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# Note on Spectrum Trading & Spectrum Exchange

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*Is it right time to permit spectrum trading in India? If yes, what should be the legal, regulatory and technical framework required for trading*

We believe that it is indeed imperative to consider spectrum trading in India. The concepts of dynamic spectrum trading are gaining ground since specific and specialized requirements for telecom infrastructure have increased in for shorter time periods. We share our thoughts on the regulatory and technical framework as well as the technical trends in the domain. In our opinion spectrum trading has the following benefits

- (1) Brings in efficiency in utilization of Spectrum,
- (2) Incentivizes efficient Telecom Service Provider (TSP) however the TSP selling spectrum achieves its opportunity cost,
- (3) The method lends itself to be used even in special cases like emergencies,
- (4) Market determined prices, as decided by TSPs, will ensure that policy interference is at minimal and regulator only will have to check for compliances,
- (5) Will prevent hoarding by appropriate policy checks,
- (6) Lower uncertainty for operators since trading can be for short term basis.

### **Forms of Spectrum Trading:**

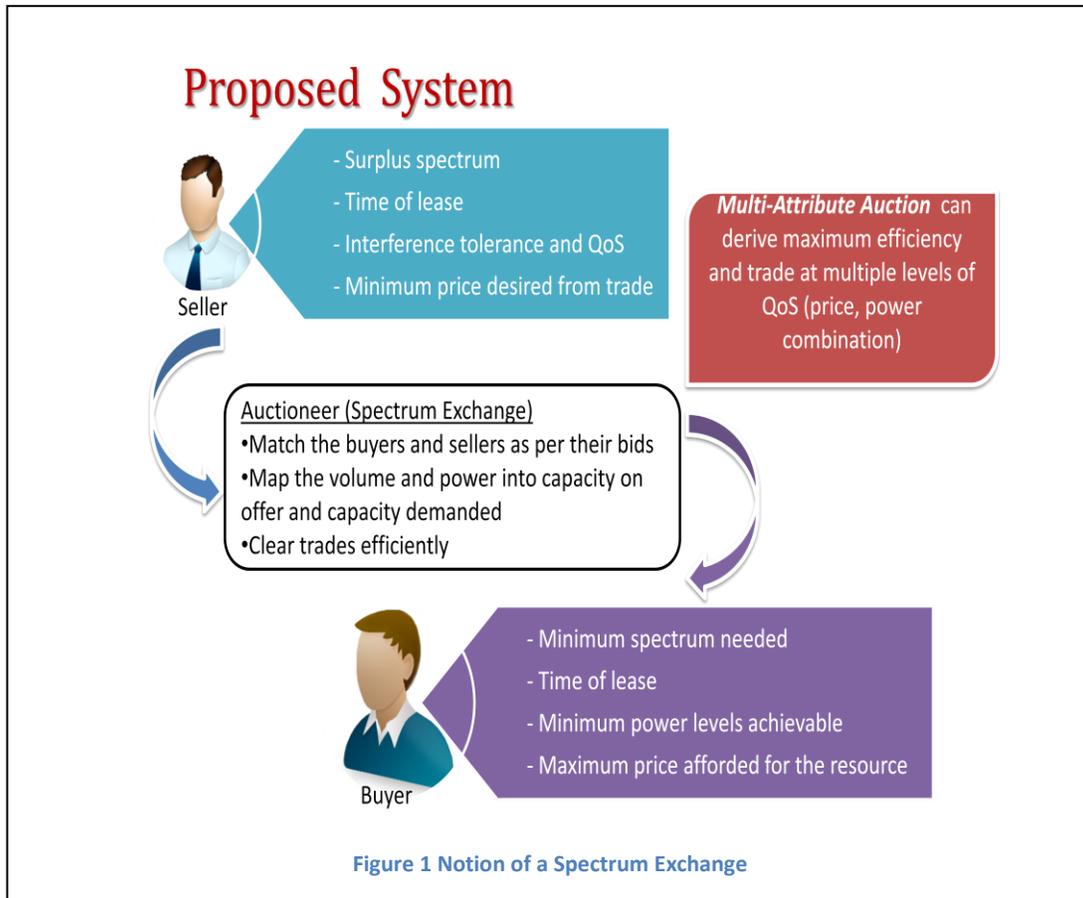
We believe that the Spectrum can be traded for medium term (eg. unused resource allocated to a new TSP which would possibly lie unused for six months or two years) or short term (eg. sports events, emergencies, concerts or fairs). The TSP having obtained the rights to the spectrum for a long term may be interested in trading in either of the formats. Moreover the trading may be for an entire telecom circle or only for specific geographic zones. The medium term spectrum trading could leverage concepts like Active Radio Access Network (RAN) sharing while short term spectrum trading would involve leasing of available spectrum with the interference restrictions to maintain appropriate Quality of Service (QoS) levels. The proposed spectrum trading platform should attempt to cover all the formats of trades possible to ensure that all trades occur within its realm and regulation.

