ingress Policy, Global Policy [Create]". The window contains the following fields and controls:

- ID:** A text box containing "0" and a checked checkbox for "Auto-Assign ID".
- Displayed Name:** A text box containing "IP match to pass traffic into a queue".
- Description:** An empty text box.
- Forwarding Class:** A dropdown menu set to "nc".
- Priority:** A dropdown menu set to "default".
- Forwarding Sub Class:** An empty text box, a "Clear" button, and a "Select..." button.
- Protocol:** A dropdown menu set to "ALL".
- Fragment:** A dropdown menu set to "off".
- IP Properties:** A section with two rows of fields:
 - Row 1: A checked checkbox for "Source IP", a text box with "10.1.2.", and a dropdown for "Src Mask" set to "0".
 - Row 2: An unchecked checkbox for "Destination IP", a text box with "0.0.0.0", and a dropdown for "Dst Mask" set to "0".
- Dscp:** A section with an unchecked checkbox and a dropdown for "Dscp" set to "default".

At the bottom of the window are four buttons: "Reset", "OK", "Cancel", and "Apply".

Accounting and performance monitoring using statistics

Monitor network performance and collect accounting statistics using service- and equipment-related statistics counters from the managed routers.

You can create statistics policies for:

- service access points to collect accounting data
- network ports to monitor performance data

Accounting

Service access point statistical counters are used to measure usage on each individual service queue, which can then be rolled up to bill for services. This information can be valuable to determine customer usage and link utilization.

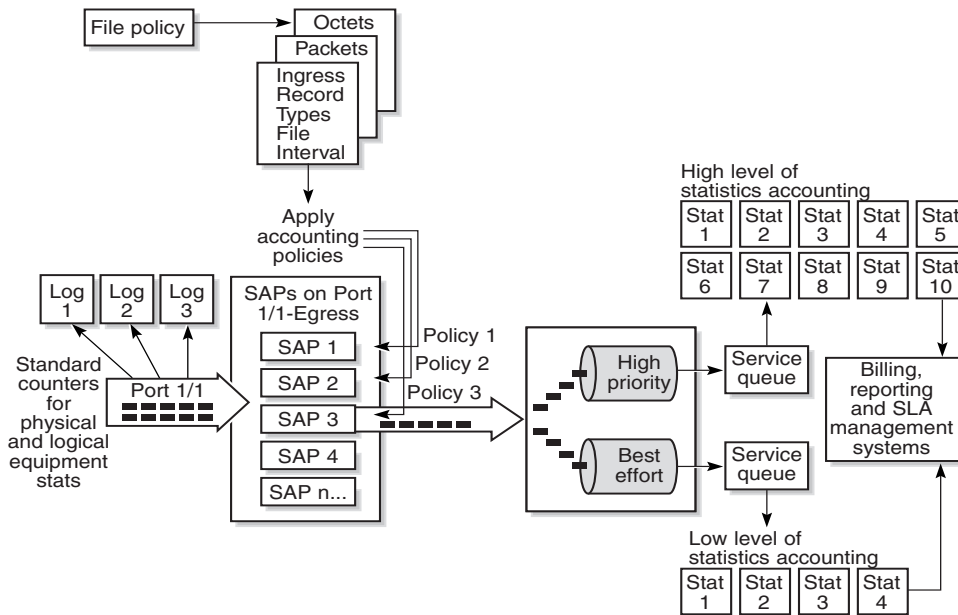
You can control how often the counters are collected and applied to all services. You can create accounting policies that determine which statistical classes, and counters within each class, are collected. These accounting policies can be applied to services such as VPLS. The statistics generated and collected can then be used to:

- check throughput to confirm SLAs
- correlate for billing
- monitor the quality of services delivered

There can be combinations of flat-rate, destination-based, or usage-based billing. Figure 16 shows how accounting policies are applied to service access interfaces, also known as SAPs, to collect different levels of statistical data.

3. Selling and managing customer services

Figure 16: Accounting statistics policies applied to services



17185

As shown in Figure 16, there are different accounting statistic policies applied to the services. The subscriber using service access point 3 on port 1/1 as a service egress point has two services, high priority and best effort. The statistics policies applied to each service type are different. For the high-priority service, more statistics are collected than for the best-effort service.

Network performance

Network port statistics are used to measure performance within each forwarding class queue as defined on the network port. This information can be used to track port performance and network traffic patterns for future capacity planning and traffic engineering.

3. Selling and managing customer services

You can view the near-real time performance statistics data from select configuration forms, or from the historical log files. The types of performance statistics you can collect include:

- Access Interface STP
- Interface
- Tunnel
- LSP
- PE
- SONET or SDH

3. Selling and managing customer services

4

Networking made easy

The managed routers were designed and optimized to deliver revenue-generating services. At the same time, the underlying system is a robust, highly scalable router, suitable for Internet peering and a wide range of ISP applications.

You can quickly enable the IP/MPLS infrastructure and routing protocols you need to offer services to your customers.

Routing protocol and signaling support and implementation

The 5620 SAM allows you to configure routing protocols and signaling methods, and navigate to the router parameters. Each router can support multiple routing protocols and signaling methods.

You use the Network, IS-IS, and OSPF tabs on the 5620 SAM GUI navigation tree to view and configure parameters that set and manage routing protocols. The routing protocols are enabled on the routers when you configure the routers. The Layer 3 interfaces are configured when you configure the routing instance on the router. You can then configure the routing protocols for the specific Layer 3 interfaces.

4. Networking made easy

Configuration is performed using routing protocol configuration forms, as shown in Figure 17.

Figure 17: BGP configuration form

The screenshot shows a web-based configuration interface for BGP. The title bar reads "BGP - 10.1.200.28, Routing Instance - 1 [Edit]". The interface has a tabbed menu at the top with "Behavior" selected. Below the menu, there are several configuration parameters, each with a text input field or a dropdown menu. At the bottom, there are several action buttons: "Resync", "Turn Up", "Shut Down", "Reset", "OK", "Cancel", and "Apply".

Parameter	Value
Router ID	10.1.200.28
Cluster ID	0.0.0.0
Preference	170
Local Preference	100
Multi Hop	0
Loop Detect	ignore
AS Path Ignore	false
Aggregator ID Zero	false
Damping	false
Disable Client Reflect	false
Min. Route Advertisement	30
Disable Fast External Failover	false
Disable Standard Communities	false
Disable Extended Communities	false

Table 6 lists supported routing protocols and signaling methods.

Table 6: Routing protocol and signaling information

Type	Details
Label Distribution Protocol (LDP) signaling	<p>There are two types of LDP signaling:</p> <ul style="list-style-type: none"> • Targeted LDP (T-LDP) • Downstream Unsolicited LDP (DU-LDP) <p>T-LDP is used to distribute labels for VPLS and VLLs.</p> <p>DU-LDP is used to create tunnels between PEs for VPLS, VPN, and IP VPNs.</p>
Routing Information Protocol (RIP)	<p>RIP is an Interior Gateway Protocol (IGP) that uses a distance-vector algorithm to determine the best route to a destination, using hop count as the deciding factor.</p> <p>In order for the protocol to provide complete information on routing, every router in the domain must participate in the protocol. RIP, a UDP-based protocol, updates its neighbors, and the neighbors update their neighbors.</p>
Border Gateway Protocol (BGP)	<p>BGP is an inter-autonomous system (AS) routing protocol. An AS is a network or a group of routers logically organized and controlled by a common network administration.</p> <p>BGP enables routers to exchange network reachability information. AS paths are the routes to each destination. There are two types of BGP, internal BGP (IBGP) and external BGP (EBGP).</p> <ul style="list-style-type: none"> • Within an AS, IBGP is used to communicate. • Outside of an AS or between ASs, EBGP is used to communicate with peers in different autonomous systems.
Resource Reservation Protocol (RSVP) signaling	<p>RSVP is a network control protocol used to request specific qualities of service from the network for particular application data streams or flows.</p> <p>RSVP is also used by routers to deliver QoS requests to all nodes along the path of the flows and to establish and maintain state to provide the requested service.</p>

(1 of 2)

4. Networking made easy

Type	Details
Open Shortest Path First (OSPF)	<p>OSPF is a hierarchical link state protocol. OSPF is an IGP used within large ASs. OSPF routers exchange relevant interface information with neighbors once the neighbors are discovered. The information exchange enables all participating routers to establish a network topology map. Each router applies the Dijkstra algorithm to calculate the shortest path to each destination in the network. The routing table is then calculated.</p> <p>Because OSPF is hierarchical, routers are configured in logical groups called areas. There are two main types of areas:</p> <ul style="list-style-type: none">• backbone area• standard area
Intermediate System to Intermediate System (IS-IS)	<p>IS-IS is a link state interior gateway protocol that uses the shortest path first algorithm to determine routers. Routing decisions are made using the link state information. IS-IS entities are comprised of:</p> <ul style="list-style-type: none">• networks, which are autonomous system routing domains• intermediate systems, which are routers• end systems, which are network devices that send and receive PDUs <p>End systems and intermediate system protocols allow routers and nodes to identify each other. IS-IS sends out link state updates periodically through the network, so each router can maintain current network topology information.</p>
Protocol Independent Multicast (PIM)	<p>PIM is a multicast routing architecture that allows the addition of IP multicast routing on existing IP networks.</p> <p>PIM uses any unicast routing protocol that populates the unicast routing table, such as OSPF, BGP, or static routes. PIM uses the unicast routing information to perform the multicast forwarding function, and is, therefore, IP protocol independent.</p> <p>PIM uses the unicast routing table instead of building a completely independent multicast routing table. PIM does not send and receive multicast routing updates between routers.</p>
Internet Group Management Protocol (IGMP)	<p>IGMP is an extension to the Internet protocol, and is used to dynamically register individual hosts in a multicast group on a particular LAN. Hosts identify group memberships by sending IGMP messages to their local multicast router.</p> <p>Under IGMP, routers listen to IGMP messages and periodically send queries to discover which groups are active or inactive on a particular subnet.</p>

(2 of 2)

The GUI facilitates complicated protocol configuration and management as follows.

- 1) Configure the router to support the protocols you plan to use from the check mark boxes on the router configuration form.
- 2) Configure the parameters to enable routing protocols on the Layer 3 interfaces.
- 3) Associate the Layer 3 interfaces with the network ports.
- 4) Configure the protocol-appropriate settings, for example for OSPF setting up at least one OSPF area and associating the router with the area.

Routing information starts to be exchanged once the ports are cabled together.

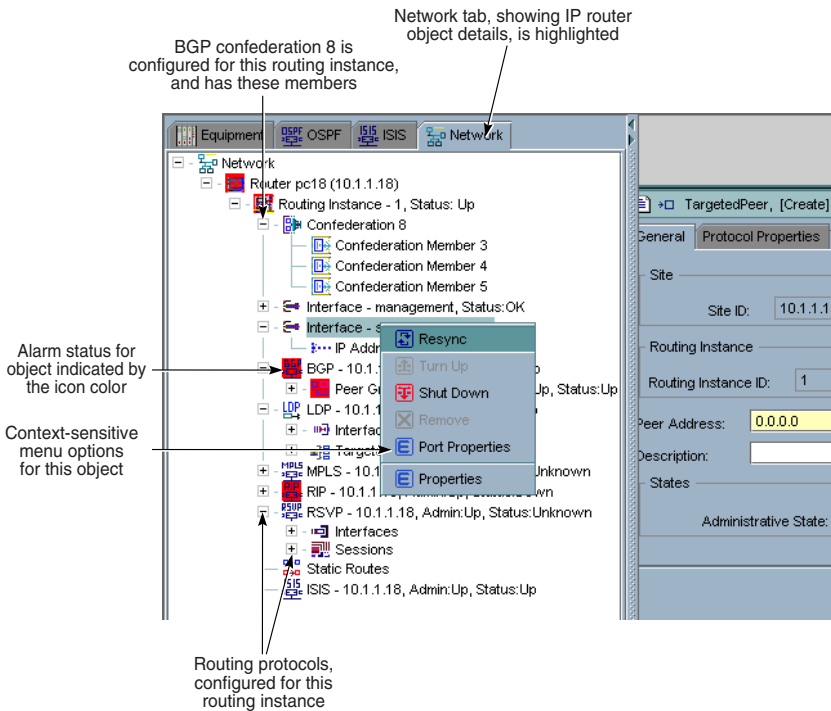
For example, OSPF configuration planning is essential to organize routers, backbone, non-backbone, stub, NSSA areas, and transit links. The GUI makes it easy:

- to create a single OSPF backbone area which contain the area border routers
- to create several areas containing the other routers for larger networks
- to place all routers in the OSPF backbone area for smaller networks

Figure 18 shows the Network tab in the navigation tree and the primary icons representing enabled routing functionality.

