Offering 3G services in the 900 MHz Band

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The reasoning behind US President Obama’s US$6 billion support for broadband rollout in underserved areas:

"For every dollar invested in broadband, the economy sees a ten-fold return on that investment."

- American Recovery and Reinvestment Bill, 2009

Source: wi-fiplanet.com, January 2009
ARPU increasingly generated with data services

Key Success Factors:
• **Attractive new data services** to generate **additional revenues**
• **Improve Cost Position** for early ROI
Data traffic and revenue keep growing
Comparison of HSDPA throughput July 07 – July 08

4000 GB / day
7000 GB / day
2000 GB / day

Operator in Europe: Data Revenue +10%
Operator in APAC: Data Revenue +16%
Operator in APAC: Data Revenue +24%
Operator in Europe: Data Revenue +10%
Operator in APAC: Data Revenue +10%

Source: NSN analysis
Source: Merril Lynch, Global Wireless Matrix Mar07-Mar08, local currencies

“3G drives data use, not the other way around”
-- Ovum, 2008
Satisfying the market’s largest unmet need

Today’s strongest opportunities for growth:
Voice for rural population
Mobile broadband for urban dwellers
Teledensity is still very low in comparison with South African population: Room to grow

- Total population: 47 Million
- Mobile Phone user base: 39.6 Million (85%)
- Internet users: 5.1 Million (11%)
- Main telephone lines: 4.7 Million (10%)
- Mobile 3G user base: 2 Million (4%)
- Fixed broadband subs: 0.3 Million (0.6%)

Fixed broadband subscribers only represent 6% of all internet users in the country

Source: ITU ICT Statistics 2006; NSN Market Compendium 2007; various public sources South Africa
Addressing challenges with WCDMA Frequency Refarming

- Operator introduces 3G services into the frequency band that is already used for GSM
- In order to fit the WCDMA carrier into same bandwidth, typically spectrum efficiency needs to be improved

Why UMTS 900?

900/850 MHz band

2100/1900 MHz band

Operators current GSM bandwidth

= WCDMA

= GSM after refarming
WCDMA at 900 MHz frequency – typical deployment scenarios

**Sub-urban & rural coverage expansion**
- Currently WCDMA services not yet available
- Easiest and most common approach
- Easier to release part of frequencies for WCDMA

**Urban 3G coverage improvement**
- Fill-in and indoor coverage
- In many cases GSM traffic pushed to 1800 MHz layer

**Wireless broadband for sub-urban & rural**
- Currently poor or non-existing fixed broadband
- Data optimized 900 MHz layer with I-HSPA

**Initial 3G roll-out**
- Currently WCDMA services not yet available
- Logical approach to start with lower frequencies
Sandwich-type frequency allocation recommended for efficient refarming

Closest frequencies at both sides of the WCDMA carrier can be optimally utilized for GSM frequencies

- Guard bands can be minimized with Flexi BTS 4.2 MHz filter and coordinated network deployment

![Diagram showing frequency allocation]

- Other operator’s band
- WCDMA/HSPA
- Other operator’s band

- 4.2 MHz
- 2.2 MHz
- 2.4 MHz
- 2.6 MHz

- = WCDMA/HSPA
- = Non-BCCH GSM, coordinated deployment
- = BCCH GSM, coordinated deployment
- = GSM, uncoordinated deployment
Unique 4.2 MHz carrier bandwidth feature to ensure GSM capacity in WCDMA Refarming

Enable 1 additional TRX in GSM layer

- Enabled by advanced design of Flexi filter
- Supported with standard UEs
- Ensures high performance
  - WCDMA network capacity same as with 5 MHz
  - GSM and WCDMA network qualities remain high
- Tested in several field trials

![Diagram showing carrier bandwidth comparison]

**Example**

<table>
<thead>
<tr>
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<th>Nokia Siemens Network solution</th>
<th>Standard solution</th>
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<tbody>
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Minimize Needed Hardware and Sites with Spectral Efficiency Features

Spectral efficiency features enable considerable reduction in

- number of sites
- amount of site hardware
- site visits

SAIC  = Single Antenna Interference Cancellation
STIRC = Space Time Interference Rejection Combining
DFCA  = Dynamic Frequency Channel Allocation
AMR   = Adaptive Multi Rate codecs

DFCA and STIRC are unique features for Nokia Siemens Networks
Reduced number of sites with WCDMA 900MHz Solution

Lower radio network CAPEX/OPEX and fast network deployment
• 65% less sites needed with WCDMA850 or 900 compared to WCDMA2100
In building 3G services without dedicated indoor systems
• 100% improvement with WCDMA and HSPA indoor data rates

WCDMA850 & 900 gives 2.8 x larger cell coverage area than WCDMA2100
Value of WCDMA Refarming with Nokia Siemens Networks

Cost of rural coverage

WCDMA900/850 triples the cell area in rural areas

HSPA data rates

HSPA900/850 boosts indoor data rates above 1 Mbps
## Terminals

### WCDMA terminal selling prices

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Sources: ABI, IDC, Strategy Analytics and Yankee Group handset shipment forecasts

The graph shows a decrease in WCDMA terminal prices from $280 in 2004 to an estimated $80 by the end of 2009. The low-tier price is expected to reach $80 by the end of 2009.
Terminals

Nokia’s target consumers are mobile subscribers in low-tier urban and rural areas.

Population spread

Population by income class

Fixed line internet

Mobile penetration

Urban

Suburban / low tier cities

Rural

No Internet access

High

Mid

Low

Tar
get
3G
han
dset
users

Source: EMS R&D material 16-May-2008
Mobile broadband growth driven by explosion of laptops with dongles

<table>
<thead>
<tr>
<th>Total</th>
<th>Jan-08</th>
<th>Feb-08</th>
<th>Mar-08</th>
<th>Apr-08</th>
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<td>244,000</td>
<td>330,000</td>
<td>428,000</td>
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<td>686,000</td>
<td>830,000</td>
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Net additions

- 55,000
- 69,000
- 86,000
- 98,000
- 125,000
- 133,000
- 144,000
- 163,000

5.6x increase in 7 months

With HSDPA, operators can market “mobile broadband” instead of “3G”

Dongle subscribers will usually have a mobile phone as well – this is almost entirely additional revenue

Unlike fixed broadband, mobile broadband’s market is individual consumers, not households

Source: Ovum, 2008

Source: Infonetics

Source: Ovum
The case for 3G in developed markets
Telstra Australia: 3G effect on ARPU

Telstra postpaid ARPU at end 2007

- 3G subscribers are:
  - 35% of Telstra’s total subscriber base
  - 60% of Telstra’s postpaid base

- 46% higher

Source: Ovum, 2008
The Question:
Can this success be replicated in emerging markets?
Finland’s entire population of 5 million is exceeded by the urban population alone of most emerging nations – given the right approach, the potential market for 3G is there

Source: World Bank Development Indicators 2006
Conclusions

Regulators moving towards technology neutral licenses and starting to allow WCDMA in 900 MHz

WCDMA 900 MHz user equipments are arriving to market

Already several operators are deploying WCDMA in 900/850 MHz

The challenge is how to successfully accommodate WCDMA into GSM band

Nokia Siemens Networks offer a complete e-2-e solution for efficient WCDMA Refarming
Thank you