Findings from the early FLEDGE experiments

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Abstract

Google Chrome's Privacy Sandbox has been in development for 3 years. Since April 2022, it has been possible to test one of the key proposals from the initiative, FLEDGE, in the real Chrome browser. Testing is conducted through an origin trial, a type of experiment dedicated to the features planned to be implemented in Chrome.

In this whitepaper, we explain how RTB House and the company's partners prepared for these early experiments, and the insights we have gathered. If not for the willingness of RTB House's partners to test, publishing this whitepaper would not be possible.

For future reference, we explain the testing setup and the key outcomes. We explain the different elements of FLEDGE that were available for testing, as well as highlight those that were not. We conclude the whitepaper by delivering predictions about the future of the proposal, taking into consideration the timeline proposed by Google Chrome, the low engagement of the advertising industry, the possible actions of the regulatory authorities, and the remaining steps from the technical perspective.

Keywords: cookieless; privacy; FLEDGE; Privacy Sandbox; digital advertising; targeting, origin trial, experiments.

Learnings from early FLEDGE experiments

For over 25 years, third-party cookies have been used to track users across websites, mostly for the purpose of digital advertising. After competing browsers blocked third-party cookies by default, in Safari through Intelligent Tracking Prevention (Wilander, 2017) and Firefox through Enhanced Tracking Protection (Nguyen, 2018), Google also announced such plans for Chrome in January 2020 (Schuh, 2020). Google's initial plan was to phase-out third-party cookies by 2022, but the deadline was extended in 2021 to 2023 (Goel, 2021), and in July 2022 to 2024 (Chavez, 2022). Google's decision is deemed the most impactful for the digital advertising industry because the Chrome browser is a market leader with over 65% of the market share as of 2022 (Liszewski, 2022).

In 2019, to replace third-party cookies functionalities, while preserving user privacy, Google launched an initiative called the Privacy Sandbox (Schuh, 2019). Among the many proposed tools, one of the most important for RTB House and similar companies is called FLEDGE. It aims to satisfy remarketing and custom audience use cases, but without the possibility for third parties to track the cross-site behavior of individual users (Dutton, 2022).

FLEDGE is the result of extensive discussions in working groups at the W3C, Prebid, and other forums. It is based on Google Chrome's Turtledove proposal, but with significant improvements provided by other members of the advertising industry. However, work on FLEDGE has not been finished yet. This is why the current stage, early in-browser testing, requires active participation from market players so that their thoughts are heard. We think that it is high time to find the gaps and propose solutions to improve FLEDGE. Testing must also be used to analyze the business consequences of FLEDGE for different stakeholders of the

advertising ecosystem - e.g. if there is a risk of unfair treatment or self-preferencing of specific companies. If discovered now, such concerns may be easily tackled by developers or regulatory authorities. When FLEDGE becomes fully operational, returning to the early stages may be more difficult. In this article, we want to summarize RTB House's approach to testing FLEDGE during the first in-browser experiments and share our findings.

Origin trials experiments setup

Origin trials definition and meaning

It requires constant updates to maintain Chrome's leadership position as a browser: innovations, improvements in security, and stability. To streamline this process, Google introduced origin trials - a way to experiment with new features and collect feedback from the web community before they become widely available (Dutton, 2020a). In principle, origin trials are open to any developer representing a specific web origin willing to participate.

There is also a special type called third-party origin trials (Dutton, 2020b). They are dedicated to companies that provide embedded content to other websites. There are countless such examples, e.g. providers of chatbots, services that embed video or social media posts. However, for the purpose of this document, we will focus on the adtech industry, as in this case, third-party origin trials allow for the testing of advertising features without the necessity to separately register each and every website where the content is embedded.

Typically origin trials only last for a specific period of time and their scale is limited, for example, to a specific share of users. Current availability can be checked on the dedicated

registration page, where one can request a token to access each of them. Such a token has to then be put in a specific place in the website's code or provided programmatically.

The first FLEDGE origin trial

Ever since FLEDGE was announced, it was clear that it would reach the origin trial stage before being enabled for all Chrome users. It was unclear, though, which elements of the proposed Turtledove evolution - FLEDGE - would be available at which stage of the expected series of experiments. The initial clarification came in January 2022, when Paul Jensen published the initial scope of the first FLEDGE origin trial (Jensen, 2022). Since then, the scope has been expanding, but it was the first time when the general idea of the trial was shared.

According to the original explainer, the key elements for testing included specific FLEDGE functions: '`joinAdInterestGroup()`', '`leaveAdInterestGroup()`' and '`runAdAuction()`'. These would allow DSPs or buyers to add users to specific interest groups and then sellers to resolve on-device ad auctions among such users. Retargeting use cases, ads composed of multiple pieces, introduced with RTB House's Product-level TURTLEDOVE, were also included. Due to the complexity of adapting to multiple new technologies, Google Chrome decided to allow the "Bring Your Own Server" (BYOS) model for trusted servers in the initial FLEDGE origin trial. Trusted servers could be used to fetch additional, real-time signals, usable in the real-time bidding auction in FLEDGE for both sellers and buyers.

