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Last Seen

Location data is sold as ground truth. In the public record, visit counts are projected or carry no stated basis, visit lift mostly rests on matched comparisons, no visit metric holds accreditation, and three companies under FTC location orders still document precise or device-level offers.

Evgeny Popov · No Fluff Advisory

RESEARCH CUTOFF 24 OCTOBER 2026 · ONLY INFORMATION AVAILABLE BY THAT DATE IS USED

793	502	47
source records registered	claims in the research ledger	products scored

221
corrections logged

ABSTRACT

Abstract

What location advertising and location intelligence actually sell in 2026: where the data comes from, how a visit becomes a number, whether anyone checks it, whether lift is causal, what the law now forbids, and whether agents can buy by place. Research current to 24 October 2026, the date the status-sensitive facts were read, with the United States as the main market.

IN SHORT

Location data is sold as ground truth, and the public record does not back the description. Visit numbers are projections from panels whose size is not disclosed on a comparable basis, or carry no stated basis at all. Most visit-lift products compare exposed devices with a matched or modelled group, not a holdout. No independent comparison of any vendor's projected retail visits with door counts or transactions was found, and no visit metric holds MRC accreditation; both that MRC once accredited have lost it. The FTC's five location orders mostly bar sensitive locations, not precise location as such, and three of the five ordered companies still document precise or device-level offers. Five states now ban the sale of precise geolocation outright. Agent protocols can describe a place, but in the sources screened no location signal has a public interoperability test. On the Ground Quotient, independent assurance is the weakest dimension in every cohort.

WHAT A BUYER CAN DO WITH THIS

Treat a visit count as a projection and a visit lift as a correlation until the vendor shows otherwise: ask which kind of number it is, what the control was, whether anyone has compared the counts with the ground, where the observations come from, and whether the vendor is under an order. Chapter 12 turns this into eight questions. This paper audits what vendors document in public by the cutoff; it does not test whose numbers are accurate.

The question

Location is the oldest offline signal in digital advertising and the one with the most enforcement against it. The same panels feed store-visit attribution, location audiences, geofenced local buying, the US out-of-home audience currency and the foot-traffic dashboards investors read as fact. This paper asks what those products measure, where their data comes from, whether anyone has checked the numbers, whether their lift is causal, what the FTC orders and state laws changed, and whether agent-driven buying can carry location. The author's own writing calls footfall attribution "correlated and modeled by default" and DOOH outcome studies "a model on a model"; those positions were registered as rival hypotheses, not evidence.

How it was done

Seven hypotheses and four coded questions were registered with their decision rules on 24 October 2026, before any research began, alongside a product register and scoring rules with fixed anchors. AI research agents then ran 11 workstreams, a vendor-universe sweep and 8 company profiles. A separate AI verifier, told to refute, checked each file. In all, 793

source records were registered, almost all of them opened in full, and the ledger holds 502 claims, each traced to a source; 493 research claims were checked by a verifier or a review, and the rest are author syntheses (the hypothesis readings and the privacy-cap effect) plus one legal finding added in review, New Jersey's 2026 sale ban, which a separate check read in the enacted statute. Another AI model reviewed the evidence and the design twice before scoring, then the full paper, then the live edition; every factual point it raised was checked at its primary source or against the paper's own data before anything changed, and several of the reviewer's own assertions turned out to be wrong. The corrections ledger holds 221 entries. 47 products are scored on 11 dimensions in five cohorts, and every counted cell was re-checked by a separate verifier. This is AI-assisted research with a published process. It has not been audited or peer reviewed, and no vendor saw it before publication. The author works at Samba, co-leads AgenticAdvertising.org's Signals & Measurement working group, and earlier worked at Verve Group, whose lineage includes the location-advertising company Verve Wireless; the full statement is in chapter 13.

