

ANALYSIS OF SHARING ECONOMY ANTECEDENTS IN THE CITIZENS BROADBAND RADIO SERVICE

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seppo.yrjola@nokia.com

Nokia Innovation Steering

This work has been done in the LASS and CORE++ research projects within the 5thGear program of Tekes, the Finnish Funding Agency for Technology and Innovation.

Outline

Introduction

Research objectives

Citizens Broadband Radio Service (CBRS) framework

Theory of sharing economy

CBRS from the sharing economy perspective

Conclusions

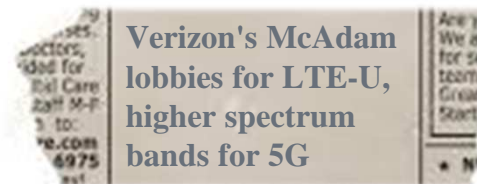
Spectrum as a market gatekeeper



Limited low frequency spectrum a key deal driver



Novel wholesale spectrum market established



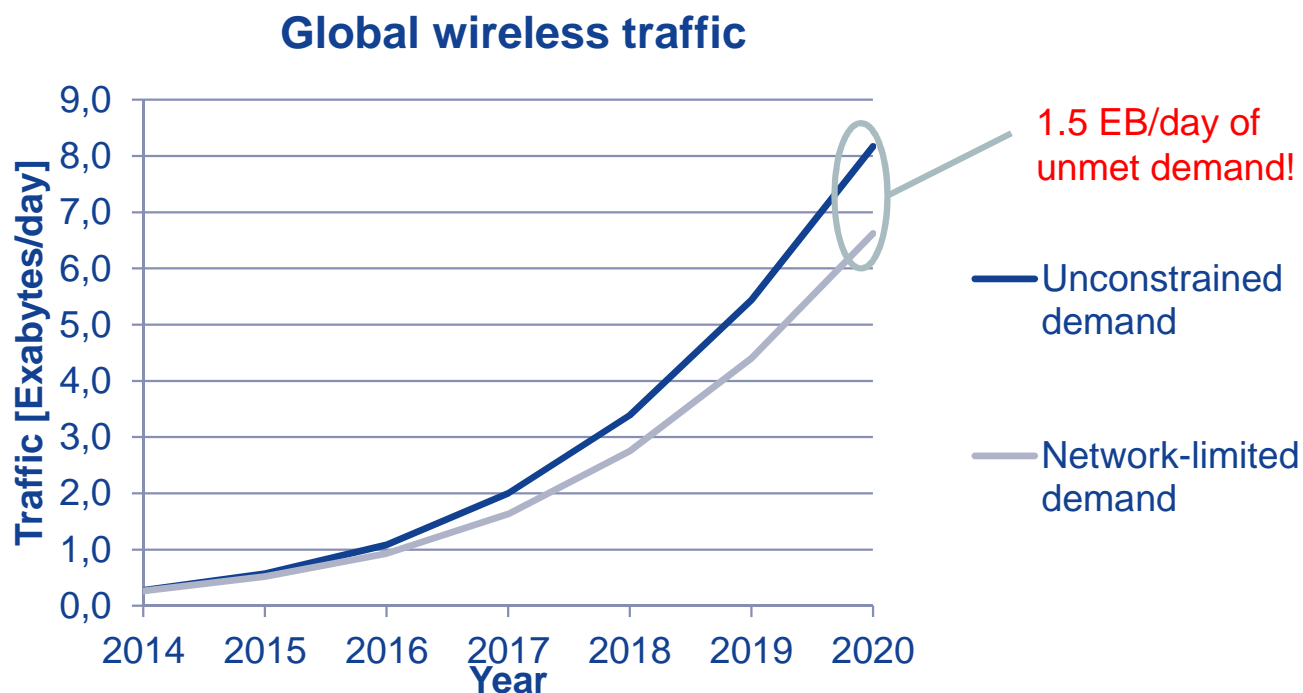
Mobile operators competing for access to bands such as mm-wave



