



# Backup and Recovery of Key KPI Statistics

This feature allows the backup of a small set of GGSN, P-GW, SAEGW, and/or S-GW key KPI counters for recovery of the counter values after a session manager (SessMgr) crash.

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## Feature Description

Before the Backup and Recovery of Key KPI Statistics feature was implemented, statistics were not backed up and could not be recovered after a SessMgr task restart. Due to this limitation, monitoring the KPI was a problem as the SGSN would lose statistical information whenever task restarts occurred.

KPI calculation involves taking a delta between counter values from two time intervals and then determines the percentage of successful processing of a particular procedure in that time interval. When a SessMgr crashes and then recovers, the SGSN loses the counter values - they are reset to zero. So, the KPI calculation in the next interval will result in negative values for that interval. This results in a dip in the graphs plotted using the KPI values, making it difficult for operations team to get a consistent view of the network performance to determine if there is a genuine issue or not.

This feature makes it possible to perform reliable KPI calculations even if a SessMgr crash occurs.

## How It Works

A key set of counters, used in KPI computation will be backed up for recovery if a SessMgr task restarts. The counters that will be backed up are determined by the KPIs typically used in several operator networks.

The backup of counters is enabled or disabled via configuration. The configuration specifies the product (currently only supported by the SGSN) for which counters will be backed up and also a time interval for the back up of the counters.

The backed up counters can be identified via CLI generated displays or via display of the four SGSN-specific backup statistics schemas: iups-bk, gprs-bk, map-bk, and sgtp-bk. The operator can use these schemas to

compute the KPI as statistics will have the recovered counters. During the display and the backup processes, both the normal counters and backed-up counters are cumulatively displayed or backed up.

- **iups-bk schema** - This schema is used for 3G GMM-SM counters which are backed up. The counters in this schema are pegged per IuPS service. Each line of output is per IuPS service. Additionally, there will be one set of consolidated counters for all IuPS services which is displayed with the SGSN service name.
- **gprs-bk schema** - This schema is used for 2G GMM-SM counters which are backed up. The counters in this schema are pegged per GPRS service. Each line of output is per GPRS service. Additionally, there will be one set of consolidated counters for all GPRS services which is displayed with the SGSN service name.
- **map-bk schema** - This schema is used for MAP and SMS counters which are backed up. The counters in this schema are pegged per MAP service. Each line of output is per MAP service.
- **sgtp-bk schema** - This schema is used for GTPU counters which are backed up. The counters in this schema are pegged per IuPS and SGTP service, one per line. Additionally, there will be one line of output which represents the counters consolidated for all IuPS and SGTP services.

