Report of Public Comments

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Section I: General Overview and Next Steps

On 14 December 2014, ICANN posted for public comment the Auction Rules for New gTLDs: Indirect Contentions Edition ("Rules for Indirect Contention") as well as a paper entitled "Auction Design for Indirect Contention" ("the Auction Design Paper"). Together with its auction service-provider, Power Auctions LLC ("Power Auctions"), ICANN developed the documents to address the rare cases of indirect contention and provide the methodology and detailed rules for resolving indirect contention with a last resort auction mechanism. Previously, ICANN had implemented auctions rules that were specific to direct contention sets.[1] These rules had been posted for public comment in December 2013 prior to being implemented in March 2014.[2] In large part, the Rules for Indirect Contention mirror the Rules for Direct Contention, and ICANN sought community feedback and input on the major differences, namely: the concept of "Feasible Sets" and the pricing (cost allocation) for winning applications.

Based on the feedback received from the community on the proposed methodology and auction design for indirect contentions, ICANN, in consultation with Power Auctions, has finalized the Rules for Indirect Contention for immediate implementation and use and has published the Rules on the resources section of the Auctions page on the New gTLD microsite (http://newgtlds.icann.org/en/applicants/auctions). ICANN will begin scheduling Indirect Contention Auctions shortly, with the first such auction expected to take place in May 2015. Currently, there are only four contention sets that contain indirect contention: SPORT/SPORTS, SHOP/SHOPPING/通販 (xn--gk3at1e), GAME/GAMES, WEB/WEBS.

[1] See latest version here: http://newgtlds.icann.org/en/applicants/auctions/rules-03nov14-en.pdf.

[2] See report here: http://www.icann.org/en/news/public-comment/report-comments-new-gtld-auction-rules-05mar14-en.pdf.

Section II: Contributors

At the time this report was prepared, a total of seven (7) community submissions had been posted to the Forum. The contributors, both individuals and organizations/groups, are listed below in chronological order by posting date with initials noted. To the extent that quotations are used in the foregoing narrative (Section III), such citations will reference the contributor's initials.

Organizations and Groups:

Name	Submitted by	Initials
Intellectual Property Constituency	Greg Shatan	IPC
ICANN Business Constituency	Steve DelBianco	IBC
Donuts	Jon Nevett	D
Google/Charleston Road Registry	Sarah Falvey	CRR
Commercial Connect	Jeff Smith	CC
Famous Four Media	Peter Young	FFM

Section III: Summary of Comments

General Disclaimer: This section is intended to broadly and comprehensively summarize the comments submitted to this Forum, but not to address every specific position stated by each contributor. Staff recommends that readers interested in specific aspects of any of the summarized comments, or the full context of others, refer directly to the specific contributions at the link referenced above (View Comments Submitted).

The following themes of comments were received. Each of the themes will be summarized and described here in this section, and in the following section will be evaluated and analyzed.

- The Rules for Indirect Contention do not address string similarity/confusion
- Feasible Sets as a Viable Solution for Indirect Contention
- Information Policy and Revealing of Contention Set Positions and Identities upon Exit from Auction
- Payment Policies

The Rules for Indirect Contention do not address string similarity/confusion

Three public comments addressed the issue of confusion on part of the internet user in regards to the existence in the root zone of both singular and plural, as well as semantically similar, strings. The commenters posited that the proposed rules and methodology for Indirect Contention auctions, namely the use of "Feasible Sets", added to this confusion and harm to consumers and overlooks a simpler solution that prevents such confusion:

> *"…We continue to believe that allowing singular and plural versions of the same TLD string will confuse users and create vulnerability to spoofing and phishing fraud… The proposed Concept for Indirect Contention Auction not only fails to address this problem, but will compound it by creating additional hurdles in the auction process for successful*

string confusion complainants…Thus, as presently envisioned, ICANN's Proposal will significantly increase the odds that certain singular/plural TLDs will be delegated." IBC

