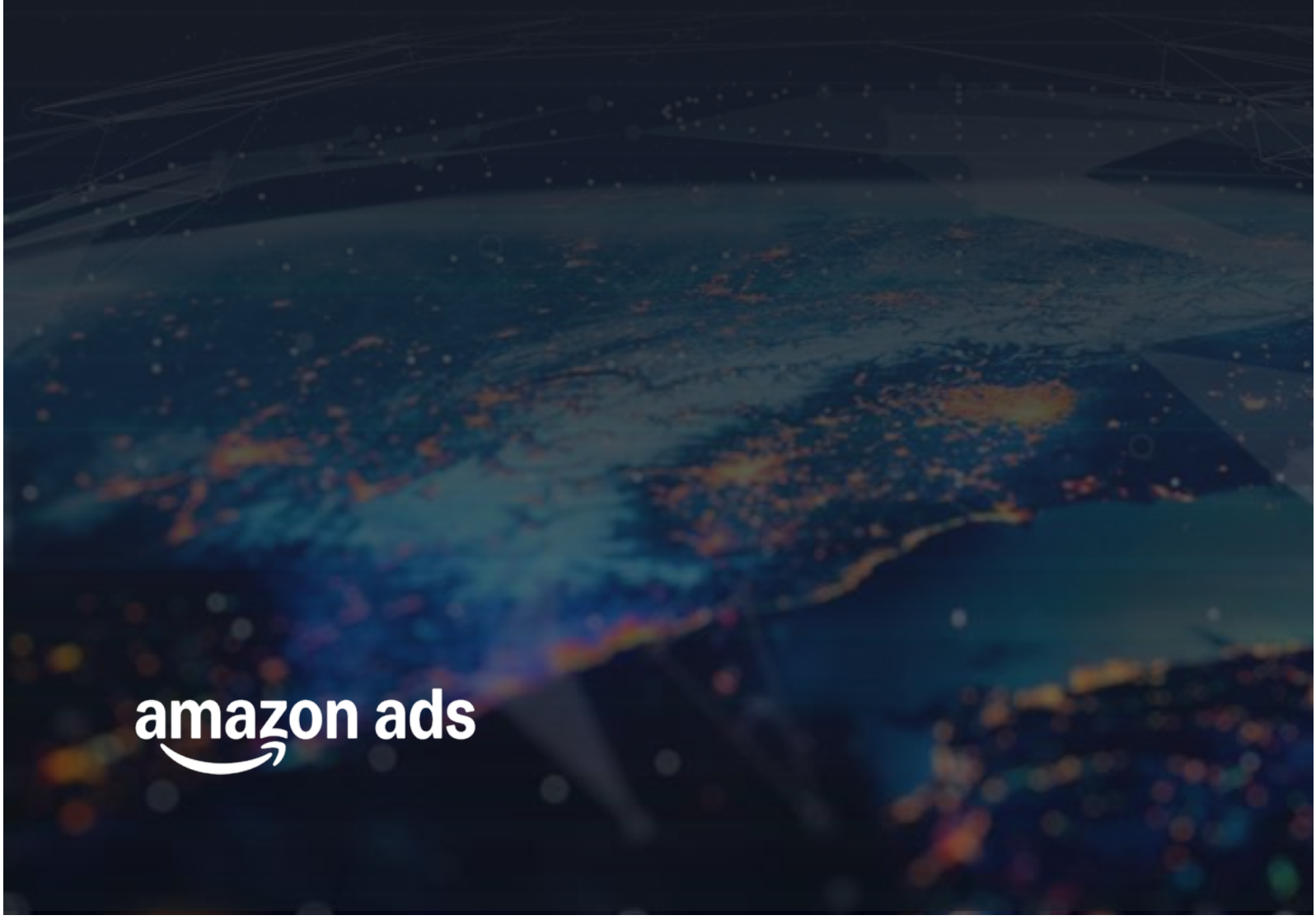
Signals to Success

Delivering Superior Performance Through Transparent Advertising Technology



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Executive summary

Amazon DSP's signal-driven approach is built on several core tenets, two of which are: maximizing advertiser performance and providing transparency. Working backwards from advertiser objectives, we optimize campaigns through sophisticated signal evaluation and data-driven decisions across media planning, forecasting, bidding, and supply paths, helping advertisers achieve their business goals while maintaining complete control of their media strategy.

