Market Opportunities for CDMA 450

IA450: International Association of 450 Operators
CDMA 450 Workshop

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BDA China
www.bdachina.com
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BDA China: telecom, media & technology (TMT) research and consulting services

- BDA provides research and consulting services to leading TMT firms and investors, with a focus on China and emerging markets and technologies in Asia.


- BDA has dedicated analysts organized around three sector groups:
  - Handsets/Devices
  - Fixed Line & Wireless Equipment & Services
  - Internet/New Media

- BDA offers the following Research Advisory Services:
  - Handset Advisory Service
  - Telecom Advisory Service
  - New Media Advisory Service
  - Mobile Data Advisory Service
  - Customized Retainer
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As developed markets reach mobile saturation, the driver of growth has shifted to emerging markets.

Emerging markets today
- c.1 billion subs of 4.5 billion total population (22% penetration)
- 3.5 billion remain un-served

Emerging markets include the following countries by rank of un-served population: India, China, Indonesia, Pakistan, Bangladesh, Nigeria, Brazil, Vietnam, Ethiopia, Mexico, Egypt, Iran, Russia, Congo Democratic Rep, Philippines, Myanmar, Sudan, Tanzania, Thailand, Turkey, Ukraine, Colombia, Afghanistan, Kenya, Algeria, Nepal, Uzbekistan, Uganda, Iraq, Zimbabwe, Malaysia, Tunisia, Congo Republic.

Source: Informa, BDA
Within emerging markets, rural areas are the biggest un-served market: CDMA 450’s wide coverage appeals

- CDMA’s 450 promise is to help bring affordable telephony to the world’s rural markets

- Asia and Africa are now the key drivers of CDMA 450 uptake, taking over from the earlier growth hotspot of Russia and the CIS countries

- CDMA 450’s crucial appeal is wide area coverage with a limited number of base stations, enabling commercially viable WLL solutions

- China is a key determinant of CDMA 450’s success. Chinese vendors Huawei and ZTE are major engines of the technology’s international proliferation and achievement of economies of scale. The extent of future deployment of CDMA within China is an important factor, as well as handset prices.
CDMA 450’s global footprint is expanding: The number of commercial networks doubled in 2005

- By Q1 2006, 29 operators in 22 countries had deployed CDMA 450 networks
- The number of subscribers served by CDMA 450 networks (operating under government-approval) is forecast to reach 3 million in 2006, an increase from approximately 1.1 million in Q3 2005.

Source: Informa, CDG, BDA
Africa and Asia are key hotspots of CDMA 450 deployment, fueled by Chinese vendor activity.

- Following the early lead of Russia and the CIS countries, operators in Africa and Asia are key new members of the global CDMA 450 club, joining in 2005 and 2006 to date.
- New deployments in Africa are expected later this year.
- Chinese vendors Huawei and ZTE, and North America’s Nortel and Lucent, are key vendors to the CDMA 450 community. Existing deployments include:

Source: CDG, BDA
Key attractions of CDMA 450: Spectral efficiency, network flexibility and industry value chain

**Spectrum**
- CDMA 450 provides a larger cell size compared to other bands, translating to fewer cell sites and reduced capex.
- 3G voice and data can offer high spectral efficiency.
- CDMA 450 offers IMT-2000 services such as high-quality voice and high-speed data access, while requiring only a small amount of spectrum (less than 1.8 MHz including guardbands).

**Networks**
- Enabling direct transition from 1st to 3rd generation networks and services.
- Low capex profile. Ability to serve both fixed and mobile users.
- Integration/complementarity of existing infrastructure.
- Variety of service segments supported with the same network.
- Expanded coverage afforded by a lower frequency band.

**Value Chain**
- Multimode / Multiband chipsets will allow users to operate on networks of different standards.
- Supported by a variety of vendors, including fast-growing Chinese vendors which have a particular focus on emerging markets and low-cost equipment.