On the other hand, reporting is meant to be preserved on an event level at this stage. Attribution Reporting API, a dedicated reporting proposal from the Privacy Sandbox, aims to ultimately split reporting into two types of reports: event-level with coarse data and summary

reports with more details in an aggregated form (Nalpas et al., 2021). The initial specification omitted another significant part of the concept - Fenced Frames API. However, in March it was announced (J et al., 2022) that it would also be available for testing. Fenced frames are a grand improvement over iframes in terms of privacy, since they disallow communication of the frame with the embedding context. In this concept, the browser strictly limits how much data from within a fenced frame can be shared with external parties. They are also a major element in FLEDGE's promised privacy-preserving properties.

Another element, which did not make it into the January FLEDGE origin trial specification, is the k-anonymity requirement. It is based on the concept of hiding the characteristics of an individual, such as interest in products, in a set of similar users (Devane, 2021). For example, if the k-anonymity requirement where k equals 100 was applied, a given product would not be displayed to the user unless at least 100 other users have also been interested in it. K-anonymity is designed to prevent user re-identification across many websites. There are plenty of elements where this limitation could be applied, like the size of interest groups, unique ads, or ad components saved in the users' browsers. Outcome-based TURTLEDOVE (Pamuła, 2020), a vital element of the full FLEDGE picture, incorporates protections offered by k-anonymity by applying it to the output of the auction instead of the input. This approach will prevent microtargeting but also more precise bidding for buyers.

Google's engineer explained the decision to not include k-anonymity in the specification, by listing three reasons (Jensen, 2022). First, due to the low scale of FLEDGE traffic in the trials, the "k" would have to be scaled down from the original 100 to 1, provided that traffic was 1%, which does not make sense. Second, this mechanism would require using an aggregation server,

which would be unavailable in this trial. Third, origin trial participants could still count how many users had been added to their interest groups to measure the implications of this requirement.

Ever since the end of January 2022, the first relatively full scope for the trial was proposed to the public, but before March 31st, it was not obvious when the trial would start, as there was only a rough quarterly estimate on the Privacy Sandbox website (Google, n.d., a). On the last day of March, Google shared that the first FLEDGE origin trial would soon be launched together with Topics API and event-level reports from Attribution Reporting API (Merewood, 2022), as a single Privacy Sandbox origin trial. Google's blog post also included instructions on how to implement origin trial tokens for these experiments.

Initially, the trial was limited to up to 0.5% of page loads in beta or developer versions of Chrome and it could only run on websites with origin trial tokens. There were also a number of user-related restrictions. To be included in the trial, the user must (Merewood, 2022):

- be using Chrome 101 Beta or above, provided that it is a desktop version of a non-iOS Chrome,
- be browsing during the trial period,
- have the trial enabled,
- have third-party cookies enabled,
- be in standard browsing and not incognito mode,
- be within the active experiment group in Chrome.

The duration of the origin trial is measured in Chrome versions and was set to last between versions 101 and 104, with the initial end date set around August 24, 2022 (Google,

n.d., b). In late July, Google announced the extension of testing until Chrome 107, planned for October 2022, together with the inclusion of Chrome stable traffic starting with Chrome 104 (Merewood & Smith, 2022). Stable traffic became available on the 11th of August.

Testing workflows and setup

RTB House is a demand-side platform (DSP). This means that RTB House serves brands by optimally buying ad slots using programmatic real-time bidding (RTB), and displaying relevant ads to users. RTB House can do so through partnerships with supply-side platforms (SSP), which sell the inventory of partnering publishers, or by integrating with publishers directly.

Over the last 3 years, since the Privacy Sandbox was announced, many players from the industry have been reluctant to engage in discussions on these new concepts. It was no different in the case of most SSPs. Over recent months, it became clear that their presence in the first FLEDGE origin trial would be limited.

Therefore, to make the most out of these trials, RTB House prepared three different testing workflows:

Direct integration with publishers. To allow interested publishers to test FLEDGE, RTB House prepared dedicated instructions to show how to enable testing. In particular, the instructions clarified how to verify if the user is included in the FLEDGE trial and pass this information to the ad server. This information in turn was used to target a specially prepared ad creative snippet designed to run a FLEDGE auction. The instructions allowed publishers to select whether they want to create an origin trial token for themselves, or use RTB House's, as per

third-party origin trials specification (Dutton, 2020b). This integration was set up in such a way that RTB House bought up all impressions on the inventory shared by the publisher, based on the requirement that the user had to have FLEDGE enabled, and then run a FLEDGE auction with one participant - RTB House DSP - representing roughly 2700 advertisers.

