APN-Backoff Timer Support

This chapter describes StarOS support for the APN-Backoff Timer feature on the P-GW and SAEGW.

Feature Description

Previously, the P-GW did not distinguish signaling traffic from Delay Tolerant or Low Priority devices such as low priority machine-to-machine traffic.

The UE was able to indicate its device profile to the MME via NAS and Attach Request messages. The MME was able to pass this information to the P-GW via the Signaling Priority Indication Information Element (IE) on the S5 interface. Some UEs may not have supported the sending of the Signaling Priority Indication IE on the S5 interface to the P-GW. As a result, the P-GW could not distinguish between the signaling types. With the current release, the P-GW can distinguish between these signaling types.

In addition, during overload situations, the P-GW previously allowed new sessions from Low Access Priority Indicator (LAPI) devices and treated the traffic from LAPI devices with the same priority as the normal UEs. With the current StarOS release, during overload conditions, the P-GW can be configured to back off the traffic that is identified as LAPI. The identification is based on either the APN configuration or the Signaling Priority Indicator IE.

The backoff timer algorithm and the R12 GTP-C Load/Overload Control algorithm work together. This feature provides the benefit of rejecting low priority calls in turn allowing more bandwidth for high priority calls.

Functionality

The following functionality has been implemented to support the APN Backoff Timer functionality:

1. The Signaling Priority Indication IE on the S5 interface in the Create Session Request message identifies the low priority devices.
2. A LAPI APN can be configured. Any call landing on that APN is considered a LAPI call.
3. A back off timer value is configured in the APN. The backoff timer is sent in Create Session Response messages in the P-GW Back-Off Timer IE.

4. If the following conditions are met, the call is rejected with the cause APN Congestion. The configured backoff timer value is inserted in the Back Off Timer IE in the Create Session Response message.
   - Once an incoming call is identified as LAPI due to condition 1 or 2 above.
   - The P-GW is in the overload state.
   - The backoff timer is configured.
5. The M2M license must be present and enabled on the system. The GTP-C Load/Overload feature's configuration and backend reporting of overload parameters works with the M2M license.
6. In some dictionaries (for example, custom35) CDRs have a LAPI field for LAPI calls. This field is populated when the Signaling Priority Indication IE indicates that the call is a LAPI call. However, if the call is of type LAPI due to the LAPI APN configuration, then the CDR should not have the LAPI field.
7. Bulk statistics, counters, and statistics have been implemented at the APN and P-GW service level to show the number of calls rejected due to the APN Backoff Timer feature.

GTP-C Overload Feature and the M2M License

To detect whether the P-GW/SAEGW is in the overload state, the GTP-C Overload feature's framework has been used. It is tied to the M2M license so that only overload configuration and reporting of the overload state is enabled. The remaining overload features such as, sending the OCI towards the peers, throttling, and receiving OCIs from peers do not work. This leads to the following behavioral scenarios:

If a Call is a LAPI call and the Backoff Timer is Configured and the P-GW is in the Overload State:

- Only M2M License: Call is rejected with cause APN Congestion.
- Only GTP-C Overload Enabled: Not applicable as backoff timer cannot be configured.
- Both M2M and Overload Enabled: Call is rejected with cause APN Congestion. That is, LAPI takes priority over the GTP-C Load/Overload feature.

If a Call is Not LAPI or Backoff Timer is Not Configured and the P-GW is in the Overload State:

- Only M2M License Enabled: No impact. Call is accepted normally.
- Only Overload License Enabled: Call accepted. OCI will be sent in the Create Session Response message. Overload feature works normally.
- Both M2M and Overload Features Enabled: Call accepted. OCI is sent in the Create Session Response message. Overload feature works normally. Backoff Timer feature is ignored.

Licensing

Important The APN Backoff Timer feature requires that the M2M license be enabled on the P-GW/SAEGW. Contact your Cisco account or support representative for licensing details.

