drawbridge
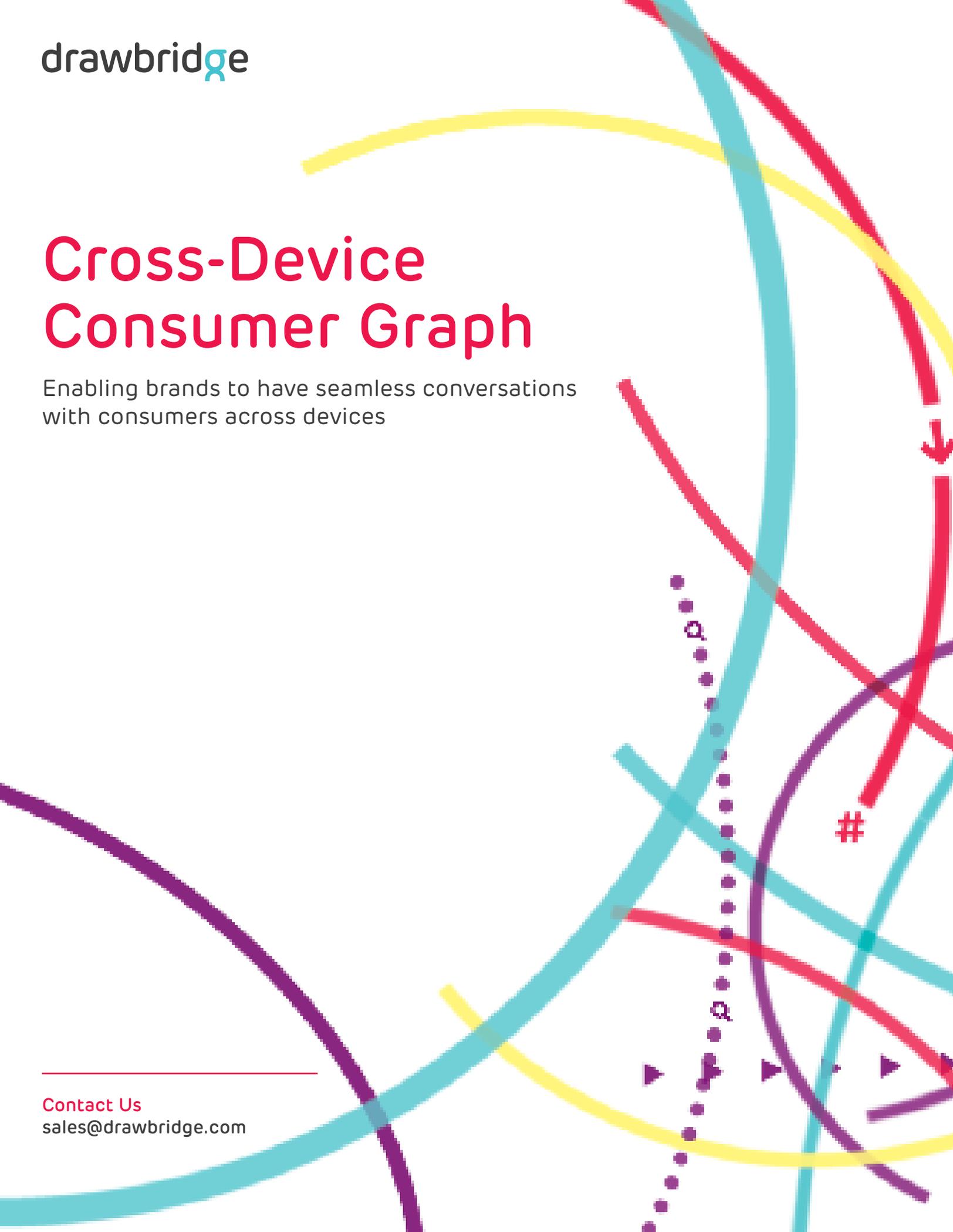
Cross-Device Consumer Graph

Enabling brands to have seamless conversations
with consumers across devices
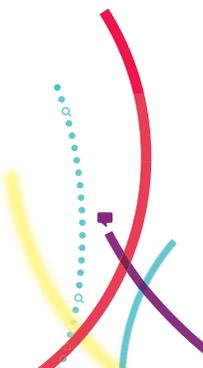
Contact Us
sales@drawbridge.com