4. Networking made easy

Figure 18: Network tab in the navigation tree



17336

Using the GUI, you can:

- create OSPF or BGP areas and add Layer 3 interfaces to them
- view and configure routing instances
- configure and assign Layer 3 interfaces
- assign routers to the OSPF area
- create BGP confederations

MPLS and LSPs

Multiprotocol label switching (MPLS) is used to set up connection-oriented paths over a connectionless IP network. MPLS facilitates network traffic flow and provides a mechanism to engineer network traffic patterns independently from

routing tables. MPLS sets up a specific path for a sequence of packets. The packets are identified by a label that is inserted in each packet. MPLS is independent of any routing protocol but is considered multiprotocol because it works with IP, ATM, and frame relay network protocols.

Use the 5620 SAM to easily configure parameters for:

- MPLS and RSVP interfaces
- MPLS paths
- LSPs
- service tunnels (SDPs)

To configure RSVP LSPs, an MPLS path must first be created between two routers. An LSP can then be created between the two routers and be associated with the MPLS path.

Services are transported across a network using service tunnels, which can use GRE or MPLS as the underlying transport mechanism. For networks that use MPLS, an MPLS path mesh and an LSP mesh should be created before you start associating LSPs with the service tunnels. LSPs and service tunnels are unidirectional, thus both LSPs and service tunnels must be created in both directions.

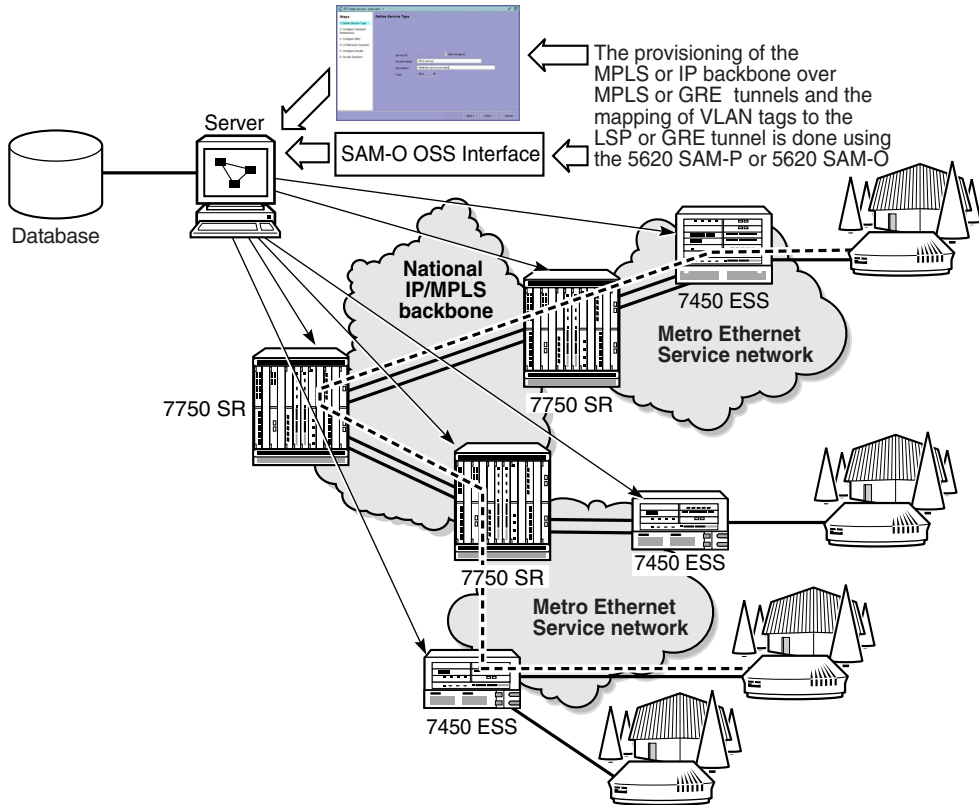
The 5620 SAM supports the ability to tailor the LSPs according to network design needs:

- loose hop MPLS paths for fast rerouting around problem routers or to find the best network route
- one-to-one backup LSPs to provide a detour at each potential point of repair
- facility backup using MPLS label stacking to protect potential failure point

Figure 19 shows how provisioning of the IP/MPLS backbone can be performed from both the 5620 SAM-P and the 5620 SAM-O.

4. Networking made easy

Figure 19: IP/MPLS backbone configuration



17343

Multicast routing

Multicast routing delivers source traffic to multiple receivers without any additional burden to the source or the receivers, which is the case with increased bandwidth requirements in a unicast environment.

A multicast-enabled device, such as a switch or router, distributes a data stream to multiple receivers. Multicast packets are replicated in the network by routers that are enabled with PIM, which results in the efficient delivery of data to multiple receivers using less bandwidth.

Key benefits

Multicast routing enables the efficient delivery of multimedia multicast services, with the following benefits for service providers:

- increases revenue by using multimedia multicast technology to offer new services, such as broadcast TV and newspaper push
- enables a triple play capability that helps attract and retain subscribers with voice, data and entertainment services over a common broadband infrastructure
- increases value to the enterprise by moving beyond basic site-to-site connectivity and adding new services (e.g., speech multicast)
- uses existing equipment to aggregate DSL traffic and provide enterprise services such as VPLS

Bridging on Telco devices

Bridging is used between a Telco device and a 7450 ESS to create a fast ring that bridges the subscriber devices (such as set top boxes for broadcast TV) and L2 services (such as VPLS distributing multicast signals). If necessary, you can configure the Telco devices with MSTP or another STP as required.

4. Networking made easy

5

Managing network CAPEX and OPEX

The 5620 SAM helps you keep track of your equipment and operations investments, allowing you to:

- efficiently provision router functionality to manage OPEX
- add equipment as demand warrants to manage CAPEX
- use remote troubleshooting to reduce network down time
- create services rapidly using template-based service provisioning
- view services and topology using custom-designed map views
- inventory provisioned and in-use equipment
- pinpoint control for resynchronization of network elements
- perform integrated Layer 2 and Layer 3 end-to-end management with the 5620 management portfolio
- collect a comprehensive set of service-related counters using accounting functionality
- reduce end-customer churn with flexible deployment strategies and service assurance

5. Managing network CAPEX and OPEX

Implementation of functionality

Some network management systems provide only partial coverage of management functionality, forcing system administrators and operators to devise complex operational procedures that move back and forth between a GUI and the CLI.

5620 SAM provides full coverage, which means less skilled operators can use the GUI to perform all necessary management tasks; more senior staff or administrators can use CLI, Telnet, and FTP for more complex tasks.

Modular 5620 SAM client GUI

The 5620 SAM functions are organized in four modules, which can be easily enabled or disabled using a license key, in combination with operator access profiles to grant the appropriate operation access rights:

- Alcatel 5620 SAM Element Manager (5620 SEM-E) base module for device mediation, equipment management, security, CLI access to managed devices, backup and restore, equipment navigation, alarm policy management, real-time equipment statistics, and inventory and reporting
- Alcatel 5620 SAM Provisioning (5620 SAM-P) optional module for service provisioning, templates, network tunnel and path management, subscriber management, and policy management
- 5620 SAM Assurance (5620 SAM-A) optional module for service assurance functionality, fault correlation using alarms, OAM tools, topology views, statistics policies and historical statistical data, and accounting policies and accounting data
- Alcatel 5620 SAM Open Interfaces (5620 SAM-O) optional module for XML-based open interfaces management, including provisioning, monitoring, configuration, and service assurance

Configuration management

Use the 5620 SAM's point-and-click configuration management to quickly:

- configure installed hardware, or pre-configure the physical equipment, such as access and network ports
- turn up pre-configured physical equipment when it is installed in the chassis
- move from Layer 1 and Layer 2 equipment configuration to Layer 3 router interface and network protocol configuration, such as OSPF, MPLS, and IS-IS
- create and apply appropriate policy attributes to reduce provisioning time
- save filtering preferences for easy list generation
- filter and list inventories of equipment
- provision services between routers and the CPEs
- test services and equipment with service assurance tools, such as OAM diagnostics, between all provider edge endpoints before handing off the service to customers

Configure equipment and interfaces

Figure 20 shows a GUI that displays the equipment in multiple ways.

5. Managing network CAPEX and OPEX

Figure 20: Equipment management drawings and forms

The screenshot displays a network management interface with several components:

- Navigation Tree (Left):** Shows a hierarchy starting with 'Router rtr44 (44.44.44.44)', followed by 'LAGs', 'Shelf 1 (7750-SR12), rtr44', 'Card Slot - 1 (2 x 10-Gig)', and 'Daughter Card Slot'. A list of ports (Port 1/1/1 to Port 1/1/17) is shown under the daughter card slot.
- Physical Port Configuration Form (Center):** Opened for 'Port 1/1/1'. It shows fields for 'Site ID' (44.44.44.44), 'Site Name' (rtr44), 'Name' (Port 1/1/1), and 'Interface ID' (18907136).
- Equipment Manager (Right):** A table showing physical ports for site rtr44. The table has columns for Site ID, Site Name, Administrative Status, Operational Status, Name, and CLI Name.
- Alarm Window (Bottom):** Shows an alarm table with columns for Site Id, Site Name, Domain, Object Type, Object Name, Object Id, and Alarm. Two alarms are visible: 'EquipmentRemoved' and 'TunnelDown'.

Site ID	Site Name	Administrativ...	Operational...	Name	CLI Na
44.44.44.44	rtr44	Up	Up	Port 1/1/1	1/1/1
44.44.44.44	rtr44	Up	Down	Port 1/1/10	1/1/10
44.44.44.44	rtr44	Up	Down	Port 1/1/11	1/1/11
44.44.44.44	rtr44	Up	Down	Port 1/1/12	1/1/12

Site Id	Site Name	Domain	Object Type	Object Name	Object Id	Alarm
38.120.182.52	sim182.52	equipment	PhysicalPort	Port 1/1/21	network:38.120.182.5...	EquipmentRemoved 01/12
10.1.200.28	sim200.28	Service Tunnel Manag...	Tunnel	from:10.1.200.28-id-300	serviceTunnelfrom:1...	TunnelDown 01/12

- The navigation tree on the left shows the Equipment tab and a daughter card opened to display its ports.
- The physical port configuration form in the centre is open for port 4/1/1, to show the parameter information that can be configured for the managed equipment from the General tab.

