

Presence Reporting Area

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Feature Summary and Revision History

Summary Data

Applicable Product(s) or Functional Area	• P-GW • SAEGW • S-GW
Applicable Platform(s)	ASR 5500
Feature Default	Disabled - Configuration Required
Related Changes in This Release	Not Applicable
Related Documentation	• *Command Line Interface Reference* • *P-GW Administration Guide* • *SAEGW Administration Guide* • *S-GW Administration Guide*

Revision History

Revision Details	Release
First introduced.	21.4

Feature Description

This feature adds support for the Presence Reporting Area (PRA) functionality to comply with the 3GPP standards.

The Presence Reporting Area is an area defined within the 3GPP packet domain for reporting of UE presence within that area. This is required for policy control and in charging scenarios. In E-UTRAN, the PRA may consist in a set of neighbor or non-neighbor Tracking Areas, or eNBs or cells. There are two types of Presence Reporting Areas: "UE-dedicated Presence Reporting Areas" and "Core Network pre-configured Presence Reporting Areas" that apply to an MME pool.

This feature has the following highlights:

- This feature is supported for LTE/S4-SGSN related RAT-type. For any other RAT type, P-GW ignores PRA information received from the PCRF.
- Currently single PRA-ID is supported per session as specification compliance.
- Currently, in P-GW, core network pre-configured presence reporting area is supported.
- For ICSR to N-1 release, PRA feature is not supported.
- PRA-ID is not supported on CDR interface, that is, Gz, Gy and Rf.

How It Works

During an IP-CAN session, the PCRF determines whether the reports for change of the UE presence in the PRA are required for an IP-CAN session. This determination is made based on the subscriber's profile configuration and the supported AVP features. The parameter CNO-ULI is set for the same. If the reporting is required for the IP-CAN session, the PCRF provides Presence-Reporting-Area-Information AVP, which contains the PRA identifier within the Presence-Reporting-Area-Identifier AVP to the PCEF. For a UE-dedicated PRA, PCRF provides the list of elements consisting of the PRA within the Presence-Reporting-Area-Elements-List AVP to the PCEF. The PCRF might activate the reporting changes of the UE presence in the PRA by subscribing to the CHANGE_OF_UE_PRESENCE_IN_PRESENCE_REPORTING_AREA_REPORT event trigger at the PCEF at any time during the entire IP-CAN session.

When the UE enters or leaves the PRA, PCEF reports the CHANGE_OF_UE_PRESENCE_IN_PRESENCE_REPORTING_AREA_REPORT event. Also, the PCEF also reports the PRA status within the Presence-Reporting-Area-Status AVP and PRA identifier within Presence-Reporting-Area-Identifier AVP included in Presence-Area-Information AVP.

Following table describes the scenario and its associated behavior:

Scenario	Behavior
When PCRF sends a new PRA ID different than the initial call setup.	• P-GW receives the new PRA ID during the initial call setup and stores the PRA ID information. • In RAR, the PRA_EVENT_TRIGGER is registered. • P-GW send PRA_ACTION PRA ID="A", ACTION=start. • In CCA-U, a new PRA ID is received. • P-GW stores new PRA ID information • P-GW sends PRA_ACTION PRA ID = "B", Action=start but does not send Action=stop for the earlier PRA. **Important** Ideally, in above condition, PCRF disables the event triggers first and sends a new PRA-ID=B and enables the event trigger in subsequent message.
When PCRF sends a new PRA ID which is same as the initial call setup.	PRA ID does not send any PRA Action toward S-GW and P-GW ignores this.
PRA ID Decode Behavior	If PRA ID received is "core network pre-configured presence reporting area", then, P-GW ignores the "Element List" coming from PCRF. Otherwise, if PRA ID is "UE-dedicated Presence Reporting Area", then, P-GW parses the "Element List" and forwards it toward the access side.
If PRA ID values from PCRF are 1 octet, 2 octets, and 3 octets.	MSB of the value received from the PCRF is evaluated to find the PRA type. While encoding, GTPC side zeros are prepended to make it 3 octets. For example, if PRA ID = FC (1111 1100) is received from PCRF it is considered as UE-dedicated PRA and while decoding it is decoded as 00 00 FC. P-GW forwards PRA information toward the roaming subscriber if it is received from the PCRF or from UE. **Important** Change of UE presence in the Presence Reporting Area reporting does not apply to the roaming scenario.
Roaming Scenario	Change of UE presence in the Presence Reporting Area reporting does not apply to the roaming scenario. When the serving EPC node (MME, S4-SGSN) is changed, the Presence Reporting Area identifier is transferred for all PDN connections as part of the MM Context information to the target serving node during the mobility procedure. The list of Presence Reporting Area elements are also transferred if they are provided by the P-GW.

