



# NB-IoT RAT Type Support for P-GW, S-GW, and SAEGW

This feature chapter describes the support for Narrow band Internet of Things (NB-IoT) RAT Type for P-GW, S-GW, and SAEGW products.

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## Feature Summary and Revision History

### Summary Data

Applicable Product(s) or Functional Area	<ul style="list-style-type: none"> <li>• C-SGN</li> <li>• P-GW</li> <li>• S-GW</li> <li>• SAEGW</li> </ul>
Applicable Platform(s)	<ul style="list-style-type: none"> <li>• UGP</li> <li>• VPC-DI</li> <li>• VPC-SI</li> </ul>
Feature Default	Disabled - License Required
Related Changes in This Release	Not Applicable
Related Documentation	<i>Statistics and Counters Reference</i>

**Revision History**

Revision Details	Release
The feature is tested and qualified on the ASR 5500 platform.	21.3
First introduced.	N5.1 (21.1.V0)

## Feature Description

The NB-IoT is a new 3GPP-specified-radio interface that supports IoT devices. This release provides support for NB-IoT RAT type for S-GW, P-GW, and SAEGW products to enable the support for NB-IoT calls that are based on 3GPP release 13 standards.

While the RAT type AVP is already supported across all the interfaces, this release introduces support for the 'NB-IoT RAT type' value in those AVPs. It provides the exact value of those RAT types for various interfaces.

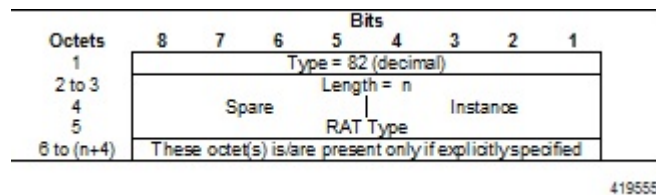
On RF billing records, NB-IoT RAT type is populated as 3GPP-RAT-Type: 0x08.

**Note**

A legacy S-GW or P-GW may reject a Create Session Request message received with an unknown RAT Type because the RAT Type is a Mandatory IE in this message. The S-GW/P-GW selection procedures for UEs accessing the network via a NB-IoT access will ensure that the selected S-GW/P-GW supports the new NB-IoT RAT-Type.

**RAT Type**

As per 3GPP 29.274 (release 13.6.0) RAT Type is coded as depicted in the following figure.

**RAT Type Values**

As part of this feature, the S-GW, P-GW, and SAEGW now support a new RAT type (EUTRAN-NB-IOT).

RAT Types	Values (Decimal)
<reserved>	0
UTRAN	1
GERAN	2
WLAN	3

RAT Types	Values (Decimal)
GAN	4
HSPA Evolution	5
EUTRAN (WB-E-UTRAN)	6
Virtual	7
EUTRAN-NB-IoT	8
<spare>	9-255

By adding a new ENUM support for RAT type (NB-IoT), calls can be decoded and calls allowed S-GW/P-GW (egtpc\_decode\_rat\_ie). New RAT type: SESS\_ACCESS\_TECH\_NB\_IOT (8)



**Note** The RAT type string (EUTRAN) is also represented as (WB-E-UTRAN). However, the string EURTRAN is also supported to provide backward compatibility.

Currently various features act based on the RAT type. Following are the features that are related to the RAT type value of the call. These features are modified to support the new RAT type: EUTRAN-NB-IOT.

#### Virtual APN Selection Based on RAT Type

The virtual APN can be selected by configuring it directly under the base APN. This APN selection can be done based on RAT Type. Now a support is added to select the virtual APN if the RAT type is NB-IoT.

Configuration under APN:

```
virtual-apn preference <> apn <> rat-type nb-iot
```

#### Intra IoT-RAT Hand Over Support

As part of this feature, support for IoT device mobility within IoT-RAT area is supported.

#### Clearing Calls Based on RAT Type

An existing call based on RAT type can be cleared including RAT type as NB-IoT using the following command:

```
Clear subscriber access-type <>
```

## License Requirements

This feature is license controlled. Contact your Cisco account representative for information on how to obtain a license.

**Note**

- All show commands where NB-IoT is only in display is not license controlled.
- If an exec command is extended - where rat type NB-IoT is newly added CLI keyword – it is not under a license.
- Only if a feature is specific to NB-IoT and requires a new config CLI change, it will be under a license.
- Call acceptance and restriction at S-GW/P-GW is based on this license. Therefore, NB-IoT calls are allowed only when the license is enabled. (Currently there are no restrictions on the number of calls – the license is just used as a Boolean – allow or deny NB-IoT calls).