Lobbying efforts for alternative spectrum access by potential new entrants

Spectrum shapes the entire communications industry

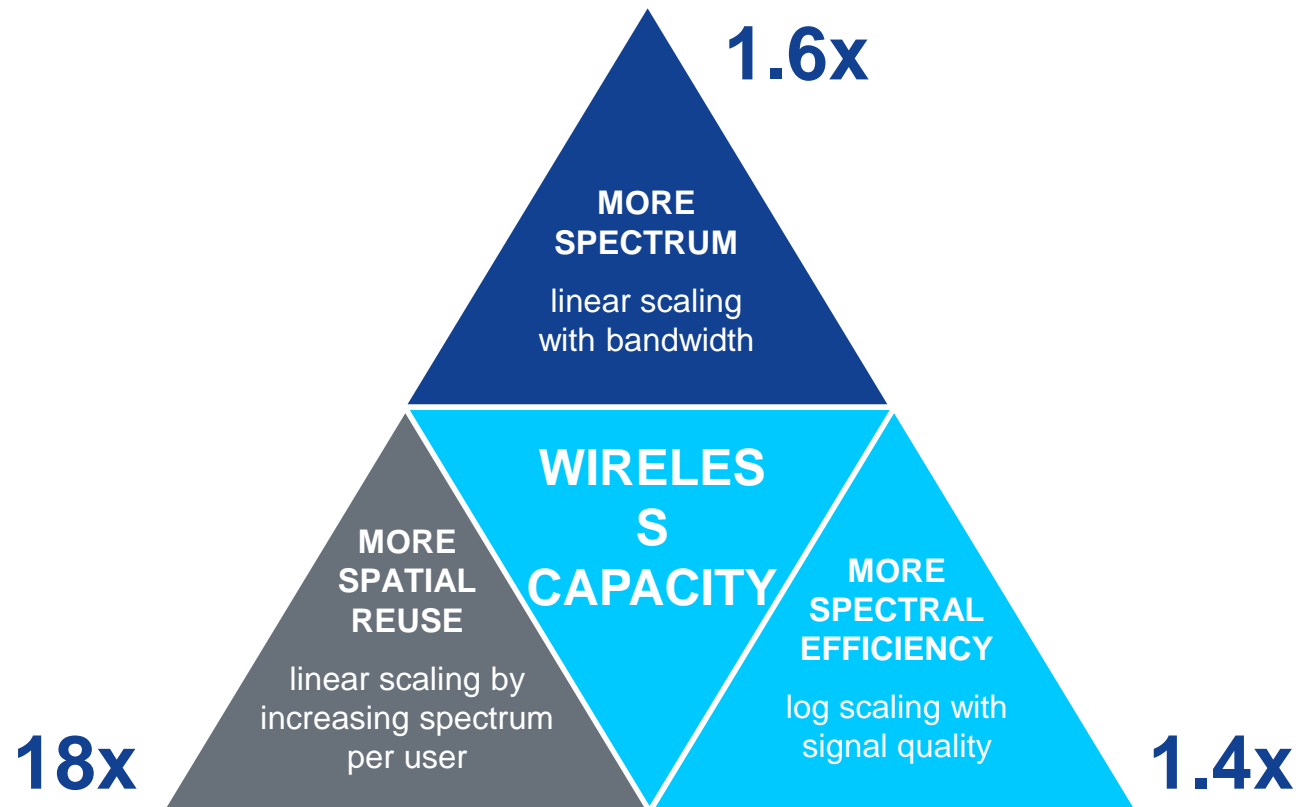
Growth in demand for spectrum shows no sign of abating



- ~17x mobile traffic over 6 years, ~60% CAGR, ...
or 110x over ten years
- up to 100% CAGR mobile data traffic in many networks

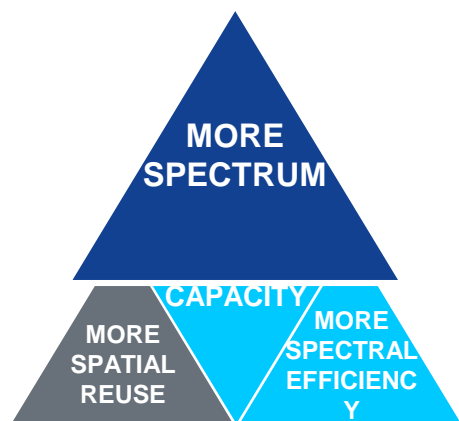
Even today demand threatens to outstrip supply. Yet, 110x more mobile traffic by 2026.