Scenario	Behavior
Handover Behavior: How the PRA identifier is communicated from source MME/S4-SGSN to target MME/S4-SGSN.	MME/S4-SGSN gets the PRA Identifier from source MME/S4-SGSN as part of MM Context information. When the serving EPC node (MME, S4-SGSN) is changed, the Presence Reporting Area identifier is transferred for all PDN connections as part of the MM Context information to the target serving node during the mobility procedure. The list of Presence Reporting Area elements are also transferred if they are provided by the P-GW.
Handoff Behavior: How PRA is disabled when the new access type is not supported PRA.	Depending on the access type and internal configuration PCRF deactivates the PRA, if the new access PRA is not supported. During an IP-CAN session, P-GW notifies the PCRF that the UE is located in an access type, where local PCRF configuration is such that the reporting changes of the UE presence in the PRA are not supported. The PCRF unsubscribes to the change of UE presence in the PRA, if previously activated.
Behavior if for E-UTRAN some nodes do not support PRA.	If PRA is enabled from PCRF, then EPC nodes supports it. If all nodes are not supported, then PRA PCRF activates the Location Change Reporting. **Important** For E-UTRAN access, homogeneous support of reporting changes of UE presence in a Presence Reporting Area in a network is assumed. When the PCRF configuration indicates that reporting changes of the UE presence in a PRA is supported for E-UTRAN, this means all P-GWs, all MME, and all S-GW support it, including the MME and S-GW working in the network sharing mode. If the change of UE presence in the PRA reporting is not supported, the PCRF may instead activate the location change reporting at the cell or serving area level.
When access side procedure failure or collision occurs (Create or Update Bearer procedure)	In Update or Create bearer procedure failure where the PRA action was sent in the request message and if PRA information was not received in response message, P-GW attempts to send the PRA action in next control procedure toward the remote peer. In Update or Create bearer procedure failure where PRA action was sent in the request message and if PRA information was not received in the response message, P-GW assumes it as PRA action was successfully communicated toward the remote peer. In the Update or Create bearer collision scenario where PRA action was sent in the request message and Update or Create procedure got aborted, P-GW attempts to send the PRA action in next control procedure toward the remote peer.

Multiple Presence Reporting Area



Important This feature is introduced in release 21.9.1.

P-GW supports negotiation of Multiple-Presence Reporting Area feature in Feature-List-ID 2 over Gx interface with PCRF. The CNO-ULI feature will be used only when the P-GW and/or the PCRF does not support Multiple-PRA and both P-GW and PCRF support CNO-ULI.

When the Multiple-PRA feature is supported during the lifetime of the IP-CAN session P-GW handles the change of UE Presence in Reporting Area(s) request from PCRF in PRA-Install AVP including the Presence-Reporting-Area-Information AVP(s) which each contains the Presence Reporting Area Identifier within the Presence-Reporting-Area-Identifier AVP.

P-GW Handling the Event Trigger

CHANGE_OF_UE_PRESENCE_IN_PRESENCE_REPORTING_AREA_REPORT from PCRF for the activation of the reporting changes of UE presence in Presence Reporting Area(s).

P-GW handles the PRA Identifier(s) modify request from PCRF with the new PRA within the PRA-Install AVP as described above and/or by removing the existing PRA(s) within the PRA-Remove AVP. In this case, the Presence-Reporting-Area-Identifier AVP of the removed PRA must be included within the Presence-Reporting-Area-Information AVP(s).

P-GW supports PRA-Install and PRA-Remove AVPs from PCRF in the following messages:

- CC-Answer (CCA) Command
- Re-Auth-Request (RAR) Command

The P-GW handles the request from PCRF to unsubscribe to the change of UE presence in Presence Reporting Area wherein PCRF provides the Event-Trigger AVP with the value CHANGE_OF_UE_PRESENCE_IN_PRESENCE_REPORTING_AREA_REPORT (48) removed, if previously activated.

P-GW supports the maximum of 4 PRA(s) for a IP-CAN session at any given point of time. The maximum number of PRAs is configurable in PCRF and must be capped to 4. P-GW will ignore the Presence Reporting Area Identifiers entries beyond 4.

When the P-GW receives the presence reporting area information from the serving node over S5/S8 interface indicating that the UE is inside or outside of one or more presence reporting areas or any of the presence reporting areas is set to inactive, the P-GW will check if the reported presence reported area identifier corresponds to a presence reporting area that is relevant for the PCRF. In that case, the P-GW reports the CHANGE_OF_UE_PRESENCE_IN_PRESENCE_REPORTING_AREA_REPORT event in the Event-Trigger AVP additionally, the P-GW also reports the presence reporting area status within the Presence-Reporting-Area-Status AVP and presence reporting area identifier within Presence-Reporting-Area-Identifier AVP included in Presence-Reporting-Area-Information AVP(s) for each of the presence reporting areas reported by the serving node.

