IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

RAVENWHITE LICENSING LLC,	§	
	§	
Plaintiff,	§	Civil Action No. 2:24-cv-688
	§	
v.	§	**JURY TRIAL DEMANDED**
	§	
THE HOME DEPOT, INC. and	§	
HOME DEPOT U.S.A., INC.,	§	
	§	
Defendants.	§	

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff RavenWhite Licensing LLC ("RavenWhite" or "Plaintiff") brings this patent infringement action against The Home Depot, Inc. and Home Depot U.S.A., Inc. (collectively, "Home Depot" or "Defendants") based on information and belief, as follows:

NATURE OF THE ACTION

1. This is a civil action for infringement of U.S. Patent Nos. 10,594,823 ("the '823 Patent") and U.S. Patent No. 11,562,402 ("the '402 Patent") (collectively, "the Patents-in-Suit"), attached hereto as Exhibit A and Exhibit B, under the patent laws of the United States, 35 U.S.C. § 1 *et seq*.

2. RavenWhite brings this patent infringement action to protect its valuable patented technology relating to (1) advanced machine-to-machine authentication techniques that store encoded information at a client device on the basis of network resource requests determined by a server; and (2) improved advertising systems that enable tiered bidding, cross-selling, and retargeting in online marketing systems.

THE PARTIES

3. RavenWhite is a Delaware limited liability company with a principal place of business at 145 La Sandra Way, Portola Valley, CA 94028.

4. Defendant The Home Depot, Inc. is a company organized under the laws of the State of Delaware with a principal place of business at 2455 Paces Ferry Rd. SE, Atlanta, GA 30339. The Home Depot, Inc. may be served through its registered agent for service, Corporation Service Company, located at 251 Little Falls Drive, Wilmington, DE 19808.

5. Defendant Home Depot U.S.A., Inc. is a corporation organized under the laws of the State of Delaware with its principal place of business located at 2455 Paces Ferry Road, Atlanta, Georgia 30339. Home Depot U.S.A., Inc. may be served through its registered agent for service, Corporation Service Company D/B/A/ CSC-Lawyers Incorporated, located at 211 E. 7th Street, Suite 620, Austin, TX 78701.

6. Home Depot U.S.A., Inc. is a wholly owned subsidiary of The Home Depot, Inc. The assets, liabilities, income, and expenditures of Home Depot U.S.A., Inc. are included in the consolidated financial statements of The Home Depot, Inc. Home Depot U.S.A., Inc., on behalf of itself and The Home Depot, Inc., operates Home Depot retail stores in this District and throughout the United States and the Home Depot retail website, www.homedepot.com, among other websites.

7. Home Depot U.S.A., Inc. is controlled and managed by The Home Depot, Inc. in connection with Defendants' infringing activities pleaded herein. Defendants function as an integrated organization and a single business enterprise in connection with those activities. Defendants hold themselves out as a single business enterprise in their advertising and in connection with the trademark "The Home Depot" in promoting the sale of products through Home Depot retail stores and homedepot.com, without any apparent distinction regarding which

Defendant is offering or would deliver those products and services.

8. Both Defendants control, participate in the commission of, and have a direct financial interest in the infringing acts set forth herein.

JURISDICTION AND VENUE

9. RavenWhite incorporates by reference and re-alleges the foregoing paragraphs as fully set forth herein.

10. This action arises under the patent laws of the United States, Title 35 of the United States Code. Accordingly, this Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a) and the patent laws of the United States, 35 U.S.C. § 1, *et seq*.

11. Venue is proper in this judicial District pursuant to 28 U.S.C. §§ 1391(b), (c) and 1400(b).

12. Home Depot's online e-commerce platform works hand in hand with its physical stores and fulfillment centers, including those located within this District:

> We are also continuing to expand our fulfillment network, investing in a significant number of new fulfillment facilities to drive speed and reliability of delivery for our customers and to help us ultimately meet our goal of reaching 90% of the U.S. population with same or next day delivery for extended home improvement product offerings, including big and bulky products. These facilities include omni-channel fulfillment centers, which deliver product directly to customers, and market delivery operations, which function as local hubs to consolidate freight for dispatch to customers for the final mile of delivery, with a focus on appliances. … In addition to our distribution and fulfillment centers, we leverage our stores as a network of convenient customer pickup, return, and delivery fulfillment locations. Our premium real estate footprint provides a distinct structural and competitive advantage.

The Home Depot 2022 Annual Report at 5, available at https://ir.homedepot.com/~/media/Files/H/HomeDepot-IR/2023/2022_HD%20Annual%20Report.pdf (last accessed September 11, 2023) (hereinafter, "Home Depot 2022 Annual Report").

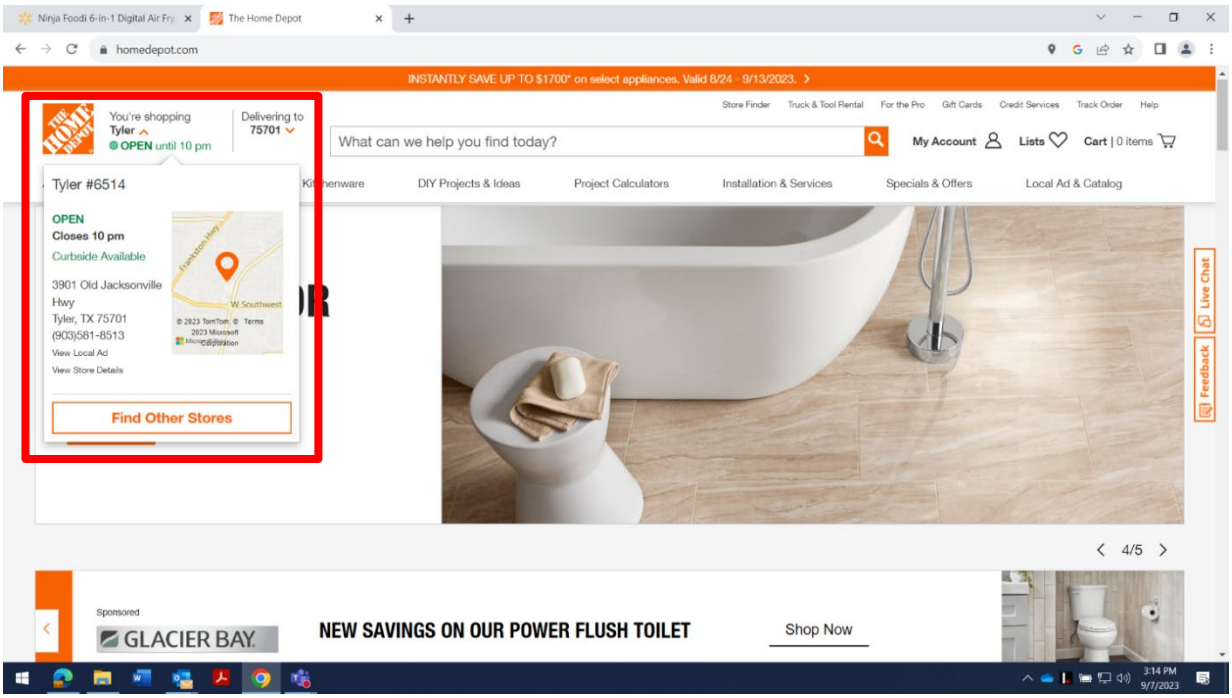
13. Home Depot's online platforms support its interconnected retail strategy: "Online

sales, which consist of sales generated online through our websites and mobile applications for products picked up at our stores or delivered to customer locations, represented 14.2% of net sales and grew by 7.4% during fiscal 2022 compared to fiscal 2021. The increase in online sales in fiscal 2022 was a result of customers continuing to leverage our digital platforms and reflects our ongoing investments to enhance these platforms and related fulfillment capabilities, which support our interconnected retail strategy." Home Depot 2022 Annual Report at 28.

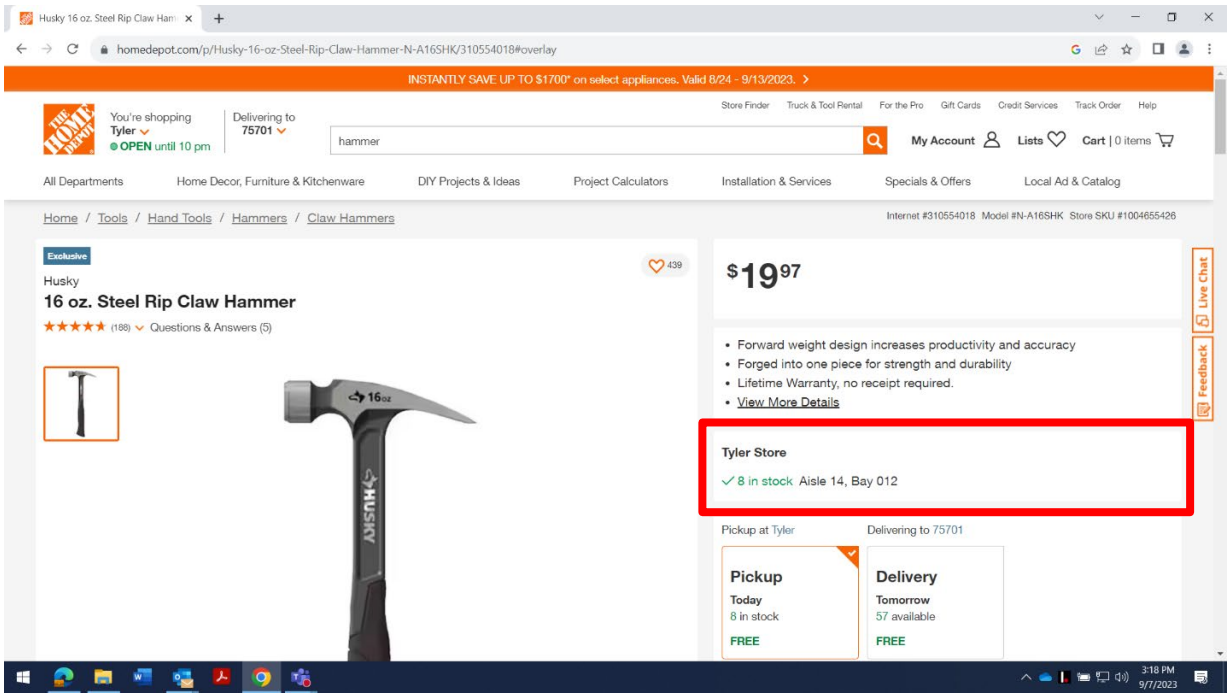
14. Home Depot intends for its websites to complement its stores: "Our online product offerings complement our stores by serving as an extended aisle, and we offer a significantly broader product assortment through our websites and mobile applications, including homedepot.com, our primary website . . . ." Home Depot 2022 Annual Report at 2.

15. When a customer who resides in the Eastern District of Texas visits the Home Depot website, www.homedepot.com, the website directs that customer to a specific store in this District.

16. As an example, when a customer residing in Tyler, Texas shops on the Home Depot website, the Tyler Home Depot address, 3901 Old Jacksonville Hwy, populates on the customer's screen indicating where the customer is shopping and providing information relating to that location. In the image below, the webpage recommends the Tyler Home Depot in Tyler, Texas as the physical Home Depot store where the customer's online shopping choices will be fulfilled.



17. As shown in another screenshot of an online transaction conducted by a customer located in this District, when a customer residing in the Eastern District of Texas selects a product, the website directs the customer to a local store (the Tyler store in this example) in this District where the customer will receive that item. The webpage even informs the customer of the specific location within the store in this District, *e.g.*, the aisle and bay in the aisle (Aisle 14, Bay 012 in the image below) where that product will be located within the store for the customer to retrieve it.



18. The Home Depot stores, and the computers located in these stores in this District not only provide relevant details regarding the location of particular products in the stores, but also displays the available products and amount in stock all as part of Home Depot's infringement of the patents-in-suit. This product information originates from Home Depot's stores located in this District, and also as part of Home Depot's infringement of the patents-in-suit in this District.

19. Home Depot's in-store servers located in this District and/or edge servers controlled by Home Depot located in this District and elsewhere in Texas process information about products in this District so they can be delivered to customers in this District all constituting material conduct that is part of and constitutes Home Depot's infringement of the patented shopping system and techniques.

20. On information and belief, as shown above, Home Depot operates and/or contracts with third parties to operate in-store servers, in-store routers, and/or edge servers in this District to receive, transmit, process, and/or collect information about the searches and purchases made from customers' devices located in this District constituting material conduct as part of Home Depot's

infringement of the patented shopping system and techniques.

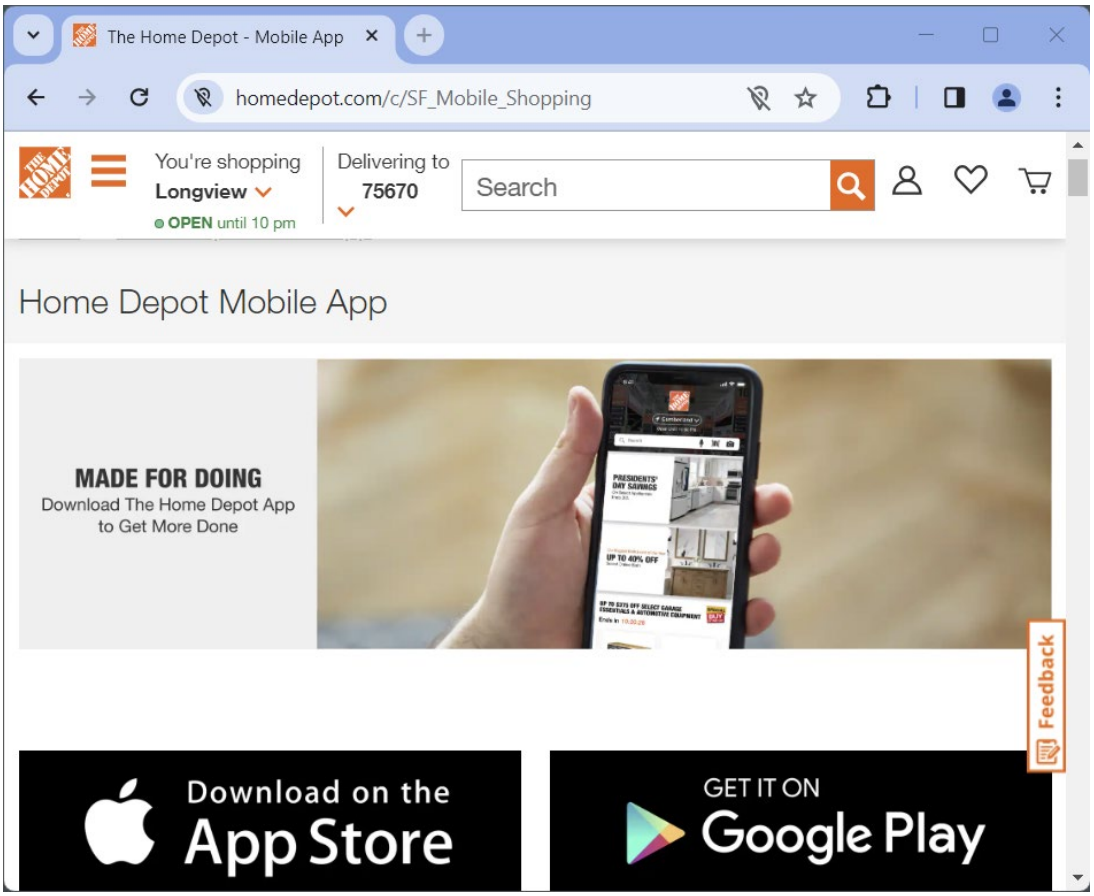
21. Those in-store servers, in-store routers, and/or edge servers located in this District are used to perform infringing acts and participate in Home Depot's infringement of the claims of the '823 Patent because, *inter alia*, they have one or more processors configured to:

> receive a network resource request from a client device, wherein the network resource request corresponds to a first cookie of a first type that was caused to be stored to the client device during a first previous network session, wherein the first cookie of the first type was caused to be stored to the client device at least in part by causing the client device to initiate a set of network resource requests determined during the first previous network session, wherein the client device initiating the set of network resource requests caused data representative of the set of network resource requests to be stored at the client device, wherein a second cookie of a second type different from the first type was caused to be stored at the client device during a second previous network session, and wherein the first cookie of the first type is stored in a first client device browser storage area and the second cookie of the second type is stored in a second client device browser storage area different from the first client device browser storage area;

as recited in claim 1 of the '823 Patent, and to perform the corresponding step of "receiving a network resource request from a client device" in claim 6 of the '823 Patent. This step is performed by, or is attributable to, Home Depot in the Eastern District of Texas and constitutes an infringing act by Home Depot in this District.

