Software Defined Evolved Packet Core – OMNET++ Model

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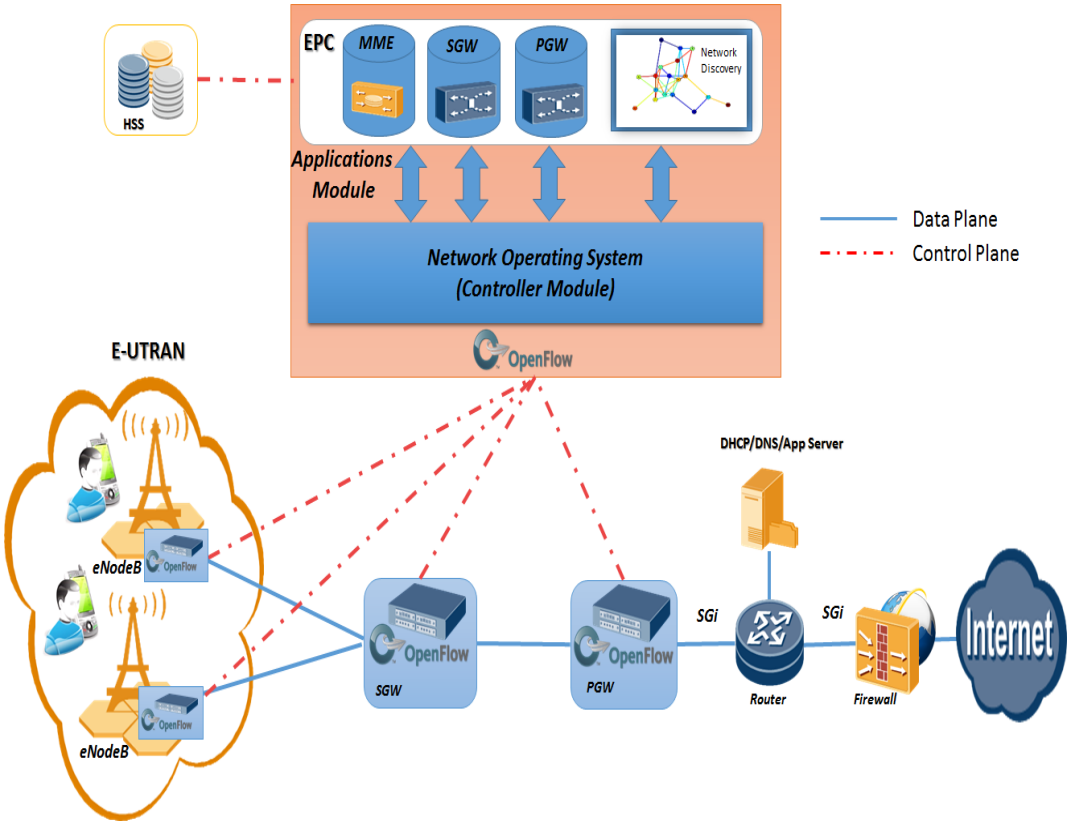
- SDEPC architecture consists of OpenFlow controller, OpenFlow based Forwarding Device, UEs, and enhanced eNodeBs that is capable of send/receive OpenFlow messages.
- The control functions of the EPC entities moved to run as applications on the centralized controller or on a standalone application that communicates with the OpenFlow controller using northbound protocol.
- The data forwarding functions are performed by the OpenFlow Forwarding Devices and the enhanced eNodeB.
- Eliminates the need for GTP tunnelling for UE traffic forwarding, and mobility management.
- Enables the writing of scalable and dynamic EPC applications to reduce overhead, increase bandwidth and improve the enforcement of QoS and firewall policies in data plane