5. Managing network CAPEX and OPEX

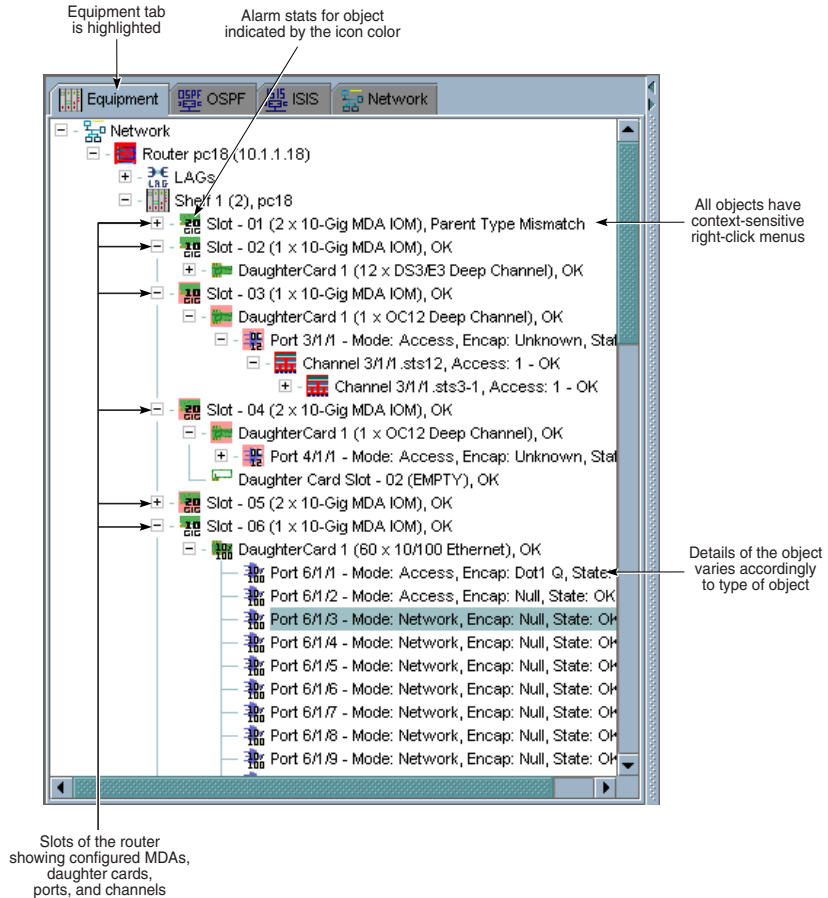
The 5620 SEM-E equipment manager allows network administrators and operators to:

- view drawings, LEDs, storage device information, and statistics about the routers in their administrative domain
- view the services that traverse or terminate on equipment
- provision and pre-provision equipment in preparation for subscriber services
- view, configure, monitor the state of, and manage the equipment hierarchy—from the chassis to the ports
- configure network and access policies for network objects, such as ingress buffer policies for a port
- manage hardware alarms
- group related equipment

Figure 21 shows the navigation tree, and how its use can help manage the network.

5. Managing network CAPEX and OPEX

Figure 21: Using the navigation tree



17335

Manage all equipment types

All shelf and slot configurations can be managed.

Supported Ethernet cards include:

- 10/100 Ethernet with 60 ports
- 100FX Ethernet with 20 ports
- Gigabit Ethernet with 5-, 10- and 20-port configurations
- 10 Gigabit Ethernet with 1 port
- 10/100/1000 Ethernet with 20 ports
- 20 Gb/s I/O module
- 10XGigabit Ethernet XFP with 2 ports LAN/WAN physical card
- RJ-45 10/100T/TX access with 24 or 48 ports
- RJ-45 100BaseT/TX uplink with 24 ports (20 copper and 4 dual copper and optical)

Supported SONET/SDH cards include:

- OC3/STM1 and OC12/STM4 16- and 8-port configurations
- OC48/STM16 4- and 2-port configurations
- OC192/STM64 with 1 port

Supported channelized cards include:

- OC12/STM4 channelized from the DS3/E3 level to the DS0 level
- DS3/E3 down to the T1/E1 channel level
- DS3/E3 T1/E1 channel down to the DS0 level

Supported ports include:

- Fast Ethernet (10/100BASE-T)
- Gigabit Ethernet (1000BASE-T)
- 10 Gigabit Ethernet (10GBASE-T)
- OC3/STM1 to OC192/STM64 SONET and SDH
- channelized OC12, OC3, and DS3/E3

You configure ports as network or access ports.

- Network ports connect and pass core network-facing traffic.
- Access ports connect and pass customer-facing traffic.

5. Managing network CAPEX and OPEX

Network ports are used in the service provider transport or infrastructure network, such as an IP/MPLS-enabled backbone network. Access ports are associated with a service access point (SAP), a subscriber, and a service to provide connectivity services to the subscriber, for example, a VLL service.

A variety of encapsulation types are supported on both the network and access ports, including BCP, Null, Dot1 Q and Q in Q for VLAN stacking.

Link Aggregation Groups (LAGs) can be configured to increase the bandwidth available between two network devices, depending on the number of links installed (up to 8). LAGs also provide redundancy if one or more links in the LAG fail. All physical links in a LAG link combine to form one logical network interface.

All physical and logical equipment components, from the chassis to the ports, are fully managed by the 5620 SAM. For each network and access port, you can use the GUI to view and configure parameters using the tab buttons.

- General tab—data includes port mode and encapsulation type parameters
- Ethernet or SONET/SDH tabs—data includes framing and frame size parameters
- Policies tab data—includes ingress and egress buffer policy settings
- Terminations tab—lists services or interfaces that terminate on the port
- Interface tab—lists IP routing information and configuration parameters
- Services tab—correlates subscriber services that use the Layer 2 or Layer 3 interface associated with the port
- Statistics tab—contains other tabs of statistics counters collected for the port

Viewing and managing inventories

You can generate and save lists of inventory, based on configurable sets of data, to send to an in-house inventory management system.

- All applications provide inventory support, so you can inventory physical components, such as cards, and logical components, such as MPLS paths.
- You can use the 5620 SAM-O to develop OSS applications to generate and feed inventory data to third-party applications, such as billing software.
- Filter the lists of GUI table data to only save or show data of interest.
- Save the data output in text, HTML, or XML formats.
- Save list filter preferences based on network needs.

5. Managing network CAPEX and OPEX

Figure 22 shows how the 5620 SAM can help you track inventories.

Figure 22: Inventory elements

The screenshot displays a network inventory table with columns for Name, CLI Name, and Interface ID. A 'Count: 60' is shown above the table. A context menu is open over the 'Name' column header, showing options for sorting and column visibility. Annotations with arrows point to various parts of the interface:

- Open the contextual inventory menu from the column headings**: Points to the 'Name' column header.
- A count of the number of objects in this list**: Points to the 'Count: 60' text.
- Click on column heading to sort objects in ascending or descending order**: Points to the 'Name' column header.
- Set how multiple columns are ordered**: Points to the 'Show Sorting' option in the context menu.
- Show or hide columns of information as needed**: Points to the checkboxes for 'Name', 'CLI Name', 'Interface ID', 'Class', 'Description', 'Hardware MAC', 'Configured MAC', 'Mode', 'Encap Type', and 'Speed' in the context menu.
- Filter based on show or hide settings**: Points to the 'Display Refined List' checkbox in the context menu.
- Save the inventory of objects to a file for storage or use by downstream applications**: Points to the 'Save To File...' and 'Save Table Preferences' options in the context menu.

Name	CLI Name	Interface ID
Port 1/1/1	1/1/1	Fast Eth
Port 1/1/2	1/1/2	Fast Eth
Port 1/1/3	1/1/3	Fast Eth
Port 1/1/4	1/1/4	Fast Eth
Port 1/1/5	1/1/5	Fast Eth
Port 1/1/6	1/1/6	Fast Eth
Port 1/1/7	1/1/7	Fast Eth
Port 1/1/8	1/1/8	Fast Eth
Port 1/1/9	1/1/9	Fast Eth
Port 1/1/10	1/1/10	Fast Eth
Port 1/1/11	1/1/11	Fast Eth
Port 1/1/12	1/1/12	Fast Eth
Port 1/1/13	1/1/13	Fast Eth
Port 1/1/14	1/1/14	Fast Eth
Port 1/1/15	1/1/15	Fast Eth
Port 1/1/16	1/1/16	Fast Eth
Port 1/1/17	1/1/17	Fast Eth
Port 1/1/18	1/1/18	Fast Eth
Port 1/1/19	1/1/19	Fast Eth
Port 1/1/20	1/1/20	Fast Eth
Port 1/1/21	1/1/21	Fast Eth
Port 1/1/22	1/1/22	Fast Eth
Port 1/1/23	1/1/23	Fast Eth
Port 1/1/24	1/1/24	Fast Eth
Port 1/1/25	1/1/25	Fast Eth
Port 1/1/26	1/1/26	Fast Eth
Port 1/1/27	1/1/27	Fast Eth
Port 1/1/28	1/1/28	Fast Eth
Port 1/1/29	1/1/29	Fast Eth

17271

Robust license key functionality

The 5620 SAM license key simplifies the monitoring and maintenance of the network by providing the following key information:

- alarms raised when thresholds are exceeded
- licensed quantity of MDA consumed and remaining

The 5620 SAM also allows you to update the license key dynamically to support increased licensed numbers of daughter cards (MDAs) without restarting the server.

5. Managing network CAPEX and OPEX

The 5620 SAM License form includes a save to file option, providing customers with a simple and direct method of ordering optional 5620 SAM modules and MDAs.

Topology management

Two network topology maps are available on the 5620 SAM:

- service topology map
- service path topology map

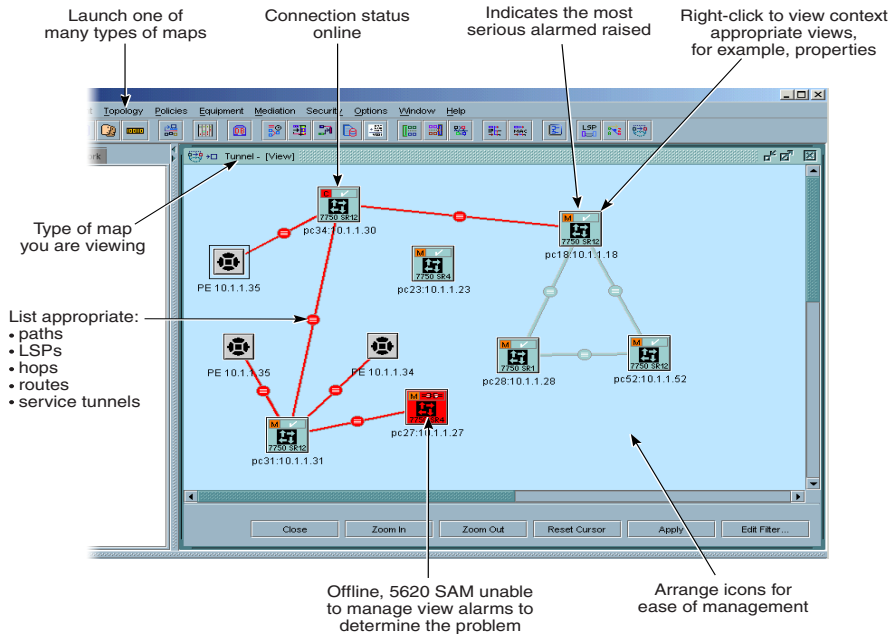
The topology manager provides:

- logical and physical maps of the network elements and the services carried on those network elements
- management of the physical and logical elements of services
- GRE/MPLS tunnels, LSPs, and routing topologies, to show network transport
- a view of all services provided to a subscriber
- a view of outstanding alarms and problems to provide a simplified logical view of faults for network operators

Figure 23 shows the map elements, which indicates all of the data that you can view.

5. Managing network CAPEX and OPEX

Figure 23: Map elements



17260

Resynchronization with network elements

The 5620 SAM simplifies network provisioning by allowing you to discover managed routers and commit them to the database for management.

An easy-to-use discovery manager helps you create any number of discovery rules to scan the network, setting both the types of elements to be discovered, and how often 5620 SAM rescans the network.

A discovery rule can contain more than one rule element. For example, you can configure one rule element to discover a subnet, and configure another rule element to exclude specific IP addresses from the subnet.

5. Managing network CAPEX and OPEX

In addition, from the same GUI form, you can set polling intervals to specify how often all router MIB elements of discovered and managed routers are polled for changes to their MIBs. Any change to the MIB triggers the 5620 SAM to re-read the entire MIB and update its database. You can detail individual rules for individual MIBs, depending on your network needs.

