GSM Association

ITU/BDT Regional Seminar on Broadband Wireless Access (BWA) for rural and remote areas for Africa

Yaoundé (Cameroon)
18-21 September 2006

Refarming 850/900 MHz Outline

- Look at the background to this – where are we with 3G deployment and how we got here
- Discuss the benefits of 850/900 MHz for UMTS – help deploy HSPA as WLL technology
- Highlight the complexities of allowing this to happen *efficiently : needs coordinated approach*
- What we need to do and when
- GSMA is working on a report on the need increase the awareness for refarming, to help bring forward the timescales

some background

- Now moving from 2nd to 3rd generation
- Core bands 2.1 GHz assigned for IMT2000 by ITU
- 2.1 GHz is good for capacity for new data services
- But coverage is more expensive at 2GHz, than 850/900 MHz
- Operators have relied on GSM850/900 for wide area coverage
- Now operators see the advantages of UMTS900

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How does this help BWA in rural areas?

- HSPA can offer fast data rates max 14 MB/s (less in real networks) on 3GSM networks
- Used primarily for mobile networks
- But low cost high volume data cards for laptops etc could be used in rural locations like schools
- Relies on cheap terminals through large volumes and
- Having the optimum spectrum (900 MHz)
- Early allowance of refarming GSM900 to 3G encourages this possibility

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The parties involved

- Operators – need equipment and regulatory approval to refarm 850/900 MHz
- Vendors – they want markets for their equipment. Uncertainty is bad for business.
- Regulators – they can significantly delay refarming, from when economically efficient
- Consumers and the economy – they are effected by the interplay of the above.
- In developing economies 3G can boost mobile internet take-up and allow for BWA in rural areas via 3GSM/HSPA

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What's to commercial driver

- The best way to deploy 3G is to use 2.1 GHz for high demand area (city centres) - capacity
- Use 900 MHz for rural and low demand areas
- Use 900 MHz for in-building penetration
- During start up might be best to use almost exclusively 900 MHz to provide low capacity coverage – delays capital expenditure
- Makes 3G a much more attractive commercial proposition
- Translates into cheaper service and more investment – consumers and economic efficiency best served – helps rural BWA

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Successful mobile deployment helps BWA

- Low cost service depends on cheap terminals and lots of subscribers to spread the upfront network costs
- Radio access layer requires backhaul and core network + billing, customer services etc
- Large customer base can amortise these core network costs over mobile and BWA subscriber base.
- 3GSM is the 3G technology of choice.

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Why HSPA and 3GSM fits the bill

- Economies of scale in access layer (deploying and maintaining base sites/access layer)
- Economies of scale in network layer (IP and voice traffic transportation) because of large number of mobile subscribers
- Rural BWA can be offered more cheaply by HSPA/3GSM because large terminal volumes.

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What's the problem

- Operators won't deploy base stations until they have competitively priced kit – especially handsets
- Can take years to plan
- Need big economies of scale to achieve this
- Vendors won't commit to large production runs until they have or expect orders
- No one wants to commit until regulators give a date
- Delays refarming 850/900 MHz from when it is economically efficient to do so.
- This delays the possibility of rural BWA using 3GSM/ HSPA

What's the solution

- All parties need to move forward together – operators, vendors, regulators
- This allows the required long term planning and economies of scale in handsets
- Allows consumers and economies to benefit from mobile broadband

What's the issue

Helping to boost the availability of IMT2000 in developing and developed markets. This is good for consumers, competition, and economic growth. There is a strong link between mobile penetration and economic growth.

This requires that spectrum in bands below 2 GHz, be made available to IMT2000 operators. In particular "mobile friendly" bands such as 900 and 850 MHz (GSM).

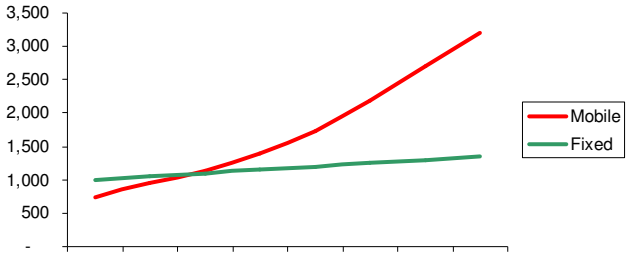
This will reduce costs and improve coverage, which will boost market penetration. Sets the best conditions for HSPA being deployed as a WLL.