Our technology infrastructure integrates three foundational innovations:

1. **A comprehensive authenticated graph** that replaces uncertainty with verified signals that directly feed into our audiences
2. **Advanced planning and forecasting technology** that optimizes budget allocation
3. **Advanced real-time bidding systems** that process trillions of weekly requests

This signal-first approach extends to our publisher partnerships through a wide range of available tools helping publishers understand signal value for customers.

This approach is validated by industry-leading results, as demonstrated through case studies with major brands including Lay's and Sol de Janeiro. These real-world examples showcase how premium brands leverage Amazon DSP to achieve enhanced performance and realize their business outcomes across both Amazon and open internet inventory.

Through continuous technological innovation and strategic publisher partnerships, Amazon DSP is building a more efficient, transparent advertising technology that delivers measurable value for all participants.

This white paper details the technical architecture, operational principles, and real-world impact of our signal-first approach to digital advertising excellence.

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A signal-driven approach to digital advertising

Media waste silently erodes advertiser performance and ROI. This inefficiency directly impacts both business outcomes and customer trust.

36%
of advertising budgets are wasted by marketers, according to ANA

37%
of ad spend is lost to imprecise targeting alone, estimated by Forrester Research

Delivering quality advertising outcomes at scale demands robust technology that can address these challenges head-on.

Performance, privacy, and transparency are core tenets of Amazon DSP—

We work backwards from advertiser objectives to maximize their success.

Our approach centers on optimal signal utilization, providing visibility and control across media planning, forecasting, deals commitment, bidding, and supply paths to achieve business goals.



Amazon DSP follows a signal-driven, inventory-agnostic approach built on rigorous data analysis.

We evaluate all available signals based on their proven ability to drive performance, consistently analyzing which signals have the highest impact on successful advertising transactions. This focus on signal quality, rather than signal source, ensures decisions are made based on performance potential while upholding advertisers' objectives.

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We believe advertisers should start with signals they can trust, and that's why our authenticated graph is at the center of how our tech works, replacing uncertainty with logged-in signals, reaching over 90% of authenticated US households.

The graph, enhanced through strategic partnerships with Roku, Liveramp, and others, is an industry-leading, tried-and-tested addressability solution that connects advertisers with verified audiences and households across the open internet, enabling more relevant targeting and consistent audience recognition across all channels.

Our commitment extends beyond advertisers to serving the broader advertising industry, including publishers, the media companies, streaming platforms, and content creators who provide advertising inventory. This includes both Amazon's own properties like Prime Video and Twitch, as well as open internet publishers.

Through services like Amazon Publisher Services (APS), partnerships with supply side platforms (SSPs), and Amazon Publisher Cloud (APC), we help publishers maximize their inventory value while maintaining high standards of signal quality.

We also enable direct publisher commitments, where Amazon DSP serves as the technology facilitator for executing agreements made between advertisers and publishers across both Amazon and third-party inventory.

To deliver on this commitment to both advertisers and publishers, our privacy-first technology seamlessly integrates multiple data streams—from advertiser first-party data through tools like Ads Data Manager (ADM) to publisher signals through Amazon Publisher Cloud (APC) to our own insights. This approach helps both advertisers and publishers achieve their advertising goals while maintaining control of their data.

By maintaining consistent evaluation standards across all inventory sources, we ensure every signal flowing to Amazon DSP is assessed for its true performance potential. This infrastructure not only helps us identify and activate the most impactful opportunities for advertisers but also helps publishers understand and maximize the value of their inventory signals.



Finally, we take a "glass box" approach to performance reporting, giving advertisers visibility into campaign results across publishers, supply paths, and inventory types.

This transparency is enabled through Amazon Marketing Cloud, a clean room solution, along with third-party measurement solutions that allow advertisers to independently validate results and make data-driven decisions about their campaign and supply strategy.

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Signal intelligence in action: Planning to performance technology



Impression and reach forecasting have become a critical capability for advertisers seeking to optimize their media investments.