Dedicated SSP-based integration. To date, not many SSPs have been willing to test this concept in practice. Previously, before the origin trial, RTB House had taken part in an experiment with Google's Authorized Buyers team, announced on GitHub in September 2020 (Belov, 2020). This experiment resulted in the first FLEDGE impressions being displayed (Filarowski, 2021). Unfortunately, this did not lead to higher participation among SSPs. In the current origin trial, RTB House has cooperated with only two SSPs. The most advanced integration is set up in such a way that the SSP runs FLEDGE auctions using `runAdAuction()`, but the ads resulting from them are not rendered. Learnings from this experiment will allow RTB House and the SSP to move to the next stage where the ads will be displayed and the results reported.

FLEDGE-over-rtb integration. The third type of integration will not be plausible in the fully cookieless world but allows early adopters to experiment with FLEDGE ad auctions in the current environment. In this case, RTB House verified if the user has FLEDGE enabled on the advertiser website. If this is true, RTB House saved this information in the user's third-party cookie. Then it collected typical user-related information, like which products were viewed. This information was stored in the on-device FLEDGE interest group. When the user visits the publisher website, thanks to the third-party cookies still being accessible in the bid request, RTB House could verify if the user has FLEDGE enabled or not. It allows RTB House to try to buy an

impression through the classic real-time bidding auction, with the aim to serve the FLEDGE experimental auction and render the FLEDGE ad. Due to the specifics of this integration, we will not include it in the numerical results.

Execution

How data flows and the key FLEDGE elements work

Essentially FLEDGE works in the shape that it was released for testing (Wlodarczyk, 2022a). As mentioned in the previous chapter, this is not the final, full FLEDGE, thus observations are limited to what is available. We will also focus on the retargeting use case, as it is the most discussed application of FLEDGE.

Adding users to interest groups. The retargeting flow starts on a website of an advertiser. FLEDGE introduces a new function '`joinAdInterestGroup()`'. This function allows adding and storing "Interest Groups" in the browser with a range of attributes (WICG, 2022). An Interest Group is a JSON object with a number of parameters:

- "owner" - URL of the group's owner,
- "name" - unique group name,
- "priority" - a place to specify an order for auction participation when the number of interest groups saved in the browser exceeds perBuyerGroupLimits,
- "biddingLogicUrl" - link to a trusted server with bidding function stored,
- "biddingWasmHelperUrl" - a place for storing computationally-expensive subroutines in WebAssembly provided by the bidder,
- "dailyUpdateUrl" - link allowing for periodical updates of interest group's attributes by overwriting previously stored information,
- "trustedBiddingSignalsUrl" & "trustedBiddingSignalsKeys" - mechanism providing real-time data for use at bidding time,

- “userBiddingSignals” - signals relevant for a specific user, stored on the user device, usable in the on-device auction,
- “ads” - specific ads which can be shown after an auction is won by a member of this group,
- “adComponents” - components which can be displayed on ads, typically products.

All these attributes can be filled in during the first FLEDGE origin trial. While most are usable there, some were reliant on implementation progress from various parties. A browser could be asked to store such information via an exposed JavaScript interface. Here is an example, of a real-life execution call, shortened for brevity:

```
ig = {
	"owner": "https://fledge-eu.creativecdn.com",
	"name": "NaSM50aRP4EWO5NXF7x4",
	"biddingLogicUrl": "https://fledge-eu.creativecdn.com/statics/
	Buyer.js",
	"biddingWasmHelperUrl":"https://fledge-eu.creativecdn.com/statics/buyer.wasm",
	"trustedBiddingSignalsUrl":"https://fledge-eu.creativecdn.com/bidder/rtbhfledg
	e/bids",
	"trustedBiddingSignalsKeys": ["v2~u9yu7HpgssKXS75aza07B(...)"],
	"ads": [{
		"renderUrl":"https://ams.creativecdn.com/creatives?id=4Xt
		TD0qO0bN6JOUO8bYy&c=NaSM50aRP4EWO5NXF7x4&s=rtbhfledge",
		"metadata": {
			"o1": "4XtTD0qO0bN6JOUO8bYy"
		}
	}],
	"adComponents": [{
		"renderUrl": "https://ams.creativecdn.com/creatives?id=
		UsrqxsOIA2a8aCwpnGaB&c=NaSM50aRP4EWO5NXF7x4&_oi=3862403936659138520&s=rt
		bhfledge",
```

```
            "metadata": {
                  "u1": {
                  "t1": 0.11124435067176819
                  }
            }
      },
      (...)],
      "priority": 1.659877072437E12
}
navigator.joinAdInterestGroup(ig, 2592000000)
```

We have successfully executed this function on over 2700 advertiser websites. The screenshot below shows the result of the interest group saved by RTB House and stored in Chrome, as it is visible in the browser's UI.

Figure 1

Successful assignment of the interest group to a user's browser, as it is presented in Google Chrome's user interface

Interest Groups

Event Time	Access Type	Owner	Name
8/7/2022, 2:57:53 PM	join	https://fledge-eu.creativecdn.com	NaSM50aRP4EWO5NXF7x4

Note. This view can be displayed only in the Google Chrome versions compatible with FLEDGE.