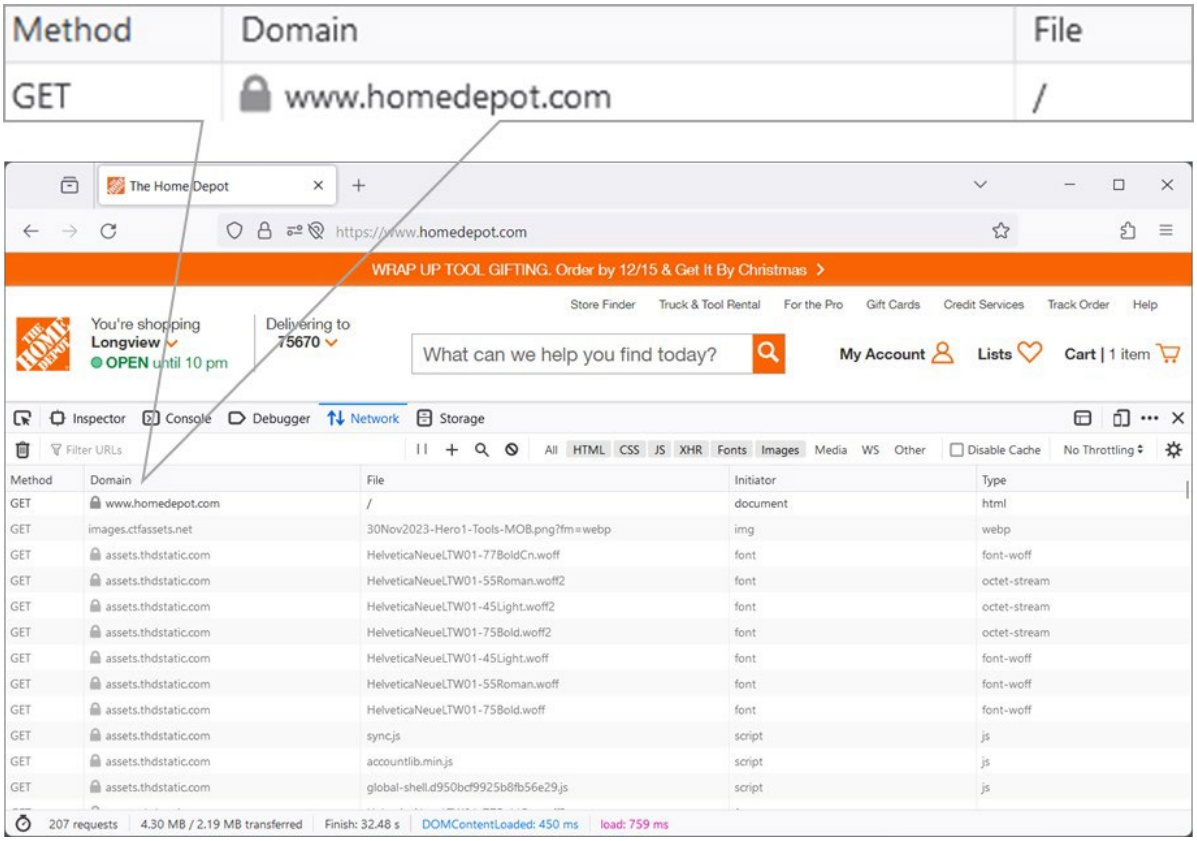
22. Those in-store servers, in-store routers, and/or edge servers located in this District are used to perform infringing acts and participate in Home Depot's infringement of the claims of the '823 Patent because, *inter alia*, they perform the step of "displaying an advertisement to the user based at least in part on at least one of the first quality level or the second quality level," as recited in claims 1 and 19 of the '402 Patent. This step is performed by, or is attributable to, Home Depot in the Eastern District of Texas and is accomplished by use of one or more servers and/or other computers located within this District and constitutes an act of infringement by Home Depot in this District.

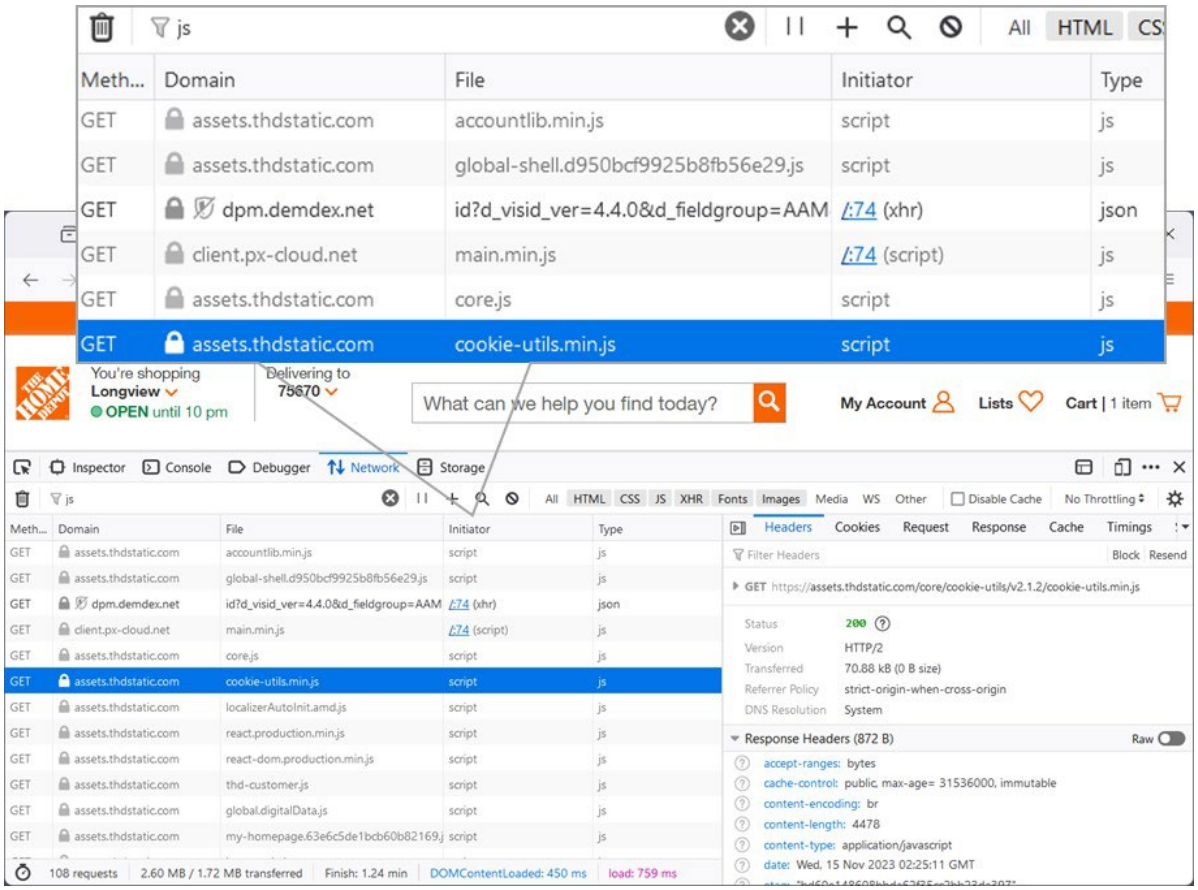
23. Home Depot provides software to client devices that run Home Depot's software as part of the infringement of the patents-in-suit in this District. The Home Depot software that is operated in this District includes, for example, the Home Depot application ("app") that Home Depot provides to and instructs its customers in this District to download and operate on their devices, and JavaScript that Home Depot causes client devices in this District to download when customers in this District view Home Depot's website, and customers use the app as part of the infringement by Home Depot in this District.

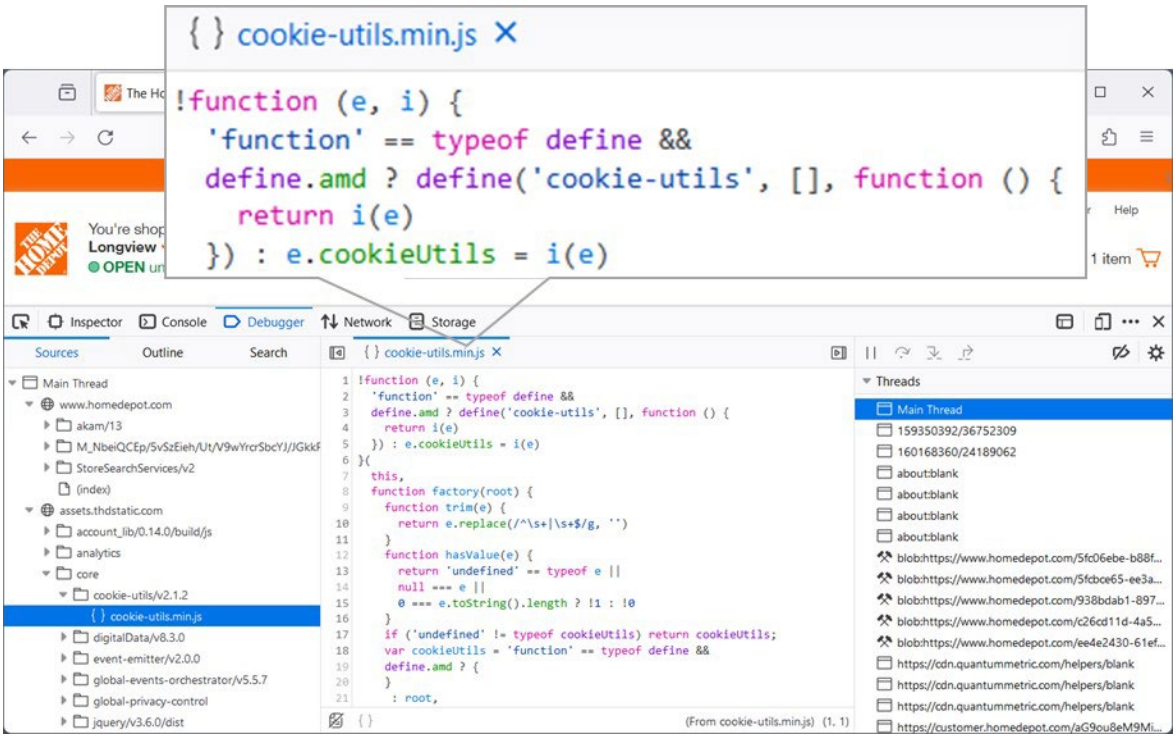


24. When a client in this District visits homedepot.com using a web browser, Home Depot causes that client to download JavaScript files (script files with a ".js" extension), such as the JavaScript file named "cookie-utils.min.js." Below are screenshots showing examples of the

JavaScript files that clients in this District download, and a screenshot showing portions of the code in the JavaScript file named "cookie-utils.min.js" that Home Depot provides, operates, controls, and causes clients to download in this District. After the client downloads the code, the client in this District executes that Home Depot code as part of, in furtherance of, and thereby constitutes a material part of Home Depot's infringement of the patents-in-suit in this District.




js
All HTML CS
Meth... Domain File Initiator Type
GET assets.thdstatic.com accountlib.min.js script js
GET assets.thdstatic.com global-shell.d950bcf9925b8fb56e29.js script js
GET dpm.demdex.net id?d_visid_ver=4.4.0&d_fieldgroup=AAM /:74 (xhr) json
GET client.px-cloud.net main.min.js /:74 (script) js
GET assets.thdstatic.com core.js script js
GET assets.thdstatic.com cookie-utils.min.js script js
You're shopping
Longview
OPEN until 10 pm
Delivering to
75670
What can we help you find today?
My Account
Lists
Cart | 1 item
Inspector Console Debugger Network Storage
Headers Cookies Request Response Cache Timings
GET https://assets.thdstatic.com/core/cookie-utils/v2.1.2/cookie-utils.min.js
Status 200
Version HTTP/2
Transferred 70.88 kB (0 B size)
Referrer Policy strict-origin-when-cross-origin
DNS Resolution System
Response Headers (872 B)
accept-ranges: bytes
cache-control: public, max-age= 31536000, immutable
content-encoding: br
content-length: 4478
content-type: application/javascript
date: Wed, 15 Nov 2023 02:25:11 GMT
108 requests 2.60 MB / 1.72 MB transferred Finish: 1.24 min DOMContentLoaded: 450 ms load: 759 ms


{ } cookie-utils.min.js
!function (e, i) {
'function' == typeof define &&
define.amd ? define('cookie-utils', [], function () {
return i(e)
}) : e.cookieUtils = i(e)
Inspector Console Debugger Network Storage
Sources Outline Search
Main Thread
www.homedepot.com
assets.thdstatic.com
core
cookie-utils/v2.1.2
{ } cookie-utils.min.js
Threads
Main Thread
(From cookie-utils.min.js) (1, 1)

25. Home Depot controls its software and the acts that client devices in this District perform when those devices execute Home Depot's software. The steps and elements that are performed by, are attributable to, and/or are controlled by Home Depot in the Eastern District of Texas when client devices in this District run Home Depot software include, for example: "displaying an advertisement to the user" as recited in claim 1 of the '402 Patent, and similar limitations in claims 10 and 19 of the '402 Patent.

26. Home Depot conducts business from and operates from at least the following locations in this District where online orders can be fulfilled: (1) 411 E Loop 281, Longview, TX 75605; (2) 3901 Old Jacksonville Hwy, Tyler, TX 75701; (3) 2530 S Jefferson Ave, Mt Pleasant, TX 75455; (4) 4110 St Michael Dr, Texarkana, TX 75503; and (5) 3120 NE Loop 286, Paris, TX 75460.

27. This Court has personal jurisdiction over Home Depot consistent with the Texas Long Arm Statute. Home Depot has committed infringing acts within the Eastern District of Texas giving rise to this action and has established minimum contacts within the forum state of Texas. Home Depot conducts business in this District and maintains regular and established places of business within this District. Home Depot has purposefully availed itself of the privileges of conducting business in the State of Texas, and Home Depot regularly conducts business within the State of Texas.

28. This Court has general jurisdiction over Home Depot due to its continuous and systematic contacts with the State of Texas, including through its operation of approximately 182 physical retail stores in the State of Texas, its targeting of Texas residents with the homedepot.com website, its ownership and/or lease of land in the State of Texas, and other business activities throughout the State of Texas.

29. Home Depot is subject to the specific personal jurisdiction of this Court because RavenWhite's patent infringement claims against Defendant The Home Depot, Inc. specifically arise from Home Depot's acts of infringement in the State of Texas. Among these acts of infringement include directing and controlling the operation of the homedepot.com website using the patented inventions, and specifically targeting residents of Texas with this website to further the sale of products and services to those customers online and at Home Depot's physical stores in this District.

30. Home Depot U.S.A., Inc.'s presence and acts of infringement committed in this District are attributable and imputed to The Home Depot, Inc. for venue purposes. The Defendants have not maintained corporate separateness. On information and belief, the Defendants function as an integrated organization in the operation of the homedepot.com website and its retail stores and with respect to the infringing actions complained of herein. For example, Home Depot states in its annual report, "When we refer to 'The Home Depot,' the 'Company,' 'we,' 'us' or 'our' in this report, we are referring to The Home Depot, Inc. and its consolidated subsidiaries." See Home Depot 2022 Annual Report at 1.

31. Further, Defendants hold themselves out as a single business enterprise under the trademark "The Home Depot" in connection with the infringing actions without any apparent distinction regarding which Defendant is performing those actions. For example, Defendants' stores are branded as "The Home Depot" with no apparent distinction over whether the store is operated by The Home Depot, Inc. or Home Depot U.S.A., Inc. Home Depot touts the significance of its brand name: "Our business has one of the most recognized brands in North America. As a result, we believe that The Home Depot trademark has significant value and is an important factor in the marketing of our products, e-commerce, stores and business." Home Depot 2022 Annual

Report at 3.

32. On information and belief, the President or COO of The Home Depot, Inc. is responsible for marketing and online strategy for both The Home Depot, Inc. and Home Depot U.S.A., Inc. The current CEO of The Home Depot, Inc., Edward Decker, served as The Home Depot, Inc.'s President and COO from October 2020 through February 2022. During that time, "he was responsible for global store operations, global sourcing operations, global supply chain, outside sales and service, and real estate, as well as merchandising, marketing, and online strategy." The Home Depot, Inc., Proxy Statement and Notice of 2023 Annual Meeting of Shareholder at 21 (May 18, 2023), available at https://ir.homedepot.com/~/media/Files/H/HomeDepot-IR/2023/Proxy-AGM/2023%20Proxy%20Statement.pdf (last accessed December 5, 2023) (hereinafter, "Home Depot 2023 Proxy").

