



Inbound Roaming

Provide best service to visitors in your network!

Today, subscribers expect all frequently used mobile services to work reliably everywhere in the world. Thus, the quality and availability of services inside and outside the home network becomes increasingly important in the battle for customers!

Inbound roaming has a big impact on your revenue and a long list of international roaming agreements may be desirable. It comes at a cost: each and every roaming agreement with a new roaming partner requires intense testing according to GSMA standards. In addition, periodic roaming tests with the most important roaming partners need to be performed. How can efforts be reduced?

Testing according to GSMA IREG standards is required whenever a new roaming partner is added. It can be a very time-consuming and exhaustive task. It may absorb your most expert staff and repetitive testing can be just as expensive as the initial test setup – if performed manually!

Therefore, test automation is key for cost effectiveness and operational efficiency. With the SITE system your staff will perform IREG specific tests in much shorter times with less effort – and the results will be easily reproducible!

Implementation of testing for new roaming partners could not be easier: the SIM card is implemented into SITE's SIM Multiplexer which can be expanded to a capacity of more than 2,000 SIM cards.

As soon as the SIM card has been implemented, staff can run the necessary tests.



Ready-to-use test cases are available for the execution of tests, according to IR 24, 26, 27, 29, 32, 35, 50, 60. These tests can be repeated at any given time!

The test results are automatically processed into GSMA conformant reports ready for evaluation.



Get the full picture of your roaming services

Features for inbound roaming testing:

- SITE offers the right concept for inbound roaming testing:
 - Core network test interfaces (A, Gb, I_UCS, I_UPS) for testing roaming, independently of radio specific problems
 - Air interface testing for measuring real end-to-end behavior and experience
- SIM Multiplexer: SIM cards can be managed centrally and securely for all roaming partners (as many as 2,000 SIM cards)
- Detailed KPI test reports according to GSMA standards
- Test sets according to IREG 24, 26, 27, 29, 32, 35, 50, 60 from GSM MoU



Roaming Hubbing Testing

Connecting the world with a single roaming relationship

- Roaming hubs safeguard multi-lateral roaming and interworking relationships.
- How can a roaming hub concentrate on managing the key roaming priorities?

Open Connectivity (OC) is replacing multiple bilateral roaming relationships between operators with a more efficient hub-based approach. Open Connectivity enables multi-lateral roaming and interworking relationships via SMS hubbing and roaming hubbing.

Keynote SIGOS' world-wide, on-demand test platform caters for roaming hubs. It enables them to perform tests of Outbound Roaming services, IREG testing for Inbound Roaming, and QoS Monitoring, as well as GRQ testing.

It improves operational and cost efficiencies because of the automated test

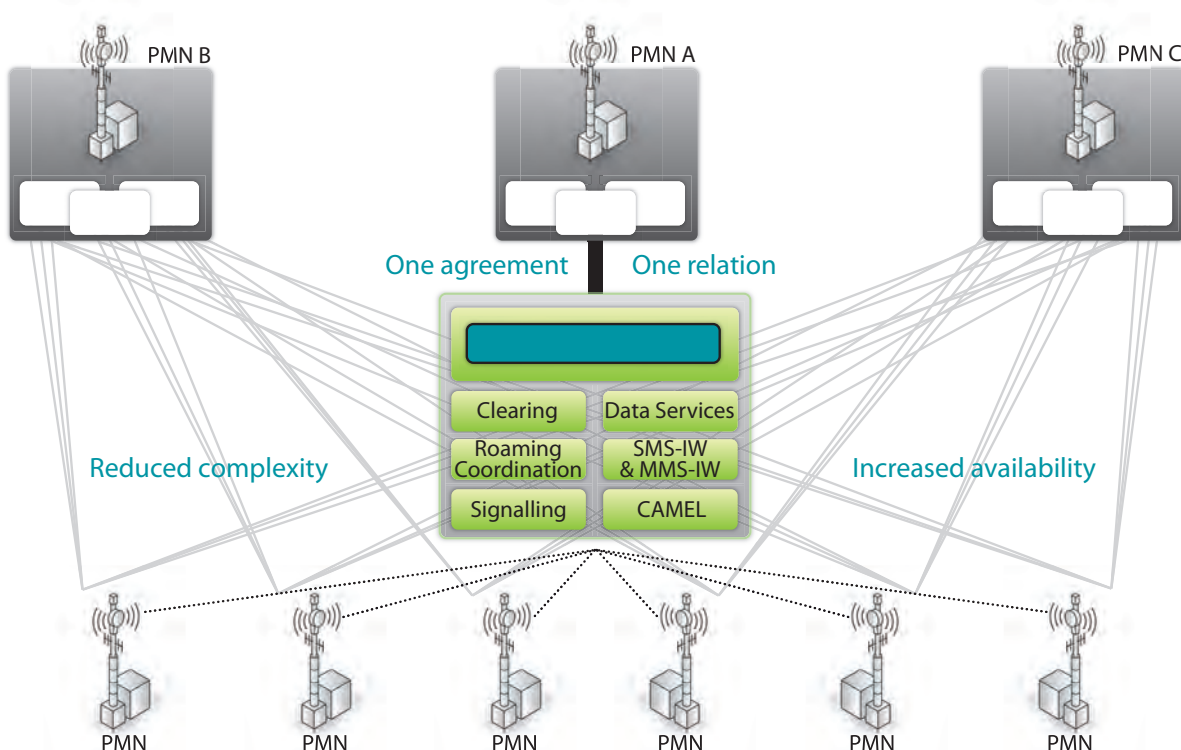
approach and real time reporting feature. Roaming hubbing providers are often tasked to actively monitor service availability and service quality on all their multilateral relations.

