



# UNDERSTANDING AUCTION DYNAMICS

A PRIMER



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With the programmatic advertising industry abuzz about transparency, there is a need for education around how auctions actually work.

Brand spend and premium content dictate our industry's future, and themes of transparency have risen to the forefront of the conversation. The word transparency means different things to different people – transparency around pricing, viewability, fraud, business models, and more. The core of the issue is the need for understanding and control. The details of any of these topics are as transient as our industry, and topics like specific pricing will always be subject to negotiation.

That said, intelligently discussing a key topic such as pricing can only be achieved if we first agree on the service being delivered and the value of that service.

Relative to an SSP, transparency falls into three distinct categories:

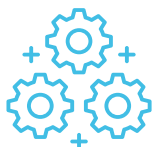
- User Experience (e.g., ad quality, latency)
- Advertiser Experience (e.g., viewability, inventory quality)
- Auction Dynamics (e.g., auction rules, pricing, platform fees)

This white paper will focus on the third category, auction dynamics. This term refers to the forces that affect the price paid when impressions are sold. The underpinnings of these dynamics are control and attribution: Who sets the direction? What kinds of tools are made available? Which impression resulted in action? And how are successful participants navigating towards better outcomes?

**Our goal is to shed new light onto this seemingly opaque realm, and we will examine auction dynamics in five parts:**



**ACCESS  
TO SUPPLY**



**AUCTION TYPES  
& INTEGRATION  
METHODS**



**AUCTION  
MECHANICS  
& FEES**



**BIDDING  
STRATEGIES**



**FUTURE  
STATE**

# ACCESS TO SUPPLY

The rules of the game are changing.

Both DSPs and SSPs grew up in the world of the ad server “waterfall,” where a single impression was first processed in the publisher’s ad server to match against a direct sold campaign. If none was available, the impression was then sent to a single SSP, who in turn ran a parallel auction among its DSPs to fill the impression.

Over time, publishers found ways to extend the waterfall by adding more SSPs, serially (Figure 1). This helped increase yield. So, if the first SSP failed to fill the impression, it was passed back to the ad server and sent to a second SSP, then to a third, and so forth. The order of the waterfall was determined by manually set prioritization rules, based on

aggregate historic pricing data. Once an SSP filled an impression, the subsequent SSPs were closed out of the auction process and any possible higher bids were never realized.

With the rise of header bidding and wrappers (a technology that simultaneously collects multiple bid requests and responses before passing them through to an ad server), publishers can now send a single impression to multiple SSPs in parallel, who each, in turn, send that impression to each of their DSP partners (Figure 2). This means that the average SSP and DSP are each receiving more traffic while filling smaller percentages of inventory. This occurs because publishers are realizing more yield with each additional

FIGURE 1

## Tag-Based Waterfall Auction Flow

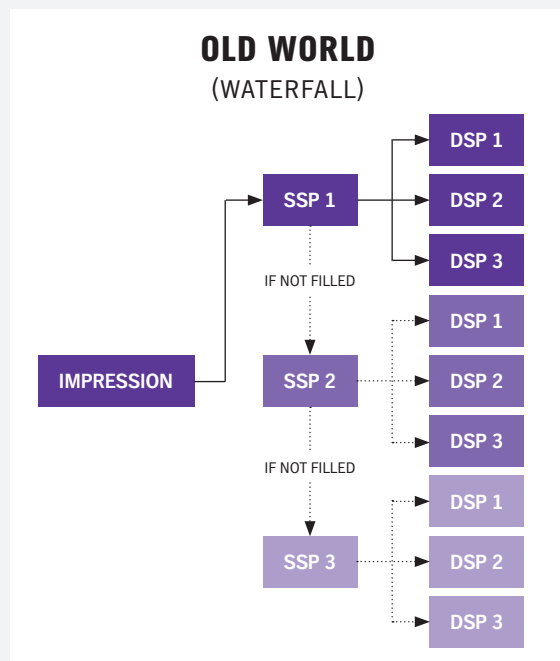
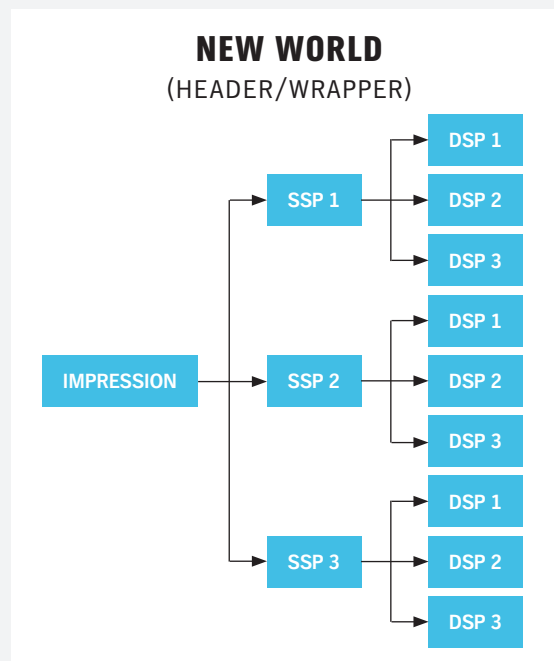