End-to-end, integrated management solutions

Whatever your management requirements, the 5620 SAM offers a range of integration solutions. For complex integration of Layer 2 and Layer 3 elements, the 5620 SAM and the 5620 NM can be integrated in the same network management domain for a seamless management solution.

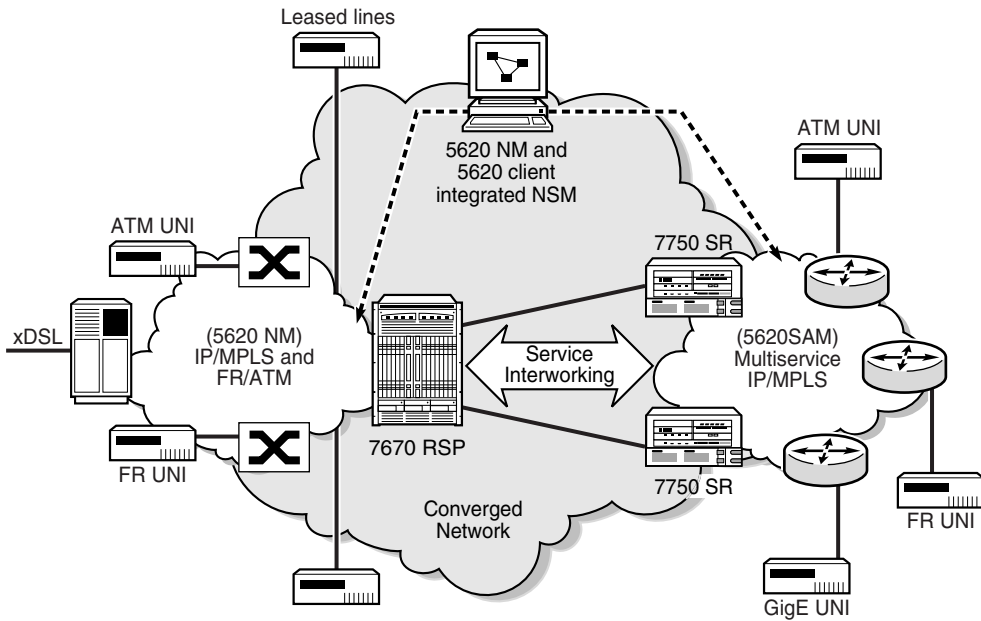
Integration using the 5620 NM

Adding new IP/MPLS-based services to an existing multiservice ATM and/or Frame Relay network requires a management system that can enable a smooth but rapid integration of existing NOC and OSS systems. A management suite that enables this transition helps reduce OPEX by increasing operational efficiency.

For standalone IP/MPLS and metro Ethernet networks, the 5620 SAM suite of modules provides all the necessary tools. For integrated traditional multi-service WAN networks with 5620 SAM-managed IP/MPLS/Ethernet services, the 5620 NM is the multi-service network manager of choice.

Figure 24 depicts the 5620 NM portfolio solution that manages end-to-end numerous services and technologies, showing how integration simplifies management.

Figure 24: Integrated service delivery and management



- Access
- xDSL
 - TDM
 - Ethernet
 - Frame Relay
 - ATM
 - LMDS

- Available
- single desktop
 - alarm list integration
 - GUI navigation
 - cross-domain configuration management support
 - common topology map

17818

5. Managing network CAPEX and OPEX

6

Integrated fault management, OAM, and service mirroring

The 5620 SAM uses a wide range of standards-based, correlated alarms, industry-leading OAM tools, and intuitive service mirroring to:

- monitor services to validate and ensure SLA agreements
- receive instant notification about the equipment alarms have affected services
- check end-to-end connectivity before turning up customer services
- perform pings and traces from the GUI and view the results from the same form
- create service mirroring to comply with government regulations and conserve technical resources

Intelligent alarm fault management

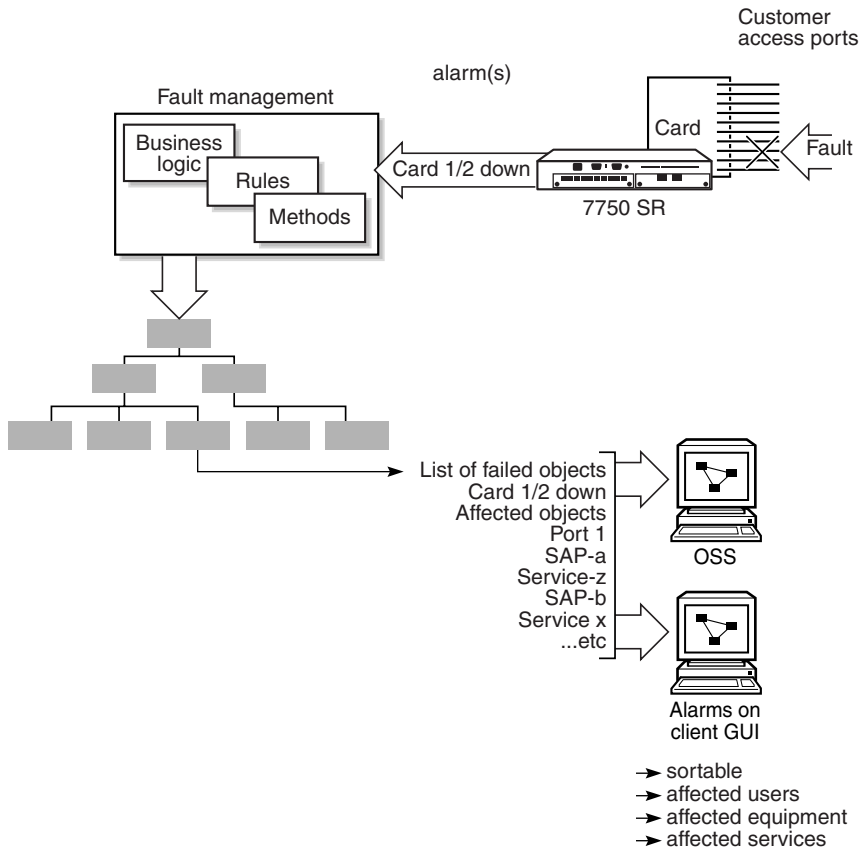
The fault management system provides:

- impact analysis and correlation of alarms on equipment to service-affecting faults on a per-service basis using the 5620 SAM-A
- color-coded alarms to show the operational status of equipment, services, and interfaces in real time
- colors standardized across Alcatel NMS systems
- alarm policy control so administrators can specify individual alarm display characteristics, suppression rules, severity assignments based on user-configurable thresholds, escalation, and storage
- wide range of X.733 and vendor-specific alarms
- point-and-click alarm management from a dynamic alarm list, and from equipment and services
- operator notes and acknowledgments to track the work as the problem is fixed
- alarm data logged in an historical alarm database for trend analysis and records

Figure 25 shows how business logic is applied to network alarms, which in turn updates subscriber services and ensures that all affected services are updated.

6. Integrated fault management, OAM, and service mirroring

Figure 25: Alarm handling



17167

From the GUI, operators can fine-tune, define, and track alarms. They can:

- view the relationship between incoming alarms and the affected objects, such as the effect of equipment alarms on service operation
- determine and then set specific policies for each alarm type, for example, the alarm's incoming severity and its escalated severity
- track the most important alarms using color codes, for example, sort all red critical alarms.

6. Integrated fault management, OAM, and service mirroring

Figure 26 shows the alarm relationships and the GUI tools to manage them.

Figure 26: Alarm relationships on the GUI

How the alarm is handled is determined by the alarm policy

Object affected by alarm shown correlated to object

From the dynamic alarm list

Site Id	Site Name	Domain	Object Type	Object Name	Object Id	Alarm	Time Detected
53.53.53.53	rh53	Service Tunnel Manag	Circuit	circui-5-2004	rh53-5-2004	CircuitDown	01/07/2005 17:21:57.4
10.1.200.28	sim200.28	sw	BackupRestoreManager	sim200.28	network:10.1.200.28...	BootableConfigBacku...	01/07/2005 11:22:59.7
15.75.75.75	rh75	Service Tunnel Manag	Circuit	circui-5-21	rh53-5-21	CircuitDown	01/07/2005 17:22:12.0
53.53.53.53	rh53	Service Tunnel Manag	Tunnel	tom-53.53.53.53.id.2	serviceTunnel-from-5	TunnelDown	01/07/2005 17:21:57.4

17345

Service assurance with diagnostics

The proper delivery of services requires that a number of operations occur correctly for the service to pass traffic to subscribers according to SLAs.

Service providers must be able to test service connectivity, not just interface status. The 5620 SAM-A module provides a set of in-band and out-of-band packet-based OAM tools.

6. Integrated fault management, OAM, and service mirroring

These OAM tools can be initiated by the operator from numerous forms on the GUI, for example, you can open a form for an individual subscriber, and enable and initiate OAM diagnostics for that subscriber's services.

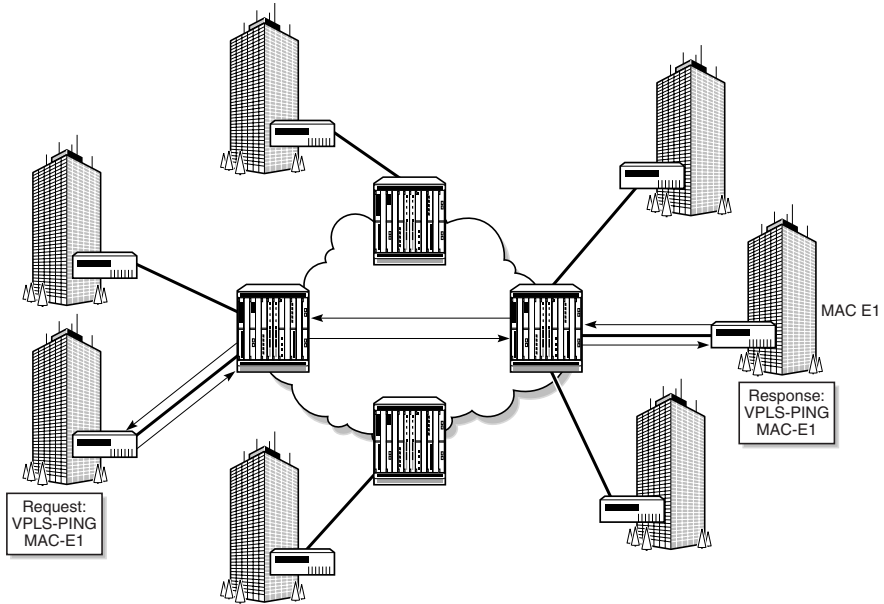
The following OAM tools are supported:

- MTU OAM
- tunnel OAM
- circuit OAM
- LSP ping and traceroute
- multiple MAC-level OAMs, including MAC ping
- IP VPN ping and trace
- ATM OAM ping

Figure 27 shows how OAM troubleshooting tools can be used to fix service problems. A MAC ping can help diagnose connectivity issues.

6. Integrated fault management, OAM, and service mirroring

Figure 27: Sample OAM diagnostic - MAC ping



17308

MTU OAM

The MTU OAM diagnostic provides a tool for service providers to determine the exact frame size that is supported between the service ingress and service egress termination points, to within one byte. Use the MTU OAM to:

- determine the maximum frame size supported
- solve troubleshooting issues that are related to equipment used across the network core which may not be able to handle large frame sizes

6. Integrated fault management, OAM, and service mirroring

Tunnel OAM

Tunnel OAM performs in-band unidirectional or bidirectional connectivity tests on service tunnels. The OAM packets are sent in-band, in the tunnel encapsulation, so they follow the same path as the service traffic. The response can be received out-of-band in the management plane, or in-band using the data plane for a bidirectional test.

