

Attach Rate Throttling

This chapter describes the Attach rate throttling feature and includes the following topics:

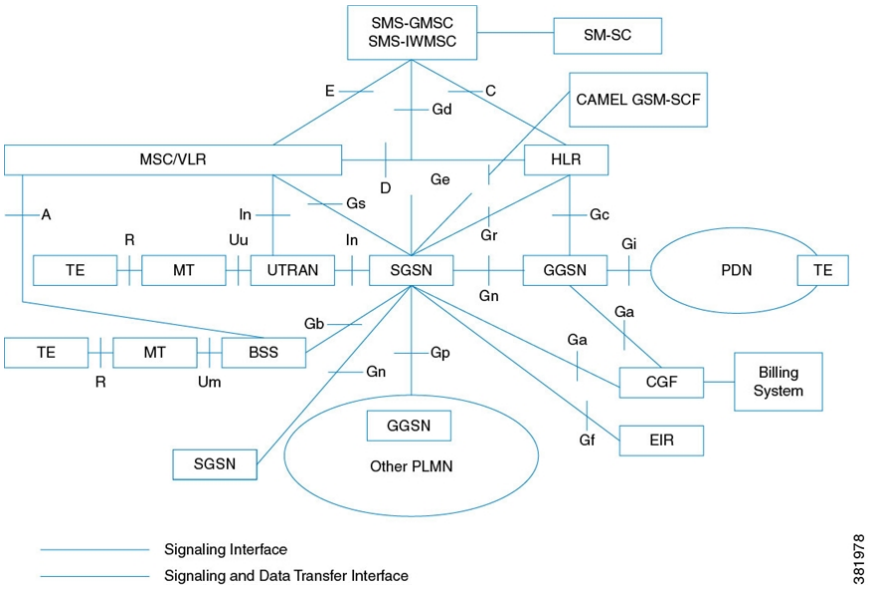
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Feature Description

The SGSN is located at the core of the GPRS Network. It is connected to several nodes in the network like the HLR, GGSN, MSC/VLR, and RNC/BSC so on.

The diagram below depicts the SGSN and its network connections in a GPRS Network.

Figure 1: SGSN in a GPRS Network.