Amazon DSP's forecasting science and budget planning system represents a sophisticated, integrated approach to predicting audience size, reach, and optimal budget allocation across diverse inventory sources, including both Amazon's owned properties and the open internet.



Through a comprehensive methodology that analyzes all bid requests, our system generates forecasts showing the relationship between investment levels and expected audience reach.

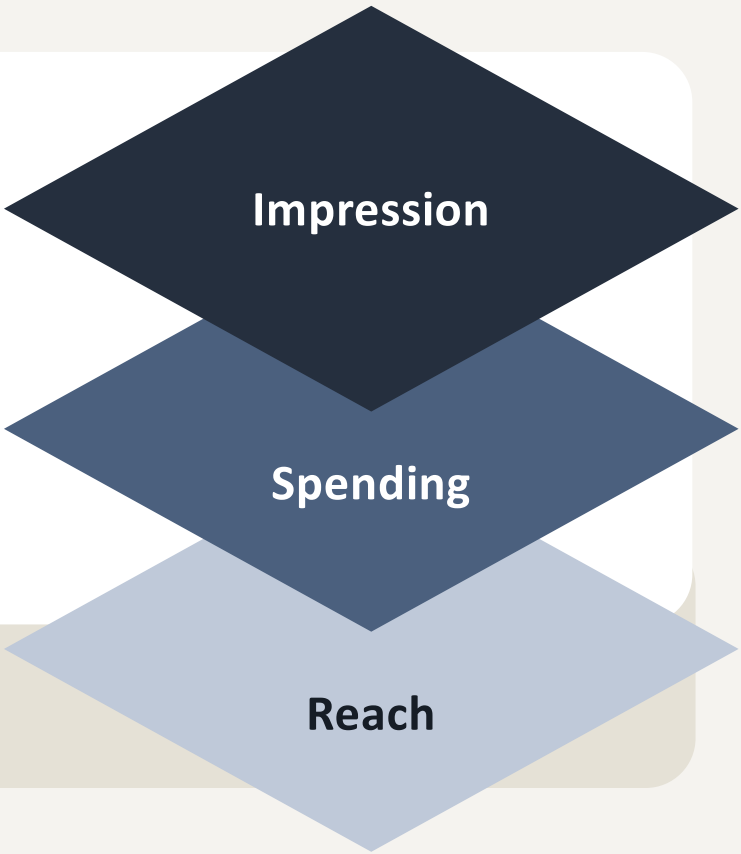
The planning component then applies these insights through advanced optimization algorithms to eliminate wasteful audience overlap and maximize unique reach. By combining predictive analytics, advanced reach deduplication, constrained optimization, and dynamic boundary setting, our system delivers data-driven budget recommendations that maximize plan effectiveness while maintaining equitable opportunities for all publishers.

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Foundations of forecasting

At the core of campaign optimization lies a critical question:

How can we accurately predict advertising opportunities, spend capacity, and audience reach across diverse publisher landscapes?



Our forecasting science addresses this through interconnected layers:

Impression

Focuses on answering "How many advertising opportunities are available?" Rather than employing conventional machine learning on historical campaign data—which risks overfitting to specific inventory patterns—our system analyzes all bid requests equally, regardless of source. This approach maintains a representative sample of recent bid requests exactly as they appeared in our ad exchange, enabling highly performant simulations that assess how individual campaign parameters would shape impression availability. The system aggregates these opportunities daily across broad categories such as media type, advertisement size, and supply source, feeding into time series models.

Spending

Builds on this foundation to determine "How much budget can be effectively deployed?" Through proprietary machine learning techniques, it models the complex interactions between available impressions, and bidding algorithms. The system continuously learns how automated systems interact with different impression characteristics and campaign configurations, while avoiding any bias in publisher treatment. This is achieved by treating true available spend as an uncertain quantity and learning parametric models of under-delivery risk, enabling the system to utilize data from all historical campaigns regardless of publisher type.

Reach

Addresses the question "How many unique users can we engage?" It employs advanced machine learning models to estimate expected audience reach across varying budget levels. The system aligns with impression forecasting models to predict user frequencies over time, considering both recognized and unrecognized traffic patterns across all supply sources.