FIGURE 2

## Header / Wrapper Auction Flow





partner they bring into their wrapper. At first glance, we may be satisfied with this simple answer that sellers can create more competition in their auction to drive up yield. The correlation between adding more partners and increased yield is enough reason for sellers to continue down the path of adding more partners in the header/wrapper, but does this really generate more competition? The answer is both yes and no. It is true that SSPs are forced to compete against one another on auction dynamics and quality of pipes (e.g., data fidelity, latency), but more importantly, they are exposing the inefficiencies of the bidding process.

Let's take a typical example of a publisher that adopts a header/wrapper strategy: The publisher was previously working exclusively with one SSP, and then adds a second partner in its wrapper. What we see time and again is that the publisher's

net revenue increases by a larger amount than the original SSP's revenue decreases, meaning that the publisher receives incremental value from the increased demand.

The waterfall model inhibited the amount of data passed to DSPs, because traditionally, buyers were only able to cookie users of unsold impressions. Header bidding, on the other hand, exposes a greater portion of publisher impressions, greatly increasing the data DSPs can action and bid on.

Setting aside proprietary demand and unique SSP value-adds (which we will address in detail at a future time), which certainly account for a significant portion of the difference noted above, open market dynamics also result in incremental value for a variety of reasons including factors like data parameters, OpenRTB integration version, etc.

## WHAT ACCOUNTS FOR THE DIFFERENCE IN WATERFALL VERSUS HEADER?

### 1 DIFFERING MATCH RATES

DSPs may recognize different users via different SSPs, causing different bidding behavior based on the matched users.

### 2 LATENCY VARIATIONS

Another driver of the difference is that two SSPs could each sustain 3% timeout rates on average, but the timeout instances will rarely overlap, so publishers benefit from the staggering. However, gains from latency are typically small.

### 3 BUY-SIDE INEFFICIENCY

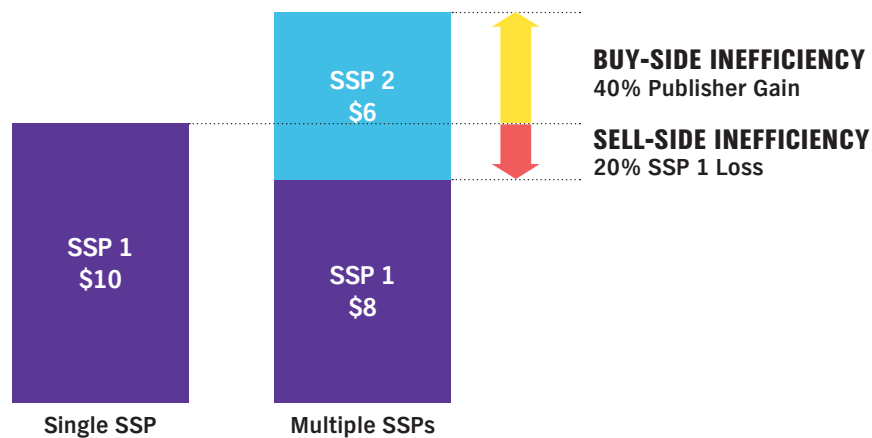
The biggest driver of the variance is due to DSPs bidding differently on the same user when presented with buying opportunities through each SSP partner (often via separate bids from different advertisers).