Contextual bid request flow. Before getting into the details on how the interest groups can be used for retargeting, it is important to mention that FLEDGE also allows for contextual targeting. The idea for this new contextual request is very similar to the classic RTB request with

small modifications, which include the redaction of sensitive information, such as a cross-site cookie identifier. Due to the limited support for FLEDGE by SSPs during the experimentation, the observed contextual bid request flow is described mostly theoretically. There are two variations of the standard, both prepared primarily by Google Ads teams. The OpenRTB format was shared by Stan Belov on Google Ads GitHub (Belov, 2021), while the proprietary Google Authorized Buyers format - was shared on the Authorized Buyers developers portal (Google, 2022). The only noteworthy difference between them is the addition of the extension “ae” that could take one of two values:

- 0: Traditional server-side auctions.
- 1: Requests with FLEDGE support, in which a contextual auction runs on the exchange’s servers and the interest group bidding and the final auction runs in the browser.

In the second case, the buyer could respond with one out of four responses:

- no bids,
- only contextual, non-personalized bids,
- a mixture of contextual bids and opt-in FLEDGE on device auction,
- no contextual bid, but an opt-in for FLEDGE auction.

In the last two cases, the bidder gets the possibility to submit a few real-time parameters into the auction. An example of the OpenRTB format as per Google Ads’ specification is available below. It should be highlighted that this canonical version has not been observed in the real browser, outside of the manual testing environment. Comments in the code describe the significance and functionality represented by the particular parts of the extension.

```
{
  "seatbid": [{
    "bid": [{
      … // Traditional contextual bids
    }]
  }],

  "ext": {
    // InterestGroupBidding object which holds information for running an
    // in-browser interest group auction.
    "igbid": [{
      // ID of the Imp object of the impression to which
      // these interest group bidding signals apply to.
      "impid": "1",

      // InterestGroupBuyer object which holds information regarding an
      // interest group buyer for the in-browser auction.
      "igbuyer": [{
        // Domain name of the interest group buyer to participate in the
        // in-browser auction.
        "igdomain": "www.example-dsp.com",

        // Optional buyer-specific signals (perBuyerSignals) to pass into
        // the buyer's interest group bidding functions. Can be left empty if
        // perBuyerSignals are not required by the bidding function.
        "buyerdata": {
```

```
      // Example of an arbitrary JSON object defined by the buyer.
      "base_bid_micros": 0.1,
      "use_bid_multiplier": true,
      "multiplier": 1.3,
      "win_reporting_id": "1234567asdf",
      "disallowed_advertiser_ids": ["1234", "2345"]
    },

    // Optional maximum interest group bid price that can be used to
    // validate the results of the bidding function.
    "maxbid": …,

    // Optional URL that should be fetched if the interest group ad wins
    // the in-browser auction and results in a billable impression.
    "igburl": "https://dsp.example/imp?auctionid=${AUCTION_ID}"
  }, {
    "igdomain": "buyer2.com",
    "buyerdata": {...}
    "maxbid": ...
    "igburl": ...
  }, {
    "igdomain": "buyer3.com",
    "buyerdata": {...}
    "maxbid": ...
    "igburl": ...
  }]
```

```
    }]
  }
}
```

FLEDGE on-device auction. According to the specification (Kleber, 2021), the publisher's delegated top-level auction vendor, using `navigator.runAdAuction()`, starts the auction. Available sellers then run their auctions, called *component auctions*, with invited bidders. The result of each of them is submitted to the top-level auctioneer, for the final ad-bid selection.

To generate their respective bids, buyers run `generateBid()` from the bidding function they provided during the execution of `joinAdInterestGroup()`. They can do so for each owned interest group available in the user's browser, potentially limited by the seller's configuration. On the other side, sellers run `scoreAd()` to order the ad-bids from the buyers and select the winning ad-bid pair. Worth noting - during the auction, both the sell side and buy side could receive real-time feedback from their trusted server of choice. Buyers can get information that could be helpful during the bidding process to submit the most accurate bid, while sellers can, for example, leverage metadata on potential ad-creative candidates, in order to enforce publisher-safety controls on the ads.

The auction-winning bid is then returned and rendered in a new object type - a fenced frame (J et al., 2022). The fenced frame prevents ad code from interacting with the page and blocks external network communication. Auction reporting, for example for the purpose of billing, is handled through two functions - `reportResult()` which is managed by the seller,

and `reportWin()` which is managed by the buyer. For ad click reporting, FLEDGE exposes a separate reporting interface called “Fenced Frames Ad Reporting” (Sharma, 2021).

The empirical scenario executed by RTB House differs from the model because, due to the various challenges in acquiring inventory partners in the first FLEDGE origin trial, RTB House mostly experimented with ad placements bought directly from publisher partners. In essence, the experiment simulated a single-level FLEDGE auction with a single buyer - RTB House - run in pre-bought placements restricted to the pre-detected origin trial-enabled Chrome users. In this case, neither component auctions nor the top-level auction have been required.