Dimensions for scaling wireless capacity to address capacity crunch

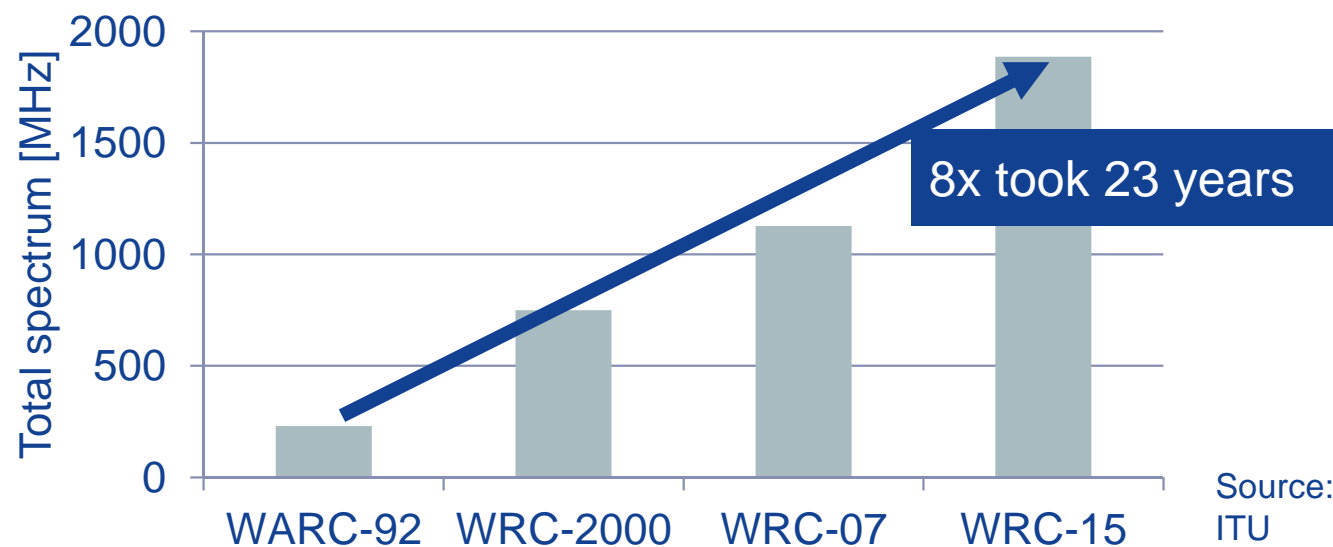


Without additional sources of spectrum, only 40x of capacity gain still available

Securing additional licensed spectrum is challenging



Total spectrum identified globally for mobile communications



Commercial mobile competes with other industries and applications for spectrum

Increasing delays in making harmonized spectrum available



Increasing delays in making harmonized spectrum available for mobile broadband

Spectrum band	6 years	8 years	10 years	more
900 MHz				
2.1 GHz				
2.5/2.6 GHz				
2.3 GHz				

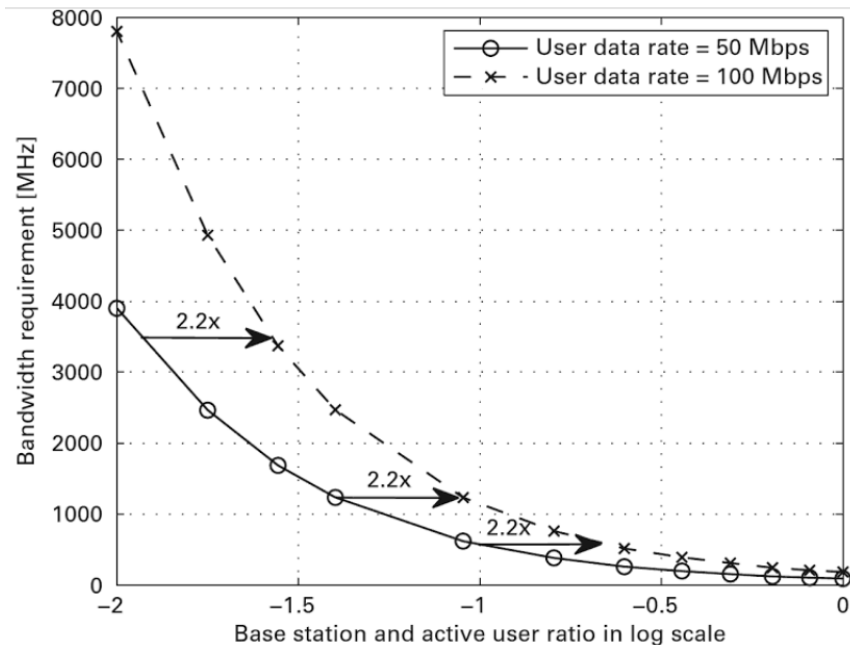
Diversified business environments and spaces