"With regards to string confusion, ICANN has consistently favored advancing applications over minimizing the risk of consumer confusion…ICANN has once again stacked the deck in favor of applications advancing, even when at least one string confusion objection has found that two particular strings are, in fact, confusingly similar. We strongly believe that this continued prioritization is harmful to users and the overall process and urge ICANN to reconsider its priorities. Given the confusion around singular and plural strings, Google Registry maintains support for a single, straightforward auction for each contention set, where all applicants bid directly against each other on equal footing and thus limiting the user confusion concern singular and plural strings present." CRR

"ICANN has continued to ignore the issue that, simply stated, TLD's are Categories as stated in RFC 1592 it clearly discusses the concept of name space as follows: 'Each of the generic TLD's was created for a general category of organizations.' …For example, the general category of commerce, .Shop, .Store, Shopping, or any other commerce related gTLD are to be considered one group. In no instance can any of the commerce TLD's co-exist as written in the policies and procedures. Therefore indirect contention cannot exist. All of the applicants for a commerce gTLD should be grouped and treated as one and the same whereby only one TLD can be allowed to exist." CC

One commenter noted, however, that this topic is out of scope for the Rules for Indirect Contention and this public comment period:

"The Google comments and the BC comments authored by a Google representative go beyond the scope of this comment period and look to change aspects of the new gTLD program long resolved in the Applicant Guidebook (AGB). The issue of indirect contention sets itself is not open to reexamination nor should we be trying to redefine relationships between applicants in direct and indirect contention." D

Feasible Sets as a Viable Solution for Indirect Contention

In the same vein as with the above theme of comments, commenters asserted that the proposed solution of "Feasible Sets" prevents all applicants from being treated fairly and contributes further to string similarity confusion. Equally, the comments contended that the argument for simplified contention sets for indirect contention exists already in the Applicant Guidebook (AGB):

"The current proposed Concept for Indirect Contention Auction pits a single applicant, typically a successful string confusion complainant, against all other applicants, rather than pitting all applicants equally against each other as described in the new gTLD Applicant Guidebook. This practice unfairly tilts the scale against successful string confusion complainants attempting to protect consumers from confusingly similar new

gTLD strings…Accordingly, the BC urges ICANN to simplify the process by entirely striking the concept of 'feasible sets' and moving all applications in an indirect contention set into a single grouping to bid directly against each other…We strongly believe that a single contention set, where all applicants bid directly against each other, is the fairest and most predictable manner in which to handle indirect contention between applications. Such a procedure would also be consistent with the plain language of the Guidebook, which sets forth a single auction procedure for both direct and indirect contention sets." IBC

"Accordingly, Google Registry maintains its position that ICANN should, as set forth in the Guidebook, place all applications in a contention set, whether through direct or indirect contention, into a single grouping for the purposes of the auction procedure. A single contention set, where all applicants bid directly against each other in accordance with the standard auction rules for new gTLDs, remains the fairest and most predictable manner in which to handle indirect contention between applications, and it also removes much of the undue complexity contained within ICANN's Proposal…As such, we request that the concept of 'feasible sets' be removed and replaced with a simple mandate for only one successful applicant to emerge from each contention set, including all direct and indirect contention." CRR

"On page 1-10 of the Applicant Guidebook it clearly states 'For applications identified as part of a contention set, the entire contention set will be kept together in the same batch.' There should be no dividing of this set and two entities in this set should not be allowed to get together and have their bids considered to be twice as important any other applicant." CC

Further, the commenters stressed that the "Feasible Set" solution creates incentives for "minimalist bidding" on part of the "C" applicants:

"The 'second-price' rule within the Design is meant to 'maximize the incentive of truthful bidding.' However, awarding multiple strings on a proportionate share basis clearly incentivizes minimalist bidding within feasible sets composed of multiple applicants. For example, applying monetary values to the complex scenario depicted in Figure 3 of the Design, the applicant in the C position is clearly incentivized to open and exit with a nominal amount, possibly only one dollar token bid, or not bid at all, in anticipation that one of the many other applicants in an Ax position will ultimately outbid the applicant in the B position." CRR

Another comment also referred to the unfairness that a "B" applicant might experience:

"If our application does end up in auction, this proposal states that not only do we have to be the highest bidder, but our highest bid must now be higher than the combined bid of two or more other bids [i.e. A and C]. How is this fair? On page 1-10 of the Applicant

Guidebook it clearly states 'For applications identified as part of a contention set, the entire contention set will be kept together in the same batch.' There should be no dividing of this set and two entities in this set should not be allowed to get together and have their bids considered to be twice as important any other applicant." CC

Conversely, two comments asserted that the AGB is clear on the issue of direct and indirect contention and that the "Feasible Set" solution fits within those parameters:

> *"We reject the principle that a single string confusion judgement should mean that indirect contention is decided by the usual auction rules across the entire direct and indirect contention set. The Applicant Guidebook was perfectly clear at Module 4.1.4 that 'where there are both direct and indirect contention situations within a set, more than one string may survive the resolution.' In essence, the other commentators appear to be requesting that ICANN extend a single successful string confusion objection, and apply that against parties that did not have the opportunity to present their case against such objection."* FFM

> *"The Guidebook is clear on [indirect contention]…We need to examine the specific proposed auction design and rules offered by ICANN to implement the indirect contention set tenets of the AGB."* D

Information Policy and Revealing of Contention Set Positions and Identities upon Exit from Auction

Two commenters touched upon the issue of information and how much is shared following the end of a round as well as after a winning and/or an exit bid. The comments were, however, on two very different ends of the spectrum of amount of information shared:

> *"The negative impact towards successful string confusion objectors is further established in both the Design and the Rules in that the auctioneer is empowered to disclose their contention set positions and identities upon their exit from the auction. This is described in the Design as having 'no remaining direct contention' with the reasoning given as 'treating bidders symmetrically.' Despite the fact that Google Registry stands to benefit from such disclosures in certain contention sets, we strongly oppose this sort of disparate treatment, and we feel strongly that all bidders (not just remaining bidders in a certain round) should be treated with parity at all times. Accordingly, if ICANN insists on proceeding with the "feasible set" concept, we recommend that ICANN not disclose this information and stop at merely preventing further bids from applicants that are already clearly successful."* CRR

> *"We support the approach, but do want to be sure that the information policy during the auction is as transparent as possible and that the payment rules are clear and precise…[We] would like to see more transparency in the bidding process. The information policy during the auction is overly opaque and should be corrected to ensure that applicants know where they stand in the auction."* D

Payment Policies

The last theme, mentioned by only one commenter, centered on the topic of payment policies and how the rules worked and were applied in various winning scenarios. The comment also included a recommendation for the Externality Pricing Payment Rule as an alternative to the those presented in the Rules for Indirect Contention:

> *"The payment rule should be quickly examined further to ensure fairness for all applicants. ICANN and Power Auctions should examine the proportional payment rule and recommend whether that is better for applicants than the externality pricing payment rule or some modified proportional rule."* D

Section IV: Analysis of Comments

General Disclaimer: This section is intended to provide an analysis and evaluation of the comments received along with explanations regarding the basis for any recommendations provided within the analysis.

ICANN appreciates the time and effort expended by the community to provide valuable feedback regarding the Rules for Indirect Contention. As indicated above, this feedback has been divided into overarching themes and will be analyzed accordingly:

- The Rules for Indirect Contention do not address string similarity/confusion
- Feasible Sets as a Viable Solution for Indirect Contention
- Information Policy and Revealing of Contention Set Positions and Identities upon Exit from Auction
- Payment Policies

The Rules for Indirect Contention do not address string similarity/confusion

ICANN recognizes the points raised by some commenters regarding string similarity/confusion, and that the Rules for Indirect Contention do not address a solution to these issues. These matters are, however, not in the purview of the rules nor this particular public comment period. The task at hand is to define a workable solution to resolve the contention sets that contain both direct and indirect contention relationships via a last resort auction. ICANN does not intend for the rules to address the issues of how contention relationships were defined nor modify the existing sets, which have been reviewed by other bodies previously, in accordance with the procedures outlined in the Applicant Guidebook (AGB).

