

PDP Context Aggregation and NSAPI/SAPI/PFI/RAB Id relation during all PS handover Scenarios

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Source: Nokia

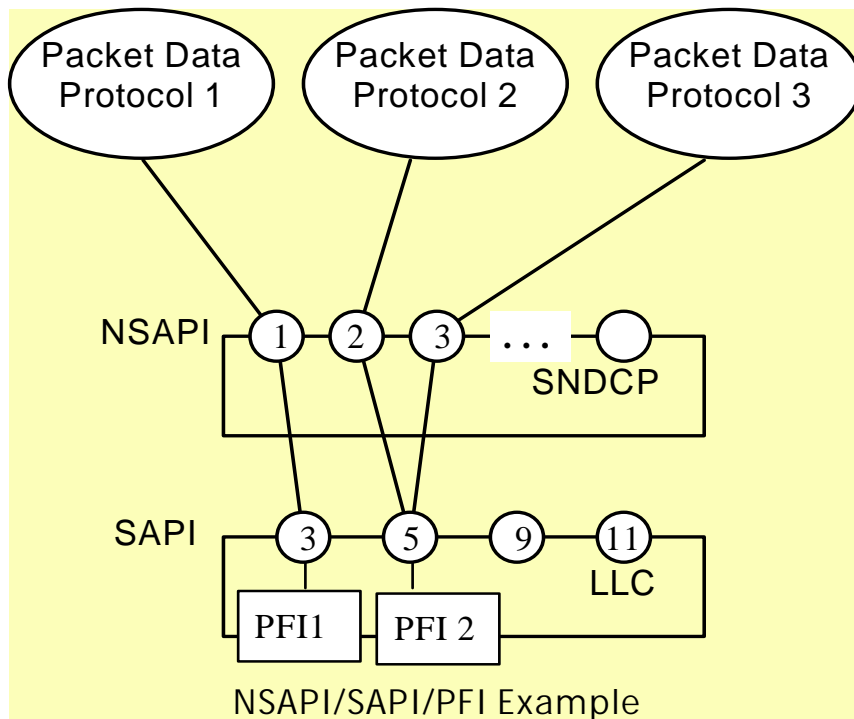
Outline

- NSAPI, SAPI, PFI in *GERAN A/Gb mode*
- NSAPI, RB Identity, and RAB ID in *Iu Mode* (UTRAN, GERAN *Iu mode*)
- PDP context and PFI in *GERAN A/Gb mode*
 - PDP Context Negotiation
 - PDP Context Modification
- PDP context and PFI in PS Handover Discussions
- Relation between NSAPI, SAPI, PFI and RAB id in Inter-mode, Inter-RAT PS handover *GERAN A/Gb mode – UTRAN / GERAN Iu mode*
- Relation between NSAPI, SAPI, PFI and RAB id in Inter-mode, Inter-RAT PS handover *UTRAN / GERAN Iu mode - GERAN A/Gb mode*
- Conclusion

NSAPI/SAPI/PFI – PDP Context Aggregation in GERAN *A/Gb mode*

PDP Context Aggregation refers to several NSAPI sharing one single SAPI and one PFI:

- SNDCP performs “Multiplexing of N-PDUs from one or several NSAPIs onto one LLC SAPI. NSAPIs that are multiplexed onto the same SAPI shall use the same radio priority level, and traffic class. In case BSS packet flow contexts are created all NSAPIs that are multiplexed onto the same LLC SAPI shall share the same BSS packet flow context.” [TS23.060]



There are four SAPI values defined for user data:

-SAPIs 3, 5, 9, and 11

- Default values for SAPIs 3, 5, 9, and 11 have been chosen to correspond with the four GPRS quality of service delay classes, although there is no fixed relationship between SAPI and delay class.

- The LLC layer parameters for any SAPI can be negotiated to support any QoS profile

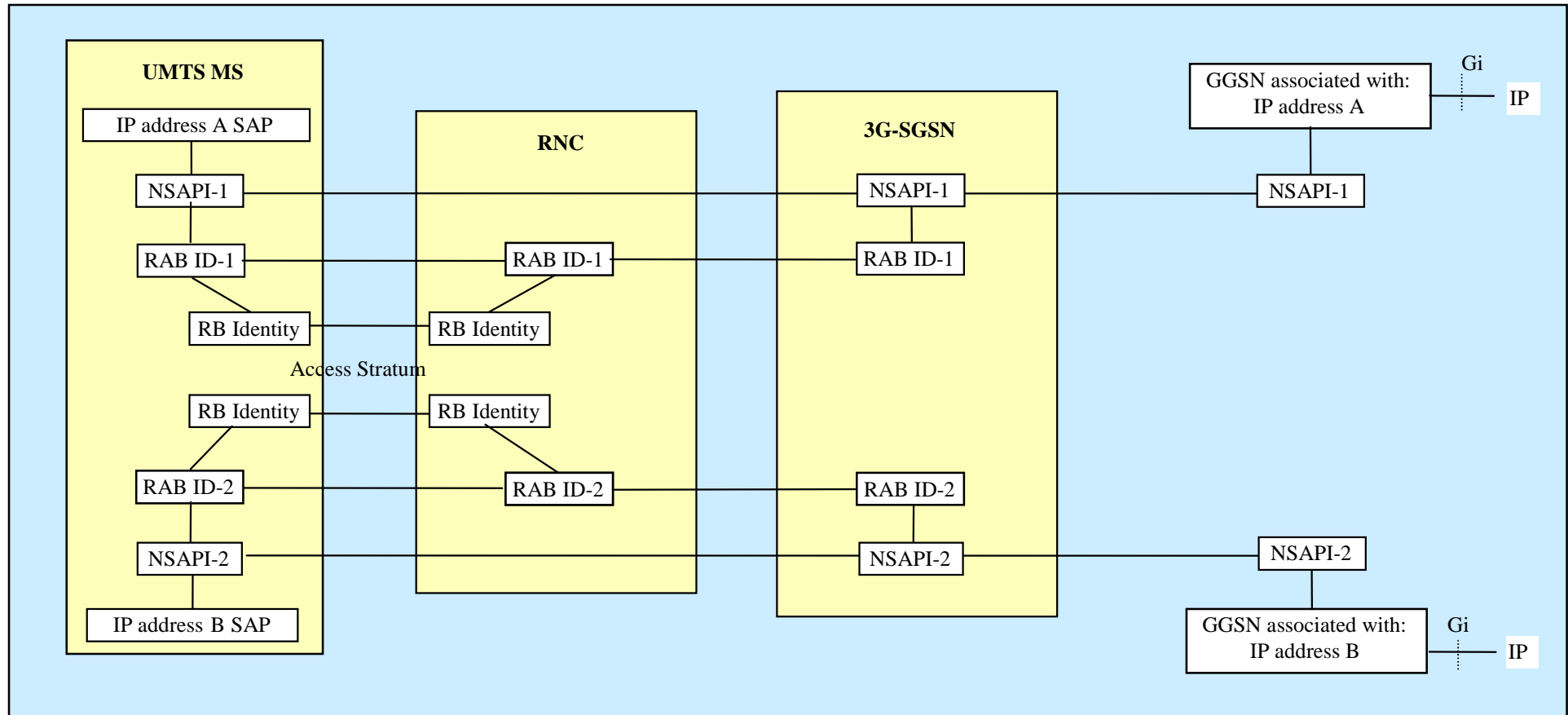
[TS44.064]