Table of Contents

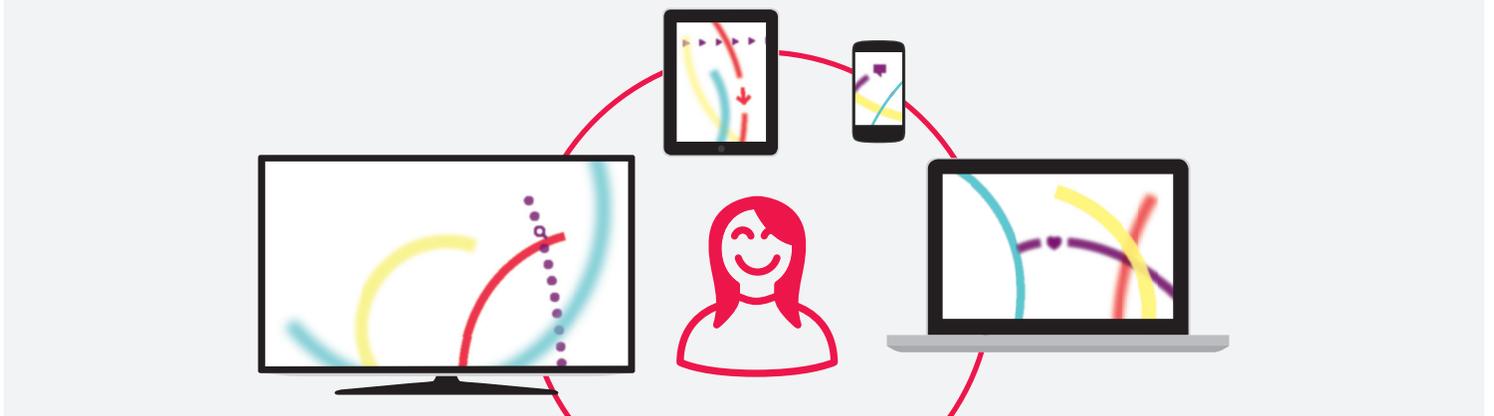# Introduction

Short of having user-submitted information, there is no completely accurate way to solve for consumer identity across devices. The Drawbridge approach to cross-device identity is a **Probabilistic Graphical Model**, which makes predictions about consumers and their device ownership. By observing a variety of event logs, including ad requests, and correlating those attributes, Drawbridge has built a **Connected Consumer Graph®** that incorporates individual Device Graphs, each of which includes several Probability Models. These connected Probability Models leverage collected or inferred demographics, user access patterns, behavioral segments, and other information to form the base of the larger hierarchical model.

The Drawbridge Connected Consumer Graph currently consists of more than **one billion consumers** connected to more than **three billion devices**, the accuracy and scale of which is measured using standard information theory metrics such as Precision and Recall against sample sets of third-party deterministic data from trusted partners. In addition, the Drawbridge Connected Consumer Graph was recently analyzed by Nielsen against a third-party sample of known user login data, and found to be 97.3% precise in indicating a relationship between two or more devices.

By leveraging the Connected Consumer Graph data, Drawbridge is able to significantly enhance advertising to consumers while adding value for advertisers and publishers. Ads become more relevant, advertisers can increase their audience reach across devices, and publishers can add more value to their inventory. In addition, Drawbridge is able to provide visibility into how consumers interact with brands across devices along the path to purchase with a true, unified, cross-device consumer view.

Drawbridge has built a Connected Consumer Graph that incorporates individual Device Graphs, each of which includes several Probability Models.