Circuit OAM

Circuit OAM provides end-to-end connectivity testing for an individual service. This diagnostic operates at a higher level than the tunnel OAM because it verifies connectivity for an individual service, rather than connectivity across the service tunnel. This allows you to isolate a problem within the service, rather than the port that is the endpoint of the service tunnel.

The diagnostic tests a service ID for correct and consistent provisioning between two service endpoints. From a circuit OAM you can:

- verify whether the local service and remote services exist
- determine the current state of the local and remote services
- ensure that local and remote service types are correlated
- ensure that the same customer is associated with the local and remote services
- ensure that there is a service to circuit association with both the local and remote services
- ensure that the local and remote ingress and egress service labels match

LSP ping and traceroute

LSP ping and traceroute diagnostics provide a mechanism to detect data plane failures in MPLS LSPs. The diagnostics are modeled after the ICMP echo request/reply that is used to detect and isolate faults in IP networks.

6. Integrated fault management, OAM, and service mirroring

MAC OAM diagnostics

Multiple MAC OAM diagnostics are supported, including:

- MAC ping to determine the existence of an egress SAP binding of a given MAC address within a VPLS
- MAC trace to display the hop-by-hop route of MAC addresses used to reach the target MAC address at the far-end
- MAC populate to populate a service FIB with an OAM-tagged MAC entry

IP VPN ping and trace

The IP VPN ping and IP VPN trace OAM diagnostics are enabled from the VRF site of the subscriber IP VPN service. The ping determines whether the far-end egress point of the service exists. IP VPN pings can be sent in band or out of band. The IP VPN trace OAM displays the hop-by-hop route used to reach the target address at the far-end. Traces can be sent in band or out of band.

ATM OAM ping

The ATM OAM ping performs a ping on an existing ATM PVC from the endpoint using ATM OAM loopback cells. An ATM OAM ping tests virtual channel integrity and endpoint connectivity for PVCs using OAM loopback capabilities.

Service mirroring

The 5620 SAM GUI implementation of service mirroring provides service-based, rather than port-based, mirroring of traffic packets from any service type. Service mirroring using 5620 SAM ensures there are no impacts on revenue-generating traffic.

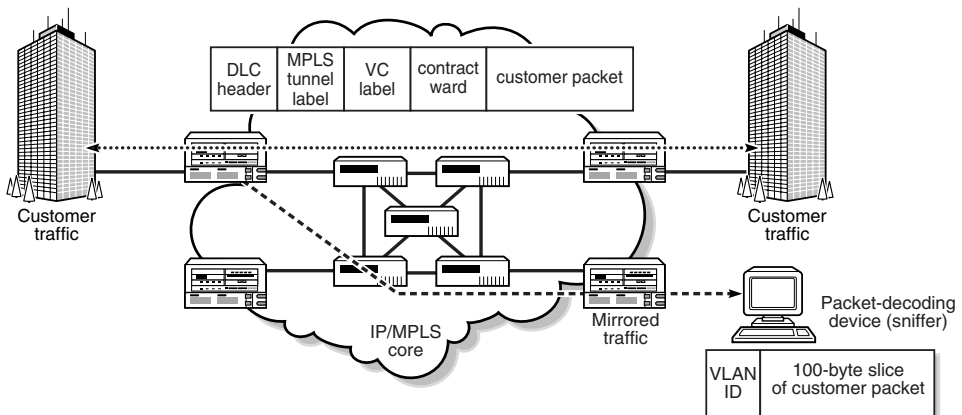
6. Integrated fault management, OAM, and service mirroring

Service mirroring can be used to:

- troubleshoot problems with customer packet delivery and content
- slice the mirrored packets to conserve core bandwidth by copying only packet header information
- allow service providers to meet regulations, for example CALEA, to obtain itemized call records as authorized by investigative authorities
- reduce the complex network analyzer network that is often implemented as an overlay to the customer-facing network
- transmit mirrored packets on mixed interface types, for example, mirrored Ethernet service packets can be mirrored to a SONET/SDH port

Figure 28 shows how service mirroring is performed.

Figure 28: Service mirroring



17265

6. Integrated fault management, OAM, and service mirroring

7

Securing your IP network edge

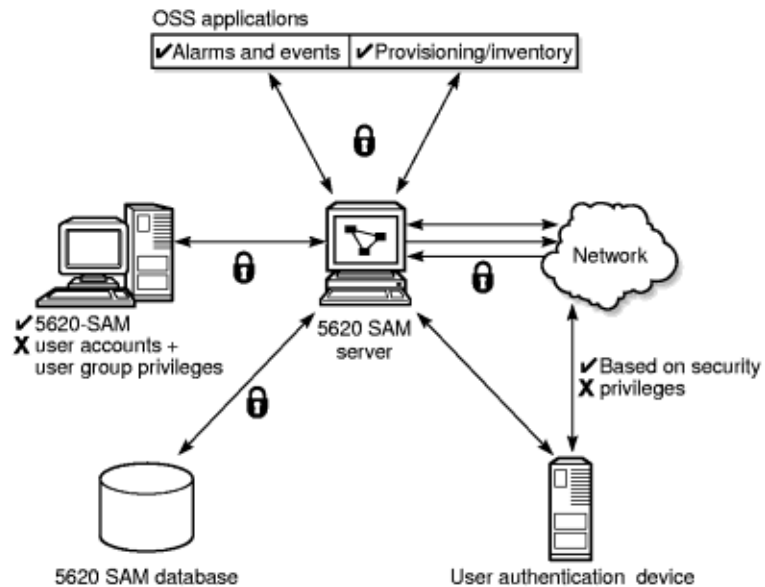
Security in the IP world has never been easier to implement. With the 5620 SAM user account templates and full support of router-aware security policies, you can:

- secure the management domain to limit operator access and privileges
- set up authentication servers
- encrypt routing protocol communications across the managed network
- log user activity and view event logs for security control and system troubleshooting

Figure 29 illustrates how communications to and from the network and network management domain are secured.

7. Securing your IP network edge

Figure 29: Security using 5620 SAM



17898

Security end-to-end

The system administrator uses the security menus to control user privileges on the 5620 SAM and control access to the equipment. 5620 SAM users are assigned to a group that has been configured with permissions for one or more functional areas of the 5620 SAM.

The system administrator can perform the following tasks:

- create an initial user login screen
- create 5620 SAM groups and configure 5620 SAM group permissions
- create 5620 SAM and managed router user accounts, assign users to groups, and specify user privileges
- view and specify the maximum number of admin sessions
- set Telnet or SSH access
- configure RADIUS and TACACS+ authentication to allow controlled access to the equipment using router-based user accounts
- modify users, passwords, groups, and policies
- suspend and reinstate users
- shut down GUI sessions on a per-client GUI basis
- view user logs

Table 7 describes the group permissions for 5620 SAM accounts.

Table 7: Group permissions

Permission group	Functional area access	Use to
Admin	All 5620 SAM functional areas	Perform all 5620 SAM tasks, including administering users and groups.
Device Mgmt	Equipment management	Configure and manage equipment operations and inventory.
Interface Mgmt	Interface management	Configure interface properties.
Topology Mgmt	Topology management	Monitor and manage network elements.
Subscriber Mgmt	Subscriber management	Configure and manage subscriber accounts.
Service Mgmt	Service management	Configure and manage service distribution paths and services.
QoS Mgmt	QoS policies	Configure and manage QoS and filter policies and counters, and manage DSCP and FC resources.
Fault Mgmt	Fault policies	Monitor and manage outstanding alarms, acknowledge and perform severity changes, manage the alarm history database, and modify fault policies.

(1 of 2)

7. Securing your IP network edge

Permission group	Functional area access	Use to
Operator	Read-only access to all functional areas, but security is hidden	Monitor applications and faults.
Operations	System maintenance	Perform system maintenance functions such as managing logs, database backups and restores, and software downloads, adding and removing network nodes, and specifying mediation policies.
CLI	CLI	Launch a Telnet or SSH session from the selected network element.

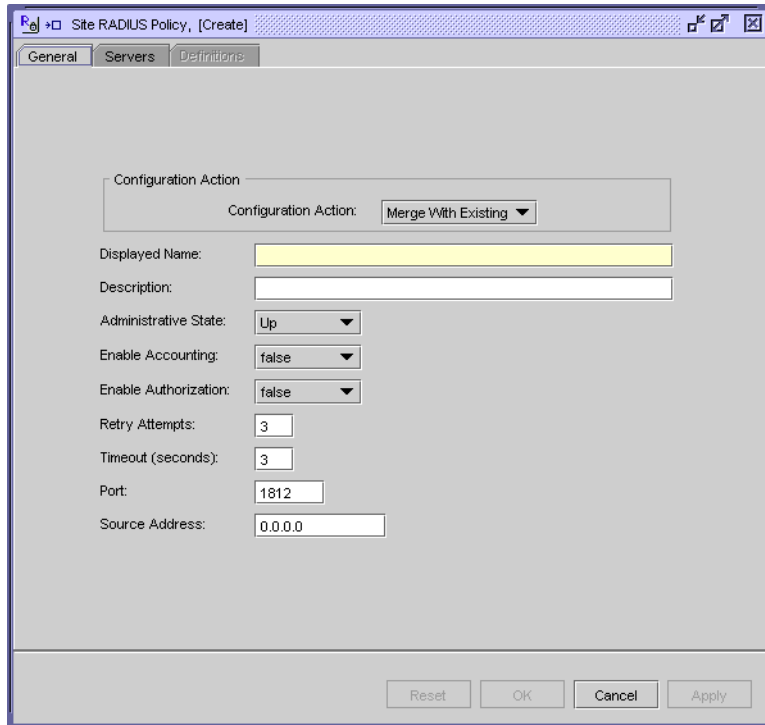
(2 of 2)

RADIUS is an access server authentication, authorization, and accounting (AAA) protocol. It provides a standardized method of exchanging information between a RADIUS client, located on the router and managed by the 5620 SAM, and an external RADIUS server. You can use the 5620 SAM to create policies, accounts, and connections to RADIUS and TACACS+ servers that complement the security policies created on the managed routers.

RADIUS functionality provides an extra layer of login security. The RADIUS client relays user account information to the RADIUS server. The server authenticates the user and returns user privilege information to the RADIUS server. This sets the level of access the user has to the router. For example, the user may not be able to FTP information to the router.

Figure 30 shows a RADIUS policy configuration form.

Figure 30: RADIUS policy configuration form



The screenshot shows a window titled "Site RADIUS Policy, [Create]" with three tabs: "General", "Servers", and "Definitions". The "General" tab is active. The form contains the following fields and controls:

- Configuration Action:** A dropdown menu set to "Merge With Existing".
- Displayed Name:** A text input field with a yellow highlight.
- Description:** A text input field.
- Administrative State:** A dropdown menu set to "Up".
- Enable Accounting:** A dropdown menu set to "false".
- Enable Authorization:** A dropdown menu set to "false".
- Retry Attempts:** A text input field containing the value "3".
- Timeout (seconds):** A text input field containing the value "3".
- Port:** A text input field containing the value "1812".
- Source Address:** A text input field containing the value "0.0.0.0".

At the bottom of the form are four buttons: "Reset", "OK", "Cancel", and "Apply".

Operators can also specify encryption for PDUs between routers sharing routing information, to ensure traffic routing security and eliminate the risk of compromising routing tables. Operators configure the GUI parameters that enable MD5 authentication and the authentication key to authenticate neighboring routers before a protocol session is set up, for example, BGP.

7. Securing your IP network edge

8

Open interfaces and OSS integration

The 5620 SAM-O OSS interface provides open interface support to develop OSS solutions that help you manage the key areas of service fulfillment, quality assurance, and billing. This OSS support enables service providers to de-risk integration costs by:

- building on the Alcatel difference, which uses Alcatel's proven OSS interfaces to preserve current OSS applications and extend support for new service offerings
- using the Alcatel connected partner program with leading OSS vendors to deliver management solutions that fit existing OSSs, reduce integration time and minimize risks to existing NOC set-ups
- offering high-value professional services to assist with solution design and certification
- delivering integrated management solutions that simplify OSS integration and build on existing applications

The Alcatel difference

The Table 8 describes how Alcatel is responding to the sea change in the OSS market.