33. On information and belief, The Home Depot, Inc.'s Board of Directors is responsible for directing the operations of all of The Home Depot, Inc.'s subsidiaries, including Home Depot U.S.A., Inc. Further, on information and belief, The Home Depot, Inc's 2023 Proxy Statement indicates that one of the qualifications and attributes required of its directors is e-commerce experience. Home Depot 2023 Proxy at 16.

34. Defendants The Home Depot, Inc. and Home Depot U.S.A., Inc. maintain regular and established places of business, and a continuous physical presence within the District. Defendants maintain stores located in this District, for example, located at (1) 411 E Loop 281, Longview, TX 75605; (2) 3901 Old Jacksonville Hwy, Tyler, TX 75701; (3) 2530 S Jefferson Ave, Mt Pleasant, TX 75455; (4) 4110 St Michael Dr, Texarkana, TX 75503; and (5) 3120 NE Loop 286, Paris, TX 75460. At least some of these stores are integrated into the operation of Home Depot's website, as described above, to provide online information to customers in this District

about the products in inventory and their physical location in the stores.

35. On information and belief, Defendants have committed infringement of the Patents-in-Suit in this District. Pursuant to 35 U.S.C. § 271, Defendants infringe the Patents-in-Suit by the infringing acts described herein in this District. Defendants' acts of infringement committed in this District includes, but is not limited to, Defendants conducting, directing, and controlling the operation of the Home Depot Website enabling customers to shop, locate items, and find a Home Depot retail store in this District where the customer can pick up products ordered through the Home Depot Website, or visit the Website for some other commercial purpose. Defendants generate significant revenue as a direct result of making the Home Depot Website available to customers in the State of Texas.

36. When customers who reside in the Eastern District of Texas purchase products from Home Depot, the stores located within the Eastern District of Texas work in conjunction with the Home Depot website, www.homedepot.com, to direct customers to stores in this District. The website also provides all the information necessary for customers to make purchases, such as the different types of products available, inventory, and location of the products within the stores. All of this information provided by homedepot.com is specific to the stores located in the Eastern District of Texas.

37. Plaintiff incorporates the allegations stated throughout this Amended Complaint, including the foregoing paragraphs above and the following paragraphs below in support of its allegation that the Home Depot defendants infringe the patents-in-suit in this District and venue is proper in this District to address defendants' infringement in this lawsuit in this Court.

PATENTS-IN-SUIT

38. U.S. Patent No. 10,594,823 ("the '823 Patent"), titled "Method and Apparatus for Storing Information in a Browser Storage Area of a Client Device," duly and legally issued on

March 17, 2020, from U.S. Patent Application No. 15/706,556, filed on September 15, 2017.

39. The ’823 Patent is owned by RavenWhite Security, Inc., a Delaware corporation located at 145 La Sandra Way, Portola Valley, CA 94028. RavenWhite Security is a research-oriented cybersecurity company. It develops technologies that address consumers’ technical and ease-of-use demands. RavenWhite Security’s mission is to make e-commerce safer for consumers.

40. Plaintiff RavenWhite Licensing LLC is a Delaware limited liability company, located at 145 La Sandra Way, Portola Valley, CA 94028.

41. Plaintiff RavenWhite Licensing LLC is the exclusive licensee of all right, title, and interest in and to the ’823 Patent, including the right to assert all causes of action arising under said patent and to seek damages and all other remedies for the infringement thereof.

42. U.S. Patent No. 11,562,402 (“the ’402 Patent”), titled “Advertising Model”, duly and legally issued on January 24, 2023, from U.S. Patent Application No. 17/201,306, filed on March 15, 2021.

43. The ’402 Patent is owned by Security Technology, LLC, a Delaware limited liability company located at 7 East 20th Street #12f, New York, NY 10003.

44. Plaintiff RavenWhite Licensing LLC is the exclusive licensee of all right, title, and interest in and to the ’402 Patent, including the right to assert all causes of action arising under said patent and to seek damages and all other remedies for the infringement thereof.

’823 PATENT BACKGROUND

45. The ’823 Patent relates generally to client-server communications and causes a browser to store information in a browser storage area of a client device. More specifically, the ’823 Patent discloses an advanced machine-to-machine authentication technique that stores encoded information at a client device on the basis of network resource requests determined by a server. Authentication has grown significantly in importance as e-commerce has shifted retail sales

online and customer have a growing need to create online accounts.

'402 PATENT BACKGROUND

46. The '402 Patent relates to improved advertising systems that enable tiered bidding, cross-selling, and retargeting in online marketing systems. Cross-selling is the notion of offering a second product based on a believed purchase of a first product. Retargeting (also known as remarketing) is the notion of reaching out to a user in response to a non-purchase and offering them a product.

COUNT I

(Home Depot's Infringement of U.S. Patent No. 10,594,823)

47. RavenWhite incorporates by reference and re-alleges the foregoing paragraphs as fully set forth herein.

48. Home Depot has directly infringed and continues to directly infringe the '823 Patent by creating, maintaining, and operating its system of physical stores and computer networks ("the Home Depot system") including the servers through which it operates the Home Depot website and allows customers to make online shopping selections that can be fulfilled at physical stores.

49. Claim 1 of the '823 Patent, for example, reads as follows:

A system, comprising:

one or more processors configured to:

receive a network resource request from a client device, wherein the network resource request corresponds to a first cookie of a first type that was caused to be stored to the client device during a first previous network session, wherein the first cookie of the first type was caused to be stored to the client device at least in part by causing the client device to initiate a set of network resource requests determined during the first previous network session, wherein the client device initiating the set of network resource requests caused data representative of the set of network resource requests to be stored at the client device, wherein a second cookie of a second type different from the first type was caused to be stored at the client device

> during a second previous network session, and wherein the first cookie of the first type is stored in a second client device browser storage area different from the first client device browser storage area;
>
> based at least in part on the network resource request from the client device corresponding to the first cookie of the first type caused to be stored at the client device during the first previous network session, determine information that was encoded and stored in the client device;
>
> perform a first identification of at least one of the client device and a user of the client device using the first cookie of the first type, wherein the first identification is performed using the first cookie of the first type at least in part by using the determined information that was encoded and stored in the client device;
>
> perform a second identification of at least one of the client device and the user of the client device using the second cookie of the second type; and
>
> perform a determination based at least in part on (1) a presence of a network resource request associated with one of the first cookie and the second cookie, and (2) an absence of a network resource request associated with the other of the first cookie and the second cookie; and
>
> a memory coupled to the one or more processors and configured to provide the one or more processors with instructions.

’823 Patent, 15:33-16:12 (claim 1).

50. Home Depot has directly infringed, and continues to directly infringe, one or more claims of the ’823 Patent, including at least claims 1 and 6 of the ’823 Patent, literally and/or under the doctrine of equivalents, by or through making, using, offering for sale, selling within the United States and/or importing the Home Depot system.

51. The Home Depot system comprises one or more processors configured to use cookies and other tracking technologies on its websites when receiving and responding to client requests such as accessing web pages. Such tracking technologies are identified in Home Depot’s Privacy & Security Statement:

We collect information from you passively.

We use tools like browser cookies, flash cookies, pixel tags, and web beacons to collect information when you use our websites and applications or interact with our emails. For more information about these tools and the choices you may have, please read the Our Tracking Tools section. And we use cameras and other technologies in our stores, in parking lots and at other facilities to learn about customer traffic and for fraud prevention, security, and asset protection.

. . .

The Home Depot, Inc. Privacy & Security Statement, https://www.homedepot.com/privacy/privacy-and-security-statement (last accessed September 11, 2023) (hereinafter, "Home Depot Privacy & Security Statement").

This Privacy and Security Statement describes the privacy practices of The Home Depot, Inc. and its subsidiaries, divisions, affiliates, brands, and other The Home Depot companies that link to this Privacy and Security Statement, including The Home Depot Foundation (subject to exceptions noted in The Home Depot Foundation section below) (collectively, "The Home Depot," "our," "us," or "we"). It applies to the information we collect in association with your interactions with us, including, but not limited to:

- Use of our websites, including mobile websites
- Visits to our stores or attendance at our events
- Use of our applications for mobile phones, tablets, or other smart devices
- Phone and email communications with us
- Social media interactions on our websites and other third-party websites like Facebook, YouTube, Pinterest, Google+, Instagram, and Twitter
- Viewing our online advertisements or emails
- Interactions with our authorized service providers

. . .

Our Tracking Tools

We collect personal and other information using digital tracking tools, such as cookies and web beacons, when you use our websites or mobile applications, interact with our emails or applications provided on connected devices, or otherwise engage with our digital offerings. We also partner with third parties that collect information this way. These third parties may place similar tracking tools on our websites, applications, and advertising to facilitate tracking, advertising, and measurement services.

The tools may collect information about your activities over time and on various digital services offered by us or others.

The tools that we, our vendors, and third parties use include:

- Browser and flash cookies. Cookies are small text files that websites send to your computer or other connected device to identify your browser or to store information or settings. Your browser may provide the ability to be notified when you receive certain types of cookies and how to restrict or disable certain cookies. Flash cookies generally can be disabled only by accessing Adobe Flash settings (information available here)
- Server logs, which record information about the device, browser, operating system, network, and other resources you use to access our digital services
- Web beacons and pixels. These are small electronic images deployed on websites and emails that collect information about how users interact with content
- Application software. Software in our mobile and other connected-device applications collects information about how you interact with the digital services

Home Depot Privacy & Security Statement, https://www.homedepot.com/privacy/privacy-and-security-statement.

52. The Home Depot system's one or more processors are configured to receive a network resource request from a client device, wherein the network resource request corresponds to a first cookie of a first type that was caused to be stored to the client device during a first previous network session, wherein the first cookie of the first type was caused to be stored to the client device at least in part by causing the client device to initiate a set of network resource requests determined during the first previous network session, wherein the client device initiating the set of network resource requests caused data representative of the set of network resource requests to be stored at the client device, wherein a second cookie of a second type different from the first type was caused to be stored at the client device during a second previous network session, and wherein the first cookie of the first type is stored in a first client device browser storage area and the second cookie of the second type is stored in a second client device browser storage area different from the first client device browser storage area. Client devices accessing the Home Depot's website

receive network resources including cookies and other similar tracking data. For example, Home Depot's privacy and security statement describes using multiple types of tracking technologies, such as cookies, web beacons, and pixels:

Our Tracking Tools

We collect personal and other information using digital tracking tools, such as cookies and web beacons, when you use our websites or mobile applications, interact with our emails or applications provided on connected devices, or otherwise engage with our digital offerings. We also partner with third parties that collect information this way. These third parties may place similar tracking tools on our websites, applications, and advertising to facilitate tracking, advertising, and measurement services.

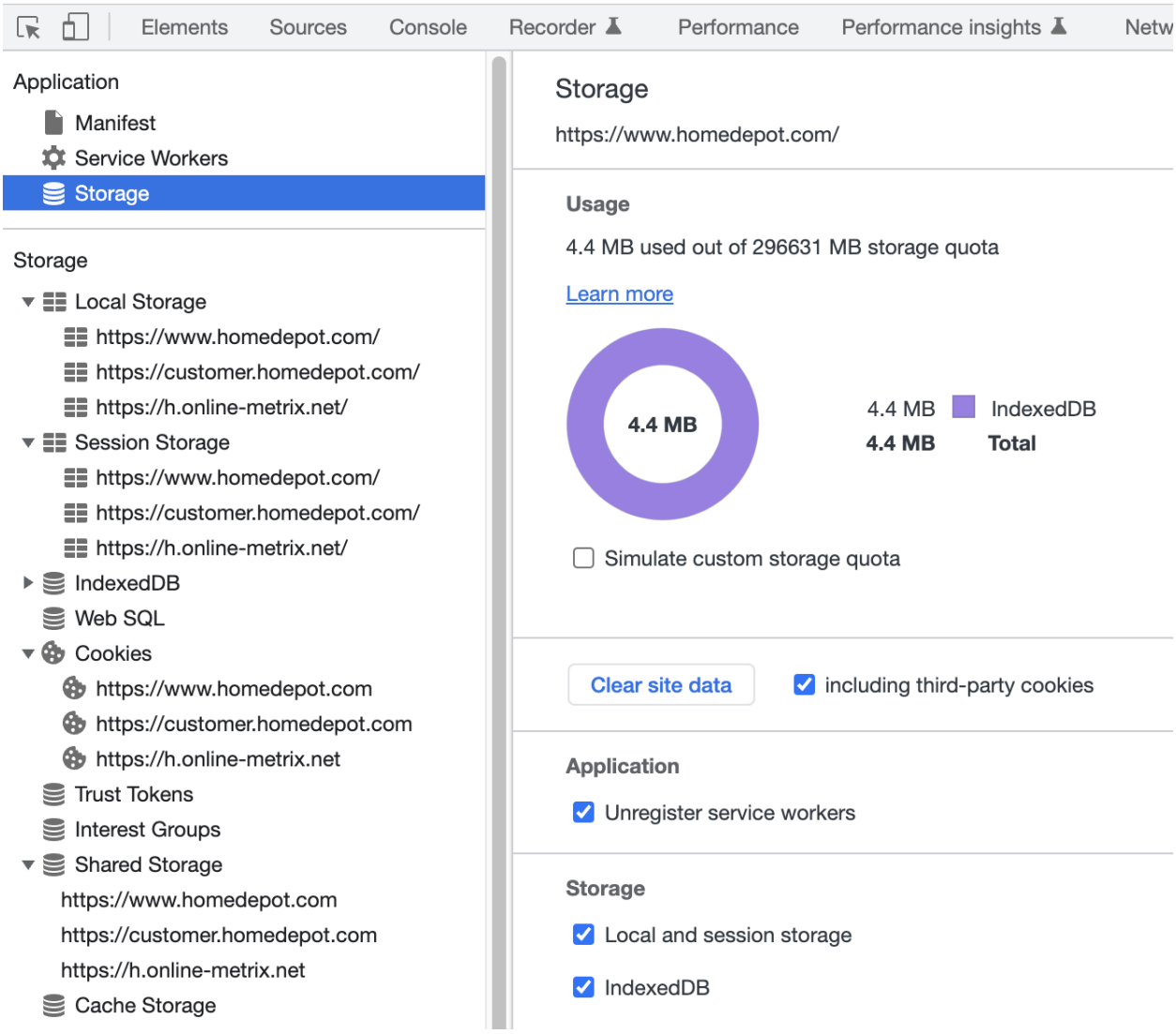
The tools may collect information about your activities over time and on various digital services offered by us or others.

The tools that we, our vendors, and third parties use include:

- Browser and flash cookies. Cookies are small text files that websites send to your computer or other connected device to identify your browser or to store information or settings. Your browser may provide the ability to be notified when you receive certain types of cookies and how to restrict or disable certain cookies. Flash cookies generally can be disabled only by accessing Adobe Flash settings (information available here)
- Server logs, which record information about the device, browser, operating system, network, and other resources you use to access our digital services
- Web beacons and pixels. These are small electronic images deployed on websites and emails that collect information about how users interact with content
- Application software. Software in our mobile and other connected-device applications collects information about how you interact with the digital services

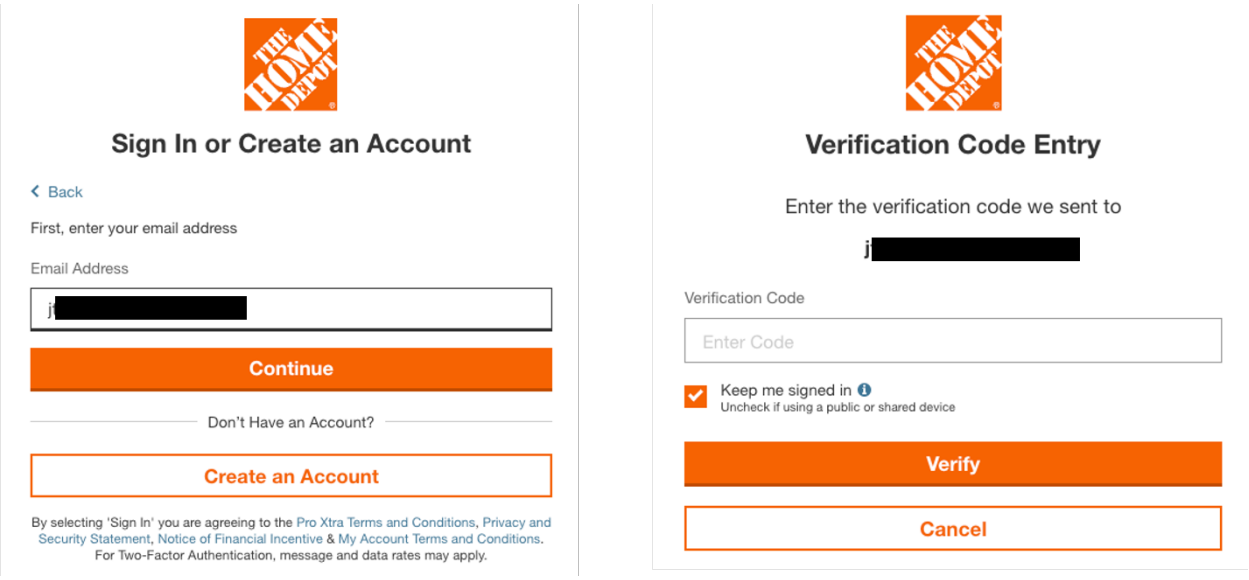
Home Depot Privacy & Security Statement, https://www.homedepot.com/privacy/privacy-and-security-statement.