This results in a significant amount of market inefficiency that publishers are now recouping from the bidding process (Figure 3). Our experience has shown that SSP losses from adding new partners are significantly smaller than publisher gains. This means that sell-side inefficiencies are often a smaller factor in yield management than buy-side inefficiencies.

The real thrust of publisher adoption of header bidding and wrappers is in sending more impressions to DSPs. These additional pings often yield bids that were not previously sent from the DSP, and deliver higher valued bids than initially submitted.

FIGURE 3

### The Effect of Adding SSPs on Publisher Yield



# AUCTION TYPES & INTEGRATION METHODS

Header bidding has introduced greater complexity to the auction dynamics debate.

As the market moves towards broader adoption of header bidding-enabled strategies and tactics, the debate around auctions types has also been elevated. Industry players have gone back and forth over the differences between the various auction types and pricing models, and which most accurately reflects the true value of an impression for both sides of the transaction.

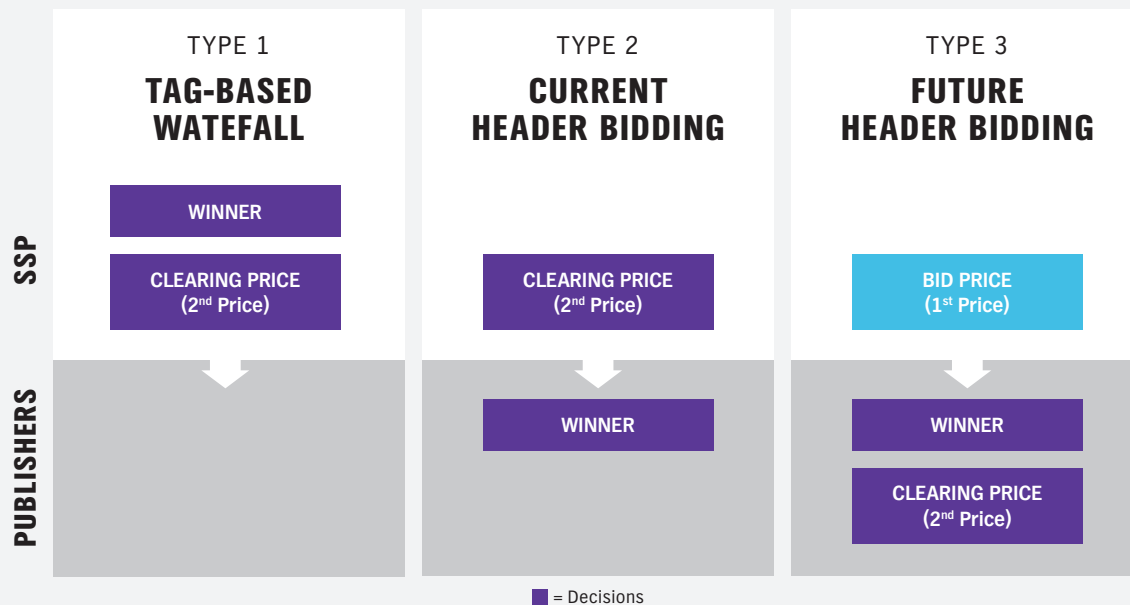
In order to be an educated participant in one of the largest discussions taking place in our industry today, and to truly understand the nuances involved in auction dynamics, we must ensure that we are speaking the same

language when it comes to auction types:

- **First Price Auction** – where the auction closes at the highest bid price
- **Second Price Auction** – where the auction closes at something less than the highest bid price (often a penny more than the second highest bid)

In addition to the different types of auctions, SSPs and publishers also have to determine the optimal mode of integrating with one another. The options available differ based upon where the ownership of two decisions lie: who determines the winner, and who determines the clearing price (Figure 4).

FIGURE 4  
Publisher-SSP Integration Options



## TYPE 1 TAG-BASED WATERFALL

When programmatic was still relatively new, all auctions were conducted via the tag-based waterfall method (Figure 5). Since SSPs were called sequentially based on pre-determined priority, the SSP determined both the winner and the clearing price. As long as its bid was above the publisher's floor price and not on an advertiser blacklist, the SSP would “win” 100% of the time that it bid. However, this could result in the publisher never seeing the highest bid since not every SSP has the opportunity to participate in the auction.

