



UPF Reporting of Load Control Over N4 Interface

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Feature Summary and Revision History

Summary Data

Applicable Product(s) or Functional Area	UPF
Applicable Platform(s)	VPC-SI
Feature Default Setting	Disabled – Configuration Required
Related Changes in this Release	Not Applicable
Related Documentation	Not Applicable

Revision History

Revision Details	Release
First introduced.	2020.02.0

Feature Description

Load control enables the UPF to send its load information to the SMF in order to balance PFCP session load across the UPF according to their effective load. The load information reflects the operating status of the resources of the UPF. Load control allows for better balancing of the PFCP session load to prevent overload.

NOTE: Overload mitigation actions are not triggered even if the UPF reports high load.

Supported IE and Messages

To report Load Control Information (LCI) to the SMF, 3GPP specification has defined the following IEs:

- Load Control Information IE – The load control Information IE is as follows: It contains the sequence number IE and load metric IE. This IE is sent in Session Establishment Response, Session Modification Response, Session Deletion Response, and Session Report Request messages sent from UPF.
- Sequence Number IE – The Sequence Number IE contains an Unsigned32 binary integer value. The Load Control Sequence Number increases whenever the load control information changes.
- Load Metric IE – The Load Metric parameter indicates the current load level of the originating node. The computation of the Load Metric happens at the implementation basis. The node considers the various aspects, such as:
 - The used capacity of the UPF
 - The load in the node. For example, memory or CPU usage in relationship to the total memory or CPU available, and so on.

The Metric IE encoding is as follows: It indicates a percentage and takes binary coded integer values from and including 0 up to and including 100. Considers the other values as 0.

Reporting Load Information to SMF

The UPF sends its load control information to reflect the operating status of its resources at the node level. It allows the SMF to use this information to augment the UPF selection procedures. The load control information is piggybacked in PFCP request or response messages such that the exchange of load control information does not trigger extra signaling.

Considering the processing requirement of the receiver of the load control information, a larger variation in the Load Metric, example 5 or more units are reasonable value to send the new load control information.

The following criteria is used to send the Load Control Information IE:

- Whenever there is an increase or decrease in the load by 5% or more
- At 95% or above, LCI is reported for any increase
- At 5% or below, no LCI is reported
- At 100%, LCI is reported in all messages.
- System timestamp is used as Sequence Number.

NOTES:

- Currently, only session-load is considered to calculate Load Metric in the UPF.
- Multiple SessMgrs report same value of Load Metric with same sequence number.

Configuring the Max Sessions

Based on various deployment scenarios, if you do not want to load UPF to its maximum capacity in terms of the count of sessions, especially, given that in 5G a single user-session can go up to 5 Gbps. To alter the max session supported in UPF, a CLI command is available under the User Plane Service configuration. It allows the operator to configure the required number of max-sessions that are supported on UPF so that the SMF can load balance the sessions across the UPF. The following is a sample configuration:

```
configure
  context context_name
    user-plane-service user_plane_service
      load-control capacity session_value
    end
```

NOTES:

- *session_value* must be an integer in the range of 1 through the maximum value that is allowed in the platform.
- The use of this configuration is only for the LCI reporting to SMF, and not for any other purpose, such as congestion control, and so on.

The following is an example configuration:

```
configure
  context ingress
    user-plane-service ups1
      load-control capacity 2500
    end
```

Show Command Support

The output of the show command to display the User Plane Service includes the value of configured max sessions.

show user-plane-service all

```
Service name                : user-plane-service
Service-Id                  : 4
Context                      : ingress
Status                       : STARTED
UPF Ingress GTPU Service    : n3-gtpu-service
SGW Ingress GTPU Service    : Not defined
SGW Egress GTPU Service     : Not defined
Control Plane Tunnel GTPU Service : n4-gtpu-service
Sx Service                   : n4-sx
Control Plane Group         : g1
Load Control Parameters
  Capacity                   : 1000
```