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Unifying forecasting and budget planning

Through our new planning tool, we address a fundamental challenge in streaming advertising: how to optimally distribute limited marketing funds across multiple streaming publishers to achieve maximum unique audience exposure. This represents a complex constrained optimization problem where we seek to maximize deduplicated viewer reach while operating within specific delivery parameters. We provide advertisers with complete control with equal treatment of all publishers, allowing them to visualize and understand the tradeoffs as they adjust their planning inputs and parameters.

Core problem definition

When an advertiser launches a plan across various publishers (labeled as I = 1, 2, ..., n), they face decisions about budget distribution represented by variables bi. The fundamental optimization problem can be formulated as:

Maximize : *Unique Audience Reach* (b_1, b_2, …, b_n)

Subject to:

$\sum b_i <=$ *Total Plan Budget,*

Lower Bound$_i <= b_i <=$ *Opportunity Size*$_i$,

Where:

- *Unique Audience Reach* represents the total number of distinct audience reached accounting for audience overlap.
- *Total Plan Budget* represents the advertiser's total investment amount.
- *Lower Bound*$_i$ and *OpportunitySize*$_i$ defines the minimum investment level and maximum available inventory for each publisher.

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Budget allocation system

At every step of this process, our system maintains the following tenets:

1. **Merit-based allocation**
   Budget allocation is determined solely by each publisher's efficiency in reaching advertiser's target audience and the size of their available inventory. This ensures the most effective publishers receive appropriate funding.

2. **Equal opportunity**
   All supply sources are evaluated using the same criteria: efficiency scores and opportunity size. Budget decisions are driven by mathematical optimization of reach and performance.

The process below explains how our system translates advertiser goals into a balanced, data-driven allocation that maximizes unique reach across publishers.

Initial user input

The process begins when advertisers provide their total campaign budget and select their preferred publishers with specific targeting. This initial input defines the scope of the optimization problem and sets the fundamental constraints for the allocation process.

Reach forecasting

Once publishers are selected, the system generates reach forecasts for each publisher.

Inventory assessment

The system then evaluates available inventory across all selected publishers. This step determines the actual delivery capacity of each publisher, ensuring we don't recommend allocations that exceed what publishers can realistically fulfill. The inventory assessment acts as a reality check on our performance forecasts and helps establish practical upper limits for budget allocation.

Budget secondary setting

Using insights from both forecasts and inventory assessment, the system establishes budget boundaries for each publisher. Lower bounds are set based on efficiency and opportunity size to ensure meaningful participation. Upper bounds are set at 100% of inventory capacity to prevent over-allocation.

Optimization engine

With performance curves and boundaries established, the optimization engine works to find the most effective budget distribution. The engine uses optimization algorithms to maximize deduplicated reach across publishers while respecting all established boundaries and constraints. It iteratively adjusts allocations until it finds the optimal solution that delivers the highest possible unique audience reach.

Recommended budget allocation

Finally, the system produces its recommended budget allocation across all selected publishers, adhering to any pre-negotiated publisher commitments which are required to deliver in full. These recommendations represent the mathematically optimal distribution of budget to maximize unique audience reach while respecting all constraints.

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Planning optimization: A practical example

To demonstrate how our service works, let's study an example of three publishers with distinct performance characteristics by their reach potential and saturation behavior:

	Performance characteristics	Growth pattern	Key metrics	Best suited for
Publisher A	**Highest reach potential**	**Explosive early growth, slows after $30K**	**110K reach at $20K; plateaus ~150K reach**	**Small campaigns needing quick impact and large campaigns seeking max reach**
Publisher B	Moderate, steady performance	Consistent growth through $60K+	95K reach at $30K; stabilizes ~120K reach	Medium to large budgets; need for sustained performance
Publisher C	Most conservative profile	Steady, reliable growth	50K reach at $10K; consistent through $50K	Long-term stability; predictable performance needs