53. The cookies and trackers used by Home Depot are stored in different locations on the client device, such as, for example, in Local Storage, Session Storage, Cookies, and Shared Storage. This is demonstrated in the image of the "Application" tab in Google Chrome for the Home Depot website, www.homedepot.com, below:



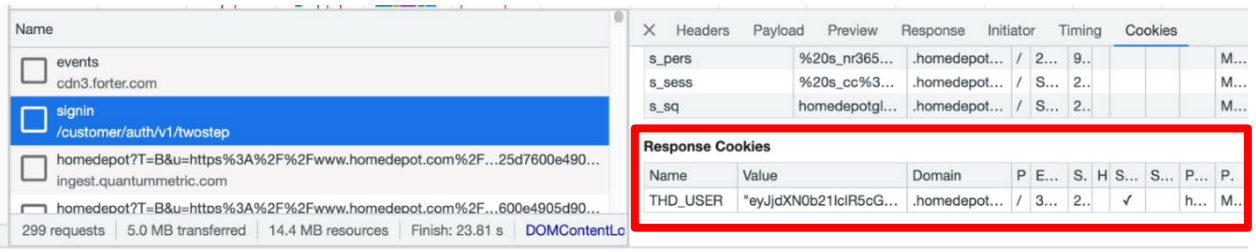
54. The network resource received by the Home Depot system's one or more processors corresponds to a first cookie of a first type that was caused to be stored to the client device during a first previous network session, wherein the first cookie of the first type was caused to be stored to the client device at least in part by causing the client device to initiate a set of network resource requests determined during the first previous network session, wherein the client device initiating the set of network resource requests caused data representative of the set of network resource requests to be stored at the client device. For example, Home Depot requires a user to sign into their account in order to purchase any products or services. Home Depot associates

unique identifiers with users as evidenced by their login identifier, as shown in the screenshots below:

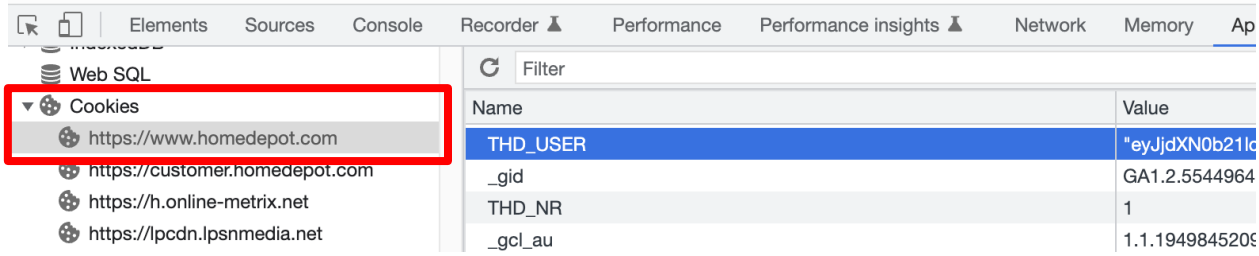


Screenshot of email and verification code entry for a customer signing in, *Sign In or Create an Account*, Home Depot, https://www.homedepot.com/auth/view/signin?redirect=/&ref=null.

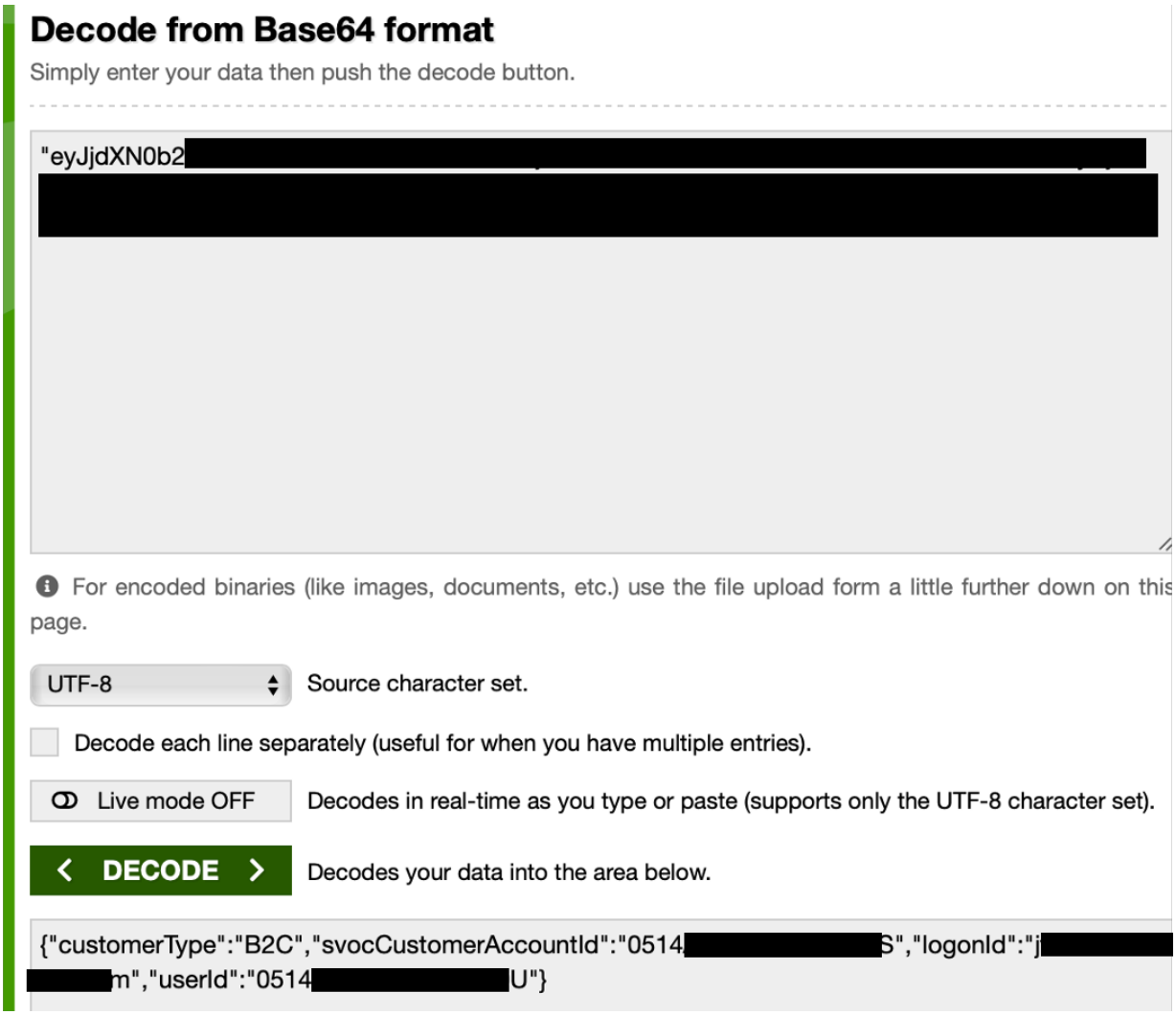
55. For example, during a first previous network session, if a user signs in by putting the user's email address and either password or verification code (verification code shown above) into the Home Depot website, Home Depot's servers will authenticate the client, which will cause a first "THD_USER" cookie to be stored on the client device, as shown in the screenshots below:



56. The THD_USER cookie is a base64 encoded string and is stored in the "Cookies" area of the client's browser:

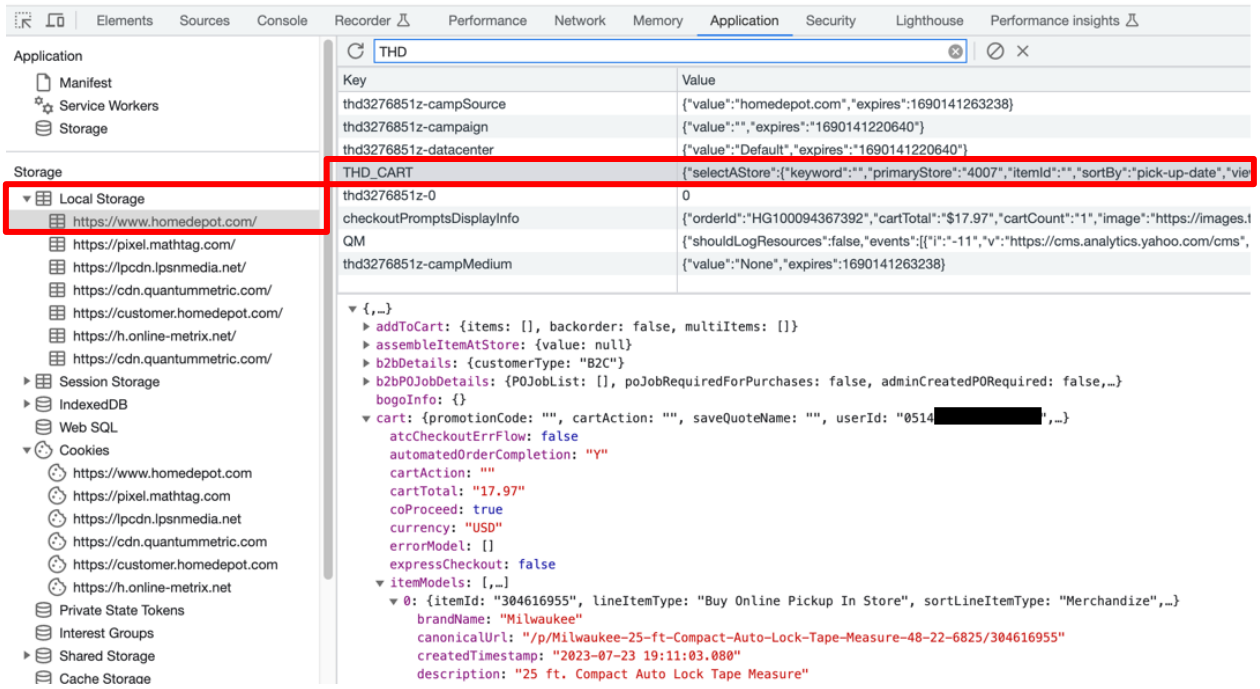


57. The THD_USER cookie includes unique customer identifiers "logonId" and "userId," which are seen after decoding the cookie in the following screenshot of decoded THD_USER cookie which uses base64 encoding:



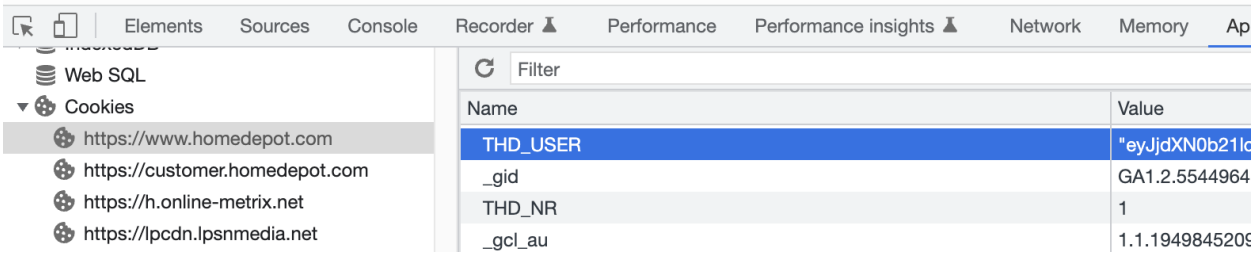
58. The Home Depot system also causes a second cookie of a second type different from the first type to be stored at the client device during a second previous network session, such

as the "THD_CART" cookie. For example, if a user is signed in and adds an item to their cart during a second previous network session, Home Depot will cause a THD_CART cookie to be stored in the "Local Storage" area of the client device, as demonstrated in the following screenshot:

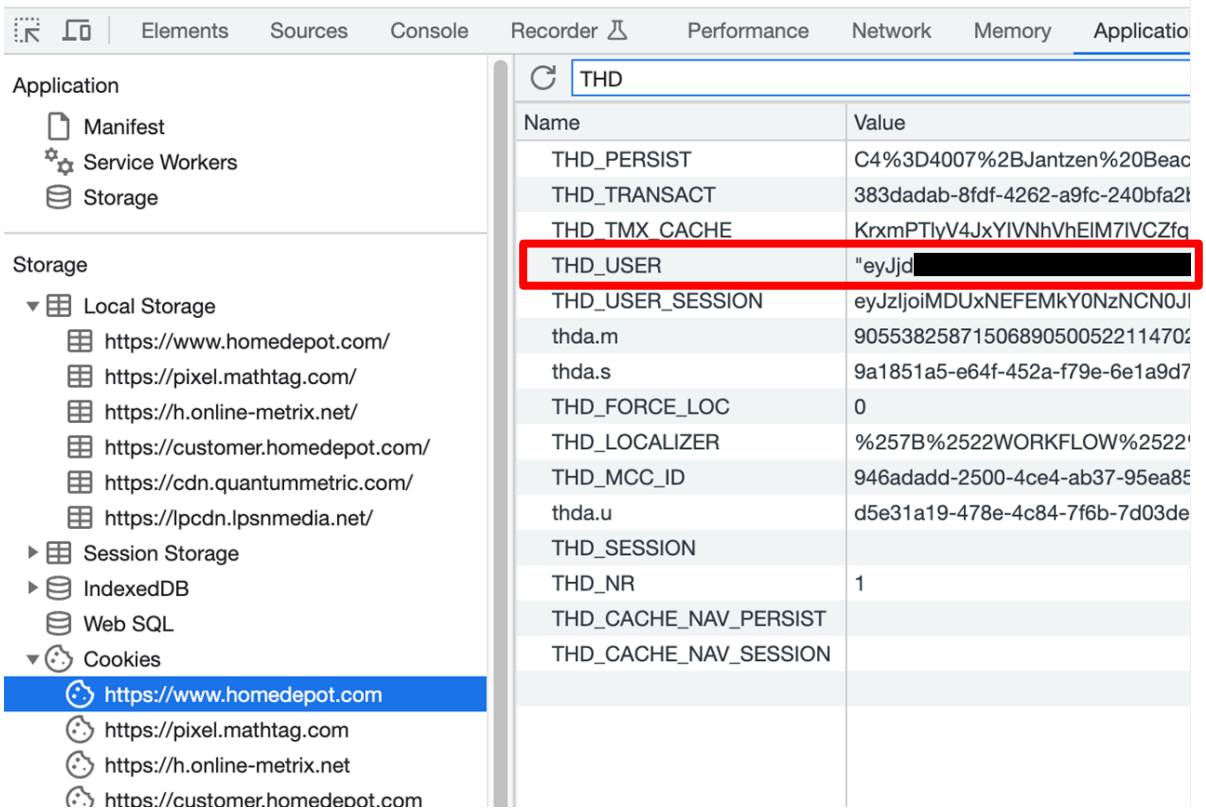


59. The THD_CART cookie is a JSON data structure holding shopping cart related information, which is different from the THD_USER cookie's base64 encoded string. The THD_CART cookie also contains the same userId seen in the decoded THD_USER cookie ("0514…"). The first cookie of the first type is stored in a first client device browser storage area and the second cookie of the second type is stored in a second client device browser storage area different from the first client device browser storage area. For example, as described above, the THD_USER is a different type of cookie than the THD_CART cookie since at least THD_USER is base64 encoded string and THD_CART is a JSON data structure. THD_USER is also stored in the cookies area of the client device, whereas THD_CART is stored in local storage.