*Source: Qualcomm, BDA*
Belarus: Nationwide coverage and the first CDMA 450 commercial roaming network

- Phase 1: Minsk City
- Phases 2 & 3: Minsk Prefecture
- Phase 4: Whole Country

- Total BTS upon completion of all 4 phases: 95
- First CDMA 450 Roaming Network in the world with Delta Telecom of St. Petersburg, Russia

Source: Huawei, BDA
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Infrastructure and handset vendors supporting CDMA 450 include fast growing Chinese and Korean vendors.
Nortel and Lucent are mainly focused on the European market for CDMA 450

- Nortel has supplied 3 commercial CDMA 450 operators all of whom are in Europe
  - Nortel had an early start (1995) in CDMA area since 1995 and has designed and deployed CDMA networks for more than 65 operators across 17 countries.
  - Nortel has expanded its CDMA networks operating in the 450 MHz radio spectrum into Central and Eastern Europe
  - Overall CDMA revenues were USD 2.3 billion in 2005

- Lucent has supplied 7 commercial CDMA 450 operators in 4 countries
  - Lucent started to trial CDMA 450 from September 2000 with Westel Radiotelephon Ltd and Qualcomm technology in Budapest, Hungary.
  - Mobility revenues were USD 4.6 billion in 2005

Source: Company information, BDA
Huawei and ZTE are key CDMA 450 infrastructure providers

- **Huawei has supplied over 18 commercial CDMA 450 operators**
  - Huawei is the world’s leading CDMA 450 supplier
  - c.40,000 employees, of whom 48% are R&D staff.
  - Headquartered in Shenzhen, China with R&D centers in China (Beijing, Shanghai, Nanjing), India, Sweden, Russia and the US.
  - Revenues of c. USD 6 billion in 2005

- **ZTE has supplied over 8 commercial CDMA 450 operators**
  - ZTE is also based in Shenzhen, China, and has 13 wholly-owned R&D centers worldwide. Invests over 10% of revenues into R&D each year.
  - Revenues of USD 2.6 billion in 2005
  - Listed on the Hong Kong Stock Exchange
  - Exports CDMA 450 products to India, Vietnam, Romania and CIS countries.

Source: BDA
Huawei has an extensive CDMA450 international footprint

- Selected Huawei CDMA 450 commercial systems:
  - Belcel (Belarus)
  - Uzbektelecom (Uzbekistan)
  - Lberiatel (Georgia)
  - Catel (Azerbaijan)
  - Cotecal (Argentina)
  - Cambodia (Cambodia)
  - China Telecom (China)
  - Mandara Selular (Indonesia)
  - Lao Telecommunications (Laos)
  - Telekom Baltija (Latvia)
  - Telecom Malagasy SA. (Madagascar)
  - JSC Moldtelecom (Moldova)
  - Telecomunicações de Mozambique (Mozambique)
  - Great Bear Int’l Services (Pakistan)
  - Pakistan Telecommunication Company Limited (PTCL) (Pakistan)
  - Volga Telecom (Russia)
  - Telekom Mobile Inc. (Uzbekistan)
  - Vietnam Power Telecom (Vietnam)

Source: Company Information, BDA
Focus on Huawei: Strong growth in 2005 driven by exports

- Huawei’s revenues grew 46% YOY in 2005
- International business (contract revenue) grew 106% in 2005
  - USD 4.7 billion in contract revenues and contributing 58% of total contract revenues
  - Middle East/Africa + Asia (ex. China) = 46% of revenues
- In 2006, Huawei expects revenue growth of 30% (USD 7.8 billion in accounting revenues, USD 10.7 billion in contracts)

Source: Huawei, BDA
ZTE’s overseas sales rose 68% in 2005, while domestic sales fell 17%.

- At home, ZTE was hit by the full build-out by Unicom of CDMA 2000 1x and shrinking PHS investment in 2005

- ZTE’s international business is strongly concentrated in Asia and Africa.

Source: ZTE, BDA
Nortel deployed its first CDMA2000 1xEV-DO network operating in the 450 MHz in Czech Republic in 2004

- Eurotel provided a wireless broadband service with the CDMA 1X EV-DO network operating in the 450 MHz.
- With 224 base stations, Eurotel was able to provide coverage to 80 percent of the Czech Republic population through Nortel’s CDMA 450 network.
- Within five months of network launch, Eurotel had acquired more than 30,000 subscribers representing over 20 percent of the Czech Republic’s broadband connections.

Source: Company information, BDA
China’s policy of ‘Informatization’ has produced the world’s largest mobile and fixed user base.

Mobile, Fixed, Internet and Broadband Subscribers

*Note: Fixed includes c.90 million fixed wireless PHS/Xiaolingtong subscribers. Mobile subscriber figure is number of active SIM cards, BDA estimates unique users represent c. 70% of this number.

Source: MII and CNNIC
China’s 3G challenge: Promoting local technology is in conflict with operator preference

**BDA view**

- 3G licenses may be delayed to 2H 2006, with some risk of further delays.
- TD-SCDMA is a certainty with licenses likely to be issued early to give the standard a head start.
- Operator restructuring remains a question mark.
- Before licensing, and beyond, the rural market opportunity holds great appeal.

