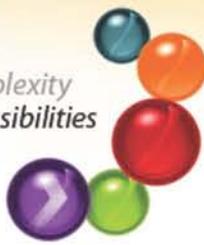




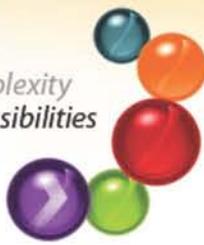
# **Presentation to the FCC**

Roaming Information

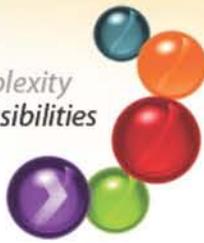


# GSM Process for New Services

- Development of new service
- Analyze impact on network and billing
- Implement required modifications to all process and procedures



# **GSM Association**

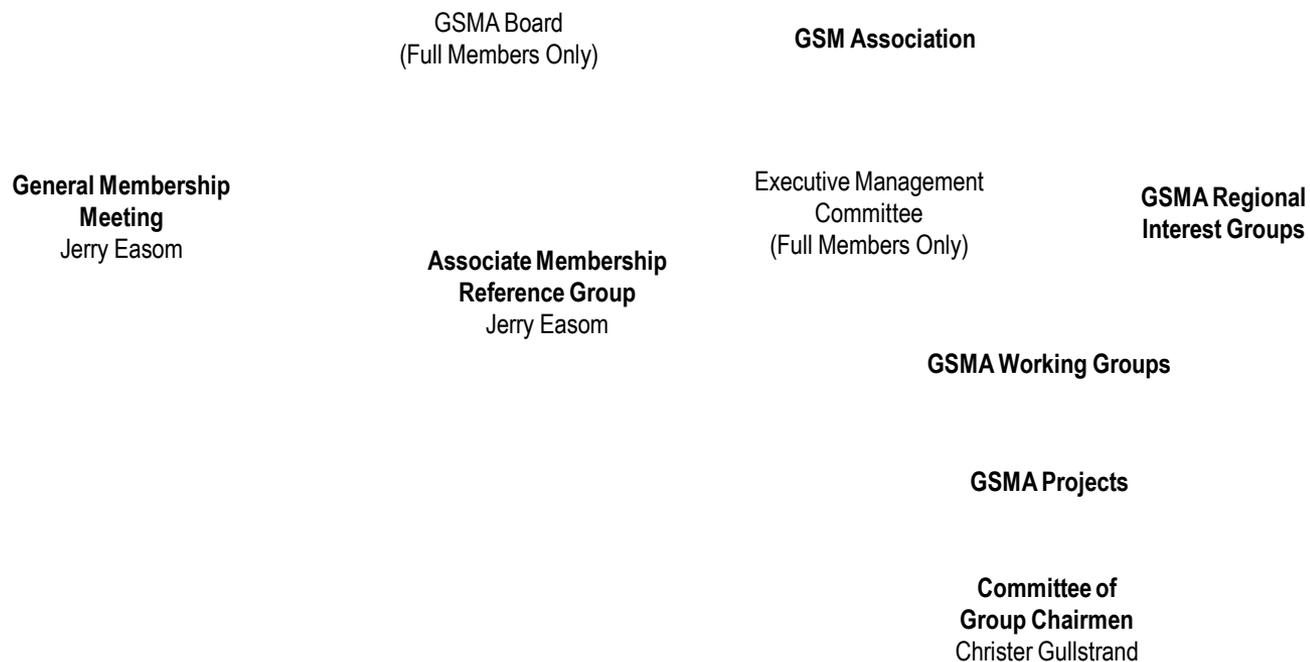
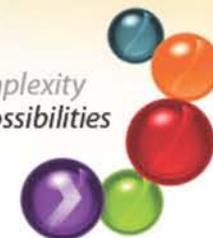


# About the GSMA

- The GSMA is the global trade association representing more than 740 GSM mobile operator Members across 219 countries and territories around the world.
- **In addition, over 219 Associate Members support the Association's Initiatives as key partners.**
- Structure of the GSMA is as follows:
  - GSMA Board – member are selected from the various organizations and serve two year term.
  - Strategy Committee – identifies strategic initiatives for the benefit of the entire mobile industry, consists of board members and is supported by GSMA Officers.
  - Executive Management Committee – **drives the GSMA's** operational activities in the areas of products, services and technology.
  - Working Groups – operator and supplier members oversee the practical aspects of running mobile services.

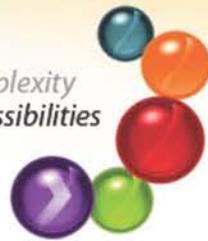
# GSMA Organization

Simplifying complexity  
Delivering possibilities



# GSM Working Groups

Simplifying complexity  
Delivering possibilities



## GSMA Working Groups

**BARG**  
Christer Gullstrand  
Kyle Spinks

**RING**  
Christer Gullstrand  
Brandee Nielsen

**RAEX TF**  
Christer Gullstrand  
Stéphan Bourges

**FCSIG**  
Andrea Seeger  
Christer Gullstrand

**AGREE**  
Pradeep Bhardwaj  
Christer Gullstrand

**CPWP**  
Haitham Mohamed  
Christer Gullstrand

**IWG**  
Pradeep Bhardwaj

**HPIG**  
Pradeep Bhardwaj

**IMQ**  
Pradeep Bhardwaj

**SOLU**  
Pradeep Bhardwaj

**RCSI**  
Pradeep Bhardwaj

**IREG**  
Pradeep Bhardwaj

**GRXWP**  
Pradeep Bhardwaj

**Roaming Hubbing**  
Pradeep Bhardwaj  
Jaime Evans

**PACKET**  
Pradeep Bhardwaj

**ENUM**  
Pradeep Bhardwaj  
John Wick

**RILTE**  
Pradeep Bhardwaj

**SIGNAL**  
Pradeep Bhardwaj  
Jaime Evans

**RAEX IR.21 Task Force**  
Jaime Evans

TRS

**Fraud Forum**  
Muhittin Salur

**Fraud Roaming**  
Christer Gullstrand

Fraud Intelligence

SFRA

SFRA

SFRA

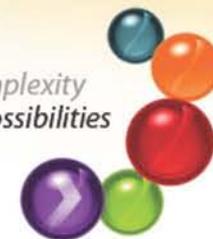
**TADIG**  
Christer Gullstrand  
Jens Beyreuther  
Stéphan Bourges  
Haitham Mohamed