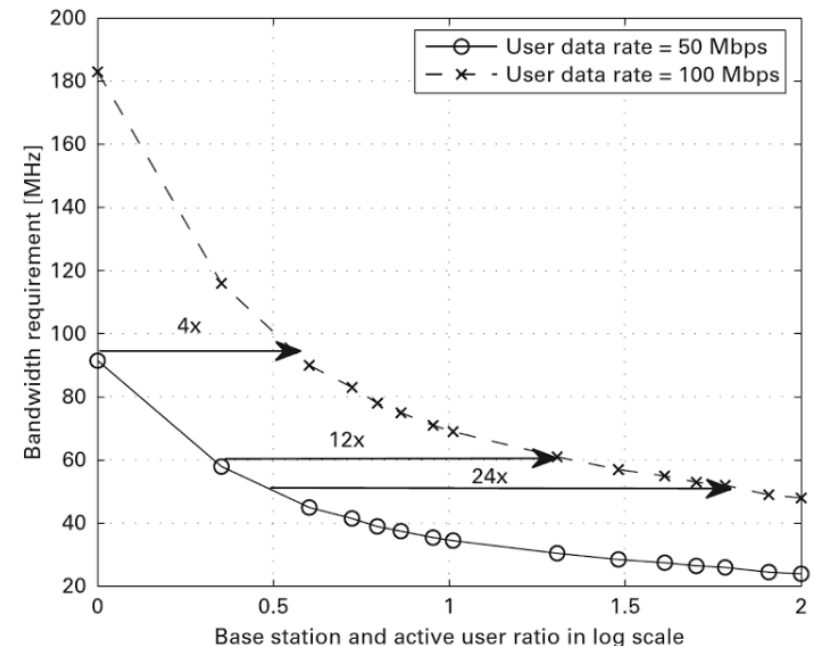
Site/premises owner role can be emphasized in building, operating and maintaining local content and services related to connectivity

How does densification help to double capacity?

Sparse networks



To double capacity in dense networks requires a lot of densification or doubling of spectrum

