5G and Autonomous Vehicles

Course Description

This short course is designed to introduce the main concepts behind 5G V2X technology. This will be considered on a high-level basis, with focus on the V2X architecture required, as well as key aspects such as authorization and provisioning, operation over both the PC5 and NR-Uu interfaces, and also the appropriate network procedures that will enable autonomous vehicles to communicate.

Prerequisites: Introduction to 5G, Introduction to V2X.
This course will contain the following sections:

1. **5G and Autonomous Vehicles**

**Topic areas covered include:**

- **Concepts and Drivers:**
  - Driving factors.
  - V2X Evolution.
  - Autonomous vehicle key concepts.
  - Use cases:
    - Vehicle platooning, co-operative operation and sensor sharing, remote driving and advanced driving.

- **High Level Architecture:**
  - High Level Architecture:
    - UE, V2X AS, PCF, AMF, UDM, UDR, NEF.
  - Local and Home Breakout.
  - Service Based Architecture APIs:
    - Npcf, Nudm, Nudr, Nnef.
  - Vehicle to vehicle and vehicle to network modes of operation.
  - Network slicing and V2X.
  - Multi-access Edge Computing support for V2X.

- **Initial Procedures:**
  - Authorization process and parameter provisioning.
  - 5G Registration procedure.

- **Autonomous Vehicle Inter-communication:**
  - QoS handling, parameters and characteristics.
  - Direct communication modes and procedures.

- **5G V2X Network Procedures:**
  - Service Request procedure.
  - N2 Handover and Xn Handover procedures.
  - Interworking between EPS V2X and 5GS V2X.

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