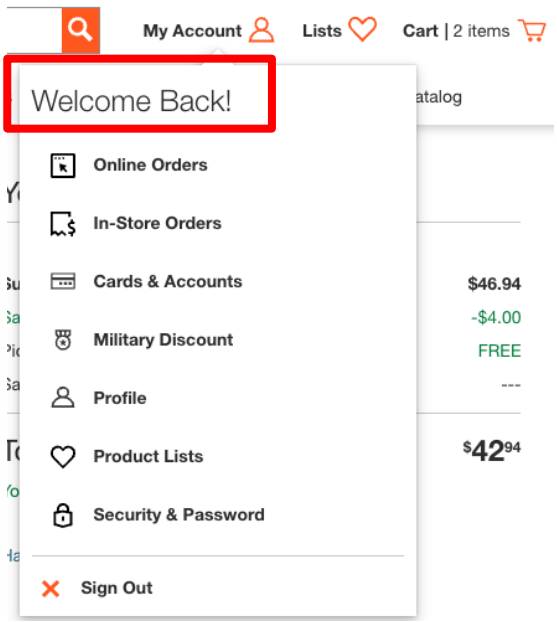
60. The Home Depot system's one or more processors are configured to, based at least in part on the network resource request from the client device corresponding to the first cookie of the first type caused to be stored at the client device during the first previous network session, determines information that was encoded and stored in the client device. A THD_USER cookie is a first cookie of the first type stored at the client device during the first previous network session, as shown below:



61. The Home Depot system's one or more processors determine information that was encoded and stored in the client device, such as whether a user has previously visited the site, based at least in part on the network resource request from the client device corresponding to the THD_USER cookie. For example, as shown below, a network resource request from the client causes Home Depot servers to determine information (such as a userId) that was encoded and stored in the THD_USER cookie. If the THD_USER cookie is deleted, Home Depot will determine that the user is not authenticated and force the user to log in again, but if the THD_USER cookie is present (as shown below), Home Depot will display the user's account information without requiring a log in.

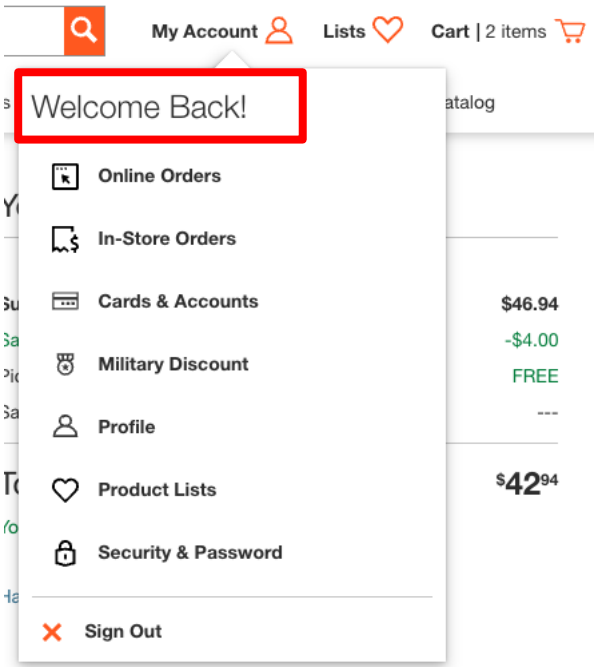


62. When the user is recognized through information present in the THD_USER cookie by the Home Depot system's servers, the user will see a "Welcome Back!" message displayed instead of a sign-in page:

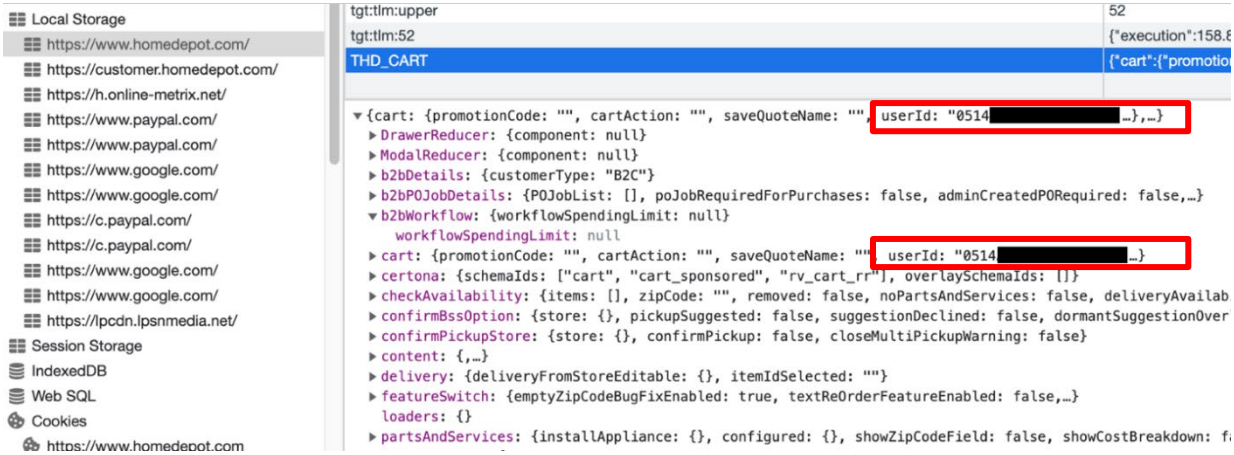


63. The Home Depot system's one or more processors are configured to perform a first identification of at least one of the client device and a user of the client device using the first cookie of the first type, wherein the first identification is performed using the first cookie of the first type at least in part by using the determined information that was encoded and stored in the client device. For example, Home Depot performs a first identification of at least one of the client device and a user of the client device using the previously stored first THD_USER cookie.

64. The THD_USER cookie is tied to and can be used to identify the user because it contains the user's userId. Home Depot associates a THD_USER cookie with at least one of the client device and a user of the client device with an email and verification code sign-in process. The THD_USER cookie is persistent and unchanged across sessions on a user's device. For example, when a user signs in with a valid THD_USER cookie, Home Depot performs the identification of the client device and a user of the client device. Because of Home Depot's identification, a returning user is presented with a "Welcome Back!" message instead of a request to sign in, as shown below:



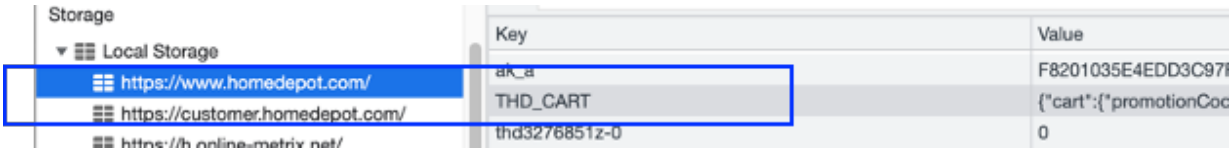
65. The one or more processors of the Home Depot system are configured to perform a second identification of at least one of the client device and the user of the client device using the second cookie of the second type. For example, Home Depot performs a second identification of at least one of the client device and a user of the client device using the previously stored THD_CART local storage cookie. The THD_CART cookie is tied to and can be used to identify the user because it contains the user's userId. Home Depot associates a THD_CART cookie with at least one of the client device and a user of the client device with an email and verification code sign-in process as its ID field contains the same customer ID as the decoded THD_USER cookie:



66. The one or more processors of the Home Depot system are configured to perform a determination based at least in part on (1) a presence of a network resource request associated with one of the first cookie and the second cookie, and (2) an absence of a network resource request associated with the other of the first cookie and the second cookie. For example, if a user attempts to view their cart, the Home Depot system determines whether the user can view the items in their cart due to the presence of the THD_USER cookie (the first cookie) and the absence of the THD_CART cookie (the second cookie). If Home Depot finds the THD_USER cookie (*see*, for example, THD_USER cookie verification) but does not find the THD_CART cookie, the Home Depot system's servers will allow the user to view their cart page without signing in again, but

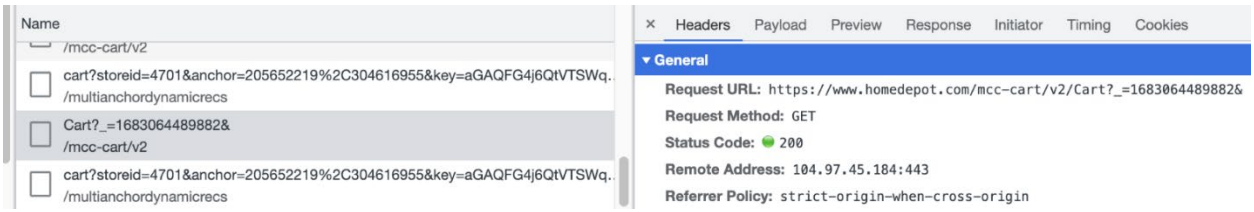
will re-download data to create the THD_CART cookie. For example, in the screenshots below, the THD_CART cookie is removed to cause it to be absent, which causes Home Depot system's servers to download the THD_CART cookie to recreate the user's cart.

67. In the screenshot below, the THD_CART cookie is present in local storage:

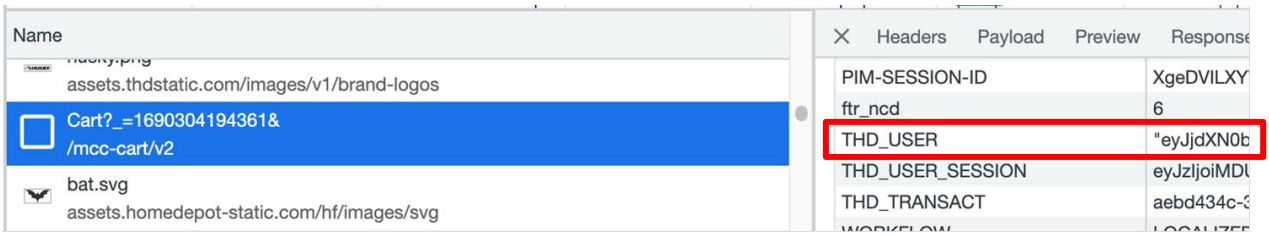


68. The THD_CART cookie is then removed from local storage:

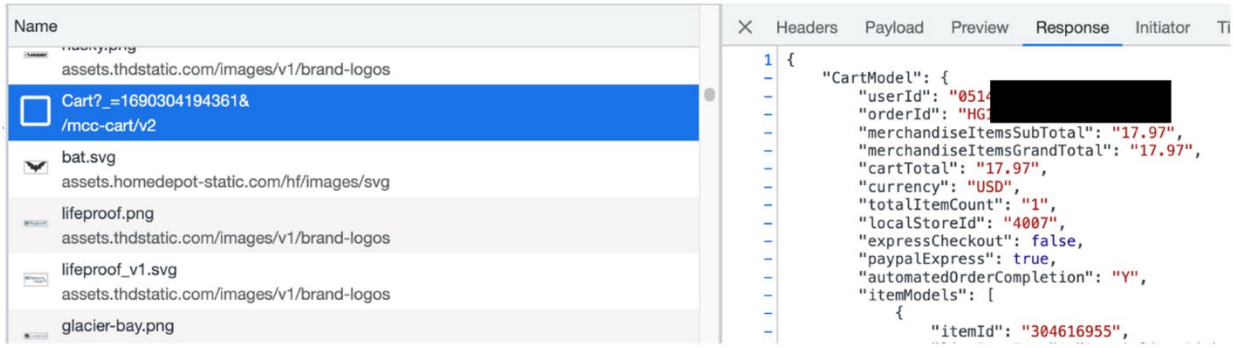
69. During a new network request, Home Depot servers request the THD_CART cookie from local storage of the client:



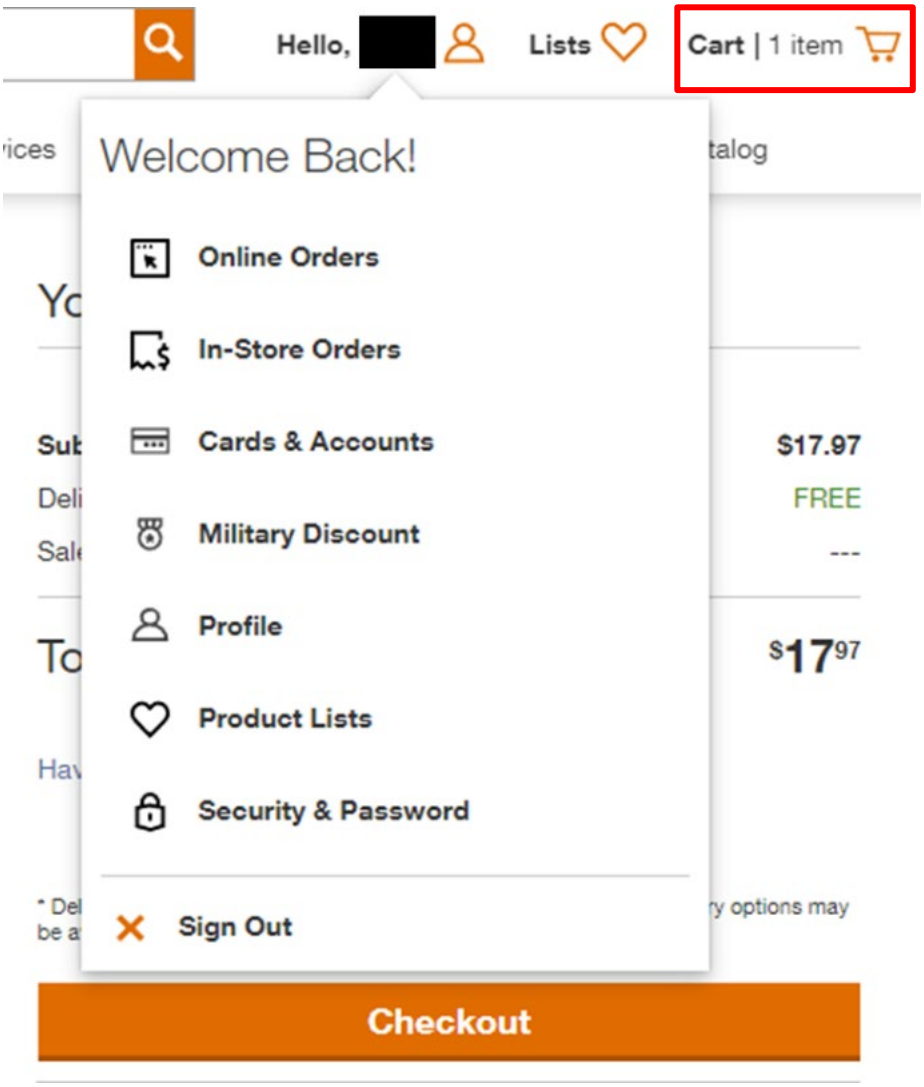
70. Because the THD_CART cookie is not present in this example, the THD_USER cookie is used as one input in order for the client to request that the Home Depot system's servers re-create the THD_CART cookie:



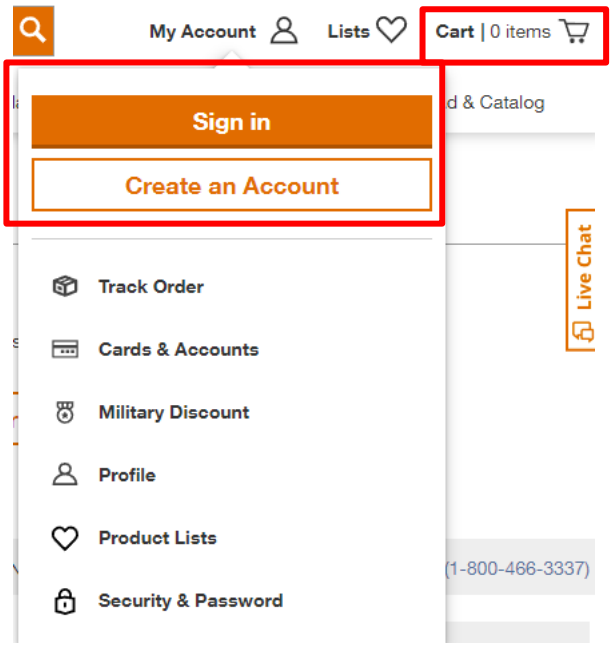
71. The THD_CART cookie is then re-created:



72. Then, in the user interface, the cart appears with the items that were present:



73. In contrast, if Home Depot does not find the THD_USER cookie, the Home Depot system's servers will not allow the user to view their cart. For example, if the THD_USER cookie is removed, a user attempting to view their cart will be met with only a request to sign in:



74. The Home Depot system comprises memory coupled to the Home Depot System's one or more processors and configured to provide the one or more processors with instructions. For example, the Home Depot system employs Nginx on its web servers, which requires memory coupled to the one or more processors and configured to provide the one or more processors with instructions. Home Depot's website information confirms the Home Depot system's use of Nginx:

Site Info - Homedepot.com

Overview of web technologies used by Homedepot.com.