-> per MS per QoS class, one SAPI is related to one PFI

-> per MS per QoS class there can be no more than one SAPI utilizing the same PFI

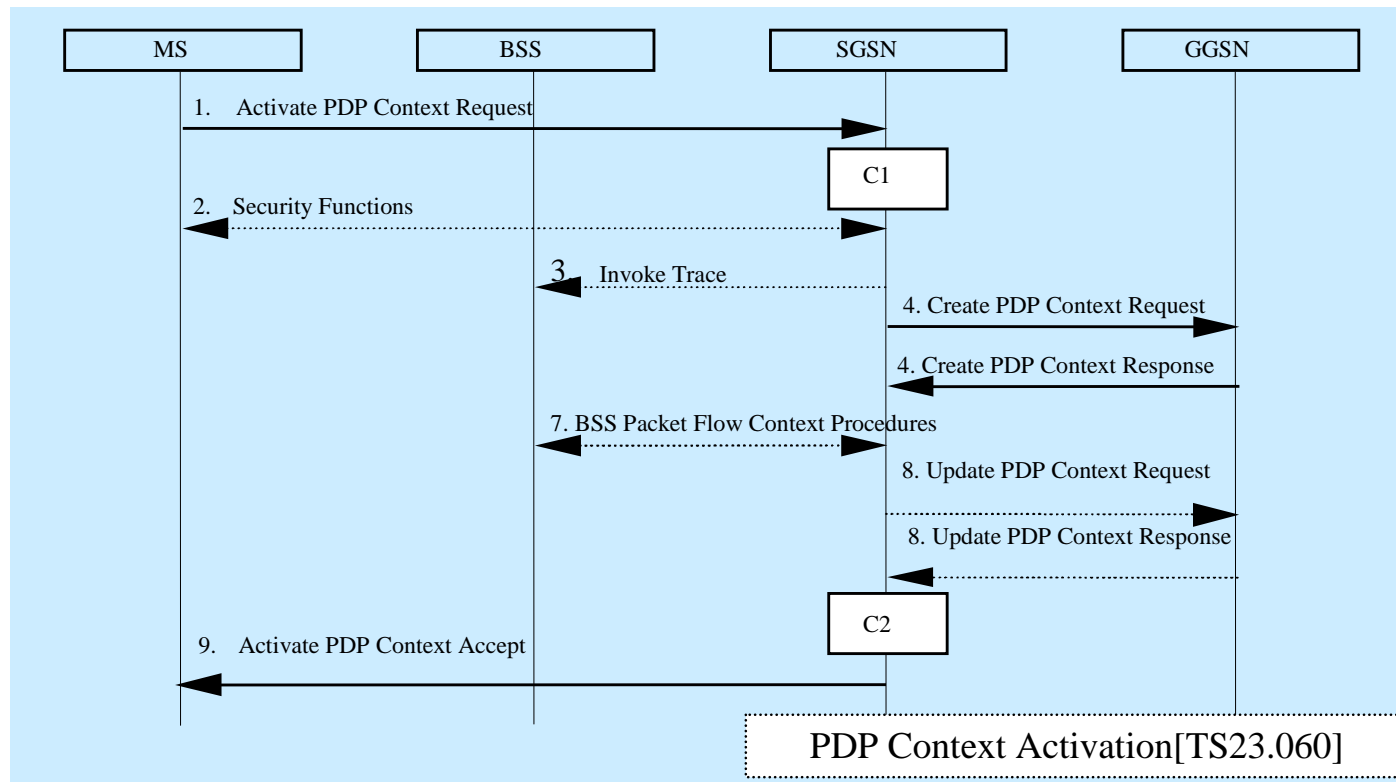
-> per MS there can be several NSAPIs utilizing the same SAPI and the same PFI

