Test results are in:
The promise of mobile app bidding has become a reality
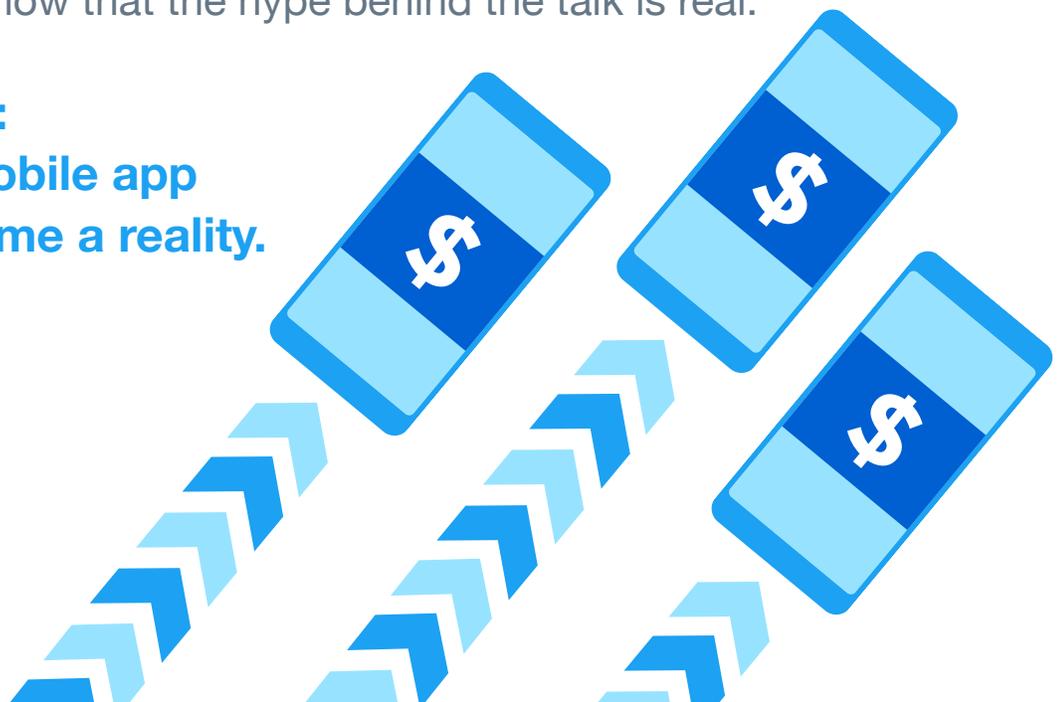
mopub

Contents

Summary

Mobile app advertising is increasingly moving more holistically towards programmatic buying methods, an approach designed to increase both overall ad revenue for publishers and supply access for buyers. It's the mobile app world's version of header bidding; at MoPub, our in-app bidding solution is known as Advanced Bidding. In-app bidding is a hot topic across the industry — but does it work?

This piece details MoPub's approach to running A/B tests designed to uncover the impact of Advanced Bidding compared to a traditional waterfall-based mediation approach. (Hint: a real, effective A/B test involves much more than just turning on bidding and measuring ARPDAU.) We ran A/B tests with two publishers, and the results for these publishers show:

- **An increase of 5% to 15% in publishers' ARPDAU.**
- **An increase in filled supply.**
- **An increase in supply access for all programmatic buyers (Advanced Bidding networks as well as MoPub Marketplace DSP buyers).**
- **An increased share of wallet for all programmatic partners.**

Talk of the potential of mobile app bidding is at a fever pitch, and MoPub's A/B tests show that the hype behind the talk is real.

The results are in: the promise of mobile app bidding has become a reality.
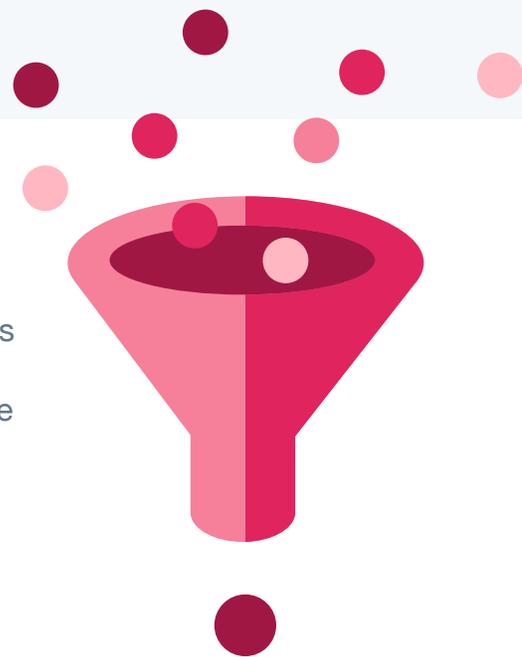
Advanced Bidding overview

For over eight years, MoPub has connected app publishers and mobile ad buyers looking to purchase supply in real-time across a variety of ad formats. Nearly from inception, MoPub had the vision that all mobile app media would eventually be transacted programmatically.

Over the last few years, we've observed publisher partners using an increasingly sophisticated mediation technique in which networks are called multiple times in an ad stack at different price points. Unfortunately in waterfall-based mediation, moving towards a more competitive waterfall landscape comes with downsides — including a significant increase in latency (and therefore lost supply opportunities), as well as noticeably more effort for monetization operations management.
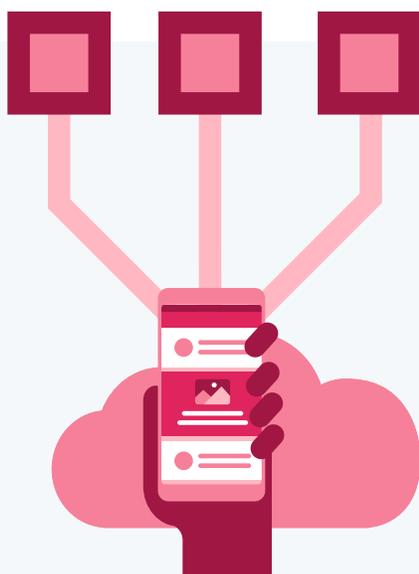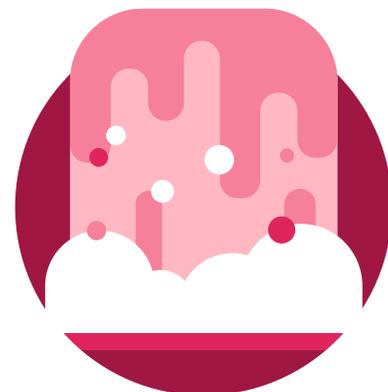
These challenges are driving a shift towards a bidding paradigm. Networks are being asked to value inventory on a per-request basis in the same way DSPs have been doing for years. A programatically-transacted future can capture the upside of great competition while eliminating the downsides. In 2017, the MoPub team conducted a lengthy R&D effort aimed at determining the best path forward to make the dream a reality.

