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# Wholesale mobile access connectivity

WIK Studie für BEREC

Nikolaus Fink

15. Juni 2023 – Mobilregulierungsdiallog - WIK Studie zu Wholesale mobile access connectivity



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- New technologies and service opportunities: focus on 5G and eSIM
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- Role played by verticals and MVNOs in fostering choice and innovation
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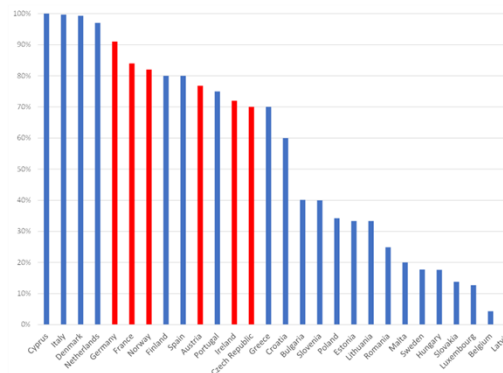


# New technologies that will shape the mobile

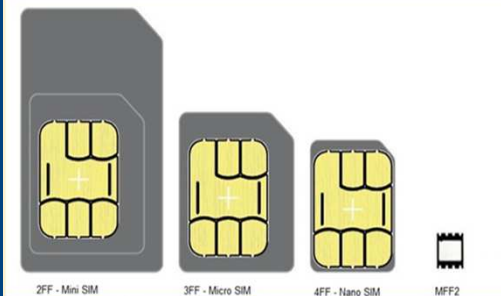
## 5G

- Potential for enhanced mobile broadband and, when deployed “standalone” (5G SA) the potential for quality-assured (ultra-reliable low latency) communications and massive M2M.
- Quality of service differentiation possible through private networks or 5G network slicing
- 5G non-SA deployment is well advanced, but SA at an early phase e.g. CZ Skoda factory private network, Hutchison 3 AT using network slicing to support FWA.
- High costs of deploying 5G SA with 3.6GHz and millimetre wave spectrum increases network duplication challenges

**Population coverage of 5G: Q3 2022 (where available)**



## eSIM



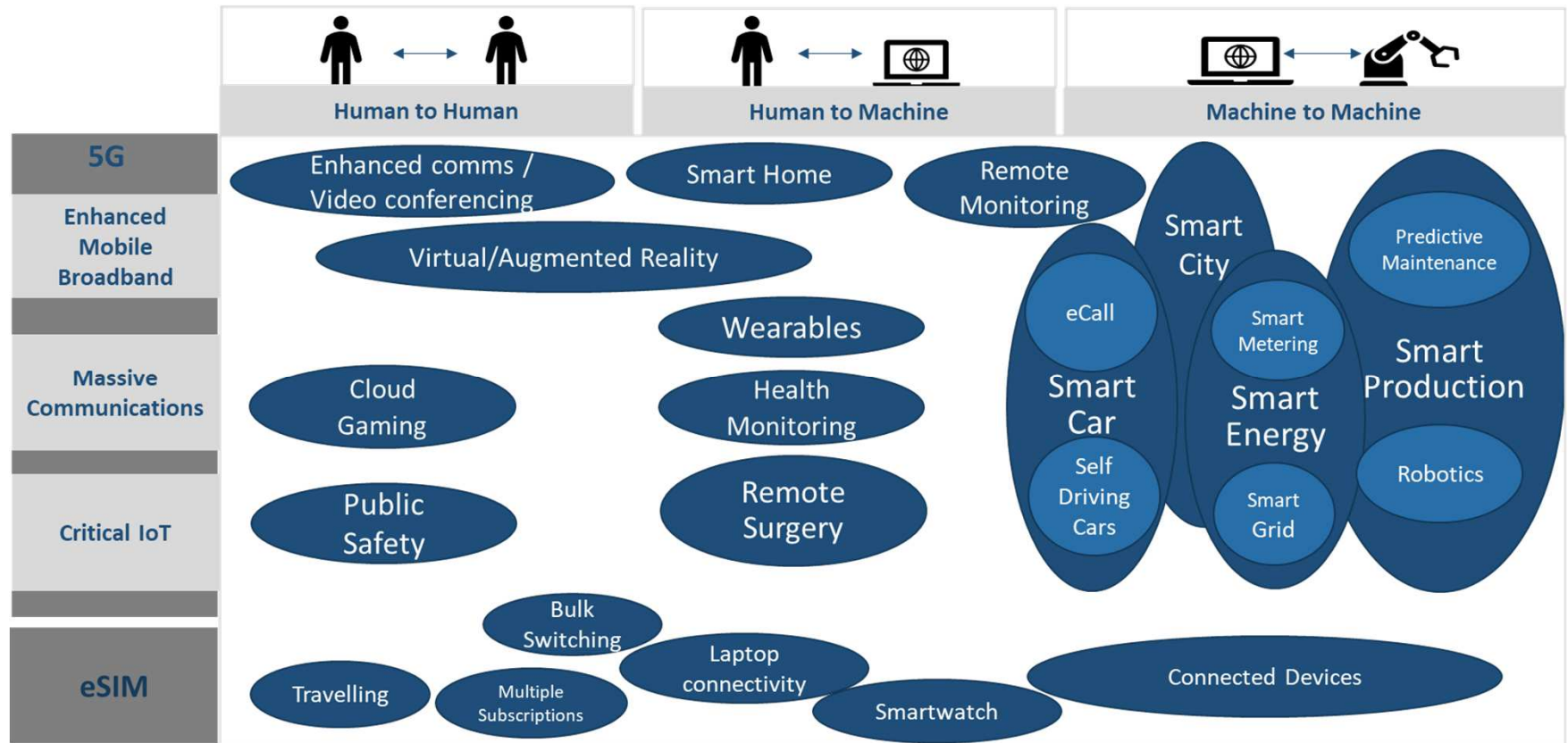
**Differences between physical SIM card and eSIM**