NSAPI, RB Identity, and RAB ID



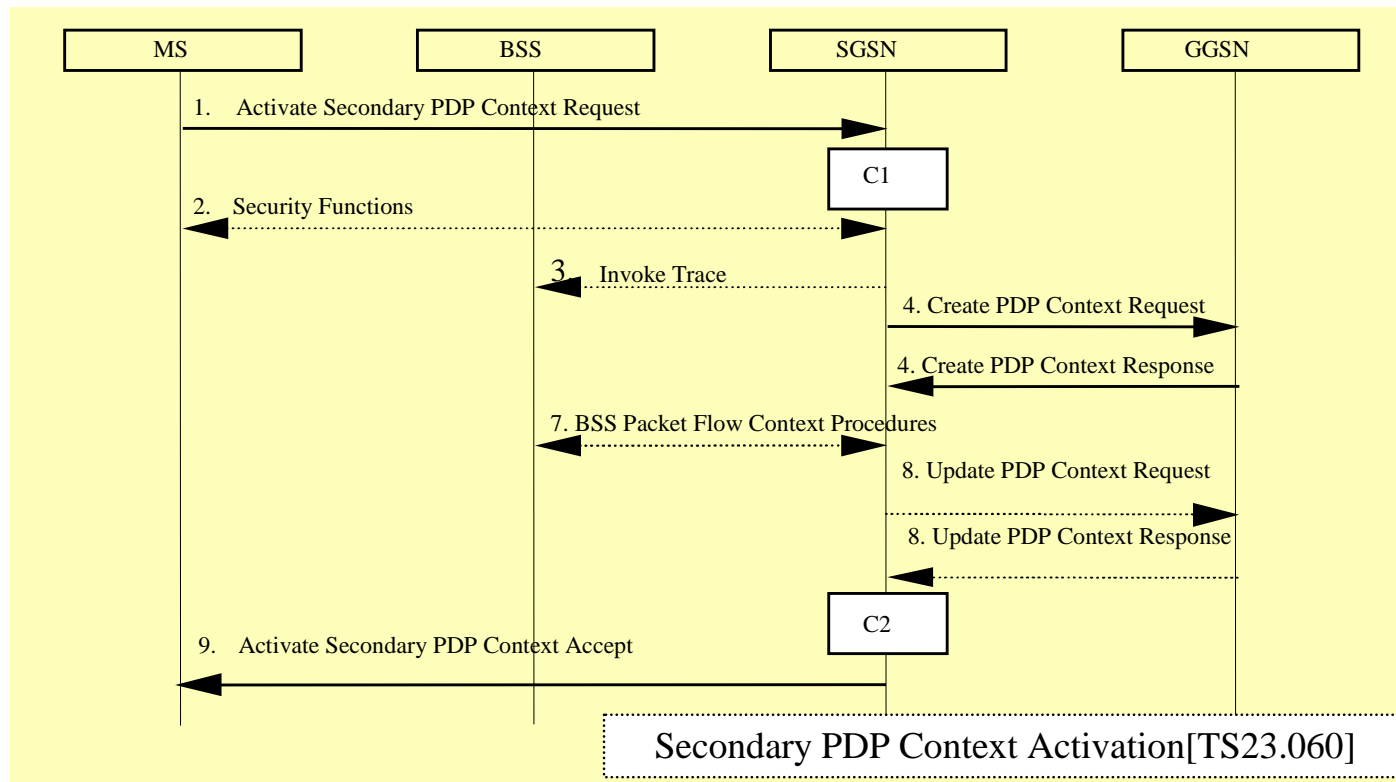
- There is a one-to-one relationship between NSAPI, Radio Access Bearer, and PDP context.
- In the packet domain, there is also a one-to-one relationship with Radio Bearer Identity

PDP CONTEXT and PFI in GERAN *A/Gb mode* (1)



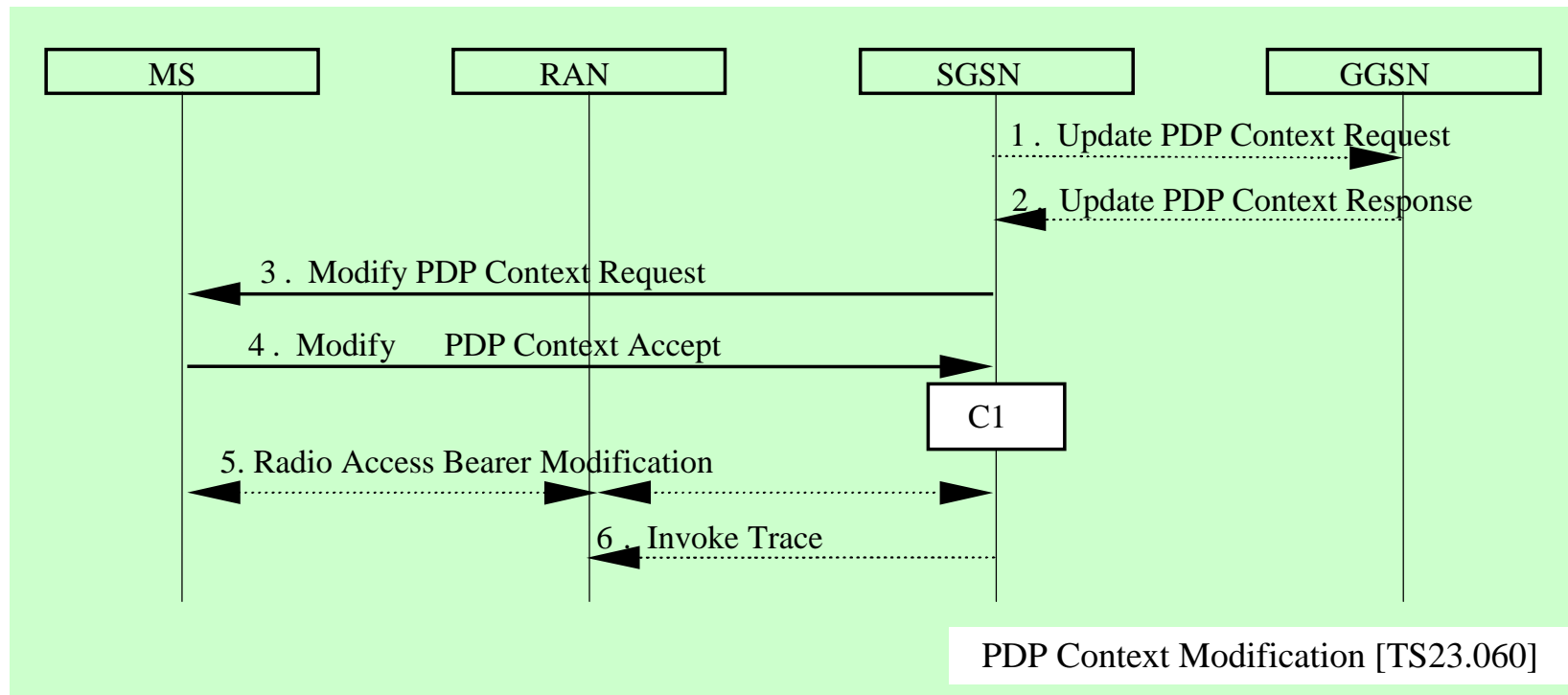
- The MS sends an *Activate PDP Context Request (NSAPI, TI, PDP Type, PDP Address, Access Point Name, QoS Requested, PDP Configuration Options)* message to the SGSN.
- The SGSN selects Radio Priority and Packet Flow Id based on QoS Negotiated, and returns an *Activate PDP Context Accept (PDP Type, PDP Address, TI, QoS Negotiated, Radio Priority, Packet Flow Id, PDP Configuration Options)* message to the MS.