In December 2017, MoPub launched the alpha version of Advanced Bidding, a first iteration in the effort to replace the app ads waterfall with a unified auction. Since then, we've made product improvements that allowed us to launch the beta upgrade of the solution, and have been busy onboarding beta publishers and ad network bidders. In the first half of 2019 MoPub launched a streamlined user interface for setting up Advanced Bidding, and defined the product roadmap for the next year.
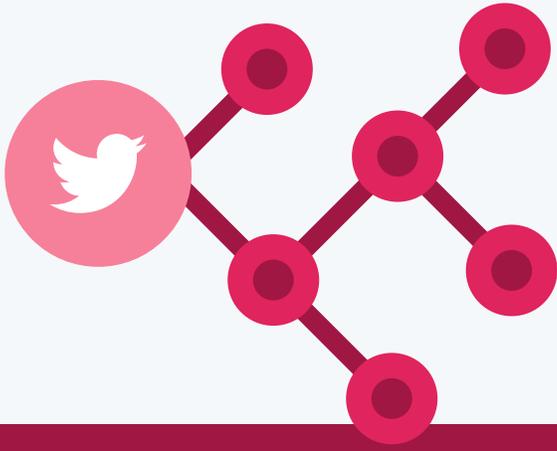
MoPub's position as a primary network mediation layer and as the leading in-app exchange, connected to over 180 demand-side platforms including the Twitter Audience Platform, gives us a unique ability to integrate Advanced Bidding without having to bias the platform towards one demand source or another.

MoPub's current Advanced Bidding participants include Facebook Audience Network, Tapjoy, and AdColony, alongside the MoPub Marketplace, our leading in-app programmatic exchange. Another 10 ad network bidders are in active implementation and testing phases.
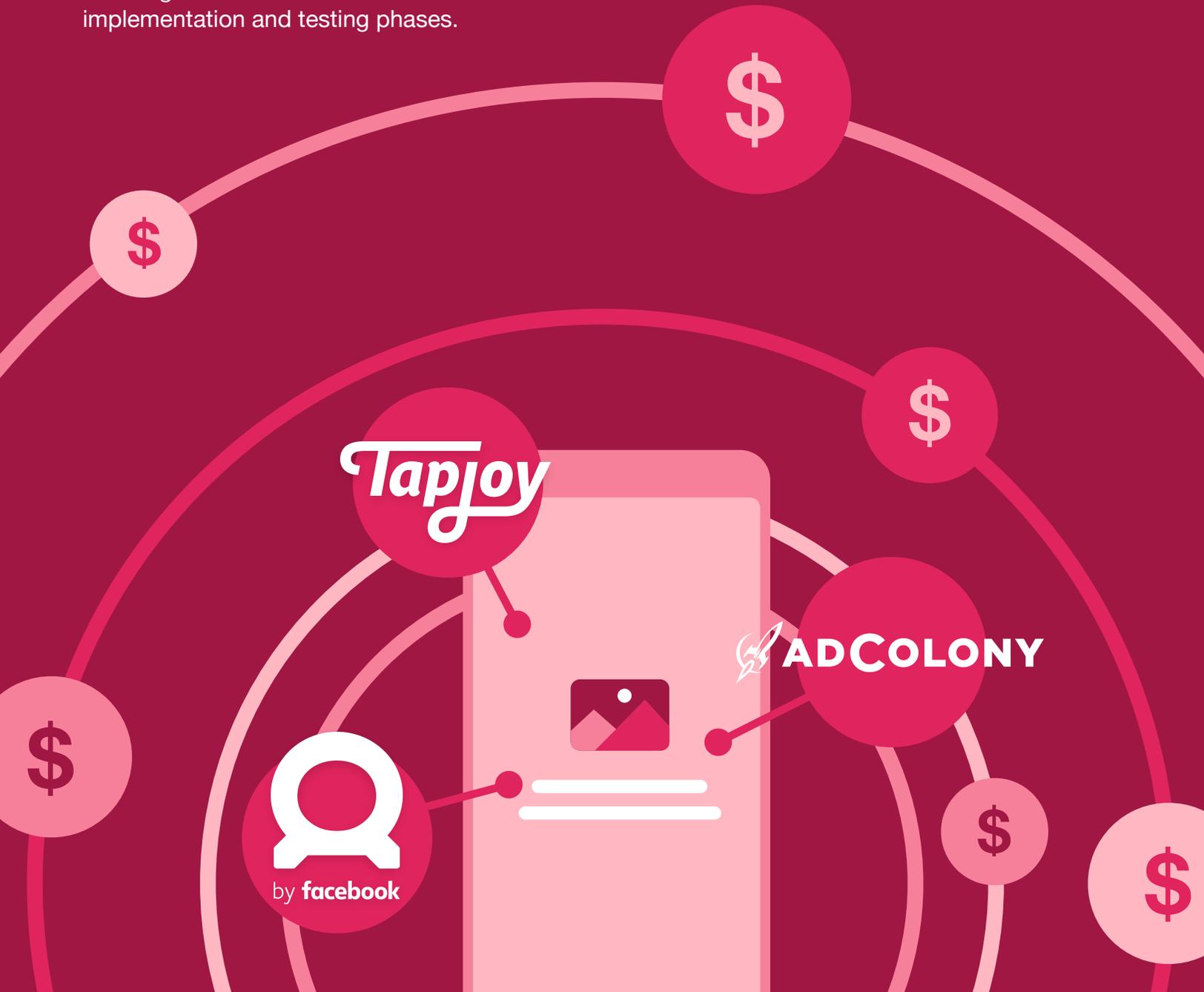
About our publisher participants

To test the impact of Advanced Bidding, we selected two leading mobile app publishers to A/B test interstitial and rewarded video ad performance.

Uken Games

The first participant was Toronto-based publisher Uken, known for building games such as Who Wants To Be A Millionaire? and Jeopardy! World Tour. These top two trivia games reach millions of global players every month. In under a year, Uken was able to scale Who Wants To Be A Millionaire? and become a top-grossing trivia game on both platforms.

