Network deployment Solution for Evolution from 3G to TD-LTE

China Mobile
April. 2012
Outline

1. TDD Spectrum Allocation
2. Evolution from 3G to TD-LTE
3. Field Trial Results of Upgrading solution
4. Future Plans
### TDD Spectrum for China Mobile

<table>
<thead>
<tr>
<th>No.</th>
<th>Frequency</th>
<th>Range</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2.0G</td>
<td>2010-2025MHz</td>
<td>TD-SCDMA</td>
</tr>
<tr>
<td>F</td>
<td>1.9G</td>
<td>1880-1920MHz</td>
<td>TD-SCDMA/TD-LTE</td>
</tr>
<tr>
<td>E</td>
<td>2.3G</td>
<td>2320-2370MHz</td>
<td>TD-SCDMA/TD-LTE</td>
</tr>
<tr>
<td>D</td>
<td>2.6G</td>
<td>2570-2620MHz</td>
<td>TD-LTE</td>
</tr>
</tbody>
</table>

- Equipments with 1.9G/2.3G has been widely deployed around China.
- All these sites support upgrading to TD-LTE.
- Most of TD-LTE macro coverage can be provided by 1.9G.
- 2.6G will focus on TD-LTE capacity requirement.
Global 1.9G TDD Spectrum Allocation

- Band 39: 1880~1920MHz
- Band 33: 1900~1920MHz
- PHS: 1884.5 -1919.6MHz
Evolution from 3G TD-SCDMA to TD-LTE

- **Network infrastructure evolution**

  - TD-SCDMA
  - Core network
  - SGSN
  - NodeB
  - RNC
  - Iub
  - Iu

  - TD-LTE
  - Core network
  - MME/S-GW
  - eNodeB
  - S1
  - X2

  **RNC eliminated in TD-LTE network, related function integrated to eNodeB**

- **Base Station Products**

  - Most of TD-SCDMA products are distributed BBU+RRU
  - TD-LTE will also deploy distributed macro basestation at initial stage

  **Evolution from TD-SCDMA to TD-LTE based on distributed BBU+RRU mostly**
Upgrading Solution for 3G Base station

- **BBU**
  - Common hardware platform for TD-SCDMA and TD-LTE
  - TD-LTE baseband card deployed in the existing TD-SCDMA BBU
  - GPS、Backhaul、Power supply are shared

- **RRU**
  - Software upgrading, supporting TD-SCDMA/TD-LTE at the same time
  - Bandwidth、RF performance、output power meet dual mode requirements

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Bandwidth</th>
<th>Mode</th>
<th>Typical Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.9G</td>
<td>30/35M</td>
<td>Dual mode or TD-LTE only</td>
<td>(20M TD-LTE+ 10M TD-SCDM) or 30/35M LTE</td>
</tr>
<tr>
<td>2.3G</td>
<td>50M</td>
<td>Dual mode or TD-LTE only</td>
<td>2*20M TD-LTE+ 10M TD-SCDMA</td>
</tr>
</tbody>
</table>
Upgrading Solution for Antenna

• **1.9G Evolution**
  – More than 90% TD-SCDMA 8-antenna support 1.9G already
  – No change needed for antenna and cable

• **1.9G + 2.6G deployment**
  – FAD antenna ready since 2011, supporting 1.9G+2.0G+2.6G
  – Combiner inside for 1.9G RRU and 2.6G RRU
3G network Upgrade to TD-LTE is Verified

• Field trial information
  – Test location: Guangzhou, Shenzhen, Hangzhou
  – Base station construction: upgraded from and co-equipment with TD-SCDMA
  – Terminal: CPE, CAT4
3G network Upgrade to TD-LTE is Verified

• Test results
  – Peak throughput: 81.7-85.1Mbps, about 90.8%-94.6% of theoretical value
  – Cell throughput: 47.1Mbps (70% loaded), about 52% of system maximum capacity
  – Latency: User-Plane ~20ms, C-Plane ~86ms, agreeing with system design target
  – Network KPI:

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Attach Success Rate</td>
<td>98%-100%</td>
<td>Call Setup Success Rate</td>
<td>98%-100%</td>
</tr>
<tr>
<td>Paging Success Rate</td>
<td>100%</td>
<td>Handover Success Rate</td>
<td>99%-100%</td>
</tr>
<tr>
<td>Call Drop Rate</td>
<td>0-1%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

  – No obvious performance degradation to existing 3G networks

• Conclusions
  – Both TD-LTE and TD-SCDMA can work well after upgrade
  – Upgrade from TD-SCDMA is an efficient method to setup TD-LTE network
Conclusion from field test:

1.9G coverage performance is 2.3dB ~ 8.3dB better than 2.6G

<table>
<thead>
<tr>
<th>Outdoor Coverage difference</th>
<th>Los</th>
<th>NLos</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.9dB</td>
<td>4.5dB</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indoor Coverage difference</th>
<th>Shallow area</th>
<th>Deep area</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.9dB</td>
<td>7.8dB</td>
<td></td>
</tr>
</tbody>
</table>

CDF of 1.9G/2.6G Propagation Loss difference
1.9G Industry Progress

**Infrastructure Products**

- 3 vendors’ 1.9G RRU/BBU have been widely deployed in China, supporting 3G/TD-LTE dual mode
- Another 3 vendors will released 1.9G commercial products by 2012Q3

**Terminals**

- 1.9G MiFi is on commercial operation in Zhejiang, China
- 7 chipsets&terminal vendors will release 1.9G data card by 2012Q3
Commercial Activities in China

**Target:** Full coverage in most cities
1. upgrade from 3G TD-SCDMA BS
2. build new TD-LTE BS

<table>
<thead>
<tr>
<th>Year</th>
<th>Base Stations</th>
<th>Cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>20k</td>
<td>9</td>
</tr>
<tr>
<td>2013</td>
<td>200k</td>
<td>Major cities</td>
</tr>
</tbody>
</table>

- Commercial multi-mode terminal, smartphone
- Converged LTE TDD/FDD enables global roaming
Thank You