AMF Interactions: 5G Standalone Access Registration

Preconditions

1:NGAP Initial UE Message
[NAS-PDU: Registration Request]

RAN UE NGAP ID,
NAS Registration Request = {Registration type, 5G-GUTI, Last TAI, Requested NSSAI, UE Capability, List of PDU Sessions},
User Location Information,
RRC Establishment Cause,
5G-S-TMSI,
AMF Set ID

The gNB sends the Initial UE Message to the selected AMF. The message carries the "Registration Request" message that was received from the UE in the RRC Setup Complete message. The "RAN UE NGAP ID" and the "RRC Establishment Cause" are also included in the message.

Obtain the UE Context from the Old AMF

2:Namf_Communication_UEContextTransfer Request

NAS Registration Request

Since the 5G-GUTI was included in the Registration Request and the serving AMF has changed since last Registration procedure, the new AMF requests context transfer from the old AMF. The complete NAS registration message received from the UE is included in the context request.

3:Namf_Communication_UEContextTransfer Response

UE Context in AMF = {SUPI, 5G-GUTI, PEI, UE Radio Capability, Registration Area, ...}

The Old AMF passes the AMF UE Context to the new AMF.

4:NAS Identity Request

Security header type,
Identity request message identity,
Identity type

The New AMF requests UE Identity (SUCI) from the UE via a NAS message.

5:NAS Identity Response

Security header type,
Identity response message identity,
Mobile identity

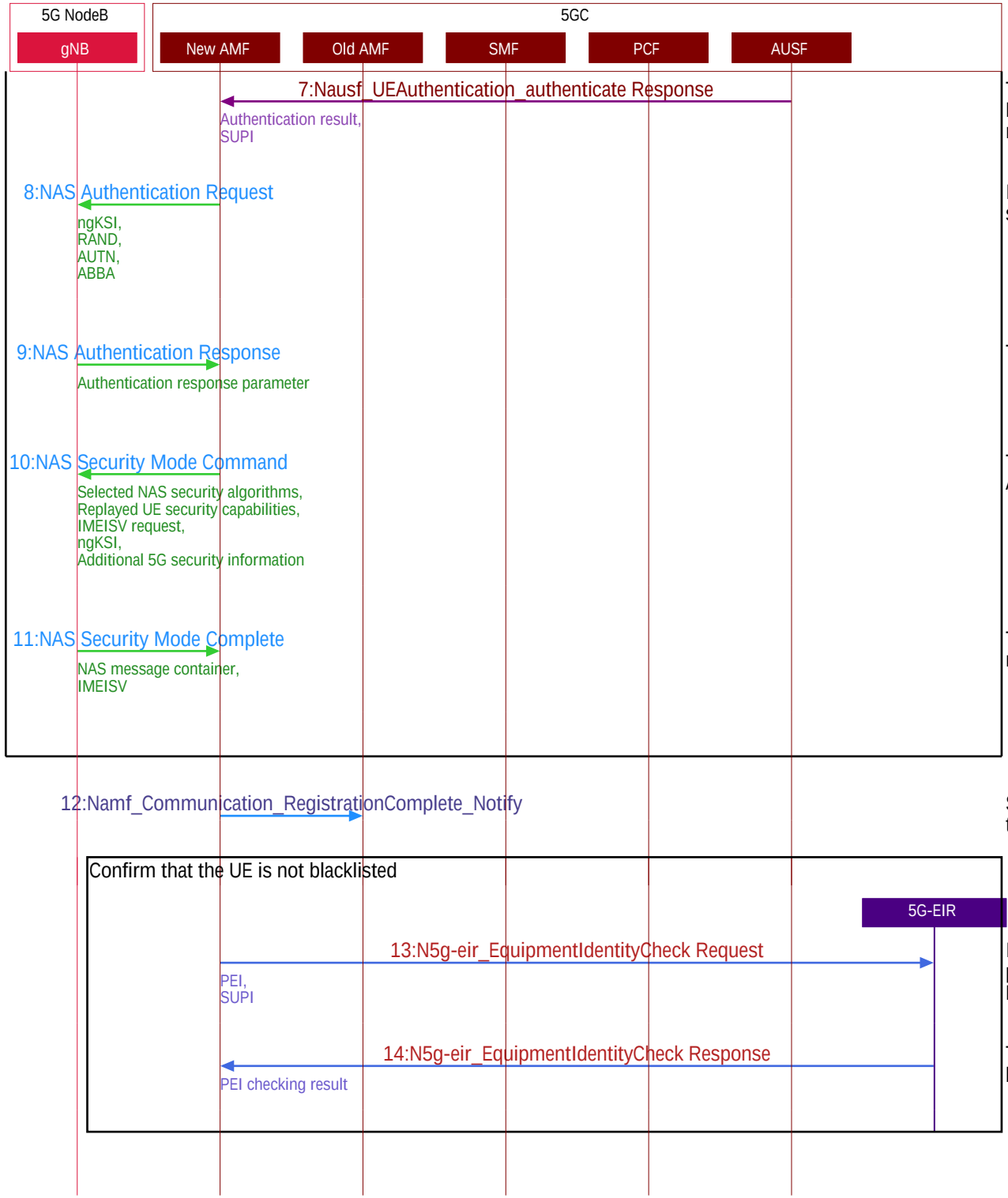
The UE responds to the Identity Request.

