Alcatel GSM Restricted Mobility Solution for Universal Access
GSM restricted mobility and its advantages

Regulatory issues

Alcatel GSM restricted mobility package

ANNEX : Network impact
Universal Access

- Universal service - a major economic and political issue in developing countries
- Particularly urgent for rural and remote communities
- Today Internet access becomes as essential as telephony
- New multimedia services and technological convergence are shifting the regulatory focus to

**UNIVERSAL ACCESS**
GSM Restricted Mobility - THE Solution for Universal Access

Subscriber density / km²

- High 1000
- Medium 100
- Low 20
- Very low 1

Services

- POTS
- Fax
- Dial-up Internet
- ISDN
- High Speed Data

BASIC WIRELINE (Direct or Concentrated)

MULTISERVICE WIRELINE

BROADBAND WLL

GSM RESTRICTED MOBILITY

MOBILE 2G

SATELLITE
Fixed GSM: Fixed cellular terminals

- Standard GSM network (NSS + BSS) in 900/1800/1900 MHz bands
- Terminals = Specific fixed cellular terminals
Fixed GSM Terminals

Variety of technical solutions

- **GSM Adapter** + standard fixed telephone (and/or other devices: fax, PC, etc.)
- **Fixed GSM Telephone** with a SIM-card
- **GSM Payphone**

Weaknesses of fixed GSM terminals:

- Less economical solution compared to standard GSM handsets
  - Priced at **more than 250 €/terminal**
  - Installation costs (outdoor antenna usually needed)
  - Higher maintenance costs
- Local AC power supply required
- Fewer end-user features than on mobile handsets
Fixed GSM Terminals: Recommended Applications

- **GSM Adapters**: when connection to other communication devices is needed, e.g. fax machine, small PABX
- Extention of a GSM coverage zone with an outdoor antenna
- **GSM Payphones**: Collective use improved business case. Example: Vodacom (South Africa)
  - A Phone Shop franchise concept
    - Fully equipped telephone bureau with 5-10 GSM payphones
    - Operated by a local entrepreneur
    - Call rates well below mobile tariffs
  - 2135 Shops in service in mid-2000
GSM Restricted Mobility: Solution Architecture

- Standard GSM network (NSS + BSS) in 900/1800/1900 MHz bands
- Additional SW feature in NSS
- Terminals = Standard GSM handsets
- Solution for 850 MHz available in 2002 (BSS + terminals)
Cell Mobility: “Semi-Fixed” Subscribers

- Mobility restricted to a small area comprising 1 to 6 cells ("Fixed Zone")
- Can be applied to 100% subscribers in the network
- Cheaper tariff, comparable to PSTN rates
- Mobile and Semi-Fixed are two distinct user profiles: do not mix
Advantages of GSM Restricted Mobility:
End-User Services & Applications

- **Mobility** (though limited)
- Easy implementation of **Pre-Paid**
- Privacy and Security due to a smart card concept (SIM)
- Mobile application platforms re-used for Semi-fixed users:
  - Voice Mail
  - SMS
  - Unified Messaging
  - IN services
- **Always-on Internet access** with GPRS
- Migration to UMTS enabling new multimedia services
Advantages of GSM Restricted Mobility:

- Proven, very mature, and the most widespread radio access technology
- High spectrum efficiency for voice services
- Excellent voice quality with enhanced coding
- Large range - up to 35 km in an open rural environment
- Indoor coverage is feasible
- Very stable coverage/capacity ratio
- Advanced data rates with GPRS (up to 40 kbit/s peak)
- Clear migration path to 3G

GSM: 66% of the world mobile market

Source: EMC, August 2001
Advantages of GSM Restricted Mobility: Economics

- GSM infrastructure is a very competitive industry with huge economies of scale → **LOW PRICES**
- GSM handsets bring significant cost advantages
  - Cheaper models available at **below 100 €/terminal**
  - No CPE installation and maintenance costs to the operator
  - Unavailability of AC power in every home can be overcome via battery recharging shops
- Network maintenance costs are low compared to wireline networks
Advantages of GSM Restricted Mobility:
Synergies with mobile infrastructure

