

Pricing mechanisms for GPRS roaming

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GSM Roaming

- **Roaming**
 - the ability for a cellular customer to automatically make & receive voice calls, send & receive data, or access other services when travelling outside the geographical coverage area of the home network, by means of using a visited network.
- **Roaming is technically supported by**
 - mobility management, authentication and billing procedures. Establishing roaming is based on Roaming Agreements.
- **National roaming**
 - If the visited network is in the same country as the home network.
- **International roaming**
 - If the visited network is outside the home country
- **Inter-standard roaming**
 - If the visited network operates on a different technical standard than the home network
- **GSM roaming**
 - single number, a single bill and a single phone
 - worldwide access to over 191 countries.
- **The convenience of GSM Roaming has been a key driver behind the global success of the GSM Platform.**
- **What about GPRS ?**

Meeting the challenges of GPRS billing

- **GPRS presents significant challenges for billing systems**
 - GPRS billing systems must cope with a range of pricing structures
 - volume
 - time
 - volume & time
 - unmetered access
 - The ability to provide cost information in real time is crucial for communicating charges to customers
 - Billing systems must be able to cope with a variety of third-party relationships
 - Operators are not charging by QoS yet, but vendors are beginning to develop the capability to do so
- **Vendors vary in their approach of addressing the challenges of GPRS**
 - Portal Software is adding wireless functionality and attempting to shake its IP-centric reputation
 - SchlumbergerSema has strengths in prepaid and postpaid mobile billing, but is a relative newcomer to IP
- **Existing billing suppliers are favoured, but vulnerable**
 - Many mobile operators have favoured existing suppliers

Meeting the challenges of GPRS billing (continue)

- **Pricing GPRS services is an important challenge for operators**
 - Prices, Billing systems, Target market segments, Competitors' strategies, Costs of provision, Value to customers
- **GPRS is critical for the continued growth of mobile revenue**
- **Current GPRS price levels are higher than GSM for file transfer, but offer savings for high volumes of browsing**
- **Operators require a detailed understanding of their market to manage the evolution of GPRS prices**
- Value is not just related to the volume of data
Suitable pricing structures differ by service and market segment
 - File transfer services
 - Messaging services
 - Collaborative working applications
 - Info- and entertainment services
 - E-commerce

Prerequisites for GPRS Roaming.

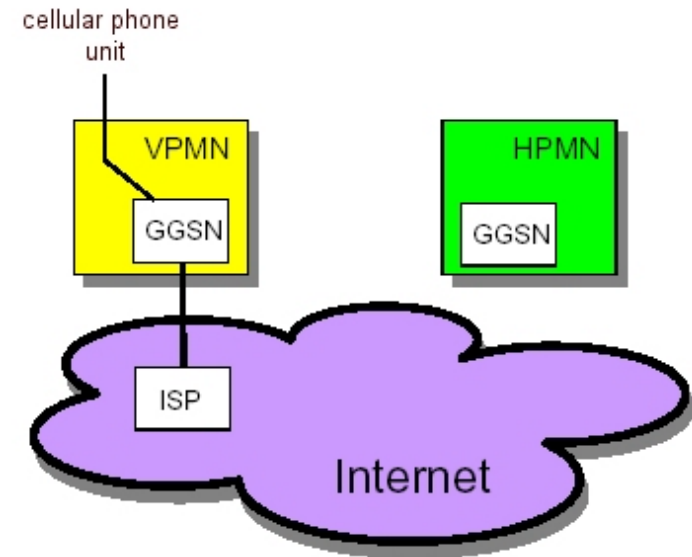
- **GPRS Operators have to decide on the roaming scenario to be implemented**
 - ISP Roaming or
 - PMN (Public Mobile Network) roaming: direct connections to other operators or over GRXs
 - PMN is technical and economically more suitable for roaming (Gerhard Heinzel: GSM Association)
- **International Roaming Agreement**
 - Bilateral roaming agreements
- **Definition and negotiation on new billing scenarios: GPRS application tariffing is different to voice**
 - (charging parameters: Data volume, duration, time, destination point, QoS, SMS, Served IMSI, etc.)
- **new TAP Interface:**
 - GPRS requires TAP3 for inter operator invoicing (billing system must be able to handle charging of data services and to produce TAP 3 Files)
- **IP addressing has to be resolved (DNS, APN)**