NAS Authentication and Security

6:Nausf_UEAuthenticate_authenticate Request

SUCI: Subscription Concealed Identifier

The AMF requests UE authentication vectors and algorithm information from the AUSF - Authentication Server Function



The response returns the master key which is used by AMF to derive NAS security keys and other security key(s). The SUPI is also returned to the AMF.

Initiate the authentication procedure with the UE. Send the key selector, RAND and AUTN to the UE.

The UE responds to the authentication challenge.

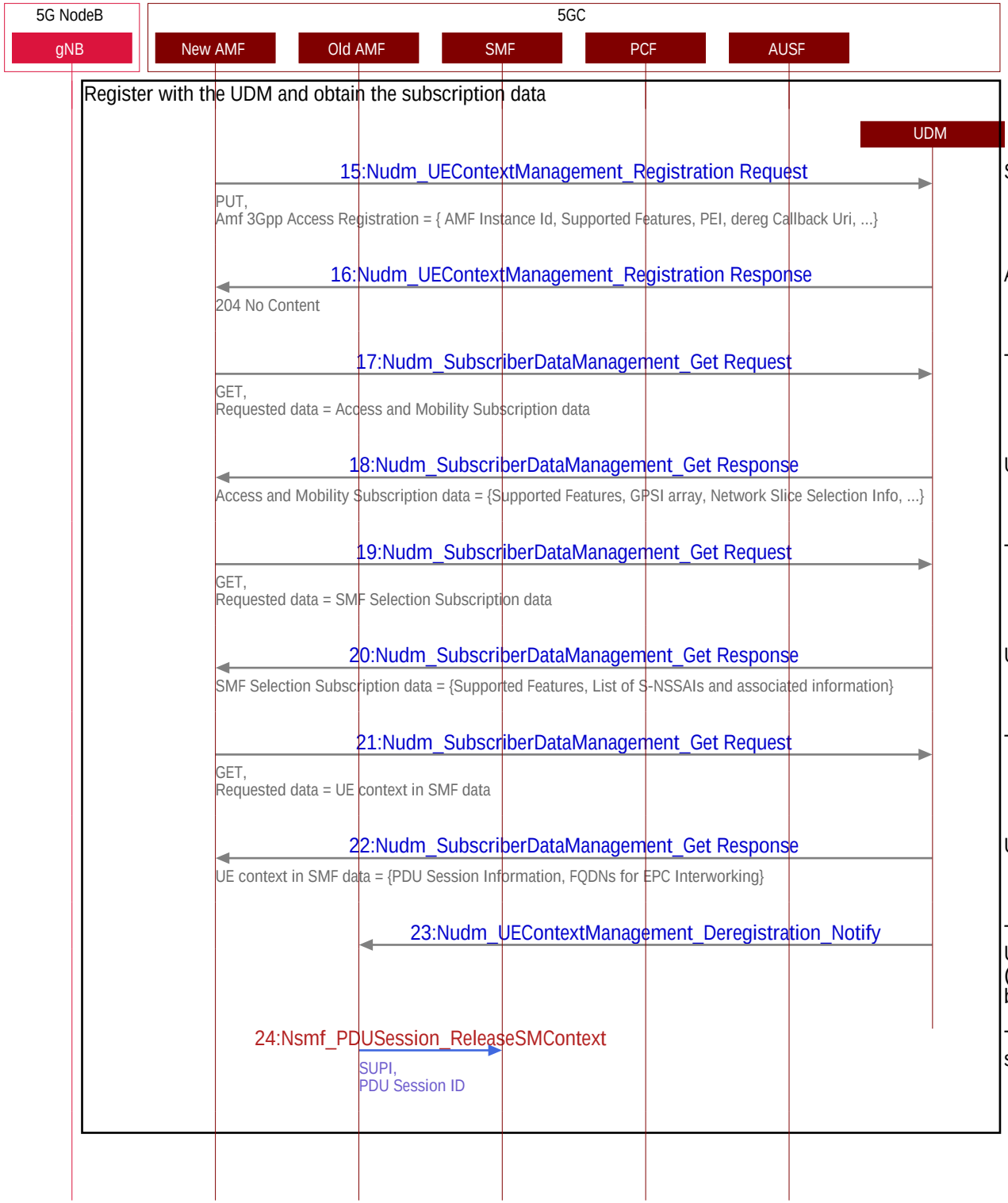
The AMF signals the selected NAS security algorithm to the UE. The AMF also requests the IMEISV from the UE.

