



# **OUTLINE**

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### Introduction

- Policy makers have recognized the importance of widespread deployment and timely take-up of very high capacity networks as the key enabler for digitalization.
- The role of 5G is emphasized in revolutionizing the traditional mobile business ecosystem to serve vertical sectors' specific needs.
- This is based on dense small cell network deployments in specific areas – still by the traditional mobile network operators (MNOs).



### Trends of change

From exclusivity in spectrum To operation in shared spectrum access rights bands From sharing between an To inter-operator spectrum sharing operator and an incumbent From outdoor macro cell To indoor small cell networks deployments From small number of dominant To emergence of a large number of **MNOs** local network operators From owning infrastructure To leasing network slices ondemand From a small number of nation-To a large number of local wide spectrum licenses spectrum licenses

Matinmikko, M. Latva-aho, P. Ahokangas, and V. Seppänen. On regulations for 5G: Micro licensing for locally operated networks. Telecommunications Policy, vol. 42, no. 8, pp. 622-635, Sept. 2018.

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### Emergence of a large number of local networks

- Vertical sector specific local cellular networks are gaining increasing interest but are still rare today.
- Majority of 5G research considers MNO driven deployments.
- University of Oulu has actively promoted the emergence of local 5G networks deployed by different stakeholders to serve verticals' specific needs (aka. micro operators).

#### Micro operators: Regulatory building build and operate small cell blocks: Technical building communication infra -Local micro licenses blocks: and offer local context related -Rights to build indoor -Dense small cell networks services and content networks -Network virtualization -Rules for collection and **Business** -Spectrum sharing and use of data management techniques models -Competition rules

Local 5G micro operators can operate a closed network for its own customers, act as neutral host for MNOs' customers, or serve both.



## Role of regulation

- Regulation is in the key position to shape the business ecosystem by promoting or stopping any development.
- Mobile operator business is highly regulated especially through the awarding of specrum licenses. There are differences between countries.
- In principle, stakeholders' conflicting views are brought together in regulation to promote innovation and competition. In practise, the dominance of MNOs prevails.



# Role of spectrum regulation

- Wide range of spectrum in 5G lots of new spectrum becomes available.
- Most of the first 5G spectrum decisions in 3.5 GHz (e.g., Finland, Italy, UK) follow traditional path giving rights to deploy cellular networks only to MNOs.
- Some countries (e.g., Germany) allow local vertical specific service provider networks to emerge through local licensing.

### **Exclusive licensing:**

Small number of license holders, long-term availability, high price, wide coverage => Free from harmful interference

#### Spectrum micro licensing:

Local access rights for a large number of stakeholders Coordination between licensees => Free from harmful interference => Efficient protection of incumbents while making spectrum available

#### License-exempt:

Anyone can access, no fee, potentially a large and varying number of users => No protection from harmful interference





### Business ecosystems

- MNOs' traditional voice and text services have been replaced by mobile data making them bit-pipes. Role of Over-The-Top (OTT) services has grown.
- There will be a wide range of new business ecosystems emerging around the specialised verticals such as industries already in 5G. The stakeholder roles will change.
- 6G development should early on consider the emergence of a large number of locally deployed cellular networks where the users can easily move between the networks. This would result in totally new business ecosystems around 6G.

Scalable small Local connectivity for MNOs customers; cell network and collaborations to use infrastructure on MNO infra demand Locally tailored Permission to services and deploy networks; operator local services and Devices for Local spectrum collecting and licenses; rules using local data in governing various sectors collaborations



### Conclusions

- 5G was expected to change the mobile business ecosystem with local vertical specific networks but still the MNOs remain the major stakeholder. However, new vertical specific ecosystems will emerge in 5G.
- Starting point in 6G should be to allow different stakeholders to deploy their own local networks to complement MNO offerings.
- Spectrum access rights in 5G/6G should cover a range of sharing-based approaches to allow locally deployed networks.
- As a result, totally new 6G business ecosystems will emerge.



### References

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