Configuring APN Backoff Timer Support on the P-GW/SAEGW

This section describes how to configure APN Backoff Timer Support on the P-GW/SAEGW. The procedure consists of the following tasks:

1. Configuring LAPI Behavior
2. Configuring the Backoff Timer
3. Verifying the Configuration

Configuring LAPI Behavior

Use the following example to configure LAPI behavior:

```
configure
  apn apn_name
    pdn-behavior lapi
    end
```

To disable LAPI behavior:

```
configure
  apn apn_name
    no pdn-behavior
    end
```

Notes:

- **pdn-behavior lapi** configures the APN as a LAPI APN.
- **no pdn-behavior** disables the LAPI APN configuration.

Caution Do not configure the emergency APN and **pdn-behavior lapi** settings in the same APN, as these two settings are mutually exclusive. If both settings are configured in the same APN the **pdn-behavior lapi** configuration takes priority. As a result, if both settings are configured and the system is overloaded, the call will be rejected.

To determine if both settings are configured in the same APN, execute the **show configuration error verbose** command in *Exec Mode*. The command output contains a warning if both settings are configured in the same APN.

Configuring the APN Backoff Timer and Jitter Values

The P-GW requires a fixed value and a jitter to introduce randomness in the Backoff Timer value that is returned to the MME for different sessions; this helps prevent a session storm after the Backoff Timer expiry.

Use the example below to configure the APN Backoff Timer and Jitter Values:

```
configure
  apn apn_name
```

```
backoff timer-value seconds [ jitter seconds ]
end
```

To disable Backoff Timer functionality:

```
configure
  apn apn_name
    no backoff timer-value
    end
```

Notes:

- **backoff timer-value** *seconds* configures the backoff timer value, in seconds. Valid entry is an integer from 0 to 576000 seconds. There is no default setting.
- **jitter** *seconds* configures the jitter value, in seconds. Valid entry is from 0 to 1000 seconds. There is no default setting.

Verifying the Configuration

To verify the configuration:

In *Exec Mode*, issue the **show apn name** *apn_name* command, *apn_name* is the name of the APN for which you want to view configuration settings.

In the command output, look for the following fields:

- pdn behavior: <*lapi*> or <*no pdn-behavior*>
- Backoff Timer Value: <*seconds*> Jitter: <*seconds*>

Verify that the configuration settings are correct. If any of the settings are incorrect, use the configuration procedure in this chapter to reconfigure the incorrect setting(s).

Monitoring the Feature

This section provides information that enables operators to monitor the APN Backoff Timer feature.

Bulk Statistics

APN Schema

The following bulk statistics have been added to the APN Schema to support the APN Backoff Timer feature:

- rej-pdn-backofftimer

P-GW Schema

The following bulk statistic has been added to the P-GW schema to support the APN Backoff Timer feature.

- sessstat-rej-pdn-backofftimer

SAEGW Schema

The following bulk statistic has been added to the SAEGW schema to support the APN Backoff Timer feature:

- pgw-sessstat-rej-pdn-backofftimer

Show Command Output

This section describes the Exec Mode show commands and output available to monitor the APN Backoff Timer Support on the P-GW/SAEGW feature.

show apn name

The output of this command has been enhanced to show the configured backoff timer, jitter, and PDN behavior settings. These settings appear only if the M2M feature license is enabled.

- pdn behavior: lapi
- Backoff Timer Value: <*seconds*> Jitter: <*seconds*>

show apn statistics

The output of this command has been enhanced to indicate the number of PDNs rejected as a result of the configured backoff timer value.

- Number of PDNs rejected due to backoff algorithm:

show configuration apn name

The output of this command provides the operator with the current APN Backoff Timer settings.

- pdn-behavior lapi (if feature is enabled)
- backoff timer-value <*secs*> jitter <*secs*>

show pgw-service statistics

The output of this command has been enhanced to provide the total number of PDNs rejected due to the configured backoff timer value.

- PDNs Rejected By Reason:
  - APN-Backoff Timer

show session disconnect-reasons

The following disconnect reason has been added to support the APN Backoff Timer feature.

- apn-congestion