The UE signals the completion of the NAS security procedure. The message contains the IMEISV.

Since the AMF has changed the new AMF notifies the old AMF that the registration of the UE in the new AMF is completed.

Invoke the Equipment Identity Check service. This service is provided by the 5G-EIR to check the PEI and determine whether the PEI is blacklisted.

The 5G-EIR reports that the Mobile (identified by the PEI) has not been black listed.



Since the AMF has changed, the New AMF registers with the UDM.

A response code of "204 No Content" signals registration success.

The AMF retrieves the Access and Mobility Subscription data.

UDM responds with the requested data.

The AMF retrieves the SMF Selection Subscription data.

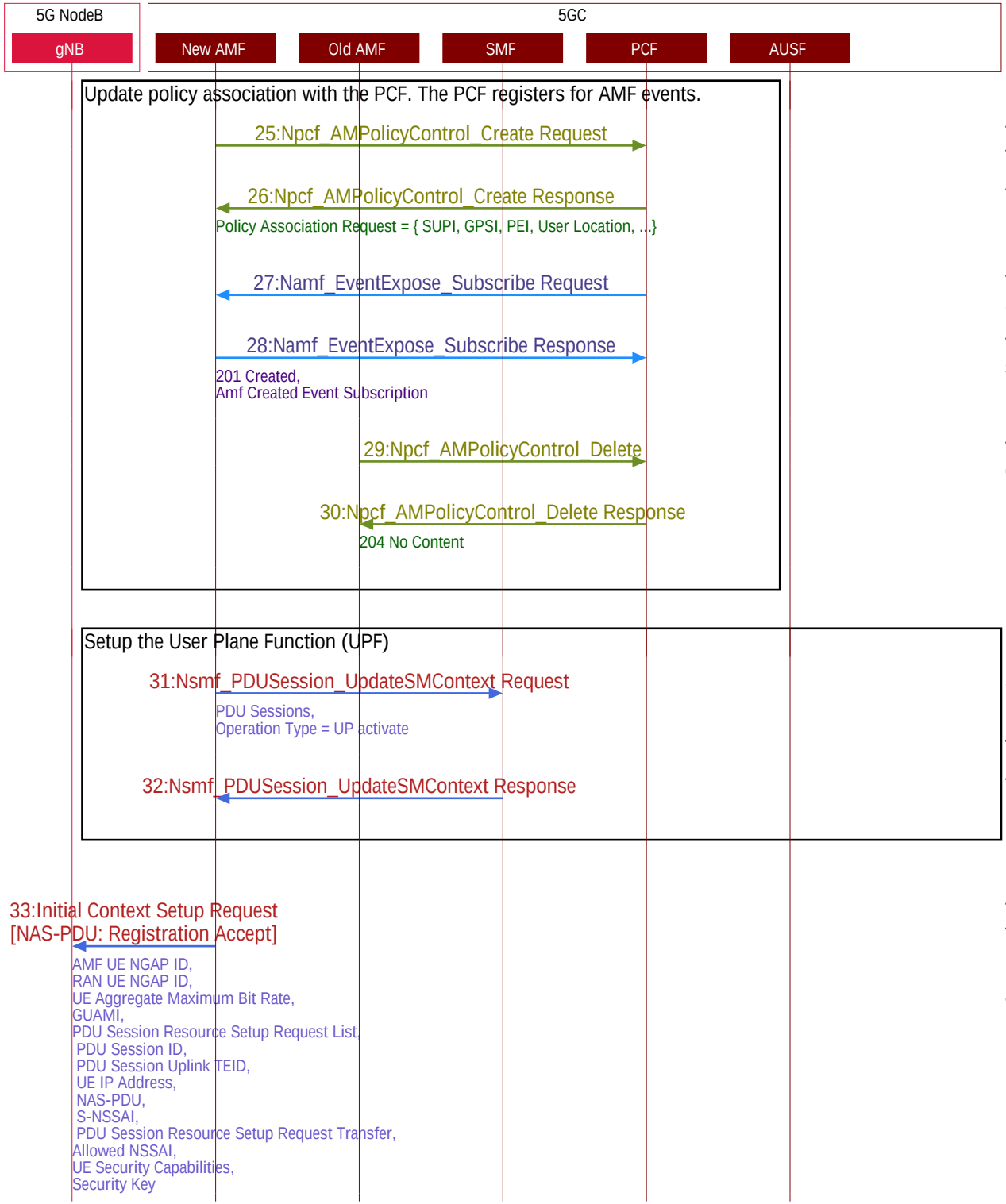
UDM responds with the requested data.

The AMF retrieves the UE context in SMF data.

UDM responds with the requested data.

The old AMF is notified that it is no longer serving the user. The UDM sends a POST request to the callbackReference (deregCallbackUri field in Amf3GppAccessRegistration) as provided by the Old AMF during the registration.

The Old AMF the SMF that it is no longer associated with the specified PDU Session.



The AMF contacts the PCF to create a policy association and retrieve the UE policy and/or Access and Mobility control policy.

The PCF responds with the policy association information.

The PCF registers for events like "Location Report", "Registration State Report" and "Communication Failure Report".

The AMF responds with "201 Created" to signal successful subscription.

