



Hardware Timestamp

Table 1: Feature History Table

Whenever periodic stats are streamed, the collector reads the stats from its internal cache, instead of fetching the stats from the hardware. When the data is read from the sensor paths of Stats manager cache, the rate calculation shows spikes. This behavior is due to the timestamp from the collector that is off by several seconds. Therefore, timestamp of some other collector takes precedence because timestamps of collectors are not in synchronization with the current timestamp. This is observed when there are multiple collectors providing stats updates for the same interface.

The YANG data model for Stats manager `Cisco-IOS-XR-infra-statsd-oper.yang` is enhanced to enable the collector to read periodic stats data from the router using hardware timestamp.

The hardware timestamp is taken into account when a primary collector (for generic or proto stats) provides stats updates from the hardware to the Stats manager. With hardware timestamping in rate computation while streaming periodic stats, the spikes due to the timestamp issue is resolved.

The hardware timestamp is updated only when the collector attempts to read the counters from hardware. Else, the value remains 0. The latest stats can be streamed at a minimum cadence of 10 seconds and periodic stats at a cadence of 30 seconds. The support is available only for physical interfaces and subinterfaces, and bundle interface and subinterfaces.

When there is no traffic flow on protocols for an interface, the hardware timestamp for the protocols is published as 0. This is due to non-synchronized timestamps sent by the collector for protocols in traffic as compared to non-traffic scenarios.

A non-zero value is published for protocols that have stats published by a primary collector for both traffic and non-traffic scenarios.



Note The hardware timestamp is supported only for primary collectors. When the hardware has no update, the timestamp will be same. However generic counters are computed for primary and non-primary collectors. The non-primary collectors show the latest stats, but not the timestamp.

When the counters are cleared for an interface using **clear counters interface** command, all counter-related data including the timestamps for the interface is cleared. After all counter values are cleared and set to 0, the last data time is updated only when there is a request for it from a collector. For example, last data time gets updated from a collector:

```
Router# :Aug 7 09:01:08.471 UTC: statsd_manager_1[168]: Updated last data time for ifhandle
0x02000408,
```

```
stats type 2 from collector with node 0x100, JID 250, last data time 1596790868.
INPUT: last 4294967295 updated 1596469986. OUTPUT: last 4294967295 updated 1596469986
```

All other counter values and hardware timestamp are updated when the counters are fetched from the hardware. In this case, all counters including the hardware timestamp is 0:

```
{"node_id_str":"MGBL_MTB_5504","subscription_id_str":"app_TEST_200000001",
"encoding_path":"Cisco-IOS-XR-infra-statsd-oper:infra-statistics/interfaces/interface/cache/generic-counters",
"collection_id":"7848",
"collection_start_time":"1596790879567",
"msg_timestamp":"1596790879571","data_json":
[{"timestamp":"1596790879570","keys":[{"interface-name":"FortyGigE0/1/0/11"}],
"content":{"packets-received":"0","bytes-received":"0","packets-sent":"0",
"bytes-sent":"0","multicast-packets-received":"0","broadcast-packets-received":"0",
"multicast-packets-sent":"0","broadcast-packets-sent":"0","output-drops":0,"output-queue-drops":0,
"input-drops":0,"input-queue-drops":0,"runt-packets-received":0,"giant-packets-received":0,
"throttled-packets-received":0,"parity-packets-received":0,"unknown-protocol-packets-received":0,
"input-errors":0,"crc-errors":0,"input-overruns":0,"framing-errors-received":0,"input-ignored-packets":0,
"input-aborts":0,"output-errors":0,"output-underruns":0,"output-buffer-failures":0,"output-buffers-swapped-out":0,
"applique":0,"resets":0,"carrier-transitions":0,"availability-flag":0,
"last-data-time":"1596790868","hardware-timestamp":"0",
"seconds-since-last-clear-counters":15,"last-discontinuity-time":1596469946,"seconds-since-packet-received":0,
"seconds-since-packet-sent":0}}],"collection_end_time":"1596790879571"}
```

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Stream Telemetry Data about PBR Decapsulation Statistics

You can stream telemetry data about PBR decapsulation statistics for GRE and GUE encapsulation protocols that deliver packets using IPv4 or IPv6. The encapsulated data has source and destination address that must match with the source and destination address in the classmap. Both encapsulation and decapsulation interfaces collect statistics periodically. The statistics can be displayed on demand using **show policy-map type pbr [vrf vrf-name] address-family ipv4/ipv6 statistics** command. For more information on PBR-based decapsulation, see .