Uken has been on the forefront of testing new products in an effort to continue to push the mobile game space forward. With all the excitement surrounding Advanced Bidding, they were keen to do a proper A/B test to understand the actual impact.

In addition to the potential for a revenue uplift, the increased operational efficiency that comes from flattening the waterfall was also very important to Uken.

For the test, Uken activated both Facebook Audience Network and Tapjoy as Advanced Bidding networks. Both networks competed against Uken's non-bidding networks and the MoPub Marketplace.

"Managing the day to day operations with Advanced Bidding makes things easier for us. It provides us more time to think about new ad placements and better user ad/IAP segmentation."

UKEN GAMES

Carlo Santiago,
Ad Operations, Uken

Publishers Clearing House

"Since adopting MoPub's ad server, and through a continued strong partnership, we've seen app revenue grow at an annual rate of 54%. MoPub's investment in Advanced Bidding will ensure we can continue to grow both our partnership and revenue."

pch.com
PUBLISHERS CLEARING HOUSE

Doug Cuesta,
Programmatic Specialist,
Publishers Clearing House

Publishers Clearing House (PCH) is a leading direct-to-consumer entertainment, commerce, and marketing company that has put consumer engagement and loyalty at the center of its client solutions for more than 60 years. The company is famous for its Prize Patrol which surprises winners on their doorsteps while TV cameras are rolling with oversized checks. In the digital age, PCH has transformed into a top entertainment and shopping destination for millions of US consumers. They help marketers acquire new customers through a unique blend of native, chance-to-win experiences.

PCH has been keen on testing Advanced Bidding in order to replace complicated waterfall management, maximize revenue from each ad opportunity, and be on the forefront of the app ecosystem's transition to auction-based monetization. Additionally, Advanced Bidding enables accurate impression-level reporting data for participating demand sources, allowing for overall efficiency gains in both monetization and user acquisition.

For the test, the Advanced Bidding networks included Facebook Audience Network, AdColony, and Tapjoy. All three networks competed with the MoPub Marketplace and the non-bidding networks.

MoPub is in the process of A/B testing several more publisher integrations across different regions, app verticals, and formats to further solidify our results. Once the tests conclude, those results will be shared as an update to this piece.

Testing methodology

MoPub's Advanced Bidding product has two goals for mobile app publishers: to reduce the complexity of demand source management and to maintain or increase publisher revenue. The former is measured more qualitatively, while the latter can be quantitatively measured given the right testing setup. Below we review the optimal testing methodology required to accurately define publisher results.
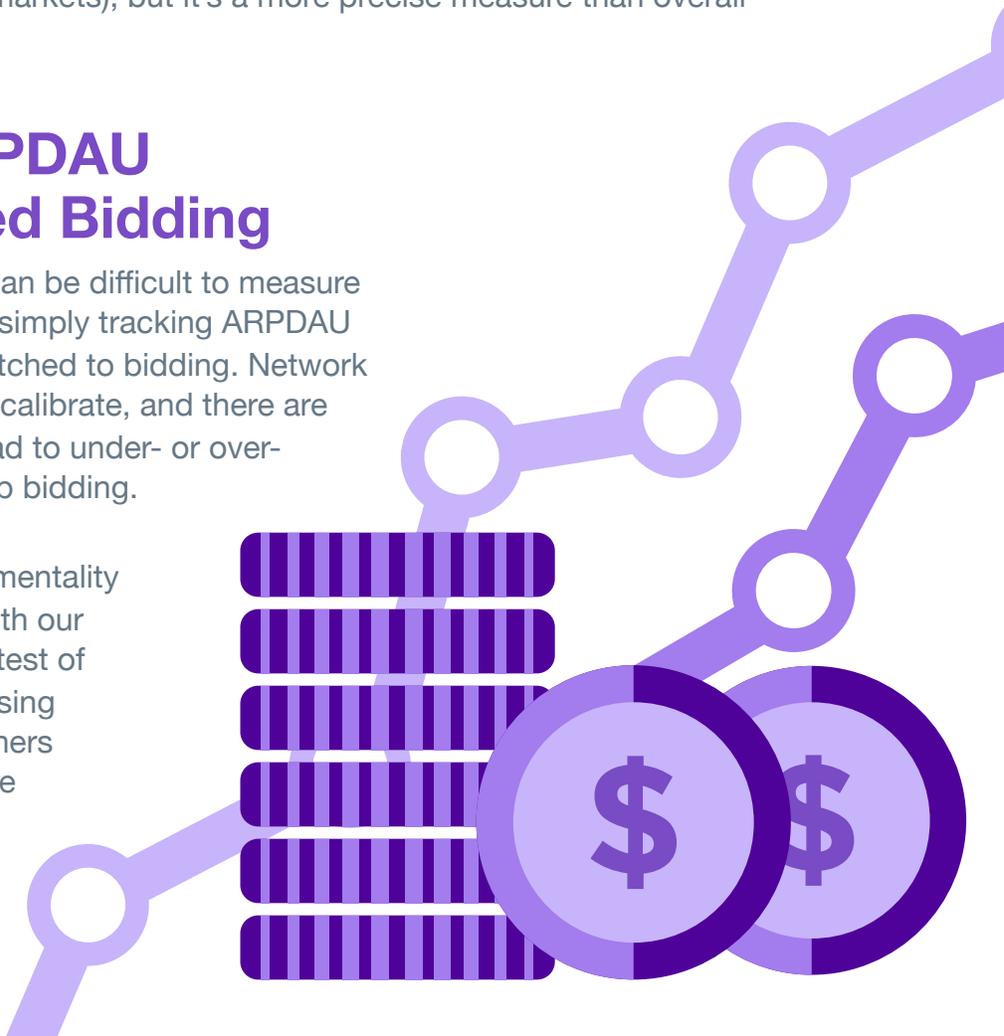
Measuring impact on publisher revenue

Publishers are constantly trying to improve their yield, and changes to either their supply or demand configurations are typically done in the pursuit of increasing revenue. There are many variables that cause changes in payout on a day-to-day basis, making it extremely difficult to isolate the effect of single changes on publisher revenue.

We always recommend that publishers control for their supply base by looking at metrics on a per user basis, rather than looking at total payout. The north star metric for publisher optimization is **average revenue per daily active user (ARPDAU)**. This is a basic measure and can't control for all variables (for example, if a publisher's user base remains the same size, but shifts to lower value regions or markets), but it's a more precise measure than overall publisher revenue.