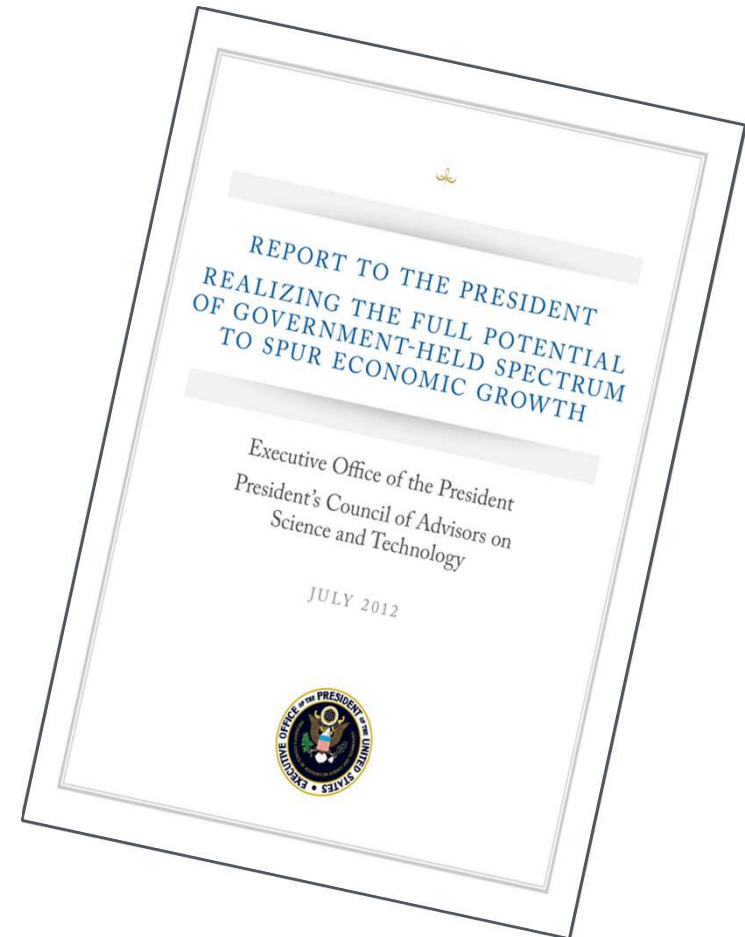


Value of spectrum increases for dense cells

WRC 2015 afterlife - New era in spectrum regulation and standardization

US President's Council of Advisors on Science and Technology Report Proposed Major Changes to Spectrum Policy, Using Federal Spectrum

- 1. Define a spectrum license to be a right not to be interfered with, but with no right to exclude --- all spectrum therefore usable by somebody*
- 2. Provide a band where all types of users have the same capability, but still allow for purchasing protection (3 tiers)*
- 3. Allow for spatial and temporal sharing of a band among a wide class of users (initially, federal radars and civil broadband)*
- 4. Automate de-confliction through micro transactions based on interference criteria*
- 5. Shorter term licenses to enable successor uses to enter the band naturally*



+ Sharing economy



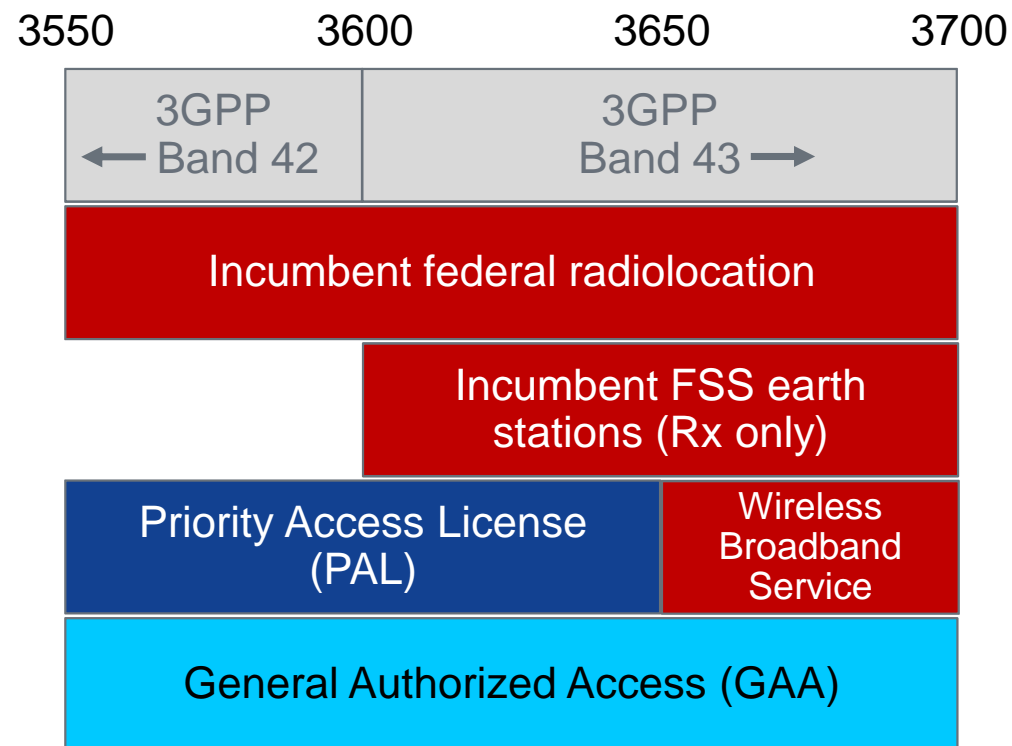
Research questions

1) What kind of business model characteristics recent spectrum sharing concepts support in the sharing economy framework?