Approaches to Determining Cross-Device Identity

	Fingerprinting	Deterministic	Probabilistic
Description	Statistical inference based on near-unique identifiers such as screen resolution, fonts, installed plug-ins, clock skew, etc.	Massive "walled gardens" (social media networks, email clients, search platforms) or platforms that stitch together data from multiple publishers with logged-in users.	Inference of cross-device identity based on non-permanent, user-resettable identifiers, such as browser cookies and mobile device IDs.
Precision	65-95%	85-99%	Up to 97.3%
Cross-device scale	-	✔	✔
Ability to opt-out	-	-	✔
Transportable across platforms	✔	✔ / -	✔

Drawbridge utilizes Probabilistic Modeling to create its Connected Consumer Graph, relying only on **non-permanent, user-resettable identifiers** such as cookies or device IDs.

Probabilistic Modeling is used commonly across various fields where large amounts of data need to be analyzed, including in meteorology for forecasting the weather, in pharmaceutical research for understanding drug behavior, and even on Wall Street for predicting market trends.
Probabilistic device pairing relies on similar algorithms and machine learning systems to make predictions about device ownership.
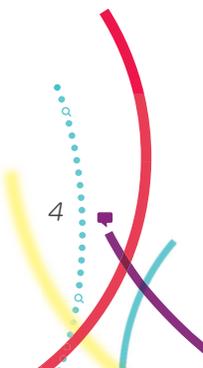
How It Works: Device and Consumer Graphing

Drawbridge technology uses correlations to establish its Connected Consumer Graph, which is made up of interconnected Device Graphs. Each of these Device Graphs consists of collected and inferred demographic and behavioral information stored in Conditional Probability Tables. In essence, this hierarchical model combines several probabilities to make educated predictions about people and devices.

Where does the data come from?

Drawbridge observes a variety of different attributes, including browser cookies, mobile device IDs, time, and application and web page visits, among others, to create these nodes. This information comes from over 50 partners, including mobile and desktop exchanges, advertisers, publishers, data management platforms, and other data providers.

Drawbridge cookies users on desktop and mobile browsers when possible through its partnerships with a variety of data management platforms and ad exchanges. On some browsers, Drawbridge cookies users upon serving an ad impression on sites where third-party cookies are accepted, otherwise Drawbridge uses its own proprietary signature.

Drawbridge observes a variety of different attributes, including browser cookies, mobile device IDs, time, application and web page visits, among others, to create these nodes.

System Overview

The graphic below illustrates the flow of information into the Drawbridge ad serving and data management pipeline. Data is ingested, processed, stored, and leveraged in Drawbridge's secure environment.
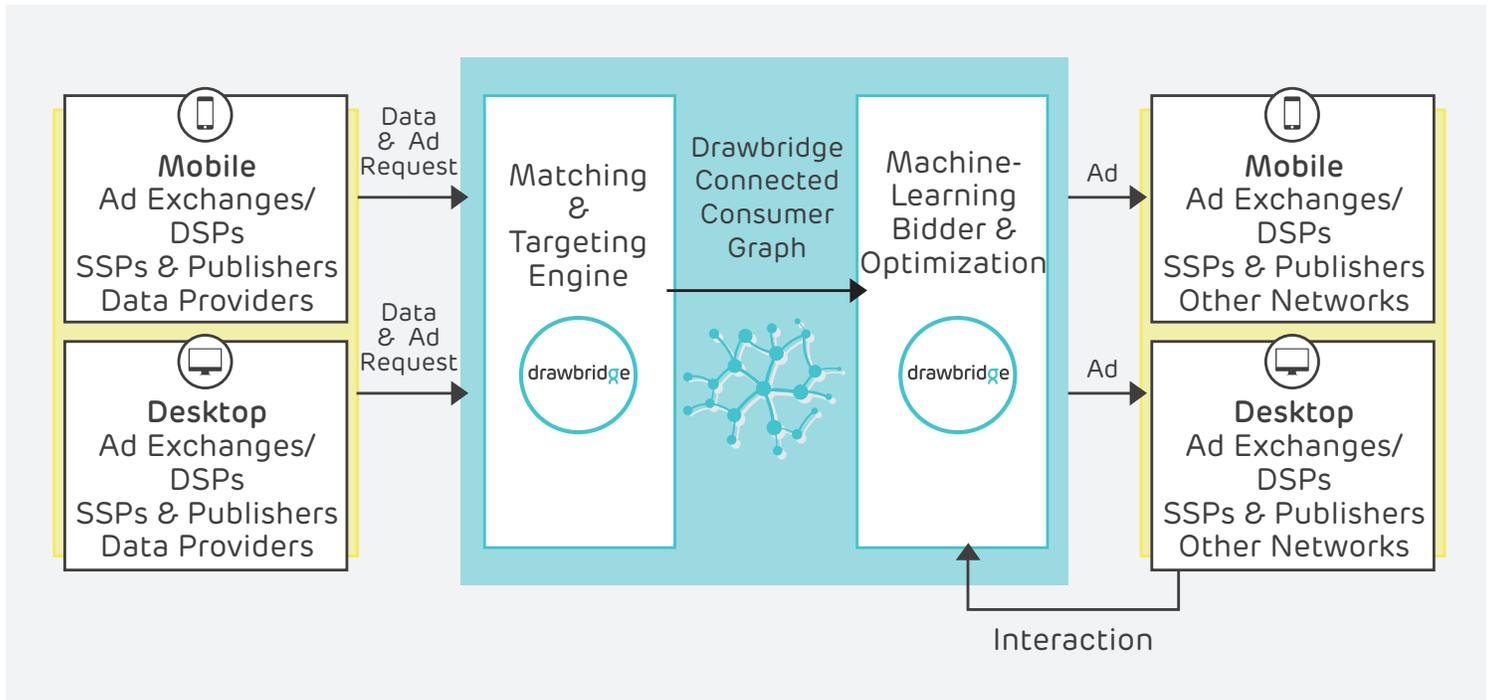
Data Storage and Dissemination