In practice, in this integration, we use the publisher’s ad server’s key-value targeting and communication with FLEDGE API. This integration does not support ad exchange with Prebid or Google demand. It relies on the completion of two important steps:

- The publisher has to insert a snippet of code on its website to verify if the user’s Chrome browser is included in the trials, and set up proper targeting. RTB House has used this simple code, or its variation for this purpose:

```
if (navigator.runAdAuction) {
      googletag.pubads().setTargeting('fledge', 'true'); }
else {
      googletag.pubads().setTargeting('fledge', 'false'); }
```

- The publisher has to create line items in the ad server for RTB House, targeting cases where FLEDGE equals “true”.

Once the publisher completed both steps and the commercial considerations for the experiments were defined, RTB House was able to buy impressions for users with FLEDGE

enabled. In this case, our DSP system generated bids for each interest group saved in the user browser and ran an internal ad auction. In cases where the user did not have any interest group stored or other exceptions occurred, a fallback creative was displayed.

To understand the outcomes of the auctions and ad displays, RTB House has taken advantage of a few debug tools that are available for the current origin trial duration while expected to be removed in the mid to long term:

- `forDebuggingOnly.reportAdAuctionWin()`
- `forDebuggingOnly.reportAdAuctionLoss()`

These two offer bridging capabilities until the fenced frames are enforced and the fenced frames ads reporting becomes fully functional. RTB House has also been experimenting with fenced frames ads reporting submitting a number of issues aiming at improving the functionality, such as number #309 (Pamuła, 2022a), #332 (Pamuła, 2022b), and #322 (Kalisz, 2022) which aimed to increase both the testability in the available, mostly iframe centric ads rendering and improve target usability.

For the duration of the first FLEDGE origin trial, log-level reporting is still allowed. Therefore, in the experiments, RTB House took advantage of both new emerging APIs like fenced frames ads reporting, debug*, reportWin, as well as the legacy log-level reporting. As far as we can assess the progress - the new APIs are growing more and more useful. However, they are still not stable enough to be production-grade ready, which was expected for the first origin trial.

Numerical results of the experiments

No test hypothesis can be proven without repeatable, converging results. Typically, experiments with such innovative tools rely on adaptation on all sides of the ecosystem. Since the very beginning of the experiments, RTB House has been ready to adapt its advertisers to the tests, so the buy-side was covered. On the other hand, both the lack of preparation on the supply-side and the low expected share of Chrome browsers with FLEDGE enabled in the trial (Merewood, 2022), suggested that the initial testing would be run at a very limited scale.

The results on the advertiser side in the first FLEDGE origin trial. The limited scale of the FLEDGE origin trial made it clear that no single advertising campaign will be large enough to validate the functioning of this tool. Therefore, RTB House decided to utilize its global reach and generate insights based on aggregated data from multiple markets.

Participation in the trials on the advertiser side was dependent on the ability to execute the `joinAdInterestGroup()` function, a key element of FLEDGE. To do so, advertisers had to have JavaScript codes implemented on their websites. Most of RTB House's clients fit this description, so the next decision the company had to undertake was the selection of the test group. RTB House's technical teams checked retargeting advertisers and singled out unusual campaigns, which would be challenging to adapt to the first trial.

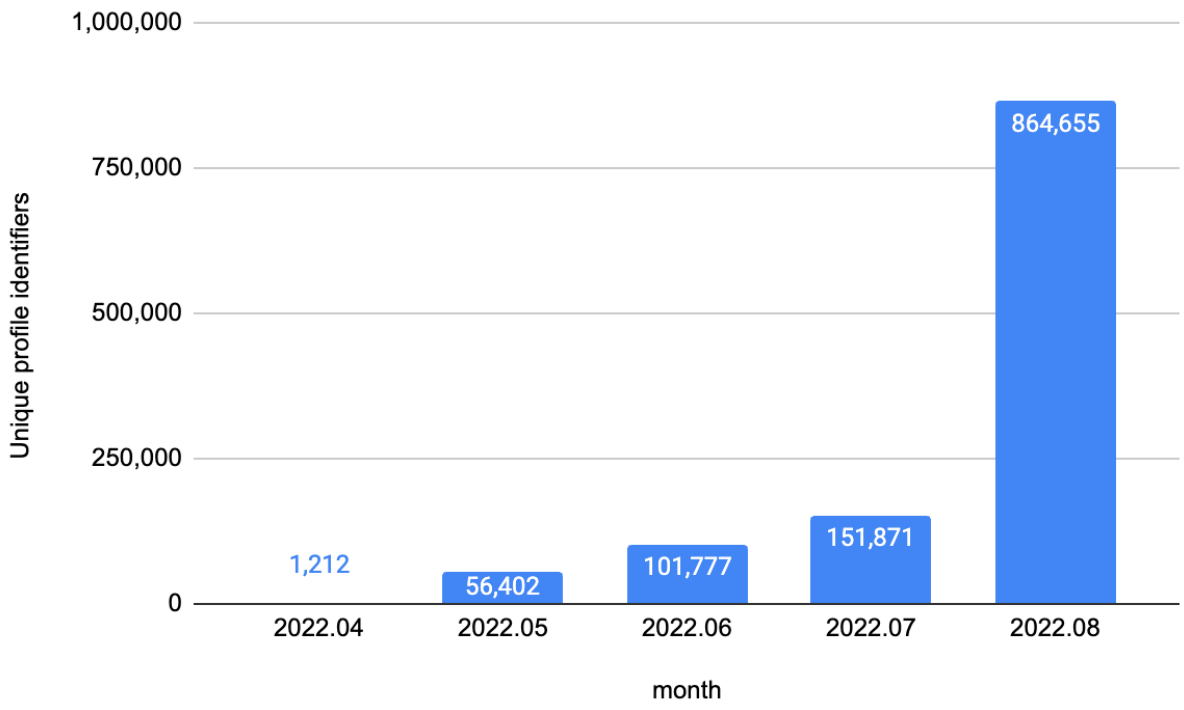
In the end, the majority of RTB House advertisers, >2,700 of them, were selected for the trial. Apart from ensuring that the `joinAdInterestGroup()` function would be executed properly, RTB House's technical teams had also prepared dedicated creatives, meeting FLEDGE's criteria, for each of them. The scale of the trial was so minimal, that it could not

