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Title:

**Business models and Investment options for use
of Licensed Shared Access of Spectrum**

Jan Markendahl (corresponding author), Ashraf Awadelakrim Widaa Ahmed
Wireless@KTH, Royal Institute of Technology
Electrum 229, S-164 40 Kista, Sweden
jan.markendahl@radio.kth.se, ahmed2@kth.se

Bengt G Mölleryd¹, Ph.D.
PTS, Swedish Post and Telecom Authority,
P.O. Box 5398, SE-102 49 Stockholm, Sweden,
bengt.molleryd@pts.se

¹Bengt G Mölleryd is also a guest researcher at wireless@kth, Royal Institute of Technology, Stockholm

1. Introduction and motivation of work

Wireless Internet access to an increasing number of new and existing services has become a major trend in just a few years. The introduction of advanced devices like smartphones, tablets, and mobile broadband dongle has made this development possible. The rapid success of these devices in combination with new pricing schemes has resulted in an enormous traffic growth in the mobile networks. Operators are enhancing their networks to meet the demand by adding more sites and capacity, and by introducing new radio access technologies such as HSPA+ and LTE. This creates an increased requirement of spectrum for mobile service

Most of the new requirements are easier to meet with more bandwidth and new spectrum bands. New frequency bands are already allocated for wireless broadband in the 2,6 GHz, 800 MHz and 1800 MHz bands. This will help for some time but quite soon more spectrum has to be made available. Governments and industry organizations have recognized this and have formulated programs targeting 500-1000 MHz of additional spectrum in the relative near term (5 years).

Another possibility is to use unlicensed spectrum band, e.g. bands used for WiFi. Yet another possibility is secondary access to spectrum which has primarily been allocated for other services. Examples of such bands are radar bands and TV white spaces. In all together several hundreds of MHz belong to those categories. These strategies do not allow dedicated use which results in low level of services guarantees and low incentives for operators to make long term investments.

At the same time there exists spectrum which is allocated public services by government organizations that are not used fully. Various forms of shared spectrum access approaches are now therefore considered. In the United States the President's Council of Advisors on Science and Technology (PCAST) recently (July 2012) proposed an accelerated process to study shared spectrum access in public services spectrum.

The licensed shared access has been received with large interest from the telecom industry since it assumes long term contracts and some guarantees for the secondary user. An Licensed Shared Access (LSA) "authorization/license" includes an agreement between the secondary sharing user (the operator) and the primary license holder (e.g. a government organization) around the conditions of use (where, when, how). Compared to secondary access LSA offers a more attractive case for long term investments.

2. Research Questions

In this paper we investigate different business scenarios where different actors make use of LSA in order to offer mobile services. We will address two main research questions:

1. What business model and investment options can we identify for LSA
2. What levels of guarantees for spectrum access under LSA is required by an operator for network investment

3. Research approach

We will look into a set of business scenarios with mobile network operators, independent LSA infrastructure providers and mobile service providers. The scenarios all consider spectrum awarded under a LSA under the following conditions

- 1) LSA contract to multiple mobile operators that also have licensed spectrum
- 2) LSA contract to a single mobile operators that also has licensed spectrum
- 3) LSA contract to an independent actor that offers capacity on a wholesale basis
- 4) LSA contract to independent actor(s) that will offer end-user services

For the interaction between market actors and the involved economic processes we use basic ideas from business network research concerning processes (Håkansson and Snehota, 1995) and (Johanson and 1992). For analysis of cooperation and competition among actors we will use findings from (Bengtsson and Kock, 2000) and (Gnyawali et al, 2008)

4. Expected results

The results will describe business model and investment options for the different LSA scenarios listed above. We will present estimates on the levels of guarantees in terms of bandwidth, capacity and availability required by an operator in order to do the network investments.

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