### **Notion of Spectrum Exchange:**

In order to have a platform that enables trades amongst the various TSPs, we propose the notion of a Spectrum Exchange that allows trade among its member TSPs. The exchange should have the following features:

- (1) Match seller with surplus spectrum to a buyer that needs the spectrum,
- (2) Ensure the seller interference levels are adhered, recommend Transmit Power Mask to the buyer,
- (3) Ensure that the clearing remains incentive compatible (None of the participating agents can benefit by lying about their value),
- (4) Ensure that a single agent will not be able to influence the price of the spectrum,
- (5) Ensure that the participating TSPs adhere to the regulations as applicable for trading,
- (6) Ensure that the opportunity cost of the seller is considered by augmenting QoS levels for the buyer,

(7) Does not require frequent intervention by the regulator, the Exchange shall work on a basis of self-supporting initiative.



### **Regulatory Framework**

In India, Power Trading is already prevalent and in fact power trade is carried out on the Indian Energy Exchange, Power Exchange and the National Power Exchange at different granularities. The Central Electricity Regulatory Commission (CERC), a key regulator of power sector in India is a statutory body with quasi-judicial status constituted under the Electricity Act 2003. We believe that it should be feasible to consider a Spectrum Exchange Regulation on similar lines of the various power exchanges that will be beneficial to all stake holders.

## **Technology Trends in Active Radio Access Network Sharing**

The 3GPP has recently formed a technical specifications group for Study on Radio Access Network sharing enhancements that looks for efficiently sharing common E-UTRAN resources. It is expected that future releases of the 3GPP and LTE would require TSPs to allow active sharing of infrastructures for higher efficiency. Such sharing also shows impact on competition and market becomes more attractive to smaller players. The following use cases have been defined by the 3GPP

- (1) For TSPs, it is possible to share the RAN elements but not to share the radio spectrum. In this case the TSPs connect directly to their own dedicated carrier layer in the shared radio network controller (RNC) in the shared RAN.
- (2) Consider one TSP deploying coverage in a specific geographical area, and other TSPs are leased/ allowed to use this coverage for their subscribers within this area, however the TSPs remain independent outside of this geographical area.

Hence, deployment of future telecom technologies like 4<sup>th</sup> generation and beyond will make it essential to have a platform similar to our proposed spectrum exchange, and having a spectrum exchange now in India may make our way into the standards and implementations globally.

## **References**

- [1] 3GPP TS 22.951, Service Aspects and Requirements for Network Sharing, v.11.0.0, 2012
- [2] 3GPP TR22.852, 3GPP System Architecture Working Group 1 (SA1) RAN Sharing Enhancements Study Item
- [3] X Costa-Perez et al, Radio Access Network Virtualization for Future Mobile Carrier Networks, IEEE Communications Magazine, vol. 51, issue 7, July 2013