**TDS**  
Jens Beyreuther  
Christer Gullstrand  
Haitham Mohamed

**AIR**  
Stéphan Bourges  
Christer Gullstrand

# GSMA Projects

Simplifying complexity  
Delivering possibilities



## GSMA Projects

2DB  
(Full Members  
Only)

**EMP**  
Martin Guilfoyle  
Christer Gullstrand

HDV

IPR (full  
Members  
only)

MMT

RCS

**VoLTE**  
Pradeep Bhardwaj  
Christer Gullstrand

**IPX PCI**  
Troy Albina  
Andrew Frederick  
Pradeep Bhardwaj

MPMNT

SMASIM

VIDSHA

ACCESS

GPM

IM/SD2

MAP

MTICK

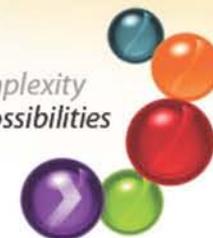
UCS

VS2

MBGP

# GSMA Regional Interest Groups

Simplifying complexity  
Delivering possibilities



## GSMA RIGs

### GSM NA

**GSM AW**  
Tamer Abou-Alam

**GSM LA**  
CALA Team

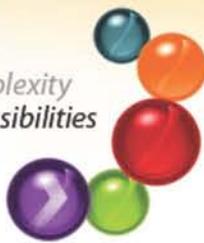
**GSM AP**  
Windy Zou

**NABARG**  
Kay Morrison  
Christer Gullstrand  
Leo Casey  
Paul Buckley  
Michelle Wilde

**APFF**  
Windy Zou

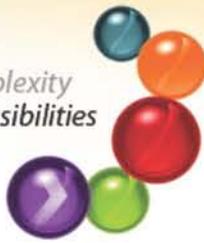
**OTS**  
Kay Morrison  
Dave Estes

**NAIREG**  
John Wick  
Nancy Dwyer

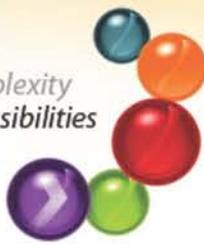


# GSMA Working Groups Defined

- AGREE** – Working group responsible for maintenance, changes, renewal and or creation of GSMA mobile to mobile agreement documents.
- BARG** – defines inter-operator charging guidelines for international roaming
- IREG** – defines inter-operator testing guidelines to verify service delivery for roaming
- TADIG** – defines inter-operator Transferred Account Procedure (TAP) verification guidelines for billing information transferred between networks
- TWG** – defines handset guidelines and conformance requirements for manufacturers



# **Roaming Implementation Process**

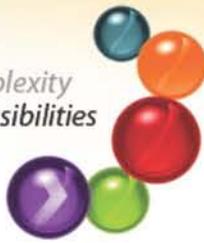


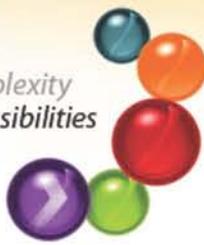
# **BA.40 Roaming Guide Review**

- Strategy for Roaming
- Setting up for Roaming Delivery
- Delivering Roaming
- GSM Association and Working Groups

# Roaming Implementation - Step by Step Process

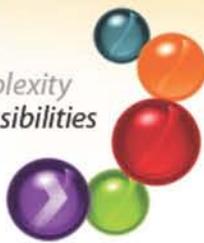
*Simplifying complexity  
Delivering possibilities*





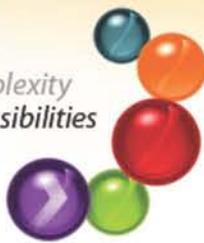
# Network Set Up

- All third party vendors need to be selected, services implemented and tested
  - Core Network (included GPRS, CAMEL, LTE if needed)
  - Billing System
  - SS7, GRX, IPX
  - Data Clearing House
  - Financial Clearing House
  - SMSIWG/MMSIWG
- GSMA Membership Acquired with associated number ranges
  - IMSI
  - PMN



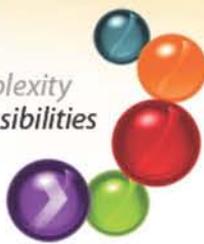
# Negotiations

- AA.12 – International Roaming Agreement
  - For use when wishing to create a bilateral roaming agreement
  - This document covers the legality of the agreement
- AA.13 – IRA - Common Annexes
  - Description of the agreement management principles
  - How you will do business with your roaming partner
- AA.14 – IRA - Individual Annexes
  - Operator specific information



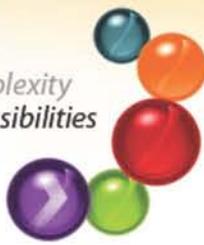
## GSM PRD - AA.12

- Implementation of the Network and Services
- Management of Modifications
- Charging, Billing and Accounting
- Customer Care
- Confidentiality
- Data Privacy
- Fraud Prevention
- Liability
- Duration
- Termination
- Suspension of Services
- Changes to the Agreement, Amendments
- Miscellaneous
- Choice of Law
- Dispute Resolution