## TYPE 2 CURRENT HEADER BIDDING

As header bidding adoption has grown, we are seeing more publishers shift their integration method. With a wrapper, each SSP determines its clearing price based on a second price auction and represents a single bid into the auction. However, the winner is determined on the publisher's (or wrapper's) side. While it is clear that header bidding has provided significant improvements over the waterfall model in terms of auction dynamics, some inefficiencies and gamesmanship can remain.

For example, the winning SSP may not be representing the highest bid across all auctions. Moreover, the publisher may lose track of the highest bidder due to blacklist/whitelist incongruences. Either of these cases means we're not serving the “correct” ad to the user.

Further, the winning SSP may not be using the highest overall second price to close the auction, meaning that the advertiser is not being charged the correct price (Figure 6). In one scenario, the highest second price may not be seen by the winning SSP, but there are even more complicated cases where a publisher could lose sight of the actual second highest bid, due to prioritized buyers.

FIGURE 5

### Example of Tag-Based Waterfall Auction

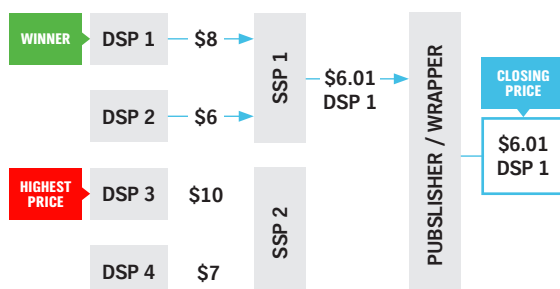
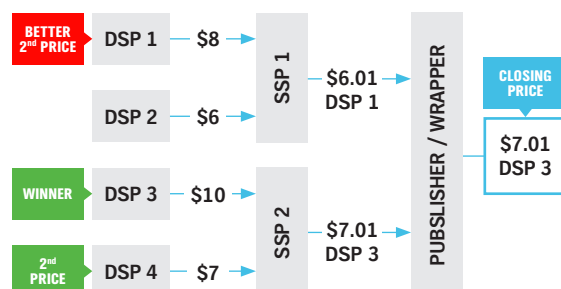


FIGURE 6

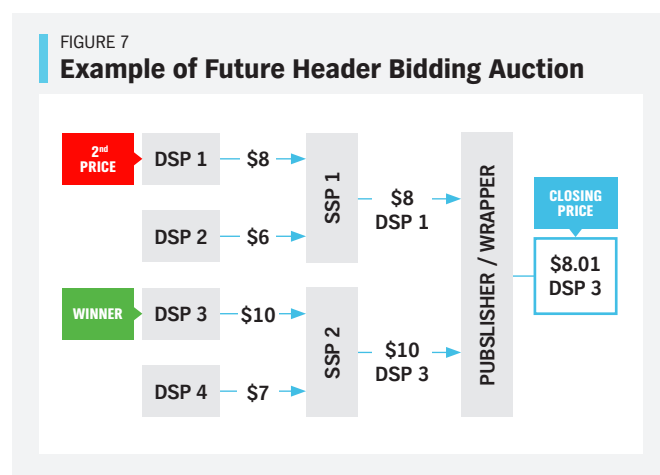
### Example of Current Header Bidding Auction



## TYPE 3 FUTURE HEADER-BIDDING

Publishers have begun to realize the benefits of increased control, so we are seeing more adoption of a new type of header bidding auction. In this integration method, the SSP passes the first price directly to the publisher, who then determines the winner and the clearing price based upon a second price auction (Figure 7).

This type of integration model is one of the fastest growing segments for the SSP category, as it allows publishers and technology companies alike to focus on creating value and improving overall industry economics. When the publisher controls the auction decisions, they are able to enrich impressions with data that buyers care about (such as better segmentation, data fidelity, addressability, viewability, etc.), ultimately extracting the most fair value for their inventory. True decisioning enables publishers to acquire more control over their revenue streams, reduce auction inefficiencies, and return more value to buyers.







# AUCTION MECHANICS & FEES

When we talk about fee structures and transparency, we should also be talking about value.