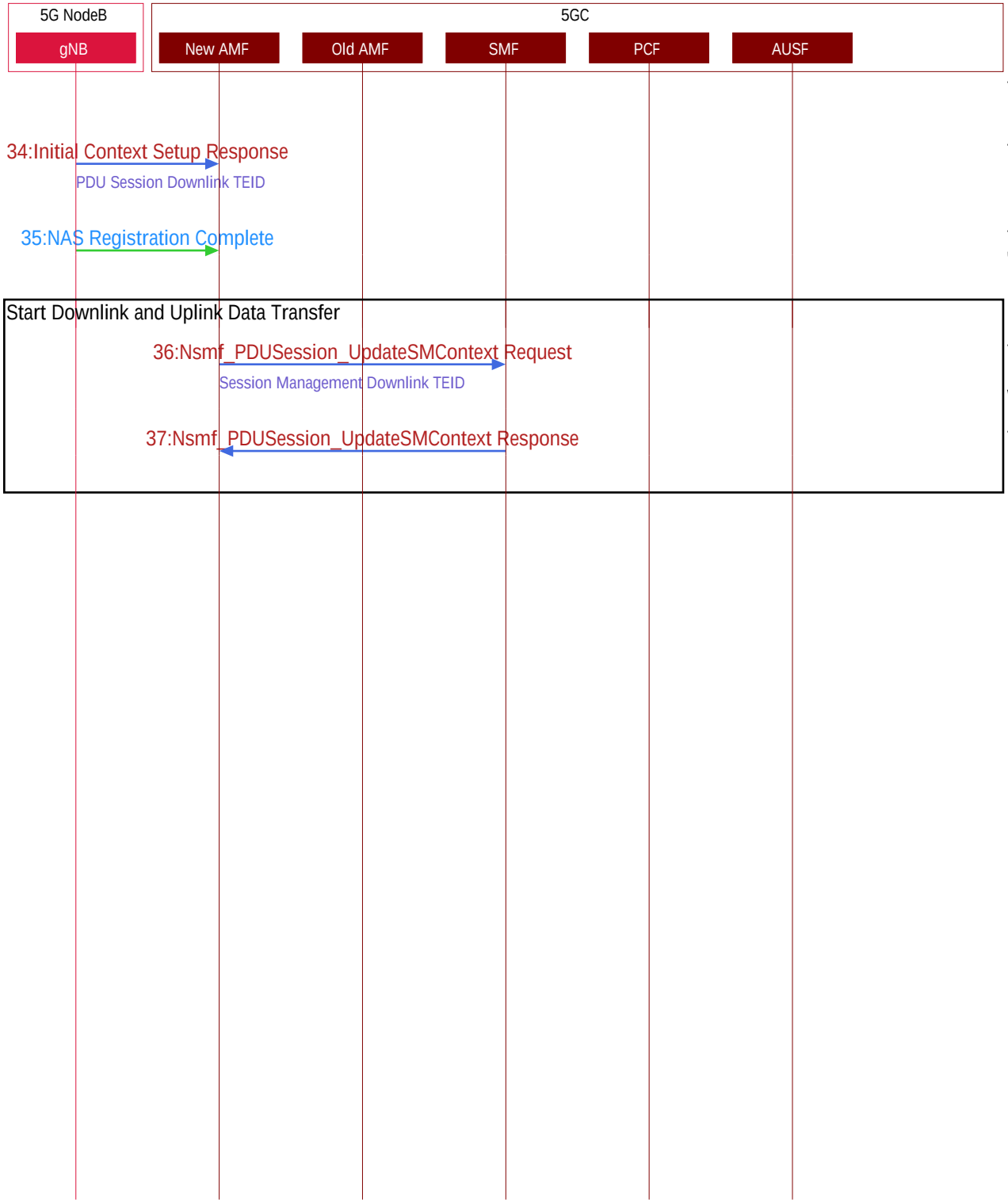
The Old AMF requests that the policy association is deleted as the corresponding UE context is terminated.

PCF signals the successful delete with the "204 No Content" HTTP response code.

Since "List Of PDU Sessions To Be Activated" was included in the Registration Request, the New AMF initiates PDU Session reactivation. The Session Management Function (SMF) is requested to setup a new session.

The SMF informs the AMF that the Session Management context has been updated.

The AMF initiates a session setup with the gNB. The message typically contains the Registration Accept NAS message. The message carries one or more PDU Session setup requests. Each PDU session is addressed with the "PDU Session ID". The message also carries the uplink TEID for every PDU session.



The message also carries the "AMF UE NGAP ID", "UE Aggregate Maximum Bit Rate", UE security capabilities and security key.

The gNB signals the successful setup of PDU sessions. The message also carries the Downlink TEID that should be used (specified per PDU session).

The UE signals the completion of the registration via the "Registration Complete" message to the AMF.

The AMF modifies the Session Management Context based on the updates from the gNB. The Downlink TEIDs for all the PDU sessions will be passed to the SMF.

The SMF notifies the AMF that session management context update is complete.