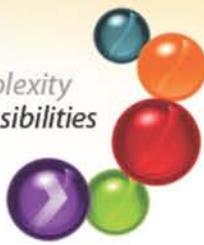
## **PRD - AA.13**

- Management Principles
- Services
- Billing and Accounting
- Information on TAP
- Settlement Procedure
- Customer Care Principles
- Technical Aspects
- Testing
- Security
- Information on Signaling Interconnection
- Data Privacy
- Fraud Prevention Procedures



## **PRD AA.14**

- Agreement Management Principles
- Services
- Billing and Accounting
- Customer Care
- Technical Aspects
- Data Privacy
- Fraud Prevention Procedures
- Billing Annexes
- BID Annexes

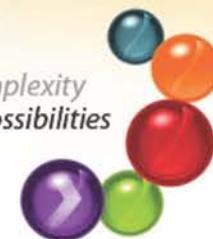


# Test Preparation

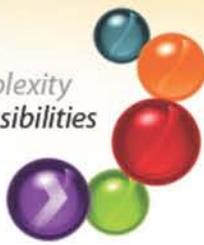
- Exchange SIM cards
- Distribute documentation
  - IR.21
  - AA.14
  - Billing & Transfer document
- Notify appropriate parties required for test preparation
- Schedule required tests
  - Voice, SMS, GPRS, LTE

# IREG Testing

*Simplifying complexity  
Delivering possibilities*



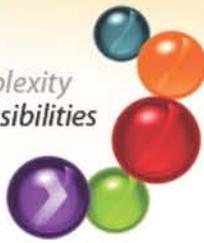
- Roaming engineering team completes required tests
  - IR.24: Voice
  - IR.35: GPRS
  - IR.32/IR.60: CAMEL
- Resolve any issues causing test failures
- Exchange completed documentation with Roaming Partner and Billing department



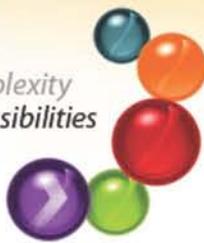
# TADIG Testing

- Pulls required CDR's for associated IREG tests
- Checks IREG documentation for accuracy
- Validates rates for each type of call
- Resolve any issues causing test failures
- Tasks should be performed for both incollect and outcollect TAP files
- Issue TAP Testing Certificate when all tests pass

# Launch

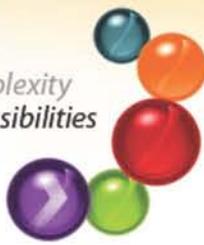


- Agree with Roaming Partner on launch date
- Notify all Parties of intention to launch
- Prepare and sign Commercial Launch Letter

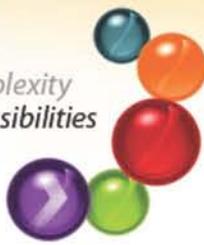


# Maintenance

- All departments manage day to day operations of roaming
  - Queries from subscribers
  - Queries from roaming partners
  - Fraud prevention
  - Financial Settlement
  - Data Clearing
  - Roaming Trouble Resolution



# **GSM Services**

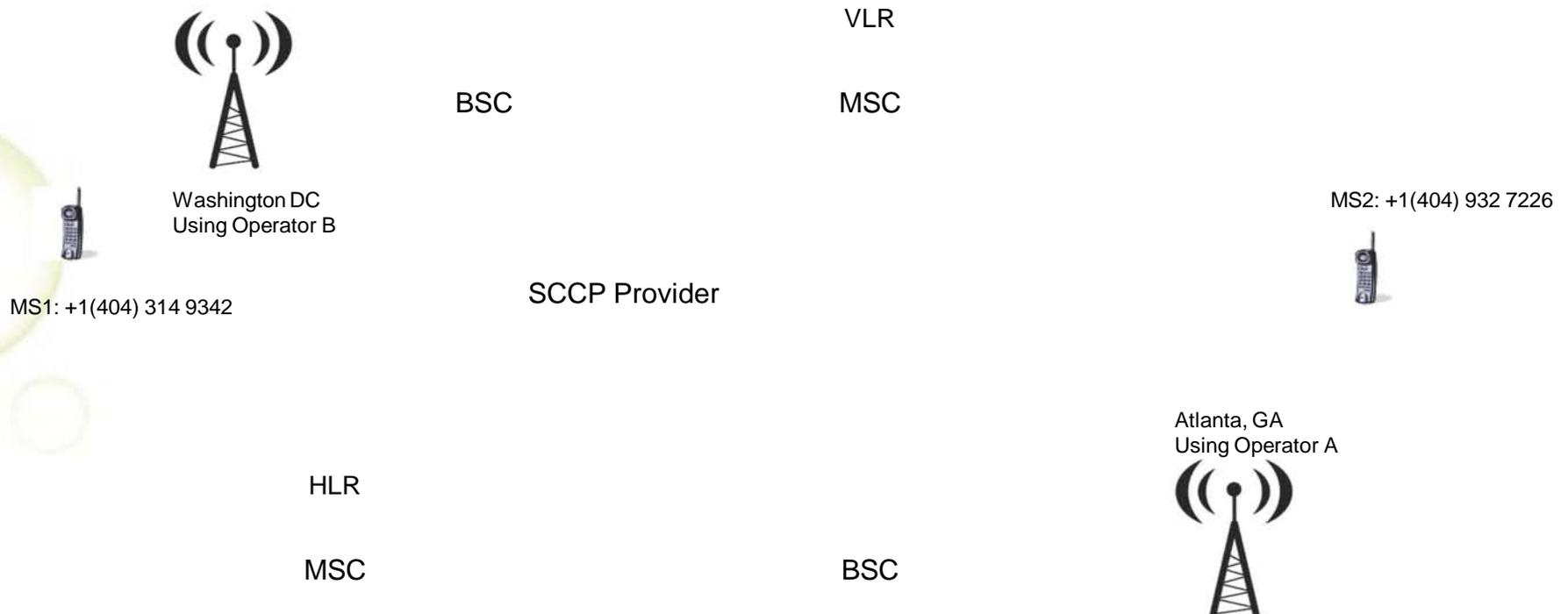
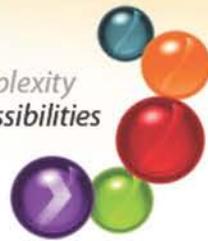