Website Background	
Description on Homepage	The Home Depot Shop online for all your home improvement needs: appliances, bathroom decorating ideas, kitchen remodeling, patio furniture, power tools, bbq grills, carpeting, lumber, concrete, lighting, ceiling fans and more at The Home Depot.
Popularity rank	Top 1k among all websites
Content Management System	
Drupal 9 1% of sites use a newer version used on a subdomain	Drupal is an open source content management system written in PHP, originally developed by Dries Buytaert.
Server-side Programming Language	
PHP used on a subdomain	PHP is a scripting language for creating websites.
Client-side Programming Language	
JavaScript	JavaScript is a lightweight, object-oriented, cross-platform scripting language, often used within web pages.
JavaScript Libraries	
jQuery	jQuery is a JavaScript library that simplifies HTML document traversing, event handling, animating and Ajax interaction. Originally developed by John Resig.
React	React is an open source JavaScript library for building user interfaces, developed by Facebook.
~~Angular~~ used until recently	Angular is a JavaScript library for building web applications, developed by Google.
Web Server	
Nginx	Nginx (pronounced as "engine X") is a lightweight open source web server developed by Igor Sysoev.

Site Info – Homedepot.com, W3Techs, https://w3techs.com/sites/info/homedepot.com (last accessed September 11, 2023).

COUNT II

(Home Depot's Infringement of U.S. Patent No. 11,562,402)

75. RavenWhite incorporates by reference and re-alleges the foregoing paragraphs as fully set forth herein.

76. Retail Media+ is an advertising platform and service provided by Home Depot. Home Depot has infringed and continues to infringe the '402 Patent through its operation of Retail Media+.

77. Claim 19 of the ’402 Patent, for example, reads as follows:

A computer program product embodied in a non-transitory computer readable storage medium and comprising computer instructions for:

determining a first quality level associated with a user profile, wherein the first quality level is based at least in part on an estimate of a likelihood of an event, wherein the first quality level is determined based at least in part on at least one of: (1) a first search associated with the user profile or (2) a first purchase associated with the user profile, and wherein the determining of the first quality level is based at least in part on a unique identifier and clustering;

determining, for a user associated with the user profile, an indication of interest in a first category, wherein the indication of interest in the first category is determined based at least in part on at least one of: (1) a second search associated with the user profile or (2) a second purchase associated with the user profile;

storing, in a record associated with the user, the indication of interest in the first category;

subsequent to determining the indication of interest in the first category, determining, for the user, that a need relative to the first category has been met based at least in part on at least one of: (1) a third search associated with the user profile or (2) a third purchase associated with the user profile;

based at least in part on the determination that the need relative to the first category has been met, determining an indication of interest in a second category, wherein the indication of interest in the first category and the indication of interest in the second category comprise a sequence of related indications of interest;

in response to determining that the need relative to the first category has been met, determining a second quality level associated with the user, wherein the second quality level is determined with respect to the first category;

wherein at least one of the first quality level or the second quality level is based at least in part on a conversion assessment associated with the user profile, and wherein the conversion assessment is based at least in part on historical click behavior; and

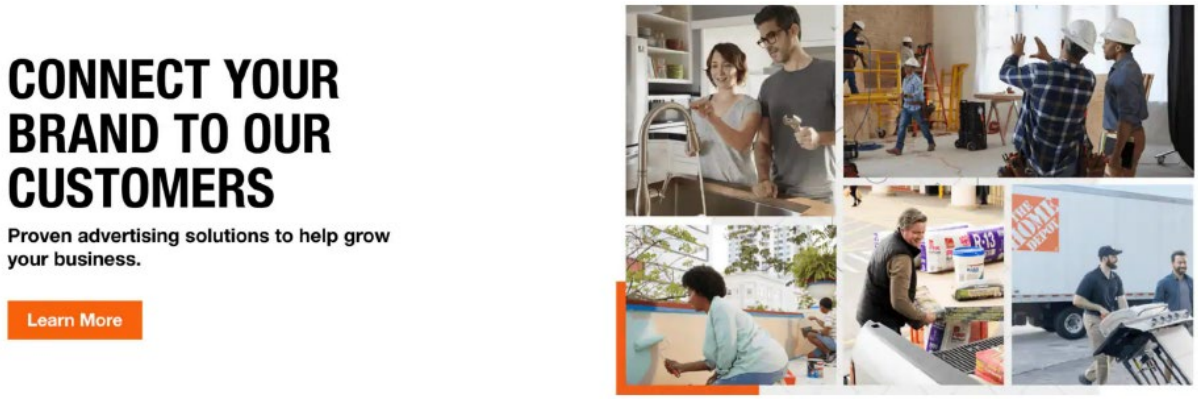
displaying an advertisement to the user based at least in part on at least one of the first quality level or the second quality level.

’402 Patent, 20:3-49 (claim 19).

78. Home Depot has directly infringed, and continues to directly infringe, one or more claims of the ’402 Patent, including at least claims 1 and 19 of the ’402 Patent, literally and/or

under the doctrine of equivalents, by or through making, using, offering for sale, selling within the United States and/or importing Retail Media+. The following paragraphs demonstrate how Home Depot performs each of the steps of claim 1 of the ’402 Patent and makes, uses and/or sells a computer program product embodied in a computer readable storage medium that includes instructions that perform each of the limitations of claim 19 of the ’402 Patent with Retail Media+.

79. Home Depot operates a method using its Retail Media+ advertising and media network solution. Home Depot advertises that Retail Media+ allows advertisers to “connect your brand to our customers”:



. . .

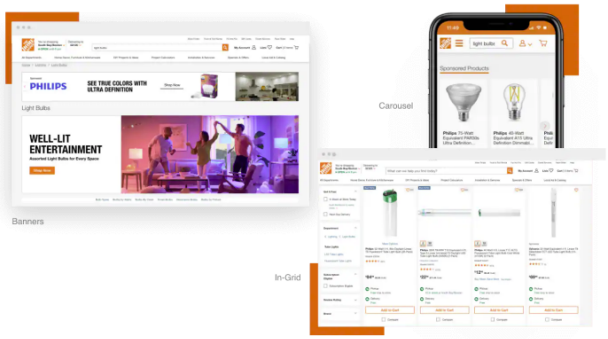
Reach

Advertising with The Home Depot means reaching our 198M individual customers online and in our 2,322 stores. Our website attracts 3.6 billion visits each year. Retail Media+ allows you to connect your brand to our customers.

Retail Media+, https://www.homedepot.com/c/Retail_Media_Advertising_Solutions (last accessed September 11, 2023) (hereinafter, “Retail Media+”).

80. Home Depot offers ad placements “on The Home Depot owned channels, including placements in-grid and in carousel for sponsored products, top of page banners, and customized email sends”:

Onsite Advertising Ad Units Get Started



Reach customers through ads on The Home Depot owned channels, including placements in-grid and in carousel for sponsored products, top of page banners and customized email sends.

Users spent 10% more time on homedepot.com when engaged with Retail Media+ products

Users were 26% more likely to convert when engaged with Retail Media+ products

Users spent 28% more $ per visit when engaged with Retail Media+ products

Retail Media+, https://www.homedepot.com/c/Retail_Media_Advertising_Solutions.

81. Home Depot describes that Retail Media+ "tracks customer interest via our website":

About Retail Media+

The Home Depot Retail Media network offers businesses like yours the opportunity to connect with consumers like never before. Regardless of your budget, we have a solution to meet your marketing needs. Choose one of our advertising offerings or mix and match to find what is right for your company and your specific products. The Home Depot advertising department leverages a myriad of online and offline channels to spread awareness of your brand and promote your products. From email advertising to social media branded marketing, these solutions are designed to propel your business and help increase sales. The Home Depot's advertising center tracks customer interest via our website, enabling us to promote your brand through retargeted ads and other off-site channels to keep your products top of mind. Retail advertising is key to setting yourself apart from competitors in an ever-changing market.

EXPAND YOUR REACH

Reach more customers using our ad center with The Home Depot Retail Media, which provides visibility for 198 million individual customers. Our advertising efforts aided in massive digital growth over the past few years, which benefits partners like you. Retail Media offers both self-service and custom capabilities to suit your advertising needs.

Creating an omni-channel experience for customers to interact with your brand is the mission of Retail Media. You can grow your business by harnessing the power of The Home Depot advertising across multiple channels that are proven to engage potential customers. A few examples of successful branded marketing tactics include email, onsite and offsite advertising. Looking to maximize your campaigns? You can do it all.

Retail Media+, https://www.homedepot.com/c/Retail_Media_Advertising_Solutions.

82. In interviews, Home Depot describes that Retail Media+ operates "on-site," "off-site," and "offline":

> **AdExchanger: What inventory does The Home Depot have in the retail media platform?**
>
> MELANIE BABCOCK: The media comes in three buckets. We have, of course, our own properties, which could be either email, in-app or websites, which we refer to as "on-site." And we have an equally healthy business off-site, with media partners like Meta, Google and Pinterest, as well as programmatic partners. Third, we have in-store placements, which we call "offline."

James Hercher, *The Home Depot's Path To Becoming A Global Advertising Player*, AdExchanger (April 13, 2023), https://www.adexchanger.com/commerce/the-home-depots-path-to-becoming-a-global-advertising-player/.

83. Retail Media+ includes the Home Depot search engine:

> The audience segmentation work that Villagomez's team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot's retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right *vendor* for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects.

WIRED Brand Lab, *The Home Depot Doubles Down on Data Science*, Wired, https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ (last accessed September 11, 2023) (hereinafter, "WIRED Article").

84. Third parties recognize the benefit of Retail Media+. For example, psfk.com writes that Home Depot uses Retail Media+ to "drive products that are mutually beneficial to Home Depot and its shoppers":

> Retail Media+ from the Home Depot is a full-service advertising and media network solution to help the brand's third-party vendors drive sales and promote products that are mutually beneficial to Home Depot and its shoppers.

Home Depot Turns Ecosystem Touchpoints Into Vendor Media Network, PSFK, (June 19, 2022), https://www.psfk.com/2022/06/home-depot-turns-ecosystem-touchpoints-into-vendor-media-net-

work.html.

85. Similarly, moloco.com notes that Retail Media+ offers a "robust range of sponsored content promotions," including through searches:

Home Depot Retail Media+

Home Depot offers a robust range of sponsored content promotions under "Retail Media+" — a program that supports onsite and offsite ad placements. Any advertiser looking to promote a new product will have access to three kinds of onsite sponsorships:

- **Search grid:** Traditional sponsored result listings that align with relevant keywords.
- **Carousel:** A display wheel of sponsored products that relate to customer searches.
- **Banner:** A top-of-page ad placement that uses imagery to stand out from search results.

Home Depot also helps advertisers supplement their sponsored content with offsite placements and retargeting options. For example, if a customer views a product during a search, brands can deploy follow-up ads for the item to associated social media feeds and email addresses. This grants advertisers a larger perspective of the buyer's journey, helping advertisers optimize their efforts beyond sponsored promotions and keywords.

What are sponsored results & how do they work?, Moloco, (December 3, 2021), https://www.moloco.com/blog/sponsored-results.

86. Home Depot determines a first quality level associated with a user profile, wherein the first quality level is based at least in part on an estimate of a likelihood of an event, wherein the first quality level is determined based at least in part on at least one of: (1) a first search associated with the user profile or (2) a first purchase associated with the user profile, and wherein the determining of the first quality level is based at least in part on a unique identifier and clustering. Home Depot determines a first quality level, such as, for example, the likelihood of a user's interaction with a recommendation. Home Depot publishes the recommendation algorithms it uses on its data in, for example, the Association for Computing Machinery (ACM):

M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations

Walid Shalaby
walid_shalaby@homedepot.com
The Home Depot
Atlanta, Georgia, USA

Sejoon Oh
soh337@gatech.edu
Georgia Institute of Technology
Atlanta, Georgia, USA

Amir Afsharinejad
amir_afsharinejad@homedepot.com
The Home Depot
Atlanta, Georgia, USA

Srijan Kumar
srijan@gatech.edu
Georgia Institute of Technology
Atlanta, Georgia, USA

Xiquan Cui
xiquan_cui@homedepot.com
The Home Depot
Atlanta, Georgia, USA

Walid Shalaby, et al., *M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations*, in Proceedings of the 16th ACM Conference on Recommender Systems, 573-578 (2022), https://dl.acm.org/doi/pdf/10.1145/3523227.3551477, available at https://arxiv.org/pdf/2209.11824v1.pdf (hereinafter, "Shalaby et al. paper").

87. In the Shalaby paper, Home Depot bases the first quality level at least in part on an estimate of a likelihood of an event, such as a "click" or an "add-to-cart" event:

> Session-based recommender systems (SBRSs) accurately model sequential and evolving preferences of users from their session data (e.g., clicks and add-to-cart events). Session data can be associated with item metadata, allowing SBRSs to capture item dependencies at the attribute level within the session. However, most of the existing SBRSs take the IDs of users and items as the main input source to learn session contexts and produce next item recommendations [13, 14, 40]. Recent hybrid models demonstrated improved performance when combining item embeddings and their attributes to be used as additional side information [5, 10, 27, 31, 32, 32, 38].

Shalaby et al. paper at 573.

88. In the Shalaby paper, Home Depot also describes that its objective is to "maximize the prediction probability of the next item the user is most likely to interact with":

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, ..., I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, ..., A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9,

Shalaby et al. paper at 574.

89. Home Depot bases the first quality level at least in part on a first search associated with the user profile. For example, Retail Media+ uses a search as one input to provide a product (and vendor) to a customer.

> The audience segmentation work that Villagomez's team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot's retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right *vendor* for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects.

WIRED Article, https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/.

90. Home Depot also advertises that it uses "past searches" when populating search results.

> **Personalization: The Next Frontier**
>
> In addition to building accurate, lightning-fast search results, we're also creating a personalized search experience for customers. Our technology team has built our online channels to consider location, past searches, personalized deal and guide recommendations when populating search results.

The Home Depot Introduces Improved Search For All, Home Depot, (April 19, 2022), https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all (hereinafter, "Improved Search Article").

Home Depot also uses search history ("including past searches") through its "vector search engine".

> The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings.
>
> "I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge," Qu says. "We've really removed the friction of asking the customer to specify 'I need this five-foot downrod outdoor ceiling fan specifically.'"

Alex Woodie, *Home Depot Finds DIY Success with Vector Search*, Datanami (March 15, 2022), https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/ (hereinafter, "Datanami Article").

91. Home Depot also advertises that it uses "ongoing search data" when showing results to customers:

Intent Search: A Smarter Platform Delivering Smarter Results

Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar.

That's why our team focuses on the *intent* of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time.

Improved Search Article, https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all.

92. Home Depot bases the first quality level at least in part on a first purchase associated with the user profile. For example, Home Depot describes that they collect information when a customer "[makes] an online purchase":

How Do We Collect Information?

There are 3 ways we collect your information:

We collect information directly from you. You provide us with your information when you visit our stores, register for an account, make an online purchase, or rent equipment.

We collect information from you passively. We use tools like cookies to collect information when you use our websites or interact with our emails.

We collect information from affiliates and third parties. This includes shipping companies, installers, service providers, social media platforms, and more.

Privacy & Security at a Glance, Home Depot, https://www.homedepot.com/privacy/privacy-and-security-at-a-glance (last accessed December 6, 2023) (hereinafter, "Privacy & Security at a Glance").

93. Home Depot uses this collected purchase information to, among other things, "recommend[] products":

How Do We Use Information?

We use your information to improve your experience, process your information, and keep things running smoothly.

We provide you with products, including order fulfillment, contest or sweepstakes entries, registration, returns, and product reviews.

We improve our business, products, and services, including optimizing our websites and apps and improving store layouts and purchasing experiences.

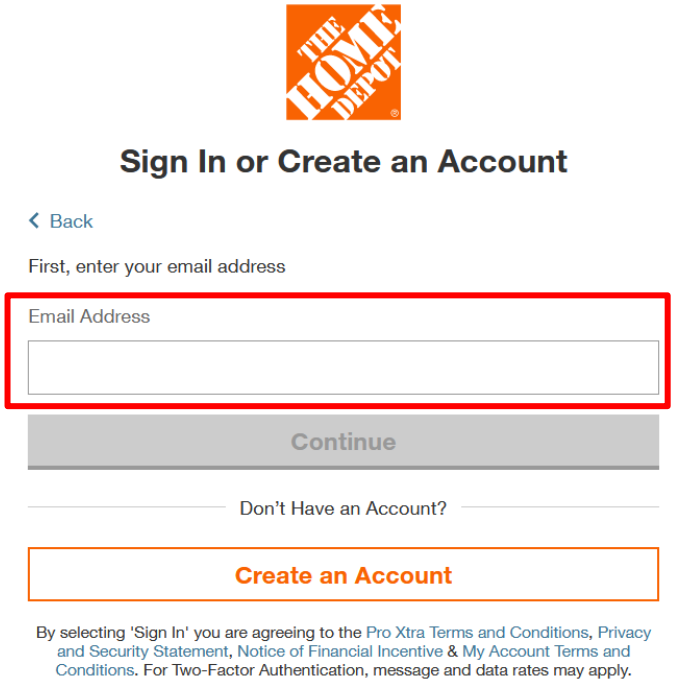
We personalize your experience, including recommending products and updating inventory to match demand.

