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5G Security Aspects

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5G security aspects

5G Security aspects :

- Mutual authentication between UE and network.
- Security context generation & distribution.
- User plane data confidentiality and integrity protection.
- Control plane signalling confidentiality and integrity protection.
- User identity confidentiality.
- Support of L1 requirements.

Security model for non-3GPP access :

Signalling security

- When a UE is connected via NG-RAN and via stand-alone non - 3GPP accesses, the multiple N1 instances are secured using independent NAS security contexts

PDU session user plane security :

It indicates : whether UP integrity & confedentiality protection is ..

- Required for all the traffic on the PDU session UP integrity protection shall apply.
- Preferred for all the traffic on the PDU session UP integrity protection shall apply.
- Not required

Security aspects :

- The SMF determines at PDU session establishment of a user plane security enforcement information.
- User plane security policy from UDM takes precedence over locally configured user plane security policy.

Security aspects :

- The user plane security enforcement information is communicated from SMF to NG-RAN for enforcement as part of PDU session related information.

Support for dual Connectivity, multi-connectivity

Support for dual Connectivity

Dual-connectivity :

- It involves two radio network nodes in providing radio resources to a given UE.
- Master RAN node which may use resources of another RAN node, the secondary RAN node, to exchange user plane traffic of an UE.

Dual-connectivity :

Dual- connectivity provides the possibility for the master node RAN to request SMF :

- For some or all PDU sessions of an UE
- For some other PDU sessions of an UE

Additional characteristics :

- User location in

Charging

Charging :

- The 5GC charging supports collection & reporting of charging information for network resource usage.
- The SMF supports the interactions towards the charging system.

Usage data reporting for secondary RAT :

- The PLMN locally activates the secondary RAT usage data reporting by NG-RAN OAM. the activation can happen separately for data volume reporting of NR and E-UTRA.
- The NG-RAN reports UL and DL data volumes to the 5GC for the secondary RAN on a per QoS flow and per time arrival .

Secondary RAT periodic usage data reporting procedure ：

- When NG-RAN is configured with a “ time interval for secondary RAT usage data reporting “ , the NG-RAN shall send a RAN usage data report message for periodic purposes to the SMF only when the timer expires for a UE for which secondary RAT usage data reporting is on-going.

Support for Edge computing

Support for Edge Computing :

- It enables operator and 3rd party services to be hosted close to UE's access point of attachment , so as to achieve an efficient service delivery through the reduced end-to-end latency and load on the transport network.

Edge Computing supported by enablers :

- User plane (re) selection
- Local routing & traffic steering
- Session & service continuity
- Network capability exposure
- QoS and charging
- Support of local area data network

Network slicing

Network slicing :

- A network slice is defined within PLMN and shall include : the CN control plane and user plane network functions.
- In Serving PLMN, at least one of the following : NG RAN and N3IWF function to non-3GPP access.

Network slicing :

- Network slices may differ for supported features and network functions optimisations , in which case such network slice may have e.g different S-NSSAI's with different slice/service types.

Identification & selection of a network slice :

- An S-NSSAI identifies a network slice and it is composed of : SST and SD.
- Based on operator's operational or deployment needs, a network slice instance can be associated with one or more S-NSSAI's and an S-NSSAI can be associated with one or more network slice instances.

Standardized SST values

SST values :

- Standardized SST values provide a way for establishing global interoperability for slicing so that PLMN's can support the roaming use case more efficiently for the most commonly used service/slice types.

SST values :

- 1 - eMBB
- 2 - URLLC
- 3 - MIOT

Network slicing & interworking with EPS

Network slicing & interworking with EPS :

- A 5GS supports network slicing and might need to interwork with the EPS in its PLMN or in other PLMNs.
- In some deployments, the MME selection may be assisted by DCN-ID provided by the UE to the RAN.

Network slicing & interworking with EPS :

- During PDN connection establishment in the EPC, the UE allocates the PDU session ID and sends it to the PGW-C + SMF via PCO.

Idle mode aspects :

- When UE moves from 5GS to EPS, the UE context information sent by AMF to MME includes the UE usage type, which is retrieved from UDM by AMF as part of subscribed as part of subscription data.
- When UE moves from EPS to 5GS , the the UE includes the S-NSSAI,s associated PDN connection in the requested NSSAI in RRC connection establishment NAS.

Connected mode aspects :

- When a UE is CM-CONNECTED in 5GC and a handover to EPS occur, the AMF selects the target MME based on the source AMF Region ID , AMF set ID and target location information.
- When a UE is ECM-CONNECTED in EPC and performs a handover to 5GS, the MME selects the target AMF based on target AMF based on target location information.

Configuration of network slice availability in a PLMN

Configuration :

- A network slice may be available in the whole PLMN or in one or more tracking areas of the PLMN.
- The availability of a network slice refers to the support of the NSSAI in the involved NFs.

Configuration :

- The NSSF may be configured with operator policies specifying under what conditions the S-NSSAIs can be restricted per TA and per HPLMN of the UE.
- The per TA restricted S-NSSAIs may be provided to the AMFs of the AMF sets at setup of the network and whenever changed.

IMS support

IMS support :

5G Supports IMS with functionality :

- Indication toward the UE if IMS voice over PS session is suppored.
- Capability to transport the P-CSCF address(es) to UE.
- Paging policy differentiation for IMS
- IMS emergency service
- Domain selection for UE originating sessions.
- Terminating domain selection for IMS voice.
- Support of P-CSCF restoration proce

IMS voice over PS session :

- The serving PLMN AMF shall send an indication towards the UE during registration procedure over 3GPP access to indicate if an IMS voice over PS session is supported or not supported in 3GPP or non-3GPP access.

Cases :

- If the network is able to provide a successful IMS voice over PS session in the current registration area with a 5G QoS flow that supports voice.
- If the network is not able to provide a successful IMS voice over PS session over NR connected to 5GC , but is able for :

P-CSCF address delivery :

- At PDU session establishment procedure related to IMS, SMF shall support the capability to send the P-CSCF addresses to the UE.
- For home routed, this information is sent by the SMF in HPLMN.