influence the results of individual campaigns while providing important information on aggregates.

In order to execute the `joinAdInterestGroup()` function, the user's browser had to be included in the trial. Initially, only a limited number of users fit this criterion and were added to an interest group. However, the gradual increases in scale, initially from 0.5% of beta Chrome users to 50%, and then to 1% of stable users in August, resulted in a significant increase in the testing population. In total, between April and August, RTB House added ~1.2 million users from 225 countries (as defined by ISO 3166-1 alpha-2 codes) to interest groups, as displayed in the chart below.

Figure 2

The number of unique users added to interest groups globally in a given month



Note. In order to be included in the first FLEDGE origin trial, the user had to have third-party cookies enabled. It allowed RTB House to calculate unique users as the number of cookies. In this case, if a given cookie was added to multiple interest groups, it would still be counted once for the sake of this chart.

RTB House has also been monitoring the internet to understand which companies are actively testing FLEDGE, by adding users to interest groups, and we could only spot three companies doing so - Google, Criteo, and RTB House. RTB House's data does not suggest that no other company has tested FLEDGE; however, the company's research technology has not spotted such a case between August 18th and 22nd or in any previous iteration.

Figure 3

The number of interest groups created by a respective origin, based on data from 13,354 websites observed between August 18th and 22nd by RTB House research technology

Owner	**Count**
https://googleads.g.doubleclick.net	9765
https://fledge-*.creativecdn.com	6087
https://fledge.criteo.com	2356
Total	**18208**

Note. Creativecdn.com stands for RTB House.

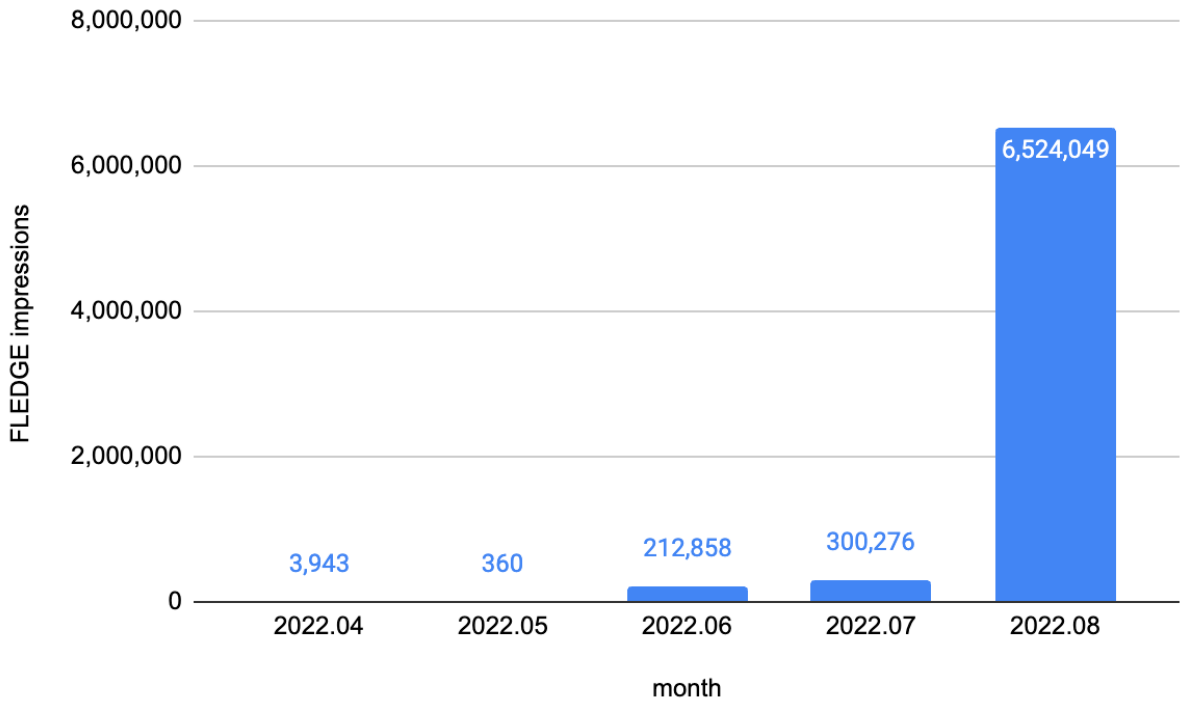
The results on the supply-side in the first FLEDGE origin trial. The low engagement on the SSP side caused RTB House to rely heavily on publisher integrations, as described in the previous chapter, to imitate the future ecosystem. Luckily, many contacted publishers were