# Services Available for Roaming

- All available services are listed in the AA.14, section I. 2.1
  - Main services covered are Voice, SMS, GRPS, WAP, MMS, CAMEL
  - Many value added services available such as Caller ID, Call waiting, barring

# Voice Service

Simplifying complexity  
Delivering possibilities

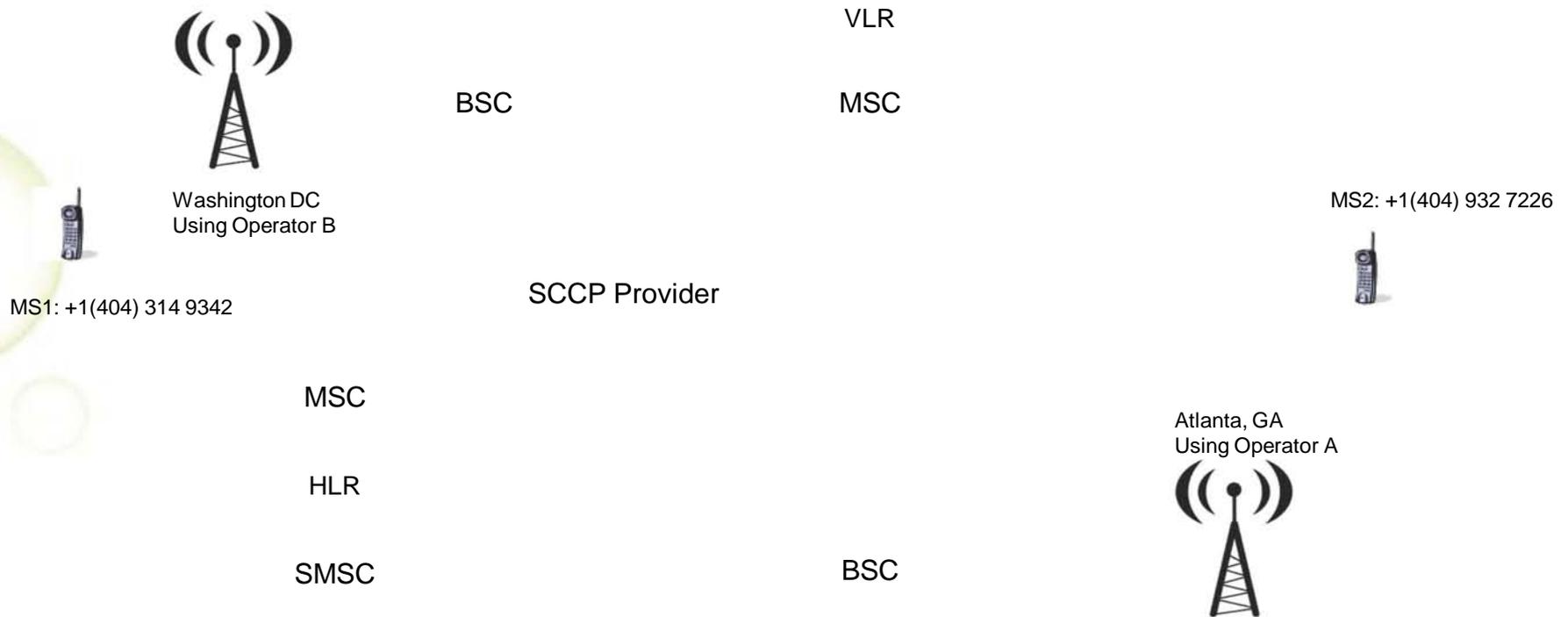


Voice Call  
Messaging

MS1 is roaming on Operator B. MS2 is at home using Operator A.  
MS1 calls MS2 and MS2 answers the call.

# Short Message Service

Simplifying complexity  
Delivering possibilities

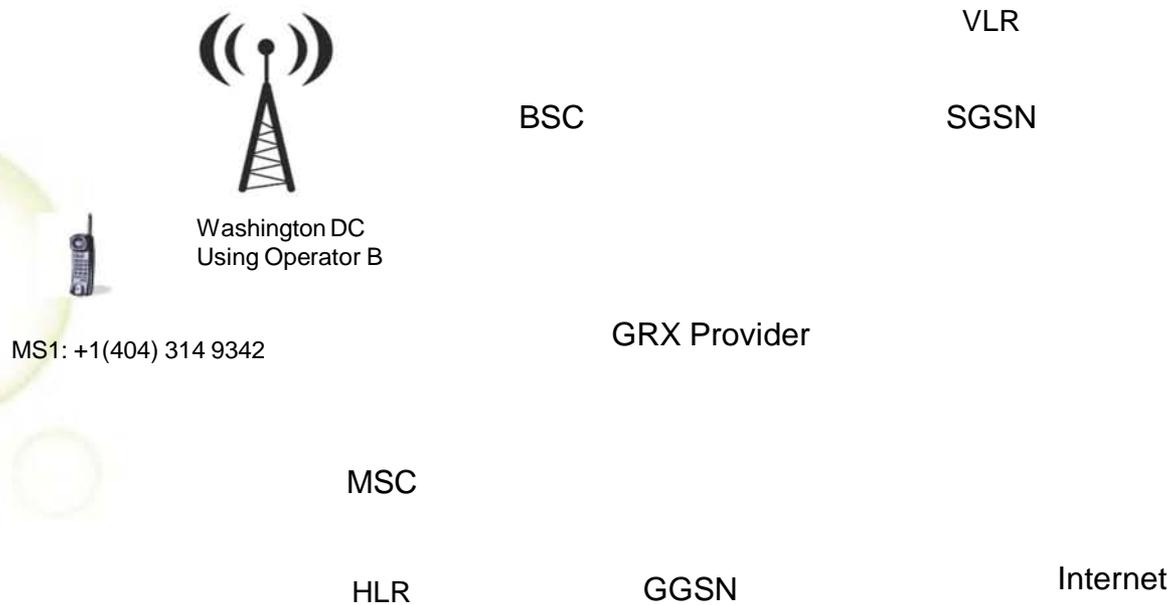
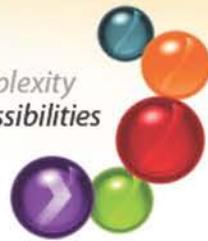


