User Plane Node Bring Down Procedure

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Revision History

Note Revision history details are not provided for features introduced before release 21.24.

Revision Details	Release
First introduced	Pre 21.24

Feature Description

The User Plane Node Bring-Down Procedure is a Maintenance Operating Procedure (MoP) that outlines the steps to bring down a specific User Plane (UP) node for maintenance operations. The purpose of this procedure is to disable specific UP node on Control Plane (CP) node while node selection takes place for new incoming sessions.

This feature provides the following functionality:

- Configuration to mark a specific UP unavailable for any new session.
- Option to delete idle subscribers.

Preconditions

Following are the preconditions to bring down the UP node for maintenance operation:

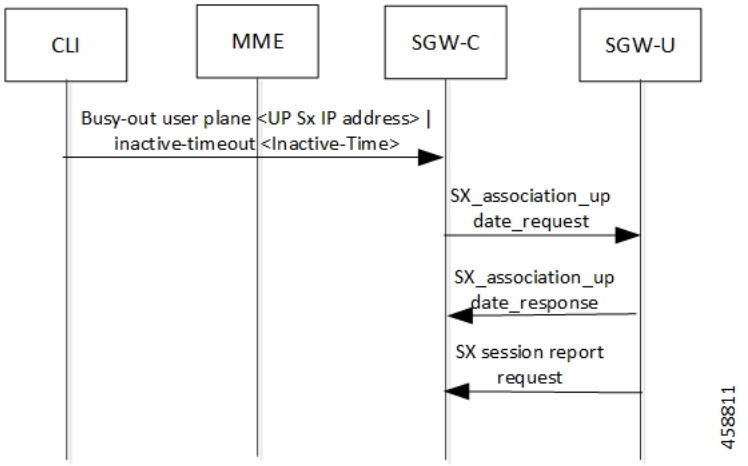
- The UP and CP nodes must be associated with each other and that the calls land on a specific UP.
- You want to disable the specific UP node for maintenance, from being selected for new incoming calls, and clear existing idle users on that UP node.
- To avoid any call loss, there's a provision of another UP node in the same CP group. If there's only one UP in the group and we disable it for maintenance, the CP rejects the new incoming sessions with disconnect reason as "user-plane-info-not-available".

How it Works

Call Flow

UP Selection when a UP is Marked Busy Out

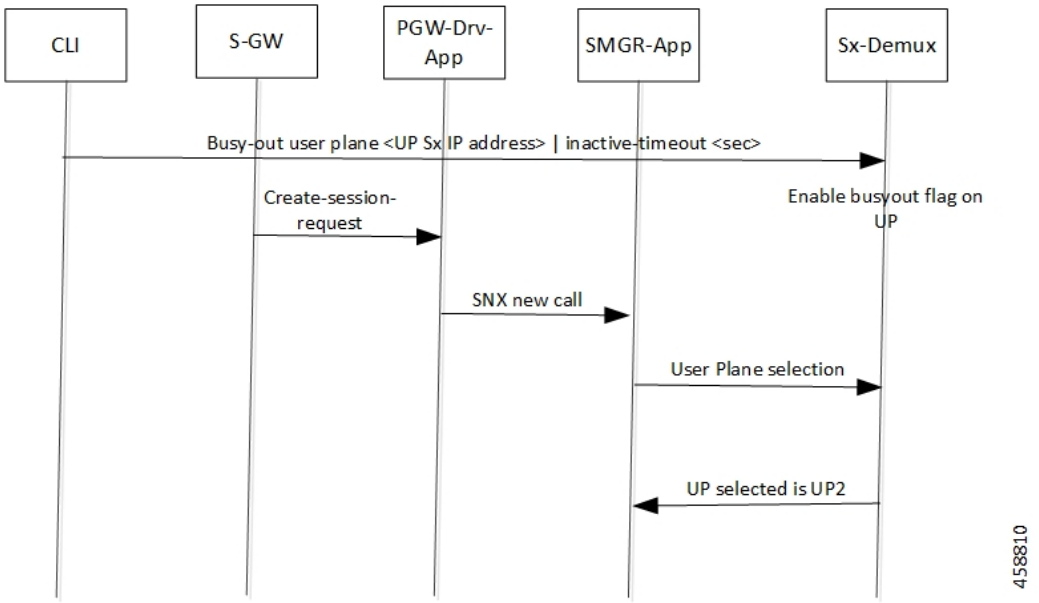
The following call flow describes about the UP selection for Pure-P and Collapse call when some UP are marked "busy-out" through the CLI command. Similarly, the UP selection for Pure-S call also takes place.



Steps	Description
1.	User configures the busy-out configuration from the CP to "busy-out" a specific UP. The inactive time value is optional in the configuration.
2.	The association state of UP is seen as "B". An association update request message is sent to User Plane with "busy-out" inactive time value if inactive time value is configured.

UP Clear Idle Subscribers based on Busy Out Inactivity Timeout

The following call flow describes how inactive sessions (Pure-S call) are cleared on UP when inactive-time is configured in “busy-out” CLI. Other call types also work similarly.



In continuation to the previous call flow, this call flow describes about the clearing of the idle subscriber based on the busy-out inactivity- timeout:

Step	Description
1.	The calls are cleared if they remain idle for the period equivalent to the inactivity time value. The UP can be pulled back to the associated state by configuring the “no” form of the same CLI command.