Traditional SIMs (UICC)	eSIMs (eUICC)
Carrier specific & contains only one carrier profile	Operator or OEM specific but can support multiple carrier profiles
Carrier profile cannot be replaced remotely	Remote download & management of additional carrier profiles
Physical SIM swap is required to change carriers	Eliminates physical SIM swaps. Over-the-air profile management
Different SIM for each carrier	One SIM for multiple carriers

- GSMA expects that by 2025 33% of smartphones will be eSIM
- Apple marketing eSIM only devices in US

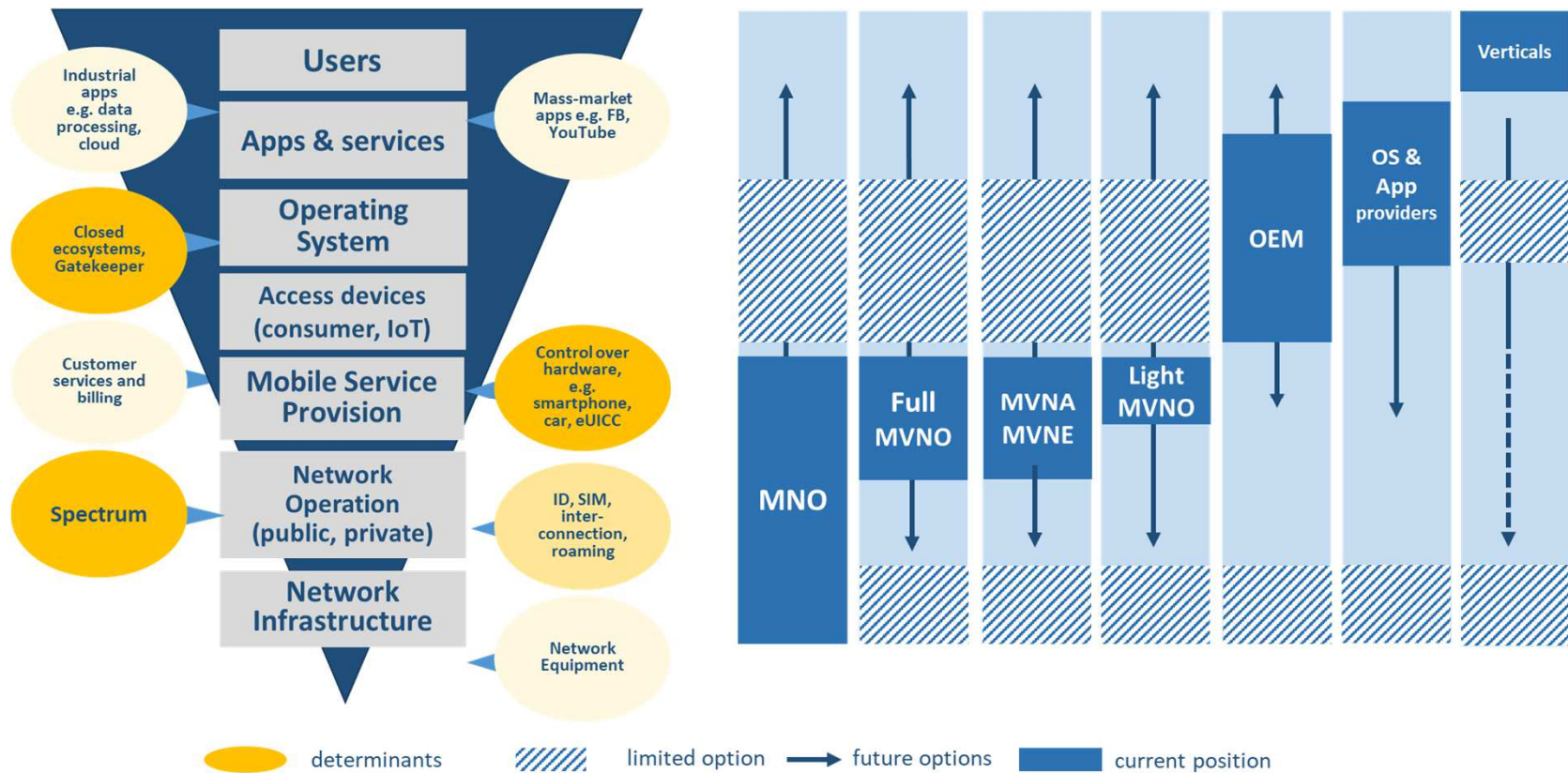


# Evolution in service offers





# Implications for the value chain





# Scenarios for competition and consumer welfare

- **Status quo**
  - Significant value possible from 5G and eSIM related business disruption and new services; but
  - In practice hold-up challenges for shift to 5G SA/eSIM in some cases
    - Concerns around loss of control linked to eSIM
    - Delays in and caution around 5G SA deployment; coupled with
    - Uncertainties from verticals around benefits in relation to cost
  - Technological shift could be linked to reduced competition in some cases / playing catch-up
- **Could non-MNOs help to unblock innovation and demand for 5G?**
  - Specialist IoT MVNOs have a strong record in patching together national networks, innovating on top and selling new use cases e.g. in automotive, logistics
  - Verticals have in some cases directly engaged with equipment manufacturers in the development of 5G private networks e.g. German manufacturing
  - Impact of consumer MVNOs on market outcomes varies, but they have played key role in stimulating data intensive offers in some countries e.g. in Austria



# Boosting competition in mass-market

## Reserve spectrum for entrant, MVNO access

- Increasing competition in markets where it is not otherwise effective, should in principle boost attractive offers and innovation
- One option is to set aside spectrum for a new entrant
  - BE, DE, and PT have pursued MNO entry in context of 5G
  - But may be challenges with viability, lack of potential entrant e.g. no bidder in AT, CZ
