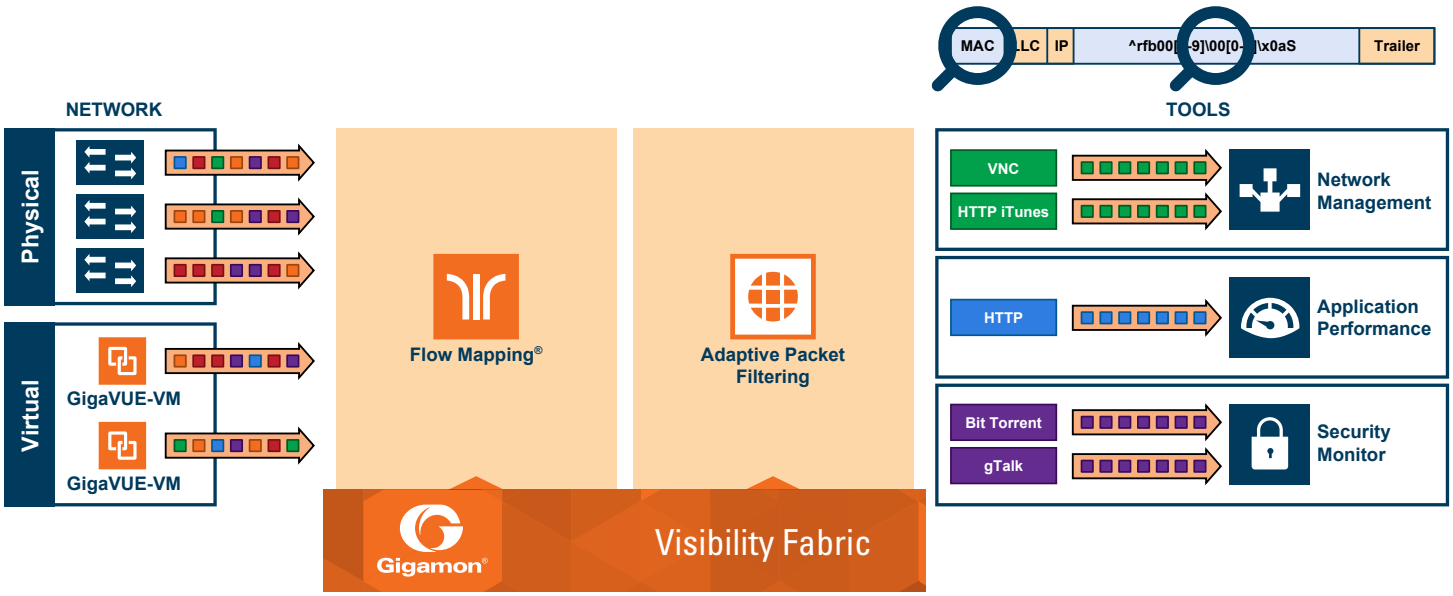
Application Note

Adaptive Packet Filtering

Regular Expression Filtering, as the name indicates offers the option to identify patterns inside a packet across any part of the packet, including the packet payload. These patterns can be as simple as a static string at a user configured offset, or an extremely complex PCRE regular expression at a variable offset.



With the flexibility offered by regular expression-based filters, an operator can for example:

- Identify and mask credit card numbers, social security numbers across user-level transactions
- Identify and mask phone numbers exchanged across SIP packets
- As part of HTTP/S transactions:
  - Filter on URLs
  - Filter on patterns in the user-agents, PCRE-anchors to identify packets
  - Identify HTTPS transactions on non-standard SSL port
- Filter on DNS queries for specific URLs
- Filter on source and destination addresses in FCoE packets

Identify and Mask Social Security Numbers in User-level Transactions

In this example, we are looking for packets that contain social security numbers in the incoming traffic stream. Once a match is detected, the SSN is masked and then packets are forwarded to a monitoring tool for additional analysis. One has to specify a single byte (in Hex) as the masking character and use it in conjunction with the mask option in the GigaSMART® rule.