willing to participate in the experiments. Out of the 38 publishers we reached out to, 17 managed to successfully implement codes that allowed them to experiment.

The sheer implementation of codes was not the ultimate outcome of the experiments. Everyone waited for FLEDGE-based impressions to appear in real user browsers, which happened almost instantly. However, while most integrations with publishers were completed between June and July, it wasn't until August that the number of FLEDGE impressions rapidly increased.

Figure 4

The number of FLEDGE impressions displayed by RTB House on the websites of publishers which implemented FLEDGE



Note. The results shown in this chart are highly influenced by the share of users whose Chrome browser was included in the trials. Since August 11th, 1% of stable Chrome traffic was added, hence the sharp increase in the number of impressions.

In total, in the first FLEDGE origin trial between April and August, RTB House displayed over 7 million FLEDGE impressions to users from 50 countries. These impressions came from almost 400 advertisers which displayed around 2,300 different creatives. Most of the impressions came from users with Chrome version 104, which was the one the Chrome team started including the stable version traffic in the experiments.

RTB House has had chances to observe how FLEDGE works on both large publisher websites and smaller ones. The ads have been served on 4,172 different domains, some of which displayed only a few of them, while the biggest website in the experiment displayed over a million impressions.

Although the number of FLEDGE impressions served is minimal, it is reassuring to see the scale of experiments growing, for the sake of future analyses.

Analysis of the situation on the supply side

The first FLEDGE origin trial was announced on March 31st and started in early April. However, 5 months have passed since then at the time of this writing, and we still cannot empirically test the proposal across the full programmatic supply chain.

SSPs are slow to respond to changes. SSPs have not been particularly active in the discussions with the Chrome team regarding FLEDGE. This has led to the fact that there is no SSP that allows the execution of the full FLEDGE flow. RTB House has been actively working

with only two SSPs. All the other major ones did not respond to the invitation to collaborate on the integration. Some of them did not provide any justification. Those that did, typically mentioned one or more of the points below:

- In their view, it is hard for them to provide added value in front of publishers because the FLEDGE design moves auctions from servers to devices. SSPs are no longer mainly responsible for executing ad exchanges for publishers.
- In their opinion, FLEDGE is mainly designed for retargeting. This separation from other use cases, such as interest-based targeting addressed by Topics API, is not helpful in prioritization. Also, most of the demand on the SSP side comes from non-retargeting campaigns.
- They lack clarity regarding how Google Ad Manager will support the multi-SSP auctions. The currently planned integration puts Google Ad Manager and Google demand at an advantage in top-level auctions, where other SSPs may only provide winners from lower-level, component auctions to be then compared by Google.
- FLEDGE design does not allow SSPs to build a single interest group to represent multiple buyers bidding against each other for the same impression. The support of cross-site audience use cases might incentivize SSPs to invest more in testing FLEDGE.

Publishers are widely unaware of the trials. Publishers have been a vital partner for RTB House in the origin trial. However, most of them were not aware of the testing possibilities and required proper education from the RTB House side to participate.

This results in their perception of not being properly informed by SSPs and ad servers on how they can participate in testing FLEDGE. They have only been provided with vague descriptions of what will be tested and how (Google Ad Manager, 2022). They lack clarity on how the integrations between SSPs and publishers' ad servers will work. It does not help them to design test scenarios that will not impact their current revenue streams, such as programmatic auctions or direct demand.

Crucially, even in the current ecosystem, publishers are unaware of which use cases, such as branding or retargeting, drive the biggest portion of revenue for them. It is caused by the fact that the buying decision logic is hosted mainly on the DSP or advertiser side. It also makes it challenging for them to compare the usability and effectiveness of FLEDGE to understand how well it supports particular use cases.

Conclusions

The first FLEDGE origin trial is a major step towards a more privacy-preserving digital advertising ecosystem. Despite the limited scope and scale, the industry could learn that FLEDGE works in reality. However, we perceive this trial to be just the beginning of testing, and many things have to happen before this proposal gets widely adopted as the industry standard.