Voice Call  
Messaging

MS1 is roaming on Operator B. MS2 is at home using Operator A.  
MS1 sends MS2 a text message.

# GPRS Service (2.5G Data)

Simplifying complexity  
Delivering possibilities

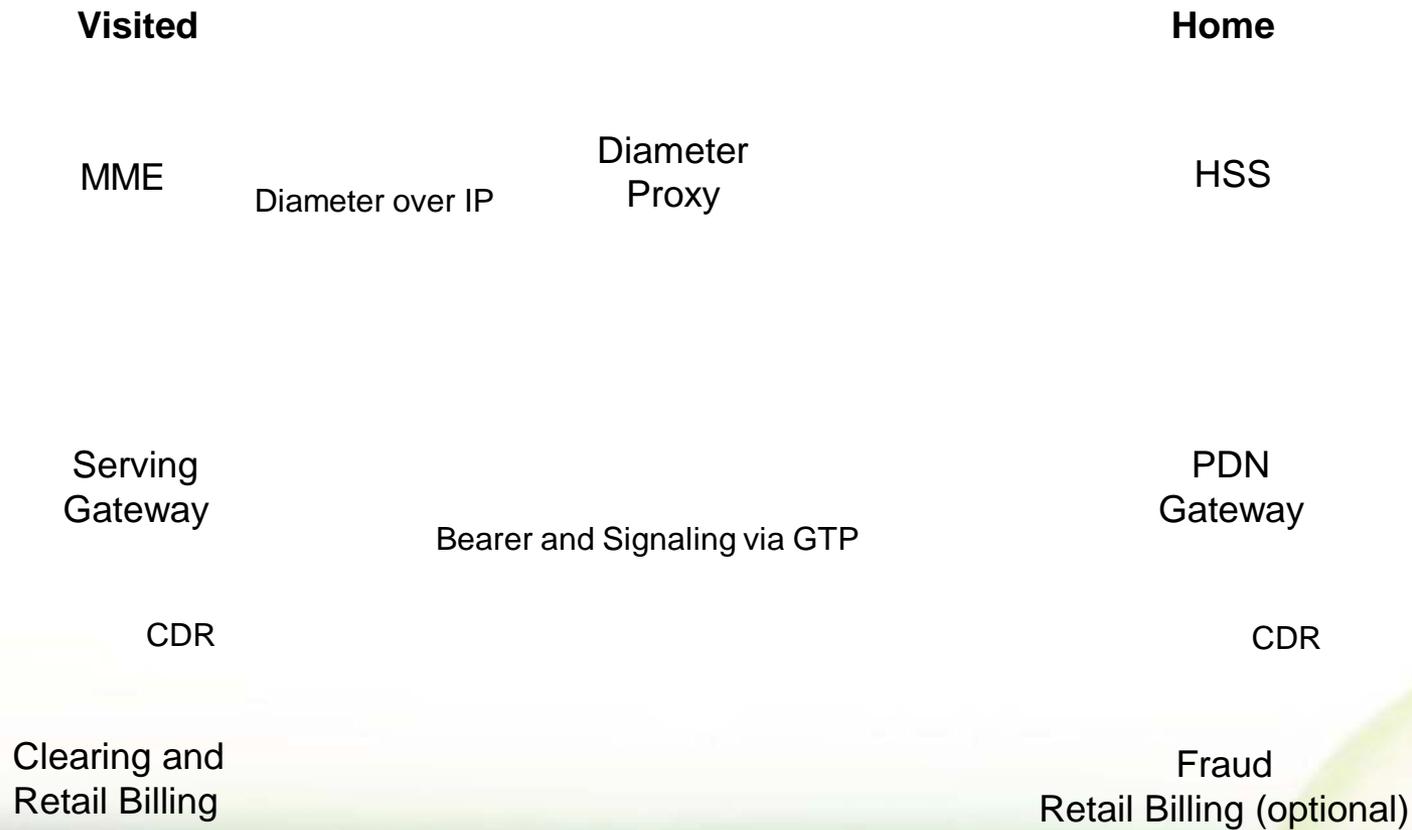
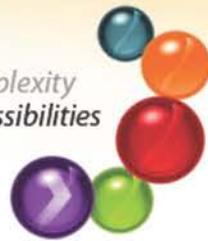


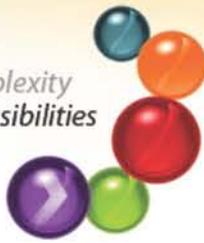
Voice Call  
Messaging

MS1 is roaming on Operator B. MS1 wants to check his flight home on the Delta web page and initiates a data session.