Statistics

- Global GSM & 3GSM mobile connections outstrip rivals:
  - 29% of the global population
  - 82% of the global mobile market
- 1000 new connections every minute
- Close to 2 billion GSM connections
- 71 million 3GSM/WCDMA subscribers*
- 3GSM/WCDMA is available on 105 networks in 47 countries
- 315 GSM/WCMDA terminal devices have been launched

Sources: Wireless Intelligence & GSA
* As of 22nd May 2006

More Mobile Than Fixed Subscribers



Source: ITU, Wireless Inteligence

- In 2002, mobiles exceeded fixed lines
- In 2006, twice as many mobile lines as fixed
- There are more mobiles in the *developing world* than in the *developed world*
- About 30% of the world's population are mobile subscribers though 80% have network coverage

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Detailed analysis of refarming

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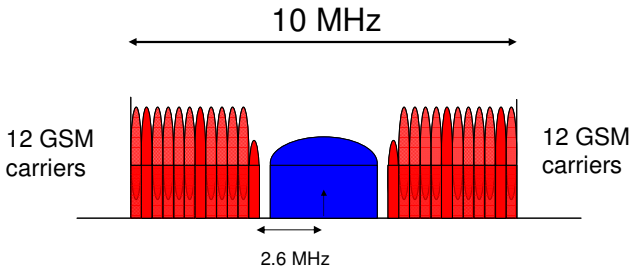
How an operator might deploy – coordinated deployment



2.8 MHz carrier separation for uncoordinated macro Cells in rural and suburban areas, and 2.6 MHz in coordianted areas. Source draft ECC report 82.

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Benefits of 900/850 MHz

- Reduce deployment costs
- Increase mobile penetration
- Leads to greater economic growth from more internet use
- Encourage foreign investment
- Increase attractiveness of wireless local loop / HSPA for greater fixed internet penetration
- Can reduce environmental impact by having fewer sites.

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Impact of frequency on deployment costs

Sites required to cover 10,000 km^2

Frequency band	voice	64 kbps	64/384 kbp
2 GHz	454 sites	887 sites	1980 sites
1 GHz	174 sites	340 sites	665 sites
% reduction	61.7%	61.7%	66.4%

Source UMTS Forum report 38

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Top level Impact on the business model

- Assume 50% are coverage limited, 50% capacity limited
- Save 31% saving in cell sites
- If 70% of capex dependent on cell site numbers means **@22% of capex saved**
- And better in-building coverage – major benefit for consumers

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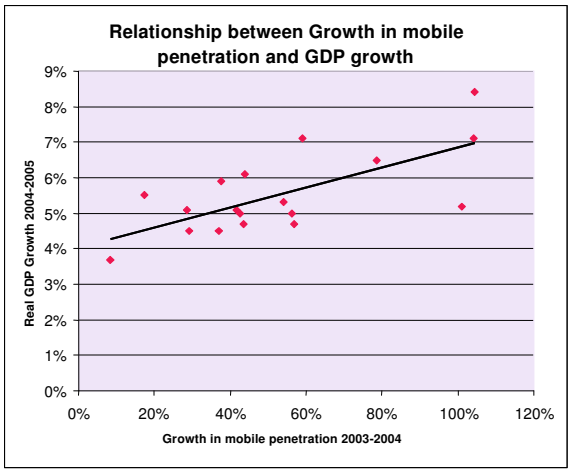
Also impacts on timing of spending - cash flows

- Can now deploy “thin” capacity networks to drive market demand initially using 900 MHz, then use 2.1 GHz to add capacity as subscriber numbers increase.
- Delays capital expenditure, save $millions on interest payments
- Makes the business plan much more attractive
- This will encourage operators to deploy 3G more rapidly

Illustration of savings

- Operator A needs to cover 10,000 km^2
- Needs @2000 sites at 2.1 GHz
- Using 900 MHz initially needs only 700 sites.
- But with only 2 x 5 MHz at 900 MHz, capacity is low. Operator needs to build capacity in when there is demand.
- When full capacity network deployed you have 1000 2 GHz cells, and 350 900MHz cells. Ie 1350 cells overall.

How do developing markets benefit



Source: Ovum - "The Economic and Social Benefits of Mobile Services in Bangladesh" For GSMA April 06.

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Impact on GDP and FDI

- In developing countries, for every additional 10 percentage points of mobile penetration, the annual GDP growth rate is increased by approximately 0.6%.
- Higher mobile penetration will assist Foreign Direct Investment (FDI), e.g. a 1% increase in mobile penetration is associated with a 0.5% to 0.6% increase in FDI as a proportion of GDP.