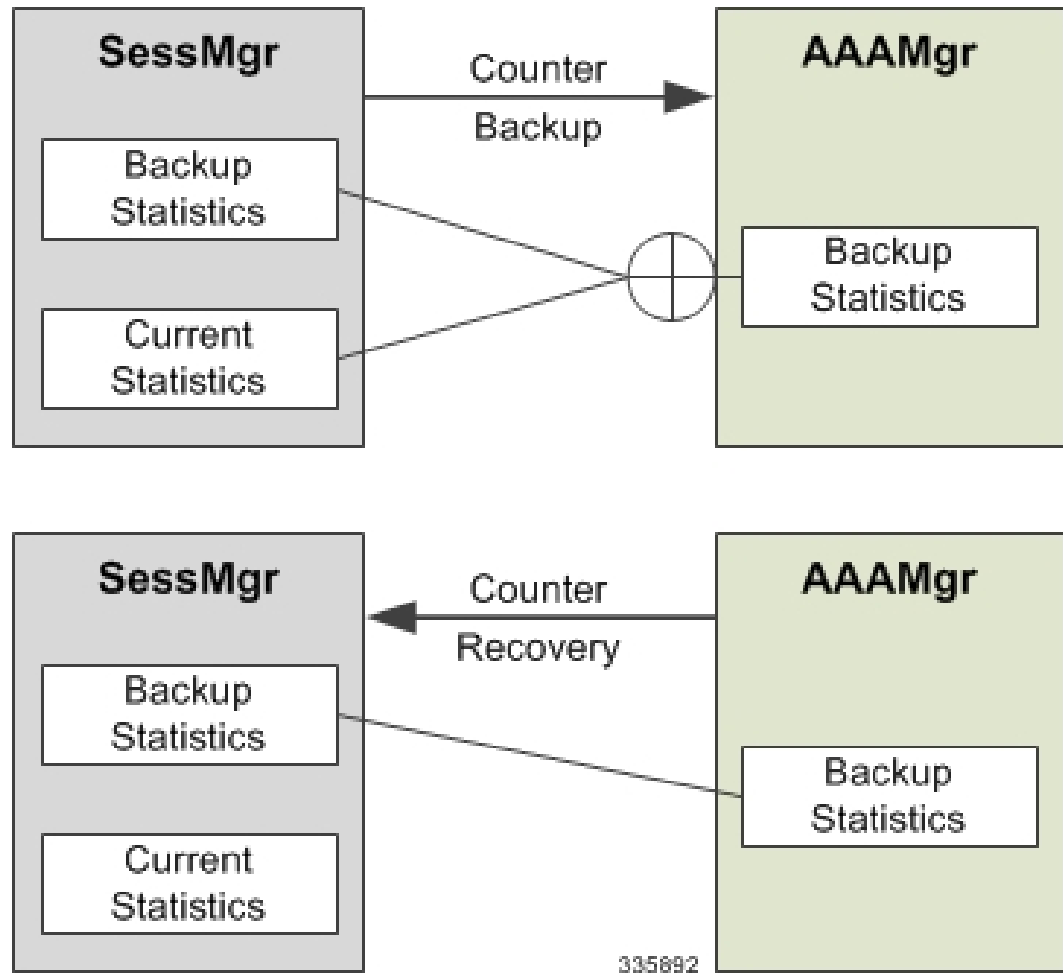
## Architecture

When this feature is enabled (see *Configuring Backup Statistics Feature* below), the SGSN only backs up the counters maintained at the SessMgr. Counters maintained by other managers, such as the LinkMgr or SGTPMgr, are not backed up. The recovery function does not need to be configured or 'started' as it occurs automatically as needed when the feature is enabled.

The counters are backed up to the AAAMgr that is paired with the SessMgr. They are recovered from the AAAMgr after a SessMgr task is killed. This feature makes use of the session recovery framework to backup and retrieve the counters.

The following diagram depicts how backed-up statistics are maintained separately at the SessMgr and how the cumulative values are backed up and recovered from the AAAMgr after SessMgr task recovery completes.

Figure 1: Back Up and Recovery of Statistics for SGSN



## Limitations

- A backup interval must be specified and counters are backed up only at the specified interval. For example, if the backup interval is specified as 5 minutes, then counters are backed up every 5 minutes. Suppose backup happened at Nth minute and the configured backup interval is for every 5 minutes, then if a task crash happens at N+4 minutes, the SGSN recovers only the values backed up at Nth minute and the data for the past 4 minutes is lost.
- Only service level statistics are backed up and recovered. Any KPI that is monitored per other granularity, such as per RA or per RNC, is not supported.
- Only statistics maintained at the SessMgr are backed up. Statistics at other managers, such as LinkMgr and GbMgr are not backed up.

# Configuring Backup Statistics Feature

For the Backup and Recovery of Key KPI Statistics feature to work, it must be enabled by configuring the backup of statistics for the SGSN.