PRE — **Budget optimization process – Step 1/50 | Total Reach: 309.4**

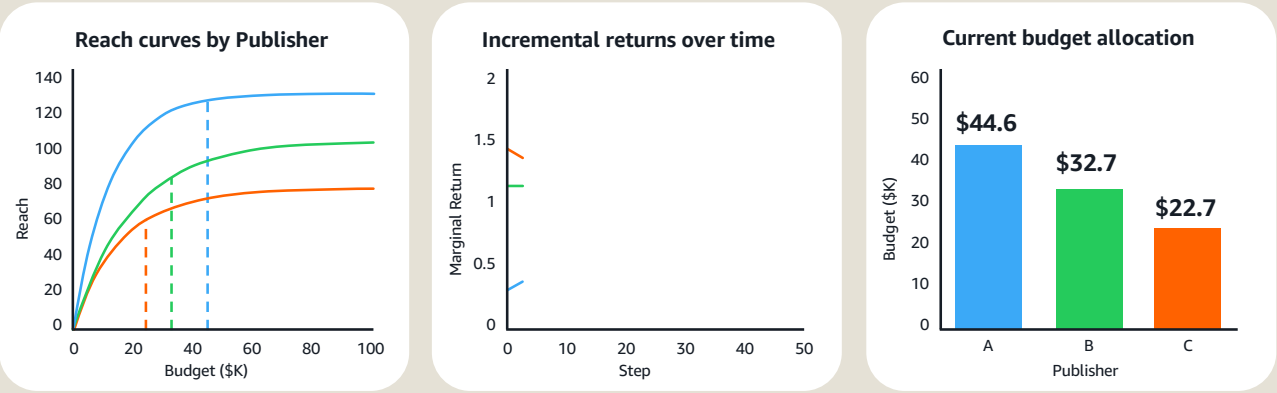


Diagram illustrates budget allocation prior to most efficient pattern mapping

POST — **Budget optimization process – Step 50/50 | Total Reach: 315.6**

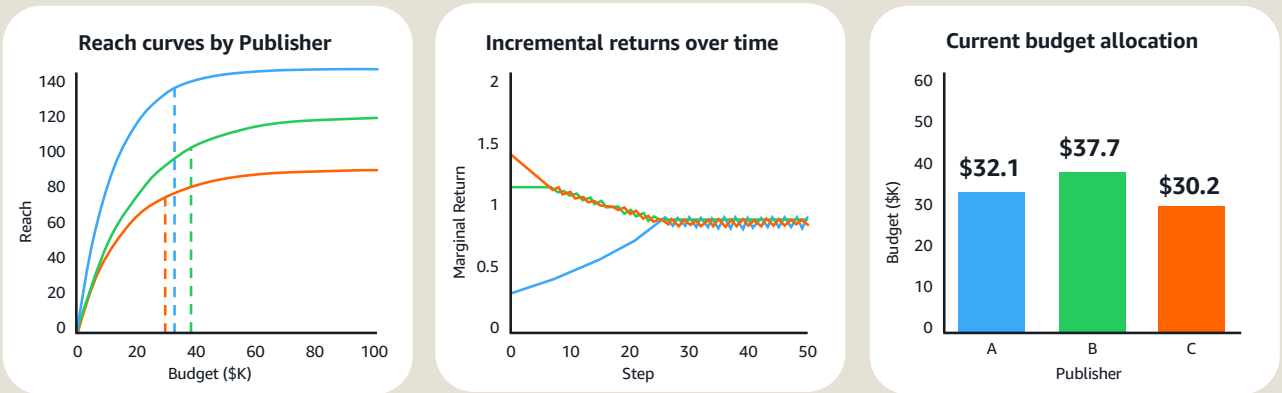


Diagram illustrates budget allocation post efficient pattern mapping

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A simplistic approach to planning would begin by allocating the largest share of budget to the publisher with the greatest opportunity size.

In other words, we might initially expect **Publisher A** to receive the majority of spend simply because it can deliver the most total reach. But when we examine performance through the lens of marginal returns across different budget levels, a more efficient pattern emerges.

Our system starts with an allocation that balances both efficiency (reach per dollar at maximum budget) and opportunity size.

From there, it applies iterative optimization to evaluate how publishers perform together as a portfolio rather than in isolation. The algorithm identifies where marginal returns are highest and continuously shifts budget away from saturated publishers and into those that still deliver strong incremental reach.

For example, when **Publisher A** begins to show diminishing returns, while **Publisher B** or **C** still offer meaningful lift on their growth curves, the system reallocates budget accordingly.