Auction dynamics are also affected by two additional factors that are typically involved in an auction transaction:

- **Floors** – prices that publishers or SSPs set to ensure that ad inventory fetches a minimum price
- **Fees** – the cost of programmatic technology

Specifically, we want to focus on the cost to the DSP of engaging in a programmatic auction by providing a clear representation of the full bid landscape. While DSPs employ varying types of fee structures, consisting of percentage based, flat rates, impact bid CPM, etc., this primer focuses on SSP behaviors.

As the ecosystem evolved from tag-based integrations to header bidding integrations, the transaction dynamics within SSPs also evolved. Historically, “buyer happiness” was maintained by creating a meaningful gap between winning first price and closing price, meaning that the actual price paid for an impression was significantly less than the buyer’s willingness to pay (or the true value of the impression). Within a tag-based waterfall environment, this did not pose a challenge since each SSP was called sequentially and as long as an eligible bid was provided, the SSP would win the auction at a discounted second price and the savings would be passed on to the buyer.

These dynamics changed with the advent of header bidding and the swift adoption of wrapper solutions. The wrapper has forced SSPs to compete against one another on price and as this trend grew, SSPs found that while they were able to source an eligible bid for an impression opportunity, win rates decreased due to real time pricing competition against other SSP. Traditional second price logic wasn’t built for a world of wrapper competition, and SSPs became incentivized to raise the closing price of their auctions in order to increase the probability of winning an auction. However, this can result in buyers spending more for an individual impression. The challenge for SSPs in today’s environment is to find the ‘sweet spot’ that maximizes win rate while maintaining distance between the winning first price and the closing price (though the gap may be smaller than it was in the past).

Further, SSPs charge fees for the services they provide, and confusion has existed in the market around what constitutes these fees (and the ultimate ‘take rate’ that the SSP receives) and the value that is provided. In actuality, SSPs employ a variety of strategies to optimize auction dynamics for their publisher and buyer partners, each with a different fee model charged to either side.

## DYNAMIC FLOORS

Dynamic floors utilize data from publishers and buyers to simulate bid density by essentially adding another floor into the auction. This floor is a prediction of the value of an impression to the buyers. The effect is to close the auction closer to first price than a normal second price auction would have done. The downside to having a floor is that if the floor is too high, the impressions can go unmonetized. These dynamic floors have become relatively common across all major SSPs. The tactic is also frequently referred to as “proxy bids”. Dynamic floors help to protect the value of a publisher’s inventory and alleviate some of the concerns around appropriate value capture/sharing from buyers.

## MODIFIED SECOND PRICE AUCTIONS

Many SSPs run modified second price auctions, meaning that the bid price has been raised above the \$0.01 premium over the second price (Figure 8). This approach results in the cost of media for the buyer being higher than if the SSP had run a true second price auction. SSPs that modify their closing prices claim that header bidding has forced their hand to be able to compete against the wrapper price competition. Moving to the ‘future header bidding’ auction referenced earlier will help SSPs mitigate this challenge by creating a more complete auction that accurately represents all demand.


Additionally, some SSPs have claimed that the closing price of auctions needs to be higher in order to compete with direct demand; but this is not entirely accurate, as the priority of direct demand is generally still higher in the ad server and will win over programmatic demand regardless of price due to outdated ad server priority rules that are based upon the waterfall. As a result, modifications an SSP makes to its auction are largely for the purposes of competing with other SSPs.

FIGURE 8

### Example of Modified Second Price Auction Model







In summary, there are three levers that impact the price that DSPs pay for media (dynamic floors, modified second price auction mechanics, and buy-side fees charged above the closing price) while there are two levers that impact how much of the auction closing price is received by the publisher (publisher fees and buy side fees charged below the closing price – both of which factor into an SSP's take rate).

Through education and common vocabulary, the debate around fees can be elevated to a strategic conversation between DSPs, SSPs and publishers, resulting in a more efficient market overall.





# BIDDING STRATEGIES

As programmatic grows in importance to publishers, so will their need for control over the revenue stream.

