Simulation environment for the Evolved Packet System

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Agenda

1. Introduction

2. EPS network

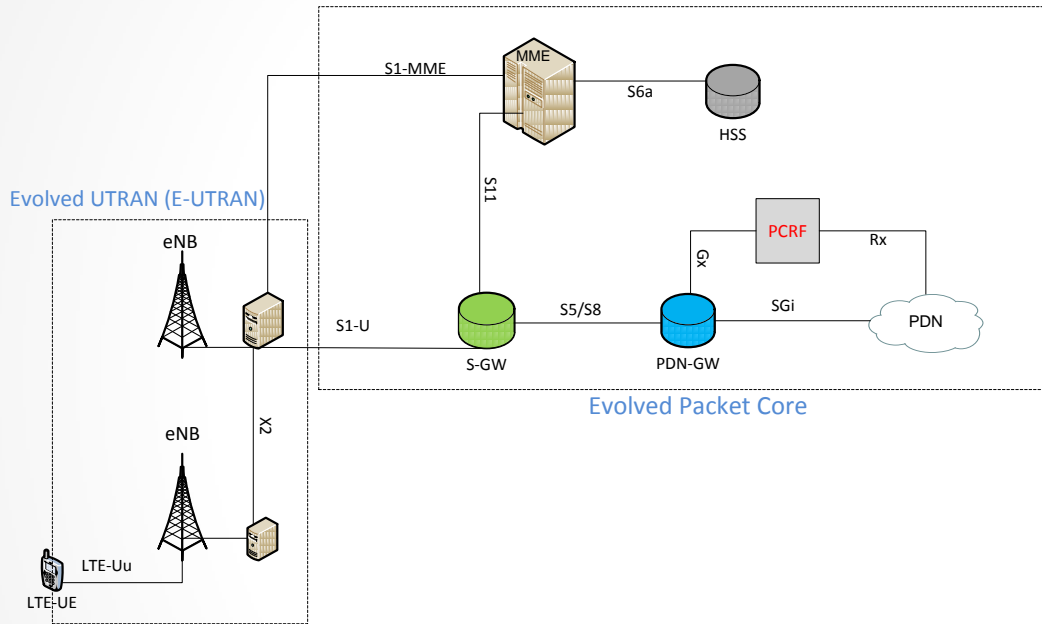3. EPS implementation

4. use cases

5. conclusion

Reasons for an EPS simulation environment

- Difficulty to gain access to real or testbed EPS networks
- Researchers
- Students

Simulation environment based on the ns-3 discrete event network simulator
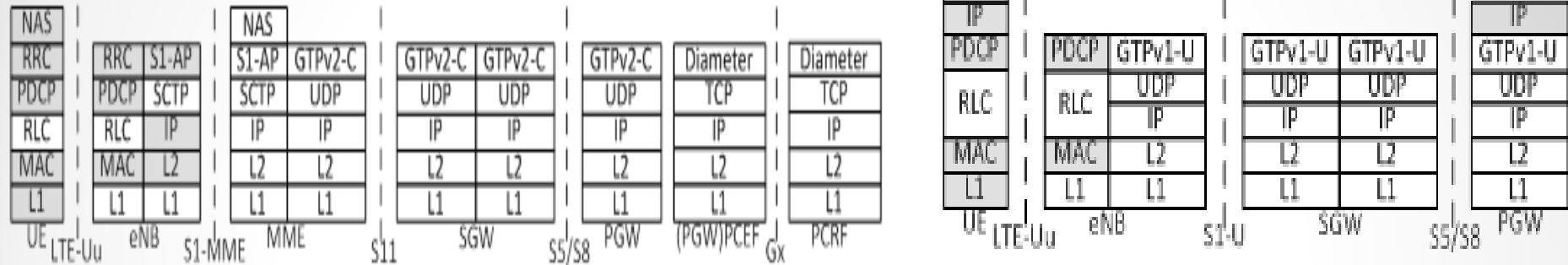
- Bit by bit implementation
  - ➢ Generate protocol trace files of the traffic
  - ➢ Analysis with a network protocol analyser (Wireshark)
  - ➢ Emulator capability (possibility of interworking with real network devices)

EPS network(1)

MME is responsible:

➢ Mobility management functions

EPS Network(2)

- Control plane protocol stack

- User plane protocol stack

Implementations on the CP

- The Non Access Stratum (NAS) with the functionalities of the EPS Session Management(ESM) and the EPS Mobility Management (EMM) protocols.