We monitor for fraud and asset protection purposes, including processing and tracking returns and confirming the identity of customers renting tools and equipment.

We advertise to you, including supporting targeted advertising for select third parties and sending you promotions, newsletters, and information from other select companies we think you might find interesting.

Privacy & Security at a Glance, https://www.homedepot.com/privacy/privacy-and-security-at-a-glance.

94. Home Depot bases the first quality level at least in part on a unique identifier. For example, Home Depot associates unique identifiers with users, as evidenced by their login identifier, such as an email address or other identifying information:



Sign In or Create an Account, Home Depot, https://www.homedepot.com/auth/view/signin (last accessed September 11, 2023).

95. After a user inputs their email address and password, web traffic shows that the user is associated with both an "svocCustomerAccountId" and a "userId," as shown from the screenshots below of the traffic capture of a user ID token used to identify a user on the Home Depot website after login:

THD_USER	"eyJjdXN0b21lclR5cG…	.homedepot.com

Decoded EDIT THE PAYLOAD AND SECRET

HEADER: ALGORITHM & TOKEN TYPE


```
{
  "customerType": "B2C",
  "svocCustomerAccountId":
"0514A[redacted],
  "logonId": "j[redacted].com",
  "userId": "0514A[redacted]
}
```


96. As another example, Home Depot discloses that it uses a unique identifier to identify users in its privacy policy:

The tracking tools we use include:

Browser and flash cookies, which send text files to your computer or device to identify your browser or store information and settings.

Server logs, which record information about your device, browser, or operating system.

Web beacons and pixels, which collect information about how you interact with content.

Application software, which collects information about how you interact with our apps.

We use these tools to:

Identify new users and recognize returning customers

Understand how you accessed our digital services and keep you logged in

Personalize your experience

Identify your location

Optimize our websites and apps

Make product recommendations and provide advertising content

Better understand our audiences and customers

Provide correct pricing and ads for your local store

Privacy & Security at a Glance, https://www.homedepot.com/privacy/privacy-and-security-at-a-glance.

97. Home Depot bases the first quality level at least in part on a unique identifier and clustering. Home Depot has developed techniques such as session-based recommender systems to estimate the likelihood of an event such as a product click by recommending the most relevant item based on a user's unique ID.

> Session-based recommender systems (SBRSs) accurately model sequential and evolving preferences of users from their session data (e.g., clicks and add-to-cart events). Session data can be associated with item metadata, allowing SBRSs to capture item dependencies at the attribute level within the session. However, most of the existing SBRSs take the IDs of users and items as the main input source to learn session contexts and produce next item recommendations [13, 14, 40]. Recent hybrid models demonstrated improved performance when combining item embeddings and their attributes to be used as additional side information [5, 10, 27, 31, 32, 32, 38].

Shalaby et al. paper at 573.

98. Home Depot determines, for a user associated with the user profile, an indication of interest in a first category, wherein the indication of interest in the first category is determined based at least in part on at least one of: (1) a second search associated with the user profile or (2) a second purchase associated with the user profile. For example, Home Depot's session-based search recommendation algorithm determines customer intent (interest) in a category based on at least in part a previous search (a second search associated with the user profile) and purchase history (a second purchase associated with the user profile), among other things:

> **3 METHODOLOGY**
>
> **Next Item Prediction:** We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \ldots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \ldots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:
>
> $$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$
>
> where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9,

Shalaby et al. paper at 574.

99. For example, Home Depot determines customer intent based on at least in part past user searches to provide search results:

> The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings.
>
> "I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge," Qu says. "We've really removed the friction of asking the customer to specify 'I need this five-foot downrod outdoor ceiling fan specifically.'"

Datanami Article, https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/.

100. Home Depot also determines customer intent based on at least in part past purchases:

> **How Do We Collect Information?**
>
> There are 3 ways we collect your information:
>
> **We collect information directly from you.** You provide us with your information when you visit our stores, register for an account, make an online purchase, or rent equipment.
>
> **We collect information from you passively.** We use tools like cookies to collect information when you use our websites or interact with our emails.
>
> **We collect information from affiliates and third parties.** This includes shipping companies, installers, service providers, social media platforms, and more.

. . .

How Do We Use Information?

We use your information to improve your experience, process your information, and keep things running smoothly.

We provide you with products, including order fulfillment, contest or sweepstakes entries, registration, returns, and product reviews.

We improve our business, products, and services, including optimizing our websites and apps and improving store layouts and purchasing experiences.

We personalize your experience, including recommending products and updating inventory to match demand.

We monitor for fraud and asset protection purposes, including processing and tracking returns and confirming the identity of customers renting tools and equipment.

We advertise to you, including supporting targeted advertising for select third parties and sending you promotions, newsletters, and information from other select companies we think you might find interesting.

Privacy & Security at a Glance, https://www.homedepot.com/privacy/privacy-and-security-at-a-glance. This is shown for example by the type of information that Home Depot collects, evidenced by the Home Depot Privacy & Security Statement:

Internet Activity

What Information Does This Include?

Browsing history, search history, information about your interaction with our websites, applications, electronic communications, or advertisements, and information about your activities when using our in-store WiFi. Session replay software may be used to record and replay your interaction.

Where Do We Collect It From?

- Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices.
- Marketing companies that help us learn about our customers and the devices they use to access digital content.
- Companies that supplement our customer records with additional information.
- Social media platforms.
- Advertising companies and content publishers that present you with our ads.

Why Do We Collect and Disclose It?

- Fulfilling orders and processing returns.
- Customer care.
- Communicating with you.
- Administering contests and promotions.
- Improving our products and services, including improving store layouts and digital content.
- Learning about customer trends and interests.
- Personalizing digital content.
- Delivering marketing communications and advertising.
- Identifying the devices you use to access digital content.
- Fraud prevention, security, and asset protection.

. . .

Commercial Information

What Information Does This Include?

Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop.

Where Do We Collect It From?

- Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices.
- Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services.
- Companies that provide services on our behalf (e.g., installers).
- Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you.
- Marketing companies that help us learn about our customers and the devices they use to access digital content.
- Companies that supplement our customer records with additional information.

Why Do We Collect and Disclose It?

- Fulfilling orders and processing returns.
- Customer care.
- Administering contests and promotions.
- Registering you for a website or program.
- Communicating with you.
- Improving our products and services, including improving store layouts and digital content.
- Learning about customer trends and interests.
- Personalizing digital content.
- Delivering marketing communications and advertising.
- Identifying the devices you use to access digital content.
- Fraud prevention, security, and asset protection.

Home Depot Privacy & Security Statement, https://www.homedepot.com/privacy/privacy-and-security-statement.

101. Home Depot stores, in a record associated with the user, the indication of interest in the first category. For example, Home Depot saves indications of interest in a first category through the user's browsing history, search history, interaction with Home Depot's website, purchase history, liked products, and reviews:

Internet Activity

What Information Does This Include?

Browsing history, search history, information about your interaction with our websites, applications, electronic communications, or advertisements, and information about your activities when using our in-store WiFi. Session replay software may be used to record and replay your interaction.

Where Do We Collect It From?

- Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices.
- Marketing companies that help us learn about our customers and the devices they use to access digital content.
- Companies that supplement our customer records with additional information.
- Social media platforms.
- Advertising companies and content publishers that present you with our ads.

Why Do We Collect and Disclose It?

- Fulfilling orders and processing returns.
- Customer care.
- Communicating with you.
- Administering contests and promotions.
- Improving our products and services, including improving store layouts and digital content.
- Learning about customer trends and interests.
- Personalizing digital content.
- Delivering marketing communications and advertising.
- Identifying the devices you use to access digital content.
- Fraud prevention, security, and asset protection.

. . .

Commercial Information

What Information Does This Include?

Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop.

Where Do We Collect It From?

- Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices.
- Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services.
- Companies that provide services on our behalf (e.g., installers).
- Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you.
- Marketing companies that help us learn about our customers and the devices they use to access digital content.
- Companies that supplement our customer records with additional information.

Why Do We Collect and Disclose It?

- Fulfilling orders and processing returns.
- Customer care.
- Administering contests and promotions.
- Registering you for a website or program.
- Communicating with you.
- Improving our products and services, including improving store layouts and digital content.
- Learning about customer trends and interests.
- Personalizing digital content.
- Delivering marketing communications and advertising.
- Identifying the devices you use to access digital content.
- Fraud prevention, security, and asset protection.

Home Depot Privacy & Security Statement, https://www.homedepot.com/privacy/privacy-and-security-statement.

102. Home Depot uses this indication of interest in a category ("the history of what we know about a customer") to store, for example, a user's interest in outdoor ceiling fans.

> The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings.
>
> "I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge," Qu says. "We've really removed the friction of asking the customer to specify 'I need this five-foot downrod outdoor ceiling fan specifically.'"

Datanami Article, https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/.

103. Home Depot describes a user's indication of interest, for example, as a user's "intent":

> **Intent Search: A Smarter Platform Delivering Smarter Results**
>
> Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar.
>
> That's why our team focuses on the *intent* of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time.

Improved Search Article, https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all.

104. The indication of interest from the sequence of items a user interacted with is also stored:

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, ..., I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, ..., A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9,

Shalaby et al. paper at 574.

105. Home Depot, subsequent to determining the indication of interest in the first category, determines, for the user, that a need relative to the first category has been met based at least in part on at least one of: (1) a third search associated with the user profile or (2) a third purchase associated with the user profile. Home Depot determines whether a need relative to the first category has been met as part of optimizing search and ad results taking into customer intent including search queries and purchase history. Home Depot uses sequences of events including search history in the determination:

Intent Search: A Smarter Platform Delivering Smarter Results

Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar.

That's why our team focuses on the *intent* of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time.

. . .

Personalization: The Next Frontier

In addition to building accurate, lightning-fast search results, we're also creating a personalized search experience for customers. Our technology team has built our online channels to consider location, past searches, personalized deal and guide recommendations when populating search results.

This is especially helpful for customers in specific trade professions, such as an electrician searching for "pliers," which the app will properly search for as "electrician's pliers."

Improved Search Article, https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all.

106. Home Depot also uses a user's purchase history to determine whether their need relative to the first category has been met:

Commercial Information

What Information Does This Include?

Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop.

Where Do We Collect It From?

- Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices.
- Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services.
- Companies that provide services on our behalf (e.g., installers).
- Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you.
- Marketing companies that help us learn about our customers and the devices they use to access digital content.
- Companies that supplement our customer records with additional information.

Why Do We Collect and Disclose It?

- Fulfilling orders and processing returns.
- Customer care.
- Administering contests and promotions.
- Registering you for a website or program.
- Communicating with you.
- Improving our products and services, including improving store layouts and digital content.
- Learning about customer trends and interests.
- Personalizing digital content.
- Delivering marketing communications and advertising.
- Identifying the devices you use to access digital content.
- Fraud prevention, security, and asset protection.

Home Depot Privacy & Security Statement, https://www.homedepot.com/privacy/privacy-and-security-statement.

107. In populating search results, Home Depot's search engine recognizes that a shopper has a need for a next product and recommends that product to them:

> The audience segmentation work that Villagomez's team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot's retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right *vendor* for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects.

WIRED Article, https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/.

108. As another example, Home Depot looks at whether the user's need has been met from their interaction history and recommends an item to the user based on whether that need has been met:

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \ldots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \ldots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9,

Shalaby et al. paper at 574.

109. Home Depot, based at least in part on the determination that the need relative to the first category has been met, determines an indication of interest in a second category, wherein the indication of interest in the first category and the indication of interest in the second category comprise a sequence of related indications of interest. For example, Home Depot determines an indication of interest in a second category using a set of search queries. For example, if a need for a patio item has been met (past searches), the interest in a second category of five-foot downrod outdoor ceiling fans will be related:

With terabytes of historic data to work with, Qu's vector search engine is able to discover hidden connections among products, such as sloped ceilings, ceiling fans, and downrods. So when a would-be customer who needs to pair their ceiling fan purchase with a downrod of a certain type and length executes their search, the engine will return more relevant results.

. . .

The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings.

"I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge," Qu says. "We've really removed the friction of asking the customer to specify 'I need this five-foot downrod outdoor ceiling fan specifically.'"

Datanami Article, https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/.

110. As another example, the Shalaby paper shows that Home Depot attempts to maximize the probability of the user's next interaction in a session, which would necessarily be based on a prior item's needs being met. The interest in the first and second categories will be related by, for example, a probability formula such as formula (1) shown below:

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, ..., I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, ..., A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9,

Shalaby et al. paper at 574.

111. Home Depot, in response to determining that the need relative to the first category has been met, determines a second quality level associated with the user, wherein the second quality level is determined with respect to the first category. For example, Home Depot determines a second quality level associated with the user considering a need relative to a first category has been met using determined customer intent, which includes product category and purchase history. This is used to determine a second quality level to respond to further searches to present "the right product for the right customer at the right time, . . . right when they need it":

> The audience segmentation work that Villagomez's team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot's retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right *vendor* for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects.

WIRED Article, https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/.

> **Intent Search: A Smarter Platform Delivering Smarter Results**
>
> Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar.
>
> That's why our team focuses on the *intent* of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time.
>
> . . .
>
> **Personalization: The Next Frontier**
>
> In addition to building accurate, lightning-fast search results, we're also creating a personalized search experience for customers. Our technology team has built our online channels to consider location, past searches, personalized deal and guide recommendations when populating search results.
>
> This is especially helpful for customers in specific trade professions, such as an electrician searching for "pliers," which the app will properly search for as "electrician's pliers."

Improved Search Article, https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all. The determination of a second quality level is also described in the Datanami article, which provides an example of prioritizing products associated with prior searches:

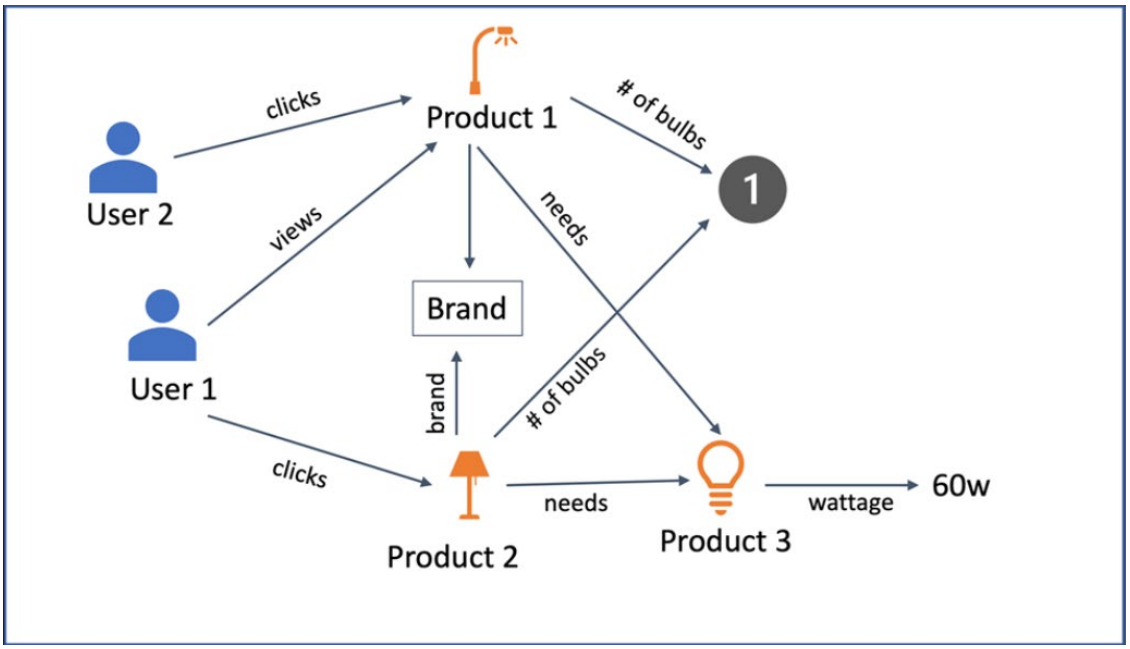
> The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings.
>
> "I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge," Qu says. "We've really removed the friction of asking the customer to specify 'I need this five-foot downrod outdoor ceiling fan specifically.'"

Datanami Article, https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/. Likewise, the Shalaby paper describes how the prediction of future items is based on item attributes from prior sessions:

> **3 METHODOLOGY**
>
> **Next Item Prediction:** We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \ldots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \ldots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:
>
> $$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$
>
> where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9,

Shalaby et al. paper at 574.

