Booking Advertising Campaigns Reliably

AdAllocator

Technical White Paper

by Butterfly Wing LLC

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Abstract

AdAllocator is the next-generation engine for booking online advertising campaigns. It solves the major challenge posed before businesses buying and selling targeted online media, which is determining advertising opportunities available for guaranteed booking, while taking into account all the bookings already made.

1. Introduction

1.1. Background

Most Internet publishers provide web content free of charge and collect revenue by placing sponsors' advertisements within their content. Each content view represents one or more advertising opportunities. The entire collection of such advertising opportunities comprises the online advertising inventory. Online advertising has traditionally been sold via "guaranteed contracts" - deals between publishers or their agents and advertisers to deliver a certain number of ads' impressions to specific audience over a certain time period. Fulfilment of such contracts requires high degree of accuracy in calculating the advertising inventory volume available for allocation. Because the number of advertising

opportunities is limited an inventory allocation system must verify that the impressions will be available before selling them to advertisers. The past viewership records are often used as a forecast (with some adjustments) of future viewership.

Internet publishers routinely collect magnitude of data related to their audiences. Online advertisers want to target specific audience segments by requiring advertising opportunities to satisfy a number of targeting constraints, ad selection criteria or attributes, including types of media content, viewers' geographical locations, time of day, behavior, age, gender, etc. Defining such criteria as sets of viewership attributes, which advertisers are looking for makes it possible to divide the advertising inventory into segments. Each segment's capacity could be determined by counting advertising opportunities matching the attributes associated with the segment. Naturally the same advertising opportunity could be counted toward multiple segments causing them to overlap.

That poses a challenge of determining the number of segment's advertising opportunities available for allocation at specific times, while taking into account allocations already made for all other overlapping segments. The challenge is exacerbated by a requirement for a quick response to allocation requests.

1.2.   What AdAllocator Is

AdAllocator is the next-generation engine for booking online advertising campaigns. It overcomes various important limitations of existing forecasting tools for ad servers, such as the number of targeting variables, the necessity of running campaign simulation on reduced data samples and delays in delivering results. Adjusted availabilities of all segments become accessible immediately following each allocation.

AdAllocator does not rely on simulation or statistical models but rather builds the analytical model of segmented advertising inventory and enables accurate determination of future campaign inventory availabilities using targeting variables and bookings for other campaigns.

AdAllocator is operated as a Software-as-a-service, minimizing integration and deployment times as well as operational maintenance costs. It comes as free and professional versions. The free version is available for limited use at www.butterflywing.net. Contact admin@butterflywing.net regarding professional version (some of the professional features are still in development stage).

1.3. What AdAllocator Is Not

AdAllocator does not forecast future viewership, instead publishers or their agents (like Ad Servers or Sell-side platforms) supply expected volume of advertising opportunities with their attributes. AdAllocator does not recommend division of advertising inventory into segments. Advertisers or third parties should provide segments and their attributes.

1.4. Who Can Benefit from It

AdAllocator is designed for online advertising platforms that require accurate knowledge of ad impressions available for booking targeted advertising campaigns. It can be used by Publishers, Sell-side platforms (SSPs), Demand-side platforms (DSPs), Ad Servers and Exchanges. It could be used for booking guaranteed contracts as well as predicting ads volume served via RTB protocol.

AdAllocator users have to provide:
- The expected volume of advertising opportunities with their attributes
- The targeted segments' criteria

1.5. Features

- All segments' availabilities are accessible at any time
- All segments' availabilities are immediately adjusted following each allocation
- AdAllocator is capable of taking into account any combination of targeting attributes
- AdAllocator is supported as GUI (professional and free versions) and programmatic API (professional version)

- Ingestion of user's data and processing customisations through collaboration with Butterfly Wing professional services (professional version)
- Frequency capping (professional version)
- Support for different delivery timetables, such as uniform pacing when the same ads volume is delivered during each fixed time interval, or opportunistic ads delivery over entire campaign duration (professional version)
- Calculating effective CPM by accounting for how low CPM segments allocations affect high CPM segments availabilities
- Running simulation of user's campaign after allocations were made as a confirmation of the allocations' validity

2. Working With AdAllocator (Free Version)

2.1. Preparing Representation Of Advertising Inventory

First the user creates representation of your advertising inventory in following JSON format and saves it in a file:

```
"segments": [
  {
   "name":                 ,
   "criteria": {
    <attribute name>: [<attribute value>,<attribute value>, ...],
    <attribute name>: [<attribute value>,<attribute value>, ...],
    ...
   },
  },
  …
 ],
 "opportunities": [
  {
   "criteria": {
    <attribute name>: [<attribute value>,<attribute value>, ...],
    <attribute name>: [<attribute value>,<attribute value>, ...],
    ...
   },
   "count": <expected number of impressions  for the view criteria>
  },
  …
```

```
 ]
}
```

JSON representation contains two upper level objects: "segments" and "opportunities". The "segments" object comprises the audience segments wanted by advertisers. Each segment has an arbitrary name and an ad selection criteria[1]. Each criteria is comprised of one or more attributes. The most common attributes are type of media content, viewers' demographics, behaviors, media use, device type, ad slots' constraints, etc. In addition, third party audience segments could be used as attributes. Names and values of attributes are arbitrary strings defined by the user but they must be consistent between both upper level objects ("segments" and "opportunities"). Only advertizing opportunities with all specified attributes meet the selection criteria (logical conjunction). Opportunities that satisfy at least one of the specified attribute values match the attribute (logical disjunction). The "opportunities" object comprises expected counts of advertizing opportunities with their attributes.