- Another option is to boost service-based competition through MVNO access or other related obligations
  - Strongest obligations linked to single SMP regulation (NO) and mergers: in particular AT, capacity-based MVNO in DE, IE but limited beneficiaries
  - Spectrum-based MVNO obligations in several (mostly 3 MNO) countries. Negotiation obligation in DE, PT, EL but access/ND required in HR, FR. CZ EEO margin squeeze
  - Outcomes vary, based on market conditions and nature of obligations. Common challenge (even with non-discrimination obligations) is conditions / payments to access 5G / adapting pricing to higher volumes
  - Application of spectrum-based MVNO conditions in future will require more in-depth analysis of competitive conditions, assessment of impact on investment (Art 52, EECC), but implicitly could not require a (joint) SMP finding

Country	MVNO access obligation due to	Nature of obligation
Austria	Merger obligations	Access obligation ( up to 16 MVNOs), reference offer, spectrum divestment, obligations expired in 2022, longer-term agreements partly in place but access conditions (pricing) for 5G are debated
Croatia	Spectrum licensing	Access obligation in all licenses, reference offer, non-discrimination
Czech Republic	Spectrum licensing	Access obligation, prices must allow equally efficient operators to profitably operate on the downstream (retail) market. Access conditions (pricing) are an issue.
France	Spectrum licensing	Access obligation (on reasonable terms), non-discrimination, high access fee for 5G
Germany	Merger commitments and negotiation order	Access obligation (30% of capacity to one of three MVNOs) in merger conditions. Access obligations expire in 2024 but national roaming agreement between 1&1 and Telefonica. Obligation to negotiate MVNO access in spectrum licence.
Ireland	Merger commitments	Access obligation (two MVNOs with each maximum 15% capacity), merger obligations expire in 2026.
Greece	Spectrum licensing	Obligation to negotiate, publish access conditions (excl. prices)
Norway	SMP regime and spectrum licensing conditions	Access obligation, reference offer, price regulation
Portugal	Negotiation order	Obligation to negotiate access for MVNO