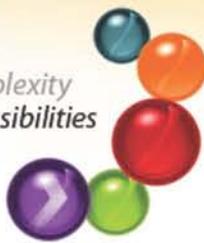
# LTE Data (Roaming)

Simplifying complexity  
Delivering possibilities



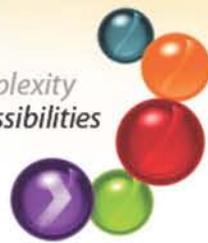


# **Services – Charging Principles**



# IOT and Charging Principles

- Charging Principles are developed by BARG CPWP and specified in BA.27
  - General rules and guidelines that must be followed by all GSMA Members
  - How each service can be charged
  - IOT rules
  - Section 1.3.3 defines which TAP call events are mandatory
- Crucial that the TAP matches exactly what has been specified in the AA.14
  - In particular Annex I.3.1 (IOT)



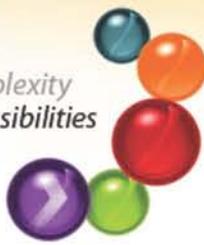
# BA.27: 1.3.3 – Default Transfer

Section of BA.27	Service	Default transfer method for non-zero rated records	Default transfer method for zero-rated records
2	MOC	File	File
3	MTC <sup>1</sup>	File	File
4	Calls with supplementary services <sup>2</sup>	File	File
5	USSD	File	No exchange
6	Optimal Routing	File	File
7	CAMEL	File	File
8	SIM Toolkit Applications	File	File
9	Different speech codecs	No exchange	No exchange
10	Signalling	No exchange	No exchange
11	Data services <sup>3</sup>	File	File
12	Value added services	File	File
13	UMTS	File	File
14	LCS	File	File
15	Interworking Service	Bulk	No exchange
16.3.1	SMS MO	File	File
16.3.2	SMS MT	File	No exchange <sup>4</sup>

**Copyright 2008, GSM Association** 1: MTC is mandatory to exchange 2: Most SS are not chargeable

3: Covers also applications implemented on top of the bearer (CSD, GPRS)

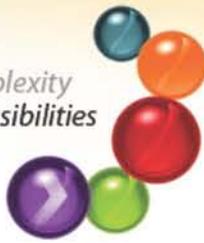
4: Mandatory if requested by the HPMN in its AA.14



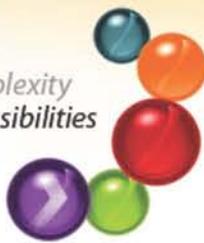
# Time Bands

- All charging can be based on specific time bands like peak, off-peak, public holidays
- These time bands are unique per Visited Network (VPMN) and must be specified in the AA.14, Annex I.3.1
- There could be different time bands for different services, for example:
  - SMS-MO: always the same rate per message
  - Voice: different peak and off-peak rates

# Taxes

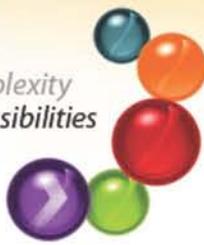


- All taxes need to be clearly specified in the AA.14, Annex I.3.1, and how they are applied for each service
- If the exact definition of a tax is not possible, then a range must be specified



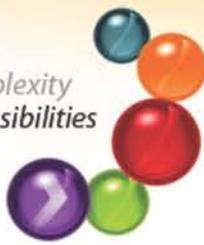
# Charging Intervals

- All duration and volume-based tariffs could be divided into charging intervals
- Duration-based charging example:
  - First minute: x.xx cents/min rounded up to 1 min
  - 1-10 minutes: x.x7 cents/min charged per second
  - 10+ minutes: x.x5 cents/min charged per second
- Volume-based charging example (not realistic):
  - 0-15 kB: x.xx cents fixed
  - 15-100 kB: x.x5 USD per MB, rounded up to nearest kB
  - 100+ kB: x.x2 USD per MB, rounded up to nearest 100kB
- Rounding needs to be clearly defined in the AA.14, Annex I.3.1



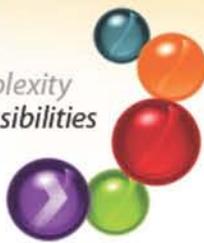
# Location-Based Charging

- Charging can also be based on the location of the subscriber
  - For example border areas
- In these cases there must be a Serving BID and/or Serving Location Description specified both in the AA.14, Annex I.3.1 and in the TAP
  - There can be one default rate, and all others need to have a Serving Location Description



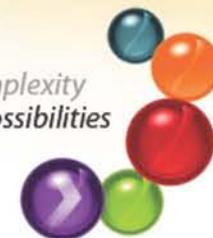
# Mobile-Originated Calls

- The VPMN can charge the Home Network (HPMN) for roaming subscribers originating calls
  - Based on destination of call
  - Charge for duration and possibly a fixed charge
- TAP: MOC
- Call Type Levels must be specified in both AA.14, Annex I.3.1 and TAP and they must match!



# MOC – Call Type Levels

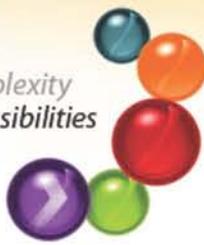
- CTL1 identifies national/international
  - 1: National
  - 2: International
  
- CTL2 identifies the destination into categories
  - 0: Unknown
  - 1: Mobile (wireless)
  - 2: PSTN (fixed, wireline)
  - 3: Non Geographic
  - 4: Premium Rate
  - 5: Satellite Destination
  
- CTL3 further breaks down the destination into countries and/or national areas as chosen by the VPMN



## Example – MOCs

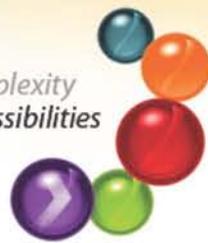
All charges in USD, and are listed per minute. Initial charging interval 60 seconds. Initial charging interval rounded up to the nearest minute. Countries listed with E.164 country codes.