The two possibilities of GPRS roaming scenarios. ISP roaming

The main characteristics of the ISP Roaming scenario are:

- **Registration of user in visited network (VSGSN) and activation of context in visited network (VGGSN).**
 - SGSN = Serving GPRS Support Node
 - GGSN = GPRS Gateway Supporting Node
 - No data and signaling exchanges across the inter-PLMN backbone.
- **The scenario requires the following:**
 - SGSN - HLR interactions via inter-network SS7/SCCP links.
 - Dynamic address allocation for the subscriber.
 - Transparent, non-authenticated network access-point (NAP) access.

ISP Roaming



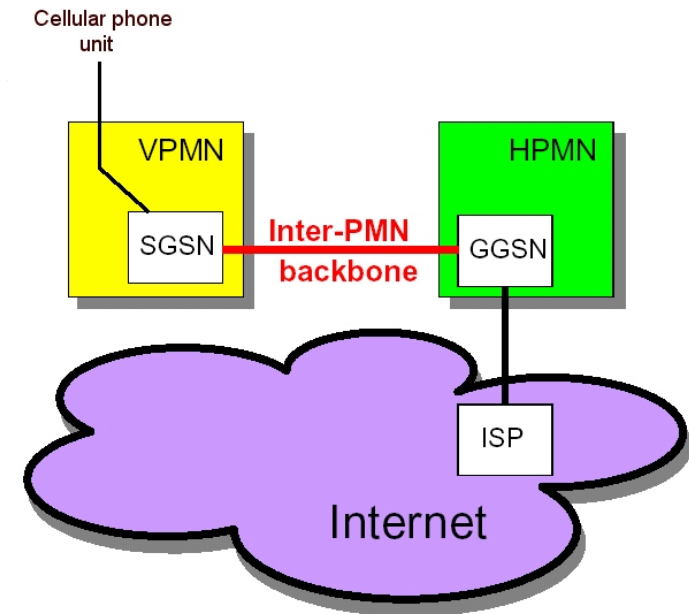
The GPRS roaming scenarios.

PMN roaming

The main characteristics of the PMN Roaming scenario are:

- **Registration of user in visited network (VSGSN) and activation of context in home network (HGGSN).**
 - Data and signaling exchanges across the Inter-PMN backbone.
- **The scenario requires the following:**
 - SGSN - HLR interactions via Inter network SS7/SCCP links.
 - Inter network DNS exchanges and possible root DNS exchanges.
 - Inter PMN backbone connectivity and address management.
 - Border Gateway (BG) involvement - firewall and additional security functionality.