As mentioned in the comments from FFM, the AGB also anticipated contention sets with both direct and indirect relationships and allows for the provision of more than one string in a particular contention set (see Sections 4.1.1 and 4.1.4):

> *"In some cases, an applicant who is not the outright winner of a string contention resolution process can still proceed..., where there are both direct and indirect*

contention situations within a set, more than one string may survive the resolution." Section 4.1.4, page 4-7

In light of the AGB's allowance for indirect contention and the possibility of more than one prevailing string, a methodology for resolving these particular sets is required. In this way, ICANN contends that the Rules for Indirect Contention align with the AGB and provide this methodology for dealing with these situations. As such, this report will treat the comments regarding revisiting the string contention relationships as out-of-scope.

Feasible Sets as a Viable Solution for Indirect Contention

ICANN appreciates the concerns of the commenters on the subject of "Feasible Sets." However, ICANN remains of the opinion, as further explained below, that this particular solution is most efficient and fair to all participants as it provides a clear and objective methodology of resolving indirect contention that aligns with the AGB and creates clear rules for which applications will prevail and which will be eliminated.

As noted above, the AGB is clear regarding Indirect Contention and its anticipation of more than one string prevailing in an auction. The proposed solution of "Feasible Sets" thus also aligns with the AGB in that more than one application (i.e. string) may prevail. In addition to alignment with the AGB, ICANN finds that "Feasible Sets" are advisable for three other important reasons:

1) **Feasible sets prevent revival of an application:**
   The "Feasible Set" design will prevent the problematic scenario of an application failing to meet the end-of-round price and thus being eliminated from the auction but later having a claim that it should be "revived" because the application's TLD can co-exist in the Domain Name System (DNS) with the ultimate winner of the auction. For example, in a contention set with applications A, B, and C, A and C can co-exist (i.e. are in indirect contention with each other), while B can co-exist with neither (i.e. is in direct contention with both).

   Should C fail to meet the end-of-round price and is eliminated, but A outbids B and thus prevails, a problem arises as to whether C should be revived since it can co-exist with A. The "Feasible Set" concept prevents this problem by looking at the viable outcomes, i.e. A and C (see below for explanation on why this is an economically efficient design) or B (with whom both A & C are directly contending). A detailed example of this situation can also be found in Section 6 "Examples" of the Auction Design Paper (Example 2, page 6), along with further explanation in Section 7 "Conclusion" (No Revival, page 10).

   The alternative of pitting all applications from a contention set together, regardless of contention relationships against each other, as proposed by Google, will not prevent the

revival scenario.

2) **Feasible sets promote economic efficiency:**
According to Power Auctions, ICANN's auction service-provider, using "Feasible Sets" as the auction design allows for the "highest sum of values" to be attained—which aligns with economic efficiency. Detailed explanation can be found in Section 7 "Conclusion" of the Auction Design Paper (Efficiency, Page 9), but to summarize: As in any auction, the result should attempt to maximize the sum of the winning applicants' values. In an indirect contention auction with A, B, and C applications, the auction seeks out where the highest value is placed, i.e. with String B versus Strings A+C. Inefficiency arises when looking at B compared to A and B compared to C, but not B compared to A+C. The highest realization of applicants' values might be determined by the sum of bids A+C surpassing that of B, since A and C are able to co-exist together in the DNS.

Further, in response to concerns over "minimalist" bidding tactics, ICANN stresses that feasible sets account for minimalism in bidding and thus efficient auctions in that the string(s) will be allocated to those who value them at the highest level. An applicant such as C who chooses to bid only $1 but values the string at a much higher price point runs the risk of losing something considered valuable, i.e. the applicant is not bidding in accordance with its objectives. If the applicant bids only $1 and values the string at that amount and prevails because applicant A values its string more than B, then the auction has been an efficient one because both A and C have obtained the string at the value they assign to it, and together these values are higher than the value assigned by B to its string.