PDP CONTEXT and PFI in GERAN *A/Gb mode* (2)



- The MS sends an *Activate Secondary PDP Context Request (Linked TI, NSAPI, TI, QoS Requested, TFT, PDP Configuration Options)* message to the SGSN (TI and NSAPI contain values not used by any other activated PDP context)
- The SGSN selects Radio Priority and Packet Flow Id based on QoS Negotiated, and returns an *Activate Secondary PDP Context Accept (TI, QoS Negotiated, Radio Priority, Packet Flow Id, PDP Configuration Options)* message to the MS

PDP CONTEXT and PFI in GERAN *A/Gb mode* (2)

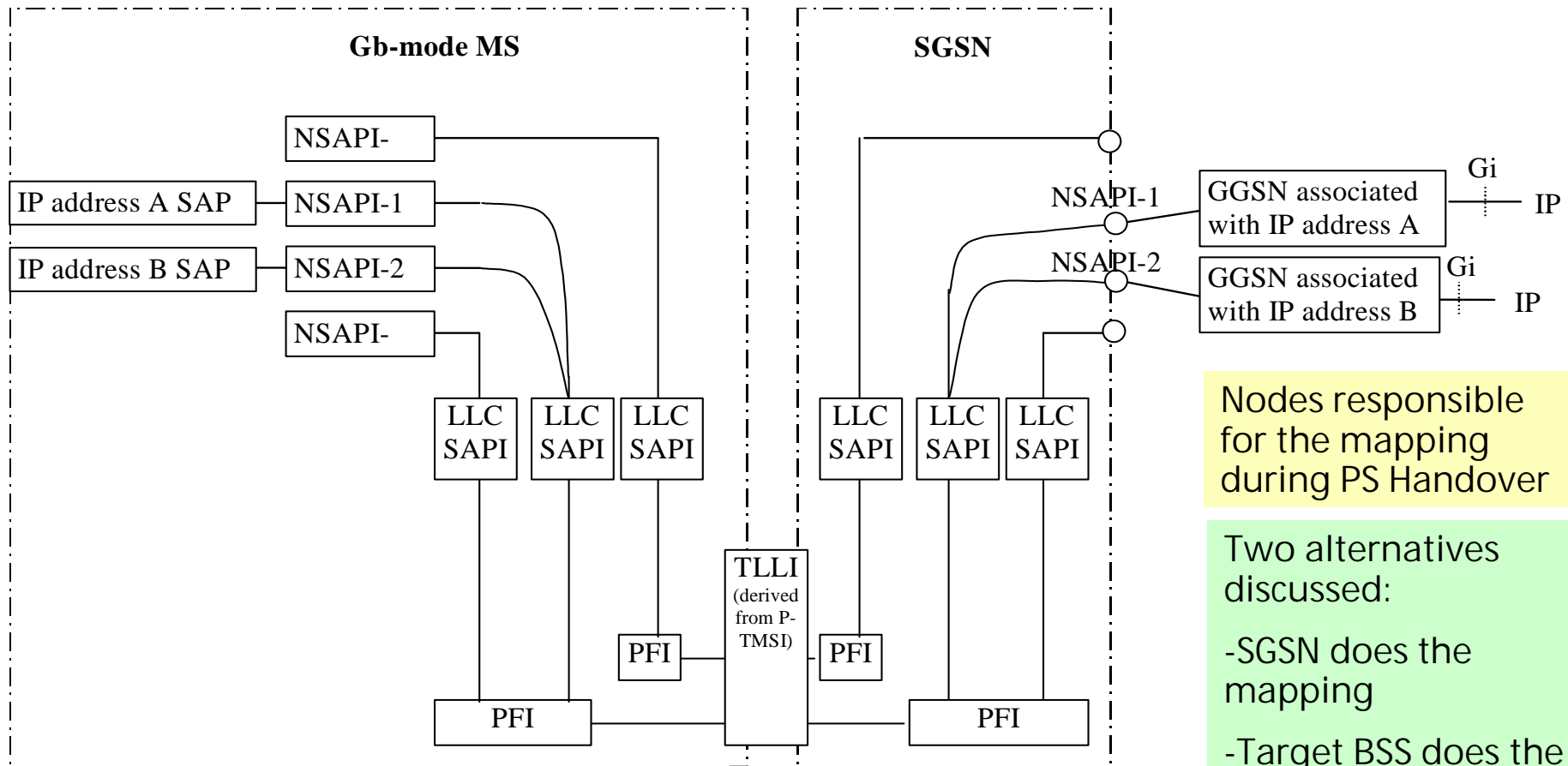


- SGSN selects Radio Priority and Packet Flow Id based on QoS Negotiated, and may send a *Modify PDP Context Request (TI, QoS Negotiated, Radio Priority, Packet Flow Id)* message to the MS.
- The MS acknowledges by returning a *Modify PDP Context Accept message*. If the MS does not accept the new QoS Negotiated it shall instead *de-activate the PDP context* with the PDP Context Deactivation Initiated by the MS procedure.

