

Potential Enhancement to support 3GPP PS DATA OFF Feature in 5GS

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Services can be exempted when PS Data Off is activated

Each of the following operator services shall be configurable by the HPLMN operator on VPLMN and HPLMN basis to be part of the 3GPP PS Data Off Exempt Services (according to definition in 23.221 and 22.011) :

- MMTel Voice;
- SMS over IMS;
- USSD over IMS (USSI);
- MMTel Video;
- particular IMS services not defined by 3GPP, where each such IMS service is identified by an IMS communication service identifier;
- Device Management over PS; and
- IMS Supplementary Service configuration via the Ut interface using XCAP.
- the signalling used to enable above services (e.g. DHCP, DNS, etc.)

3GPP PS Data Off feature currently expands 3GPP SA2 Release 14 and 15, applies to 2G, 3G and 4G and impacts TS 23.060, 23.221, 23.401, 23.228 and 23.203.

A similar description can be documented in 23.501 by referring to 23.221.

Exempt Services list(s) provisioning

For the non-SIP based services:

- UEs may be configured with up to two lists of 3GPP PS Data Off Exempt Services and the list(s) are provided to the UEs by HPLMN via **Device Management** or UICC provisioning. When the UE is configured with two lists, one list is valid for the UEs camping in the home PLMN and the other list is valid for any VPLMN the UE is roaming in. When the UE is configured with a single list, without an indication to which PLMNs the list is applicable, then this list is valid for the home PLMN and any PLMN the UE is roaming in.
- When PCRF is deployed, it shall be configured with the list(s) of 3GPP PS Data Off Exempt Services and the event trigger of 3GPP PS Data Off status change is used to inform the PCRF about every change of the 3GPP PS Data Off status. When PCRF is not deployed, the PCEF (PGW/GGSN) shall be configured with the list(s) of 3GPP PS Data Off Exempt Services.

NOTE 1: The operator needs to ensure coordinated lists of 3GPP Data Off Exempt Services provisioned in the UE and configured in the network.

For SIP based services:

- The UE may be provisioned by HPLMN with up to two enumerated lists of SIP-based services that are 3GPP PS Data Off exempted either via **Device Management** or in the UICC, one list is valid for the UEs camping in the home PLMN and the other list is valid for any VPLMN the UE is roaming in. When the UE is configured only with a single list, without an indication to which PLMNs the list is applicable, then this list is valid for the home PLMN and any PLMN the UE is roaming in.
- Each Application Server shall be configured with up to two lists of 3GPP PS Data Off Exempt Service, one list for non-roaming users, and the other list for users roaming in the various VPLMNs with whom roaming agreements exist.

Potential enhancements in 5GS:

- Considering the update to the Exempt Services list(s) shouldn't be very often, 5GS can still use the same solution (UICC provisioning or Device Management) with Rel-14 PS Data Off and Rel-15 PS Data Off2.
- But is Device Management still an option in 5GS?

UE reporting PS Data Off status to network in LTE

Reporting for Non-IMS PDN connections in LTE:

- The UE shall report its 3GPP PS Data Off status in PCO (Protocol Configuration Option) to PDN GW during Initial Attach procedure as described in clause 5.3.2.1 and UE requested PDN connectivity procedure as described in clause 5.10.2.
- For those PDN GWs that indicated support for the 3GPP PS Data Off feature during PDN connection setup and at Initial Attach, the UE shall report immediately a change of its 3GPP PS Data Off status in PCO by using Bearer Resource Modification procedure as described in clause 5.4.5. If the UE has not received any 3GPP PS Data Off Support Indication during the establishment of the PDN connection, it shall not report any change of its 3GPP PS Data Off Status for this PDN connection.

NOTE: Similar mechanism applies to 2G and 3G system

Similar enhancement can be applied to 5GS:

- (1) UE reports its 3GPP PS Data Off status in PCO to (h)SMF during PDU Session Establishment procedure;
- (2) UE immediately reports a change of its 3GPP PS Data Off status in PCO by using PDU Session Establishment procedure.