- **Large CAPEX/OPEX synergies for an operator who has already deployed a mobile GSM network:**
  - Only extension of the GSM infrastructure is needed (incremental costs only)
  - All mobile application platforms (e.g. IN) and OSS systems can be re-used for Semi-fixed subscribers
  - Trained and qualified technical personnel for installation, operation and maintenance already available
  - Spare parts
GSM restricted mobility and its advantages

Regulatory issues

Alcatel GSM restricted mobility package

ANNEX : Network impact
Pre-requisite Asset - GSM Frequency Spectrum

Available frequency bands for GSM operation

- **850 MHz**: 824, 849, 869, 894 MHz
- **900 MHz & E-GSM**: 880, 890, 915, 925, 935, 960 MHz
- **1800 MHz**: 1710, 1785, 1805, 1880 MHz
- **1900 MHz**: 1850, 1910, 1930, 1990 MHz
- **900 MHz & E-GSM**: 1710, 1785, 1805, 1880 MHz
GSM Spectrum Availability

- **Historical position of Governments/Regulators**
  - Sell GSM spectrum to mobile operators at a high price
  - Allocate non-GSM spectrum to WLL projects not to allow fixed wireless operators to enter the mobile market via a back door

- **GSM Restricted Mobility should be treated in the universal access context**
  - *Rural and remote areas* not covered by commercial GSM operators due to a difficult business case
  - Services to be provided at PSTN-like tariffs
  - Green light should be given to any technical solution which enables more extensive and economical universal access

---

GSM spectrum should be made available at a low price (or even given for free) for universal access projects
Historical position of Governments/Regulators
- Require installation of fixed terminals when fixed operators deploy cellular systems
- Use of mobile handsets by fixed wireless operators seen as an attempt to enter the mobile market via a back door

Such restriction is unnecessary in the universal services context:
- Rural areas do not provide sufficient return for commercial GSM operators
- Why to offer premium mobile services at regulated PSTN-like tariffs?

GSM Cell Mobility feature restricts inter-mobility to an area surrounding...
New Regulatory Approach to Fixed/Mobile Convergence

Telecom market reality: in a growing number of developing countries mobile infrastructure is substituting fixed networks

- South Africa, Morocco, Venezuela, Paraguay, Philippines, etc.

Proven success & efficiency of GSM as an access technology makes regulators reconsider their position on fixed/mobile convergence.
Examples of New Regulatory Approach

- GSM restricted mobility solutions received regulatory approval in:
  - **Guinea** (Conakry)
    - *Sotelgui*, the incumbent operator with an *Alcatel* GSM 900 network, provides mobile and restricted mobility services
  - **South Africa**
    - The telecom regulator is planning to allow *Telkom* and the future *Second National Operator* to offer fixed-mobile services
  - **Senegal**
    - *Sonatel*, the incumbent operator with a GSM license, will deploy GSM restricted mobility solution in rural areas
- Regulators have ongoing discussions with operators & vendors in:
  - Latvia, Tanzania, Morocco, Mongolia, Vietnam, Cuba
Presentation Outline

- GSM restricted mobility and its advantages
- Regulatory issues
- Alcatel GSM restricted mobility package
- ANNEX : Network impact
End-to-end Alcatel Solution

Applications

platforms & Internet portals

Radio Access Network

Core Network

Transport

Support Services

Terminals
Key Evolium™ Assets

**Evolium™ radio solutions**

- **Coverage**
- **Transmission inside:**
  - IDU (Indoor unit) microwaves board integrated in the same cabinet
- **Compactness**
  - Up to 16 TRX per outdoor cabinet
- **Voice Quality**
  - EFR, HR & AMR features

---

**Evolium™ core-network solutions**

- **Scalability & high capacity**
- **Multi-functional Switch**
  - Allows fixed-mobile convergence
- **Secure inter-working with services environment**
  - Added value services (Camel, GPRS, optimal routing…)
  - Field-proven resistance to IN

---

**Evolium™ 800 MHz solution available in Q1 2002**

**Cell Mobility feature available since 2001**
EVOLIUM™ MSC:
Multi-Access Fixed & Mobile Platform

Unique switching platform (HW+SW)
+ Unique IN platform (SCP, SCE, SMP)
+ Unique NM platform (NMC)

for
- Mobile Switching Center
- Local Exchange
- Transit Exchange
- IN Services and Features
The right number of sites with EVOLIUM™ in rural areas

Leader in radio performance since 1998

On a 3x2 TRX 900 or 1800 MHz rural an EVOLIUM™ BTS provides up to 49% gain on sites comparing to the other BTS available on the market.
Data inside: GPRS & EDGE

You just need to add this to a GSM network!

