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Micro operator concept to boost local services in 5G era

Towards 5G Enabled Gigabit Society

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Outline

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- **Assumptions for Smart City**
- **Spectrum valuation**
- **Micro operator concept**
- **Conclusions**



Introduction



Introduction

- **Policymakers have recognized the importance of widespread deployment and timely take-up of very high capacity networks as the key enabler for digitalization.**
- **5G will revolutionize the traditional mobile business ecosystem to serve vertical sectors' specific needs by connecting billions of devices.**
- **The development is based on local dense small cell network deployment in specific high demand areas. This will assume to adopt new approaches in spectrum policy.**
- **Market will be opened for new players.**



6Genesis



Vision for 2030

Our society is data-driven, enabled by near-instant, unlimited wireless connectivity.

6G will emerge around 2030 to satisfy the expectations not met with 5G, as well as, the new ones fusing AI inspired applications in every field of society with ubiquitous wireless connectivity.

2030



National Flagship on Wireless Communications

- National Flagship for 2018-2026
- 6G Enabled Wireless Smart Society & Ecosystem (6Genesis); volume 251M€.
- Operated by UOulu, in collaboration with: Nokia, VTT, Aalto University, BusinessOulu, Oulu University of Applied Sciences.
- Flagship Director: Prof. Matti Latva-aho (matti.latva-aho@oulu.fi)

RESEARCH AREAS:

Wireless Connectivity

Ultra-reliable low-latency communications



Unmanned processes

Devices & Circuit Technology

THz communications materials & circuits



Unlimited connectivity

Distributed Computing

Mobile edge intelligence



Time critical & trusted applications

Services and Applications

Multidisciplinary research across verticals



Disruptive value networks

Click for video

Vision 2030: Society is data driven enabled by unlimited wireless connectivity

www.6genesis.org

https://www.youtube.com/watch?time_continue=10&v=T6ubRoZCeVw



Assumptions for Smart City



Assumptions for Smart City

- To enable future proof highly localized services Smart Society will be composed of many entities from technical, stakeholder and regional aspects.
 - Technical requirements assume high scalability and interoperation. Instead of giant players this welcomes ecosystemic approach to ensure successful offering of services. Regional requirements will set strict demands to scale from tiny locations to large regions.
 - To react in highly local requirements it probably sets challenges for MNOs due to capability or business reasons. Some giant MNOs have shared this concern.
- **Micro operator concept is proposed to tackle the concern.**

Trends of change with 5G and beyond

Today:

- Small number of big mobile network operators (MNOs) dominate the mobile market with equal service offerings
- Wide area spectrum licenses are auctioned for tens of years
- Market entry for new players is high due to high investment barrier

Future:

- Local service demand grows in digitalization of different verticals especially in indoors
- There is growing need for location specific high-quality small cell networks
- Sharing based spectrum access and infrastructure deployment models become common

Challenges:

- Existing regulation do not support local and specialized operator businesses
- How different stakeholders can get local spectrum access rights?
- There is a need for a new mobile business ecosystem to speed up digitalization



Spectrum valuation





What is different in 5G?

- **Advanced spectrum sharing techniques and models are getting more and more mature (see LSA and CBRs).**
- **Operations in higher carrier frequencies limit the network coverage but also interference to local areas.**
- **Vertical specific service delivery requires specialized networks with different requirements.**
- **Spectrum sharing brings new and changing stakeholder roles.**
 - Different types of entrants: MNOs and local 5G operators
 - Incumbent spectrum users' rights – value of spectrum
 - Need for spectrum brokerage functions



Spectrum valuation

- **Spectrum management decisions aim at maximizing the value of spectrum, its efficient utilization and benefits to the society, which calls for a thorough understanding of spectrum valuation approaches.**
- **True benefits of 5G can only be achieved with local 5G networks for vertical specific service delivery, which requires assignment of local spectrum access rights to different stakeholders.**
- **Prior research on spectrum value for mobile communications has considered engineering value, economic value and strategic value from the mobile network operator (MNO) viewpoint.**
- **There is no research on spectrum valuation to help regulators in their 5G spectrum decisions with the emergence of local 5G networks.**
- ***How to value spectrum in the context of local 5G networks in shared spectrum bands?***



