Providing the Spectrum to Fuel the 5G Eco-System
March 16, 2017

Vikram Tiwathia
Deputy Director General
COAI was constituted in 1995 as a registered, non-governmental society. COAI’s vision is to establish India as the global leader of innovative mobile communications infrastructure, products and services and achieving a national tele-density of 100%, including broadband. The association is also dedicated to the advancement of modern communication and towards delivering the benefits of innovative and affordable mobile communication services to the people of India.
Indian Telecom Sector
Vital Role in Government’s Nation Building Agenda

- Among Highest contributors in FDI in last two decades – INR 92,700 crores
- Among the highest contributors to Govt.: nearly INR 70,000 crores p.a.
- Lowest tariff in the world
- Over 5,000,000 villages covered
- Contributes 6.5% to India’s GDP
- Contributes directly to 22 Lakh employment and indirectly to 18 Lakh jobs
- 2nd largest private sector investment in infrastructure – INR 9,20,000 crores

Investment in Spectrum Auctions since 2010: INR 3,27,000 crores

* Source: GSMA The Mobile Economy India Report, 2016, Industry Estimates
Indian Telecom Sector Commitments for 2020

- Incremental Private sector investment in infrastructure by 2020 – INR 5,00,000 crores
- To provide data connectivity to next 1 billion citizens
- Number of M2M connections by 2020 – 72 million
- 100 smart cities

- Contribution to India’s GDP by 2020 – 8.2 % of total GDP
- 2,50,000 villages to be covered under BharatNet by 2017
- Contribute directly to 30 Lakh jobs by 2020

* Source: GSMA The Mobile Economy India Report, 2016, Cisco, Industry Estimates
Significant Role in Government’s Nation Building Agenda

10% increase in mobile penetration incur
0.60%-0.81% GDP increase
0.60% increase for high income economies
0.81% increase for medium and low income
World Bank (2009)

10% increase in high-speed internet connections
boosts annual GDP 1.38%
World Bank (2012)

10% substitution from 2G to 3G penetration
increases GDP per capita growth 0.15%
GSMA (2012)

Doubling of mobile data use
leads to a GDP per capita growth rate increase of 0.5%
1.2% for South Korea
0.5% for medium income economies
Negligible for low-income economies
GSMA (2012)

Source: GSMA; World Bank
Growing Broadband

- Between 2014 and 2015, mobile data traffic in India increased 89%.
- Mobile data traffic is expected to grow 12-fold between 2015 and 2020, a CAGR of 63%.
- This is ahead of growth in the Asia Pacific region overall, forecast at a CAGR of 54%.

Source: GSMA, CISCO VNI
1. India Ranks 36 in Global LTE Download Speeds, Up From 50 Last Year

2. Mobile data traffic will:
   a. Grow 12-fold from 2015 to 2020, a compound annual growth rate of 63%.
   b. Reach an annual run rate of 20.6 Exabytes by 2020, up from 1.8 Exabytes in 2015.
   c. Grow 2 times faster than fixed IP traffic from 2015 to 2020. Account for 34% of Indian fixed and mobile data traffic by 2020, up from 11% in 2015.

3. Number of smartphones grew 52% during 2015, reaching 239 million in number.

4. Number of smartphones will grow 2.9 fold between 2015 and 2020, reaching 702 million in number.

5. No. of PAN India 4G BTSs : approx. 4,00,000
Smart Infrastructure

Convergence

IoT/M2M

M2M/IoT enables seamless communication by making the ICT ecosystem domain ‘intelligent’

Smart Cities/Communities

New Supply Chain model & Regulations
Financial Inclusion

Mobile a key instrument in JAM (Jan Dhan, Aadhar and Mobile) trinity

Cashless Transactions have increased 22% in 2016; Mobile is fastest growing

Source: Reserve Bank Of India, Monthly Bulletins for 2016
Government of India Programmes

- National Optical Fibre Network Project
- Make in India
- Broadband for all
- Smart Cities Mission
- Digital India
<table>
<thead>
<tr>
<th>Initiative</th>
<th>Broadband</th>
<th>NOFN Restructured as BharatNet</th>
<th>Smart Cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Ahead</td>
<td>~3600 villages every month</td>
<td>150,000 Villages by Mar 2018</td>
<td>100 Cities by 2020</td>
</tr>
<tr>
<td>Achievement</td>
<td>218 million in Nov 2016</td>
<td>20,000 in Mar 2015</td>
<td>List of 20 cities announced</td>
</tr>
<tr>
<td>Target</td>
<td>600 million by 2020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source: TRAI Recommendations on Delivering Broadband Quickly: What do we need to do?; TRAI</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Spectrum Requirements for Mobile Broadband Services