3) **Feasible sets contribute to fairness**
Related to the above points regarding efficiency and in response to the comment suggesting that some applicants are in a disadvantaged position, ICANN asserts that "Feasible Sets" provide for a fair (and efficient) outcome given that each Bidder's position [relative to another] in a Contention Set may be different. For example, in the A—B—C scenario, positions A and C may only be delegated if B is eliminated. In turn, B may only be delegated as a TLD if both the A and C positions are eliminated. Feasible Sets are determined based on feasible auction outcomes, i.e. outcomes where Direct Contention does not exist among winning applications. The AGB had encompassed this situation as provided in Section 4.3 of the AGB:

"*When a sufficient number of applications have been eliminated so that no direct contentions remain (i.e., the remaining applications are no longer in contention with one another and all the relevant strings can be delegated as TLDs), the auction will be deemed to conclude."*

It would be unfair for the auction to treat two applications the same when they are in fact situated very differently—for example, when one application is able to co-exist with a

particular string, while a second application cannot co-exist with this particular string. The feasible set methodology contributes to fairness by explicitly taking this into account.[3]

Information Policy and Revealing of Contention Set Positions and Identities upon Exit from Auction

ICANN appreciates the comments regarding the Information Policy and the need to be cautious in providing the correct amount of information. ICANN's intention with the Information Policy is to strike a balance of bidder positions and anonymity of the bids, while taking into account the unique situation that indirect contention sets create.

The comment from Google suggests that the Rules for Indirect Contention allow for disparate treatment of and disadvantages to particular applicants (e.g. string confusion objectors) when information upon their exit from the auction is disclosed, but because the auction rules already contemplate disclosing the number of bidders in each round in a public report after the auction, the concerns here reside with how the information would affect remaining bidders during the auction, i.e. that the knowledge that B has been eliminated creates unfavorable incentives that reduce the efficiency of the auction.

Based on further review of the Information Policy, ICANN has determined that the policy does not create disadvantages and is necessary to maintain symmetry in information across all remaining bidders. ICANN bases this determination on the following reasons and/or assumptions:

1) Providing this information contributes to treating bidders "symmetrically," as indicated in the Auction Design paper (Section 5, "Information Policy"). Firstly, not disclosing information equally to all applicants creates the potential for a situation where an applicant (or bidder) with two applications in one contention set would be at an advantage. Secondly, to ensure clarity be provided to all participating applicants regarding a fundamental and material change in the bidding "landscape," should, for example, a B application exit the auction.
2) Applicants participating in the auction are choosing to do so because they value (i.e. there is demand for) the sought-after TLD.
3) Applicants participating in the auction understand that a bid is a financial commitment with contractual penalties for default, and that bidding is not to be taken lightly.

[3] Power Auctions has also provided further explanation on this matter: "In the A—B—C scenario, we believe it increases fairness to base the criteria for elimination of an application on its position within the contention set. In determining whether application A is eliminated, the sum of the bids of applications A and C is taken into account, whereas application B does not receive any credit for the bid of application C. This is precisely because application A can co-exist with application C, while application B cannot. The differentiation is based on an objective standard. Application A is defined to be "positioned better" than application B if the two applications are in direct contention with one another, but if the set of all other applications that are in direct contention with application A is a subset of those that are in direct contention with application B. In short, any differential treatment of applications is based on the other applications with which they are in direct contention, enhancing both efficiency and fairness."

Further, ICANN has reviewed the comment by Donuts regarding more transparency in the Information Policy and discussed this request with its auction service-provider. In consultation with Power Auctions, ICANN finds this request to be appropriate. ICANN agrees that it should be made known to all bidders not just how many remain from round-to-round but also how many bidders have made a Continue Bid. In light of this determination, ICANN has made the following changes to the rules (see rules 43 and 44):

- The Auction Manager will communicate the number of applications remaining eligible for bidding in the next round and the Aggregate Demand. This communication provides insight into not only how many remain in the auction, but of those, how many met the end-of-round price.
- The Auction Manager will communicate the position of an eliminated application if its elimination causes the contention set to break into two independent subsets. This communication provides insight into the elimination of a "joiner" application, which will change the fundamental make-up of the contention set.