Storage and dissemination of information within the Drawbridge Connected Consumer Graph is an integral and crucial aspect of the Drawbridge ad serving system. Data is stored in the Drawbridge system as a table map of targeting data.

Drawbridge can segment audiences into tens of thousands of targeting dimensions, many of which are proprietary.

Third-Party Data and Accuracy Validation

Drawbridge uses sample sets of hashed deterministic data from multiple trusted third-parties to both train the probabilistic model and validate the accuracy of the results. In total, Drawbridge uses over 100 million deterministic pairs to train and validate its model.
There is a negative correlation between consumer reach (scale) and the accuracy of the results, as seen below. As the accuracy of the results increases, the consumer reach becomes smaller, and as scale increases, the accuracy declines.

Nielsen recently analyzed a portion of the company's probabilistic Connected Consumer Graph against a third-party sample of known user login data.

The analysis found that the Drawbridge model was 97.3% precise in indicating a relationship between two or more devices. This indicates that the Drawbridge Connected Consumer Graph is at comparable scale and precision to major social platforms and web portals, and far greater than other cross-device technology providers.

**Example Relationship Between Accuracy and Scale**
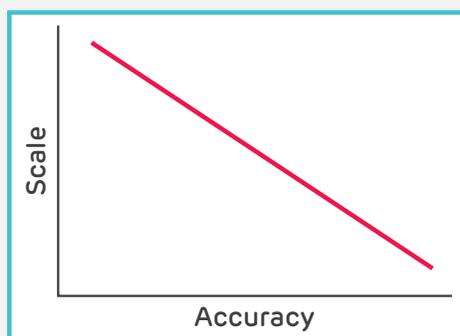
Self-Learning Programmatic Bidder

Drawbridge has built a self-learning programmatic bidder that incorporates data from RTB exchanges, historical ad requests, and the Drawbridge Connected Consumer Graph to make decisions in response to incoming ad requests.

