

Roaming Gateway

System Overview

It is impossible to imagine modern-day mobile services without roaming, which allows the subscriber to travel all over the world while staying in touch on his own home number.

Similarly, it would be impossible to imagine the modern-day telecommunications map without inter-operator alliances based on cooperation and coordination between major operators to provide wide coverage and high service quality.

However, when operators join in alliances they meet an array of challenges that are not so easy to solve using the capabilities of typical GSM network components. Joining several operators in a single alliance is a case where administrative and technical realities differ.

No less complicated challenges are faced by newcomers to the mobile market – MVNOs and small network operators. Making roaming agreements on a one-to-one basis requires considerable organizational and technical expenditure (testing, signing agreements) that is often beyond the means of a small operator.

The Roaming Gateway is ideal not only for optimizing inter-operator cooperation on the level of alliances, but also for resolving the challenges faced by MVNOs and small operators.

For the first group, the Roaming Gateway allows powerful and flexible network selection management to encourage the 'right' roaming network choice for subscribers from networks working in the alliance (Steering of Roaming concept).

The roaming brokerage concept is aimed at the needs of the second group of operators. This mechanism allows such companies to gain access to all the roaming partners of a major operator, just by making one agreement with that operator. For the large operator, the Gateway provides a source of extra income from providing roaming brokerage services.

Roaming Gateway solves the following tasks:

- Network selection management for outbound roamers when working in inter-operator alliances;
- Network selection management for outbound roamers when working through a roaming broker;
- Network selection management for inbound roamers.

The Roaming Gateway gives a significant geographical expansion of roaming coverage due to the ability to work through a roaming broker.

The system ensures correct interoperation with roaming partners' networks in case of compatibility problems with MAP, CAP or ISUP. Thanks to continuous monitoring, roaming quality criteria are under constant control.

Flexible registration procedure (network choice) control for outbound (optionally for inbound) roamers is performed in full accordance with IR-73, approved by the GSM Association, allows effective deployment of Steering of Roaming services as well as influencing roaming partners with a view to optimizing roaming agreements and providing the required quality of service.

Tools for gathering and analyzing statistical information and the ability to generate detailed CDRs for all processed transactions allows the structure of roaming traffic to be analyzed effectively.

Functionality

- Real-time detection of Update_Location transactions, registration and processing based on transaction details;
- Can allow or block registration based on the analysis of several criteria;
- Modification of SS7 (MAP, SCCP, MTP) when working through roaming broker;
- Simple connection scheme prevents interruption of roaming traffic in case of equipment malfunction;
- Compatibility with any external SIM-based roaming management solutions.

Algorithm and Service Delivery

Roaming Gateway connects to the network as a Signal Transit Point (STP), or as signal end-point depending on network configuration, and processes MAP and CAP traffic between roaming partners and the operator's HLR and SCP.

Lists of countries and roaming partners are defined in the system configuration. For each partner, a set of parameters can be configured to define signaling traffic processing rules for traffic from that partner's network:

- MCC+MNC;
- VLR list;
- Proportion of successful registrations in the network over a specified period of time;
- Minimal allowable threshold for successful registrations over a specified period of time.

The following algorithm is used when providing Steering of Roaming services:

First, messages related with the location information update procedure are detected. VLR information is extracted from MAP_Update_Location. By analyzing the information gathered, the system identifies the roaming partner network and retrieves its parameters and operational statistics. This information is compared with predefined criteria for the given roaming operator, and on this basis the decision to allow or deny registration is taken.

Statistical parameters configured for the roaming partner include:

- Priority level of the network in relation to other networks in that country;
- Number/proportion of subscribers registered in the network over a specified time period;
- Proportion of successful registrations in the network over a specified time period.