8. Open interfaces and OSS integration

Table 8: The OSS market and Alcatel

OSS market	Alcatel's answer	Making a difference for your business
OSS consolidation	Innovative plug-ins and extensive partnering programs with leading vendors	<ul style="list-style-type: none"> • Leading the industry in IP/MPLS/Ethernet OAM&P tools delivery • Service-aware XML-based OSS interface • Comprehensive connected partner program to provide wide ranging solutions to business integration challenges • Clearly articulated, vendor-led professional services offering • Commitment to customer's capital where solutions involved MS WAN and IP/MPLS Alcatel domains
IP/MPLS in data networks	Common management for Alcatel IP/MPLS using the 5620 management suite	
CLI/SNMP deficiencies in OAM&P integration	Aggressive commitment to open, extensible XML OSS interfaces	
Need to support Ethernet services	OSS connected partner program targets Ethernet and IP/MPLS best-of-breed applications	
Cost control for outsourced enterprise Ethernet and MPLS-based services	OSS connected partner applications include web-based enterprise customer management to view and control outsourced networks	

Alcatel connected partner program

Deploying or upgrading an OSS is a business challenge for service providers. The goal of the OSS is to automate key business processes. However, continuous upgrades, a mix of vendors, and the requirement to quickly deploy new technologies while growing the customer base can put pressure on CAPEX and OPEX.

The Alcatel connected partner program relieves the pressure. The program provides:

- pre-certified integration with numerous OSS independent software vendors in the areas of:
 - customer and service QoS management using partners such as InfoVista, Quallaby, and Concord
 - invoicing and collection of network and service performance, and accounting data using partners such as Ace*Comm
 - service configuration, activation, modification, and extensions using partners such as Syndesis and MetaSolv
 - service problem resolution using partners such as Quallby, InfoVista, and Concord
 - network inventory bulk uploading and configuration
- concurrency of software releases between connected partners and the 5620 SAM due to parallel and coordinated development efforts
- testing of product and deployment inter operability across and between releases to ensure smooth upgrades
- reduced costs by avoiding expensive integration while meeting aggressive time to market schedules

The following scenarios illustrate two examples of the connected partner program in action —one for real-time alarm and event monitoring using Micromuse’s Netcool solution for the 5620 SAM, and the other for VistaLink performance management for 5620 SAM service and customer SLAs.

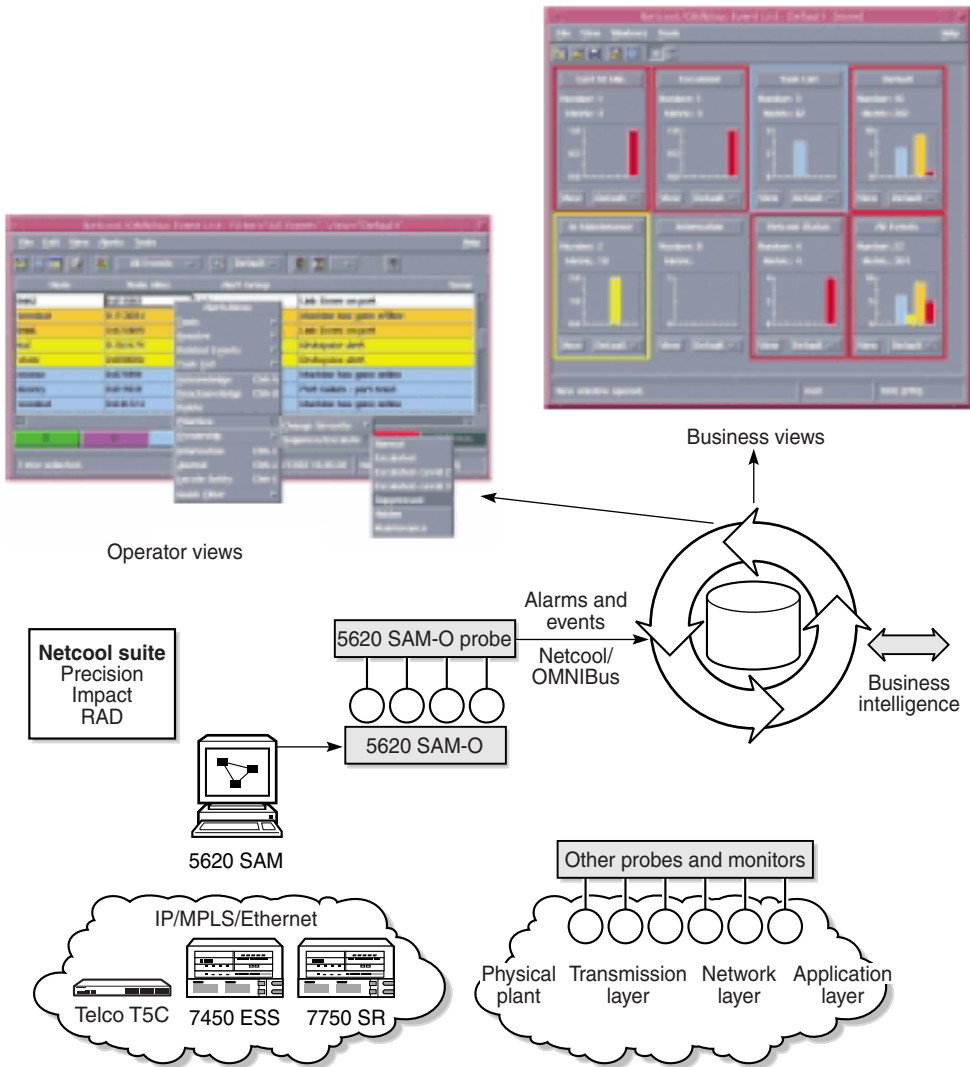
Real-time event and alarm monitoring

You can integrate and view in real time all network and service alarms from a single console, quickly identify and troubleshoot problems, reduce OPEX, and improve the availability and management of IP/MPLS/Ethernet services.

Figure 31 shows the OSS application integration with 5620 SAM and 5620 SAM-O.

8. Open interfaces and OSS integration

Figure 31: Micromuse Netcool and 5620 SAM-O



17766

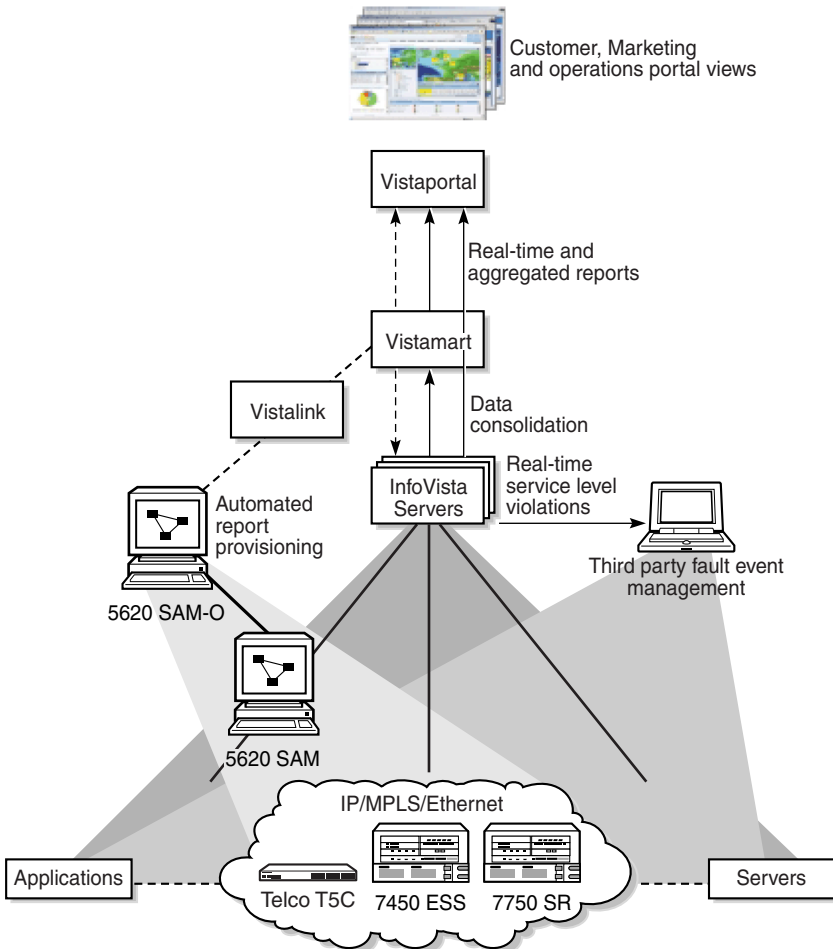
Performance management for SLAs

You can view in real time the IP/MPLS/Ethernet network and service performance indicators, identify QoS performance degradation and routing problems, decrease mean-time-to-resolution for problems, and improve service reporting and resource availability tracking.

Figure 32 shows the OSS application integration with 5620 SAM and 5620 SAM-O.

8. Open interfaces and OSS integration

Figure 32: InfoVista VistaLink and 5620 SAM-O



17766

Alcatel professional services

The Open Interfaces Professional Services organization offers extensive integration services, including:

- working with connected partners to develop, support, and certify OSS solutions for inter operability
- providing design consultation and product training

The organization works with connected partners to ensure the OSS solutions maximize the IP/MPLS/Ethernet capabilities of the 5620 SAM-O and 5620 SAM. They review software designs, and provide guidance and support to ensure the design methodology is appropriate for the OSS application. While development of new applications is ongoing, they work with all parties, and provide comprehensive training and in-depth product knowledge. After development is complete, they test and certify the solution to facilitate integration into the service provider's existing back office.

How the XML open interface works

The 5620 SAM-O module provides a simple XML open interface to develop OSS applications that enable functionality of the entire 5620 SAM suite. An OSS application can use the rich, open 5620 SAM-O XML interface to:

- configure or access network management information in the 5620 SAM database
- send configuration requests to the managed network devices
- create plug-ins to existing inventory application to collect data about resources
- use JMS to receive an event stream
- leverage 5620 SAM transaction management capabilities and service-oriented network view to reduce the complexity of OSS integration

SOAP encapsulation is used to securely transmit requests to the 5620 SAM server running the 5620 SAM-O.

This carrier-grade OSS interface allows:

- provisioning of services and policies
- real-time alarm and event fault management notifications
- equipment and inventory management

8. Open interfaces and OSS integration

The information and object model of the managed network is fully revealed to allow for ease of OSS application development, and consists of:

- packages— each package has one or more groups of related domain objects (classes), data types, bitmasks, and enumerations
- domain objects (classes)—contain the properties of the class
- data types—contain standard XML schemas, as defined by the W3C consortium; for example, strings and integers; extended XML schemas, for example, IpAddresses; and other XML schemas, for example, bitmasks
- information structures—contain both the domain objects (classes) and the properties of the information, which are called elements in the XML but are also known as parameters in the CLI or GUI
- methods —used to execute the particular functions the OSS application performs
- inheritance—in which domain objects and properties interact with each other



Associated documents

Alcatel is committed to providing superior product documentation in convenient and effective formats. Development and delivery of documentation online is one way that the Alcatel continues to meet the changing needs of customers.

Product manuals and other documentation are available through the Alcatel Support Documentation Service at www.alcatel.com. If you are a new user and require access to this service, contact your Alcatel account representative.

A. Associated documents

See the 5620 SAM user documentation for more detailed information about using the network management suite of applications.