Limitations and Considerations

Following are the known limitations of this feature:

- The multi PDN calls for same UE can fall to different UPs.
- The “busy-out” configuration is done on all Active and Standby CPs.
- Currently, the new IP Pool isn’t added for the specified UP or the belonging UP group so that some of the IP chunks doesn’t get assigned to this UP, leading to loss in capacity.
- All CPs must have the same configuration for “busy-out”. Else, UP uses the latest configuration value triggered from any one of the CPs. Similarly, when you do the “no busy-out” on any of the CPs, UP comes out of “busy-out”.
- To block the UP completely, “busy-out” both its IPv4 and IPv6 addresses using two separate CLIs.
- Currently, there’s a spike in CPU usage when idle timeout triggers for a huge number of calls. The CPU usage eventually goes down when all the calls get cleared out.

Configuring UP Node Bring Down Procedure

The MoP is applicable only when CPs and UPs are on the same software version where the support of the following “busy-out” CLI is available.

```
configure
  busy-out user-plane { ipv4-address ipv4_address | ipv6-address ipv6_address
 } [ inactive-timeout inactive_time ]
  end
```

You must enable the configuration on CP to make a UP unavailable for new sessions and clear the idle sessions which exceeds the time configured in “inactive-timeout”. The *ipv4_address*/*ipv6_address* is the IPv4 or IPv6 address of the UP. “Inactive-Time” is configured in seconds.

If you don’t configure the inactive timeout, then the behavior for the idle session remains unchanged.

NOTES:

- Existing **clear subscribers saegw-only uplane-address** *ip_address* **no-select-up** CLI command is not extended or reused for “busy-out” logic as it is exec-level CLI which is not fit in the scenario of session-recovery. There is also no other way to roll back the up-selection logic without reassociating the UP using this CLI.

Note When the **clear subscribers** command is executed on UP, CP will not be informed and will consider the sessions as running.

- After “busy-out” CLI command is executed, the UP is removed from UP selection. Existing calls continue to function as usual. No extra operation is performed to the assigned IP pool chunk.
- If you want to bring the same UP after upgrade to handle new calls, you must undo the configuration by executing the **no busy-out user-plane** { **ipv4-address** *ipv4_address* | **ipv6-address** *ipv6_address* } CLI command.
- After “inactive-timeout” is configured for UP in “busy-out” CLI, calls get cleared and some of the assigned pool chunks to this UP gets reclaimed if the other UPs sharing the same IP Pool reach threshold of approximately 70% of the chunks allocated.

Monitoring and Troubleshooting

Following are the CLI commands available in support of this feature.

Show Commands and Outputs

show sx peers

The output of this CLI command has been enhanced to include the following new association state:

- Busy-Out: Indicates that the given UP is undergoing “busy-out” operations and is not available for new calls.

show sx peers wide

The output of this CLI command has been enhanced to include the following new fields:

- Last Busy-Out Time: Indicates the time at which UP last stayed in “busy-out” state.
- Last Busy-Out Clear Time: Indicates the time when “busy-out” state in UP was last cleared

Following is a sample output of **show sx peers** CLI command.

```
+---Node Type:    (C) - CPLANE       (U) - UPLANE
|
|+--Peer Mode:    (A) - Active       (S) - Standby
|
||+-Association   (i) - Idle         (I) - Initiated
||| State:        (A) - Associated   (R) - Releasing
|||               (X) - Released     (B) - Busy Out
|||
|||+Configuration (C) - Configured   (N) - Not Configured    (X) - Not Applicable
||||State:
||||
||||+IP Pool:     (E) -  Enable      (D) - Disable           (N) - Not Applicable
|||||
|||||
|||||
|||||  Sx Service
   No of
|||||  ID
  Restart
|||||  |                                                                          Recovery
     |    Current    Max       Peer
vvvvv  v       Group Name               Node ID                Peer ID       Timestamp
     v   Sessions  Sessions    State  LCI  OCI
----- ---- ------------------- ---------------------------- ---------- -------------------
 ---- --------- --------- -------- ---- ----
UABCE 20   default              209.165.200.225                   33554433
2021-04-14:01:25:32 0    0         1         NONE       X   X

Total Peers:    1

[local]qvpc-si# show sx peers wide

+---Node Type:    (C) - CPLANE       (U) - UPLANE
|
|+--Peer Mode:    (A) - Active       (S) - Standby
|
||+-Association   (i) - Idle         (I) - Initiated
||| State:        (A) - Associated   (R) - Releasing
|||               (X) - Released     (B) - Busy Out
|||
|||+Configuration (C) - Configured   (N) - Not Configured  (X) - Not Applicable
||||State:
||||
||||+IP Pool:     (E) -  Enable      (D) - Disable         (N) - Not Applicable
|||||
|||||+Push Config Status: (C) - Push Complete (P) - Push in Progress (X) - Not Applicable
||||||                     (E) - Push Error
||||||
||||||+Monitor State:    (U) - UP   (D) - DOWN  (N) - Not Applicable
```

show sx peers wide

```
|||||||
|||||||  ID
    Restart
|||||||  |                                                                                  Recovery
       |    Current    Max   Peer     Config    Auto-Config Config Push         Config Push
                  Last Busy-Out       Last Busy-Out
vvvvvvv  v       Group Name               Node ID                Peer ID       Timestamp
       v   Sessions  Session State    Failures  Success     Start Time          End Time
          LCI OCI   Time                Clear Time
------ ---- -------------------- ------------------------------ ---------- -------------------
 ---- --------- -------- -------  -------  ---------   ------------------- -------------------
 ---- ----  ------------------  --------------------
UAACECN 20   UP-Grp-1             209.165.200.225                   33554435
2021-05-10:12:41:03 0    1         1         NONE     0       0          2021-05-10:12:41:21
 2021-05-10:12:41:22   X   X   2021-05-10:12:42:50  2021-05-10:12:43:09

Total Peers:    1
```