Payment Policies

ICANN also appreciates the comment regarding payment policies and the suggestion to review other potential pricing theories and/or rules. Firstly, ICANN would like to reiterate that the bidding and payment procedures do not differ from Direct Contention Auctions in one clear manner: no bidder will ever be obligated to pay more than his or her willingness-to-pay (WTP). As stated in Rule 47g, *"In no event will the Winning Price for a Winning Application exceed the highest Bid submitted for the Winning Application"*.

Second, we would like to observe that, for Direct Contention Sets, the AGB specifically adopts an ascending-bid auction that takes on the characteristics of a "second-price auction" (i.e., the highest bidder wins the string and pays the price offered by the second-highest bidder). As indicated in the Auction Design Paper, the rationale for applying a second-price payment methodology is as follows:

> *"…to the extent that a feasible set of applications bids higher prices than was necessary for them to win, the set of applications receives a commensurate reduction in price. Second-price rules are advocated since they maximize the incentives for truthful bidding; they simplify bidding; and they tend to yield efficient outcomes."* Section 4, page 4

ICANN finds that the chosen pricing methodology to be most persuasive for Indirect Contention Sets because it closely aligns with the AGB's prescription of a second-price methodology, as A and C are awarded the string at B's exit (or "second") price. In particular, it seems problematic to if applicants A and C were awarded strings, instead of applicant B, but applicants A and C together were charged less than applicant B was willing to pay. The proposed auction procedure avoids this problem by focusing on the second-price methodology. If applicants A and C prevail in the auction, they are together charged the losing applicant B's exit price. Further information regarding this decision as well as

economic reasoning provided by Power Auctions can be found in Appendix 1, "Economic Discussion of Payment Methodology for Indirect Contention Auctions".

Conclusion

ICANN greatly appreciates the time spent by the commenters to provide their thoughtful input on the Rules for Indirect Contention. The topic is a unique and challenging one, and ICANN understands the desire on part of the community to ensure that the best solution is implemented. As noted in the analysis, some of the issues raised in this public comment period were out-of-scope and cannot be tackled in this report, but that does not deflate their importance; we are merely unable to address them further. With comments where ICANN and the commenters disagreed, we would like to emphasize again that those points posed challenges to ICANN staff and Power Auctions, but in the end, ICANN and Power Auctions found the proposed approach to indirect auctions to be the most appropriate. Finally, as noted in the analysis, changes were made to the rules regarding information and what is shared at the end of rounds, as ICANN is committed to transparency and fairness in the auction process.

The rules for Indirect Contention, including redlines, can be found in resources section of the Auctions page on the New gTLD microsite (http://newgtlds.icann.org/en/applicants/auctions).

Appendix 1

"Economic Discussion of Payment Methodology for Indirect Contention Auctions"
Provided by Power Auctions, LLC

When attempting to generalize the second-price payment methodology to Indirect Contention Sets, the economic literature on combinatorial auctions suggests taking either of two approaches:

(1) Vickrey auction: Each winner pays the "opportunity cost" of allocating the item to it, as opposed to the next-highest valuation expressed for the item. Phrased differently, each winner is allowed to keep the entire incremental surplus attributable to it.[4]

(2) Core-selecting auction: A pricing formula is used which assures that the outcome is always in the "core", meaning that it is feasible and unblocked by any coalition. In particular, winners pay at least the sum of the bids of the highest-value set of losers that they displace.[5]

The difference between these two concepts can be seen in situations such as Figure 2 of the Auction Design paper:

Suppose in this Figure that applicant A's value is 80, applicant B's value is 100, and applicant C's value is 80. Using either the Vickrey or core-selecting auction concept, applicants A and C win, since their combined value is 160, whereas applicant B's value is only 100. However, with the pricing of the Vickrey auction, applicant A pays 20, since 20 is the opportunity cost of awarding to applicant A.[6] Similarly, applicant C pays only 20. However, if applicants A and C each pay 20, then together they pay less than the amount that the losing applicant B was willing to pay. With a core-selecting auction, applicants A and C each pay 50, which is the least that they could pay so that together they pay at least as much as the losing applicant B was willing to pay.