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[1] If more than one segment share the same criteria the duplicates will be eliminated while creating the inventory model and only first segment remains.

2.2. Advertising Inventory Example

Here is a snippet from an example of an advertising inventory data file:

```
{
 "version": 1,
 "owner": "Me",
 "name": "choices for Me",
 "update": false,
 "segments": [
  {"name": "highrollers",
    "criteria": {
      "state": ["CA, NY, WA"],
      "income": ["affluent","middle"],
      "gender": ["M"],
      "content": ["business","sport","food","news"],
      "age": ["middle","yong"]
    },
  },
   …
 ],
 "opportunities": [
  {
   "criteria": {
    "state": ["CA"],
    "income": ["middle"],
    "gender": ["M"],
    "content": ["fashion","food","investments"],
    "age": ["young"],
    "hobby": ["fishing"],
   },
   "count": 280000
  },
  {
   "criteria": {
    "state": ["NY"],
    "gender": ["M"],
    "age": ["young"]
   },
   "count": 80000
  },
  {
   "criteria": {
    "state": ["WA"],
    "income": ["middle"],
    "gender": ["M"],
    "content": ["investments","politics"],
    "age": ["middle"]
   },
   "count": 150000
  },
```

```
  ...
 }
]
```

In the advertising inventory example above the first object in "opportunities" (it represents 280000 advertising opportunities) matches the first segment because its "gender" attribute is the same as in the segment and the values of "state", "income", "content" and "age" attributes are listed in the corresponding segment's attributes while the "hobby" attribute doesn't make any difference as it isn't listed in "segment". The second "opportunities" object doesn't match the first segment because it is missing "income" and "content" attributes. The third "opportunities" object doesn't match the first segment because neither of its "content" attribute values matches the values of the first segment.

2.3.   Creating Account

To work with AdAllocator a user need to create an account. The following Information is required for the creation of an account:

- First and last name
- Contact email
- Contact phone number
- Organization identification as a single word (preferably based on business/department name). All non-alphanumeric characters in organization name will be converted to underbars. This will be used to identify user's dataset

The user who created the account becomes the primary user and can later create accounts for secondary users. Those users share the same "organisation" and work with the same dataset.

2.4.   Specifying Advertising Inventory

A registered users can upload their own advertising inventory (file in JSON format) or use supplied "Test Inventory" if they just wants to try it out. They also can download "Test Inventory" as a file, modify it as necessary and upload as their own advertising inventory. It is recommended to start with modified versions of "Test Inventory" to get a better understanding of how AdAllocator works. The

free AdAllocator version allows the use of just one inventory at a time. Any registered user of the same organization can upload a new advertising inventory file replacing the old one.

The free version has following advertising inventory restrictions:

- Inventory file should not exceed 512KB,
- the number of segments in inventory file should not exceed 20,
- segments' overlap is too high.

The violations display error message "Uploaded inventory file is wrong. Upload correct file and reinitialize the inventory".

Other problems with the inventory file producing the same message:

- no data in segments,
- no data in opportunities,
- inventory file in wrong format.

Contact admin@butterflywing.net if you get the error message and can not resolve the problems by yourself.

2.5.   Building Advertising Inventory Model

After advertizing inventory is specified, a user can build an analytical model that represents the inventory just by pressing the button. Depending on the size of the inventory, it may take a few minutes or more .

2.6.   Performing Allocation

After the build is complete, the "Allocation" button can take the user to the Allocation page that lists all inventory segments with their calculated capacities and availabilities. The user can enter a number of advertising opportunities to allocate in the "allocate" field and a buyer's identification in "advertising id" field, then press "submit" button. Only a single allocation can be made at one time. This action initiates an adjustment of the model and change of all availabilities affected by the allocation. The step could be repeated until all the inventory is used up which means all availabilities become 0.

If the ads are served via RTB protocol the desired numbers should be entered in the order of their priorities (higher CPM first). If a desired number of impressions is lower than the segment's availability, the customer could be notified about the shortfall.

2.7.   Allocation Report

By pressing the "Report" button on the Allocation page, the user can review all allocations made for the inventory.

2.8.   Running Simulation

If the user wants to confirm that all allocations made could be delivered in full they can run a simulation by pressing the "Run Simulation" button. It shows the Simulation page and launches mock Ad Server as a background process that imitates every single advertising opportunity from the inventory in random order and decrements goal count for a single matching segment. The process ends when all goals are delivered or the entire inventory is used up. Because a single advertisement opportunity processing may take a few milliseconds, the entire simulation can take a long time. During that time, the Simulation page will display the progress and after it ends the user can review the Simulation report. Served count represents advertising opportunities that were matched with segments. If the inventory was allocated completely (which means all availabilities were at zero) the served counts at the end of the simulation should be very close to the total number of advertising opportunities.