PDP Context IE [TS29.060]

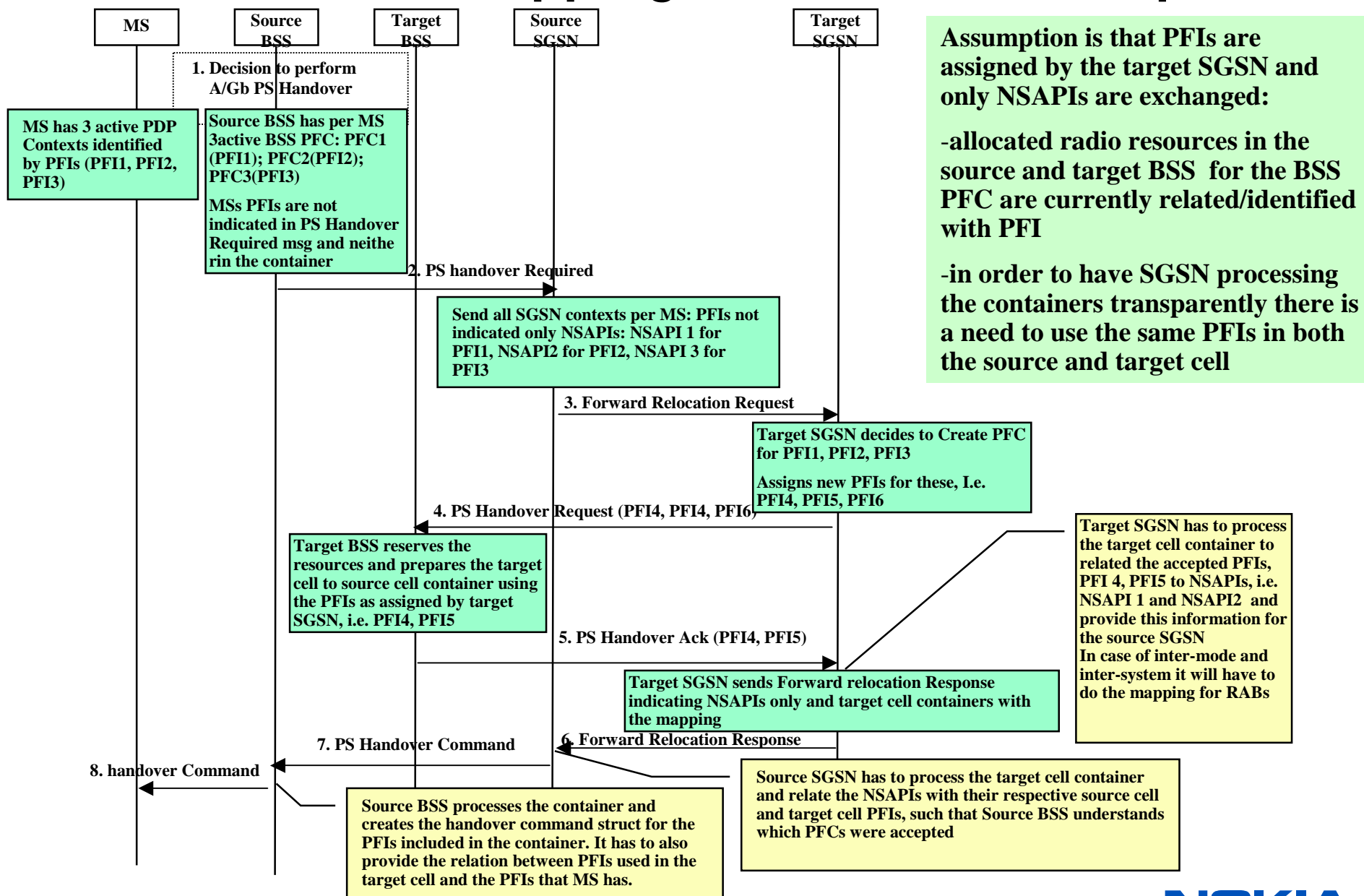
Octets	Bits							
	8	7	6	5	4	3	2	1
1	Type = 130 (Decimal)							
2-3	Length							
4	Res- erved	VAA	Res- erved	Order	NSAPI			
5	X	X	X	X	SAPI			
6	QoS Sub Length							
7 - (q+6)	QoS Sub [4..255]							
q+7	QoS Req Length							
(q+8)-(2q+7)	QoS Req [4..255]							
2q+8	QoS Neg. Length							
(2q+9)-(3q+8)	QoS Neg [4..255]							
(3q+9)-(3q+10)	Sequence Number Down (SND) (note)							
(3q+11)-(3q+12)	Sequence Number Up (SNU) (note)							
3q+13	Send N-PDU Number (note)							
3q+14	Receive N-PDU Number (note)							
(3q+15)-(3q+18)	Uplink Tunnel Endpoint Identifier Control Plane							
(3q+19)-(3q+22)	UplinkTunnel Endpoint Identifier Data I							
3q+23	PDP Context Identifier							
3q+24	Spare 1 1 1 1				PDP Type Organisation			
3q+25	PDP Type Number							
3q+26	PDP Address Length							
(3q+27)-m	PDP Address [0..63]							
m+1	GGSN Address for control plane Length							
(m+2)-n	GGSN Address for control plane [4..16]							
n+1	GGSN Address for User Traffic Length							
(n+2)-o	GGSN Address for User Traffic [4..16]							
o+1	APN length							
(o+2)-p	APN							
p+1	Spare (sent as 0 0 0 0)				Transaction Identifier			
p+2	Transaction Identifier							