# Supporting innovation in industrial applications

## Spectrum for verticals and spectrum leasing

- **Certain MS have assigned spectrum directly to verticals**
  - In DE around 226 requests to use spectrum for campus networks incl. Bosch, Lufthansa, FR licence to airport operator and subsidiary HubOne. IE lower frequencies to smart grid operator (but demand otherwise limited)
  - GSA suggests link between dedicated spectrum and private networks, 40% with 5G. DE, FR & FI leading in 5G private networks (5G observatory)
  - Demand in particular from larger companies, cities seeking coverage in specific zones.
  - Some have collaborated with MNOs, but 60% in DE have no interface to public network.
- **Spectrum leasing obligations can provide an alternative approach**
  - In NO MNOs must in the first instance provide 5G services to verticals, and if this is not possible must lease spectrum. In FR MNOs can choose between these options
  - CZ has spectrum leasing obligations for certain blocks applying over limited geographic area
- **Assigning or leasing spectrum to verticals relevant in particular where there are specific needs, lack of business interest from MNOs or delays in deploying 5G SA and/or interest in retaining control for data security, cost. However, may be less relevant for SMEs / businesses with widespread coverage needs**
- **Enabling entry / expansion by industrial MVNOs can also increase choice for verticals**



# Supporting innovation in industrial applications

## Addressing challenges linked to global connectivity

- **Providing global offers**
  - Providing global connectivity requires a combination of access sources. Own network (for MNOs), as well as MVNO access and international roaming all relevant
  - Key challenge for IoT MVNOs today is difficulty obtaining access in some jurisdictions (typically where MNOs are themselves engaged in IoT)
  - Roaming Regulation provides special “permanent roaming” regime for M2M, but questions arise when B2B and B2C are combined e.g. in cars
  - Access to 5G and QoS guaranteed services may present upcoming challenges
  - The next review of the Roaming Regulation may present an opportunity to consider updates
- **Switching between global providers of connectivity**
  - Customers incl. verticals may not be able to take full advantage of eSIM switching opportunities if they do not control server managing profiles
  - Improvements in eSIM M2M standards and model contracts could help
  - Role for BEREC to support in ensuring effective monitoring and enforcement of rules regarding provisioning, switching and fair contractual practices in relation to cross-border IoT?

