

PS Handover Principles and Way Forward

TSG GERAN#20,
21st – 25th of June,
Bilbao, Spain

Source: Ericsson, Nokia, Siemens

PS Handover Principles

The following PS Handover Principles have been discussed offline:

- PS Handover Procedures
- Security handling
- XiD negotiation during PS Handover
- Identifiers
- Packet data forwarding during PS handover
- PS handover impact/relation on/to existing procedures

Keys used in the following slides:

- Agreed Options
- Issues for FFS

PS Handover Procedures (1)

- PS Handover Initiation
 - Initiated by the Source BSS if there are active BSS PFC – no PFIs indicated
- PS Handover Access
 - BSS side – upon receiving the PS Handover access bursts with the Handover reference
 - MS side PS Handover Access is completed upon receiving of Physical Info
- PS Handover Completion
 - BSS side
 - upon receiving the 1st correct normal bursts in uplink following the PS Handover access bursts with the Handover reference
 - upon sending of the PS Handover Complete message
 - SGSN side
 - upon receiving of the PS Handover Complete message on the Gb Interface
 - MS side
 - MS shall have the USF and the Physical Info with the TA (in case of unsynchronised networks) for sending normal bursts in uplink
- The content of the PS handover Complete is not clear e.g. it could include XiD response,
- Usage of PS Handover DETECT might speed up the switching of the user plane data, however so far there is no need for it

PS Handover Procedures (2)

- PS Handover Failure

Preparation phase failures (per each interface: Um, Gb, Gn)

Um

- no resources available in the target cell (see Section 5 [TS43.129]);
- generic causes; follow TS44.060

Gb

- Generic causes; follow TS48.018

Gn

- Context transfer failure, i.e. failure of the exchange of PDP and MM contexts in inter-SGSN case;
- Generic causes; follow TS29.060

Execution phase failures (per each interface: Um, Gb, Gn)

Um

- initial access failure in the target cell;
- loss of radio link;

Gb

- Generic causes

Gn

- “Update PDP Context” failure;
- Generic causes

- Only Failures between the PS Handover initiation and PS handover completion at the MS side and network side should be discussed

- It is FFS when the PS handover Execution phase is declared completed

Security handling (1)

- Key's exchanged as part of the MM context
- Ciphering Algorithm
 - The impact of the RESET of the LLC on the ciphering algorithm
 - LLC should not be RESET
 - If the LLC is reset (LLC Frame Number back to 0), there is a risk that IOV generated by the SGSN will be the same as previously generated as it is a random number). Also, Key, Direction, OC will be the same, so as a consequence, the same mask will be generated (with the same key).
- *Common view:*
 1. *RESET LLC and increase the OC or*
 2. *RESET LLC and make sure that the IOV is not the same*

➔ *to be narrated in GERAN#20*

Security Handling (2)

- Start_PS / UE RAC value in inter-RAT / inter-mode case
- *Common View:*
 - *Start_PS, UE RAC is needed in the target RNC*
 - *the MS should send START_PS, UE RAC to the network if it has not been received from UTRAN/GERAN Iu*
- Mechanism to get the START_PS, UE RAC from the MS to the BSS and SGSN in the Source Cell
 - New RLC/MAC message to BSS
 - RAU Request or other to SGSN
 - 3 cases:
 - Store it in the BSS Context
 - Store it in the SGSN
 - Store it in BSS Context and SGSN
 - Mechanism to handle the START_PS in the BSS and/or SGSN after the PS handover: store it or not
 - Could the Start_PS value be sent to the target cell in A/Gb to A/Gb PS HO?
 - Mechanism for sending MS RAC (Iu -> A/Gb mode) from the Target BSS to Target SGSN provided that the source RNC sends this in the RRC container – Inter-RAT Handover Info need to be updated for the PS side as well
- Target SGSN may not need the MS RAC during PS handover as it will receive it during the RAU procedure

Security Handling (3)

- Solution 1:
 - Send the START_PS from the MS to SGSN and store it in the Source SGSN
 - Send the START_PS from the SGSN to the BSS and store it in the BSS Context
 - Send the START_PS in the RRC Container as part of the inter-RAT handover Info
- Solution 2 – RLC/MAC messages only:
 - Send the START_PS to the BSS from the MS upon request from the BSS and store it in the BSS Context
 - Send the START_PS from the BSS in the RRC Container as part of the inter-RAT handover Info
- Solution 3 – RLC/MAC & Gb messages:
 - Send the START_PS to the BSS from the MS upon request from the BSS and store it in the BSS Context
 - Send the START_PS to the SGSN and store it in the SGSN
 - Send the START_PS from the BSS in the RRC Container as part of the inter-RAT handover Info
- Solution 4:
 - Send the START_PS from the MS to SGSN and store it in the Source SGSN
 - Send the START_PS in the RRC container from the SGSN