112. As another example, Home Depot may recommend a lightbulb to a user if their need for a lamp has been met:



We can observe that the interactions between users, products and their attributes are easier to visualize when represented as a 3-dimensional graph. It becomes intuitive to recommend Product 3 to User1 and User 2 even though both users have not interacted with Product 3, since the relationship between Product 1, Product 2 and Product 3 becomes more easily discoverable through this graph.

Janani Balaji, Data Science Manager, The Home Depot, *Knowledge Graphs in E-Commerce*, Data Science Salon, https://roundtable.datascience.salon/knowledge-graphs-in-e-commerce (hereinafter, "Janani Balaji Article") (last accessed September 11, 2023).

113. Home Depot bases at least one of the first quality level or the second quality level at least in part on a conversion assessment associated with the user profile, and wherein the conversion assessment is based at least in part on historical click behavior. For example, Home Depot's quality levels are based at least in part on a conversion assessment associated with the user profile, which is based at least in part on historical click behavior. For example, Shalaby explains that Home Depot tracks "the items a user interacted within that session." In order to

maximize the probability of interacting with the next item (a conversion assessment).

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, ..., I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, ..., A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9,

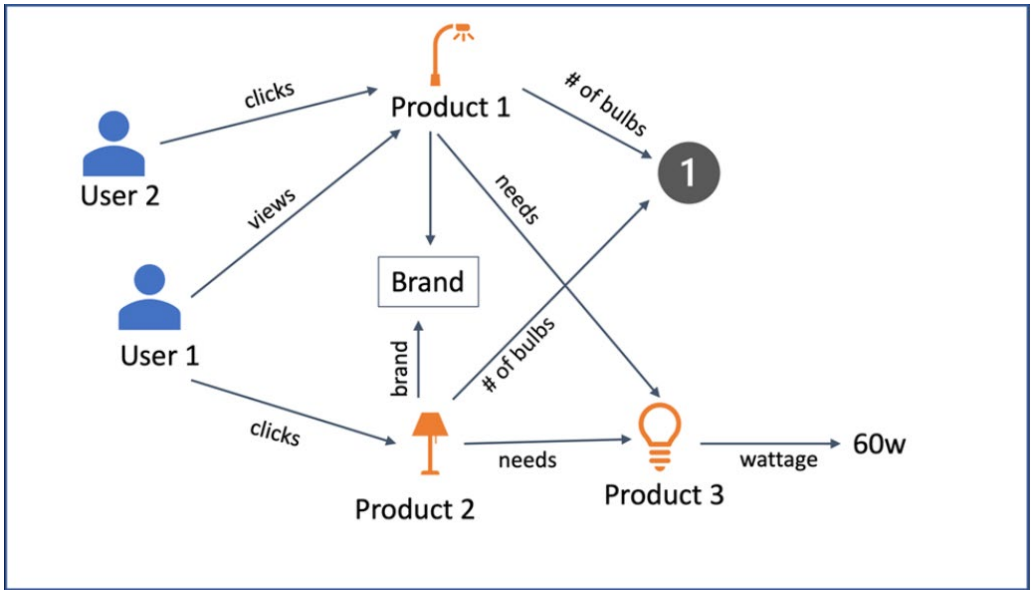
Shalaby et al. paper at 574.

114. The M2TRec algorithm in Shalaby is compared against two common algorithms which recommend the user's most frequent past sessions' categories and the top items based on all metadata.

Predicting next item's category: One of the main objectives of this research is to develop a scalable architecture that serves both item and category recommendations in one model using an efficient MTL regime. We found significant performance gains when jointly training our model to predict next item and its categories at different levels of the catalog taxonomy (see ablation study below). We demonstrate the efficacy of training our SBRS to predict next category over deriving it from session items by comparing the category prediction performance against two heuristics: (1) ***Personalized top-N Frequent:*** This simple heuristic uses past session items' categories and recommends the most frequent ones, and (2) ***Top-N Predicted:*** This simple strategy works by first predicting top-N next items from a metadata-aware single task model called MeTRec (see ablation study below), and then uses their categories as recommendations such that the category of the top-ranked next item will be ranked first and so on.

Shalaby et al. paper at 576 (emphasis in original).

115. As another example, Home Depot may recommend a lightbulb to a user if their need for a lamp has been met, which is explicitly based on a user's prior clicks.



We can observe that the interactions between users, products and their attributes are easier to visualize when represented as a 3-dimensional graph. It becomes intuitive to recommend Product 3 to User1 and User 2 even though both users have not interacted with Product 3, since the relationship between Product 1, Product 2 and Product 3 becomes more easily discoverable through this graph.

Janani Balaji Article, https://roundtable.datascience.salon/knowledge-graphs-in-e-commerce.

116. Home Depot's privacy policy confirms that it saves users' interaction with Home Depot's website:

Internet Activity

What Information Does This Include?

Browsing history, search history, information about your interaction with our websites, applications, electronic communications, or advertisements, and information about your activities when using our in-store WiFi. Session replay software may be used to record and replay your interaction.

Where Do We Collect It From?

- Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices.
- Marketing companies that help us learn about our customers and the devices they use to access digital content.
- Companies that supplement our customer records with additional information.
- Social media platforms.
- Advertising companies and content publishers that present you with our ads.

Why Do We Collect and Disclose It?

- Fulfilling orders and processing returns.
- Customer care.
- Communicating with you.
- Administering contests and promotions.
- Improving our products and services, including improving store layouts and digital content.
- Learning about customer trends and interests.
- Personalizing digital content.
- Delivering marketing communications and advertising.
- Identifying the devices you use to access digital content.
- Fraud prevention, security, and asset protection.

Home Depot Privacy & Security Statement, https://www.homedepot.com/privacy/privacy-and-security-statement.

117. Home Depot also uses Google Cloud to analyze its clickstream data:

> While THD's legacy data warehouse contained 450 terabytes of data, the BigQuery enterprise data warehouse has over 15 petabytes. That means better decision-making by utilizing new datasets like website clickstream data and by analyzing additional years of data.

The Home Depot: Helping Doers Get More Done Through a Data-Driven Approach, Google Cloud, https://cloud.google.com/customers/the-home-depot. (last accessed September 11, 2023).

118. Home Depot advertises that its conversion numbers are improved by Retail Media+, including through placements "in-grid" (search) and "in carousel":

Reach customers through ads on The Home Depot owned channels, including placements in-grid and in carousel for sponsored products, top of page banners and customized email sends.

Users spent 10% more time on homedepot.com when engaged with Retail Media+ products

Users were 26% more likely to convert when engaged with Retail Media+ products

Users spent 28% more $ per visit when engaged with Retail Media+ products

Retail Media+, https://www.homedepot.com/c/Retail_Media_Advertising_Solutions.

119. Home Depot displays an advertisement to the user based at least in part on at least one of the first quality level or the second quality level. For example, Home Depot displays advertisements to users through its Retail Media+ system, including through placements "in-grid" (search) and "in carousel":

Reach customers through ads on The Home Depot owned channels, including placements in-grid and in carousel for sponsored products, top of page banners and customized email sends.

Users spent 10% more time on homedepot.com when engaged with Retail Media+ products

Users were 26% more likely to convert when engaged with Retail Media+ products

Users spent 28% more $ per visit when engaged with Retail Media+ products

Retail Media+, https://www.homedepot.com/c/Retail_Media_Advertising_Solutions.

120. Retail Media+ includes the Home Depot search engine:

> The audience segmentation work that Villagomez's team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot's retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right *vendor* for that product. Take a kitchen remodel, for example: the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects.

WIRED Article, https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/.

121. As described above, a user's first and second quality level are based on user behavior including search and interaction history:

> **Intent Search: A Smarter Platform Delivering Smarter Results**
>
> Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar.
>
> That's why our team focuses on the *intent* of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time.

Improved Search Article, https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all.

122. For example, Shalaby explains that Home Depot tracks "the items a user interacted within that session." In order to maximize the probability of interacting with the next item (a conversion assessment):

> **3 METHODOLOGY**
>
> **Next Item Prediction:** We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \ldots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \ldots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:
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> $$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$
>
> where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9,

Shalaby et al. paper at 574.

123. As described above, Home Depot determines a first or second quality level in order to present "the right product for the right customer at the right time," "when they need it":

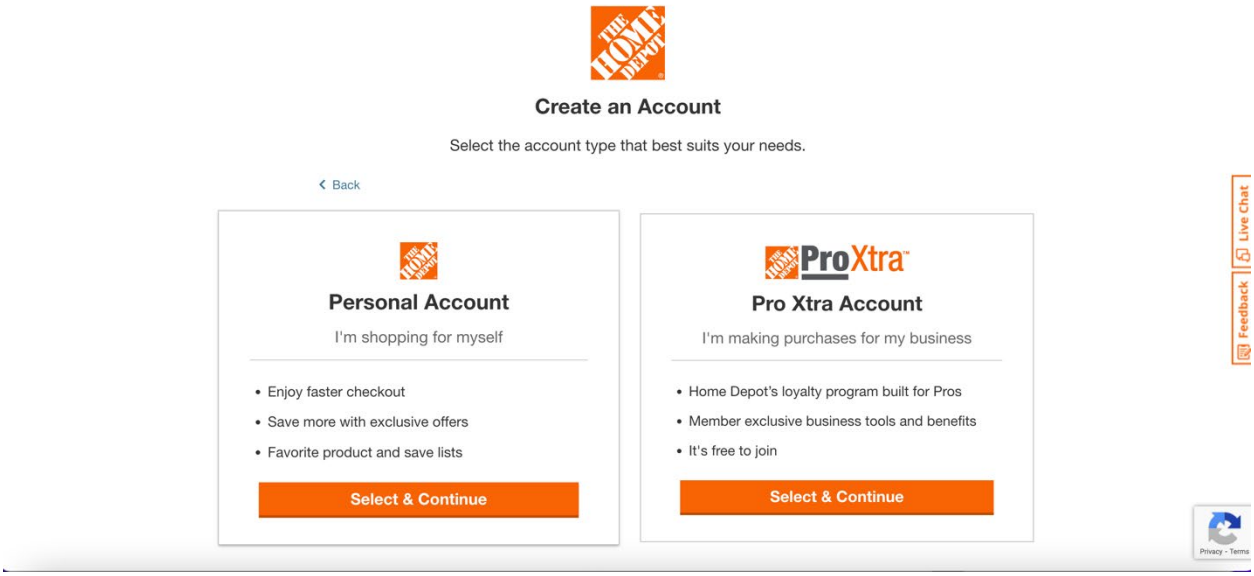
> The audience segmentation work that Villagomez's team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot's retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right *vendor* for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects.

WIRED Article, https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/.

124. Upon information and belief, Home Depot has indirectly infringed and continues to indirectly infringe at least claims 1 and 19 of the '402 Patent in violation of 35 U.S.C. §271(b). From at least the time Home Depot received notice of the '402 Patent, Home Depot has induced others to infringe at least claims 1 and 19 of the '402 Patent under 35 U.S.C. §271(b) by, among other things, and with specific intent or willful blindness, actively aiding and abetting others to infringe, including but not limited to Home Depot's clients, customers, and end users, whose use of Home Depot's website and mobile app constitutes direct infringement of at least claims 1 and 19 of the '402 Patent in this District. Home Depot's clients, customers, and end users put the Home Depot system, including the computer program for implementing Retail Media+, into service, i.e., control the computer program and obtain benefits from it. These benefits include the targeted search results that the clients, customers, and end users obtain when they control the Home Depot system by logging into their accounts and submitting search queries. By causing the Home Depot

system, including the computer program for implementing Retail Media+, to process the login and searches and by obtaining the benefits of the results, the clients, customers, and end users use the Home Depot system and directly infringe in this District under 35 U.S.C. § 271(a).

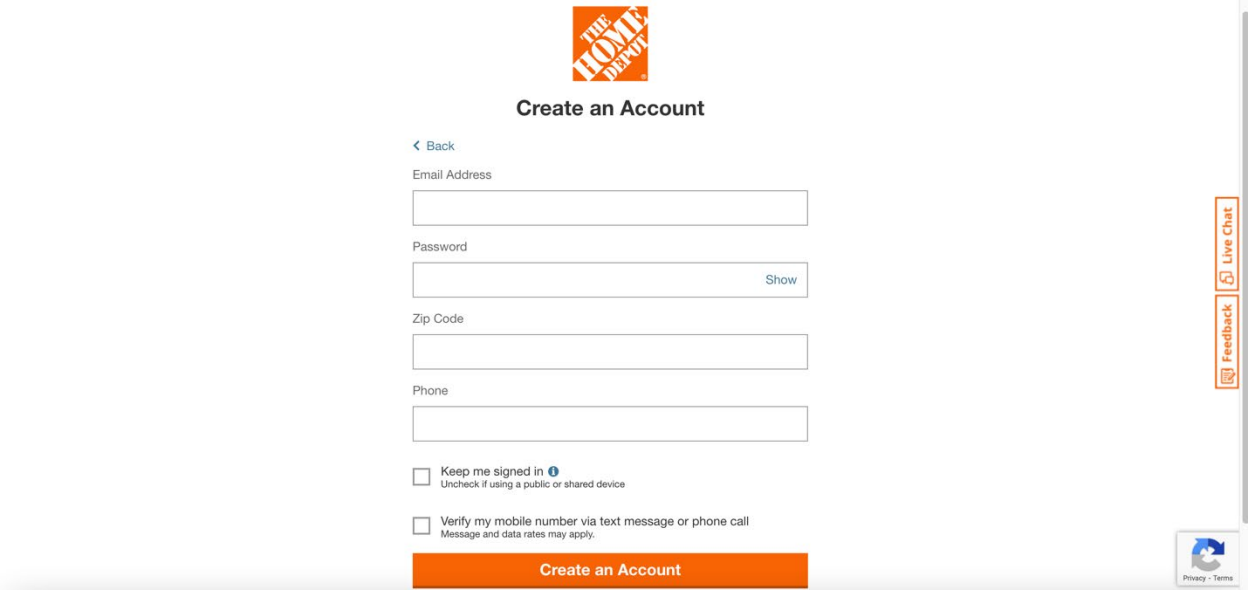
125. In particular, Home Depot's actions that aided and abetted others such as customers and end users to infringe include providing instruction, support training, and services, and actively inducing its customers to sign up for online accounts.



See, e.g., https://www.homedepot.com/auth/view/createaccount; *see also* https://www.homedepot.com/c/customer_service; *see also* https://corporate.homedepot.com/page/contact-us; *see also* https://www.homedepot.com/c/View_Pro_Directory; *see also* https://www.homedepot.com/c/pro_customer_support.

126. Home Depot does so knowing that its customers will commit these infringing acts. Despite its knowledge of the '402 Patent, Home Depot continues to make, use, sell, and/or offer for sale its infringing products thereby specifically intending for and inducing its customers to infringe the '402 Patent.

127. Home Depot supplies customers with a predetermined set of inquiries where customers and end users fill in information to create an account:



Create an Account, Home Depot, https://www.homedepot.com/auth/view/createaccount/diy.

PRAYER FOR RELIEF

WHEREFORE, RavenWhite requests the following relief from this Court:

(A) A judgment that each defendant is liable for infringement of one or more claims of the ’823 Patent and the ’402 Patent;

(B) Compensatory damages in an amount according to proof, and in any event no less than a reasonable royalty, including all pre-judgment and post-judgment interest at the maximum rate allowed by law; and

(C) A judgment granting RavenWhite such further relief as the Court may deem just and proper.

DEMAND FOR JURY TRIAL

Pursuant to Rule 38(b) of the Federal Rules of Civil Procedure, RavenWhite demands a trial by jury for all issues so triable.

Dated: August 21, 2024

/s/ *Andrea L. Fair*

Robert F. Kramer
CA Bar No. 181706 (Admitted E.D. Texas)
rkramer@krameralberi.com
David Alberti (Admitted E.D. Texas)
CA Bar No. 220265
dalberti@krameralberti.com
Sal Lim (Admitted E.D. Texas)
CA Bar No. 211836
slim@krameralberi.com
Russell S. Tonkovich
CA Bar No. 233280 (Admitted E.D. Texas)
rtonkovich@krameralberi.com
Robert C. Mattson (pro hac vice to be filed)
VA Bar No. 43586
rmattson@krameralberi.com
KRAMER ALBERTI LIM
& TONKOVICH & LLP
577 Airport Blvd., Ste 250
Burlingame, CA 94010
Telephone: 650 825-4300
Facsimile: 650 460-8443

Of Counsel:
Andrea L. Fair
Texas Bar No. 24078488
andrea@wsfirm.com
WARD, SMITH & HILL PLLC
1507 Bill Owens Pkwy
Longview, Texas 75604
Telephone: (903) 757-6400
Facsimile: (903) 757-2323

Attorneys for Plaintiff
Ravenwhite Licensing, LLC