



## EC-GSM Support on the SGSN

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### Feature Description

In the EC-GSM feature, the Base Service Station (BSS) allocates special physical resources needed for extended channels to reach a Mobile Station (MS) based on a given location. Coverage classes are defined for identifying the optimal level of repetitions to reach the MS. This coverage class value is used by the BSS to reach the MS with optimal use of resources.

With this feature, the coverage extension frequency of 20 dB, which is beyond GSM coverage, can be achieved. This indicates a seven-fold improvement in the low-rate application range. The extended coverage frequency provides the ability to reach challenging locations – deep indoors, basements, remote areas where smart meters and sensors are deployed for monitoring purposes.

EC-GSM multiplexes with existing legacy GPRS and Extended GPRS (EGPRS) traffic channels that leads in easy deployment of EC-GSM in the existing EGPRS network with a minimal impact.

EC-EGPRS is an evolution of EGPRS providing a streamlined protocol implementation, reducing device complexity while supporting energy efficient operation with extended coverage compared to GPRS/EGPRS operation. EC-GPRS is also referred as EC-GSM. EC-GPRS aims to adapt and leverage existing 2G infrastructure to provide efficient and reliable IoT connectivity over an extended GSM Coverage to enable fast time to market.

A valid license key is required to enable the Extended Coverage Class feature. Contact your Cisco Account or Support Representative for information on how to obtain a license.

## How It Works

An EC-GPRS abled MS supports extended coverage where one or more blind physical layer transmissions are used for both Uplink and Downlink. For more information, refer to the 3GPP TS 45.002 specifications information.

EC-GPRS MSs operate in four different coverage classes where each class is approximated with a level of extended coverage compared to GPRS/EGPRS operation denoted as CC1, CC2, CC3 and CC4 respectively.

In Idle-mode, the MS performs a coverage class selection and communicates the selected class to the network. In Packet transfer mode, the network performs the coverage selection and communicates the coverage class to the MS. For Paging, the MS communicates the coverage class to the network when required. For more details on selection procedures, refer to 3GPP TS 45.008 [15] and 3GPP TS 44.018 [6] specifications document.

The MS reports the extended coverage class during system access to the BSS, and the BSS relays the uplink and downlink coverage class of the MS in the UL-UNITDATA BSSGP message. The SGSN stores the coverage class information for the MS and relays it back in all the DL-UNITDATA BSSGP messages towards the MS.

Also, SGSN provides downlink coverage class of the MS in Perform Location Requests, and the MS Radio Access capability with the LCS feature enabled.

### Coverage Class

Coverage class IEI consist of two-bit field tokens namely Uplink coverage class and Downlink coverage class. BSS communicates the class in the UL-UNITDATA BSSGP message to the SGSN.

The SGSN stores this IEI and relays it back in the DL-UNITDATA BSSGP message. Also SGSN provides the downlink coverage class of the MS in the Paging-PS request and the Perform Location Request (LCS).

### Paging-PS

When performing a Paging-PS procedure, the SGSN include the following IEIs in support of EC-EGPRS:

- Downlink Coverage class: of the MS that was received in UL-UNITDATA previously.
- Global Cell ID: The corresponding Cell ID from where the coverage class is reported.
- MS Radio Access Capabilities.
- Paging Attempt information, which has the following two-bit field tokens:
  - Paging Attempt count: to indicate the current paging-retry request number.
  - Intended number of Paging attempts: to indicate maximum retries for paging-algorithms like cell, BSS, RA and LA.

## Standards Compliance

The Extended Coverage Class for SGSN feature complies with the following standard:

- 3GPP TS 48.018 version 13.1.0, General Packet Radio Service (GPRS); Base Station System (BSS) -Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP) (Release 13)

## Limitations and Restrictions

The EC-GSM feature is functional only when all three nodes: SGSN, MS and BSS, are compliant with the feature requirements.

## Configuring EC-GSM on the SGSN

The following CLI configuration allows SGSN to enable extended coverage support. The configuration supports:

- Handling of coverage class parameters in the BSSGP for the UL-UNITDATA and DL-UNITDATA messages.
- Paging Requests towards the BSS.
- Perform Location (LCS) request towards the BSS.

The configuration is provided under the SGSN Global Configuration mode.

```
configure
sgsn-global
  [ no ] ec-gsm
end
```

Notes:

- By default, this command is disabled.
- **no** disables the extended coverage support in the SGSN.
- **ec-gsm** enables the extended coverage support on all gprs services.

## Verifying EC-GSM for SGSN

Use the following command to verify the extended coverage class support on the SGSN:

**show sgsn-mode**

On executing the above command, the following new field(s) are displayed:

```
Extended Coverage Enhanced GPRS (EC-EGPRS/EC-GSM): Enabled
```

## Monitoring and Troubleshooting EC-GSM on the SGSN

### Extended Coverage Class Support on the SGSN Show Command(s) and /or Outputs

This section provides information regarding show commands and their outputs for the Extended Coverage Class support on the SGSN feature.

**show network-service-entity ip-config**

The above show command provides the Network Service Entity (NSE) details, the feature supported by NSEI and the negotiated features by SGSN

```
Peer Nse Name: - Peer Nse Id: 1
Config Type: Auto Config
Status: Unlocked
peer-nsvl: 0
port: 31000
ip-address: 192.168.71.2
data-weight: 1
sig-weight: 1
Features supported by NSEI: RIM EC-GSM
Features Negotiated by SGSN: EC-GSM
```

### **show-subscribers gprs-only full**

The above command provides the Uplink and Downlink coverage class values for the subscriber.

On executing the above show command, the following new fields are displayed:

```
Username: 491740460103
Access Type: sgsn Network Type: IP
Access Tech: GPRS GERAN
Callid: 00004e21 Msid: 262090426000193
-----
-----
DRX parameter:
  Split PG Cycle Code: 7
  SPLIT on CCCH: Not supported by MS
  Non-DRX timer: max8 sec non-DRX mode after Transfer rate
  CN Specific DRX cycle length coefficient: Not Specified by MS
Uplink Coverage Class: 0
Downlink Coverage Class: 0
Negotiated Ciphering Algorithm: GEA0 (No Ciphering)
```