  - -initial attach procedure with a combined establishement of a default bearer

  - -establishment of a dedicated bearer

- The X2 Aplication protocol (X2-AP) used for X2 based handover procedures between two eNBs

- The GTPv2-C for establishing and modifying, UP default and dedicated bearers. The GTPv2-C is deployed on the MME, the SGW and the PGW

- The diameter protocol which is used in the EPS simulation environment for authentication of QoS resources.

Implementation on CP

- The protocols for this use cases and the functionalities of the network entities are implemented
  - o Pcap traces can be generated and analysed with a network analysis tool

  - o In general all kind of performance analysis can be made with the EPS simulation environment

  In the core network the S1-AP and the SCTP are missing

Implementation On UP

- On the UP the GTPv1-U is implemented to realise UP default and dedicated bearers.

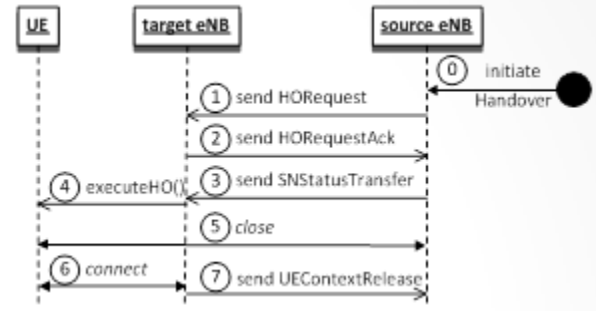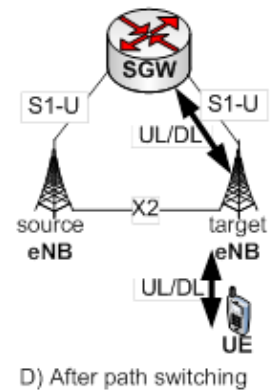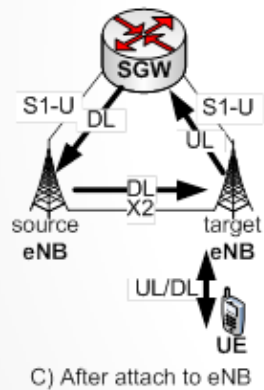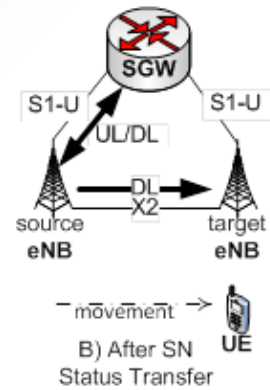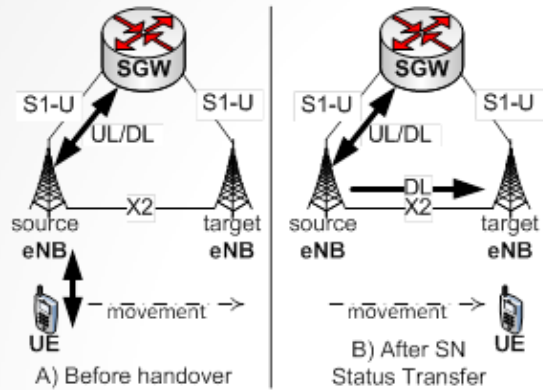# Implementation on the Radio Interface

- The implentation of the LTE is done by the centre Technològic de Telecommunication de Catalunya in Barcelona under the project name LENA
  - Not implemented in a bit by bit manner and therefore generation of pcap is not possible at the moment.

