

5G Policy Control Architecture - 2 days

CONTENTS

This course presents the 5G Policy Control as specified in the current (R16) 3GPP standards.

In order to provide the general context the course briefly introduces the overall roles of all the major 5G Network Functions (NFs), the three basic 5G use cases (eMBB, MIoT/mMTC and URLLC), as well as an overview of the fundamental 5G signaling procedures (5G Registration and PDU Session Establishment).

The course focuses on the 5G Policy Control Function (PCF), explaining the Policy Control model used to enforce both the subscription-specific Access and Mobility Management and the service-specific QoS, routing and charging handling rules. 3GPP definitions for User Plane resources are presented, as well as external AF traffic influencing.

PREREQUISITES

Technical knowledge of the EPS system is crucial – the 5G features are discussed in relation to existing 4G features and concepts. Both a general 5G System knowledge, and prior exposure to the 4G PCC environment with the PCRF would be highly beneficial. We strongly recommend APIS' one day 5G Core Network Architecture course to provide an overall orientation.

A brief 5G System introduction

- Introduction of the main 5G network elements: 5G-AN, AMF, SMF, UPF, UDR, UDM, AUSF, NEF, PCF, NSSF, NRF, SCP, SMSF, NWDF, CHF, SEPP
- NG-RAN with NR, WiFi and fixed accesses
- Service Based Architecture model for the 5G Core including the definitions of Network Functions, NF Services, Service Producers and Service Consumers
- The 5G Reference Point model for non-roaming and roaming scenarios (LBO and HR options)
- 5G protocol stacks
- Basic communication principles for the SBA
- UE identities in 5G: SUPI, SUCI, GPSI, PEI, 5G-GUTI

Overview of the 5G Network Slicing

- Definition of a Network Slice
- Main 5G use cases (eMBB, MIoT, URLLC) realized as separate Network Slices
- Vo5G as a service within the eMBB Network Slice
- Identifiers used for slice selection: NSI Id, S-NSSAI, NSSAI
- An overview of allocating an appropriate Network Slice to a particular UE/service

5G Policy Control overview: the role of the PCF

- Definition of the 4G PCC
- 5G requirements on Policy Control
- Comparison of the 4G and the 5G Policy Control
- Npcf services
- Various sources of information for the PCF: AF, NEF, UDR, SMF, AMF and the parameters defined in the standards for all these information streams
- The roles of the vPCF and the hPCF in roaming scenarios

5G Registration procedure

- Definition of types of Registration procedures: Initial, Mobility Update, Periodic Update
- Definition of a UE Registration Area
- Signaling flow with basic parameters for Access and Mobility enforcement, AF selection, Network Slice selection and creation of relevant UE contexts
- Negotiation of service-specific features and capabilities at Registration: MICO mode, LADN, UE Reachability, Mobility Patterns, Mobility restrictions
- Access and Mobility handling for a UE using AM Policy Associations between the PCF and the AMF

User Plane resources in 5G

- Definition of a PDU Session
- Signaling flow with basic parameters for AF selection, session QoS and routing enforcement and creation of relevant UE contexts
- Definitions of Service Data Flows, QoS Flows and their relationships to PDU Sessions, Data Radio Bearers and N3 Tunnels
- Definitions of QoS Rules, QoS Profiles, PCC Rules, SDF Templates
- PDU Session routing principles: PDU Sessions with Multiple PDU Session Anchors, UPF/PSA relocation, edge computing using ETSI MEC
- Various NFs receiving information and orders from the PCF: SMF, AMF, UPF, gNB, UE, and the parameters defined in the standards for all these information streams
- QoS parameters: 5QI, QoS Flow parameters
- PDU Session handling using SM Policy Associations between the PCF and the SMF
- Definitions of Packet Detection Rules, QoS Enforcement Rules, Forwarding Action Rules, Usage Reporting Rules, Session Reporting Rules
- SMF control of UPF over the N4 interface
- Session-related parameters provided to the gNB and the UE
- Protocol on N4: PFCP

AF Service Influencing

- Mechanisms for the external AFs to control access, QoS, routing and charging of application data over 5GS
- Routing principles for service-specific traffic steering
- Network Exposure Function (NEF) role in the interactions between 5GC and external NFs
- SMS-based Application Triggering of a UE

5G Charging overview: the role of the CHF

- Roles and definitions of the Network Functions used for charging in 5G: CHF, OCS, CDF, CTF, CGF, ABMF, RF
- Nchf services: Converged Charging, Offline Only Charging, Spending Limit Control
- An overview of charging-related messages, parameters and procedures