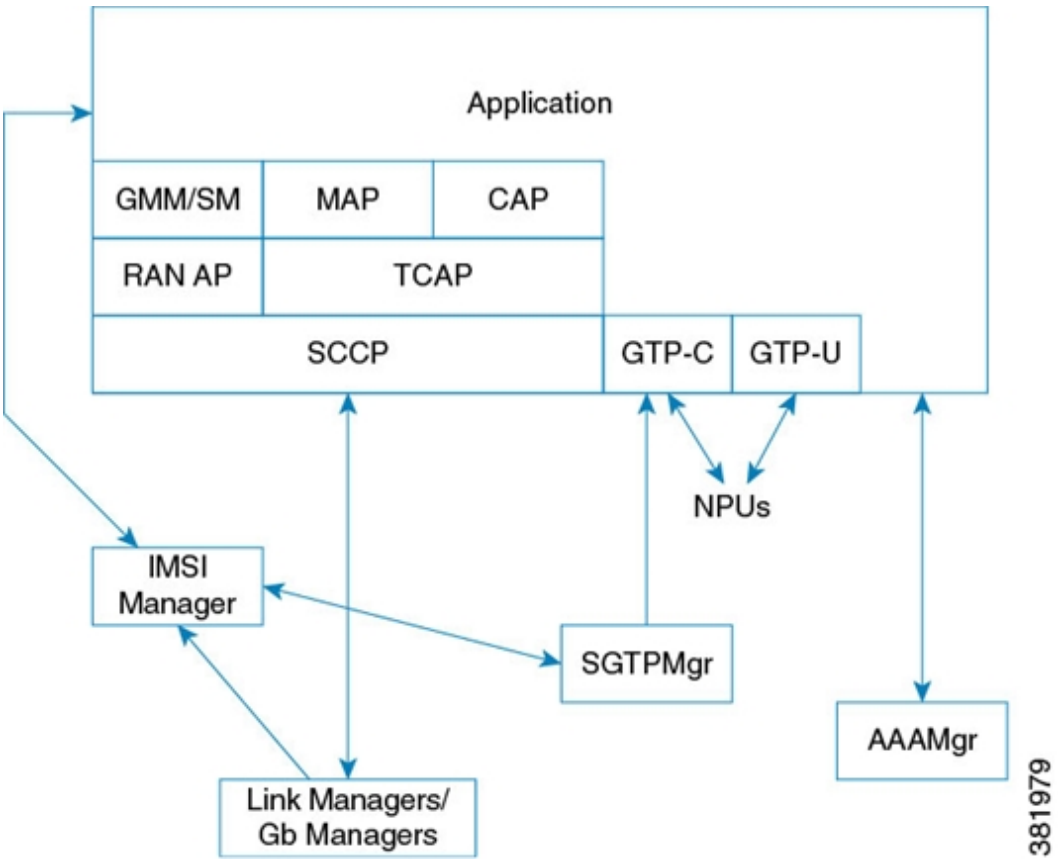
How it Works

Attach Rate Throttling Feature

The Mobile Stations access the services of a GPRS Network by attaching themselves to the network through SGSN nodes. The SGSN can process more than "5000" such attach requests per second. In a typical network the SGSN can be connected to other network elements over a narrow band link and these network elements may not able to process requests at high rates such as the SGSN. This may lead to an overload condition in other network elements. To prevent such scenarios, the Attach Rate throttling feature is designed, this feature limits the rate at which the SGSN processes requests.

The diagram below depicts the high level software architecture in a SGSN node:

Figure 2: Software architecture in a SGSN node.



In a SGSN node the Link Manager/Gb Managers and the IMSI Manager perform the following tasks:

1. **Link Manager/GbManager:**Manages the links towards different network elements such as RNC, HLR so on. The Attach requests and ISRAU requests received on the Link Manager/Gb Manager are sent to the IMSI Manager.
2. **IMSI Manager:** The IMSI Manager assigns the new connection requests to the various Session Managers. The assignment is done after verifying the load on the Session Managers. The Attach Rate Throttling feature is implemented at the IMSI Manager.

The IMSI manager is responsible for identifying the Session Manager to handle the incoming requests. The requests are then queued for the identified Session Manager. These queues are processed at the maximum possible rate. With the introduction of Attach Rate Throttling feature, an intermediary queue is introduced which buffers the incoming requests and processes these requests at the rate configured by the operator. The requests from the intermediary queue are processed at the configured attach rate and then forwarded to the identified Session Manager queue for normal processing. This allows the operator to cap the rate at which new requests are accepted by the SGSN. An overload scenario can be prevented with the introduction of the Attach Rate Throttling feature. The intermediary queues are operational only when the Attach Rate Throttling feature is enabled. If the feature is disabled, attach requests are directly queued for processing at the identified Session Manager.

Limitations

The operator must ensure that an optimal attach rate must be configured based on the network conditions:

1. If the incoming requests arrive at a very high rate and the attach rate configured to a very low rate, the requests will be dropped from the intermediary queue once the queue is full. The IMSI Manager can send a reject response with the appropriate reject cause codes for such all dropped requests or silently drop the requests.
2. If the configured attach rate is very low, the requests waiting time in the queue increases. The "t3310" timer at the MS expires and the MS will have to re-transmit the request. The IMSI Manager drops all requests which have waited in the queue for more than the configured wait time.

The configured Attach rate must have an optimal processing rate and waiting time.

Configuring the Attach Rate Throttling Feature

The following command is used to configure the Attach Rate Throttling feature, this command configures an attach rate throttle mechanism to control the number of new connections (attaches or inter-SGSN RAUs), through the SGSN, on a per second basis:

```
config
   network-overload-protection sgsn-new-connections-per-second
_new_connections action { drop | reject with cause { congestion | network
failure } } [ queue-size  queue_size  ] [ wait-time  wait_time ]
   default network-overload-protection sgsn-new-connections-per-second
   exit
```

Notes:

- The default mode of the command disables the Attach Rate Throttling feature.

  For detailed information on the command, see the *Command Line Interface Reference*.

Monitoring and Troubleshooting the Attach Rate Throttling Feature

Attach Rate Throttling Show Commands and Outputs

This section provides information regarding show commands and/or their outputs in support of the Attach Rate Throttling feature.

The counters for this feature are available under the show command **show gmm-sm statistics**, as a part of the Network Overload Protection counters.

- Network Overload Protection
-
  - Number of valid packets processed in the last sec.
  - Number of packets in Q in the last tick
  - Packets to be dequeued in the last tick
  - Number of new requests processed from the pacing queue in the last tick
  - Number of requests dropped from the pacing queue in the last tick
  - Average Number of requests processed per min (1 min)
  - Average Number of requests processed per min (5 min)
  - Average Number of requests processed per min (10 min)