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IP Switching Protocols

In order to fill an ATM 155 Mbps line, an IP router may need to send up to 100,000 packets per second. This is beyond the capability of most routers, mainly because each IP datagram needs to be routed separately (IP is not connection oriented).

Ipsilon developed the IP switch, to solve this problem by implementing Cut Through Routing, thus allowing IP routing to be 5 times faster than other IP routers on the market. This is done by detecting several classes of IP flows during the routing process. A **flow** is a sequence of packets, having the same source and destination addresses, as well as common higher-level protocol types (UDP, TCP), type of service and other characteristics (as indicated by the information in the IP packet header).

Once a flow is detected and classified, the IP switch signals the upstream node (where the data comes from) to use a new VC for that flow. The same is done by the downstream node, making the switch send flow packets using a new VC.

When the flow is received and transmitted through dedicated VCs, it can be switched using the ATM switching hardware, with no routing involved. In

addition, a layer 2 label is attached to the header of each flow packet, enabling faster lookup in cache routing tables.

Signalling between IP switches is done using two protocols: Ipsilon Flow Management Protocol (IFMP) and General Switch Management Protocol (GSMP).

IFMP

RFC 1953 1996-05 <http://www.cis.ohio-state.edu/htbin/rfc/rfc1953.html>

The Ipsilon Flow Management Protocol (IFMP), is a protocol for instructing an adjacent node to attach a layer 2 label to a specified IP flow to route it through an IP switch. The label allows more efficient access to cached routing information for that flow and allows the flow to be switched rather than routed in certain cases.

IFMP is composed of two sub-protocols: the Adjacency Protocol and the Redirection Protocol. IFMP messages are encapsulated within an IPv4 packet. They are sent to the IP limited broadcast address (255.255.255.255). The protocol field in the IP header contains the value 101 (decimal) to indicate an IFMP message.

The structure of the IFMP header is shown in the following illustration:

Version (1)	Op Code (1)	Checksum (2)
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IFMP header structure

Version

The ICMP protocol Version number. The current version is 1.

OP Code

The function of the message.

Four Op Codes are defined for the IFMP Adjacency Protocol.

- 0 SYN.
- 1 SYNACK.
- 2 RSTACK.
- 3 ACK.

Five Codes are defined for the IFMP Redirection Protocol.

- 4 REDIRECT.
- 5 RECLAIM.
- 6 RECLAIM ACK.
- 7 LABEL RANGE.
- 8 ERROR.

Checksum

The CRC value.

GSMP

RFC 1987 1996-08 <http://www.cis.ohio-state.edu/htbin/rfc/rfc1987.html>

The General Switch Management Protocol (GSMP), is a general purpose protocol to control an ATM switch. GSMP allows a controller to establish and release connections across the switch, add and delete leaves on a point-to-multipoint connection, manage switch ports, request configuration information and request statistics.

GSMP packets are variable length and are encapsulated directly into AAL5 with an LLC/SNAP header 0x00-00-00-88-0C to indicate GSMP messages.

The structure of the GSMP header is shown in the following illustration:

Version (1)	Message type (1)	Result (1)	Code (1)
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GSMP header structure

Version

The GSMP protocol version number, currently version 1.

Message type

The GSMP message type. There are five classes, each of which have a number of different message types. The classes are: Connection Management, Port Management, Statistics, Configuration, and Events.

Result

Used in request messages. Indicates whether a response is required if the outcome is successful.

Code

Further information concerning the result in a response message. Mostly used to pass an error code in a failure response. In a request message, the code field is not used and is set to 0.