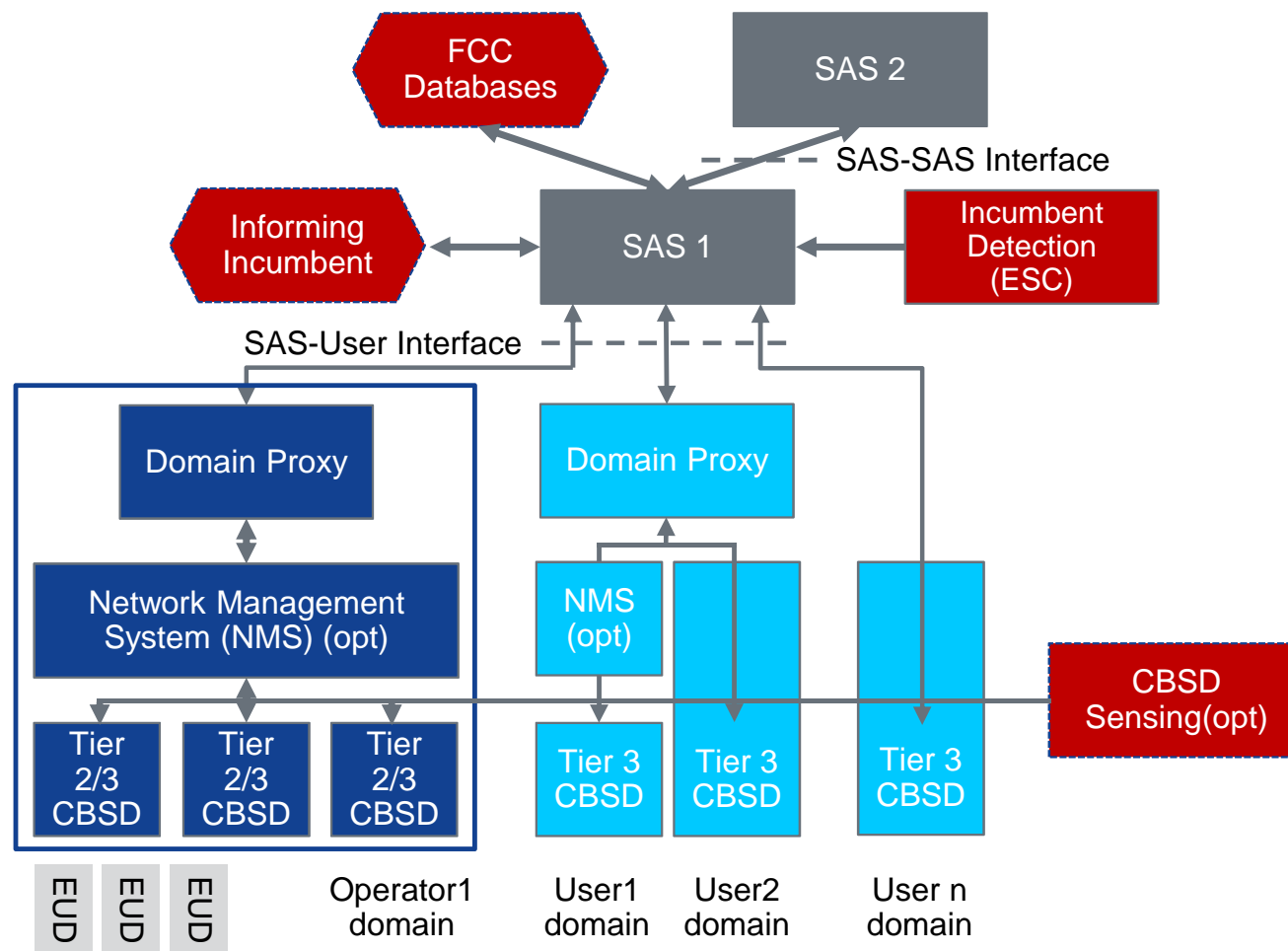
2) How do these sharing concepts support the antecedents for business model scalability in the sharing economy framework?