GlobalRoamer allows the activation and testing of Roaming Hubbing customers' SIMs. It helps them to work more efficiently to improve the quality of voice, data and SMS services for their customers.

Keynote SIGOS' GlobalRoamer can add value to many aspects of the Roaming Hub business model. GlobalRoamer is an ideal enhancement to hubs.



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SLA Testing according to GSMA GRQ

Consistency & comparability of roaming QoS testing

Since the traffic in outbound roaming has a big value for operator revenue, it is important to monitor the most frequently visited roaming operators. The GSM Association has designed the right concept: GRQ.

Roaming traffic may be a low percentage of the entire network traffic, but remains a significant profit contributor.

How to gain a global perspective on roaming quality with consistent measurements and thus comparability between home network and visited networks?

And how to achieve this goal in a cost efficient manner?

The Global Roaming Quality (IR.81) standards – developed by the GSMA in cooperation with selected partners like Keynote SIGOS – provide an answer to this question regardless of the monitoring and testing methods used.

GRQ is a comprehensive framework for pro-active testing and assurance of end-to-end roaming services quality. With SITE and GlobalRoamer you have a unique tool to monitor your SLA agreements with numerous roaming partners.

Keynote SIGOS is a self-certified vendor of the GSMA GRQ compliant test systems.

- 27 Active QoS parameters on voice, data and SMS traffic
- KPIs for five different categories:
 - Network access
 - Service Accessibility
 - Connection Establishment
 - Connection Sustainability
 - Connection Quality

Why GRQ?

- Common understanding about the criteria for measuring Quality of Service in outbound situations
- Developed and defined by GSMA
- Focus on periodic testing of service quality
- Applied for monitoring of top roaming partners

Key Benefits:

- Cost-efficient co-operation with roaming partners by adherence to a shared set of QoS KPIs
- Improve operational cost effectiveness, by automated testing and realtime reporting
- Increased Roaming revenue through fast resolution of home and visited networks' SLA violations



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SMS HUB ROAMING HUB GLOBAL ROAMING QUALITY

GRQ Parameters, defined by GSMA

#	GRQ Parameter name	Category	Description	Major target	Minor target	KPI alarm	Trend report
1	CS LU SR	Voice	Circuit Switched Location Update Success Rate Network Accessibility Circuit Switched	95%	98%	yes	X
2	CS LU Delay	Voice	Circuit Switched Location Update Delay	50s	10s		
...							
10	CLI	Voice	CLI Transparency	95%	98%		x
11	SpQ	Voice	Speech Quality	2.5	3		x
12	SA-MO	SMS	Service Accessibility SMS MO	95%	98%	yes	X
13	SA-MT	SMS	Service Accessibility SMS MT	95%	98%	yes	X
14	AD-MO	SMS	Access Delay SMS MO	10s	4s		
15	AD-MT	SMS	Access Delay SMS MT	10s	4s		
...							
24	Throughput	Data	Throughput (kbit/s)				X
25	Goodput	Data	Goodput (kbit/s)				X
26	Roundtrip Time	Data	Roundtrip Time				
27	Packet Loss	Data	Packet Loss	2%	1%		



Outbound Roaming Testing

Assure QoS abroad to optimize and develop outbound roaming revenue

- The possibility to travel the world quite easily is perceived as a matter of course nowadays.
- Traveling subscribers take availability and proper operation of all mobile services for granted.
- Outbound roaming contributes considerable revenue and therefore requires QoS assurance.

Operators require information on service quality beyond their own network. To subscribers, perceived mobile quality when traveling abroad is vital, especially for corporate customers.

Mobile operators need to ensure subscribers are able to log onto preferred roaming partners' networks when traveling, whilst preserving consistently high levels of QoS to maintain long term business sustainability.

When your subscribers arrive at a foreign destination, they expect their mobile service to work at all times.

All relevant services need to be tested with at least each top roaming partner. If you depend on these partners to execute these required tests, it will be a huge task, considering availability of staff, time zone differences and the like.