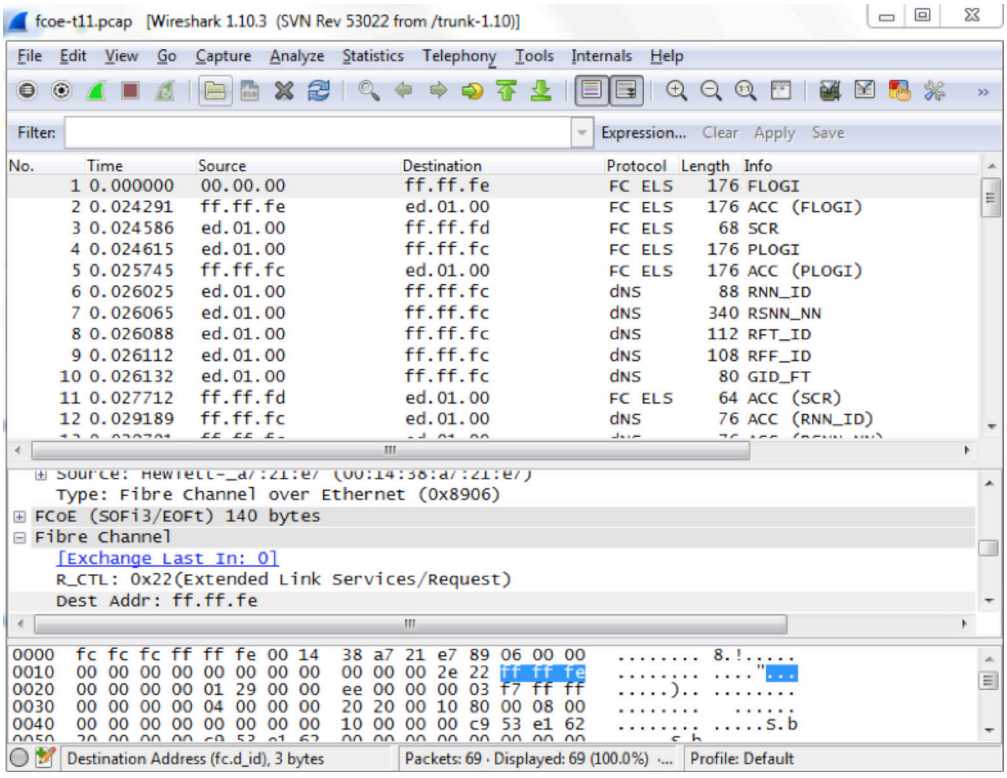
Please note: operators can always match against a specific social security number pattern if that's what they are looking for.

```
# Configure ports
port 1/1/x3 type network
port 1/1/x4 type tool
port 1/1/x1 type tool
# configure gigasmart gsops
gsgroup alias gsg1 port-list 1/1/e1
gsop alias gsfil apf set port-list gsg1
# configure vport
vport alias vp1 gsgroup gsg1
# forward all traffic to first-level map
map alias to_vp
  to vp1
  from 1/1/x3
# forward any traffic to vp1
rule add pass ipver 4
 exit
# configure second-level map to filter on string and mask it
map alias m1
  use gsop gsfil
  to 1/1/x1
  from vp1
# Pattern match across the entire packet, mask it with '255' for each digit of the SSN
  gsrule add pass pmatch mask 0xFF RegEx "^\d{3}-\d{2}-\d{4}$" 0..1750
  exit
```

Filtering on FCoE traffic

Adaptive Packet Filtering offers tremendous flexibility leveraging expression-based filters. These filters can be used as an infrastructure to classify traffic streams with protocol headers that are typically unsupported on traditional TAP/SPAN aggregation devices.

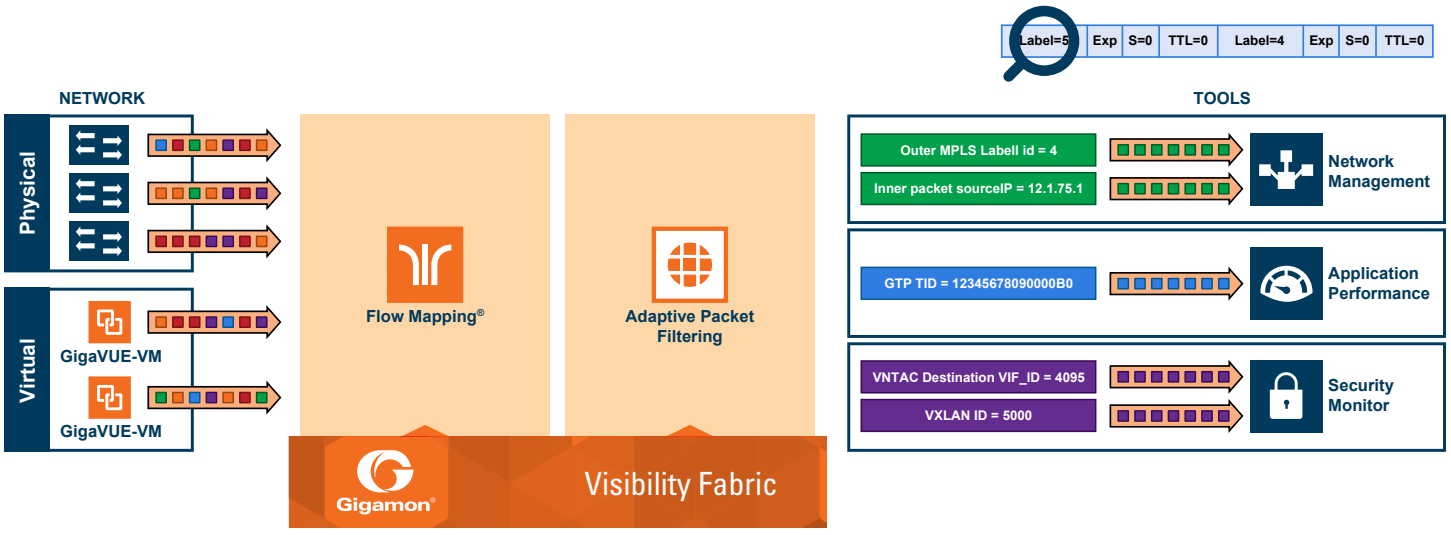
In this example we are using regular expression-based filters for filtering on source addresses in a Fibre Channel header.



```
# Configure ports
port 1/1/x3 type network
port 1/1/x4 type tool
port 1/1/x1 type tool
# configure gigasmart gsops
gsgroup alias gsg1 port-list 1/1/e1
gsop alias gsfil apf set port-list gsg1
# configure vport
vport alias vp1 gsgroup gsg1
# forward all traffic to second-level map
map alias to_vp
  to vp1
  from 1/1/x3
# forward FCOE traffic to vp1
rule add pass ethertype 8906
exit
# configure second-level map to filter on regular expression
map alias m1
  use gsop gsfil
  to 1/1/x1
  from vp1
# string match at a specific offset
# search for dst addr in FCOE packet
gsrule add pass pmatch string "\xff\xff\xfe" 29
exit
```

