

# International Roaming Protocols & Procedures

## Overview

For an operator, seamless international roaming is a lucrative revenue stream as well as being an essential service that sets the mobile environment apart from other types of communications networks. However in recent times, there are two major changes underway in our mobile networks that have necessitated a rethink in how roaming and billing work. Firstly, the networks are all evolving towards IP based platforms, and secondly, users are accessing multiple services through their mobile device. Customers expect the same level of performance and quality in a roaming context as they get in their home environment, and also expect this to be delivered cost-effectively.

This program explains the role of the mobile device, SIM card and network user settings in ensuring that a customer has a continuance of service in both a national and international context. The participant will first learn how the mobile device connects and interacts with the network and the security features that are invoked in GSM, and then the changes as the system evolves through GPRS/EDGE to UMTS/HSPA. Following this is an explanation of the data storage features of an international network identifying the key components and what information is stored in each. The program describes the signalling architecture for both circuit and packet traffic and a review of the IP Multimedia System (IMS) and its service capability requirements for roaming.

## You Will Learn

- 3GSM network roaming architecture & operation
- How a mobile device attaches and selects a network
- Signalling procedures for roaming
- Signalling architecture of the radio network, circuit and packet core
- Network architecture to support roaming
- What is Policy & Charging Control (PCC)
- Practical examples of 3GSM signalling messages and call scenarios
- The importance of the IP Multimedia Subsystem (IMS)

## Who Can Benefit

Staff who require a detailed understanding of end to end roaming operation & analysis

## Prerequisite Knowledge:

It is assumed that the participants have a basic understanding of communications and cellular networks.

## Outline

### Introduction

- International roaming model for 3GSM
- Role of the GSM Association
- Standards/guidelines for roaming
- Charging and billing internationally
- 3GSM network evolution
- Overview of GSM/UMTS/HSPA network architecture
- Why is the Internet Protocol (IP) so important?
- UMTS bearer model and QoS classes

- Radio Resource Management (RRM) function
- Logical, transport and physical channels

### Circuit Core Signalling Protocols

- SS7 signalling architecture
- Q.931 framework & ISDN User Part (ISUP)
- Signalling Connection Control Part (SCCP)
- Transaction Capabilities Application Part (TCAP)
- Mobile Application Part (MAP)
- Mobility management procedures
- Operation of the HLR/VLR
- Circuit core evolution: IP transport
- Sigtran Protocol

### International Roaming Procedures

#### GSM/UMTS Network Selection Process

- General description of Idle mode
- Network search procedures
- PLMN selection process
- Role of the SIM/USIM & ISIM card in preferred network selection
- Automatic vs. Manual selection
- Out of coverage issues
- Periodic home & preferred network search
- Over the air SIM updates
- PLMN & cell selection/reselection
- Cell Reservations and Access Restrictions
- Role of the Gateway Location Register (GLR)

#### GSM Signalling Scenarios

- VPLMN location updating
- Location cancellation

- Registration, authentication & security process
- Mobile originated and mobile terminated call
- Mobile originated and mobile terminated SMS transfer
- Paging procedures

#### GPRS/EDGE Packet Signalling Scenarios

- Mobility & Session states
- Establishment of a packet switched connection
- Access point Name (APN)
- APN Resolution using DNS in HPLMN or VPLMN
- GPRS attach in a visited PLMN
- PDP context activation using HGGSN (through Gi)
- PDP context activation using VGGSN (through Gp)
- GPRS Attach and PDP Context Activation
- GPRS tunnelling protocol (GTP)
- Mobility Management
- End to end DNS resolution
- GRX connectivity & GPRS Roaming

#### UMTS/HSPA Signalling Scenarios

- UMTS Mobility & Session states
- VPLMN location updating
- Location cancellation
- Registration, authentication & security process
- Security scenarios for 2G/3G device with SIM/USIM
- Mobile originated and mobile terminated call
- Mobile originated and mobile terminated SMS transfer
- Paging procedures
- Mobility management
- HSDPA and roaming

#### **Roaming Evolution**

- Policy and Charging Control (PCC)
- CAMEL
- The IP Multimedia Subsystem (IMS) Protocols & Procedures
- Roaming in LTE

DURATION	3 days
MAX CLASS SIZE	12