- *5620 SAM Installation and Upgrade Guide* for more information about installing and upgrading the database, server, and client 5620 SAM software
- *5620 SAM User Guide* for more information about using the GUI to perform network management tasks
- *5620 SAM Parameter Guide* for more information about configurable GUI parameters, including defaults, ranges, and descriptions
- *5620 SAM Troubleshooting Guide* for more information about network and network management troubleshooting, including alarms and OAM
- *5620 SAM Routine Maintenance Procedures Guide* for more information about base measures to monitor performance, and daily, weekly, monthly, and as required maintenance procedures
- *Alcatel 5620 SAM-O OSS Interface Developer Guide* for XML-based OSS application development
- *5620 SAM Planning Guide* for information about specific deployment considerations

See the 7750 SR and 7450 ESS user documentation for more detailed information about device installation, functionality, and specific CLI commands.

- router or switch guides for information about configuring the managed devices and routing or bridging protocols
- service guides for information about policies, quality of service, and services
- system guides for information about system configuration
- the appropriate 7750 SR and 7450 ESS Installation Guides for information about installing hardware and cards

See the appropriate Release Descriptions, Planning Guides, Telco documentation, and Release Notices for more general information about the status of specific product releases, including supported functionality, restrictions, and configuration updates.

Glossary

5620 NM

Alcatel 5620 Network Manager

The 5620 NM provides advanced management of large, complex LAN/WAN networks, including hybrid circuit-switched, IP/MPLS, ATM, frame relay, and X.25 networks. The GUI operates on a Sun workstation. It can be used to configure databases, monitor network operation in real time, set up and manage paths, and perform diagnostics to isolate and manage problems on the network.

With the addition of optional software modules, the 5620 NM can perform advanced management functions such as managing multivendor equipment, interfacing with UMS, and partitioning networks.

5620 SAM

5620 Service Aware Manager

The 5620 SAM is the network manager portfolio of modules for the 7750 SR.

5620 SAM client

The 5620 SAM client provides a GUI to configure IP network elements.

5620 SAM database

The 5620 SAM database stores network objects and configurations.

5620 SAM server

The 5620 SAM server mediates between the 5620 SAM database, 5620 SAM client, and the network.

5620 SAM-A

5620 SAM Assurance

The 5620 SAM-A provides service assurance functionality.

5620 SEM-E

5620 SAM Element Manager

The 5620 SEM-E provides network element configuration and management functionality.

5620 SAM-O

Alcatel 5620 SAM Open Interfaces

The 5620 SAM-O provides an XML interface for OSS applications to interact with the 5620 SAM.

5620 SAM-P

Alcatel 5620 SAM Provisioning

The 5620 SAM-P provides service provisioning functionality.

7450 ESS

7450 Ethernet Service Switch

7750 SR

7750 Service Router

The 7750 SR is a router that provides scalable, high-speed private data services with SLAs.

7750 SR-1

The one-slot version of the 7750 SR chassis.

7750 SR-7

The seven-slot version of the 7750 SR chassis.

7750 SR-12

The 12-slot version of the 7750 SR chassis.

ACL

access control list

An access control list, which is also known as a filter policy, is a template applied to services or ports to control network traffic into (ingress) or out (egress) of an SAP or port based on IP and MAC matching criteria. Filters are applied to services to examine packets entering or leaving a SAP or network interface. An ACL policy can be used on several interfaces. The same filter can be applied to ingress traffic, egress traffic, or both.

API

application programmable interface

ARP

address resolution protocol

ASIC

application specific integrated circuit

An integrated circuit accommodating a group of functions that are dedicated to supporting a specific application in an optimized way. This is in contrast to integrated circuits accommodating functions that can be used to implement a wide variety of applications.

ATM

asynchronous transfer mode

Asynchronous transfer mode is a very high-speed switching and transmission technology. ATM is a high bandwidth, low-delay, packet-like switching and multiplexing technique. Usable capacity is segmented into 53-byte fixed-size cells, consisting of header and information fields, allocated to services on demand.

Glossary

BGP

border gateway protocol

BGP is an IETF standard EGP used to propagate routing information between autonomous systems.

CAPEX

capital expenditure

CIR

committed information rate

The CIR is the guaranteed minimum rate of throughput between two end-user devices over a network under normal operating circumstances. This rate, measured in bits or kb/s, is used in congestion control procedures.

CLI

command line interface

The CLI is an interface that allows the user to interact with the operating system by typing alphanumeric commands and optional parameters at a command prompt.

CoS

class of service

CoS is the degree of importance assigned to traffic. During queuing and forwarding, service points give preferential treatment to traffic that originates on elements configured for premium CoS.

CPE

customer premises equipment

Network equipment that resides on the customer's premises.

CPU

central processing unit

The CPU is the part of a computer that performs the logic, computational, and decision-making functions. The CPU is typically a single computer chip.

DCE

data circuit-terminating equipment

DIA

direct Internet access

Also referred to as Internet enhanced service.

DLCI

data link connection identifier

DSAP

destination service access point

DTE

data terminal equipment

ECMP

equal cost multipath

A method of distributing traffic to multiple destinations over several equivalent paths.

EGP

exterior gateway protocol

A routing protocol used by gateways in two-level Internets.

EJB

Enterprise JavaBeans

Glossary

An architecture for setting up program components, written in the Java programming language, that run in the server parts of a computer network that uses the client/server model. Enterprise JavaBeans is built on the JavaBeans technology for distributing program components (which are called Beans, using the coffee metaphor) to clients in a network.

Enterprise JavaBeans offers the advantage of being able to control change at the server rather than having to update each individual computer with a client whenever a new program component is changed or added.

EMC

Electromagnetic Compatibility

Epipse service

Another term for Ethernet virtual leased line (VLL).

Ethernet

Ethernet is a popular LAN technology based on bus topology.

fault

A fault is a failure or defect in a network, causing the network, or part of the network, to malfunction.

FCAPS

FCAPS is the abbreviation for a broad categorization of network and service management activities, including:

- fault management
- configuration management
- accounting/administration management
- performance management
- security management

FIB

forwarding information base

FIB is the set of information that represents the best forwarding information—for example, next IP hop—for each destination (or set thereof). The entries in the FIB are derived from the reachability information held in the RIB, subject to administrative routing.

forwarding class

A forwarding class, also called a CoS, provides to network elements a method to weigh the relative importance of one packet over another in a different forwarding class. Each forwarding class is important only in relation to other forwarding classes.

Queues are created for a specific forwarding class to determine the manner in which the queue output is scheduled into the switch fabric and the type of parameters the queue accepts. The forwarding class of the packet, along with the in-profile or out-of-profile state, determines how the packet is queued and handled (the per-hop behavior at each hop along its path to a destination egress point).

Table 1 describes the forwarding classes supported by the 7750 SR.

Table 1: Forwarding class types

Forwarding class type	Designation	Class type	Description
Network control	NC	High priority	For network control traffic
High-1	H1		For a second network control class or delay- and jitter-sensitive traffic
Expedited	EF		For delay- and jitter-sensitive traffic
High-2	H2		For delay- and jitter-sensitive traffic
Low-1	L1	Assured	For assured traffic (default)
Assured	AF		For assured traffic
Low-2	L2	Best effort	For best-effort traffic
Best effort	BE		For best-effort traffic

FTP

file transfer protocol

Glossary

FTP is the Internet standard client-server protocol for transferring files from one computer to another. FTP generally runs over TCP or UDP.

GRE

generic routing encapsulation

GUI

graphical user interface

A GUI is a computer user interface that incorporates graphics to make software easier to use.

H-QoS

hierarchical QoS

HTML

hyper-text markup language

H-VPLS

hierarchical VPLS

ICMP

Internet control message protocol

ICMP is an extension to the Internet protocol. ICMP supports packets containing error, control, and informational messages. The ping command, for example, uses ICMP to test an Internet connection.

IEEE

Institute of Electrical and Electronic Engineers

IES

Internet Enhanced Service

IES is a routed connectivity service where the subscriber communicates with an IP router interface to send and receive Internet traffic. An IES has one or more logical IP router interfaces, each with an SAP that acts as the access point to the subscriber network. IES allows customer-facing IP interfaces to participate in the

same routing instance used for service network core routing connectivity. IESs require that the IP addressing scheme used by the subscriber be unique between other provider addressing schemes and possibly the entire Internet.

While the IES is part of the routing domain, the usable IP address space may be limited. This allows a portion of the service provider address space to be reserved for service IP provisioning and be administered by a separate but subordinate address authority.

IP interfaces defined within the context of an IES must have an SAP associated as the access point to the subscriber network. Multiple IESs are created to segregate subscriber-owned IP interfaces.

IETF

Internet Engineering Task Force

IGMP

Internet group management protocol

IGMP is an extension to the Internet protocol, used by IP hosts to report their host group memberships to neighboring multicast routers.

I/O

input/output

IP

Internet protocol

IP is part of the TCP/IP family of protocols that describes the protocol that tracks the Internet address of nodes, routes outgoing messages, and recognizes messages. IP is used in gateways to connect networks at OSI network level 3 and higher.

IP VPN

Internet protocol virtual private network

A class of VPN that allows the connection of multiple sites in a routed domain over a provider-managed MPLS network.

Glossary

IS-IS

intermediate system to intermediate system

IS-IS is an ISO standard link-state routing protocol. Integrated IS-IS is an extension that allows IS-IS to be used for route determination in IP networks.

ISO

International Standards Organization

An international organization that is responsible for a wide range of standards, including those relevant to networking. ISO developed the OSI model, a popular networking reference model.

ISP

Internet service provider

ITU-T

International Telecommunications Union — Telecommunication Standardization Sector

The ITU is an international organization within the United Nations, where governments and the private sector coordinate global telecommunication networks and services. The ITU Telecommunication Standardization Sector (ITU-T) is one of the three Sectors of the ITU. The ITU-T's mission is to ensure efficient and on-time production of high-quality standards, in the form of recommendations, covering all fields of telecommunications.

JMS

java messaging service

JMS is used by the 5620 SAM-O to retrieve event and real-time alarm information from the 5620 SAM.

LAG

link aggregation group

An LAG increases the bandwidth available between two nodes by grouping up to eight ports into one logical link. The aggregation of multiple physical links allows load sharing and offers seamless redundancy. If one of the links fails, traffic is redistributed over the remaining links. Up to eight links can be supported in a single LAG, and up to 64 LAGs can be configured on a node.

LAN

local area network

LDP

label distribution protocol

LDP is a signaling protocol used for MPLS path setup and teardown. An LDP is used by LSRs to indicate to other LSRs the meaning of labels used to forward traffic.

LDP is defined in RFC 3036.

LED

light-emitting diode

LLC

logical link control

LLC is the higher of the two data link layer sublayers defined by the IEEE. The LLC sublayer handles error control, flow control, framing, and MAC-sublayer addressing. The most prevalent LLC protocol is IEEE 802.2, which includes both connectionless and connection-oriented variants.

LMI

local management interface

A set of enhancements to the basic frame relay specification.

LSP

label switched path

LSPs support MPLS functionality and allow network operators to perform traffic engineering. There are two types of LSPs:

- static LSP
A static LSP specifies a static path. All routers that the LSP traverses must be configured manually with labels. No signaling is required.
- signaled LSP
A signaled LSP is an LSP that is set up using a signaling protocol. The signaling protocol allows labels to be assigned from an ingress router to an egress router. Signaling is triggered by the ingress router. Only the ingress router, and not the intermediate routers, must be configured. Signaling also facilitates path selection.

LSR

label switched router

An LSR is an MPLS node that runs MPLS control protocols and is capable of forwarding packets based on labels. An MPLS node may also be capable of forwarding native Layer 3 packets.

MAC

media access control

MAC is a sublayer of the data link layer, defined in IEEE 802.2 specifications, that is responsible for accessing the LAN medium. The MAC layer handles the recognition and identification of individual network devices.

Every computer and network node has a MAC address that is hardware-encoded.

MD5

message digest version 5 algorithm

MD5 is a type of authentication. The MD5 algorithm takes an input message or arbitrary length and produces a 128-bit message digest of the input.

menu bar

The menu bar is a tool on the GUI that organizes tasks across broad headings. You can perform functions on the application by selecting an action from the menu bar.