PMN Roaming

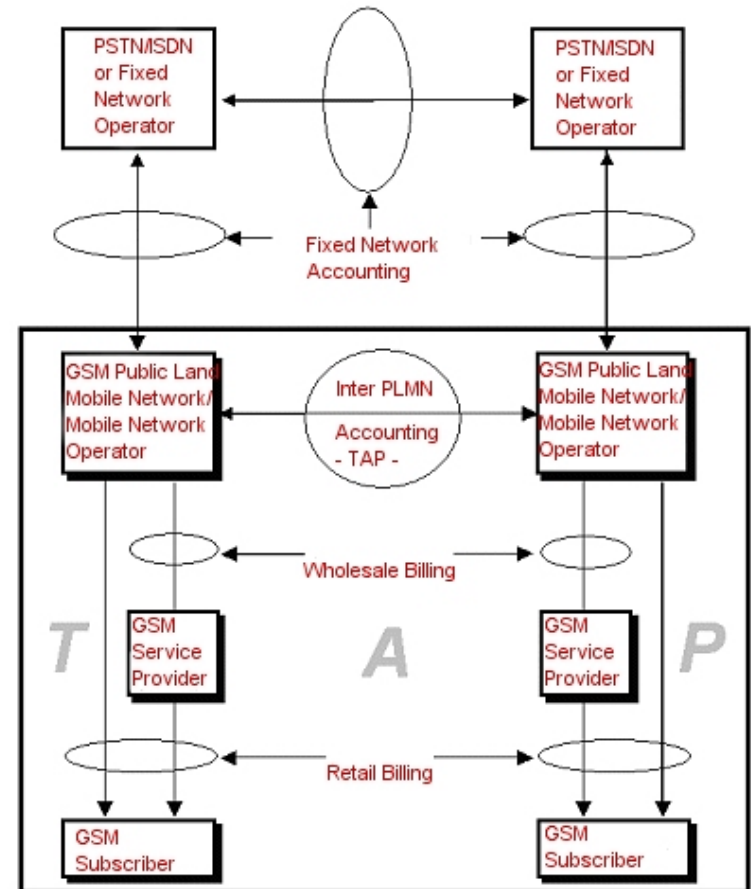


GPRS Roaming

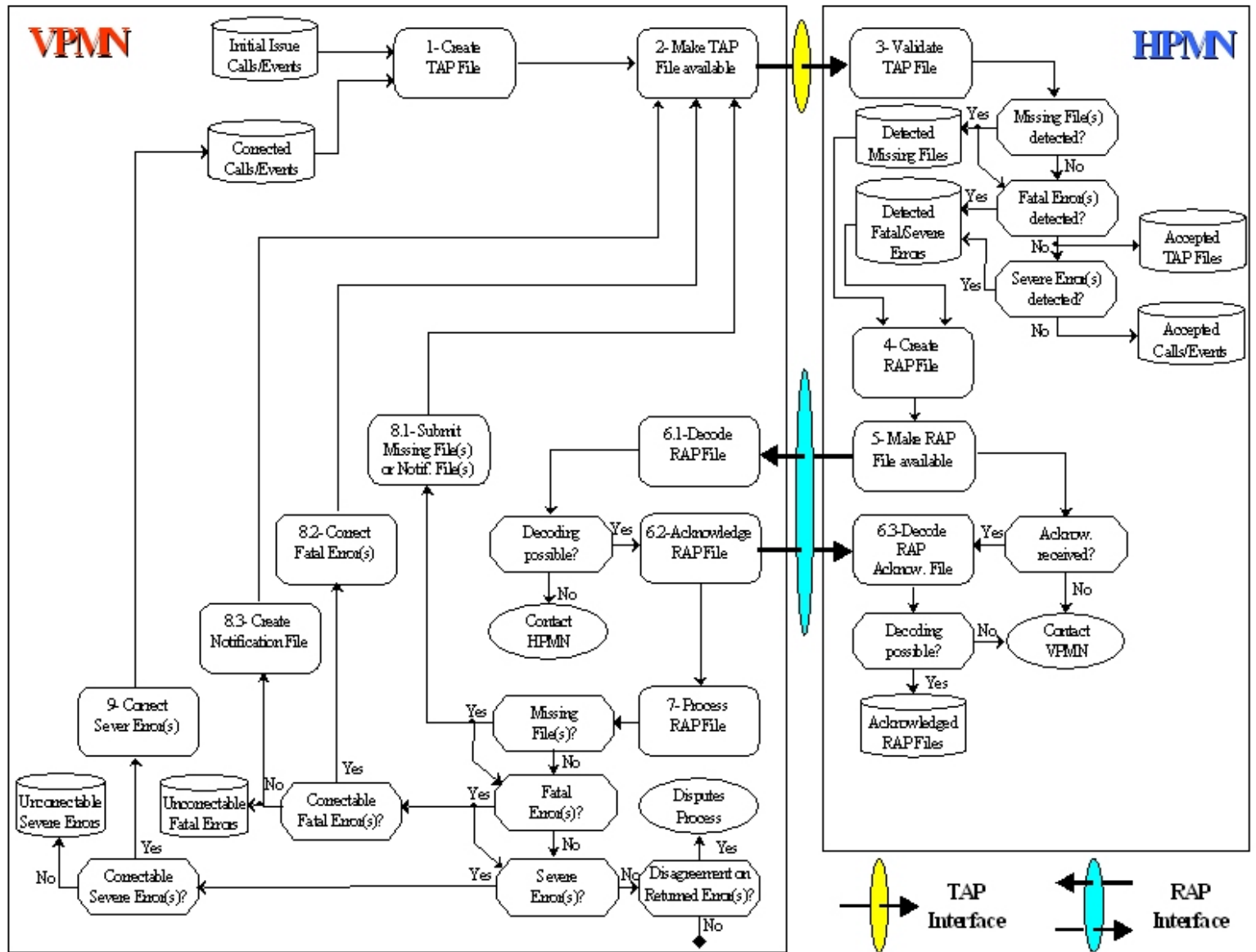
- GPRS roaming enables subscribers to access their GPRS services while abroad or beyond the reach of their home mobile network. Roaming requires a connection between GPRS operators so that subscribers can move from one network to another and yet still access their GPRS service.
- GPRS Roaming based on bilateral relationships between individual GPRS operators (compare to GSM roaming)
 - > incredibly complex and expensive to maintain
- GPRS Roaming eXchange (GRX) recommended for the roaming scenario.
- The GPRS Roaming Exchange (GRX)
 - is built on a private or public IP backbone
 - transports GPRS roaming traffic via the GPRS Tunnelling Protocol (GTP) between the visited and the home PMN.
- GRX Service Provider consists of
 - set of routers that are made up of the links connecting to the GPRS networks and the links connecting to other GRX nodes (peering).
- The GRX service provider acts as a hub. There is no need for a GPRS operator to establish a dedicated connection to each roaming partner; instead the GPRS operator establishes a connection to the GRX.
 - faster implementation of new roaming relations
 - rapid time to market for the new operator.
 - better scalability for GPRS operator. The operator may start with a low capacity connection to the GRX and upgrade if volume and type of traffic require more bandwidth and better quality.