With this release, the decapsulation statistics can be displayed using

Cisco-IOS-XR-infra-policymgr-oper.yang data model and telemetry data. You can stream telemetry data from the sensor path:

```
Cisco-IOS-XR-infra-policymgr-oper:policy-manager/global/policy-map/policy-map-types/policy-map-type/vrf-table/vrf/afi-table/afi/stats
```

The following steps show the PBR configuration and the decapsulation statistics that is streamed as telemetry data to the collector.

Step 1 Check the running configuration to view the configured PBR per VRF.

Example:

```
Router#show running-config
Building configuration...
!! IOS XR Configuration 0.0.0
!!
vrf vrf1
 address-family ipv4 unicast
 !
 address-family ipv6 multicast
 !
netconf-yang agent
```

```

ssh
!
!
class-map type traffic match-all cmap1
  match protocol gre
  match source-address ipv4 161.0.1.1 255.255.255.255
  match destination-address ipv4 161.2.1.1 255.255.255.255
end-class-map
!
policy-map type pbr gre-policy
  class type traffic cmap1
  decapsulate gre
!
  class type traffic class-default
!
end-policy-map
!
interface GigabitEthernet0/0/0/1
  vrf vrf1
  ipv4 address 2.2.2.2 255.255.255.0
  shutdown
!
vrf-policy
  vrf vrf1 address-family ipv4 policy type pbr input gre-policy
!
end

```

Step 2 View the output of the VRF statistics.

Example:

```
Router#show policy-map type pbr vrf vrf1 addr-family ipv4 statistics
```

```

VRF Name:      vrf1
Policy-Name:   gre-policy
Policy Type:   pbr
Addr Family:   IPv4

Class:        cmap1
  Classification statistics      (packets/bytes)
    Matched                      :      13387587/1713611136
  Transmitted statistics        (packets/bytes)
    Total Transmitted            :      13387587/1713611136

Class:        class-default
  Classification statistics      (packets/bytes)
    Matched                      :                0/0
  Transmitted statistics        (packets/bytes)
    Total Transmitted            :                0/0

```

After you have verified that the statistics are displayed correctly, stream telemetry data and check the streamed data at the collector. For more information about collectors, see *Operate on Telemetry Data for In-depth Analysis of the Network* section in the [Monitor CPU Utilization Using Telemetry Data to Plan Network Infrastructure](#) chapter.

```

ios.0/0/CPU0/ $ mdt_exec -s Cisco-IOS-XR-infra-policymgr-oper:policy-manager
/global/policy-map/policy-map-types/policy-map-type/vrf-table/vrf/afi-table/afi/stats -c 100
{"node_id_str":"ios","subscription_id_str":"app_TEST_200000001","encoding_path":
"Cisco-IOS-XR-infra-policymgr-oper:policy-manager/global/policy-map/policy-map-types/policy-map-type
/vrf-table/vrf/afi-table/afi/stats","collection_id":"1","collection_start_time":"1601361558157",
"msg_timestamp":"1601361559179","data_json":[{"timestamp":"1601361559178","keys":[{"type":"ipv6"},
{"vrf-name":"vrf_gue_ipv4"}, {"type":"ipv4"}],"content":{"pmap-name":"gre-policy","vrf-name":
"vrf1","appln-type":2,"addr-family":1,"rc":0,"plmgr-vrf-stats":{"pmap-name":"gre-policy",
"cmmap-stats-arr":[{"cmmap-name":"cmap1","matched-bytes":"1713611136","matched-packets":"13387587",
"transmit-bytes":"1713611136","transmit-packets":"13387587"}]}]}]}],

```

```
"collection_end_time":"1601361559183"}
```

```
----- snipped for brevity -----
```