MIB

Management Information Base

The MIB is the database of an SNMP-managed device that store objects representing the components of the network.

MPLS

multiprotocol label switching

MPLS is a technology in which forwarding decisions are based on fixed-length labels inserted between the data link layer and network layer headers to increase forwarding performance and flexibility in path selection.

MTU

maximum transmission unit

MTU is the largest unit of data that can be transmitted over a particular interface type in one packet. The MTU can change over a network.

multicast routing

Multicast routing delivers source traffic to multiple receivers without any additional burden to the source or the receivers. Multicast packets are replicated in the network by routers that are enabled with PIM, which results in the efficient delivery of data to multiple receivers.

navigation tree

The navigation tree displays a view of all managed equipment, services, and protocols, and allows you to navigate through these components.

network topology

A network topology is the layout of a network, which can include the way in which elements in a network, such as nodes, are connected and how they communicate.

NOC

network operations center

OAM&P

Operations, Administration, Maintenance, and Provisioning

Glossary

Network maintenance includes connectivity verification, alarm surveillance, continuity checking, performance monitoring, and service provisioning.

OC-N

Optical Carrier - level *N*

An optical SONET signal carried at the speed of *N*, for example, OC-12 is a signal at 622.08 Mb/s.

OPEX

operations expenditure

OSI

open systems interconnection

A reference model of protocols organized in seven layers, with the aim of facilitating the interworking of equipment from different manufacturers.

OSPF

Open Shortest Path First

OSPF is an IETF standard link-state routing protocol used to determine the most direct path for a transmission in IP networks.

OSPF-TE

OSPF traffic engineering

OSS

operational support system

Network management system supporting a specific management function, such as alarm surveillance and provisioning, in a carrier network.

OUI

organizational unique identifier

Three octets assigned by the IEEE in a block of 48-bit LAN addresses.

PDU

protocol data unit

PE

provider edge

PID

profile identifier

PIM

protocol independent multicast

Multicast routing architecture that allows the addition of IP multicast routing on existing IP networks. PIM is unicast routing protocol independent and can be operated in two ways — dense and sparse.

PIR

peak information rate

The maximum rate at which a connection can carry traffic.

POS

packet over SONET

PPP

point-to-point protocol

PPP is an IETF standard protocol that allows a computer to use TCP/IP with a standard telephone line and a high-speed modem to establish a link between two (and only two) terminal installations.

pseudo-wire

Another term for virtual leased line (VLL).

Q-in-Q

Q-in-Q refers to stacked VLANs. The term derives from 802.1Q, an IEEE standard that defines the operation of VLAN switch/bridges which permit the definition, operation, and administration of VLAN topologies within a switched/bridged LAN

Glossary

infrastructure. The protocol uses a labeling or tagging mechanism that identifies the VLAN number. It supports the ability to prioritize the VLAN traffic based on prioritization labels (802.1P).

QoS

Quality of Service

QoS is a term for the set of parameters and their values that determines the performance of a virtual circuit. This service level is usually described in a network by delay, bandwidth, and jitter.

RADIUS

remote authentication dial-in user service

A remote user authentication, authorization, and accounting protocol.

RFC

Request For Comment

The IETF document category that contains many documents, including standards, produced by the IETF.

RIB

routing information base

RIB-IN

RIB ingress

RIP

Routing Information Protocol

RIP is a Bellman-Ford routing protocol based on distance vector algorithms that measure the shortest path between two points on a network in terms of the number of hops between those points. Various forms of RIP are used to distribute routing information in IP, XNS, IPX, and VINES networks.

router

A router is an interface device between two networks, connecting LANs to LANs or LANs to WANs. It selects the most cost-effective route for moving data between multiprotocol LANs, making sure that only one route exists between source and destination devices. Routers make forwarding decisions based on network layer addresses.

RSVP-TE

Resource Reservation Protocol is used two ways:

- RSVP is the process of reserving network and host resources to achieve a QoS for an application.
- RSVP is an IP-based protocol that is used for communicating application QoS requirements to intermediate transit nodes in a network. RSVP uses a soft-state mechanism to maintain path and reservation state in each node in the reservation path.

SAP

service access point

SDH

synchronous digital hierarchy

SDH is an ITU-T standard for optical interfacing that is technically consistent with SONET.

SDP

service distribution path

A service distribution path acts as a logical way of directing traffic from one router to another router through a unidirectional service tunnel. The 5620 SAM uses the term service tunnel. The SDP terminates at the far-end router, which directs packets to the correct service egress SAPs on that device. A distributed service consists of a configuration with at least one SAP on a local node, one SAP on a remote node, and an SDP binding the service to the service tunnel.

SFP

small form factor pluggable

SFP is a specification for a new generation of optical modular transceivers. The devices are designed for use with small form factor connectors and offer high-speed and physical compactness. They are hot-swappable.

SLA

service-level agreement

An SLA is a service contract between a network service provider and a subscriber that guarantees a particular QoS. SLAs are used for providing network availability and data-delivery reliability.

SNAP

subnetwork access protocol

SNAP is an Internet protocol that operates between a network entity in the subnetwork and a network entity in the end system. SNAP specifies a standard method of encapsulating IP datagrams and ARP messages on IEEE networks. The SNAP entity in the end system makes use of the services of the subnetwork and performs three key functions: data transfer, connection management, and QoS selection.

SNMP

Simple Network Management Protocol

A protocol used for the transport of network management information between a network manager and a network element. SNMP is the most commonly used standard for most interworking devices.

SOAP

simple object access protocol

SOAP is a XML-based protocol for exchange of information in a decentralized, distributed environment. SOAP is defined by the World Wide Web Consortium (w3c).

SONET

Synchronous Optical Network

SONET is an ANSI standard for fiber-optic transmission of high-speed digital traffic. SONET allows internetworking of transmission products from multiple vendors and defines a physical interface, optical line rates known as OC signals, frame format, and an OAM protocol. The base rate is 51.84 Mb/s (OC-1), and higher rates are multiples of the base rate.

SONET uses synchronous high-speed signals and provides easy access to low-speed signals by mapping them into VTs.

SONET is a North American standard that is technically consistent with SDH, which is international.

SSH

secure shell

STM-N

Synchronous Transport Module - level N

An SDH signal carried at the speed of N , for example, STM-4 is a signal at 622.08 Mb/s.

subscriber

A subscriber is a customer who buys services from a network provider.

TACACS+

terminal access controller access control system

A remote user authentication, authorization, and accounting protocol.

TCP and TCP/IP

transmission control protocol and transmission control protocol/Internet protocol

Protocols widely used for communicating across interconnected networks. TCP provides transport functions that ensure that all information sent is received correctly at the final destination. IP defines the format of the routing information.

Telnet

Telnet is the Internet-standard TCP/IP protocol for remote terminal connection service. It allows a user at one site to interact with a remote timesharing system at another site as if the user's terminal connected directly to the remote machine.

The Telnet command and program are used to log in from one Internet site to another. It gets the user to the login prompt of another host.

tiered architecture

Tiered architecture refers to the way in which the GUI and the network management components use a Java-based technology that provides distributed, secure, and scalable applications. This tiered architecture allows for scaling and fair load balancing, which improves performance.

UDP

user datagram protocol

UDP is a minimal transport network protocol above the IP network layer that does not guarantee datagram delivery.

VC

virtual channel

VLAN

virtual local area network

VLL

virtual leased line

A virtual leased line is a type of VPN where packets are transported in a point-to-point manner.

Other terms used for VLL: Epipe service and pseudo-wire.

VPLS

virtual private LAN service

A VPLS is a type of VPN in which a number of sites are connected in a single bridged domain over an IP/MPLS network.

VPN

virtual private network

VPRN

virtual private routed network

Another term for IP VPN.

VRRP

virtual router redundancy protocol

VT

virtual tributary

SONET format for mapping a lower-rate signal into a SONET payload. For example, VT-1.5 is used to transport a DS1 signal.

WAN

wide area network

window

Windows are forms, panels of information, equipment drawings, or graphics that appear on a screen. Windows commonly allow a user to input data and initiate functions, but some windows simply display information.

XML

extensible markup language

XML defines the syntax to customize markup languages. The markup languages are used to create, manage, and transmit documents across the Web.

Index

Numbers

5620 NM
 integration with 5620 SAM, 62
5620 SAM
 integration with 5620 NM, 62
 security, 76
5620 SAM architecture, 19
5620 SAM client, 22
5620 SAM components, 22
5620 SAM database, 22
5620 SAM functionality, 2
5620 SAM GUI, 3
5620 SAM GUI modules
 SAM-A, 52
 SAM-E, 52
 SAM-O, 52
 SAM-P, 52
5620 SAM server, 22
5620 SAM-A, 27
5620 SAM-O, 81

5620 SAM-P, 26

A

access ports, 56
alarm management, 66
Alcatel IP migration solutions, iii
ATM
 OAM diagnostics, 72

B

BGP, 43
BGP/MPLS VPN; *See* IP VPN
billing for services, 37
bridging, 49

C

circuit OAM, 71
configuration management, 53

Index

connected partner program, 82

D

diagnostics with OAM, 68

documentation
 additional, 89

E

Epipe service; *See* VLL

equipment

- alarm correlation, 66
- ease of management, 53
- GUI configuration, 53
- MDAs, 56
- ports, 56
- synchronization, 61

Ethernet

- LAN-WAN interface, 13
- point-to-point connections, 11

F

forwarding classes, 35

H

HP OpenView integration, 62

HQoS, 35

I

IES, 9

IGMP, 43

Internet enhanced service; *See* IES

inventory management, 58

IP VPN, 10

- OAM diagnostics, 72

IS-IS, 43

L

LANs

- virtual, 14

- virtual private, 13

Layer 3 VPN; *See* IP VPN

LDP, 43

license key, 59

LSP, 46

LSP ping and traceroute, 71

M

MAC OAM, 72

maps, 60

MDAs supported, 56

MPLS, 46

MPLS-enabled services, iii

MTU OAM, 70

multicast

- triple play solution, 16

multicast routing, 48

multiple device support

- 7450 ESS, 8

- 7750 SR, 8

- Telco, 8

N

network management policies, 29
network ports, 56
network synchronization, 61

O

OAM, 68
 ATM ping, 72
 circuit, 71
 IP VPN ping and trace, 72
 LSP ping and traceroute, 71
 MAC, 72
 MTU, 70
 tunnel, 71
open interfaces, 81
OSPF, 43
OSS interface
 connected partner program, 82
 professional services, 87
OSS support, 81

P

performance accounting using statistics,
 37
PIM, 43
platform support, 19
policies overview, 29
ports supported, 56
professional services, 87
provisioning
 5620 SAM-P, 26
pseudo-wire; *See* VLL

Q

QoS, 29

R

RADIUS, 76
redundancy, 22
RFC 2547; *See* IP VPN
RIP, 43
router functionality enabled on GUI, 52
router security, 76
routing policies, 29
routing protocol
 ease of configuration, 45
 using the GUI, 41
RSVP, 43

S

scalability sizing, 23
security, 76
service assurance
 5620 SAM-A, 27
service configuration, 4
service management policies, 29
service mirrors, 72
service routing, 2
service templates, 26
services
 IES, 9
 IP VPN, 10
 mirrors, 72
 VLAN, 14

Index

- VLL, 11
- VPLS, 13
- signaling methods
 - using 5620 SAM, 41
- statistics, 37

T

- TACACS+, 76
- topology management, 60
- triple play solution, iv
 - multicast, 16
- tunnel OAM, 71

U

- user documentation, 89
- user management, 76

V

- virtual leased line; *See* VLL
- virtual private LANs; *See* VPLS
- VLAN, 14
- VLL, 11
- VPLS, 13
- VPNs
 - IP, 10
- VPRN; *See* IP VPN

X

- XML OSS interface, 81

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