

General Switch Management Protocol Applicability

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Abstract

This memo provides an overview of the GSMP protocol and includes information relating to its deployment in a MPLS environment.

1. Overview

The General Switch Management Protocol (GSMP) has been available to the IETF community for several years now as informational RFC's. Both V1.1 released in March 1996 as [RFC1987](#) [2], and V2.0 released in August 1998 as [RFC2297](#) [3] are available. V1.1 has been implemented by several vendors.

In V1.1 and V2 GSMP was intended only for use with ATM switches. During the course of the last year, the GSMP working group has decided to expand the purview of GSMP to the point where it can be used to control a number of different kinds of switch and can thus live up to what its name indicates; a general switch management protocol. To do this, commands and arguments needed to be generalised, with sections added discussing the manner in which the generalised protocol could be applied to specific kinds of switches and port types. In short the protocol has gone through major changes in the last 18 months.

GSMP provides an interface which can be used to separate the data forwarder from the routing and other control plane protocols such as LDP. As such it allows service providers to move away from monolithic systems which bundle control plane and data plane into a single tightly coupled system - usually in a single chassis. Separating the control components from the forwarding components and using GSMP for switch management, enables service providers to create multi-service systems composed of various vendors equipment.

The IETF GSMP working group was established in the routing area because GSMP was being seen as an optional part of the MPLS solution. In a MPLS system, it is possible to run the routing protocols and label distribution protocols on one system while passing data across a generic switch, e.g. an ATM switch. GSMP provides the management mechanism needed in such a scenario.

GSMP has also been selected by the Multiservice Switching Forum(MSF) as its protocol of choice for the Switch Control Interface identified in their architecture. The MSF is an industry forum which establishes their member's requirements and then works with the appropriate standards bodies to foster their goals. In the case of GSMP, the MSF presented the IETF GSMP Working Group with a set of requirements for GSMP. The working group has made a determined effort to comply with those requirements.

2. GSMP V3 Document Set

The current version of GSMP is documented in 3 documents:

- General Switch Management protocol V3 [[5](#)]
- GSMP Packet Encapsulations for ATM, Ethernet and TCP
- Definitions of Managed Objects for the General Switch Management Protocol [[1](#)]

3. Description of protocol

The General Switch Management Protocol V3 (GSMPv3) [5], is a general purpose protocol to control a label switch. GSMP allows a controller to establish and release connections across the switch; add and delete leaves on a multicast connection; reserve resources; manage switch ports; request configuration information; and request statistics. It also allows the switch to inform the controller of asynchronous events such as a link going down. The GSMP protocol is asymmetric, the controller being the master and the switch being the slave.

A physical switch can be partitioned in many virtual switches. GSMP does not provide support for defining switch partitions. GSMP treats a virtual switch as if it were a physical switch.

GSMP may be transported in three ways:

- GSMP may run across an ATM link connecting the controller to the switch, on a control connection (virtual channel) established at initialisation.
- GSMP operation across an Ethernet link is specified.
- GSMP operation across an IP network is specified.

Other encapsulation are possible, but have not been defined. Encapsulation are defined in a separate standards track document.

A label switch is a frame or cell switch that supports connection oriented switching using the exact match forwarding algorithm based on labels attached to incoming cells or frames.

A label switch may support multiple label types, however, each switch port can support only one label type. The label type supported by a given port is indicated by the switch to the controller in a port configuration message. Connections may be established between ports supporting different label types. There are two forms of labels support; short 28 bit labels which are sufficient for many purposes and TLV labels which are defined for labels that do not fit in 28 bits. Examples of the

label types which use the short form include ATM, Frame Relay, and MPLS Generic Labels. Examples of labels which use the TLV form include DS1, DS3, E1, E3 and MPLS FECs.

A connection across a switch is formed by connecting an incoming labelled channel to one or more outgoing labelled channels. Connections are generally referenced by the input port on which they arrive and the Labels values of their incoming labelled

channel. In some messages connections are referenced by the output port.

GSMP supports point-to-point and point-to-multipoint connections. A multipoint-to-point connection is specified by establishing multiple point-to-point connections each of them specifying the same output branch. A multipoint-to-multipoint connection is specified by establishing multiple point-to-multipoint trees each of them specifying the same output branches.

In general a connection is established with a certain quality of service (QoS). This version of GSMP includes a default QoS Configuration and additionally allows the negotiation of alternative, optional QoS configurations. The default QoS Configuration includes three QoS Models: a default service model, a simple priority model and a QoS profile model.

GSMP contains an adjacency protocol. The adjacency protocol is used to synchronise state across the link, to negotiate which version of the GSMP protocol to use, to discover the identity of the entity at the other end of a link, and to detect when it changes.

[3.1](#) Switch Partitioning

In this version of GSMP switch partitioning is static and occurs prior to running GSMP. The partitions of a physical switch are isolated from each other by the implementation and the controller assumes that the resources allocated to a partition are at all times available to that partition and only to that partition. A partition appears to its controller as a physical label switch. The resources allocated to a partition appear to the controller as if they were the actual physical resources of the partition. For example if the bandwidth of a port is divided among several partitions, each partition would appear to the controller to have

its own independent port.