	CTL1	CTL2	CTL3	0-60 seconds Peak	0-60 seconds Off-peak	1+ minute Peak	1+ minute Off-peak
National							
to Mobile	<b>1</b>	<b>1</b>	<b>0</b>	x.xx	x.xx	x.xx	x.xx
to PSTN	<b>1</b>	<b>2</b>	<b>0</b>	x.xx	x.xx	x.xx	x.xx
to Directory Assistance	<b>1</b>	<b>3</b>	<b>0</b>	x.xx per call	x.xx per call	-	-
International							
Band 1 Canada, Mexico	<b>2</b>	<b>0</b>	<b>1</b>	x.xx	x.xx	x.xx	x.xx
Band 2 Europe (list of countries)	<b>2</b>	<b>0</b>	<b>2</b>	x.xx	x.xx	x.xx	x.xx
Band 3 Satellite destinations	<b>2</b>	<b>0</b>	<b>3</b>	x.xx	x.xx	x.xx	x.xx
Band 4 Rest of world	<b>2</b>	<b>0</b>	<b>4</b>	x.xx	x.xx	x.xx	x.xx



# Mobile-Terminated Calls

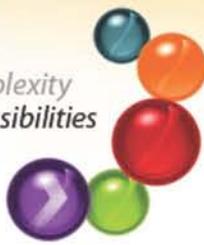
- The VPMN can charge the HPMN for roaming subscribers receiving calls
  - Calling Party Pays recommended, however not mandatory
  - Charge for duration and possibly a fixed charge
- TAP: MTC must always be transferred even if the VPMN does not charge for incoming calls
- AA.14, Annex I.3.1 needs to clearly state whether incoming calls are charged or not



# SMS Roaming

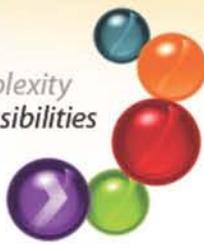
- The VPMN can charge the HPMN for SMS messages sent and received by the roaming subscriber
  - SMS-MO (and SMS-MT, **although most don't charge**) can be charged an event charge, and possibly based on the SMSC used
- TAP: MOC and MTC
  - Sending of SMS-MO is mandatory
  - Sending of SMS-MT is mandatory if requested by the HPMN, otherwise optional
- AA.14:
  - Call Type Level 1 specifies if a national or international SMSC has been used
  - Note: At least both national and international needs to be specified, even if the charge is the same
  - Call Type Level 3 is used to specify distinct charging per SMSC

	CTL1	CTL2	CTL3	Flat rate
National	<b>1</b>	<b>0</b>	<b>1</b>	x.xx
International	<b>2</b>	<b>0</b>	<b>1</b>	x.xx



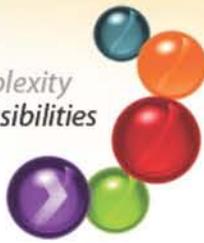
# MMS Roaming

- The VPMN cannot distinguish MMS from other WAP services used by roamers, and can therefore charge only for the bearer (normally GPRS)
- There are non-standard solutions like distinct APNs that could be used to identify MMS, and the AA.14 must then specify a distinct Call Type Level 3 for those APNs



# Messaging Interworking

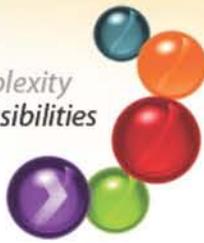
- SMS and MMS Interworking are charged by measuring and a bulk monthly invoice
  - Interoperator charging where the subscriber is not identified
- TAP is not used
- Details in the AA.19, AA.40, AA.60 agreements, and not in the AA.14



# Supplementary Services

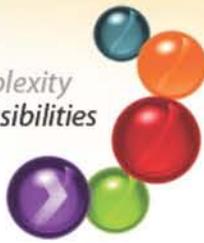
- The VPMN can charge the HPMN for roaming subscribers using Supplementary Services
- TAP: Supplementary Service Event or inline within MOC
- Invocation of Call Forwarding must be transferred in TAP, but is not chargeable
- Only the following SS are chargeable (on a per event basis):
  - Activation of CCBS (Call Completion to Busy Subscribers)
  - Invocation of UUS (User to User Signalling)
  - Activation/Deactivation of Call Barring

# USSD

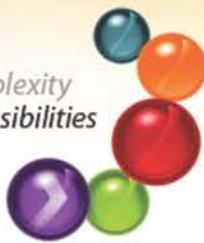


- The VPMN can charge the HPMN for the network resources involved in a roaming subscriber sending/receiving USSD messages
  - Only USSD events where the underlying service has been provided by the HPMN can be charged for
  - Each USSD event must be charged the same rate
  - The underlying service can NOT be charged for
  - Charging for complete USSD sessions is not feasible
- TAP: Supplementary Service Event
  - Zero-priced records NOT sent
- AA.14, Annex I.3.1 must clearly state if USSD is charged for

# CAMEL

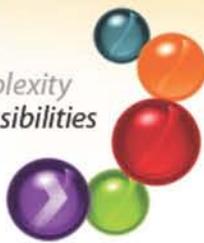


- The VPMN can charge the HPMN for extra switch processing for CAMEL subscribers
  - CAMEL Invocation Fee (CIF), event charge based on CAMEL Service Level (CSL)
  - CAMEL tones and announcements on duration
  - Signalling for further study
- The call is charged just like without CAMEL
  - However based on the actual routed destination (CAMEL Destination Number) rather than what the subscriber entered
- TAP: MOC, MTC or GPRS Call with CAMEL Service Used
- AA.14, Annex I.3.1 must specify the CIF (if any) per CSL