When an ad request is received, Drawbridge matches the request's relevance against data from the Connected Consumer Graph and available ad inventory across devices, and makes a decision to pass or bid on the impression, and how much to bid. This entire process occurs in an average of 25 milliseconds. When an ad is served, any interaction, such as a click, is passed back to Drawbridge, and that information is added to the bidding engine and considered in future bidding decisions.
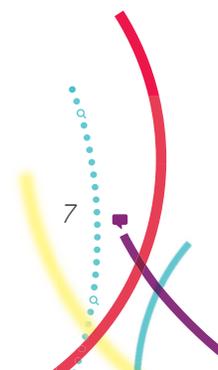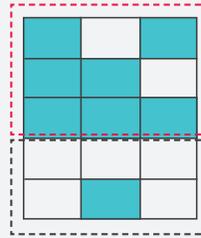
Calibration
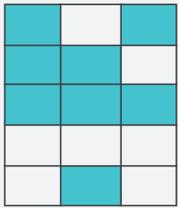
Population
Blue cells are true device-matches. Of the total population of 15, there are 8 device-matches.

Prediction
In this example, the Drawbridge algorithm predicts that the red dotted area are matched devices (9), and the gray dotted area are not matched (6). The accuracy of the model would be the correctly predicted positive (7) and negative (5) matches as a proportion of the total (15).
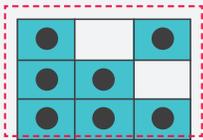
Precision
The number of correct positive predictions (7), as a proportion of the total predicted positive matches (9).
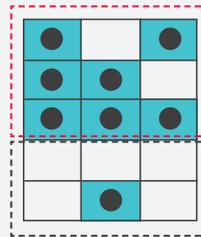
Recall
The number of correct positive matches (7), as a proportion of the total positive matches (8).

The Drawbridge cross-device pairing platform constantly calibrates the Precision and Recall of the learning model by constructing a Confusion Matrix on training samples of the same user handles on mobile and desktop devices.

A Confusion Matrix is a table layout that visualizes the performance of an algorithm, and helps determine where the system is confusing matches.

Accuracy measures the number of correct positive and negative predictions as a proportion of the total population.

Precision measures the number of correctly predicted positive results as a proportion of the total predicted positive results.

Recall measures the number of true correctly predicted positive results as a proportion of that actual positive results.

Data Protection

Industry Self-Regulation

The Network Advertising Initiative (NAI) is the leading self-regulatory association dedicated to responsible data collection and its use for digital advertising. Drawbridge is a member of the NAI and has policies and procedures in place that meet the NAI's high standards.

The Interactive Advertising Bureau conducts research and develops standards related to online advertising in order to create an environment of trust in the marketplace. Drawbridge is committed to the quality assurance guidelines fostered by the IAB.

Drawbridge participates in the Digital Advertising Alliance (DAA), which establishes and enforces responsible privacy practices across industry for relevant digital advertising, providing consumers with enhanced transparency and control.

Customer Preference

The AdChoices Advertising Option Icon gives users transparency and control for interest-based ads. Drawbridge supports the use of AdChoices, giving users access to the ability to manage their preferences and opt out of online interest-based targeted advertising.

Privacy Controls

TRUSTe is a leading data privacy management company that delivers compliance controls and privacy assessments and certifications. Drawbridge has taken the step of partnering with TRUSTe to jointly develop the Drawbridge/TRUSTe Universal Opt-out mechanism that allows consumers to opt out from targeting across multiple devices all at once.

Evidan provides tools for companies to comply with self-regulatory guidelines for online privacy. Drawbridge works with Evidan to ensure compliance with privacy standards and offer transparency to users.

Summary
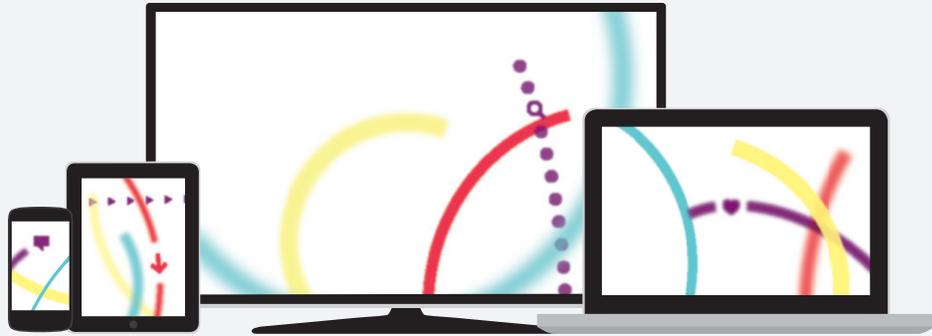
Nielsen estimates that Americans own an average of four digital devices and engage with media content across screens for more than 60 hours per week. As consumers work, socialize, research, and buy products across devices, marketers will continue to shift focus to reaching audiences more effectively across their devices, and they will depend on advanced advertising tools to do this.