Multiple Encapsulations

In order to complement the mobility brought about by the virtualized server infrastructure, network virtualization overlays like VXLAN, VN-Tag, and NVGRE are being designed and implemented in data centers and enterprise environments. Across service provider environments, huge volumes of traffic are being tunneled over GTP. Gigamon's Visibility Fabric™ provides the option of stripping out or removing these headers, thus providing visibility to monitoring tools that do not understand these overlays and encapsulation protocol. Now with Adaptive Packet Filtering, this capability is further enhanced. Operators have the option of making forwarding decisions based on the encapsulation and inner packet contents.



With encapsulation awareness enabled by Adaptive Packet Filtering, operators have multiple options to act on the packet, such as the flexibility to:

- Filter on encapsulation header parameters, Layer 2 – 4 parameters in the outer or inner headers (up to 5 layers of encapsulation) and in any combination. As an example:
  - Forward traffic specific to a subset of VXLAN IDs to one or more monitoring tools
  - Distribute traffic based on MPLS label values across one or more monitoring tools
- In combination with header stripping and/or tunnel decapsulation:
  - Decapsulate a header or terminate a tunnel and then make forwarding decisions based on the original packet
  - Implement "conditional" header stripping, based on encapsulation header parameters or inner/outer packet contents
    - » Forward a subset of traffic "as-is" to monitoring tools that need these encapsulations for analysis
    - » Alternatively strip out the outer headers/encapsulations and distribute traffic to monitoring tools that do not require these outer headers for analysis
- Since Adaptive Packet Filtering is implemented as a second level map, operators can also implement overlapping rules where:
  - A copy of the traffic can be distributed across a group of monitoring tools
  - A refined subset from the same incoming stream is distributed across a different set of tools

Filtering on Subscriber Device IP (User-Endpoint IP or UE-IP)

Encapsulation awareness enabled by Adaptive Packet Filtering allows mobile operators to filter on Layer 2 – 4 header parameters found in an encapsulated packet.

This enables operators to filter and forward traffic specific to a mobile subscriber device or a group of subscriber devices, identified by their IP addresses (User-Endpoint IP) to one or more monitoring tools. In this example, we are:

- Identifying and forwarding traffic from/to a UE-IP of 1.1.1.1 to a monitoring tool connected to 1/1/x1
- Identifying and forwarding traffic from/to a UE-IP of 1.1.1.2 to a different monitoring tool connected to tool port 1/1/x4

In many cases, the GTP control sessions are low-volume and are useful in providing some level of visibility into the quality of experience of the subscribers. To this end, operators prefer to replicate the control sessions across all the monitoring tools, while filtering and forwarding a subset of the user-plane sessions to a subset of monitoring tools. The example below also illustrates configuration commands, leveraging Gigamon's patented Flow Mapping® technology to replicate the GTP control sessions across all the monitoring tools involved in the traffic analysis.

```
# Configure ports
port 1/1/x3 type network
port 1/1/x4 type tool
port 1/1/x1 type tool
# configure gigasmart gsops
gsgroup alias gsg1 port-list 1/1/e1
gsop alias gsfil apf set port-list gsg1
# configure vport
vport alias vp1 gsgroup gsg1
# forward GTP-u traffic to second-level map
map alias to_vp
  to vp1
  from 1/1/x3
  rule add pass portsrc 2152
 exit
```