Reporting for IMS PDN connections:

- The UE shall include an indication that depicts the 3GPP PS Data Off status (active/inactive) at initial IMS registration, and subsequent to that, any time the end user changes the 3GPP PS Data Off status in a (re-)REGISTER request. In all these registration requests the UE shall register the SIP based services in the 3GPP PS Data Off Exempt Services list that are configured in the UE.

As currently 23.228 is reused for IMS, no enhancement is needed in 23.228 on this aspect.

Controlling of non-SIP based services

This feature, when activated by the user, prevents transport via 3GPP access of all IP packets except those related to 3GPP PS Data Off Exempt Services. The 3GPP PS Data Off Exempt Services are a set of operator services, defined in TS 23.221, that are the only allowed services when the 3GPP PS Data Off feature has been activated by the user.

Controlling in UE:

- If 3GPP PS Data Off is activated, the UE prevents the sending of uplink IP packets except those related to 3GPP PS Data Off Exempt Services, based on the pre-configured list of Data Off Exempt Services.

Controlling in PCRF/PCEF:

- When the PCRF is informed about the activation of 3GPP PS Data Off, it shall update the PCC rules in such a way that downlink and optionally uplink packets for services belonging to the list of 3GPP PS Data Off Exempt Services are forwarded while all other downlink packets are discarded.
- When the PCRF receives service information from the AF, in addition to what is specified in clause 6.2.1.0, PCRF shall check if the requested service information belongs to the 3GPP PS Data Off Exempt Services. If the requested service belongs to 3GPP PS Data Off Exempt Services, PCRF shall continue as specified in clause 6.2.1.0. If the requested service doesn't belong to the 3GPP PS Data Off Exempt Services, PCRF shall reject the service request.
- When the PCRF is informed about the deactivation of 3GPP PS Data Off, it shall perform policy control decision as specified in clause 6.2.1.0 and perform PCC rule operations as specified in clause 6.3.2 2 to make sure that the services are allowed according to user's subscription and operator policy (irrespective of whether they belong to the list of 3GPP PS Data Off Exempt Services).
- When PCRF is not deployed, predefined PCC rules, as example, can be configured in the PCEF to ensure the following:
 - when the PCEF is informed about activation of 3GPP PS Data Off, only downlink packets for services belonging to the list of 3GPP PS Data Off Exempt Services are forwarded while all other downlink packets are discarded, and
 - When PCEF is informed about deactivation of 3GPP PS Data Off, downlink packets are forwarded according to the operator policy for the subscriber.

Enhancements in 5GS on controlling non-SIP based services

- Similar solution can be applied to (h)SMF/UPF and PCF, similar changes need to be reflected in 23.503.

Controlling of SIP based services

Controlling in UE:

When the UE changes its 3GPP PS Data Off status from inactive to active, the UE shall ensure that only the 3GPP PS Data Off Exempted Services in the provisioned list are allowed to be transported, and the corresponding IP uplink packets shall be sent accordingly as follows:

- The UE shall prevent sending of UE-originating SIP requests which are for services other than the 3GPP PS Data Off Exempted Services configured in the UE via device management or in the UICC.
- The UE shall prevent sending of SDP offers and SDP answers with media streams for the media types other than those related to the 3GPP PS Data Off Exempted Services configured via device management or in the UICC.
- A UE shall immediately stop sending any media packets and shall terminate all ongoing sessions for all SIP-based services that are not 3GPP PS Data Off Exempt.
- A UE provisioned with an updated list shall enforce the updated list immediately. To that effect, the UE shall immediately stop sending any media packets and terminate all ongoing SIP-based sessions handling the 3GPP PS Data Off Exempt Service(s) removed from the list.

Controlling in Application Server:

- If the UE has changed its 3GPP PS Data Off status from active to inactive, the AS shall also let through the terminating requests to the UE for services that were not Data Off exempted.

As currently 23.228 is reused for IMS, no enhancement is needed in 23.228 on this aspect.

Thanks!

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