Headers and wrappers have given publishers the ability to select auction winners, but very few publishers are flexing this capability to build buy-side relationships. Today, virtually all header/wrapper auction winners are determined by price. An alternative to selecting the highest bidder, is choosing a winner based on priority. The highest price does not always need to win, especially if a lower price will lead to guarantees, or outsized spend in the future (these are the promises of private marketplaces and Biddable IO).

Many buyers believe that there is risk in bidding against themselves during header bidding auctions. However, based on analysis of the auctions hosted within PubMatic's OpenWrap wrapper, the percent of time a single DSP is both the highest and second highest bidder is less than 0.10% (one-tenth of one percent).<sup>1</sup>



< 0.10%

of time that DSPs bid  
against themselves  
in header bidding  
auctions

In fact, the biggest inefficiency of current header bidding auction pricing from the buyer's perspective is a ballooning "listening cost," or an infrastructure tax of receiving duplicate impressions. DSPs and other programmatic players have the option to choose preferred supply paths. 'Choosing' can be done via technology, or by partnering with SSPs who have direct connections with publishers (through header integrations, for example).

Current header bidding strategies are not standardized. As SSPs continue to implement strategies like dynamic price floors in order to increase publisher yields, the auctions themselves may end up looking more like first price auctions than second price auctions. Consequently, DSPs will treat this scenario as a first price auction and learn to bid lower (some DSPs have already developed this capability).

In this scenario, the determination of bid price would no longer be based upon the value of an impression, but rather by how little the buyer can pay for that user. This means that publishers would no longer have insight into the DSPs' true willingness to pay, thereby creating handicaps for negotiating direct deals, forecasting future revenues, and potentially eroding partnerships. It is important for publishers to retain control over closing auctions, securing their position as the arbiters of consumer surplus.



# FUTURE STATE

**The current state of auction dynamics is extremely complex, so where do we go from here?**

Within the fragmented, crowded ecosystem in which we operate, there are a variety of options that both DSPs, SSPs and publishers can employ in order to optimize performance within programmatic auctions. Based upon what we have seen to date, we anticipate the following trends to emerge, affecting the future state of auction dynamics:

## **1 ACCELERATED ADOPTION OF HEADER BIDDING PARTNERS**

Sellers will continue to add new header bidding and wrapper partners until the incremental yield of each additional partner approaches zero. This yield equation must also take into account the user experience, which each publisher should consider carefully. More precisely, the incremental yield of each additional adapter implemented will equal the incremental cost of ad operations and engineering overhead required to complete the integration and sustain ongoing partner management costs (relationship maintenance, discrepancy management, billing and collections, etc.), and user engagement.

## **2 SSP CONSOLIDATION**

Publisher acquisition will accelerate for SSPs. DSP fear of losing agency budgets for “not having supply access” will dissipate as the top SSP partners become omnipresent.

## **3 INFRASTRUCTURE COSTS**

The cost of infrastructure will become a focal point for SSPs and DSPs alike. Throttling, efficient computing, and lower cost of capital become competitive differentiators for vendors.

## **4 PUBLISHER CONTROL**

Efficient bidding will grow in importance for buyers while sellers will assume more control over auction rules. Within this environment, the second price auction will remain prevalent, but publishers will control it rather than SSPs.

## **5 FOCUS ON THE METRICS THAT MATTER**

The noise surrounding take rates will fade as the focus returns to ROI and yield. Over time, this will result in an ecosystem where performance and feature complete platforms win.

<sup>1</sup>PubMatic sampled 400M OpenWrap auctions, and counted the number of instances where a DSP could potentially be bidding against itself. The instances were defined by the same DSP representing both the highest and second highest bid. Note: PubMatic has controls in place to prevent DSPs from bidding against themselves, so the count only represents a potential value, not an actual value.

## About PubMatic

PubMatic is the automation solutions company for an open digital media industry. Featuring the leading omni-channel revenue automation platform for publishers and enterprise-grade programmatic tools for media buyers, PubMatic's publisher-first approach enables advertisers to access premium inventory at scale. Processing nearly one trillion ad impressions per month, PubMatic has created a global infrastructure to activate meaningful connections between consumers, content and brands. Since 2006, PubMatic's focus on data and technology innovation has fueled the growth of the programmatic industry as a whole. Headquartered in Redwood City, California, PubMatic operates 11 offices and six data centers worldwide.

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