NEXT GENERATION SPECTRUM MANAGEMENT USTTI, WASHINGTON DC



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Future Areas of Focus

• Future is unpredictable-Transformative Agenda of disruptive technologies

• 5G

- Spectrum Management
- Infrastructure sharing
- Consultative approach- Policy and Regulatory Decisions



What Next ? Do we really Know?

- Future is nearer than what we think
- Infrastructure competition may not be sustainable.
- Future may have type of services using digital connectivity platform which you and me may not imagine today.



5G Deployment

- There are around 100 commercial 5G operations having around 100 Mn 5G subscribers
- 5G covers mainly three type of services:
 - High speed broadband
 - IoT
 - Low latency applications
- Separation of Radio Unit(RU), Distribution Unit (DU), and Central Unit (CU)-Virtualization, Softwareization and Telecom cloud
- End to End Network slicing
- Beam splitting
- Mobile Edge Computing(MEC)
- Mobile Cloud



5G Services: beyond voice and data

5G will bring disruptive changes and new opportunities in many areas





REGIONAL PROJECTIONS

 GSMA expects 5G to represent 20% of global mobile connections by 2025 but with much lower penetration in Latin America, Northern and Sub-Saharan Africa:



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- Half the 5G network launches in 2019 were in emerging economies (22 out of 44).
- 5G adoption in developing countries may be slower because the 4G build-out is still unfinished and 4G is both a practical alternative to 5G at low data traffic levels and a stepping-stone to 5G at high traffic levels.
- 5G's affordability- if all feasible measures are applied to reduce the cost of 5G build out, nationwide coverage is achievable in most low- to middle-income countries. Due to geography and population distribution, however, there may still be areas of market failure which require social subsidies or some other regulatory intervention as a last resort to ensure universal availability of service.



- COVID-19 has impacted 5G deployments and equipment production around the world, with losses of customer demand, business closures, travel bans, delayed equipment deliveries and installers staying home during lockdowns.
- Some countries cancelled or postponed their 5G spectrum auctions (*e.g.* Austria, Brazil, France, India, Poland, Portugal, Russia, Spain and elsewhere). This will delay deployments in those countries.
- On the other hand, some countries saw increased demand for 5G. China signed up 48.3 million new 5G subscribers in the first quarter of 2020, ten times as many as predicted. Thailand accelerated 5G installations in hospitals to support medical workers. Korea put 5G in the center of the Digital New Deal for Post COVID19 stimulus package.
- As one analyst put it: "The spread of COVID-19 has indeed been a global challenge, but it has also been a platform for illustrating that 5G has been designed to be much more than just a consumer-focused mobile broadband network."



- There is a risk that the same technologies making 5G spectrally efficient and capable of supporting millions of nodes in an Internet of Things will also increase energy consumption.
 - GSMA: "5G-era networks will be much more efficient on a per-bit basis. However, they are set to carry many more bits over more cell sites powered by energy-hungry Massive MIMO antennas, so 5G-era operators could face up to 2-3 times higher energy costs versus 4G."
- The mobile industry contributes just 1.3% to global carbon emissions and greatly reduces the carbon footprint of other industries.
- Nevertheless about one-third of the world's MNOs have committed to reducing their greenhouse gas emissions by 45% by 2030. This would be achieved by phasing out 2G and 3G networks and by using electricity from low-carbon sources.



KEY MESSAGES: CLIMATE CHANGE?



Mobile networks electricity consumption (and total human subscriptions)

Source: "Recommendation ITU-T L.1470: Greenhouse Gas Emissions Trajectories for the Information and Communication Technology Sector Compatible with the UNFCCC Paris

Agreement." January 2020.



What sets 5G apart from 4G?

Mobilizing mmWave; New frontier of mobile broadband







SHANNON'S THEOREM -WHAT DOES IT TELL?

Bandwidth(BW) increase is the only solution to enhance the channel capacity(C) beyond a limit



Shannon's Law: C = BW x log₂(1 + SNR)



Spectrum Management

- Future wireless technologies will be driven by massive bandwidth , low latency as well, but high bandwidth is a big differentiator.
- About eight years ago, 4G services were launched with 10X10 MHz spectrum in different sub 3 GHz bands but today we are talking about 400 MHz to a Gig bandwidth. With more than ten fold increase in spectral efficiency the uplink and downlink data speeds will be in multiple Gigs.
- Even the current technology launch will easily achieve 1 GBPS peak speed
- Use of MM wave (6-100 GHZ frequency range) will have its own challenges to the industry and regulators like small cell configurations in dense urban areas
- Government has a monopoly in supplying spectrum



Risks of Increasing Digital Divide

- Deployment of 5G infrastructure is most likely to happen in dense urban areas to provide a return on investment not the rural areas that are commonly underserved.
- Because of its integrated nature with vertical sectors, investment in 5G can determine the competitiveness of economy as a whole.





Infrastructure sharing

Challenge: How to reduce the cost of investing in 5G deployment?

Policy Consideration

- 1. passive infrastructure sharing: duct, poles, towers, lampposts, traffic signals, cabinets, etc. (Best Practice)
- Mandated network sharing
 - Netherlands(Nov 2017), to accelerate broadband roll-out
 - Indonesia, new rules to encourage passive infrastructure sharing
 - UK, Ofcom, a market consultation to mandate incumbent and SMP to offer duct fiber access
 - Italy, Utility companies' assets
- ✓ Commercially driven network sharing
 - Spain(MASMOVIL+Orange Espana); Portugal(Vodafone+NOS), Cameroon(Vodafone Cameroon + CamTel), Denmark(Telenor Denmark+Telia Denmark+Nokia /TT-
- 2. independent wholesale infrastructure providers (Best practice)
- ✓ New Zealand Chorus, calling on the government a single 5G mobile network



Streamlining regulation

Challenge: How to remove or relax regulatory barriers blocking the deployment of small cells ?

Policy Considersation

- 1. Streamline regulations related to 5G small cell deployment (Actions required)
- Grants providers non-discriminatory access to public property
- ✓ Standardize the right of way agreement and procedures of approval
- ✓ Limit the costs charged by local governments
- ✓ Hold a central database identifying key contacts, showing assets

(Best Practice)

- ✓ US, FCC The 5G FAST Plan, DECLARATORY RULING AND THIRD REPORT AND ORDER
- ✓ US California, Florida, Washington state
- ✓ London, Standardized right of way agreement toolkit



Incentivizing private investment

Challenge: How to accelerate 5G deployment when Telcos are skeptical about ROI

* High levels of investment needed in small cells, backhaul, edge computing, and new core network

Cost Estimate

For US nationwide coverage

 Ovum(T-mobile US), \$25 billion ~ Barclays, \$300 billion

For Europe wide coverage

EC, \$64 billion ~DT,
 \$335~\$558 billion

Small Cell Deployment

Software upgradeability

Policy Consideration

1. Policy makers' actions will make a difference (Actions required) tax, grants, loans, investment fund, PPPs, infrastructure sharing

(Best practices)

- Korea, tax incentives(3% of total investment)
- UK, grants to local government; Malaysia, low-cost loans
- PPP
 - Publicly led: Qatar, government builds/owns fibre networks
 - Privately led: Germany, gov't partly funds the deployment of fibre networks



Consultation Process

- All policy and regulatory decisions should be taken in consultation with various stakeholders
- We suggest to streamline the consultation process.
 The World Bank team will be very happy to share international experience in this regard.



Thank you !