The solution is the world's largest automated on-demand test network: GlobalRoamer. Tests can be executed in more than 500 networks in three quarters of the world's countries. GlobalRoamer is hosted by Keynote SIGOS and can be accessed from anywhere in the world by logging on through a web interface.

Why risk losing subscribers and roaming revenue, when the ability to test the performance of all your roaming partners is at your fingertips?

Standard services as well as complex technologies and services like Video Telephony, MMS and UMTS/HSDPA networks can be tested without the need for co-operation with your roaming partners and independently of time zone.



Use GlobalRoamer, the most extensive global infrastructure for automated active End-to-End testing hosted by Keynote SIGOS. With GlobalRoamer you can access an ever increasing number of world-wide networks through a web interface.



Get the full picture of your roaming services

"Thanks to GlobalRoamer we were able to increase our outbound roaming capability dramatically in very short time."

Reports				
Lup Success - country				
	LUP-avail.	GPRS-avail.	Speech	SMS
Afghanistan-Kabul	100	100	100	100
Angola-Luanda	100	100	100	75
Argentina-Buenos_Aires	--	--	100	100
Australia-Melbourne	100	100	100	50
Australia-Sydney	66.67	66.67	100	66.67
Austria-Vienna	0	100	100	100
Bahamas	0	0	0	0
Bangladesh-Dhaka	100	0	0	0
Barbados-Saint_Michael	66.67	50	100	0
Belgium-Diegem	100	100	100	100
Bermuda	100	100	100	--
BosniaHerzegovina-Sarajevo	100	--	100	100
Brazil-Sao_Paulo	100	--	100	--
BruneiDarussalam-Bandar	0	66.67	100	0
Bulgaria-Sofia	100	100	100	100
Cambodia-PhnomPenh	100	0	50	50
Canada-Calgary	--	100	--	50
Canada-Toronto	100	66.67	100	50
Chile-Santiago	71.43	33.33	100	--
China-Beijing	--	50	100	100
China-Beijing_Xicheng	--	100	--	100
China-Guanazhou	--	100	--	100



Roaming Steering Testing

Are subscribers roaming with preferred roaming partners abroad?

Steering of Roaming (SoR) has been rolled out by Operators in order to direct their outbound roamers to preferred VPMNs in the roaming destinations. Does it work?

Steering of Roaming (SoR) solutions have been implemented by mobile operators in order to direct their outbound roamers to preferred VPMNs in each country. In some cases just one preferred VPMN in a country is chosen, in other cases SoR is about managing the proportion of revenue and traffic shares between two or more VPMNs.

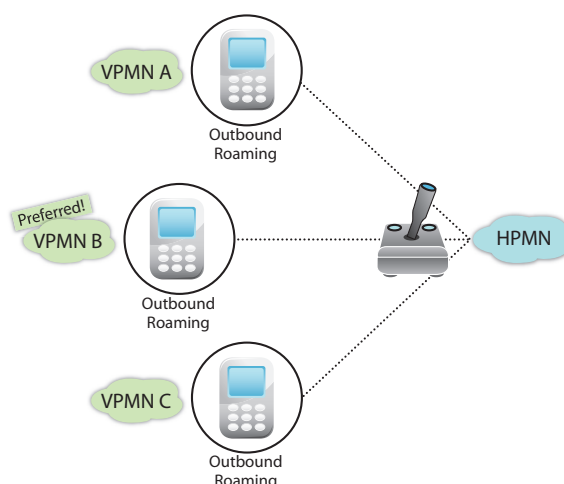
SoR is the logical result of roaming/IOT agreements which are linked to volumes and percentages for one or more preferred VPMNs. On one hand it is a significant commercial matter to detect short- or long-term deviations from these target distributions, on the other hand it is worthwhile to test potential deterioration of customer experience caused by SoR.

Detection of Anti-Steering of Roaming is essential as operators may lose subscribers to non-preferred networks resulting in margin losses. Anti-steering is not only a breach to roaming agreements but may also lead to a bad roaming experience as the subscribers could be left without any coverage. Subscribers will not blame

the VPMN but their subscribed home network. Subscribers will also not be able to benefit from the special roaming retail tariffs that have been offered to them. By detecting anti-steering activities, higher roaming costs can be avoided. Operators' primary business goal is to streamline roaming steering mechanisms such that outbound roaming revenues are optimized while maintaining high levels of end user satisfaction.



Get the full picture of your roaming services



KPIs (examples):

- Location Update Duration also delivering indication of deterioration of end user experience
- Number of PMNs rejected number of quad attempts or roaming not allowed rejects
- List of rejected PMNs non-preferred PMNs tried
- PMN after successful steering also indicating successful SoR at all
- LUP mode (automatic/manual) testing correct behavior of SoR Server for manual selection
- Reject Causes (i.e. Network Failure, PLMN)