Measuring the ARPDAU effects of Advanced Bidding

Even when measuring ARPDAU, it can be difficult to measure the effects of Advanced Bidding by simply tracking ARPDAU before and after a publisher has switched to bidding. Network bidding algorithms can take time to calibrate, and there are plenty of other variables that can lead to under- or over-stating the true impact of mobile app bidding.

In order to isolate the revenue incrementality of Advanced Bidding, we worked with our publisher partners to set up an A/B test of two waterfalls, with the test group using Advanced Bidding. All network partners who support Advanced Bidding were enabled.

A/B test setup

1. Identify ad units to opt into the test

Ad Unit Control

Priority 1
- **Network A** Placement ID: "abc"
- **Network B** Placement ID: "def"
- **Network C** Placement ID: "ghi"
- **Network C** Placement ID: "jkl"

Priority 2
- **Network B** Placement ID: "mno"
- **Network A** Placement ID: "pqr"
- **Network D** Placement ID: "stu"
- **Network D** Placement ID: "vwx"
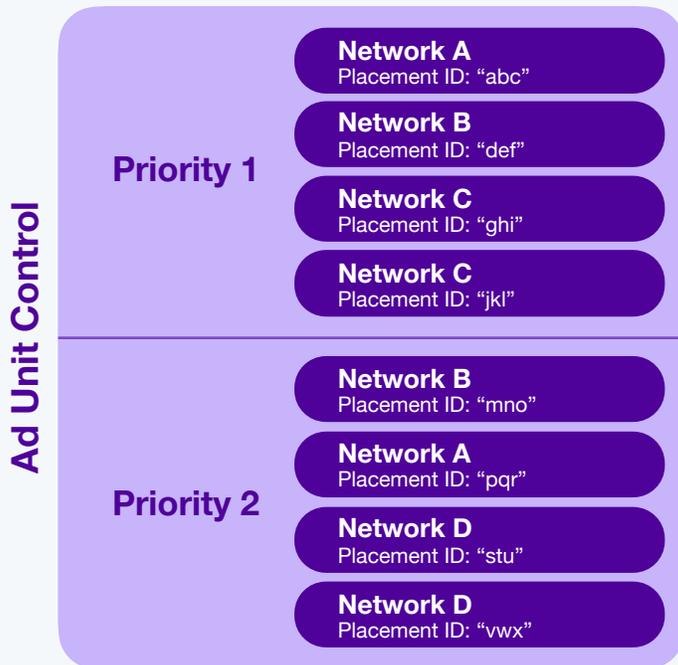
We worked with our publisher and network partners to identify ad units (slices of publisher inventory with unique waterfall configurations) that would be suitable for the test. Ad units were considered if they contained at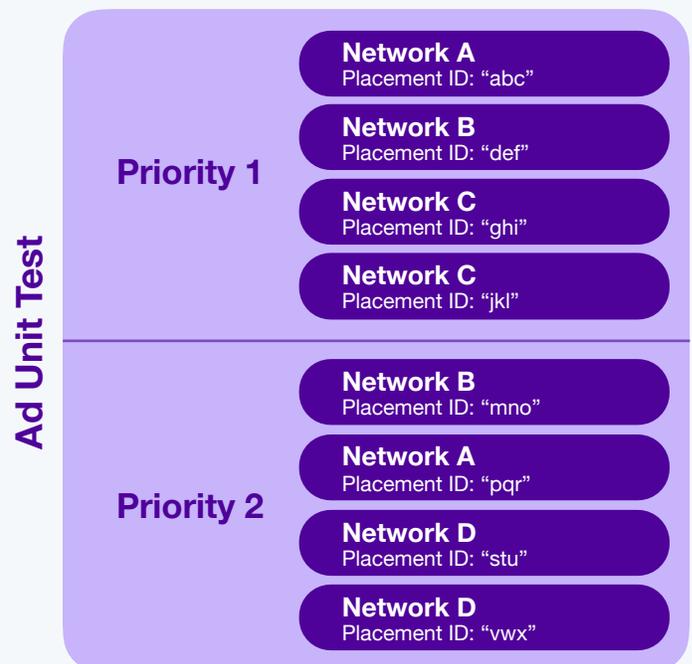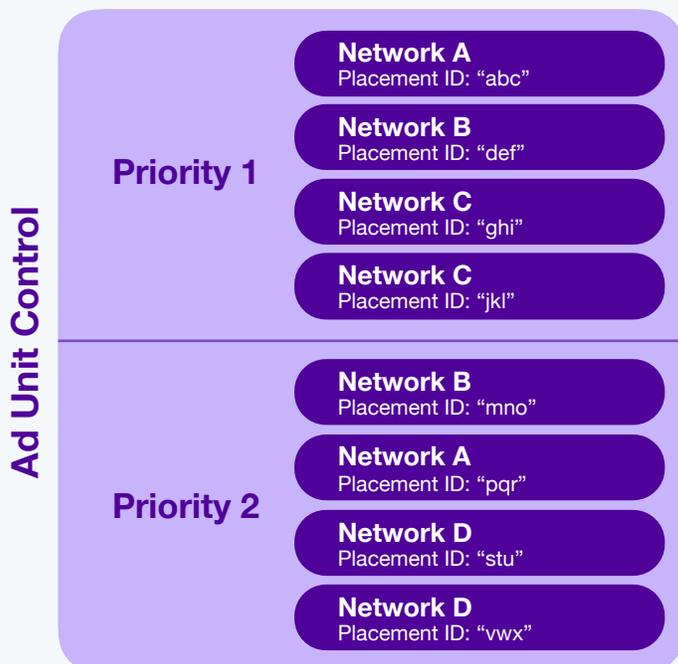 least two Advanced Bidding networks, the MoPub Marketplace, and the significant volume required to drive a conclusive result. We also wanted publishers to select ad units that were well optimized in order to measure the performance of Advanced Bidding against the best waterfall competition.

2. Duplicate the ad units

Ad Unit Control

Priority 1
- **Network A** Placement ID: "abc"
- **Network B** Placement ID: "def"
- **Network C** Placement ID: "ghi"
- **Network C** Placement ID: "jkl"

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- **Network B** Placement ID: "mno"
- **Network A** Placement ID: "pqr"
- **Network D** Placement ID: "stu"
- **Network D** Placement ID: "vwx"

We duplicated the waterfalls of the control group ad units into new, test group ad units.

