Economic and financial challenges of spectrum

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Main goal of spectrum management

To ensure that adequate spectrum is provided over both the short and long term for public service organizations to fulfil their missions for public correspondence, for private sector business communications, and for broadcasting information to the public

Main objective of spectrum management

Spectrum management system must provide an orderly method for allocating frequency bands, authorizing and recording frequency use, establishing regulations and standards to govern spectrum use, resolving spectrum conflicts, and representing national interests in international fora

Spectrum utilization efficiency

$$SUE = \frac{M}{U} = \frac{M}{B * S * T}$$

where:

***M* – useful effect obtained with the aid of the communication system in question;**

***U* – spectrum utilization factor for that system;**

***B* – actual measurement result on occupation bandwidth (or regional statistics)**

***S* – actual measurement result on coverage area (or regional statistics)**

***T* – actual measurement result on operating time (or regional statistics).**

Source: Recommendation ITU-R SM.1046-3 Definition of spectrum use and efficiency of a radio system (2017)

Main challenges for government

- **Effective provision of emerging telecommunication/ICT services for consumers (tariff regulation, competition regulation, digital literacy, incentive methods)**

- **Bridging the Digital Divide (provision of services on equal rights for all of consumers)**

- **Socio-economic efficiency of spectrum management**

Main challenges for operators

- Effective provision of emerging telecommunication/ICT services for consumers (marketing, tariff design, increasing the revenue)
- Increasing the Digital Divide (provision of services in economical attractive areas)
- Economic efficiency of spectrum management

Main challenges for customers

- Consuming of emerging telecommunication/ICT services (buying the equipment, acquiring the skills)
- Subject of the Digital Divide
- Socio-economic efficiency of spectrum management

Digital Economy

- The same laws as for traditional one
- Drastically increasing the use of information and ICT
- Bridging the Digital Divide – main objective to implement Digital Economy nationally

Digital Economy (consequences)

- Spectrum becomes more valuable than ever
- Determination of economic/socio-economic value of spectrum are necessary by all means

Distribution of spectrum

- Administrative decision (non-economical method)
- Beauty contest (semi-economical method)
- Auction (economical method)

Beauty contest

- Spectrum fees
- Operators not pay one-time big amount of money for spectrum
- Regulator provides the set of requirements and demands
- Socio-economic value of spectrum

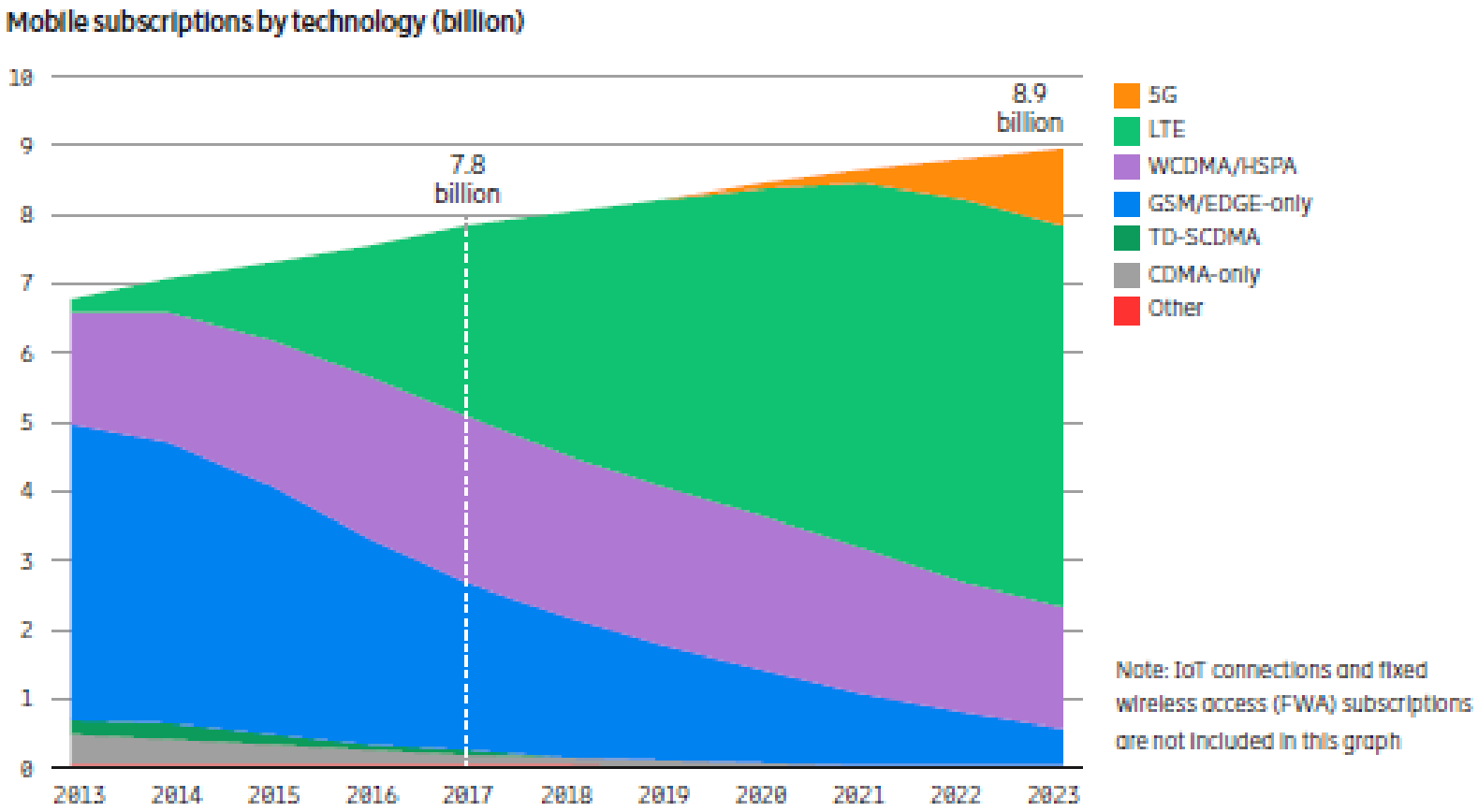
Auction

- Auction price
- Operators not face the big set of requirements and demands for acquiring the spectrum
- Economic value of spectrum

Consequences of mass move to auctions

1. Operators spend massive amount of money on one-time basis
2. Less money for constructing new networks and developing of current
3. 2G/3G/4G/5G simultaneous maintenance
4. Increasing the Digital Divide
5. Fail to implement the Digital Economy

Layered cake of modern mobile communications



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5G Frequency Plans

Main

- **3,5 GHz: ~100 MHz/operator, global harmonization**
- **26-28 GHz: ~ 800 MHz/operator, outdoor-only/hotspot**

Additional

- **600/700 MHz: ~20 MHz/operator, most business cases**
- **2600 MHz: ~40 MHz/operator**
- **4,8; 37 GHz; 40 GHz: TBD**

5G Field Trial

10 Cells @ 3.5 GHz / 100 MHz bandwidth:

- **1 Gbps outdoor, 100 Mbps indoor**

2 Cells @ 28 GHz / 800 MHz bandwidth:

- **20 Gbps within 100 m**
- **~5 Gbps on 100-250 m**
- **nearly the same speed as for 3.5 GHz on 250-400 m**

Regulatory approaches

- Sharing the infrastructure and spectrum
- Determination the method of spectrum valuation
- Lowering the burden on operators providing services on economical non-attractive areas
- “Freezing” the decisions on spectrum utilization before adequate implementation of current networks will be reached

International Telecommunication Union

Thank you very much!!!