IEEE NETSOFT 2020

Tutorial - A softwarized perspective of the 5G networks - 5G Core (main)

Presenters: Kleber, Cristiano, Lucio, Ciro, and Victor

Computer Networks & Distributed Systems LABORAtory

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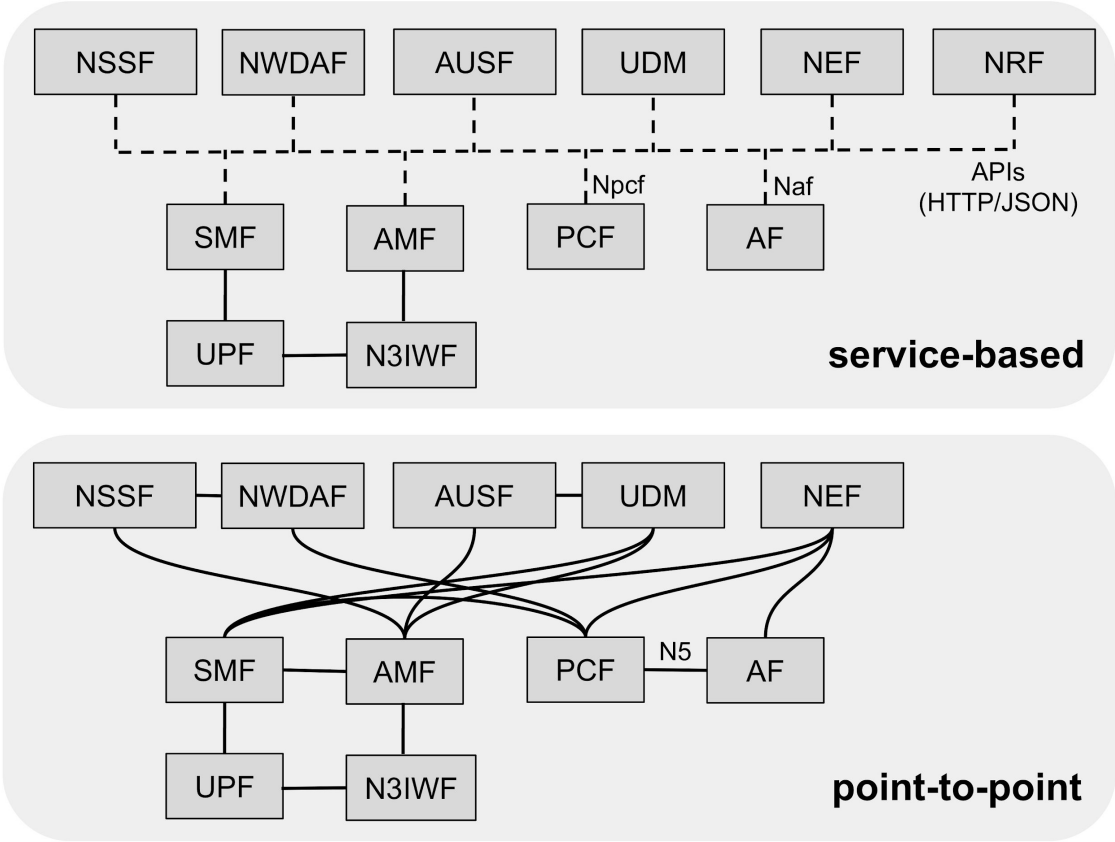
5GC Design

Requirements included:

- Service-based architecture (SBA)
- Cloud-native and web-scale technologies
- 3GPP and non-3GPP access networks
- Improved quality of service
- M2M communications services with low-latency
- Edge Computing
- Among others

