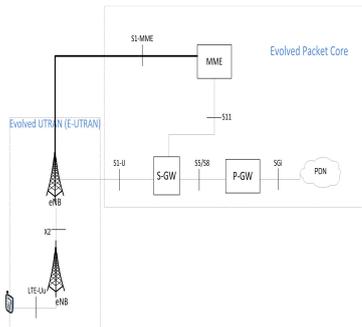


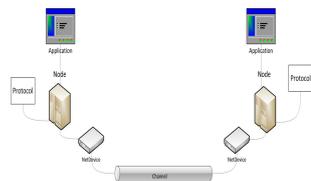
Dionysios Vergakis	Graduate Candidate	Dionysios Vergakis
	Examiner	Prof. Dr. Andreas Rinkel
	Co-Examiner	Frei Sandra
	Master Research Unit	Software and Systems

Evolved Packet System analysis and implementation

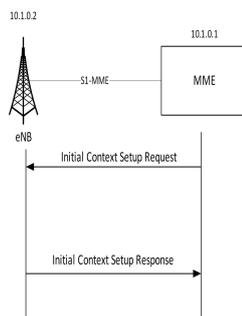
Protocol analysis and partial implementation of the S1-AP in ns-3



EPS Network Elements



ns-3 components



Network for the simulation scenario for the Initial Context Setup

Introduction: In the last few years, new technologies have been developed in telecommunications, which bring available data rates to a totally new dimension. EPS (Evolved Packet System) is an actual project of the 3GPP group. The goal of this project is to design a network for mobile subscribers, which allows true global roaming and provides high data rates which, in turn, will allow users to access applications ranging from basic IP voice communication to seamless real time video streaming. This project work is part of the DHPE project in which the University of Applied Sciences Darmstadt, Germany, the University of Applied Sciences Rapperswil (HSR), Switzerland and the University of Plymouth, United Kingdom are participating. The DHPE project aims at expanding the network simulator ns-3 with an EPS module in order to enable the simulation of 4G network protocols.

Objective: The aim of the project work is to partially implement the S1AP according to the needs and the limitations that the DHPE had defined. The main focus is to implement the appropriate messages that allow the implementation of the protocol automata, which realizes the behaviour of the EPS components.

Result: The Initial Context Setup Request message was implemented and the Initial Context Setup Request message was adopted in order that the protocol automata, which illustrates the general behavior of the function, can be implemented. The messages were tested in various ways, however, problems arose in the course of the implementation. All problems were documented and described in an analytical way. Following the testing, the protocol automata was implemented which realizes the behaviour of the EPS components. In order to verify the correctness of the programming, a simulation scenario was implemented. In this scenario the MME sent the Initial Context Setup Request message to the eNB. The eNB received the message and sent an Initial Context Setup Response message back to the MME. Additionally, the Downlink NAS transport and the Uplink NAS transport were partially implemented.