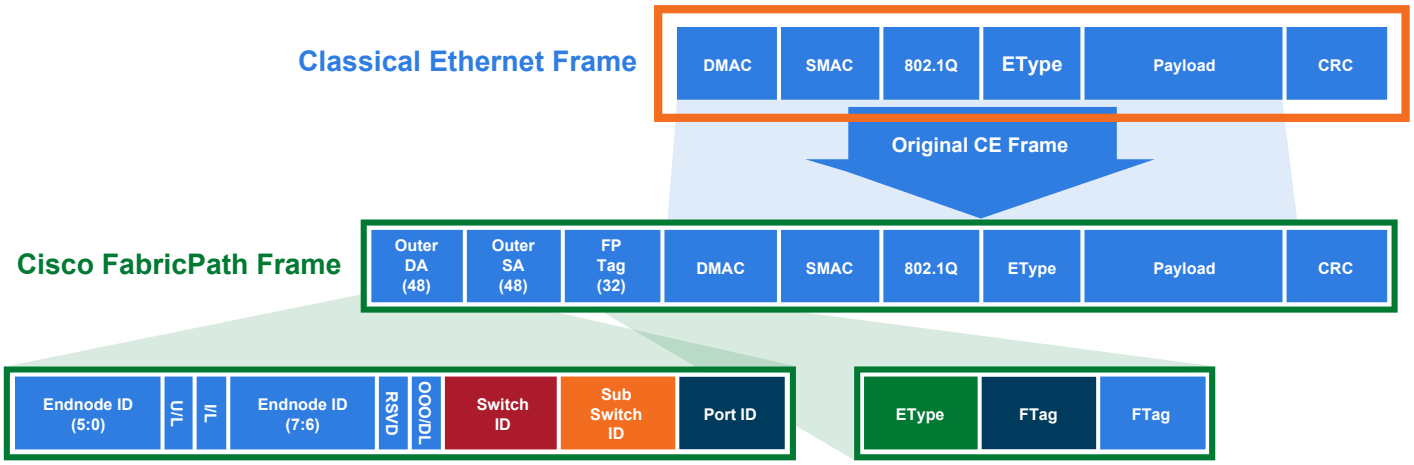
```
vport alias vp1 gsgroup gsg1
# Replicate GTP-c traffic to all the tools
map alias to_tool
  to 1/1/x1,1/1/x4
  from 1/1/x3
  rule add pass portsrc 2123
 exit

# configure second-level map to filter on src/dst (bidirectional) ip 1.1.1.1
map alias m1
  use gsop gsfil
  to 1/1/x1
  from vp1
  gsrule add pass ipv4 src pos 2 value 1.1.1.1 255.255.255.255
  gsrule add pass ipv4 dst pos 2 value 1.1.1.1 255.255.255.255
  exit
# configure second-level map to filter on src/dst (bidirectional) ip 1.1.1.2
map alias m2
  use gsop gsfil
  to 1/1/x4
  from vp1
  gsrule add pass ipv4 src pos 2 value 1.1.1.2 255.255.255.255
  gsrule add pass ipv4 dst pos 2 value 1.1.1.2 255.255.255.255
  exit
```

Filtering on Inner Layer 2 – 4 Parameters for Unrecognized Headers

The flexibility of encapsulation awareness enables filtering on encapsulated contents even if advanced packet filtering doesn't recognize the outer encapsulation header. The example below illustrates a packet encapsulated in FabricPath headers. FabricPath headers, as shown in the figure below, are MAC-in-MAC headers that are currently not recognized by advanced packet filtering; however, operators can still filter and forward traffic flows based on Layer 2 – 4 parameters found in the encapsulated packets.

- Identifying and forwarding traffic from/to ip 1.1.1.1 in the inner/original packet to monitoring tool connected to tool port 1/1/x1
- Identifying and forwarding traffic from/to ip 1.1.1.2 in the inner/original packet to monitoring tool connected to tool port 1/1/x4



```
# Configure ports
port 1/1/x3 type network
port 1/1/x4 type tool
port 1/1/x1 type tool
# configure gigasmart gsops
gsgroup alias gsg1 port-list 1/1/e1
gsop alias gsfil apf set port-list gsg1
# configure vport
vport alias vp1 gsgroup gsg1
# forward fabric path packets to second-level map
map alias to_vp
  to vp1
  from 1/1/x3
  rule add pass ethertype 8903
 exit
# configure second-level map to filter on src/dst (bidirectional) ip 1.1.1.1
map alias m1
  use gsop gsfil
  to 1/1/x1
  from vp1
  gsrule add pass ipv4 src pos 1 value 1.1.1.1 255.255.255.255
  gsrule add pass ipv4 dst pos 1 value 1.1.1.1 255.255.255.255
  exit
# configure second-level map to filter on src/dst (bidirectional) ip 1.1.1.2
map alias m2
  use gsop gsfil
  to 1/1/x4
  from vp1
  gsrule add pass ipv4 src pos 1 value 1.1.1.2 255.255.255.255
  gsrule add pass ipv4 dst pos 1 value 1.1.1.2 255.255.255.255
  exit
```

Filtering on Encapsulation Headers

Adaptive Packet Filtering also provides the flexibility of filtering on specific parameters found in the encapsulation headers related to GTP, VXLAN, VN-Tag, just to name a few.

Intelligent filtering across advanced encapsulation headers include:

- VXLAN ID,
- ERSPAN ID,
- GRE Key,
- VN-Tag src/dst vif id, list id,
- VLAN ID in QinQ,
- MPLS labels
- GTP tunnel ID

GTP Tunnel ID-Based Filtering

The example given below illustrates filtering and forwarding traffic based on tunnel IDs that are included as part of the GTP user-plane messages. It also illustrates the concept of optionally sending traffic to a shared collector when that traffic does not match any of the configured filters. In this example, GTP control sessions are being forwarded to all the monitoring tools leveraging the power of Flow Mapping by filtering on Layer 4 UDP port 2132.