There is a long road ahead before the final implementation

The first mention of the Privacy Sandbox was in 2019 (Schuh, 2019), followed by the announcements of TURTLEDOVE, FLEDGE's predecessor, in January 2020, and FLEDGE itself in January 2021 (Kleber, 2021). It shows that this concept has already been in development for 3 years, and it is still not production-ready. Many key elements, such as the k-anonymity requirement, have never been tested in the browser and it is safe to assume that adjustments will be required after industry feedback. Moreover, the interoperability of different proposals is a big question mark. Adding to that the necessity for the industry to adopt FLEDGE beforehand, the initial timeline of phasing-out third-party cookies from Chrome in the second half of 2023 was ambitious, which proved true in July 2022 when it was extended to 2024 (Chavez, 2022).

Engagement from the advertising industry is relatively low

Even though there are more and more articles from various Google teams on the applications of Privacy Sandbox APIs, the activity of third-party companies is still relatively low. There are regular events, such as bi-weekly meetings in the Web Incubator Community Group at W3C or less regular but more complex Private Advertising Technology Community Group

meetings, but the list of participants in these calls has been relatively stable for quite some time now.

There are also new initiatives launched by the Chrome team, such as the Privacy Sandbox developer office hours (Hart, 2022), but they failed to attract a larger audience. In fact, the first edition of this event was nearly exclusively attended by various Google teams, IAB Tech Lab, and RTB House representatives.

The lack of engagement is visible across the ecosystem, both on the supply side, which we have mentioned multiple times over the course of this document, and the buy side. For a tool that is to become the foundation of the internet advertising ecosystem of the future, this fact is disappointing.

Unfortunately, another delay in cookie withdrawal will not encourage the advertising industry to change its attitude. Google has to incentivize members of the ecosystem to undertake actions to prepare for what is coming. RTB House believes there are two possible types of incentives that Google could apply for this purpose (Włodarczyk, 2022b). For example, the privacy-preserving way of provisioning additional data to the ecosystem that was previously available only to the browser would constitute a positive incentive. On the other hand, decisively limiting the capabilities of alternative, privacy-intrusive tracking mechanisms, such as fingerprinting, would be a strong negative incentive.

Regulatory moves are a big unknown

The Privacy Sandbox has been under heavy regulatory scrutiny for a long time. Perhaps the most important event to date was the investigation by the United Kingdom's Competition and Markets Authority (CMA) into the Privacy Sandbox which started in January 2021 and concluded in February 2022 with a signed list of commitments that Google is supposed to follow in the initiative's development (Competition and Markets Authority, 2022). This investigation influenced the initial delay of the third-party cookies phase out from 2022 to 2023 (Goel, 2021).

However, it is not the only regulator with the potential to influence how the Privacy Sandbox moves forward. The European Union had accepted regulations that either have already impacted Google's advertising business or will likely do so in the upcoming years, like the GDPR or DMA and DSA acts. Moreover, it formed a dedicated unit to investigate "possible anticompetitive conduct by Google in the online advertising technology sector" (European Commission, 2021), which is yet to publish its conclusions.

Also, a growing commitment of US authorities to regulating the digital space is becoming visible. One example is a lawsuit by Texas attorney general Ken Paxton into Google's alleged misleading practices related to tracking their location data (The Office of the Texas Attorney General, 2022). Another is the proposed federal bipartisan privacy bill called the American Data Privacy and Protection Act ("ADPPA"), which passed the House Committee on Energy & Commerce by a vote of 53-2 to be eligible for a full house hearing (Duball, 2022).

All the above examples show how complex the Privacy Sandbox initiative is in terms of regulatory compliance. Google cannot adequately prepare for compliance with regulations that

do not exist yet. Therefore, further delays in the assumed schedule, even beyond 2024, are still possible.

From the technical standpoint, the next steps are clear

The origin trial is a big step forward towards the final implementation of the Privacy Sandbox proposals in Chrome. However, as mentioned, the first origin trial is limited in scope and scale, so it does not allow for portraying the cookieless future with full accuracy. To do so, a range of technical activities have to be performed by various sides of the advertising ecosystem.

Firstly, the integrations between the buy and the supply side need more attention. There is a lot of effort required to evaluate, develop, and validate the different options of the FLEDGE implementation on the SSP side. It will be possible once the multi-ssp auctions use case is enabled by Google Ad Manager, the most popular ad server used by publishers. There is also a big topic of a potential prebid-based implementation, which is not an easy thing and requires the engagement of the wider prebid community. In this case, a Google Ad Manager representative shared that the functionality of participation in component auctions run by other top-level auctioneers is currently not available (Kooverjee, 2022).

Secondly, the tech stack of both sides of the ecosystem has to be adjusted. The solutions that have been in development for years now will have to either be adjusted or replaced entirely. At RTB House, we have been doing so for almost three years now. We are still working on the improvement of resource allocation, as well as improving our deep learning algorithms.

Lastly, there is a great need for data analysis, especially because many legacy measurement tools, such as log-level reporting, are still available. However, this can only be

done when all the key FLEDGE elements are enabled for testing, and when the scale of the FLEDGE-enabled Chrome users reaches satisfactory levels. Only then should the comparison of FLEDGE's performance against both cookie-based and alternative tools be measured. At this point, a lot of engineering effort will be required to properly optimize it to ensure the optimal balance between privacy and the utility of FLEDGE.

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