Service-based vs. point-to-point

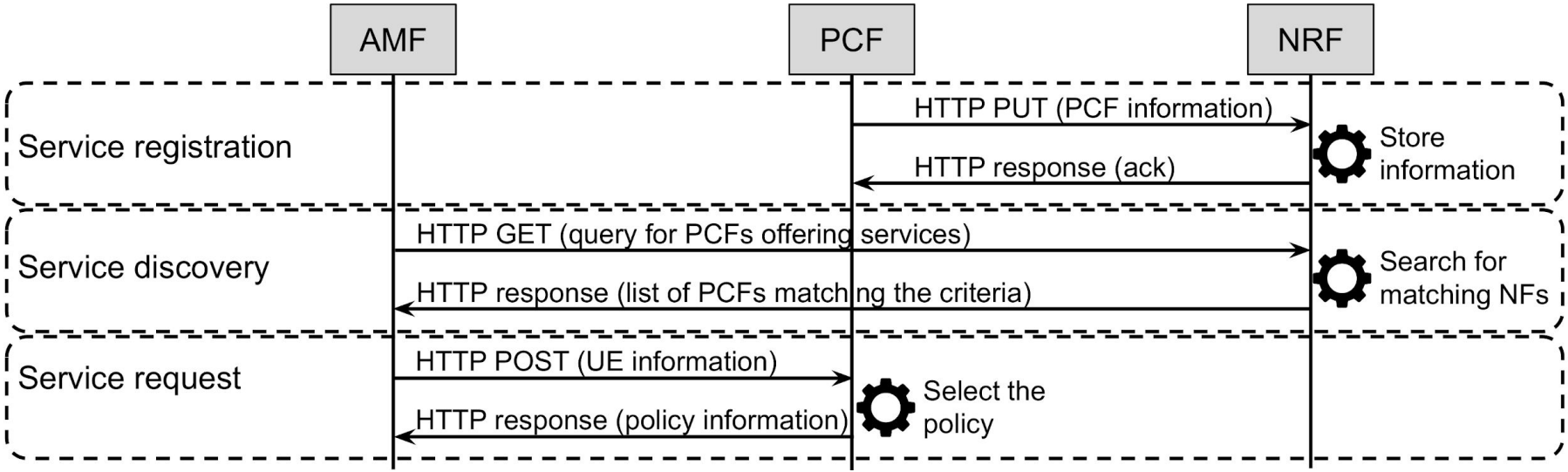


Service-based architecture - SBA

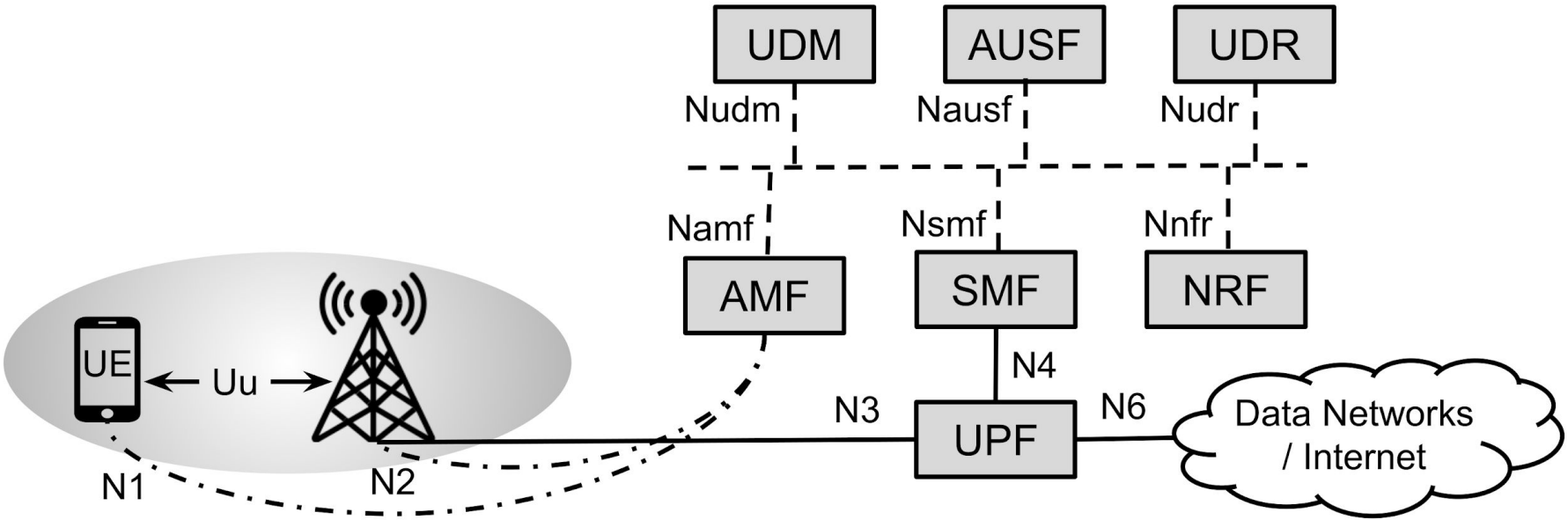
- Services
  - Service-Based Interface (SBI)
  - Control plane
- HTTP REST interfaces
  - HTTP REST paradigm
  - REST: a ‘standard’ for IT networking applications
  - Harmonization between IT and Telecom
  - Stateless: high scalable and distributed

Service-based architecture - SBA (2)

- Service registration, discovery, and access
  - Example: AMF looking for a PCF



Main 5GC components - the minimum core



Access and Mobility Management Function (AMF)

- Key component of an essential task: mobility support
- Involved in most of the signaling flows in a 5G network
- Mobility procedures:
  - Standard
  - Specific
  - Connection Management

Session Management Function (SMF)

- Responsible for managing the UE sessions
  - Indirect communication with UE through the AMF component
- Responsible for controlling the UPF component
  - A sort of SDN controller
- Also monitor and control charging

User Plane Function (UPF)

- Process and forward user data
  - a sort of SDN packet forwarding element
  - Several tasks: notification, packet inspection, packet filtering, QoS marking, traffic shaping, etc.
- Used as anchor in the mobility management

UDM and UDR

- Unified Data Management (UDM)
  - Similar to the HSS in 4G/EPC
  - Registration and authentication of UEs, user identification, application of access rules and authorization, etc.
  - Front-end for UDR
- Unified Data Repository (UDR)
  - Database

AUSF and NRF

- Authentication Server Function (AUSF)
  - Responsible for the authentication service of UEs
- Network Repository Function (NRF)
  - Repository of functions and associated services