- For GTP-u
  - Filter and forward teid ranges 0x001e8480..0x001e8489 to monitoring tool connected to tool port 1/1/x1
  - Filter and forward teid ranges 0x001e8490..0x001e8499 to monitoring tool connected to tool port 1/1/x4
  - Forward the rest of the traffic to a shared collector

```
# Configure ports
port 1/1/x3 type network
port 1/1/x4 type tool
port 1/1/x1 type tool
port 1/1/x2 type tool
# configure gigasmart gsops
gsgroup alias gsg1 port-list 1/1/e1
gsop alias gsfil apf set port-list gsg1
# configure vport
vport alias vp1 gsgroup gsg1
# forward GTP-u traffic to second-level map
map alias to_vp
  to vp1
  from 1/1/x3
  rule add pass portsrc 2152
 exit
map alias ctrl_to_tool
  to 1/1/x1..2,1/1/x4
  from 1/1/x3
  rule add pass portsrc 2123
 exit
# configure second-level map to filter on teid range 0x001e8480..0x001e8489
map alias m1
  use gsop gsfil
  to 1/1/x1
  from vp1
  gsrule add pass gtp gtpu-teid range 0x001e8480..0x001e8489 subset none
  exit
# configure second-level map to filter on teid range 0x001e8490..0x001e8499
map alias m2
  use gsop gsfil
  to 1/1/x4
  from vp1
  gsrule add pass gtp gtpu-teid range 0x001e8490..0x001e8499 subset none
  exit
## Add collector for unmatched data
map-scollector alias scoll
from vp1
collector 1/1/x2
exit
```

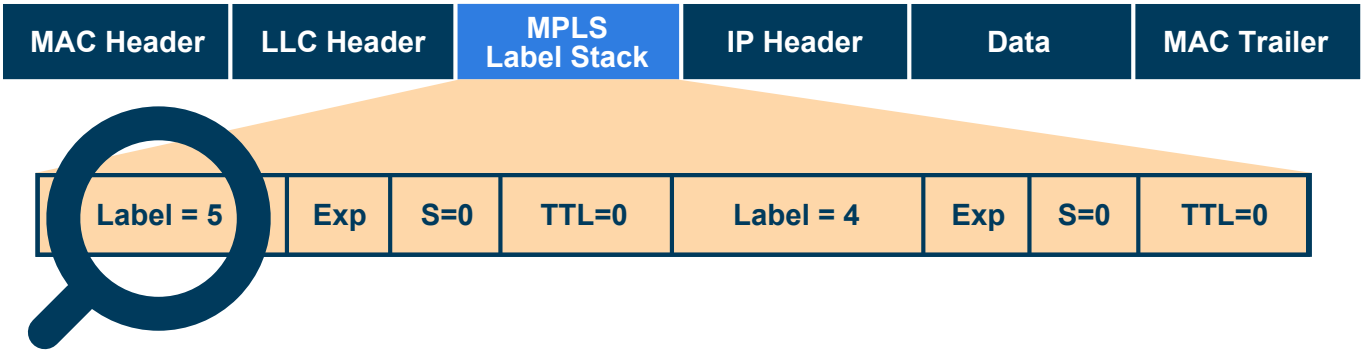
MPLS Label-based Filtering

Multiprotocol Label Switching (MPLS) is a mechanism in high-performance telecommunications networks that directs data from one network node to the next based on short path labels rather than long network addresses, avoiding complex lookups in a routing table. The labels identify virtual links (paths) between distant nodes rather than endpoints.

MPLS is a scalable, protocol-independent transport. In an MPLS network, data packets are assigned labels. Packet-forwarding decisions are made solely on the contents of this label, without the need to examine the packet itself. This allows one to create end-to-end circuits across any type of transport medium, using any protocol.

However in the context of visibility nodes, traffic flows encapsulated in MPLS labels cannot be filtered and forwarded. With the wide-scale adoption of MPLS as a technology across enterprise and service provider environments, the ability to classify traffic flows based on MPLS labels would be a huge value add to granularly control the flow of traffic to the monitoring tools. Adaptive Packet Filtering can be leveraged to filter and forward traffic flows based on MPLS label values. MPLS can stack multiple labels to form tunnels within tunnels. The flexibility of advanced packet filtering facilitates traffic classifications across up to 5 levels of MPLS label stacks in addition to the capability to filter and forward based on Layer 2 – 4 parameters found in the encapsulated packet. The example given below illustrates filtering and forwarding traffic based on MPLS labels.