PDP Context Aggregation and PFI in PS Handover Discussions

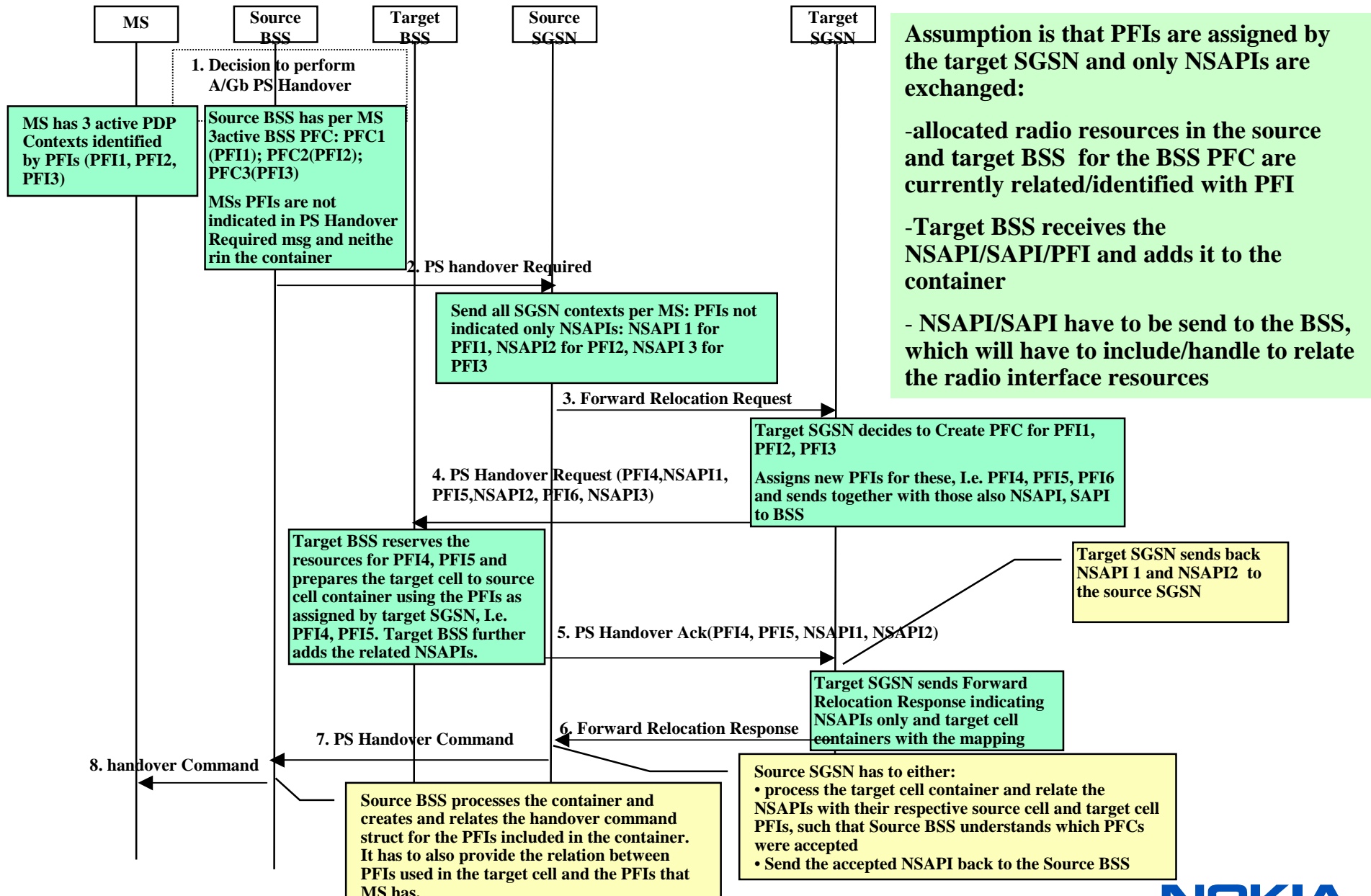


There can be one or more NSAPIs per LLC SAPI according to 44.065. SAPI values are primarily used to keep the sequence order within one "flow". PFI is used for traffic with similar QoS requirements.