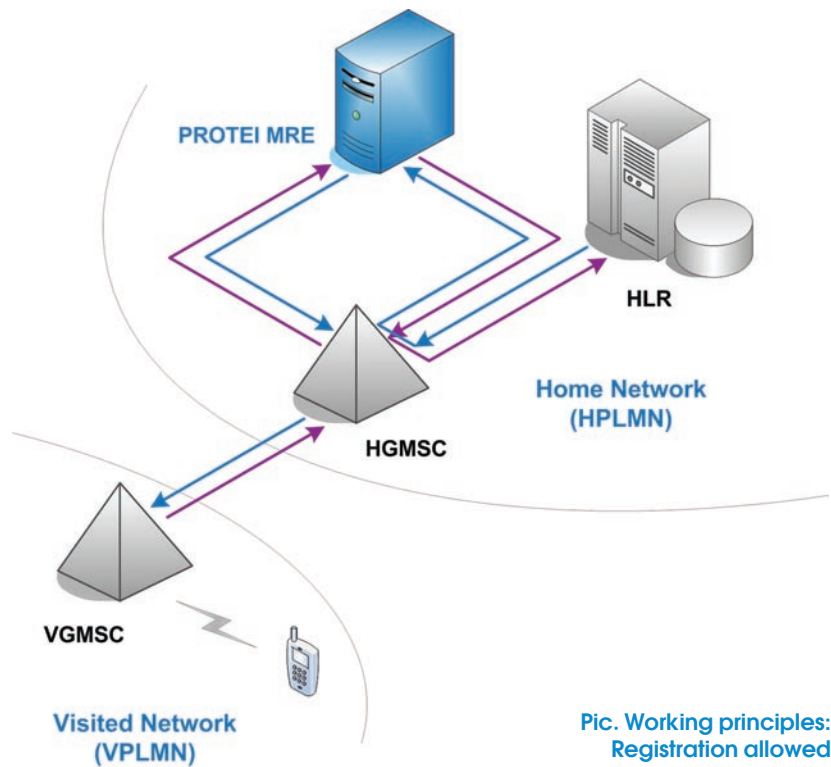
The network code (MCC+MNC) or address (GT) of the VLR on which an outbound roamer is trying to register, as well as a list of available roaming partners in the country are used as criteria for analysis on update of location details.

Roaming traffic for specified time interval – both actual and predefined for the given roaming partner - is also analyzed (number of registration attempts, number/proportion of successful registrations).

Additional Options

Roaming Gateway can also be used as a universal signal modifier, and provides:

- Modification of MAP parameters for location management procedures, subscriber management, identification management, call processing and also for USSD and SMS.
- Modification/translation of SCCP (GT) subsystem global titles (GTT functionality)
- MSRN modification for inbound roamers
- IMSI modification for outbound roamers
- Any low-level modification of MTP signal units using binary masks
- Modification of MTP-level routing labels of ISUP and SCCP signal units
- Modification of CgPN and CdPN parameters of ISUP subsystem using specified binary mask
- Aggregation of multiple SS7 signal links into one signaling link (with corresponding modification of routing label)



Pic. Working principles: Registration allowed

Call Records and Statistics

Statistics and CDR files are logged for all transactions. The web-based administration kit provided with the system contains specialized analytic tools for effective analysis of roaming traffic and its structure.

Connection with Existing Equipment

Roaming Gateway connects with MSC via E1 trunks (G.703 interface) with SS7 signaling or via SIGTRAN interface. It process MAP and CAP SS7 subsystems when in use as a signal traffic modifier.

SIGTRAN (M3UA) is supported in accordance with RFC standards.

The system supports MAP v1...3 in accordance with GSM 09.02 when providing roaming management.

SNMP is supported for alarm indication and integration with external Operation Support Systems.

System Architecture and Performance

The system is built using industrial servers on an Intel platform (HP DL), with interface boards of PROTEI's own design. One interface board is installed into each module, supporting up to 4E1 and up to 16 SS7 signaling links. Redundant HDD storage is provided by SCSI Raid I controllers.

System software runs on Linux (XFS) operating system.

System Scaling and Reliability

One server handles up to 100 transactions per second.

The system is horizontally scalable. When one of the subsystems reaches its performance threshold, appropriate additional modules are brought online. The system has network architecture, which additionally increases reliability.

Regional Sales Offices

Europe and North Africa

Na Piskach 65
Praha 6, CZ-160 00
Czech Republic
Tel.: +420 2 333 21 808
www.mobitel.cz
E-mail: mobitel@mobitel.cz

Russia, ex-USSR, MEA

60A B.Sampsonievsky
Business Center "Telecom SPb"
St.Petersburg, 194044, Russia
Tel.: +7 812 449 47 27
www.protei.com
E-mail: info@protei.com

R&D Center

60A B.Sampsonievsky
Business Center "Telecom SPb"
St.Petersburg, 194044, Russia
Tel.: +7 812 449 47 27
www.protei.com
E-mail: info@protei.com