US 3-tiered CBRS spectrum access model and band plan

FCC's spectrum access models for 3550-3650MHz and 3650-3700MHz spectrum segments



CBRS Functional Architecture



Key factors for a sharing economy enabled scalable business model

“The value in taking the underutilized assets and making them accessible online to a community, leading to a reduced need for ownership of those assets,”

A. Stephany, “The Business of Sharing: Making it in the New Sharing Economy,” Palgrave and Macmillan, 2015

Sharing economy antecedent factors:

- a) Platform for online, on-demand accessibility,
- b) Reduced need for the ownership,
- c) Utilization of underutilized assets,
- d) Adaptability to different legal and policy regimes,
- e) Communities and trust, and
- f) Value creation and user orientation.

CBRS in the sharing economy view

Platform

- 3 tier dynamics requires new intelligent and near real time SAS and ESC sensing functions.
- New capabilities in spectrum analytics and big data needed in horizontal interference, and transaction management
- New spectrum band and introduced dynamism impacts BS and UE radios
- Extend 3GPP ecosystem to unlicensed and standalone LTE
- Dense urban deployments have additional utility and infra assets to share, e.g., fixed optical infra

CBRS in the sharing economy view

Reduced need for the ownership

- Unbundles investment in spectrum, network infrastructure and services
- Spectrum access with low initial annuity payments
- Access to local spectrum driven by business needs, when and where
- Expands sharing into other assets, e.g., with local venue owners.
- Utilizes as-a-service business models (NFV, Cloud)

CBRS in the sharing economy view

Utilization of underutilized assets

- Concerns over the QoS predictability particularly with and at GAA layer and neighboring users across census tracks
- Low cost offloading for established operators
- Nomadic Wi-Fi type of access on dense urban environment hot spots
- Wireless Internet Service Provider (WISP) rural coverage use case
- Spectrum and small cell hosted / as-a-Service solution
- Enables new vertical segments: IoT
- Transaction costs increase in early development with increased complexity

CBRS in the sharing economy view

Adaptability to different legal and policy regimes

- Uncertainty with short PA license term and GAA with opportunistic access only
- Need regulation and standardization with incumbent ecosystem
- Low administrative burden with low entry barrier on GAA
- Initially US federal specific – need adaptability to other regimes

CBRS in the sharing economy view

Communities and trust

- Trust implemented using the SAS
- Complemented by ESC sensing (Defense incumbents)
- Protection of MNOs sensitive information assets in external SAS
- Internet 'innovation' ecosystems to trigger communities
- Customer data ownership on apps and services for customer lock-in
- Small cell ecosystem introduces new players and shared asset opportunities

CBRS in the sharing economy view

Value and user orientation

- Flexible regulatory framework facilitates introduction of innovative local business model designs
- Local and Internet players offer differentiation based on user knowledge.
- Enables heterogeneous customer segments, e.g., verticals, enterprises,
- Introduces new roles SAS admin, broker and sensing
- Local services, e.g., media broadcasting and advertisement

Conclusions - Sharing economy antecedents for spectrum sharing

- Harmonization and scalability of the platform and automation of processes will drive economies of scale and trigger early market opening.
- The concept must be able to offer superior value proposition that offer access over ownership and ability to realize more choices with lower initial transactions costs compared to exclusive models.
- Value of the shared spectrum resources are highly dependent on its availability, liquidity and the predictability.
- Access and deployment of the underutilized assets on-demand is essential to generate continuous revenue early.
- Scalability of sharing concept could be highly impacted by fragmented national incumbent use cases, related different incumbent protection mechanisms and regulatory differences.
- Trust is the trigger of all collaborative shared consumption that makes system grow and scale.
- The creation of a critical mass ecosystem with positive network effects is important with new spectrum administrator and broker roles.
- Simplicity of the offer built around user knowledge driven 'demand pull' is critical in value differentiation for existing services as well as in scaling new spectrum sharing enabled services.

Conclusions - Analysis of sharing economy antecedents in the Citizens Broadband Radio Service

- The CBRS concept and particularly the opportunistic GAA layer lowers entry barrier to new alternative operators, scale out ecosystem with new roles and foster service innovation particularly.
- Introduced dynamism will increase system complexity that requires novel technology enablers in building trust, managing micro-transactions and ensuring pragmatic predictability in the spectrum management platform.
- Technology harmonization in spectrum and radios with dominant ecosystems, 3GPP (and IEEE), will be essential to ensure economies of scale and fast time to market.

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Thank you
Questions/discussion?

seppo.yrjola@nokia.com