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Tutorial - A softwarized perspective of the 5G networks - 5G Core (additional)

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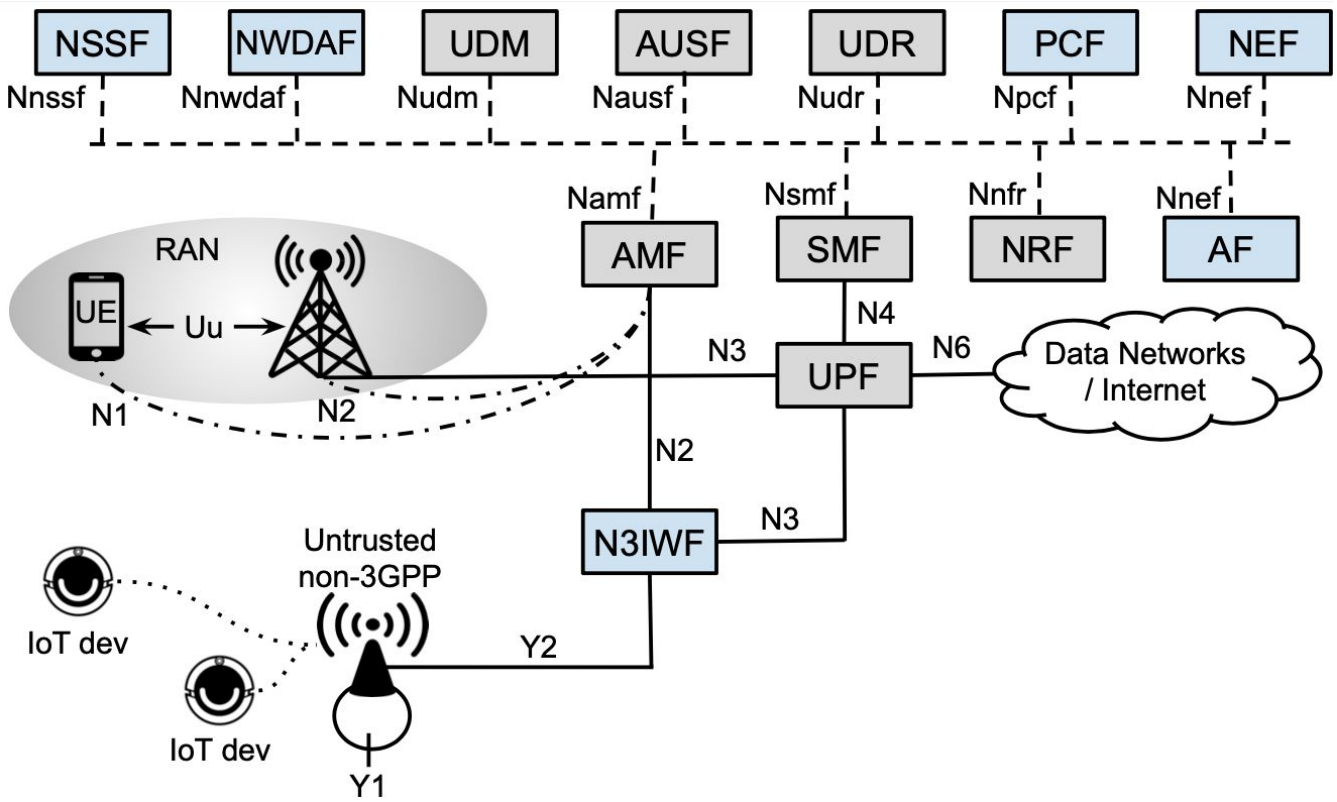
Additional 5GC components



Network Slice Selection Function (NSSF)

- The aim is to offer support for a wide range of services
- Responsible for managing the available network slice instances
- A slice can include RAN and core resources, end even to transport networks
- NSSF can be seen as an orchestrator that can influence how network traffic is routed
- Provide two services:
  - Selection
  - Availability

Network Exposure Function (NEF)

- Responsible for exposing some internal events related to UEs and SBA
- A NEF access interface opens news business opportunities for services providers
    - More advanced services to be offered by third parties

Network Data Analytics Function (NWDAF)

- Responsible for collecting several data from the network and its users
- Collect information about the operation of the system and record in UDR
- The analyzes on the data collected over time can be used as a historical and statistical resource to predict future values
- A detailed specification is expected for Release 16

Application Function (AF)

- It is a generic component that represent a possible application, internal or external
- An import factor that must be evaluated by the system operator is the confidence degree that an AF component can have to interact directly with specific functions

Policy Control Function (PCF)

- Responsible for controlling the behavior of the network, mainly for functionalities associated with the user mobility
  - Applying security policy
  - Control rules for resources and slicing
- Manage the Radio Frequency Selection Priority (RFSP)
- Interact with AF and SMF to provide metrics of QoS and data flow

Non-3GPP InterWorking Function (N3IWF)

- Integrate non-3GPP access with the 5G core
- Responsible for forwarding signaling and data between the 5G core and the non-3GPP access network
- All traffic from N3IWF is sent through secure channel, and it is isolated from all 3GPP traffic