

Telecommunications Bandwidth Market Design, using Agent Based Modelling

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Bandwidth markets have attracted a significant amount of attention in recent years, due to the increased competition in the telecommunications industry and rapid growth in data traffic. Constructed correctly, a market should create a more flexible and cost effective means of purchasing bandwidth compared to conventional bilateral agreements. The effective pooling of bandwidth resources in a marketplace should lead to their more efficient use, benefiting all concerned from an economic point of view. Network expansion could be more effectively and efficiently managed. The ability to buy additional capacity at short notice should enable participants to accept business they normally would have turned away. New markets could be created with applications that require significant amounts of bandwidth over relatively short periods of time such as video conferencing or large database backups etc, producing additional revenue streams. The spot market could, in theory, be extended to include a market for derivatives of the bandwidth commodities such as options and more exotic contractual arrangements such as swaps. These additions would improve flexibility and control over risk management and could present additional enticement for potential participants to enter the market.

The appropriate design of a market is therefore crucial in order to achieve the benefits described above and understand the potential risks. Companies are therefore interested in understanding the implications of market design choices for cases where a company either wants to create a market proposition or to evaluate a potential market opportunity that is presented by a third party.

We demonstrate how Agent Based Modelling (ABM) using adaptive behaviours can be used as one of the possible tools to design a market for bandwidth, both in terms of the structure and the rules of operation. In the telecommunications bandwidth market, design issues include the effects of network topologies, participant business models, participant types and possible buyer-seller mixes. The relatively small numbers of participants and the definability of the business objectives makes the ABM technique ideally suited to the task. From the results of the ABM, we show how fundamental economic performance parameters, such as price levels compared to true competitive equilibrium, levels of competition and price volatility can be derived. Demonstration of these parameters is important to assuage potential industry regulatory concerns and provide evidence of the business benefits of participation.