The community Internet access service is an application example.
The most flexible solution:

- Multi-standard
  - GSM, GPRS, EDGE & UMTS in the same base station
  - GSM/GPRS core network evolves to UMTS
- Sharing of sites, transmission

Since 1998
Evolium
protects investment

GSM
GPRS
EDGE
UMTS
Low-cost terminals and wide variety
Unresolved issue of **universal access** demands new, innovative approaches
  - This position is strongly supported by the World Bank

GSM has emerged as **the winning radio access technology**
  - Very efficient for residential communication needs
  - Most economical access solution for medium/low density areas

Regulators should accept this market reality and facilitate the use of **GSM Restricted Mobility** for universal access

**Evolium™** brings additional advantages to GSM Restricted Mobility
  -Flexible, integrated end-to-end solution
  - Evolium™ solution is Internet-embedded
Presentation Outline

- GSM restricted mobility and its advantages
- Regulatory issues
- Alcatel GSM restricted mobility package
- ANNEX : Network impact
# Solution Impact Summary

<table>
<thead>
<tr>
<th>SOLUTIONS</th>
<th>Average Traffic</th>
<th>Number of hand-overs</th>
<th>Location Updates</th>
<th>Signalling Traffic</th>
<th>Average n° of subscribers (3x2 TRX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile</td>
<td>10-15 mErl.</td>
<td>+++</td>
<td>+++</td>
<td>High</td>
<td>550</td>
</tr>
<tr>
<td>Cell Mobility</td>
<td>60-80 mErl.</td>
<td>+</td>
<td>+</td>
<td>Small</td>
<td>115</td>
</tr>
<tr>
<td>Fixed GSM Terminal</td>
<td>80-120 mErl.</td>
<td>-</td>
<td>-</td>
<td>Very small</td>
<td>82</td>
</tr>
<tr>
<td><strong>GSM Payphone</strong> (for comparison)</td>
<td><em>Up to 800 mErl. (peak hours)</em></td>
<td>-</td>
<td>-</td>
<td>Very small</td>
<td>-</td>
</tr>
</tbody>
</table>
Radio design impacts of GSM Restricted Mobility

General traffic impact compared to a full mobile design:

<table>
<thead>
<tr>
<th>New traffic and user pattern</th>
<th>Design impact</th>
<th>BSS impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher traffic per user</td>
<td>Fewer subscribers per cell</td>
<td>Increased number of TRX and/or BTS sites</td>
</tr>
<tr>
<td>Users are mostly residential</td>
<td>Deep indoor coverage may be requested (increased margin between 15dB and 30dB)</td>
<td>May lead to increased number of BTS sites</td>
</tr>
<tr>
<td>Reduced or no mobility</td>
<td>Low level of interference</td>
<td>Better speech quality</td>
</tr>
</tbody>
</table>
Impact on NSS

- HLR Software feature: An OSS mark forbids any communication of the mobile outside its identified cell
- VLR Software feature
  - First localisation: VLR identification
  - Later localisation: OSS mark testing & discrimination between allowed & non-allowed Originating Calls
- OMC-S Software feature
  - Inclusion in Call Data Records of OSS mark for differ. tariffs

- Forced hand-over in VLR/RCP for Mobile at Cell boundary
  - Failed hand-over  ❌ Subscriber to be rejected, not allowed
  - Successful hand-over  ✔ Cell boundary of allowed subscriber
Design impacts for Fixed GSM compared to a full mobile design

**Impact on NSS**
- Re-dimension the SSP capacity due to increased traffic & BHCA
- Increased capacity of RCP/VLR due to limited Mobility functions

**Numbering impacts**
- Requirement of specific “pq” prefixes for discrimination at PSTN toll exchange between:
  - GSM subscriber and PSTN subscriber (translation)
  - GSM mobile subscriber (0nn) and GSM fixed subscriber (0mm)

**Impact on Billing System**
- Number of charging rates doubled
www.alcatel.com