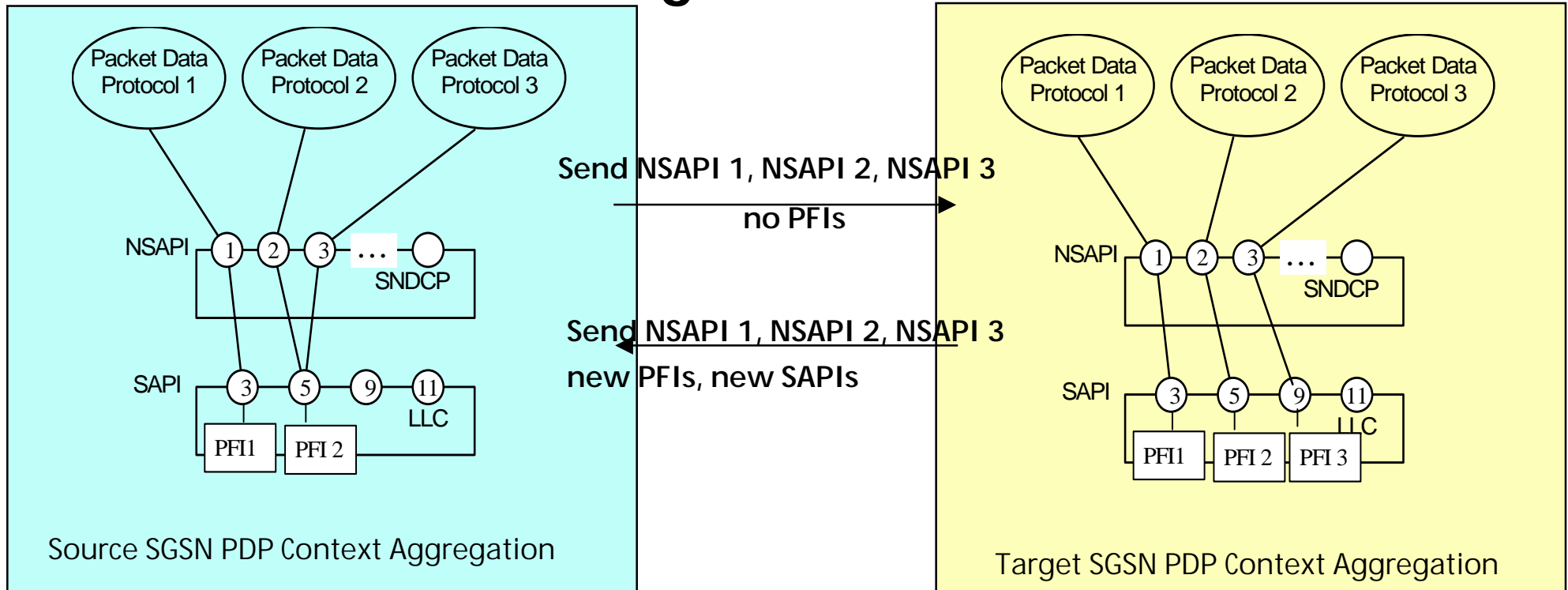
NSAPI/SAPI/PFI mapping – SGSN case example



NSAPI/SAPI/PFI mapping – BSS case example



Impact of NSAPI/SAPI/PFI mapping during PS Handover



- According to the current specifications there is no indication that NSAPI/SAPI mapping may not be supported by an SGSN
- The assumption “Source SGSN and Target SGSN do not support the same mapping” leads to:
 - Target SGSN is allowed to modify the PDP context, i.e. QoS profile can be renegotiated during the PS Handover;
 - MS may reject the modification and deactivate the PDP context;
 - LLC settings will change as NSAPIs will be related to different SAPIs.

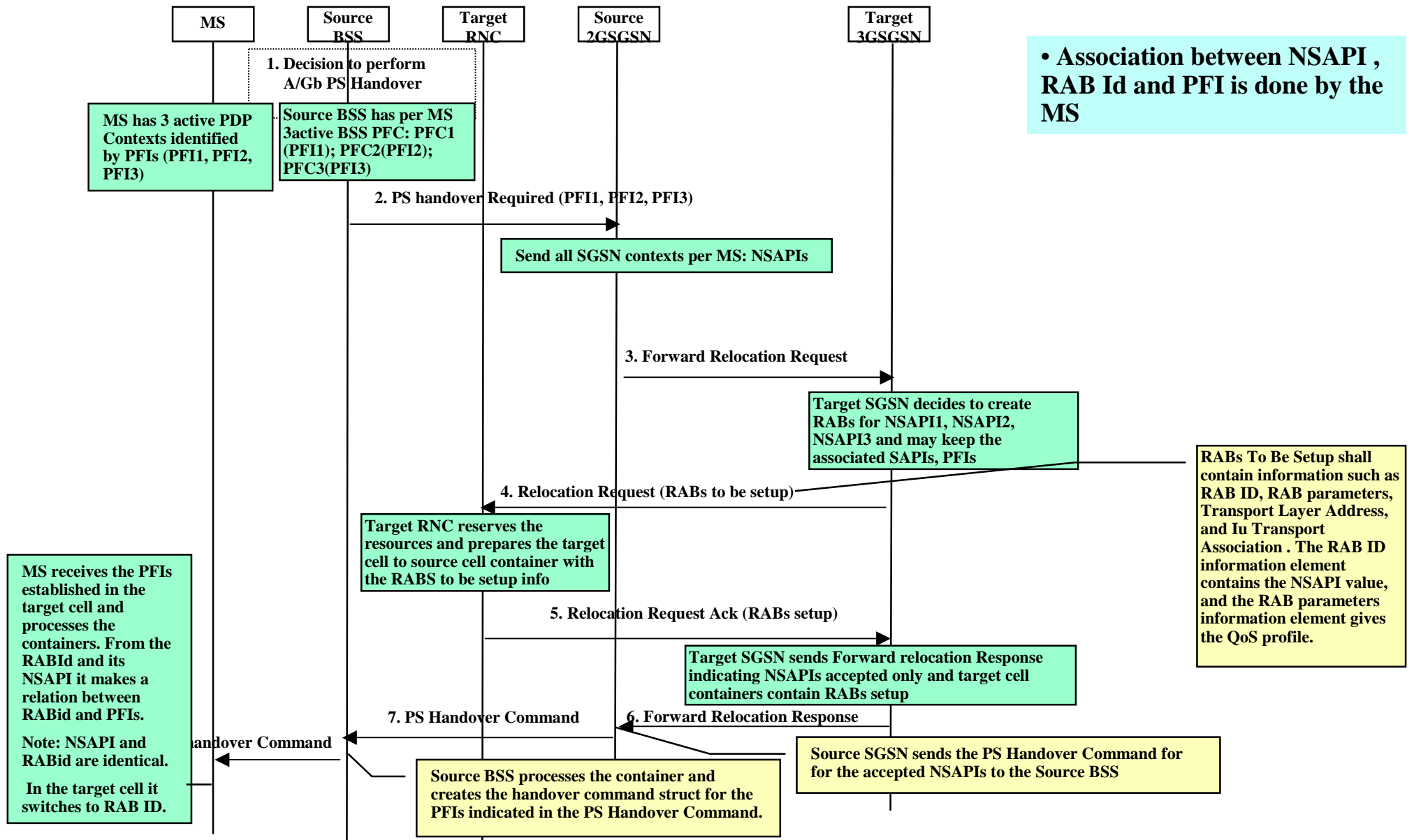
Way Forward Proposal (1)