use case (1)
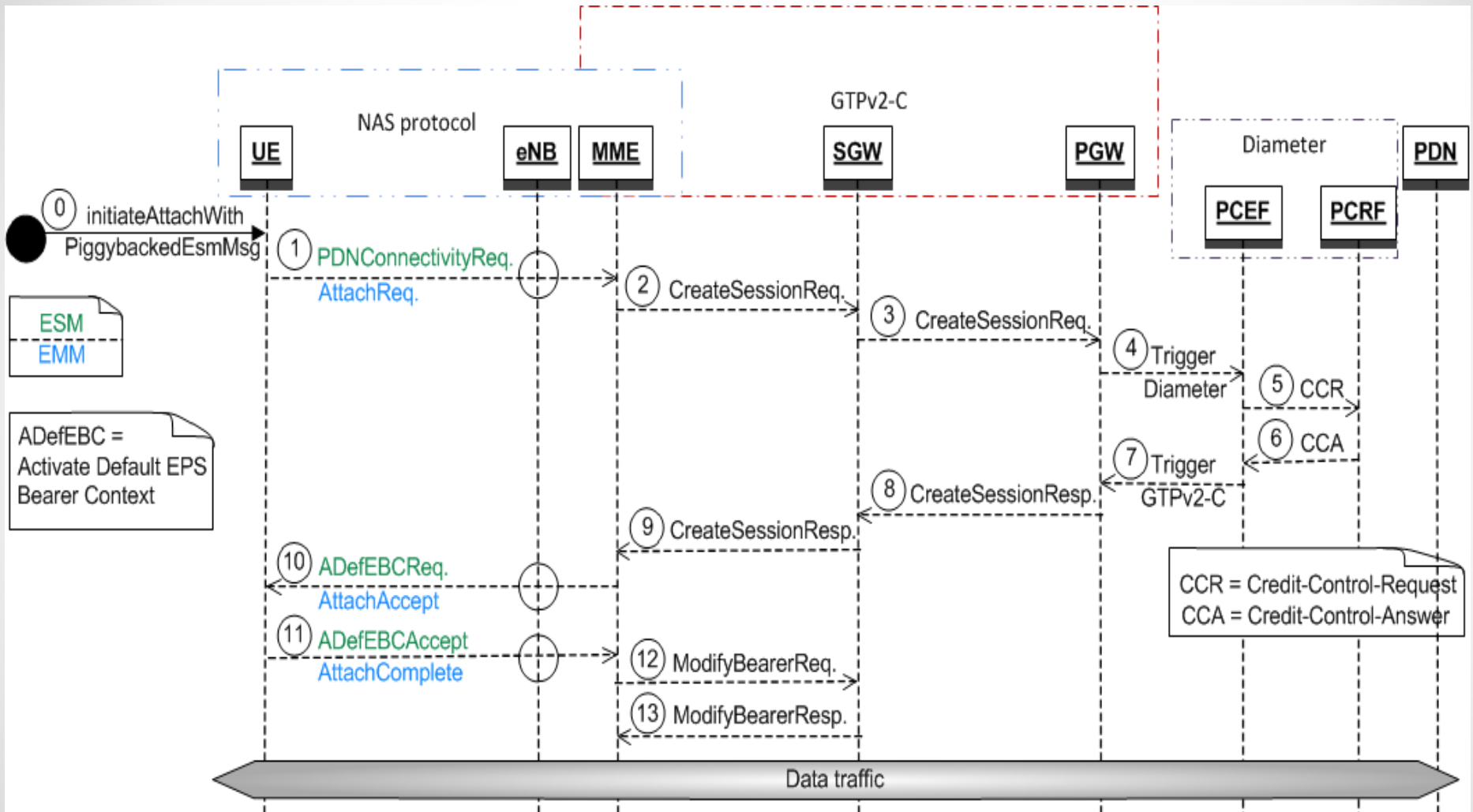
Initial Attach with a default bearer activation

use case (2)

UL/DL flow during X2 based handover

X2 handover without SGW relocation

Conclusion

❑ The presentation gives reason for the necessity of a simulation environment of the EPS and provides an overview of the important network entities and its protocols

❑ Implementation state of the EPS simulation environment is introduced

❑ Use case are described in detail by means of sequence

❑ S1-AP and SCTP are now in progress