*Source: BDA*
With mobile penetration at 30%, many urban markets are saturated - rural subs are becoming key.

- China Mobile is one of the most aggressive operators investing in rural markets.
  - China Mobile has invested nearly RMB 9 billion (USD 1.1 billion) in the rural telecom market since 2004, connecting over 25,000 villages.
  - In 2006, China Mobile plans to further expand its service coverage in rural area in 2006.

- China Mobile considers the rural market a key growth driver and is trying different ways to develop its business in there.
  - Designing customized products and sales packages suited to rural consumption patterns.
  - Utilizing existing resources in rural areas to build sales and a marketing service at low cost.
  - Customizing services to meet the needs of customer from rural markets.
  - Using low cost technology and solutions to build network.
  - Working with handset vendors to supply low price products to lower the entry threshold.

Source: China Mobile, BDA
When 3G comes China Mobile will focus on high-traffic users in coastal areas - 3G is not relevant for rural areas

1. Reducing voice traffic pressure on 2G
   - The top 15% of China Mobile’s subscriber base accounts for 47% of all voice traffic.
   - China Mobile can significantly reduce voice traffic over its 2G GSM network by migrating high usage users to 3G.

   MOU as % of total
   - 25% 50% 75% 100%
   - Top 15% of users account for 47% of total MOU

2. 3G network deployment plan
   - China Mobile plans to upgrade its 2.5G network to 3G in 1st tier provincial markets within two years after 3G licensing.
   - China Mobile will leverage the extensive coverage of its 2G network and provide dual mode services initially.

Source: company information, BDA
In Tibet, CDMA 450 has proven extremely popular

- Tibet is the only province where China’s Ministry of Information Industry has formalized a universal service approach, which includes licensed deployment of CDMA 450 by China Telecom.

- 408 BTS with 7,000 sq km maximum coverage area each are deployed to cover all the towns in Tibet.

- Service was launched in early 2003.

- Uptake has been strong with 4,500 new subscribers per month, compared to 8,000 subscribers prior to the commercial launch.

- Total number of subscribers is estimated to be 260,000 as of 1Q 2006, close to 10% penetration of 2.7 million population.

Source: Huawei, BDA
In China a rival technology to CDMA 450 is taking shape: SCDMA

SCDMA

- SCDMA is a Chinese technology designed for the low end wireless market, especially the rural market.
  - Beijing Xin Wei, a subsidiary of TD-SCDMA promoter Datang, is the main supplier of SCDMA
  - Beijing Xin Wei had strong growth; revenues rose 37% YOY to RMB 3 billion (USD 375 million) in 2005.
    - Xin Wei won contracts from most operators in 2005, including China Unicom, China Tietong and China Netcom.
    - China Netcom has deployed SCDMA in southern China in an attempt to compete with rival China Telecom’s PHS/PAS networks in the region.
    - Only Xin Wei and its subcontractor Putian Group are producing SCDMA equipment.

- SCDMA now has approximately 3 million users; government backing has produced strong growth.
- However, BDA does not believe SCDMA will become a mainstream wireless technology due to the lack of vendor choice for carriers

Source: BDA Interview
Compared to SCDMA, CDMA 450 is a much more mature technology solution.

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<th>PHS</th>
<th>GSM</th>
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<tr>
<td>Frequency band</td>
<td>450 MHz</td>
<td>1785-1805 MHz &amp; 406.25-409.25 MHz</td>
<td>1900-1920 MHz</td>
<td>900/1800/1900 MHz</td>
</tr>
<tr>
<td>Base station coverage</td>
<td>1.1-70 km</td>
<td>1-40 km</td>
<td>500 m</td>
<td>0-35 km</td>
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<tr>
<td>CAPEX</td>
<td>Low/Medium</td>
<td>Medium</td>
<td>Medium / High (if include backhaul)</td>
<td>High</td>
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<tr>
<td>Industry value chain</td>
<td>Mature</td>
<td>Immature</td>
<td>Mature</td>
<td>Mature</td>
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- **CDMA 450**: Infrastructure provided by major vendors including internationalizing Chinese players.
- **SCDMA**: Only Xin Wei provides SCDMA systems, and only Xin Wei & Putian make SCDMA handsets.
- **PHS**: Supported by international and Chinese vendors but growth prospects and innovation are fading.
- **GSM**: Dominant global technology supported by wide range of vendors.

*Source: BDA*
Q&A

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