GSMP controls a partitioned switch through the use of a partition identifier which is carried in every GSMP message. Each partition has a one-to-one control relationship with its own logical controller entity (which in the remainder of the document is referred to simply as a controller) and GSMP independently maintains adjacency between each controller-partition pair.

[3.2](#) Switch and controller interactions

Multiple switches may be controlled by a single controller using multiple instantiations of the protocol over separate control connections.

Alternatively, multiple controllers can control a single switch. Each controller would establish a control connection to the switch using the adjacency protocol. The adjacency mechanism maintains a state table indicating which the control connections that are being maintained to the same partition. The switch provides minimal information to the controller group about the number and identity of the attached controllers. It does nothing, however, to co-ordinate the activities of the controllers, and will execute all commands as they are received. It is the controller group responsibility to co-ordinate its use of the switch. This mechanism is most commonly used for controller redundancy and load sharing. Definition of the mechanism controllers use to co-ordinate their control is not within GSMP's scope.

[3.3](#) Service support

All GSMP switches must support the default QoS Configuration. A GSMP switch may additionally support one or more alternative QoS Configurations. GSMP includes a negotiation mechanism that allows a controller to select from the QoS configurations that a switch supports.

The default QoS Configuration includes three models:

The Service Model is based on service definitions found external to GSMP such as in CR-LDP, Integrated Services or ATM Service Categories. Each connection is assigned a specific service that defines the handling of the connection by the switch. Additionally, traffic parameters and traffic controls may be assigned to the connection depending on the assigned service.

In the Simple Abstract Model a connection is assigned a priority when it is established. It may be assumed that for connections that share the same output port, a cell or frame on a connection with a higher priority is much more likely to exit the switch before a cell or frame on a connection with a lower priority if they are both in the switch at the same time.

The QoS Profile Model provides a simple mechanism that allows connection to be assigned QoS semantics defined external to GSMP. Each profile is an opaque indicator which has been predefined in the controller and in the switch.

[4.](#) Summary of Message Set

The following table gives a summary of the messages defined in this version of the specification. It also makes a recommendation of the minimal set of messages that should be supported in an MPLS environment. These messages will be labelled as "Required", though the service provided by the other messages are essential for the operation of carrier quality controller/ switch operations. V1.1 or V2 commands which are no longer support are marked as "Obsolete" and should no longer be used.

[4.1](#) Messages Table

Message Name	Message Number	Status
Connection Management Messages		
Add Branch	16	Required
ATM Specific - VPC.....	26	
Delete Tree.....	18	
Verify Tree.....	19	Obsoleted
Delete All Input.....	20	
Delete All Output.....	21	
Delete Branches.....	17	Required
Move Output Branch.....	22	

ATM Specific - VPC.....	27	
Move Input Branch.....	23	
ATM Specific - VPC.....	28	
Port Management Messages		
Port Management.....	32	Required
Label Range.....	33	
State and Statistics Messages		
Connection Activity.....	48	
Port Statistics.....	49	Required
Connection Statistics.....	50	
QoS Class Statistics.....	51	Reserved
Report Connection State.....	52	
Configuration Messages		
Switch Configuration.....	64	Required
Port Configuration.....	65	Required
All Ports Configuration.....	66	Required
Service Configuration.....	67	

Reservation Messages		
Reservation Request.....	70	Required
Delete Reservation.....	71	Required
Delete All Reservations.....	72	
Event Messages		
Port Up.....	80	
Port Down.....	81	
Invalid Label.....	82	
New Port.....	83	
Dead Port.....	84	
Abstract and Resource Model Extension Messages		
Reserved.Message Range.....	200-249	

5. Security Considerations

The security of GSMP's TCP/IP control channel has been addressed in [4]. Any potential remaining security considerations are not addressed in the current revision of this draft.

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References

- [1] Sjostrand, H., "Definitions of Managed Objects for the General Switch Management Protocol (GSMP)," Internet-Draft [draft-ietf-gsmp-mib-01](#), March 2000.
- [2] Newman, P, Edwards, W., Hinden, R., Hoffman, E. Ching Liaw, F., Lyon, T. and Minshall, G., "Ipsilon's General Switch Management Protocol Specification," Version 1.1, [RFC 1987](#), August 1996.
- [3] Newman, P, Edwards, W., Hinden, R., Hoffman, E., Ching Liaw, F., Lyon, T. and Minshall, G., "Ipsilon's General

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- [4] T. Worster, "GSMP Packet Encapsulations for ATM, Ethernet and TCP," Internet-Draft [draft-ietf-gsmp-encaps-00](#), Jan 2000.
- [5] Doria, A, Sundell, K, Hellstrand, F, Worster, T, "General switch Management Protocol V3," Internet Draft [draft-ietf-gsmp-04.txt](#), March 2000
- [6] Worster, T,. " GSMP Packet Encapsulations for ATM, Ethernet and TCP," Internet Draft [draft-ietf-gsmp-encaps-00.txt](#), October 1999

Authors' Addresses

Avri Doria
Nokia
5 Wayside Road
Burlington MA 01803
Phone: +1 781 993 4656
avri.doria@nokia.com

Kenneth Sundell
Nortel Networks AB
S:t Eriksgatan 115 A
P.O. Box 6701
SE-113 85 Stockholm Sweden
ksundell@nortelnetworks.com