3. Create new placements for remaining networks in the waterfall

Ad Unit Control

Priority 1
- **Network A** — Placement ID: "abc"
- **Network B** — Placement ID: "def"
- **Network C** — Placement ID: "ghi"
- **Network C** — Placement ID: "jkl"

Priority 2
- **Network B** — Placement ID: "mno"
- **Network A** — Placement ID: "pqr"
- **Network D** — Placement ID: "stu"
- **Network D** — Placement ID: "vwx"

Ad Unit Test

Priority 1
- **Network A** — Placement ID: "123"
- **Network B** — Placement ID: "456"
- **Network C** — Placement ID: "789"
- **Network C** — Placement ID: "754"

Priority 2
- **Network B** — Placement ID: "221"
- **Network A** — Placement ID: "098"
- **Network D** — Placement ID: "923"
- **Network D** — Placement ID: "982"

In order to be able to report on the total payout and ARPDAU for each ad unit, we needed to be able to collect performance data from all demand sources in the waterfalls, and to be able to distinguish which revenue came from the control group, and which came from the test group.

To achieve this, publishers took each placement (known variously by networks as "placements," "zone," etc) in the original waterfall, and created new, identically-configured placements for each non-bidding network. We also ensured that these placements were not used in any other ad units. This allowed us to query each network and obtain performance data for both the test and control groups independently.
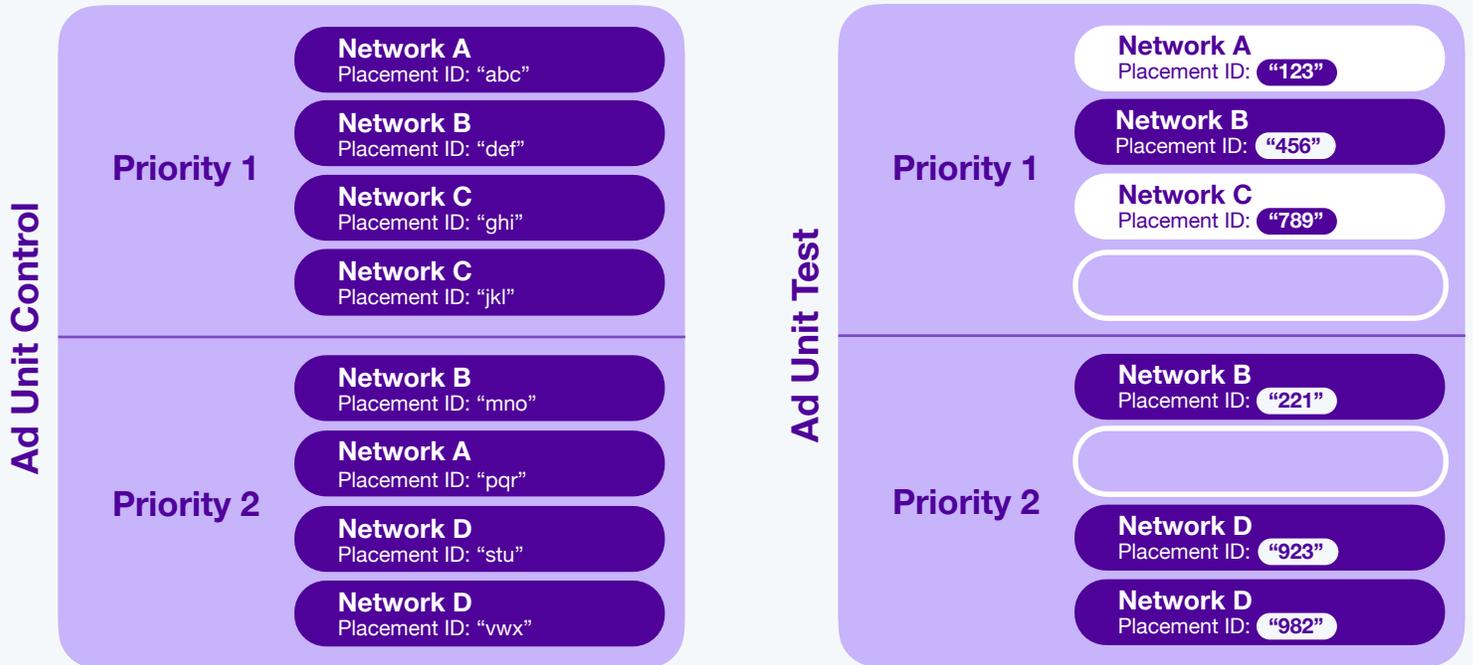
4. Divert 50% of users making ad requests into the test ad unit

All users in the publishers' apps were making requests to the control group. We had our servers divert the request for half the users into the test group. We ran test vs. control for approximately two weeks — until the groups saw identical ARPDAU results.

This was important as it allowed us to confirm that we hadn't introduced any unintended variables into the system, and to make sure that given a similar environment, two different network placements would perform similarly.

5. Make changes to the test group to enable Advanced Bidding

Ad Unit Control

Priority 1
- **Network A** Placement ID: "abc"
- **Network B** Placement ID: "def"
- **Network C** Placement ID: "ghi"
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Ad Unit Test

Priority 1
- **Network A** Placement ID: "123"
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- **Network C** Placement ID: "789"
-

Priority 2
- **Network B** Placement ID: "221"
-
- **Network D** Placement ID: "923"
- **Network D** Placement ID: "982"

We configured the test group waterfalls to use Advanced Bidding. This consists of creating a new Advanced Bidding entry for each bidding network, and removing their traditional mediation entries. Non-bidding networks remain unchanged.
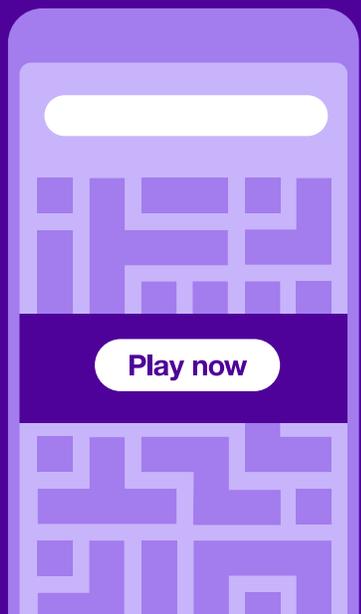
6. Run the test

Once Advanced Bidding was live, we let the test run for approximately two weeks. This allowed bidding networks to calibrate their new models, and allowed non-bidding network models to shift their performance according to the different supply mix that they began seeing across the two groups.