<table>
<thead>
<tr>
<th>BAND</th>
<th>USAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>700 MHz</td>
<td>New spectrum for LTE, in some markets previously used for TV, referred to as “digital dividend” band</td>
</tr>
<tr>
<td>1800 MHz</td>
<td>Originally only used for GSM and CDMA, progressive redeployment to 3G HSPA and recently to LTE</td>
</tr>
<tr>
<td>2100 MHz</td>
<td>Originally only used for GSM, progressive redeployment to LTE</td>
</tr>
<tr>
<td>800/900 MHz</td>
<td>Currently used for 3G, upgrading to dual carrier HSPA+ and LTE</td>
</tr>
<tr>
<td>2300 MHz</td>
<td>Originally used for WiMax, now a standardised LTE band for capacity</td>
</tr>
<tr>
<td>2500 MHz</td>
<td>New capacity band for LTE</td>
</tr>
</tbody>
</table>
5G CAPABILITIES

Source: 5GPP, European Commission
## Outcomes of WRC-2015 for India

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Band (MHz)</th>
<th>Amount (MHz)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>470-698</td>
<td>228</td>
<td>Supported at WRC-15, but not included in Footnotes.</td>
</tr>
<tr>
<td>2</td>
<td>1427-1452</td>
<td>25</td>
<td>Supported at WRC – 2015</td>
</tr>
<tr>
<td>3</td>
<td>1452-1492</td>
<td>50</td>
<td>Supported at WRC – 2015</td>
</tr>
<tr>
<td>4</td>
<td>1492-1518</td>
<td>26</td>
<td>Supported at WRC – 2015</td>
</tr>
<tr>
<td>5</td>
<td>3300-3400</td>
<td>100</td>
<td>Supported at WRC – 2015</td>
</tr>
<tr>
<td>6</td>
<td>3400-3600</td>
<td>200</td>
<td>Supported at WRC – 2015</td>
</tr>
</tbody>
</table>
# Spectrum Considerations for 5G at WRC – 2019

<table>
<thead>
<tr>
<th>S No.</th>
<th>Working Group</th>
<th>Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>WG 2 – 30 GHz</td>
<td>Sharing and compatibility studies: 24.25 – 27.5 GHz, 31.8 – 33.4 GHz</td>
</tr>
<tr>
<td>2.</td>
<td>WG 3 – 40/50 GHz</td>
<td>Sharing and compatibility studies: 37 – 40.5 GHz, 40.5 – 42.5 GHz, 42.5 – 43.5 GHz, 45.5 – 47 GHz, 47 – 47.2 GHz, 47.2 – 50.2 GHz, 50.4 – 52.6 GHz</td>
</tr>
<tr>
<td>3.</td>
<td>WG 4 – 70/80 GHz</td>
<td>Sharing and compatibility studies: 66 – 76 GHz, 81 – 86 GHz</td>
</tr>
</tbody>
</table>
## Status of 5G Spectrum Bands in India

<table>
<thead>
<tr>
<th>S No</th>
<th>Frequency Ranges (GHz)</th>
<th>Sub Ranges (GHz)</th>
<th>India Remarks</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24.25-27.5</td>
<td>24.5-26.5</td>
<td>IND79</td>
<td>LMDS (Local Multipoint Distribution Service)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25.5-27</td>
<td>IND79</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>31.8-33.4</td>
<td>NA for Mobile</td>
<td>NA for Mobile</td>
<td>NA for Mobile</td>
</tr>
<tr>
<td>3</td>
<td>37-43.5</td>
<td>37-40</td>
<td>IND80</td>
<td>HCDN (High Capacity Dense Network)</td>
</tr>
<tr>
<td>4</td>
<td>45.5-50.2 50.4-52.6</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>51.4-52.6</td>
<td>IND80</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>66-76 81-86</td>
<td>64-66 71-76 81-86</td>
<td>IND80 IND81</td>
<td>HCDN (High Capacity Dense Network)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IND81</td>
<td>FDD (Frequency Division Duplex)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TDD (Time Division Duplex)</td>
</tr>
</tbody>
</table>
Recommendations

1. Indian needs to actively participate at all ITU meetings (WP, JTG, etc.)
2. Coordination with Defence on L Band for early adoption
3. Need to provide India inputs to the upcoming JTGs for Indian needs in the WRC identified spectrum bands for 5G
4. On UHF Band ask is:
   a. Requirements of fixed and IMT applications will be considered in the frequency band 470-520 MHz and 520-585 MHz on case-by-case basis.
   b. The requirement of IMT applications, Digital Broadcasting Services including Mobile TV may be considered in the frequency band 585-614 MHz subject to coordination on case-by-case basis.
   c. The requirement for IMT and Broadband Wireless Access will be considered in the frequency band 614 – 698 MHz.
5. Reserve Price of spectrum needs to be reduced. In Oct 2016 auction, around 80% of the spectrum offered went unsold, 100% in 700 MHz was unsold.
6. Need for urgent opening up of E&V bands for backhaul for enhancing broadband coverage in the short time frame for the national objectives.
Thank you

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