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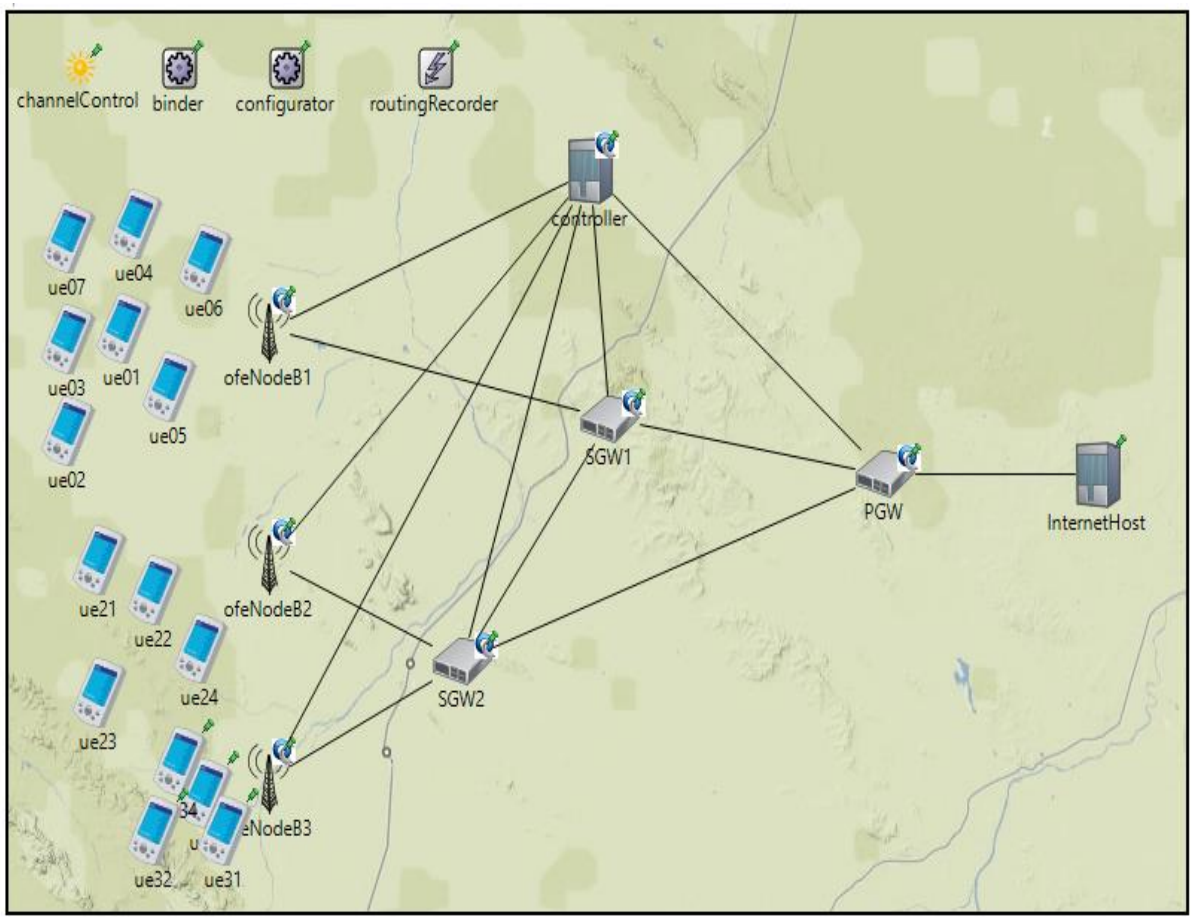
- SDEPC architecture is implemented on OMNeT++ and modelled by a combination of OpenFlow 1.3 and SimuLTE modules where the SGW and PGW are replaced by OpenFlow Forwarding devices, while the UE and eNodeB nodes are imported from the SimuLTE
- Currently SDEPC OMNeT++ module only supports the data plane.
- We are working on adapting the required control plane messages and compare its performance with the SimuLTE module