In order to make sure that those performance changes were reflected, all non-bidding networks had MoPub's Auto CPM product enabled. Auto CPM enables automatic updating of network performance, which allows networks to naturally shift their positions in the waterfall according to their performance.

Once the results and performance of the demand sources had stabilized, we continued to run the test for an additional two weeks in order to validate the stability of the ARPDAU changes.

Play now

Results & analysis

ARPDAU

Both participants saw significant ARPDAU gains by switching their eligible network demand sources to Advanced Bidding.

Publisher	Change in ARPDAU
PCH	+15.3%
UKEN	+4.8%

(Avg(ARPDAU Test)/Avg(ARPDAU Control)-1) 100

Fill

Any increase from ARPDAU must come from an increase in revenue per impression, an increase in impressions per user, or a combination of both. In order to explore these dynamics we measured the change in impressions per user.

Publisher	Change in impressions/user
PCH	+53.4%
UKEN	-1.3%

PCH, which saw the greater increase in ARPDAU, also saw the more significant increase in impressions per user. We believe that an increase in impressions per user is the result of a combination of factors, including two notable ones:

1. Shift in buying incentives

If a demand source competes against others in a CPM-based waterfall, they always have to make a trade-off between perceived performance and fill. If they choose to fill only the highest performing ads, then their CPMs look impressive and they can retain a higher spot in the waterfall, but they have low fill rates and therefore can drive limited overall revenue. If they try to drive as much revenue as possible by filling as much as possible, then their average CPMs will decline and they risk being pushed down the waterfall and losing access to the majority of impressions, which further compounds the perception of poor results.

Advanced Bidders compete *against* the waterfall rather than *within* it. Publishers know that any time a bidding partner is chosen to fill inventory, it's because that partner was the demand source willing to pay the most for that ad opportunity. No longer measured using the yardstick of eCPM, Advanced Bidders are able to drive as much revenue performance as possible for their publishers.

2. Reduction in latency

A complex waterfall can take a significant amount of time to resolve. For some publishers this can come at the cost of losing additional ad opportunities. In a traditional waterfall with demand sources in the ad stack at multiple price points, mediation platforms must make a trade-off between the time cost of performing multiple "guess-and-check" round trip communications with a network SDK, and the potential user-bandwidth cost of calling multiple sources in parallel and unnecessarily making too many client-side ad requests.

Advanced Bidding solves this problem. By calling our bidding partners in parallel, server-side, and in real time, we minimize the round trips required. And, as a bid is a commitment to fill if it wins the auction, we can also instruct the publisher to only make a final, single ad request to the demand source that was willing to pay the most.

> "The results from the A/B test exceeded our expectations. We're excited for additional networks to come onboard so we can continue to take advantage of the benefits we saw in our initial test."

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Doug Cuesta,
Programmatic Specialist,
Publishers Clearing House

Demand mix

One possible reason for publishers to see an increase in ARPDAU from Advanced Bidding could be that bidding networks actually contribute *less* to a publisher's revenue. Weak bids could mean that other waterfall networks had a chance to compete where they did not previously, and ARPDAU lift could be attributed to strong performance from non-bidding partners. However, we were able to confirm that this is not the case.

Publisher	Change in RTB* SOW	Change in traditional mediation SOW
PCH	+4.3%	-26.4%
Uken	+13.0%	-28.2%

*Advanced Bidding networks and the MoPub Marketplace

To explore this, we analyzed the impact of bidding on the share of wallet (SOW) from both RTB partners (DSPs and Advanced Bidders) and traditional mediation networks. Switching to Advanced Bidding allowed those networks to grow their SOW even further. For both participants, networks that switched to Advanced Bidding had already held a significant share of wallet, so further growth was unexpected and impressive to see.

Conversely, non-bidding networks had their shares of the publisher wallet reduced significantly, losing over a quarter of their SOW. We expect this trend to continue as we increase the number of publishers on Advanced Bidding, and to accelerate as we welcome more network partners to Advanced Bidding.

Key takeaways

1. Advanced Bidding drives positive results.

App publishers benefit from in-app bidding. It's clear from the results of our testing that even if only one or two of your network partners are ready to move to bidding, there are immediate gains to be had from Advanced Bidding:

- A waterfall that is easier to manage: simpler and more fair to all involved.
- Incremental ARPDAU gains.
- A monetization management platform that is set up for further success as you onboard additional networks to bidding.

2. Demand competition maximizes revenue.

When testing mobile app bidding platforms, publishers should ask their providers about the demand composition in the unified auction. It should be clear which demand sources will be bidding in real-time and how those demand sources will or will not compete with traditional networks. Given that some networks are still transitioning to a bidding model, a hybrid solution like Advanced Bidding that enables a unified auction between real-time bidders and static demand sources is best to ensure a dense auction. Advanced Bidders are able to compete with a real-time price for every single impression, leveling the playing field for all real-time buyers and maximizing competition. Publishers should sit down with their top demand sources that aren't yet bidding and ask for their timelines to make the transition.
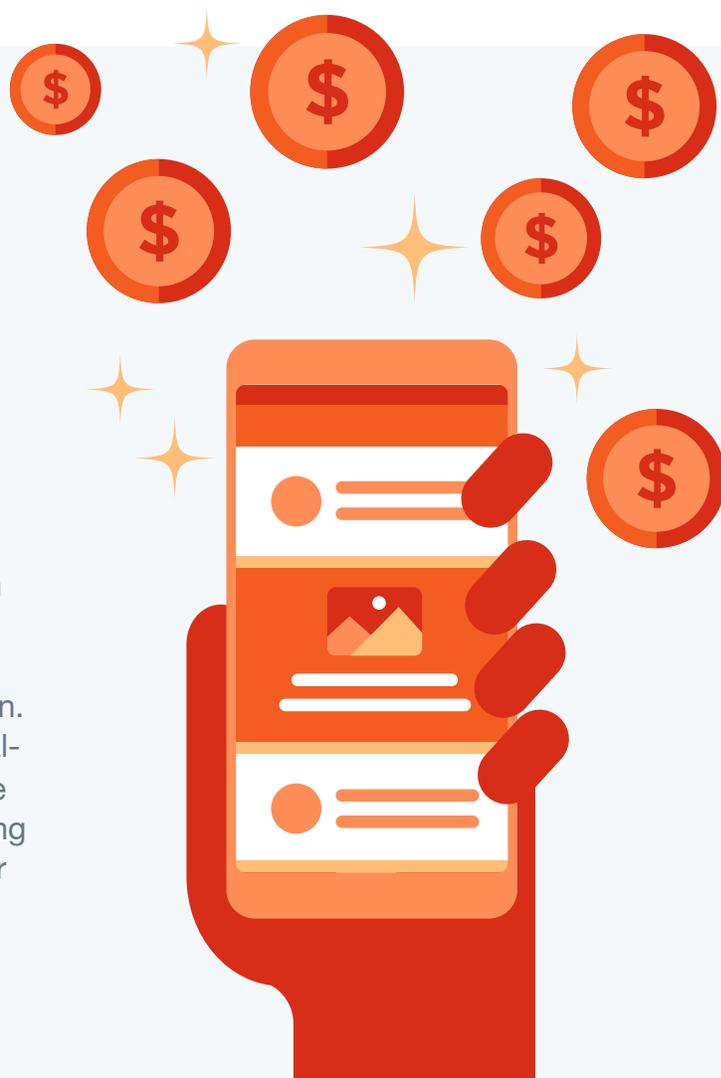
3. Bidding partnerships are crucial.