Forrester research indicates that 71% of consumers don't take well to inconsistent cross-channel messaging, and one in 10 consumers even go so far as to say that inconsistencies in the brand experience across devices would make them stop interacting with a brand altogether. The marketers adopting smart, scalable cross-device technology today are at the forefront of these trends.

Drawbridge enables brands to have seamless conversations with consumers across their devices, including desktops, smartphones, tablets, and connected televisions. By leveraging its Connected Consumer Graph, Drawbridge is able to drive better results for marketers - from creating brand awareness to driving incremental sales.

Drawbridge is able to drive better results for marketers - from creating brand awareness to driving incremental sales.
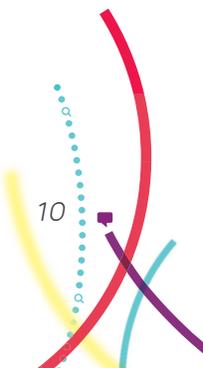
Appendix

What is a cookie?

A cookie is a piece of data issued in an HTTP response (an ad response) for future use by the HTTP client (a web browser). The client then re-supplies the cookie in subsequent requests to the same server. This mechanism allows the server to store user preferences and identify individual users.

Drawbridge HTTP Response

Drawbridge Ad/Data Servers supply cookies by populating the set-cookie response header with the following details:

Name: U
Value:
Expires: Thu Apr 14 14:59:17 2022
Path: /
Domain: .adsymptotic.com
Here is the sample Drawbridge HTTP response:
HTTP/1.1 200 OK
Content-Type: text/html;
charset=utf-8
Set-Cookie:
U=3D9efb55e39df30077629fefd77
31d6a93; expire=Thu Apr 14 14:59:17;
domain=.adsymptotic.com; path=/

Mobile Application

In the case of a mobile application, a cookie can be set using the standard HTTP cookie approach. Additional options for a cookie are one of the following:

An anonymous one-way hash of a randomly generated fully anonymous 40-character string. This does not carry across applications:
Example-An anonymous one way hash of a device ID
Name: NSUUID
Value: 68753A44-4D6F-1226-9C60-0050E4C00067

Example-Android
Name: ANDROID_ID
Value 643ba7cf4165bf8b

Example-iOS
Name: advertisingIdentifier

Value:68753A44-4D6F-1226-9C60-0050E4C00067

A confusion matrix[1] contains information about actual and predicted classifications done by a classification system. Performance of such systems is commonly evaluated using the data in the matrix. The following table shows the confusion matrix for a two class classifier.

The entries in the confusion matrix have the following meaning in the context of our study:

- a is the number of correct predictions that an instance is negative
- b is the number of incorrect predictions that an instance is positive
- c is the number of incorrect predictions that an instance is negative
- d is the number of correct predictions that an instance is positive

	Predicted	
Actual	Negative	Positive
Negative	a	b
Positive	c	d

Several standard terms have been defined for the two-class matrix:

Precision (P) is the proportion of the predicted positive cases that were correct, as calculated using the equation:

Recall (R) is the proportion of positive cases that were correctly identified, as calculated using the equation:

$$P = \frac{d}{b + d}$$

$$R = \frac{d}{c + d}$$

1. Glossary of Terms, Editorial for the Special Issue on Applications of Machine Learning and the Knowledge Discovery Process, Machine Learning (1998), 30(2-3), Ron Kohavi, Foster Provost

Cross-Device Consumer Reach

275M
North America

150M
Latin America

350M
EMEA

500M
APAC

20M
AUS/NZ

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