OMNET++ OPENFLOW – Switch and Controller Modules

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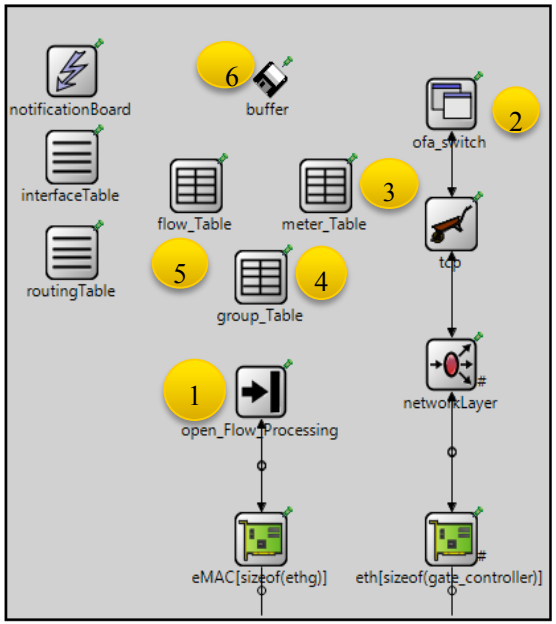
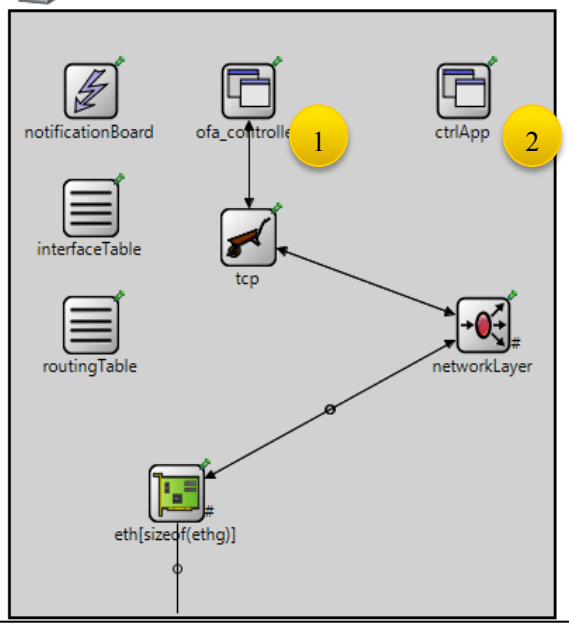
Open_Flow_Switch



Open_Flow_Controller



1	▪ OpenFlow 1.3 Packet processing pipeline
	  ▪ Packet lookup, execute instruction
	  ▪ Traffic metering
	  ▪ Group action execution
	▪ Notify ofa_switch module about unmatched packets

2	▪ Communication with controller ▪ Handling of unmatched packets ▪ Handling of Asynchronous messages
3	▪ Management of meter entries
4	▪ Management of group entries
5	▪ Management of flow entries
6	▪ Store messages during controller request

1	▪ Communication with OpenFlow switch ▪ Sending Packet-Out messages ▪ Sending Meter Modification messages ▪ Sending Flow Modification messages ▪ Sending Group Modification messages

2	▪ Placeholder module
	▪ Implemented behaviour
	  ▪ Network Discovery app
	  ▪ Packet Classifier
	  ▪ Firewall
	  ▪ EPC Base
	  ▪ EPC application

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- Future Work
  - Rerouting to avoid congestion
  - Handover due to mobility
  - Cashing near to access network as opposed to at the far end of the core due to tunnelling
- Seeking to join:
  - 5G NFV and SDN proposals
  - Heterogeneous Home Access Network proposals
  - Control Plane proposals (for designing scalability, app awareness and multi-tenancy, etc.)
  - Core Network resource sharing (Network Slicing) proposals Traffic monitoring for Security and Privacy proposals
  - 5G air-interface centric proposals

Preliminary Results!!

Blue Plot – End-to-end delay without SDN rerouting

Red Plot - End-to-end delay with SDN rerouting