For ad networks, moving to a real-time buying approach is no small task. Most networks have to build out the infrastructure to bid in real-time and adjust their models to transact on a CPM basis versus their historical CPI models. Despite these challenges, we are seeing rapid adoption of bidding across the ecosystem because there are so many benefits to real-time bidding. MoPub's Advanced Bidding product allows Advanced Bidders (networks and bidders in the MoPub Marketplace) to get the first look at all ad requests, which increases the compete rate of Advanced Bidders to 100%. This increases all Advanced Bidders' ability to reach the users required to meet their advertisers' KPIs. In addition, Advanced Bidders are able to compete with a real-time price for every single impression, which evens the playing field for all real-time buyers.

By leveling the playing field and providing transparency, network Advanced Bidders and DSPs can expect to see optimized performance.

It's expected that a majority of MoPub's mediation partners will evolve to become Advanced Bidding networks within the next year.

As an early adopter of bidding, and MoPub's first Advanced Bidding partner, Facebook Audience Network has been part of Advanced Bidding's fair and transparent auction since 2017.

"We believe bidding is the future of app monetization as it creates an open and fair ad ecosystem which helps publishers maximize revenue for every impression. We're excited to be partnering with MoPub to help make bidding a reality."

audience network
by facebook

Vijay Balan, Head of Publisher Solutions Partnerships, Facebook Audience Network

"We're very excited about the prospect of Advanced Bidding to level the playing field, and enable fair access to sought-after inventory for all buyers involved. This is especially valuable to help advertisers achieve their campaign objectives."

Peter Turner, Head of Partnerships, LinkedIn Audience Network

"Transparency is the way forward. Advanced Bidding is the best way to shine a light onto the process, and MoPub is at the forefront, leading the way. We've seen an exponential growth in the number of Advanced Bidding impressions over Q2 2019, which is really exciting."

AdColony

David Pokress, EVP of Publishing, AdColony

"Advanced Bidding potentially presents many advantages for game publishers; it's a major change for the whole ecosystem. Working with partners like MoPub is important to us because we are among the first to fully embrace programmatic mediation. We all believe in transparency and true performance, and ultimately want to continue to evolve and support publisher monetization. True transparency will go a long way in making the mobile world more democratic and accessible. It's the natural next step for our industry."

Tapjoy

Ben Chen, SVP & GM Global Developer Relations, Tapjoy

4. Time is a currency, and bidding can provide significant savings.

Time spent has always been a key ad engagement metric. But what about time spent on ad network management? We all have an internal barometer for how much our time is worth. What we don't often do is consider that time has an actual cost, and then factor that cost into the ROI calculation for setting up many individually-priced line items for several demand sources.

Coming up with a simple cost calculation for staff time can help publishers understand the savings that will result with simplified management. Compared to traditional waterfall mediation, Advanced Bidding also offers the opportunity to reduce time spent on ad network management and ad trafficking operations.

5. In-app bidding is a long term investment.

As a publisher getting started with in-app bidding, it's key to approach the test with the right mindset: this is a chance to iterate, learn, and improve, and should be viewed as a long-term investment (not just a short-term chance to boost revenue).

Both our publishers saw initial dips in ARPDAU in the first few days of switching to bidding, as their newly programmatic demand partners switched their buying method. Within two weeks they had hit revenue neutrality, and then they started seeing incremental lift. Different publishers may see positive results more quickly or more slowly, so it's important to give your demand partners time to adjust.

Other best practices for getting started: pick the right apps for your test. They should have meaningful user volume, and not have an overly complex waterfall set-up. Finally, publishers should push their demand sources to participate in bidding.