The call is rejected as: EGTPC\_SET\_SERVICE\_NOT\_SUPPORTED\_CAUSE

## Limitations

This feature has the following limitations:

- GBR bearer is not created for NB-IoT RAT type.
- Inter-RAT mobility to and from NB-IoT is not supported.
- Emergency Bearer services are not available when the UE is using NB-IoT RAT type.
- Under ACS, only GERAN, UTRAN, and WLAN access types are supported.
- If the call is NB-IoT, then the ICSR checkpointing to a lower version of ICSR peer is not performed.

## Monitoring and Troubleshooting

This section provides information regarding show commands and bulk statistics for this feature.

### Show Commands and/or Outputs

This section lists all the show commands available to monitor this feature.

#### **show subscribers activity all**

The following new field is added to the show output to display the new NB-IoT RAT type:

NB-IoT

The show output displays the RAT type of the call as NB-IoT.

#### **show subscribers all**

The following new field is added to the show output to display the new NB-IoT RAT type:

(N) - NB-IoT

'N' is used to represent the Access Technology in the call description. The show output displays the RAT type of the call as NB-IoT.

**show subscribers callid <call\_id>**

The following new field is added to the show output to display the new NB-IoT RAT type:

(N) - NB-IoT

'N' is used to represent the Access Technology in the call description. The show output displays the RAT type of the call as NB-IoT.

**show subscribers full all**

The following new field is added to the show output to display the new NB-IoT RAT type:

NB-IoT

The show output displays the RAT type of the call as NB-IoT.

**show subscribers pgw-only all**

The following new field is added to the show output to display the new NB-IoT RAT type:

(N) - NB-IoT

'N' is used to represent the Access Technology in the call description. The show output displays the RAT type of the call as NB-IoT.

**show subscribers pgw-only full**

The following new field is added to the show output to display the new NB-IoT RAT type:

NB-IoT

The show output displays the RAT type of the call as NB-IoT.

**show subscribers pgw-only full all**

The following new field is added to the show output to display the new NB-IoT RAT type:

NB-IoT

The show output displays the RAT type of the call as NB-IoT.

**show subscribers saegw-only full**

The following new field is added to the show output to display the new NB-IoT RAT type:

NB-IoT

The show output displays the RAT type of the call as NB-IoT.

**show subscribers saegw-only full all**

The following new field is added to the show output to display the new NB-IoT RAT type:

NB-IoT

The show output displays the RAT type of the call as NB-IoT.

**show subscribers saegw-only all**

The following new field is added to the show output to display the new NB-IoT RAT type:

(N) - NB-IoT

'N' is used to represent the Access Technology in the call description. The show output displays the RAT type of the call as NB-IoT.

**show subscribers sgw-only all**

The following new field is added to the show output to display the new NB-IoT RAT type:

(N) - NB-IoT

'N' is used to represent the Access Technology in the call description. The show output displays the RAT type of the call as NB-IoT.

**show subscribers sgw-only full**

The following new field is added to the show output to display the new NB-IoT RAT type:

NB-IoT

The show output displays the RAT type of the call as NB-IoT.

**show subscribers sgw-only full all**

The following new field is added to the show output to display the new NB-IoT RAT type:

NB-IoT

The show output displays the RAT type of the call as NB-IoT.

**show subscribers subscription full**

The following new field is added to the show output to display the new NB-IoT RAT type:

NB-IoT

The show output displays the RAT type of the call as NB-IoT.

**show apn statistics all**

The following new field is added in the “Initiated Sessions per RAT Type” and “Active Sessions per RAT Type” sections.

NB-IoT

The show output displays the number of initiated sessions and active sessions with NB-IoT RAT type per APN.

**show apn <apn\_name>**

The following new field is added in the “Initiated Sessions per RAT Type” and “Active Sessions per RAT Type” sections.

NB-IoT

The show output displays the number of initiated sessions and active sessions with NB-IoT RAT type per APN.

#### **show pgw-service name**

The following new field is added in the “Initiated PDNs By RAT-Type:” and “Current PDNs By RAT-Type:” sections.

NB-IoT

The show output displays the number of initiated PDNs and current PDNs with NB-IoT RAT type per P-GW service.

#### **show pgw-service statistics all**

The following new field is added in the “Initiated PDNs By RAT-Type:” and “Current PDNs By RAT-Type:” sections.

NB-IoT

The show output displays the number of initiated PDNs and current PDNs with NB-IoT RAT type per P-GW service.

#### **show sgw-service name**

The following new field is added in the “Current Subscribers By RAT-Type:” and “Current PDNs By RAT-Type:” sections.

NB-IoT

The show output displays the current subscribers and current PDNs with NB-IoT RAT type per S-GW service.