- There are only 4 SAPIs defined for user data
 - Future proof issues: is it expected that there will be more than 4 SAPIs defined for user data.
- NSAPI and SAPI information is already part of the PDP Context – the information on NSAPI/SAPI mapping is already there; changing SAPI will result in the PDP Context Modification
- PFI may be indicated during SGSN Context Transfer during RAU already according to the current specs; thus NSAPI/SAPI/PFI mapping is there; changing PFI will result in the PDP Context Modification
- PFI is changed during an ongoing session only if QoS profile changes, i.e. during PDP Context Modification procedure;

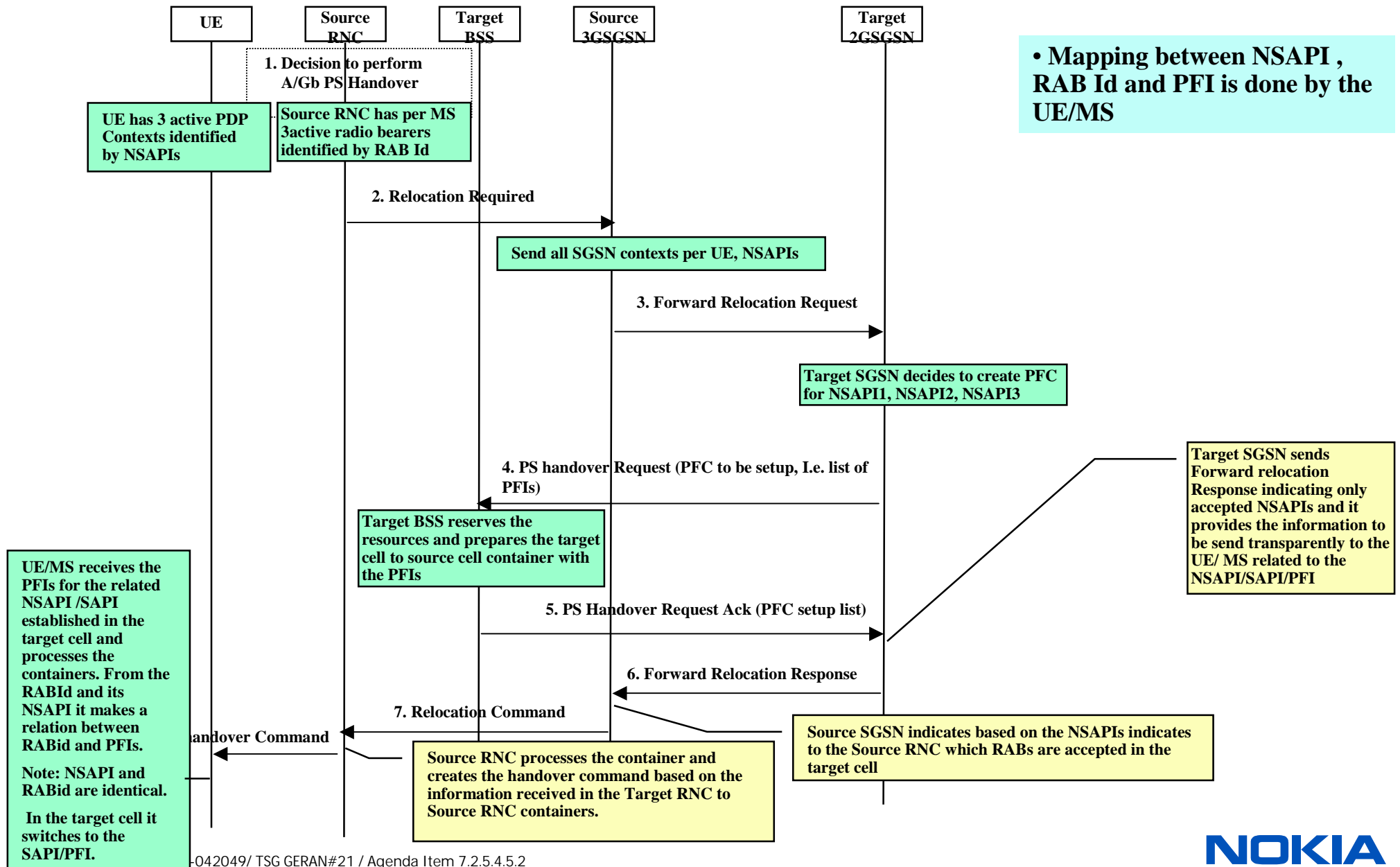
Way Forward Proposal (2)

- Target SGSN will be able to support the same mapping as Source SGSN NSAPI/SAPI/PFI
- The SAPI and the PFIs used in the Source SGSN should be indicated to the Target SGSN
- No need for the assumption that the mapping will not be supported
- Allowing this flexibility introduces too much complexity in the MS
- Relation between NSAPIs, RABs and PFIs should be defined separately from the NSAPI/SAPI/PFI mapping issue

GERAN A/Gb to UTRAN / GERAN Iu mode PS Handover



UTRAN / GERAN Iu mode to GERAN A/Gb PS Handover



Conclusions

- Source SGSN shall always send for each NSAPI the related SAPI and PFI whenever available
 - 3G SGSN may not have the SAPI and PFIs to send to the Target SGSN
- Target SGSN shall based on its local policies apply the same SAPI and PFI related to the NSAPI whenever received
 - When no SAPI or PFI is received related to this NSAPI it shall choose its own values based on its local policies
- In inter-RAT and inter-mode PS Handover NSAPI/SAPI/PFI and RAB Id relation is done at the MS /UE