## Configuration

The following CLI commands are used to manage the functionality for the backing up of the key KPI statistics feature

### Enabling

The following configures the backup of statistics for the SGSN and enables the Backup and Recovery of Key KPI Statistics feature.

```
configure
  statistics-backup sgsn
exit
```

### Setting the Backup Interval

The following command configures the number of minutes (0 to 60) between each backup of the statistics. When the backup interval is not specified a default value of 5 minutes is used as the backup interval

```
configure
  statistics-backup-interval minutes
exit
```

### Disabling

The following configures the SGSN to disable the backing up of statistics for the SGSN.

```
configure
  no statistics-backup sgsn
exit
```

Notes:

- When the new keyword is used, only the **recovered** values will be displayed.
- If no session manager crash has occurred, the above commands output displays with the normal counter values.
- If a session manager crash has happened, the above commands display the cumulative value so far (*including* the backed up value).
- The display of the counters will be similar to the **show sgsn-service statistics** command output with respect to naming and indentation. Only the subset of counters which are backed up will be displayed with the **recovered-values** option.

## Verifying the Backup Statistics Feature Configuration

Use either the **show configuration** command or the **show configuration verbose** command to display the feature configuration.

If the feature was enabled in the configuration, two lines similar to the following will appear in the output of a **show configuration [ verbose ]** command:

```
statistics-backup mme
statistics-backup-interval 5
```

Notes:

- The interval displayed is 5 minutes. 5 is the default. If the **statistics-backup-interval** command is included in the configuration, then the 5 would be replaced by the configured interval number of minutes.
- If the command to disable the feature is entered, then no **statistics-backup** line is displayed in the output generated by a **show configuration [ verbose ]** command.

## Managing Backed-up Statistics

A new keyword, **recovered-values**, is used with existing show and clear commands to either generate a display of the backed-up statistics or to clear the backed-up statistics.

### Displaying Backed-up Statistics

Use one of the following commands to generate a display of the backed up statistics:

- `show gmm-sm statistics [ recovered-values ] [ verbose ]`
- `show gmm-sm statistics sgsn-service sgsn_service_name [ recovered-values ] [ verbose ]`
- `show gmm-sm statistics gprs-service gprs_service_name [ recovered-values ] [ verbose ]`
- `show gmm-sm statistics iups-service iups_service_name [ recovered-values ] [ verbose ]`
- `show map-statistics [ recovered-values ]`
- `show map statistics map-service map_service_name [ recovered-values ]`
- `show sms statistics [ recovered-values ]`
- `show sms statistics name map_service_name [ recovered-values ]`
- `show sms statistics [ gprs-only | sgsn-only ] [ recovered-values ]`
- `show sgtpu statistics [ recovered-values ]`
- `show sgtpu statistics iups-service iups_service_name [ recovered-values ]`
- `show sgtpu statistics sgtp-service sgtp_service_name [ recovered-values ]`

Notes:

- When the **recovered-values** keyword is used, output includes both current + recovered backed-up statistical values.
- If no SessMmgr crash has occurred, then the recovered values in the output of the above commands will be 0 (zero).

### Clearing Backed-up Statistics

Use one of the following commands to clear (delete) the backed-up statistics. Note that the order entry for the service name identification varies in some of the commands. As well, the verbose keyword is not used with the **clear** commands.

- clear gmm-sm statistics [ recovered-values ]
- clear gmm-sm statistics [ recovered-values ] sgsn-service *sgsn\_service\_name*
- clear gmm-sm statistics [ recovered-values ] gprs-service *gprs\_service\_name*
- clear gmm-sm statistics [ recovered-values ] iups-service *iups\_service\_name*
- clear map-statistics [ recovered-values ]
- clear map statistics name *map\_service\_name* [ recovered-values ]
- clear sms statistics [ recovered-values ]
- clear sms statistics name *map\_service\_name* [ recovered-values ]
- clear sms statistics [ gprs-only | sgsn-only ] [ recovered-values ]
- clear sgtpu statistics [ recovered-values ]
- clear sgtpu statistics iups-service *iups\_service\_name* [ recovered-values ]
- clear sgtpu statistics sgtp-service *sgtp\_service\_name* [ recovered-values ]

## Notes:

- When the **recovered-values** keyword is used, only the **recovered** values will be cleared.