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The benefits of 3G service

- There is a strong link between mobile penetration and economic growth in developing economies.
- Strong link between internet penetration and economic growth for developed economies – could apply to developing markets?
- Use of internet to reduce business costs and boost productivity. Remote working, working on the move. Use of internet to allow better markets for goods and services.

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The benefits of 3G service continued

- Small business can market themselves with web sites and consumers can access them
- With a mobile phone your in business, with a 3G phone your on top of business
- Farmers can check the spot price for their goods more easily with internet
- Internet gives a qualitative boost for developed economies – can do the same for developing ones too
- But requires that lots of people have them for maximum effect – network effects

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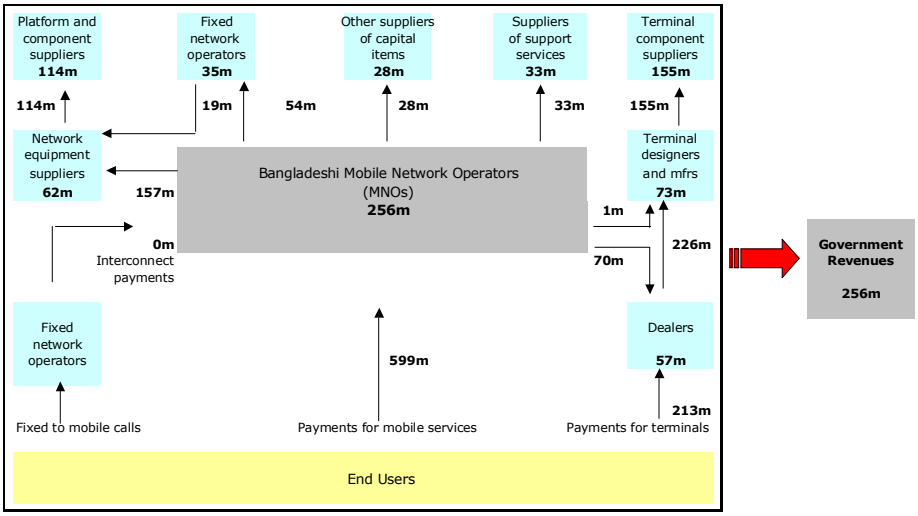
Mobile Services Value Chain Example



Source: Ovum Report, April 2006. All figures in US$

Challenges posed

- Potentially lose 50%+ of GSM capacity, depending on how much spectrum an operator has
- This requires that in capacity limited areas 50% of users are dual mode – ie GSM/UMTS-900
- Takes time to "seed" markets to allow uptake of dual mode handsets
- The more expensive UMTS900 is the more handset subsidy is required. This will likely increase the time required to build UMTS900 penetration

Handsets

- Key issue to making this happen
- Need to be available at low cost for all market segments
- Needs time for vendors to make them available in sufficient quantities to benefit from economies of scale.
- Economies of scale requires regulatory certainty about when refarming 850/900 allowed.
- Takes time to develop new handsets, modify handset production facilities, test and type approve. A year, 18 months?
- No major technical problem.

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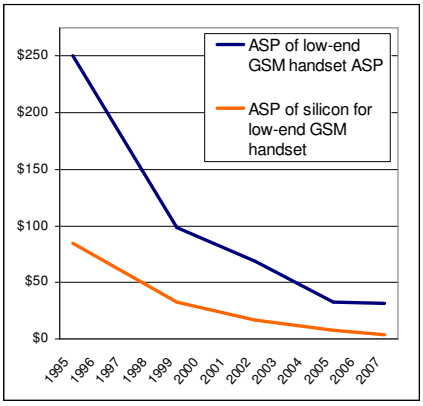
Benefits of economies of scale on GSM



Average sales price (ASP) of low-end GSM handsets and their silicon chip components 1995-2007 (Arete)

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Regulatory uncertainty

- Erratic regulation in developing countries has put a brake on telecom investment increasing the cost of capital
- Best practice regulation in Sub-Saharan Africa would have generated:
  - An increase in investment of 25%, nearly $5 billion
  - A 30% increase in mobile penetration, from 83 to 108 million
  - Additional regional annual GDP of $1 billion

Source: PwC, London Business School, Wireless Intelligence and GSMA data and analysis

Conclusions

- Refarming 850/900 MHz good for businesses and consumers
- Successful 3G/HSPA deployment for mobile allows use rural HSPA for BWA to “piggy-back” on this success.
- Good for economic growth and efficiency
- Investments have long lead times and need regulatory certainty
- Regulators must act now to resolve this uncertainty, or risk harming consumers economic growth

Thank you
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