#### **show sgw-service statistics all**

The following new field is added in the “Current Subscribers By RAT-Type:” and “Current PDNs By RAT-Type:” sections.

NB-IoT

The show output displays the current subscribers and current PDNs with NB-IoT RAT type per S-GW service.

#### **show saegw-service name**

The following new field is added in the “Colocated PDNs”, “PGW-Anchor PDNs:”, and “SGW-Anchor PDNs:” sections.

NB-IoT

The show output displays the statistics for Colocated PDNs , PGW-Anchor PDNs, and SGW-Anchor PDNs with NB\_IoT RAT type.

#### **show saegw-service statistics all**

The following new field is added in the “Colocated PDNs”, “PGW-Anchor PDNs:”, and “SGW-Anchor PDNs:” sections.

NB-IoT

The show output displays the statistics for Colocated PDNs , PGW-Anchor PDNs, and SGW-Anchor PDNs with NB\_IoT RAT type.

#### **show session subsystem**

The following new field is added in the “User Data Statistics” section.

NB-IoT

The show output displays the data packets per RAT type and subscribers count per RAT type.

#### **show session subsystem full**

The following new field is added in the “User Data Statistics” section.

NB-IoT

The show output displays the data packets per RAT type and subscribers count per RAT type.

#### **show session subsystem verbose**

The following new field is added in the “User Data Statistics” section.

NB-IoT

The show output displays the data packets per RAT type and subscribers count per RAT type.

#### **show session summary**

The following new field is added in the “User Data Statistics” section.

NB-IoT

The show output displays the data packets per RAT type and subscribers count per RAT type.

## RADIUS Attributes

<b>RADIUS Attributes</b>	
Type of change - new / modified	New
Attribute Name	RAT Type
AAA Attribute (if applicable)	
Description	RAT type
Vendor ID	
VSA Type	
Length - Data part	
Value	
Source	



<b>RADIUS Attributes</b>	
Applicable product/feature. Please indicate products/features individually, do not include generic statement such as “all.”	

## Diameter Attributes

<b>Diameter Attributes</b>	
Type of change - new / modified	New
Attribute Name	RAT-Type
Description	Provides the RAT type of the call.
AVP Header	
Vendor ID	(10415) 3GPP
VSA Type	
AVP Type	(1032) RAT-Type
Group Value	NB-IoT (1005)
AVP Flag	
Source	
Applicable product/feature. Please indicate products/features individually, do not include generic statement such as “all.”	P-GW/S-GW/SAEGW

## CDR Dictionaries/Fields

<b>CDR Dictionaries/Fields</b>	
Type of change - new / modified dictionary:	New
Dictionary name	RAT-Type
Customer name	Provides the RAT type of the call.
Standard(s), based on	
Applicable record type(s)	(10415) 3GPP
Link to Engineering document with details of fields	
<b>For new/modified fields</b>	New

<b>CDR Dictionaries/Fields</b>	
Field name	ratType
Description of new/modified field	New rat type field information added for NB-IoT.
Custom field?	N.A.
Standard(s) based? Which standard(s)	Standard
Applicable dictionaries	All
Category	New value added for specifying NB-IoT RAT Type
Format	String
Length	4
Exceptions for each applicable dictionary (if any)	N.A.
Corresponding CLI command to configure the field	No CLI is required to configure this.
Default value for field	NB-IoT

## Bulk Statistics

This section lists all the bulk statistics that have been added, modified, or deprecated to support this feature.

### APN Schema

This section displays the new bulk stats that have been added to indicate number of NB-IoT sessions for APNs.

- active-nb-iot-sessions%: The total number of active NB-IoT sessions per APN (with RAT Type NB-IoT).
- initiated-nb-iot-sessions%: The total number of initiated NB-IoT sessions.

### P-GW Schema

This section displays the new bulk stats that have been added to indicate NB-IoT PDNs.

- sesstat-pdn-rat-nb-iot%: The total number of PDN Type statistics with RAT type=NB-IoT.
- sssstat-rat-init-nb-iot-gtp%: The total number of initiated NB-IoT PDNs (with RAT Type NB-IoT).

### SAEGW Schema

This section displays the new bulk stat that have been added to indicate NB-IoT PDNs.

- pgw-sesstat-pdn-rat-nb-iot%: The total number of NB-IoT PDNs (PGW anchored/Collapsed PDN) with RAT Type NB-IoT.

### S-GW Schema

This section displays the new bulk stats that have been added to indicate active UEs.

- `sessstat-totcur-ue-nb-iot%`: The total number of active UEs with RAT type=NB-IoT.
- `sessstat-totcur-pdn-nb-iot%`: The total number of active PDNs with RAT type=NB-IoT.