"Advanced Bidding has always been of interest to Uken because of its promise to provide the highest price and more efficient inventory management, while also solving transparency problems and stale prices. Our initial A/B test showed potential, moving one step closer to a full real-time bidding stack."
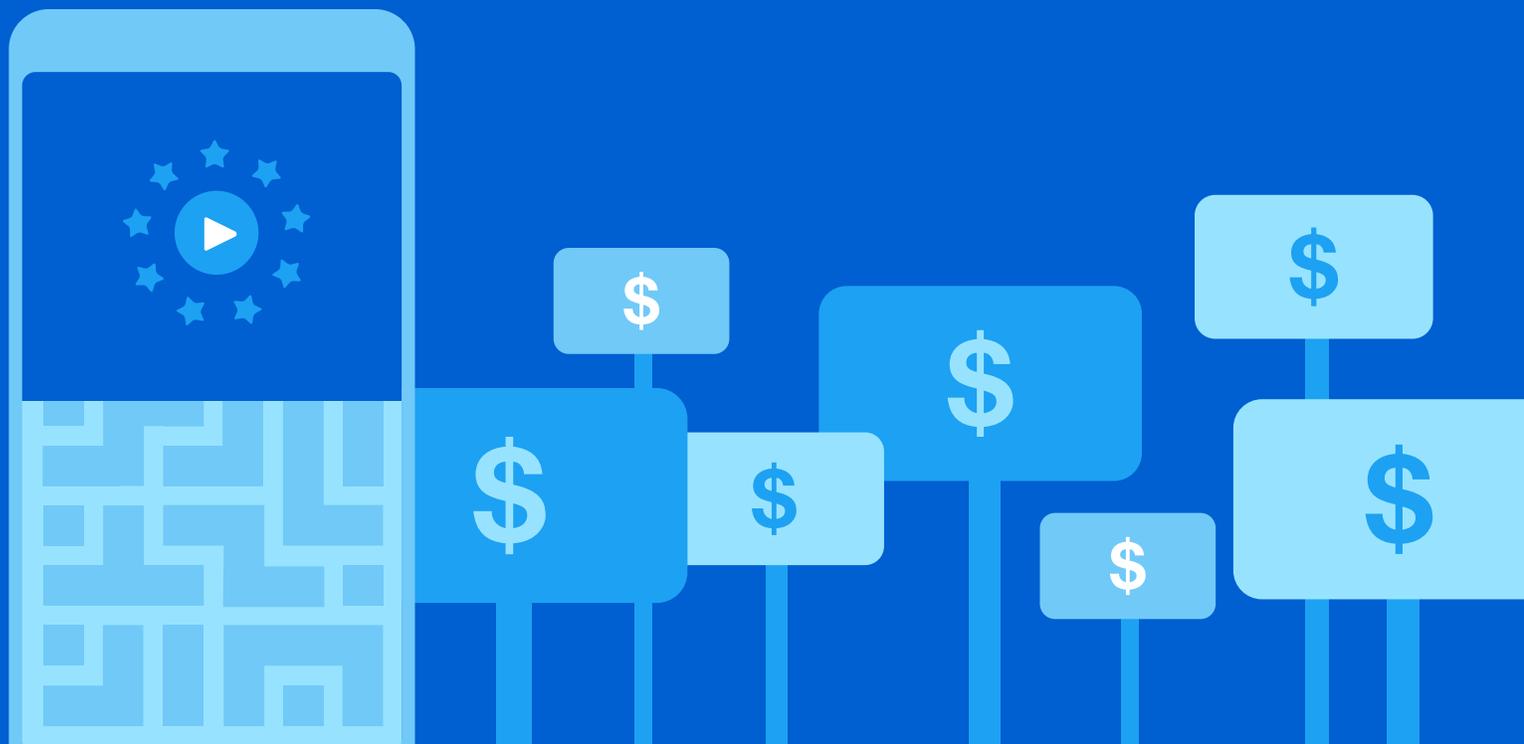
UKEN
GAMES

Conrad McGee-Stocks,
Growth Lead, Uken

What's next?

MoPub is conducting similar A/B tests with several more publishers and is looking forward to sharing those results. At the same time, we continue to monitor our publishers who have Advanced Bidding live and are adding new apps every day.

We also intend to work with publishers to scientifically measure any change in time-to-fill for each ad request (ad latency). This will allow us to test our hypotheses that Advanced Bidding can reduce waterfall latency and unlock additional inventory for publishers.

In-app bidding is a gamechanger for mobile app publishers and ad buyers, and at MoPub, we're excited to continue investing in our Advanced Bidding product. We'll be using publisher feedback to iterate on the setup and management flows, and actively working with additional network partners to onboard them to our platform as bidders. Keep an eye on mopub.com/advanced-bidding for the latest updates, and be sure to get in touch if you'd like to speak with our team about the opportunities that bidding provides.

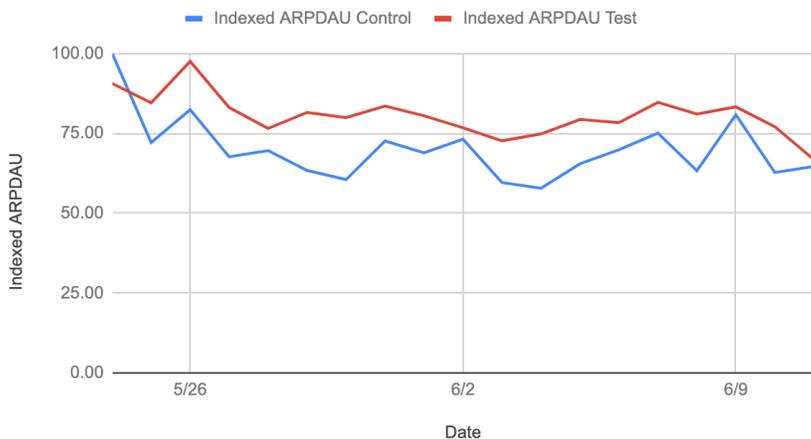# Appendix

Publishers Clearing House
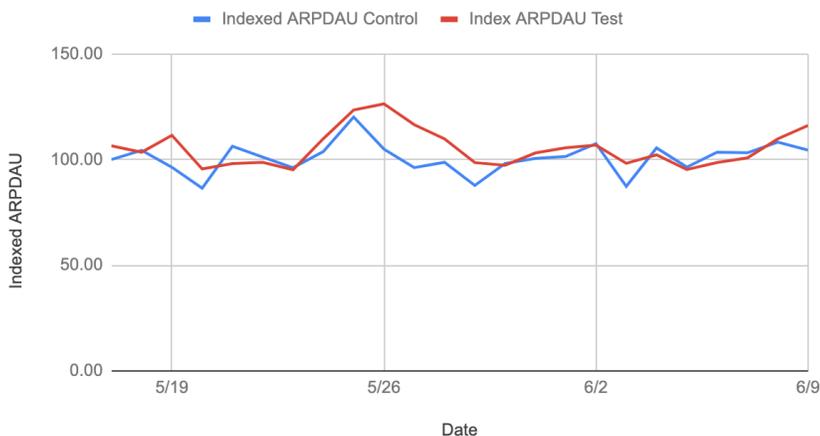
ARPDAU

Indexed ARPDAU Control vs. Test

Demand mix

SOW	Control	Test
Static Network	14.0%	10.3%
Bidding Network	86.0%	89.7%

Uken

ARPDAU

Indexed ARPDAU Control vs Test

Demand mix

SOW	Control	Test
Static Network	31.6%	22.7%
Bidding Network	68.4%	77.3%

About MoPub

To learn more about MoPub's suite of products, please visit the MoPub Monetization Platform and check out some of our latest solutions: Advanced Bidding, MoPub Analytics, and impression-level revenue data.

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This whitepaper was co-authored by MoPub's Jackelyn Cooper, Jayme Farrell-Ranker, David Gregson, and Shivani Singh, with contributions from many members of the MoPub team. Questions? Get in touch at www.mopub.com/contact.