The P-GW de-activates the relevant IP-CAN specific procedure for reporting change of UE presence in Presence Reporting Area, when the PCRF and OCS unsubscribe to change of UE presence in Presence Reporting Area.

PRA-Install AVP (3GPP-EPS access type) Definition

The PRA-Install AVP (AVP code 2845) is of type Grouped, and it is used to provision a list of new or updated Presence Reporting Area(s) for an IP-CAN session.

AVP Format:

```
PRA-Install ::= < AVP Header: 2845 >
 *[ Presence-Reporting-Area-Information ]
 *[ AVP ]
```

PRA-Remove AVP (3GPP-EPS access type) Definition

The PRA-Remove AVP (AVP code 2846) is of type Grouped, and it is used to stop the reporting of a list of Presence Reporting Area(s) for an IP-CAN session.

AVP Format:

```
PRA-Remove ::= < AVP Header: 2846 >
 *[ Presence-Reporting-Area-Identifier ]
 *[ AVP ]
```

Configuring Presence Reporting Area

Configuring PRA

Use the following configuration to enable the PRA:

```
configure
   context context_name
      ims-auth-service service_name
         policy-control
            diameter encode-supported-features cno-uli
            { default | no } diameter encode-supported-features
            end
```

NOTES:

- **diameter encode-supported-features**: Enables or disables encoding and sending of Supported-Features AVP.
- **cno-uli**: Enables Presence Reporting Area Information Reporting feature.
- **no**: Removes the previously configured supported features.
- **default**: Applies the default setting for this command.

Configuring Multiple-PRA

Use the following configuration to enable Multiple Presence Reporting Area (Multiple-PRA) Feature.

```
configure
   context context_name
      ims-auth-service service_name
         policy-control
            diameter encode-supported-features multiple-pra
```

```
{ default | no } diameter encode-supported-features
end
```

NOTES:

- **ims-auth-service** *service_name*: Creates an IMS authentication service. *service_name* must be an alphanumeric string of 1 through 63 characters.
- **policy-control**: Configures Diameter authorization and policy control parameter for IMS authorization.
- **diameter encode-supported-features**: Enables encoding and sending of Supported-Features AVP.
- **multiple-pra**: Enables the Multiple Presence Reporting Area Information Reporting feature.
- **no**: Removes the previously configured supported features.
- **default**: Applies the default setting for this command.

Monitoring and Troubleshooting

The following sections describe commands available to monitor the feature.

Show Commands and Outputs

This section provides information regarding show commands and their outputs in support of this feature.

show ims-authorization service name *<service-name>*

The output of the above command is modified to display the negotiated conditional policy features related information. The modified output is as follows:

```
Context: ha
  IMS Authorization Service name: imsa-Gx
                  ……
  Diameter Policy Control:
    Endpoint: gx.st16.starentnetworks.com
    Origin-Realm: starentnetworks.com
    Dictionary: r8-gx-standard
    Supported Features:
      mission-critical-qcis
      conditional-policy-info-default-qos
cno-uli
    Request Timeout:
        Initial Request   : 100 deciseconds
        Update Request    : 100 deciseconds
        Terminate Request : 100 deciseconds
    Endpoint Peer Select: Not Enabled
    Reauth Trigger: All
    Custom Reauth Trigger:
      QoS-Change
```

show ims-authorization sessions full all

The output of this command includes the following fields:

```
CallId: 00004e26            Service Name: imsa-Gx
  IMSI:  123456789012349
  Session ID: gx.st16.starentnetworks.com;20006;2305;598ab8cf-102
  Bearer Type: GTP
  SGSN IP-Addr: 192.168.23.4
  APN: starent.com
  Bearer Control Mode: UE/NW
  State: Connected
  Negotiated Supported Features:
    3gpp-r8
    conditional-policy-info-default-qos
    cno-uli
  Auth Decision:
    Event Triggers:
      QoS-Change
      RAT-Change
      Change-Of-UE-Presence-In-PRA
      Usage-Report
      Resource-Modification-Request
    multiple-pra
```