This dynamic rebalancing continues until the model reaches an optimized distribution—one where every dollar drives maximum incremental unique reach across the full portfolio, all while maintaining system objectivity.

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Anatomy of smart bidding

At the core of our advertising technology is a sophisticated bidding system that processes trillions of weekly bid requests from across the digital industry. Every time an ad opportunity becomes available, our system evaluates, enriches, and optimizes it through a precise sequence of steps to ensure the best possible outcome for advertisers. Here's how it works:

1. **Initial quality assessment**
   Our system evaluates each bid request through multiple quality gates, including advertiser relevance, format verification, fraud detection, traffic quality analysis, and win-rate probability assessment.
2. **Signal enrichment**
   Qualified requests are enhanced with behavioral data, contextual information, and frequency details to enable precise targeting and optimization.
3. **Ad candidate selection**
   The system identifies suitable ad candidates by verifying creative size compatibility, audience targeting alignment, and frequency cap compliance.
4. **Pre-ranking and evaluation**
   Advanced algorithms reduce the candidate pool to a predicted optimal set, then apply advanced bidding models to determine optimal bid prices based on campaign objectives.
5. **Final ranking**
   The highest bid is selected based on campaign goals, ensuring efficient ad placement and maximizing advertiser outcomes.



This systematic approach enables us to process massive scale while maintaining precise optimization for each advertiser's unique objectives.

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The challenges of smart bidding

Amazon DSP faces a complex optimization challenge: maximizing advertiser ROI through optimal budget allocation across billions of potential impressions.

The core problem involves determining optimal bid prices while maximizing campaign objectives, operating within advertiser constraints (budget, eCPM, eCPA), and adapting to dynamic industry conditions.

What makes this optimization particularly challenging is predicting rare-occurring events at unprecedented scale. This common industry challenge - extremely low engagement or conversion probabilities across billions of impressions - requires sophisticated solutions for accurate prediction and optimization.

The system must make real-time decisions while adapting to constantly changing competitive landscapes. This goes beyond traditional optimization problems, requiring systems that can make AI model calculations in microseconds while managing prediction uncertainty and complex performance patterns in a volatile industry environment.

Objective:
Max NbrOfActions
$b1, b2, \ldots$

subject to
Spend ≤ Budget

The campaign optimization formula uses four key components:

1. **The desired action**
   Defined by the advertiser
2. **NbrOfActions**
   Total actions achieved from campaign start to end
3. **Budget**
   Maximum amount advertiser is willing to spend on all awarded impressions
4. **Spend**
   Actual amount spent on awarded impressions during the campaign

In simpler terms, advertisers define what success looks like and their maximum budget, while our system tracks both total actions and actual spend throughout the campaign period.

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Building an optimal bidding strategy

To solve for these challenges, our bidding system evaluates each advertising opportunity by answering two crucial questions:

1 **How likely is this audience to perform an action?**

(like engaging with the ad or making a purchase)

2 **What's the minimum amount we need to bid to win this opportunity?**

Think of it like a shopping strategy:

Imagine plotting all available impressions on a value chart. The best opportunities are those with high action probability and low cost—these are our prime targets. The worst advertising opportunities are expensive impressions with low action probability.

For each opportunity, our algorithm calculates the value to the advertiser by analyzing things like the predicted action probability based on user behavior signals, historical performance patterns, real-time bidding dynamics and competition levels, campaign goals and pacing requirements, and available budget and spending constraints. We then apply bidding strategies that translate into the final bid price.

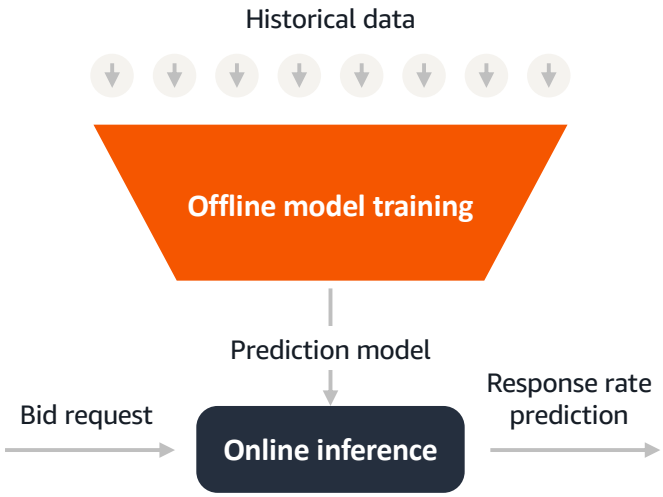
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Algorithm architecture: Two core components