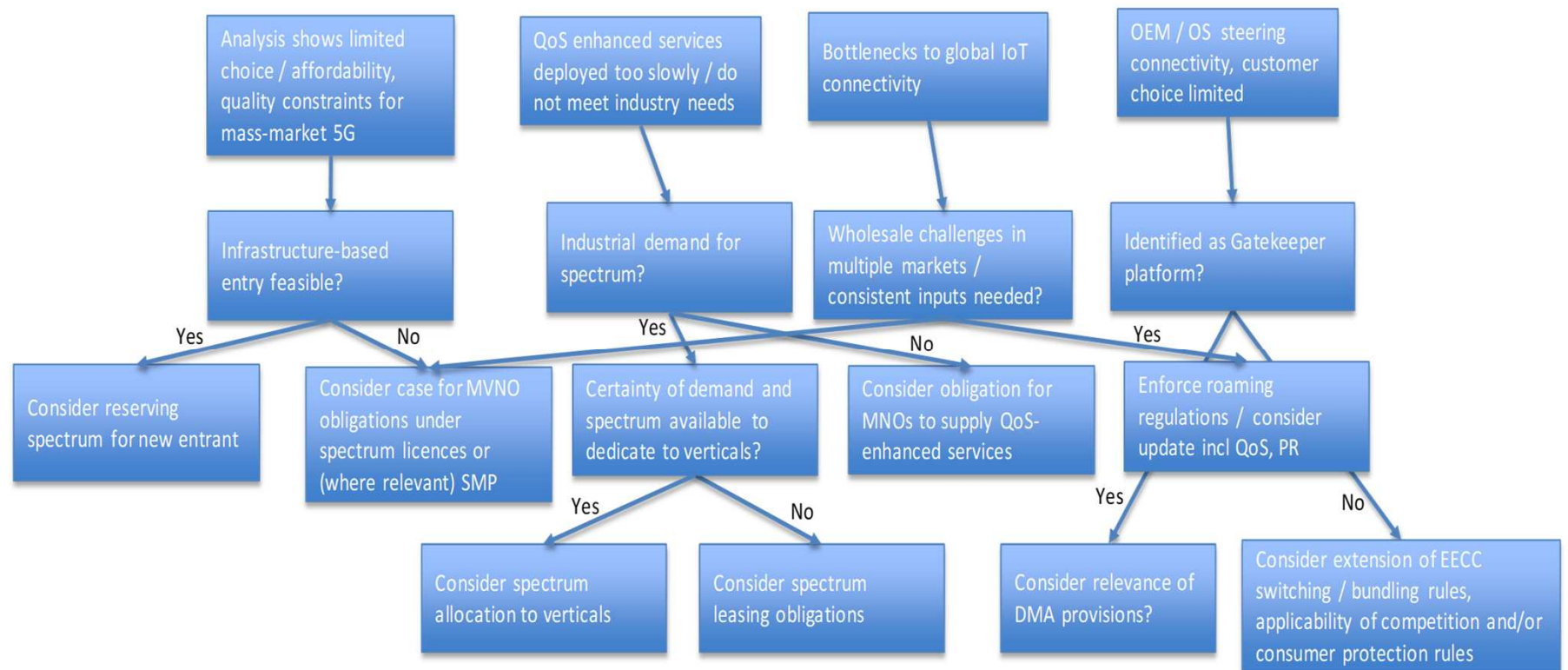


## Addressing challenges at the OS layer

- The potential for OEMs and OS providers to exercise control in the evolving mobile ecosystem must also be considered.
- A key concern is the ability for powerful platforms to steer connectivity to specific players or limit access to functionality that is essential for connectivity. This could be addressed by Article 6(6) of the DMA, which provides that:
  - *“The gatekeeper shall not restrict technically or otherwise the ability of end users to switch between, and subscribe to, different software applications and services that are accessed using the core platform services of the gatekeeper, including as regards the choice of Internet access services for end users.”*
- However, the DMA applies only to “gatekeepers” in “core platform services”. Other solutions may be needed to address issues where OEMs e.g. car manufacturers bundle connectivity and limit opportunities to switch



# Overview of possible challenges and solutions





## Summary

- By 2025 basic 5G networks are expected to be complete and one third of smartphones eSIM enabled
- 5G and eSIM could enable new industrial applications and IoT as well as connected consumer devices; however delays to “full” (standalone) 5G network deployment could limit the industrial benefits
- New technologies are likely to expand the **mobile value chain**: OEMs, OS, app providers and verticals themselves will play a more important role
- While new technologies bring many opportunities, the transition could impact competition in connectivity as well as introducing possible new bottlenecks at the OS/OEM level
- Specialist IoT MVNOs as well as verticals themselves could be drivers of innovation. Consumer MVNOs can also play a valuable role in fostering competition, in some situations
- MVNO obligations through spectrum licences may be relevant where competition may otherwise not be effective, and MNO entry is not feasible. Under the EECC, further justification and impact assessment are required, but the analysis logically cannot not require an assessment of (joint) SMP
- Where mandated, MVNO access conditions are important in enabling MVNOs to innovate: should allow technical and operational flexibility, pricing flexibility e.g. through capacity-based pricing, and provision to ensure that MVNOs have access to the latest technologies on reasonable terms, without undue delay
- Assigning spectrum to verticals or spectrum leasing could be considered to help to enable faster / more tailored deployment of 5G SA private networks, where there is demand. Obligations for MNOs to meet reasonable requests for QoS assured services could also be considered
- Other issues which may require attention include roaming conditions, switching for (cross-border) IoT
- The DMA provides a mechanism to act if control over OEM / OS is leveraged to limit options for connectivity.



## Quelle

- <https://www.berec.europa.eu/en/document-categories/berec/reports/study-on-wholesale-mobile-connectivity-trends-and-issues-for-emerging-mobile-technologies-and-deployments>



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