GRX

- GRX = GPRS Roaming Exchange
- Instead of building up bilateral links between the operators, it's possible to use specialized agents that provide a hubbing function. Each operator can link up with one or more GRXs.
- Two Associations:
 - BARG = Billing, Accounting and Roaming Group is responsible for creating a framework that allows operators to charge each other for every new service subscribers can access in a roaming context
 - TADIG develops the technical specifications that are incorporated into the Transferred Account Procedure (TAP).
- TAP is the process that allows a visited network operator (VPMN) to send billing records of roaming subscribers to their respective home network operator (HPMN). TAP3 is the latest version of the standard and will enable billing for new services.



TAP. Return and reject process

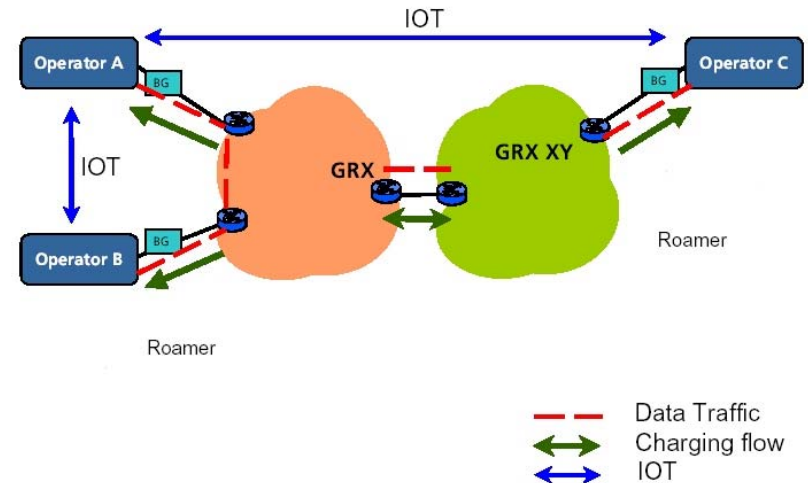


GPRS Roaming. The charging mechanisms.

- IOT = Inter Operator Tariff
- BG = Border Gateway
 - firewall and security

Mostly Used Parameters:

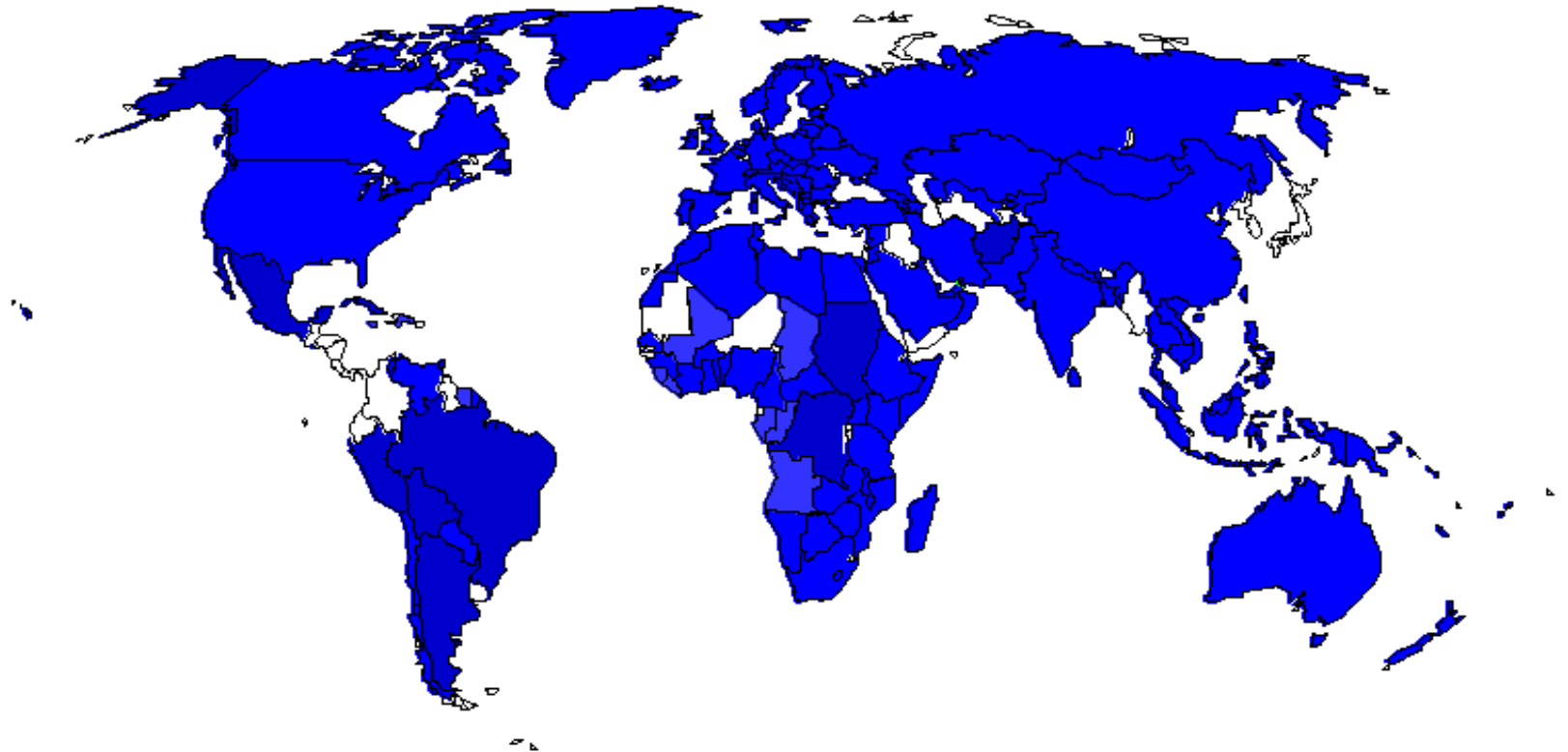
- Costs for bytes of data sent & received over the GRX network
 - Data connectivity path (intra GRX port to port)
 - Geographical length of path
 - Interconnection between 2 GRXs (for peering): charges between GRXs