Motivation and goals of spectrum authorization

- Promote efficient use of the band and prevent spectrum warehousing
 - Promote innovation (by not restricting potential stakeholders)
 - Promote investment in technology
 - Open the market for new entrants to promote competition
 - Encourage new business models
- It's a design challenge in 5G how to provide localized services for vertical sectors' needs



Micro operator concept





Micro operator concept

Technical building blocks:

- Dense small cell networks
- Network virtualization
- Mobile edge computing
- Operation in higher carrier frequencies
- Spectrum sharing and management techniques

Micro operators:

- Build and operate indoor small cell communication infrastructure
 - Offer local context related services and content
- to complement existing mobile connectivity offering.

Business models

Regulatory building blocks:

- Availability of 5G spectrum
- Local micro licenses
- Rights to build indoor networks
- Rules for collection and use of data
- Collaboration/competition rules with MNOs

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



Micro operator (uO5G) ecosystem





Micro licensing for granting local access rights

- Micro licensing can open the mobile market for new entrants to deploy and operate local 5G networks in specific areas.
- Micro licensing exploits horizontal spectrum sharing by protecting micro licensees from harmful interference in their license area. Vertical spectrum sharing protects the potential incumbents.

Exclusive licensing:

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

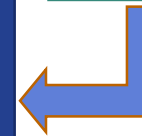


Micro licensing:

Local access rights for a large
number of new entrants
Coordination with other licensees
=> Free from harmful interference
=> Efficient protection of incumbents
which makes spectrum available

License-exempt:

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





EU recommendation for 5G frequency regulation

- In the recent draft of spectrum policy recommendation by European Commission it is proposed that verticals will be supported by local licensing in national auction process.
- In many countries there is lively discussion of spectrum policy. Verticals have set high requirements for 5G implementation.
- The following countries have already proceeded to enable local spectrum licensing
 - The Netherlands
 - Germany
 - Sweden

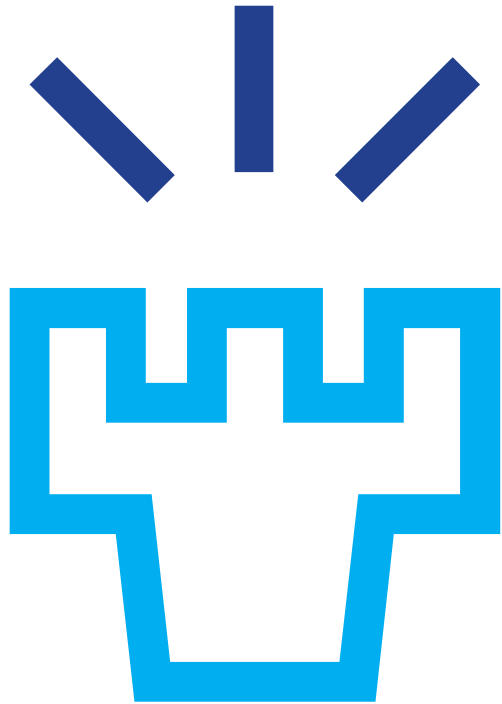


Conclusions



Conclusions

- **Smart Society will set unforeseen demands for localized services.**
- **5G brings local networks to various vertical sectors if spectrum is made available at an affordable cost level to those who need it, when and where they need it.**
- **Market entry is to be enabled for new players with local networks.**
- **Ensuring local spectrum availability should be a key priority for regulators in 5G decision making. It requires adjustments to existing spectrum valuation approaches that are used as basis for spectrum assignment decisions.**



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Thank you!

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