show ims-authorization service statistics

The output of the above command is modified to display the PRA feature statistics. The modified output is as follows:

```
IMS Auth Service Statistics Summary:
Total Services:      2
Auth Session:
  Current Active:               1
  Current Fallback Session:     0             Current PCRF Session:          1
  Total Attempted:              1             Total Setup:                   1
  Total Failed:                 0             Total Released:                0
  Total Fallback:               0
Re-Authorization Triggers:
  SGSN Change:                  0             PLMN Change:                   0
  RAT Change:                   0             TFT Change:                    0
  Bearer Recovery:              0             Bearer Loss:                   0
  QoS Change:                   0             Policy Failure:                0
  IP-CAN Change:                0             Resources Limitation:          0
  Max Num of Bearers Rchd:      0             QoS Chng Exceeding Auth:       0
  RAI Change:                   0             User Location Change:          0
  TAI Change:                   0             ECGI Change:                   0
  PCRF Triggered ReAuth:        0             Preservation Changed:          0
  Reactivation Changed:         0             Revalidation Timeout:          0
  AN GW Changed:                0             Out Of Credit Reauth:          0
  Reallocation Of Credit:       0             Def EPS Bearer QoS Chng:       0
  Successful Resource Alloc:    0             Usage Report:                  0
  Service Flow Detection:       0             UE Timezone Change:            0
UE IP Address Allocate:         0             UE IP Address Release:         0
  Resource Modification Req:    0             APN AMBR Mod Failure:          0
  Def Bearer QOS Mod Failure:   0             Tethering Flow Detected:       0
  Chrg Correlation Exchange:    0             Subnet Change:                 0
  Session Recovery:             0             Session Sync:                  0
  Access Nw Info Report:        0             DCCA Failure Report:           0
  Application Start:            0             Application Stop:              0
  Change Of UE Presence In PRA: 1
Local Fallback:
CCRU sent:                      0
```

show subscribers pgw-only full all

The output of this command includes the following fields:

```
Username        : xyz
Subscriber Type : Visitor
Status          : Online/Active
State           : Connected
Connect Time    : Mon Aug 28 07:32:13 2017
Auto Delete     : No
Idle time       : 00h00m06s
MS TimeZone     : n/a                  Daylight Saving Time: n/a
Access Type: gtp-pdn-type-ipv4         Network Type: IP
Access Tech: eUTRAN                    pgw-service-name: pgw1
Callid: 00004e23                       IMSI: 123456789012349
MSISDN: 9326737733
Interface Type: S5S8GTP                Low Access Priority: N/A
TWAN Mode: N/A
eMPS Bearer: No
Emergency Bearer Type: N/A
IMS-media Bearer: No
S6b Auth Status: Enabled
Access Peer Profile: default
Acct-session-id (C1): C0A8170100000003
ThreeGPP2-correlation-id (C2): 00500660 / 002shwI-
Card/Cpu: 2/0                          Sessmgr Instance: 1
ULI:
 TAI-ID:
  MCC: 214  MNC: 365
  TAC: 0x6789
 ECGI-ID:
  MCC: 214 MNC: 365
  ECI: 0x1234567
PRA Information:
 PRA-ID: 0x801204      Action: Start           Status: In
PRA Information:
 PRA-ID: 0xA11202      Action: Start           Status: N/A
```

show subs saegw-only full all

The output of the above command is modified to include the PRA Information such as PRA-ID, PRA Status, and PRA Action. The modified output is as follows:

```
Username          : xyz
SAEGW Call mode   : Co-located
Subscriber Type   : Visitor
Status            : Online/Active
State             : Connected
Bearer State      : Active
Connect Time      : Mon Aug 28 08:21:45 2017

SAEGW UID         : 10001
Idle time         : 00h00m19s
Auto Delete       : No
Callid            : 4e25                        IMSI                : 241460144418770
Card/Cpu          : 2/0                         Sessmgr Instance    : 1
Source context    : ingress                     Destination context : egress
Bearer Type       : Default                     Bearer-Id           : 5
Access Type       : gtp-pdn-type-ipv4           Network Type        : IP
Access Tech       : eUTRAN                      saegw-service-name  : saegw
MSISDN            : 9326737733
```

```
TWAN Mode          : N/A
eMPS Bearer        : No
IPv6 alloc type    : n/a
ECS Rulebase       : prepaid
Chrg Char Sel Mod : Peer Supplied
Restoration priority level : n/a
HLCOM Session      : No
IP Address         : 10.0.0.5
Bearer capable for restoration: No
UE P-CSCF Restoration Support : No

Peer Profile       :
  PGW Access       : default
  SGW Access       : default
  SGW Network      : default

ULI                : TAI-ID
  MCC              : 214                          MNC              : 365
  LAC              : n/a                          TAC              : 0x6789
  SAC              : n/a                          RAC              : n/a
  CI               : n/a                          ECI              : 0x1234567

PRA Information    :
  PRA-ID: 0xFC0104     Action: Start           Status: In

Bearer QoS         :
 QCI               : 5
 ARP               : 0x08
 PCI               : 0 (Enabled)
 PL                : 2
 PVI               : 0 (Enabled)
 MBR Uplink(bps)   : 0                          MBR Downlink(bps)    : 0
 GBR Uplink(bps)   : 0                          GBR Downlink(bps)    : 0
```