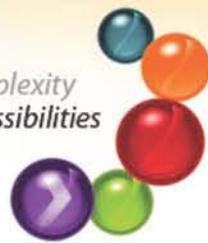
# GPRS/3G PS

- The VPMN can charge the HPMN for GPRS sessions activated by roaming subscribers, based on QoS and APN used
  - Charge for incoming and outgoing volume, duration, or fixed charges per session or day
- TAP: GPRS Call
- Partial GPRS TAP records need to be produced at least once or maximum twice per 24-hour period
  - Network partials are typically produced more regularly, and must therefore be aggregated when creating the TAP partials
- AA.14, Annex I.3.1 must specify Call Type Levels



# GPRS – Call Type Levels

- CTL1 identifies type of access
  - 10: HGGSN access
  - 11: VGGSN access
  - 12: Other GGSN access
  
- CTL2 identifies QoS
  - 0: Unknown
  - 10: Broadband
  - 11: Narrowband
  - 12: Conversational
  - 13: Streaming
  - 14: Interactive
  - 15: Background
  
- CTL3 identifies the APN
  - If charges differentiated by APN, otherwise default
  - Chosen by the VPMN

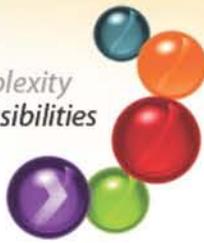


# Example – GPRS/3G PS

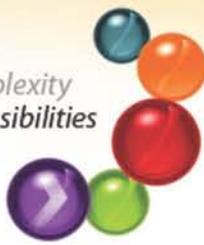
All charges in USD, and are listed per MB. Initial charging interval rounded up to 30kB, subsequent charging intervals rounded up to nearest kB. 1 partial produced per session per 24 hours. Each partial rounded individually. GGSN access via the HPMN.

	CTL 1	CTL 2	CTL 3	0-30kB Peak	0-30kB Off-peak	30-100kB Peak	30-100kB Off-peak	100kB+ Peak	100kB+ Off-peak
GPRS									
APN: blackberry.net	<b>10</b>	<b>11</b>	<b>1</b>	x.xx	x.xx	x.xx	x.xx	x.xx	x.xx
All other APNs	<b>10</b>	<b>11</b>	<b>2</b>	x.xx	x.xx	x.xx	x.xx	x.xx	x.xx
3G PS									
APN: blackberry.net	<b>10</b>	<b>10</b>	<b>1</b>	x.xx	x.xx	x.xx	x.xx	x.xx	x.xx
All other APNs	<b>10</b>	<b>10</b>	<b>2</b>	x.xx	x.xx	x.xx	x.xx	x.xx	x.xx

# UMTS

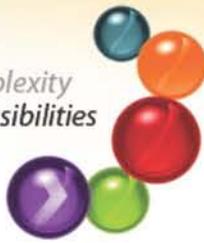


- Charging for UMTS is not fundamentally different from charging for 2G/2.5G GSM/GPRS
- You can ONLY charge extra if a higher QoS delivered to and requested by the subscriber
- In TAP, UMTS CS can not be distinguished from GSM CS (except for Video Telephony)
- Call Type Level 2 specifies (in AA.14 and TAP) different classes of QoS that can be used if UMTS PS is charged differently from GPRS
- Note: Because of Inter-PMN handover, GPRS partial records could potentially be received from different VPMNs for the same UMTS PS session

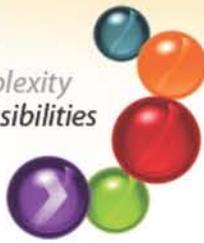


# LTE (Data)

- The VPMN can charge the HPMN for GPRS sessions activated by roaming subscribers, based on QoS and Volumenused
  - Charge for incoming and outgoing volume, duration, or fixed charges per session or day
- TAP: still being defined
- AA.14, Annex I.3.1 must specify Call Type Levels



# **Syniverse GAIN**

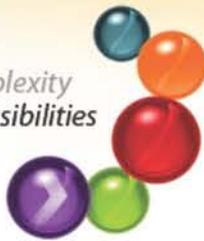


# Syniverse GAIN Overview

- Provides outsourced roaming department functions for wireless operators
- **Offers easy access to Syniverse's roaming expertise**
- Delivers skills, experience and industry contacts
- Helps operators define their roaming strategies
- Delivers an end-to-end roaming solution, or provides tailored options, such as:
  - Components of end-to-end roaming management
  - On-the-job training
  - Customized training courses
- Supports the negotiation, setup and maintenance of roaming agreements

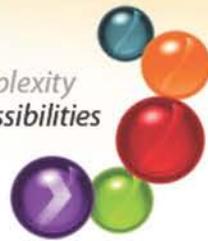
# Product Summary - Benefits

Simplifying complexity  
Delivering possibilities



- ➔ Tailored to operator needs
  - Courses trained by recognized roaming experts
  - Involved in GSMA and CDG initiatives to ensure that we train on the most current standards
  
- ➔ Assistance available on demand
- ➔ Provided by recognized roaming experts
  
- ➔ Customized to operator needs
- ➔ Rapid results through Syniverse know-how and contacts
- ➔ Economies of scale
- ➔ Protected Investment

Outsourcing



## Why Syniverse?

- Critical business intelligence tools to **optimize roaming revenue** and **enhance subscriber quality of experience**
- **Future proof**: support for IPX, roadmap to 4G
- **Simplified operations** for existing customers
- **Market longevity** and financial stability with \$1B market cap
- **Global presence** with over 800 people in the Americas, 200 people in EMEA and 200 people in Asia Pacific *The only complete single provider solution*