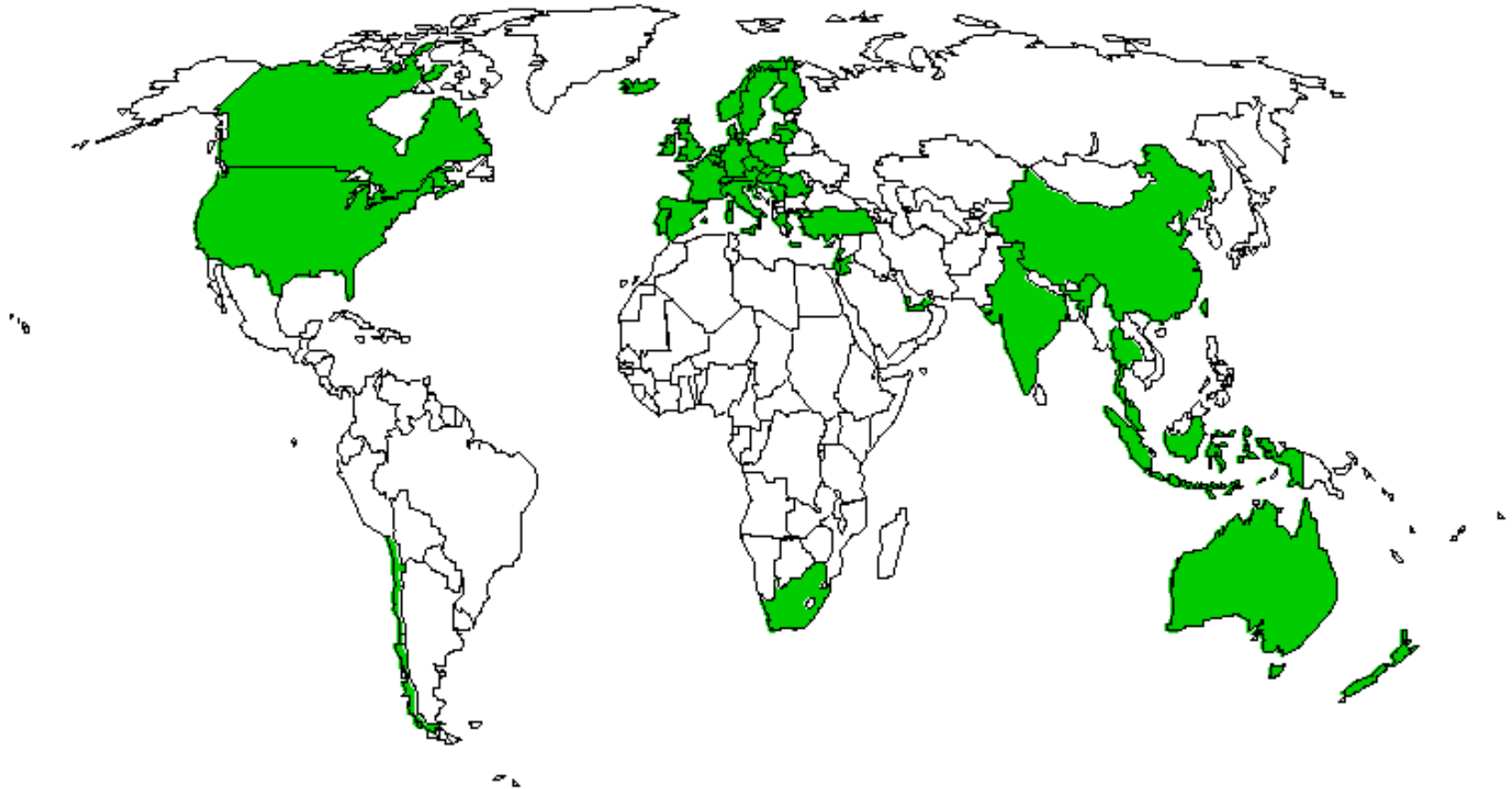
Important facts about GPRS roaming

- **commercial status of GPRS roaming**
 - for example Sonera has GPRS roaming contracts with
 - Aicent GRX
 - Belgacom GRX
 - BT Ignite GRX
 - Cable & Wireless GRX
 - France Telekom GRX
 - Infonet GRX
 - Marconi GRX
 - MTT GRX
 - Reach, Hong Kong
 - SingTel GRX
 - TDC GRX
 - Telecom Italia GRX
 - Telefonica GRX
 - Telenor GRX
 - Telia GRX
 - TSI Communication Services GRX
 - T-Systems GRX
 - Nokia and Sonera were the first who completed the GRX based GPRS roaming!
- **other operators have agreements too and the total number of roaming agreements becomes very large**

Availability of GSM (26.4.2002) picture by InfoNet



Availability of GPRS (26.4.2002) picture by InfoNet



Important facts about GPRS roaming (continue)

- **services currently supported on top of GPRS roaming contracts (via GRX):**
WAP, MMS, Internet access, security functions
- **the pricing challenges of the access via visited network**
 - + efficient (direct) routing
 - HMPN has no control over the call
 - dependent on TAP files for billing -> no prepaid billing possible
 - no end to end QoS guaranteed