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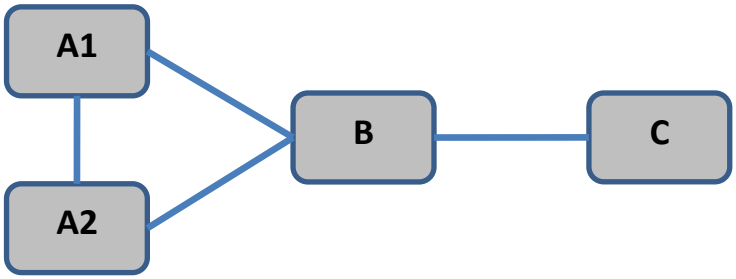
[4] See: Ausubel, Lawrence M. and Paul R. Milgrom (2006), "The Lovely but Lonely Vickrey Auction", Chapter 1 in P. Cramton, Y. Shoham, and R. Steinberg (eds.), *Combinatorial Auctions*, MIT Press, http://www.ausubel.com/auction-papers/lovely-but-lonely-vickrey-auction.pdf .

[5] See: Day, Robert W. and S. Raghavan (2007), "Fair Payments for Efficient Allocations in Public Sector Combinatorial Auctions," *Management Science*, 53, 1389-1406, http://www.terpconnect.umd.edu/~raghavan/preprints/fpea.pdf; and Day, Robert W. and Paul R. Milgrom (2008), "Core-Selecting Package Auctions," *International Journal of Game Theory*, 36, 393-407, http://web.stanford.edu/~milgrom/publishedarticles/Core%20Selecting%20Package%20Auctions.pdf.

[6] The surplus with applicant A "present" is 160 (since the value from allocating to applicants A and C is 80 + 80 = 160). The surplus with applicant A "absent" is 100 (since the value from allocating to applicant B is 100. Thus, the incremental surplus attributable to applicant A is 160 – 100 = 60. The Vickrey auction allows applicant A to keep the entire incremental surplus attributable to it. In order for applicant A to keep surplus of 60, it must pay only 20 (since its value is 80).

Third, both the Vickrey and the core-selecting auctions embody the principle of "causation" that we adopt in the proposed auction procedure. Consider a situation such as in Figure 3 of Auction Design for Indirect Contentions:



Suppose in this Figure that applicant A1's value is 100, applicant A2's value is 90, applicant B's value is 80, and applicant C's value is 60. Using either the Vickrey or core-selecting auction concept, applicants A1 and C win, since their combined value is 160, whereas applicant B's value is only 80 and the combined value of applicants A2 and C is only 150. In the Vickrey auction, a price of 90 is paid by applicant A1,[7] while a price of 0 is paid by applicant C.[8] Moreover, the prices of 90 and 0 are also consistent with a core-selecting auction, since with these prices, there does not exist any coalition of other bidders who can "block" the allocation.

This example demonstrates that the principle of "causation" in the proposed auction procedure is consistent with both leading pricing concepts for combinatorial auctions. As prices increase, applicant C is not responsible for eliminating applicant B. (Instead, applicant B is eliminated by applicants A1 and A2.) Thus, applicant C is not charged for causing applicant B to be eliminated, and applicant C may end up paying only a nominal amount such as $1.

[7] The surplus with applicant A1 "present" is 160 (since the value from allocating to applicants A1 and C is 100 + 60 = 160). The surplus with applicant A1 "absent" is 150 (since the value from allocating to applicants A2 and C is 90 + 60 = 150). Thus, the incremental surplus attributable to applicant A1 is 160 – 150 = 10. The Vickrey auction allows applicant A1 to keep the entire incremental surplus attributable to it. In order for applicant A1 to keep surplus of 10, it must pay 90 (since its value is 100).

[8] The surplus with applicant C "present" is 160 (since the value from allocating to applicants A1 and C is 100 + 60 = 160). The surplus with applicant C "absent" is 100 (since the value from allocating to applicant A1 is 100). Thus, the incremental surplus attributable to applicant C is 160 – 100 = 60. The Vickrey auction allows applicant C to keep the entire incremental surplus attributable to it. In order for applicant C to keep surplus of 60, it must pay nothing (since its value is 60).