3GPP security standards, application layer security and core network and RAN virtualization

Legend
- **Control plane**: Includes signaling protocols to control the functionality of the mobile network, such as mobility and authentication.
- **User plane**: Includes the protocols to carry user’s data (applications) over the mobile network to the applications domain.
- **Application layer**: Includes the protocols to carry application protocols over the mobile network from the device to the applications domain.
- **Device domain**: Includes the devices that use the mobile network to reach applications in the applications domain.
- **Access network domain**: Connects the devices to the core network domain.
- **Core network domain**: Divided into serving and home network domains. It includes services such as mobility and session management, authentication and charging.
- **Interconnect network domain**: Connects the core networks of different operators together, and as such enables roaming.
- **Network function in RAN or core network**: Only some of the network functions are shown.

Network function is in core network. Only some of the network functions are shown.
- **Protocol specified by 3GPP**: Protocol specified by 3GPP.
- **Protocol specified by IETF**: Protocol specified by IETF.

User to network security includes authentication of subscribers and protection of signaling and user data between the device and the network.

Network domain security includes protection of signaling and user data between the access network and core network, between network functions within core network domain, and between core networks over the interconnect network. (Network domain security within the home network is not shown.)

Application layer security includes the protection of application protocols between the device and the applications in the applications domain. Application layer is outside the scope of mobile network and interoperability is up to the applications to guarantee. Figure shows the example of HTTP over TLS (i.e. HTTPS).