

Spectrum Pricing and the Future of Spectrum Auctions

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Recommendations

- Integrated spectrum management by a meta-ministry
- Benchmark reserve prices to international reserve prices
- Redraw LSA map
- Explore package auctions
- Put greater emphasize unlicensed spectrum
- Incentivize functional separation of infrastructure and services

Package auctions

- Address *exposure problem in case of synergistic items*
- When the synergies between the various units are high, it may become necessary to use package or combinatorial auctions

- total number of packages a bidder could choose are enormous, the auction designers restrict bidding to certain pre-determined packages
With 'n' objects, the total number of packages is equal to $(2^N - 1)$.

- These packages need not be mutually exclusive. For example, a bidder could place a package bid for licenses A and B, and simultaneously another package bid for license B and C.
- The reserve price for any package is equal to the sum of the reserve prices of the individual licenses.
- The provisional winning bid in any round is determined by computing the set of 'consistent bids,' that would maximize the overall proceeds of the auction

- *threshold problem* -

Bidders for single units may have difficulty in outbidding bidders for packages even though they value the package at higher amount when taken together

Each bidder will hold back hoping the other will raise the bid

Functional Separation of Services and Infrastructure for 5G

- Rapid innovation in services layer
 - OTT Communications service providers functionally equivalent to telco services
 - Enhanced possibilities of interconnection
 - Prospect of massive Machine to Machine Communication services
 - *EU, Malaysia, Australia already use principles of functional separation for regulation of digital communications*
- Prospect of plug and play interfaces with infrastructure
- Significant infrastructure investment needed, need to avoid duplication

Our Approach: Rethinking Communications

Recognise and leverage functional equivalence with VNOs

OTT Communication Apps (Significant and Non-Significant)

Virtual Network Operators

Avoid duplication in investment

Network Provider (only Spectrum licensee)

Satellite

Towers

Fibre

Equipment

Cloud

Content
Delivery
Networks

Manage Heterogeneity

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End-User
(Enterprises and
Individuals)

Enhance
competition in
services

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Supply Chain

New licensing framework

	OTT Communications Service Providers	VNOs	Network Provider	Other entities in infra layer
Type of Licensing	General Authorization, if significant, else Registration	General Authorization	License required, license fees to recoup administrative costs, spectrum usage charge if applicable	Registration
Interconnection regulation	Universal interconnection and portability between all types of service providers	Universal interconnection and portability between all types of service providers	Universal interconnection between all types of service providers	No regulation (governed through contractual agreements)
License and Regulatory Fees	Fixed Authorization fee + Broadband Infrastructure Levy @3% as percentage of AGR for Significant OTT Communication and Video Service Providers Fixed Registration Fee for non-significant OTTs	Fixed Authorization fee + Broadband Infrastructure Levy @3% as percentage of AGR	License Fee + Universal Service Levy @5% as percentage of AGR + Annual Spectrum Usage charges as percentage of AGR as applicable	Fixed Registration Fee
Emergency Services	Yes, if significant	Yes, if significant	No (applied through contractual agreements)	No (applied through contractual agreements)
QoS	Yes	Yes	No (applied through contractual agreements)	No (applied through contractual agreements)
Net Neutrality	No	Yes, minimum QoS for public networks	No (applied through contractual agreements)	No (applied through contractual agreements)