- Filter and forward traffic flows specific to mpls label = 4 at the second level in the MPLS label stack to tool 1
- Filter and forward traffic flows specific to mpls label = 3 at the first level in the MPLS label stack to tool 2




```
# Configure ports
port 1/1/x3 type network
port 1/1/x4 type tool
port 1/1/x1 type tool
# configure gigasmart gsops
gsgroup alias gsg1 port-list 1/1/e1
gsop alias gsfil apf set port-list gsg1
# configure vport
vport alias vp1 gsgroup gsg1
# forward all traffic to second-level map
map alias to_vp
  to vp1
  from 1/1/x3
# forward any traffic to vp1
rule add pass ipver 4
 exit
# configure second-level map to filter on mpls label
map alias m1
  use gsop gsfil
  to 1/1/x1
  from vp1
  gsrule add pass mpls label pos 1 value 4
  exit
# configure second-level map to filter on mpls label
map alias m2
  use gsop gsfil
  to 1/1/x4
  from vp1
  gsrule add pass mpls label pos 1 value 3
  exit
```

Session Aware Adaptive Packet Filtering

Session Aware Adaptive Packet Filtering (SAPF) allows users to search for a particular string in a packet and once a match is made capture all subsequent packets belonging to the same flow. Session awareness provides mechanisms to match and drop particular flows that are of no interest (e.g. a streaming media service such as Hulu, Netflix, Pandora, Rdio, etc. or a peer to peer application such as eMule, Bit Torrent, etc.) or match and forward flows that are important (such as SSL running on non-standard TCP ports, phone conversations, etc.) to the business.

To create session aware maps, one has to initially define what constitutes a session. This can be done by specifying attributes such as the IPv4 source or destination, Layer 4 port source or destination, and many more. These can be added in combination.

```
# configure a SAPF application
apps sapf alias id_netflix_stream
sess-field add ipv4-5tupple outer
exit
# Configure ports
port 5/4/x3 type network
port 5/4/x4 type tool
port 5/4/x1 type tool
# configure gigasmart and gsops
gsgroup alias GS4 port-list 5/4/e1
gsop alias sapf_netflix_drop apf set sapf id_netflix_stream port-list GS4
# configure vport
vport alias vp4-1 gsgroup GS4
# forward all traffic to first-level map
map alias L1_drop_netflix
  to vp4-1
  from 5/4/x3
# forward any traffic to vp4-1
rule add pass ipver 4
 exit
# configure second-level map to filter on string
map alias L2_drop_netflix
  from vp4-1
  use gsop sapf_netflix_drop
  to 1/1/x1
# Pattern match across the entire packet, once found drop all packets (entire session)
  gsrule add drop pmatch protocol tcp pos 1 RegEx "netflix|nflxvideo|nflximg|Netflix|nflxext"
0..1750
  exit
```

Find and forward HTTPS traffic running on non-standard ports

Since the traffic is running on a port which cannot be predetermined, we use Adaptive Packet Filtering to search for the beginning of SSL v2 client hello packet. Once found, a session is formed and all packets will be distributed among multiple tool ports (load balanced).

```
# configure a SAPF application
apps sapf alias non_std_ssl_with_lb
sess-field add ipv4-5tupple outer
exit
# Configure network port
port 5/4/x3 type network
port 5/4/x4 type tool
port 5/4/x5 type tool
port 5/4/x6 type tool
port 5/4/x7 type tool
# Configure a load-balancing tool-port group
port-group alias ssl_lb
  port-list 5/4/x4..x7
  smart-lb enable
  exit
```

```
# configure gigasmart and gsops
gsgroup alias GS4 port-list 5/4/e1
gsop alias gsop_non_std_ssl_with_lb apf set sapf non_std_ssl_with_lb lb app sapf metric round-
robin port-list GS4
# configure vport
vport alias vp4-2 gsgroup GS4
# forward all traffic to first-level map
map alias L1_non_std_ssl
  from 5/4/x3
  to vp4-2
# forward any traffic to vp4-2
rule add pass ipver 4
 exit
# configure second-level map to filter on string
map alias L2_non_std_ssl
  from vp4-2
  use gsop gsop_non_std_ssl_with_lb
  to ssl_lb
# Pattern match across the entire packet, once found drop all packets (entire session)
  gsrule add pass pmatch protocol tcp pos 1 RegEx " \x16\x03.{3}\x01 " 0
  exit
```

Combining Adaptive Packet Filtering with GigaSMART Operations

Alternative to Second-level Map

Adaptive Packet Filtering can also be combined with other GigaSMART functions including header stripping, packet slicing/masking, de-duplication and FlowVUE™. This allows network administrators and operators to perform a second layer of filtering in combination with the GigaSMART tool optimization and packet manipulation operations. In the example illustrated below, operators can distribute traffic to monitoring tools based on decapsulated contents, more specifically, after header stripping VXLAN:

- Identifying and forwarding traffic from/to ip 1.1.1.1 from the decapsulated packets to a monitoring tool connected to a tool port 1/1/x1
- Identifying and forwarding traffic from/to ip 1.1.1.2 in the decapsulated packets to a monitoring tool connected to a tool port 1/1/x4

Note: This can be applied to any protocol that is supported via header stripping, for example:

- GTP, VXLAN, ISL, MPLS, VLAN, VN-Tag, FabricPath
- This is also supported for Gigamon tunnel decapsulation

```
# Configure ports
port 1/1/x3 type network
port 1/1/x4 type tool
port 1/1/x1 type tool
# configure gigasmart gsops
# configure gigasmart gsops
gsgroup alias gsg1 port-list 1/1/e1
gsop alias gsfil_vxlanhs apf set strip-header vxlan 0 port-list gsg1
# configure vport
vport alias vp1 gsgroup gsg1
# forward VXLAN traffic to second-level map
map alias to_vp
  to vp1
  from 1/1/x3
  rule add pass portsrc 8472
 exit
```

```
# configure second-level map to filter on src/dst (bidirectional) ip 1.1.1.1
map alias m1
  use gsop gsfil_vxlanhs
  to 1/1/x1
  from vp1
  gsrule add pass ipv4 src pos 2 value 1.1.1.1 255.255.255.255
  gsrule add pass ipv4 dst pos 2 value 1.1.1.1 255.255.255.255
  exit
# configure second-level map to filter on src/dst (bidirectional) ip 1.1.1.2
map alias m2
  use gsop gsfil_vxlanhs
  to 1/1/x4
  from vp1
  gsrule add pass ipv4 src pos 2 value 1.1.1.2 255.255.255.255
  gsrule add pass ipv4 dst pos 2 value 1.1.1.2 255.255.255.255
  exit
```

Conditional Header Stripping

Another use case that can be addressed leveraging the flexibility of Adaptive Packet Filtering would be the capability to header strip packets based on specific contents found across the packet including the inner packet contents. Since the Adaptive Packet Filtering rules are enforced before any other GigaSMART operation, operators can filter based on encapsulation protocol values and/or encapsulated (original) packet contents and apply conditional header stripping operations. The example illustrated below shows how an end-user can filter and strip out outer VXLAN headers for a subset of the traffic based on inner IP addresses, while sending the rest of the traffic "as-is" to monitoring tools that need the VXLAN headers for traffic analysis.

- Identifying and forwarding traffic from/to ip 1.1.1.1 in the inner/encapsulated packets to a monitoring tool connected to a tool port 1/1/x1 after header stripping VXLAN
- Identifying and forwarding traffic from/to ip 1.1.1.2 in the inner/encapsulated packets to a monitoring tool connected to a tool port 1/1/x4 without stripping the VXLAN header

VXLAN Encapsulation

Outer MAC DA	Outer MAC SA	Outer 802.1Q	Outer IP DA	Outer IP SA	Outer UDP	VXLAN ID (24Bit)	Inner MAC DA	Inner MAC SA	Optional Inner 802.1Q	Original Ethernet Payload

Note: This can be applied to any GigaSMART operation. While this example shows filtering based on inner packet contents, conditional GigaSMART operations can be applied by filtering on encapsulation headers as well.

Note: This can be applied to any protocol that is supported via header stripping, i.e.:

- GTP, VXLAN, ISL, MPLS, VLAN, VN-TAG, FabricPath
- This is also supported for Gigamon tunnel decapsulation

```
# Configure ports
port 1/1/x3 type network
port 1/1/x4 type tool
port 1/1/x1 type tool
# configure gigasmart gsops
gsgroup alias gsg1 port-list 1/1/e1
```

```
gsop alias gsfil_vxlanhs apf set strip-header vxlan 0 port-list gsg1
gsop alias gsfil apf set port-list gsg1
# configure vport
vport alias vp1 gsgroup gsg1
# forward VXLAN traffic to second-level map
map alias to_vp
  to vp1
  from 1/1/x3
# filter by UDP port #
  rule add pass portsrc 8472
 exit
# configure second-level map to filter on src/dst (bidirectional) ip 1.1.1.1
map alias m1
  use gsop gsfil_vxlanhs
  to 1/1/x1
  from vp1
  gsrule add pass ipv4 src pos 2 value 1.1.1.1 255.255.255.255
  gsrule add pass ipv4 dst pos 2 value 1.1.1.1 255.255.255.255
  exit
# configure second-level map to filter on src/dst (bidirectional) ip 1.1.1.2
map alias m2
  use gsop gsfil
  to 1/1/x4
  from vp1
  gsrule add pass ipv4 src pos 2 value 1.1.1.2 255.255.255.255
  gsrule add pass ipv4 dst pos 2 value 1.1.1.2 255.255.255.255
  exit
```

Combining Adaptive Packet Filtering with Gigamon Tunnel Decapsulation and Forward-specific IPs in the Original/Inner Packets to Specific Tools

The flexibility of Adaptive Packet Filtering can also be leveraged to conditionally forward traffic based on original/decapsulated packet contents for Gigamon tunnel decapsulation operation. In the example illustrated below, Adaptive Packet Filtering is being used for filtering on the IP address of the decapsulated packets to distribute traffic across a group of monitoring tools.