To execute this bidding strategy, our system breaks down the complex challenge into two independent components, primarily activated during Step 4 (Pre-ranking and evaluation) and Step 5 (Final auction) of our bidding system.

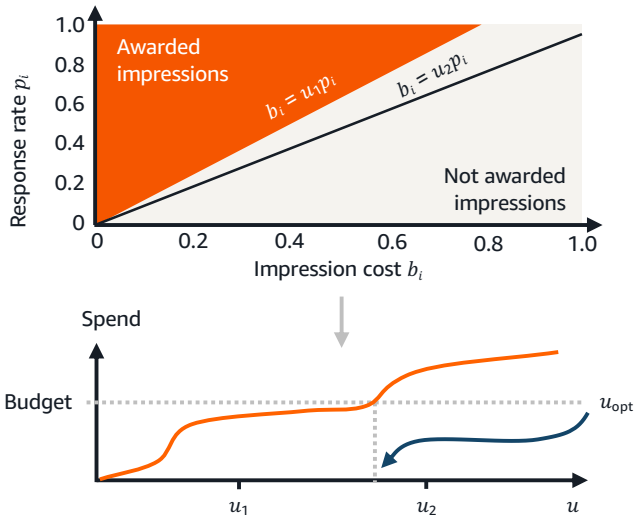
Response rate estimation

This component estimates how likely a user is to take an action when shown an ad. It processes billions of impressions daily, analyzing user behavior patterns and contextual signals to make predictions within milliseconds. The system faces significant challenges with extremely low action rates and sparse, noisy training data. To address this, as shown in the figure at right, it employs deep learning and logistic regression models, trained offline on massive historical datasets and deployed for real-time inference, balancing exploration of new patterns with exploitation of known ones.



Campaign control

This module determines optimal bidding intensity levels to achieve campaign goals. It manages complex nonlinear relationships between bid adjustments and spend, while accounting for time-varying patterns in internet traffic and feedback delays in performance data. As shown in the figure at right, small changes in bidding lead to disproportionate changes in spend rate. Therefore, using adaptive feedback control algorithms borrowed from aerospace technology, it combines proactive planning (like accounting for time-of-day patterns) with reactive learning from campaign performance.



Each module operates independently but works in concert to deliver optimal bidding decisions, continuously refining its approach based on real-time performance data.

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Real-world success

To illustrate how this technology drives real business outcomes, let's look at a recent advertiser success story and publisher testimonials:

CASE STUDY

Lay's Unlocks Media Efficiency with Unified Amazon DSP Strategy

Problem

Lay's, America's beloved potato chip brand, faced a critical challenge in maximizing the impact of their video investments for the "Do Us A Flavor" contest while maintaining efficient frequency and measuring true incremental reach across Prime Video and premium streaming broadcasters. While the brand had previously executed streaming campaigns across multiple media sources, this fragmented approach prevented them from accessing comprehensive measurement insights, cross-platform optimization capabilities, and cost efficiencies.

Solution

OMG partnered with Amazon Ads to implement a comprehensive streaming strategy through Amazon DSP that delivered holistic supply access by combining Prime Video's "Best of Prime" programming, open internet streaming TV inventory, and Lay's curated shows—all while benefiting from competitive 1% fees across programmatic guaranteed deals. The solution leveraged Amazon DSP's unified frequency controls to eliminate duplicate impressions across platforms, utilized both PepsiCo's first-party signals and Amazon's retail signals for precision targeting at scale, and unlocked unprecedented measurement insights through Amazon Marketing Cloud to analyze cross-platform impact between Streaming TV and Prime Video placements.

