

ISAS Briefing Sheet

The FCC's Automated Auction System (AAS) which was originally designed and developed to facilitate SMR auctions of spectrum licenses was recently enhanced. In 2003, the FCC began developing the Integrated Spectrum Auction System (ISAS) which: 1) combines functionality into a single system that allows for multiple types of auctions (e.g., simultaneous or sequential auctions, single-round or multiple round-auctions, and combinatorial auctions); 2) provides a single portal interface for user access, based on user permissions and 3) integrates existing auctions modules, including the application, bidding and administration processes.

With combinatorial or "package" bidding, bidders may combine multiple licenses into a package, and place a single bid on the package of multiple licenses and/or bid on individual licenses. This approach allows bidders to better express the value of any synergies (benefits from combining complementary items) that may exist among licenses and to avoid the risk of exposure by winning only part of a desired set. In general, package bidding works best when there are strong complementarities among licenses for some bidders and the pattern of those complementarities varies among bidders. Under these circumstances, package bidding may yield a more efficient outcome, improving the chances that licenses are sold to those bidders who value them the most.

In the FCC auctions, strong synergies exist when licenses are worth more to some bidders as a package than individually. Strong and divergent preferences occur, for example, when one company's business plan is not viable unless it is awarded a single frequency block across a nationwide service area, whereas another user requires multiple frequency blocks in a smaller service area.

The ISAS is a flexible parameter-driven software package that allows an auction administrator to define the goods being auctioned and tailor the auction parameters to meet their needs. The ISAS is easily customized, allowing the auctioneer to specify what is being sold and how it will be sold (combinatorial, non-combinatorial). The ISAS integrates an auction administration module that allows the auctioneer to control the parameters of the auction and change them as the auction progresses.

In order to keep the auction moving along, the ISAS incorporates an activity-based bid increment system using an exponential smoothing formula that is parameter-driven to calculate a minimum acceptable bid for each item auctioned in each round of the auction. The formula is based on specific values chosen by the auction administrator. The auctioneer has the flexibility to allow bidders to bid more than the minimum acceptable bid, and can specify the number of multiples and the percentage used to calculate the multiple increment bids.

The software is Internet-based and extremely user friendly, despite the complexities of the SMR auction format. Users are simply required to have a compatible browser and an Internet connection. The software allows both bidders and non-bidders to access a

variety of reports and results and watch the auction as it progresses. The ISAS can support at least 200 users and 1000 items.

The software has been used for two tests and performed flawlessly. The software is ready to be implemented and will completely replace the AAS by June 2005. In addition, Industry Canada has decided to purchase the FCC ISAS to conduct its auctions of electromagnetic spectrum. The purchase is expected to be finalized next month and they will take delivery of the software in February 2005.

In addition to developing the ISAS, the FCC has also developed an auction simulation tool called BidBots that allows the FCC to conduct research. BidBots is an intelligent-agent auction simulation tool composed of three modules: 1) auction setup, 2) bidding agent, and 3) auction mechanism. The auction setup module sets the parameters and auction rules for the other two modules. The bidding agent module is comprised of a collection of autonomous bidding agents (each with a bidding strategy), a collection of items that it values (both separately and with synergistic interactions), a budget, and a set of goals. The auction mechanism module operates the simulation using the information gained from the other two modules. BidBots has the ability to change many of the rules associated with a variety of auction designs. By using automated bidders, BidBots has the capability of running through many rounds of an auction quickly and evaluating how changes in auction rules and bidding strategies impact the overall speed, efficiency, and scalability of a variety of auction designs.

Most recently, the FCC has initiated two new software development efforts that expand on both ISAS and BidBots software. The fungible auction simulation tool (FAST) and the bidder aid tool set are being developed to study possible enhancements to the FCC's current auction capabilities. These research and development efforts are particularly useful for designing a flexible auction mechanisms that are easier for bidders and that allow the FCC to auction even larger numbers of licenses as well as competing bandplans.