- Tunnel Decap and forward packets with src ip 1.1.1.1 in inner/original packet to tool 1
- Tunnel Decap and forward packets with src ip 1.1.1.2 in inner/original packet to tool 2

```
# Configure ports
port 1/1/x3 type network
port 1/1/x4 type tool
port 1/1/x1 type tool
# configure gigasmart gsops
gsgroup alias gsg1 port-list 1/1/e1
gsop alias gsfil_decap apf set tunnel-decap type portdst 4000 port-list gsg1
# configure vport
vport alias vp1 gsgroup gsg1
# forward gmip traffic to second-level map
map alias to_vp
  to vp1
  from 1/1/x3
# filter by UDP port #
  rule add pass portdst 4000
 exit
# configure second-level map to filter on src/dst (bidirectional) ip 1.1.1.1.
# decap and send it to 1/1/x1
map alias m1
  use gsop gsfil_decap
  to 1/1/x1
  from vp1
```

```
  gsrule add pass ipv4 src pos 2 value 1.1.1.1 255.255.255.255
  gsrule add pass ipv4 dst pos 2 value 1.1.1.1 255.255.255.255
  exit
# configure second-level map to filter on src/dst (bidirectional) ip 1.1.1.2
# decap and send it to 1/1/x4
map alias m2
  use gsop gsfil_decap
  to 1/1/x4
  from vp1
  gsrule add pass ipv4 src pos 2 value 1.1.1.2 255.255.255.255
  gsrule add pass ipv4 dst pos 2 value 1.1.1.2 255.255.255.255
  exit
```

Facilitating Overlapping Rules

Since Adaptive Packet Filtering is implemented as a second-level map operation, Adaptive Packet Filtering can also be leveraged for implementing basic overlapping rules. For the same incoming input stream, a copy of the traffic can be sent out to a group of monitoring tools while a refined subset of the traffic stream can be sent to a different set of monitoring tools. Typically overlapping rules would be implemented by combining Adaptive Packet Filtering with the patented Flow Mapping technology.

Please note that Role-Based Access Control in case of advanced packet filtering is applied at the gsgroup/e-port. In the example illustrated below, for the same input stream:

- HTTP traffic is identified and distributed to a monitoring tool connected to tool port 1/1/x1
- At the same time, the same stream of HTTP packets are being sent out after slicing unwanted packet contents to a different monitoring tool connected to tool port 1/1/x4

```
# Configure ports
port 1/1/x3 type network
port 1/1/x4 type tool
port 1/1/x1 type tool
# configure gigasmart gsops
gsgroup alias gsg1 port-list 1/1/e1
gsop alias gsfil apf set port-list gsg1
      gsop alias gsfil_slice apf set slicing protocol none offset 150 port-list gsg1
# configure vport
vport alias vp1 gsgroup gsg1
# forward all traffic to second-level map
map alias to_vp
  to vp1,1/1/x4
  from 1/1/x3
# forward all traffic to vp1 and tool2
rule add pass portsrc 2152
exit
# configure second-level map to filter on HTTP traffic and slice it
map alias m1
  use gsop gsfil_slice
  to 1/1/x1
  from vp1
  gsrule add pass l4port dst pos 2 value 80
  gsrule add pass l4port src pos 2 value 80
  exit
# configure second-level map to forward the rest of the traffic
map alias m2
  use gsop gsfil
  to 1/1/x1
  from vp1
  gsrule add pass ipver pos 1 value 4
exit
```

In this example, for the same traffic stream, we are sending TCP traffic to one monitoring tool while forwarding a subset of TCP flows specific to HTTP to another monitoring tool connected to tool port 1/1/x4.

```
# Configure ports
port 1/1/x3 type network
port 1/1/x4 type tool
port 1/1/x1 type tool
# configure gigasmart gsops
gsgroup alias gsg1 port-list 1/1/e1
gsop alias gsfil apf set port-list gsg1
# configure vport
vport alias vp1 gsgroup gsg1
# forward TCP traffic to second-level map
map alias to_vp
  to vp1,1/1/x4
  from 1/1/x3
# forward TCP traffic to vp1
rule add pass protocol tcp
exit
# configure second-level map to filter on HTTP
map alias m1
  use gsop gsfil
  to 1/1/x1
  from vp1
  gsrule add pass l4port dst pos 1 value 80
  gsrule add pass l4port src pos 1 value 80
  exit
```

Common Debug Commands Used to Verify Configuration

```
# Map Statistics #
show map stats alias <map-name>

# Port Statistics #
show port stats port-list <port-list>

# GigaSMART Statistics #
show gsop stats all
show vport stats all
show gsgroup stats all
show gsgroup flow-ops-report alias <gs-group> type flow-filtering any summary
show gsgroup flow-ops-report alias <gs-group> type flow-filtering gtp-imsi-pattern * upload
tftp://192.168.6.37/IMSI_list1
```

Note: For more information on Adaptive Packet Filtering GigaSMART operations (gsop) and mixing and matching gsops please review the GigaVUE-OS CLI User's Guide.

About Gigamon

Gigamon provides an intelligent Unified Visibility Fabric™ to enable the management of increasingly complex networks. Gigamon technology empowers infrastructure architects, managers and operators with pervasive visibility and control of traffic across both physical and virtual environments without affecting the performance or stability of the production network. Through patented technologies, centralized management and a portfolio of high availability and high density fabric nodes, network traffic is intelligently delivered to management, monitoring and security systems. Gigamon solutions have been deployed globally across enterprise, data centers and service providers, including over half of the Fortune 100 and dozens of government and state and local agencies.

For more information about the Gigamon Unified Visibility Fabric visit: **www.gigamon.com**

4023-04 04/15

Gigamon® 3300 Olcott Street, Santa Clara, CA 95054 USA | +1 (408) 831-4000 | www.gigamon.com