Note: START_PS and UE RAC will be handled in the same way

→ *To be discussed in GERAN#20*

Mechanism for the exchange of the security parameters

- MM context
- IEs forwarded transparently in an container format, e.g. START_PS

XiD Negotiation (1)

- XiD Command send in the Source Cell from the New SGSN transparently to the MS through the Old SGSN, source BSS
- XiD Response send in the target cell

- Should the XiD parameters send from the Old SGSN to New SGSN?
 - New SGSN creates XiD command to be send to the MS based on its local policies and utilizing the parameters send by the old SGSN
 - LLC/SNDCP kept the same when possible
 - If LLC/SNDCP parameters are the same no need for XiD command
 - From the MS side is simple only one configuration is to be kept for the whole duration of the session
- Mechanism for the exchange of the XiD parameters
 - XiD Command send as tunneled
 - Send XiD parameters as new IEs /message forwarded transparently in an container format

XiD Negotiation (2)

- Three cases related to XiD Command:
 - Target SGSN keeps the same NSAPI/SAPI/PFI as received in the Forward Relocation Request messages as part of the SGSN Context
 - Target SGSN accepts what Source SGSN has send and creates the LLC/SNDCP XiD Command based on its local policies using the same NSAPI/SAPI and PFI
 - Target SGSN changes the SAPI received in the PDP Context
 - Target SGSN starts the PDP Context Modification if needed
 - Target SGSN sends a modified XiD Command to notify the relation between the new SAPI for the NSAPI to the MS
 - Target SGSN may need to change the PDP Context IE - SAPI in GMM/SGSN Context
 - The MS needs to keep two different LLC/SNDCP states for the same NSAPI
 - Target SGSN changes only the PFI
 - Indicate the relationship between the NSAPI and the new PFI to the MS
 - The MS needs to keep two different PFIs for the same NSAPI

XiD Negotiation (3)

- Common View (to be checked)
 - Option 1 (A/Gb to A/Gb)
 1. Source SGSN may send the current MS's SNDCP/LLC parameters incl. in the XiD Command in the Forward relocation Request to Target SGSN
 2. Target SGSN based on its local policies may accept some or all of these parameters
 1. If it accepts all parameters an XiD command shall not be sent
 2. If it accepts only a set of parameters an XiD Command shall be send
 3. If it does not accept these parameters an XiD Command shall be send

Note: PS Handover shall not be rejected due to SNDCP/LLC parameters

- Option 2 (all scenarios)
 1. Source SGSN does not send any SNDCP/LLC parameters incl. in the XiD Command in the Forward relocation Request to Target SGSN
 2. Target SGSN applies the default SNDCP/LLC parameters and sends an XiD Command with the RESET to the MS
 - Additionally parameters that may not be rejected by the MS may also be included in the XiD Command
- These two options allow for downlink data transmission for lossy PS services prior to XiD Response
- XiD Command is sent either as: a new IE or as a message in a transparent container or as a tunnelled LLC frame

Identifiers

- Addressing resources on the source and target cell
 - Current Solution:
 - Temporary P-TMSI, Local – TLLI
 - According to the current specs RAU Request is send with the Foreign TLLI from the MS
 - Impact on the LLC is ffs
- PDP context and NSAPI/SAPI/PFI and RABs
 - In GERAN A/Gb to GERAN A/Gb no need for the mapping
 - PFIs send to the New SGSN for all active PDP Contexts
 - same as RAB Id, which does not change for the whole duration of the session
 - Solution is needed only in case of inter-mode / inter-RAT were a mapping relation is needed between the RAB Id and PFI

Packet data forwarding during PS handover (1)

- Common View
 - Lossless PS Handover cannot be guaranteed
 - » remove all references to Lossless and Lossy PS handover from the spec TS43.129
 - it is up to Source SGSN to decide based on the QoS on the packet forwarding / bi-casting of the user plane data
 - Minimize packet loss at user plane whenever applicable using packet forwarding concept
 - Bi-casting is supported
 - Support in-order delivery is required (mechanism to be checked TS29.060, TS23.060)

Packet data forwarding during PS handover (2)

- Packet Forwarding behaviour in the case of LLC ABM
 - Source SGSN informs the Target SGSN of the N-PDU sequence number to start downlink data transmission by using PDP Context – Forward Relocation Request; Target SGSN starts the downlink transmission when it receives the N-PDU number by the MS
 - disadvantage is larger Target SGSN buffers
- Optimisation for the LLC ABM
 - Source SGSN informs the Target SGSN of the N-PDU sequence number to start downlink data transmission by using separate signalling message, e.g. FORWARD SRNS Context
 - The advantage is that Target SGSN buffers are smaller
 - The disadvantage is new signalling messages

PS handover impact/relation on/to existing procedures

- PS handover and Cell Update /Cell reselection
 - PS handover is a new procedure independent of the Cell Update / Cell Reselection procedure
- PS handover and RAU procedure
 - No impact on the RAU procedures
 - GMM signalling send as specified currently