Results

SAVINGS

$22k **Savings or incremental** media achieved through Amazon DSP's unified frequency management

3% Estimated savings achieved through Amazon DSP's lower fees *(Based on competitive estimates)*

PERFORMANCE

+133% **Higher purchase rate** through combined media exposure

+79% **Incremental reach** achieved by adding premium broadcasters and apps PG to Prime Video and Amazon O&O campaigns

+9% **Lift in awareness** with 90% statistical significance

SOURCE: AMAZON INTERNAL, U.S., DEC 2024.

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Real-world success

To illustrate how this technology drives real business outcomes, let's look at a recent advertiser success story and publisher testimonials:

CASE STUDY

Sol de Janeiro increases reach and improves efficiency by activating deals across premium streaming TV broadcasters

Problem

Sol de Janeiro had found success growing awareness for their brand with Amazon Ads solutions including Sponsored Brands, Sponsored Products, and Prime Video ads. While successfully targeting beauty shoppers through premium content on Prime Video, they wanted to further optimize their video strategy by expanding their audience reach and improving cost efficiency.

Solution

To help drive incremental reach to relevant audiences, Amazon Ads curated custom Amazon shopper insights streaming TV (STV) deals for the brand. With these deals, the brand was able to leverage Amazon DSP to target premium streaming TV publishers like Discovery+, A&E Networks, and Hallmark that indexed highly against audiences searching for the brand's products on Amazon. By incorporating these custom, open internet STV deals into their existing advertising mix, the brand built upon the top-of-funnel momentum previously established through their Prime Video ads campaign.

Results

+42% Incremental Reach of STV deals with Prime Video ads[1]

40% Improved efficiency in cost per reach of STV deals with Prime Video ads[1]

+360% Higher purchase rate of STV deals with Sponsored Ads and Display[1]

The addition of the Amazon shopper insights STV deals to the campaign was successful in helping Sol de Janeiro increase their reach by 42% when compared to their previous campaign with only Prime Video and improved efficiency in cost per reach of 40%. In addition, the purchase rate of customers who were exposed to Amazon DSP STV deals in combination with Sponsored Ads and Display was 360% higher than those who saw only Sponsored Ads and Display.

Sources: 1. Amazon internal, MARCH 2025, US. Results are representative of performance based on this specific campaign and are not necessarily indicative of future performance.

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Publisher success

The success of our signal-first approach extends across the advertising industry.

While advertisers achieve superior performance, publishers benefit from our commitment to helping them maximize inventory value while maintaining high signal quality.

Here's what our publisher partners are saying:

"Combining viewing behavior with shopping intent creates meaningful opportunities for advertisers to connect with audiences through connected TV," said Eldad Persky, Senior Vice President, Global Product, Engineering and Business Development, Samsung Electronics. "By securely joining Samsung's deep understanding of what people watch with Amazon's signals, we're enabling advertisers to reach the right audiences at scale more effectively across Samsung's connected TV platform."

Eldad Persky

SENIOR VP

SAMSUNG

"By analyzing our first-party signals with Amazon Ads audience insights through their publisher tools, we're able to map intent-to-buy signals to our more than 1.5 million articles across People Inc., making the content you read a stronger and more durable predictor of what you are likely to buy than any cookie signal. We're excited to deepen the collaboration with Amazon Ads and build a robust future that unlocks previously unaddressable audiences, drives advertiser performance, and enhances the consumer experience."

Dr. Jon Roberts

CHIEF INNOVATION OFFICER

People Inc.

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Looking ahead



As digital advertising evolves, the industry continues to struggle with media inefficiency—wasted impressions, imprecise targeting, and fragmented supply paths that dilute performance and erode trust. Solving these challenges requires technology that can deliver precise, transparent, and repeatable results at scale.

Amazon DSP is built for this future. Our approach centers on maximizing advertiser outcomes through intelligent, signal-driven decisioning while providing full transparency and control across planning, forecasting, deal commitments, bidding, and supply.

By advancing innovation grounded in signal intelligence—not signal source—we're helping build an industry where advertisers and publishers can achieve higher-quality outcomes with minimal waste and greater long-term value.

Further building on this signal-based approach will be crucial in shaping agentic offerings for the future. This enables advertisers to exercise greater control and make more informed, outcome-driven decisions at scale.

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