What it found

1. **Visit numbers are projections or unlabelled.** In cohort A, four products document a projected visit number (Foursquare, InMarket, GroundTruth and Azira), some alongside an observed count, and nine visit numbers (including Arrivalist's arrival counts) state no basis at all ◆. Chapter 1.
2. **Supply is undocumented.** In the sources screened, no vendor discloses a US panel series on one definition across the 2019 to 2021 permission changes, and no filing attributes a quantified supply change to them, so H1 is unresolved ◆. Ownership concentrated: T-Mobile bought Vistar Media and Blis in 2025 ◆, ZeroToOne.AI announced it had acquired GroundTruth in March 2026 ◆ and Infillion announced it would acquire Foursquare in September 2026 ◆. Chapter 2.
3. **Platform changes are dated; their effects are not.** Apple's and Google's permission changes are dated from their own documentation, and in the sources screened no filing, platform statement or independent measurement quantifies what that did to US SDK supply ◆. Chapter 3.
4. **Nobody has checked the counts against the ground at scale.** No independent multi-site comparison of projected retail visits with door counts or transactions was found; the independent checks cover parks, trails, census counts and polling places, mostly before 2021, and are adverse for SafeGraph's 2018 panel. H2 is unresolved ◆. Chapter 4.
5. **Lift is mostly correlation.** Six of the eight cohort A products that document a lift method use a matched or synthetic control, and a ninth documents exposed-only visits with no lift claim; H3 is contradicted ◆. The comparator decides the number: one vendor's case shows 29% lift against its holdout and 310% against unexposed devices ◆. Chapter 5.
6. **What audiences are built from is not disclosed.** Too few audience products name their primary source to say whether bidstream or SDK data dominates; H4 is unresolved ◆. T-Mobile's app-based audience segments have been on Vistar's DOOH buying platform since May 2025, and on 5 October 2026 Vistar announced enhanced segments with location insights, available only there ◆. Chapter 6.

7. **The orders did not end the trade.** Only InMarket's FTC order bans selling precise location outright ◆; three of the five ordered companies still document precise or device-level offers, so H5 is contradicted ◆. Gravy Analytics, a Unacast company, confirmed a breach of its cloud storage in January 2025 ◆. Chapter 7.
8. **Nobody accredits the number.** MRC's only location standard dates from 2017 and says nothing about lift ◆; on 24 October 2026 no visit or location metric was on any of its lists, so H6 is contradicted ◆. Chapter 8.
9. **Out-of-home runs on mobility data.** Half the US DOOH products coded name no mobility source for their audience numbers ◆, and the US audience currency is being rebuilt, with a pilot in the second half of 2026 ◆. Chapter 9.
10. **Agents can describe a place; production buying by place is not established.** In the protocols and registry screened on 24 October 2026, the furthest any location signal reaches in agent-driven buying is one implemented connector; H7 is unresolved ◆. Chapter 10.
11. **On the Ground Quotient, independent assurance is the weakest dimension everywhere.** The field GQ is 41 in visit measurement, 44 in audiences, 41 in foot-traffic analytics and 38 in raw movement data. 1 product reaches the Most documented band, by less than a quarter of a point. Chapter 11.

What it means

On this paper's reading, location data is a useful signal sold with more certainty than the public record supports. A buyer who wants to treat a visit count as a count, or a lift as causal, should ask for the kind of number, the control, a ground-truth comparison, the sources and the vendor's regulatory record. Chapter 12 sets out those questions.

CHAPTER 1

What a location number is

Every location number is one of four kinds: observed, projected, declared or inferred. Most visit numbers in the documentation opened for this paper are projections or carry no stated basis. "Precise" has no single boundary. The US statutes read draw it at 1,750 or 1,850 feet, industry rules at two decimal places of latitude and longitude, and the bid-request standard draws none. A visit counted after exposure is visitation, and lift needs a control. Most of the controls vendors document are matched or modelled.

IN SHORT

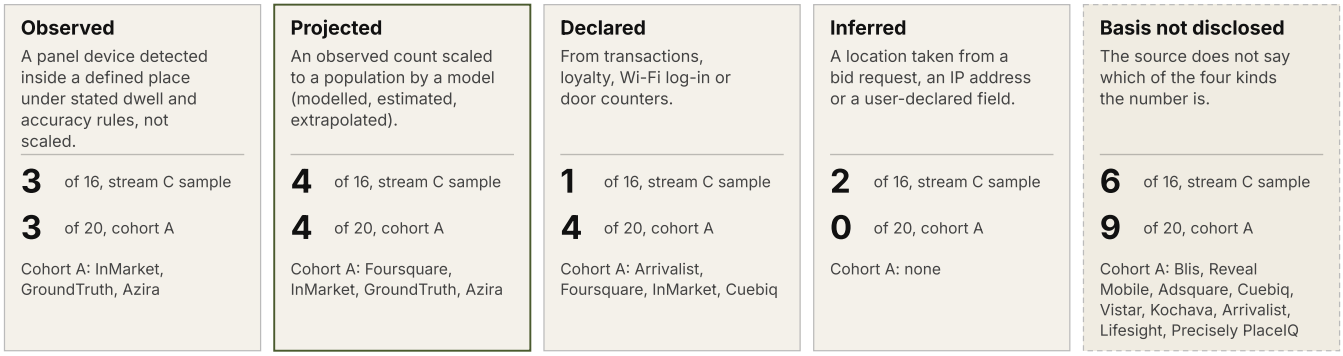
Under this paper's coding rule, the visit totals reported by Foursquare Attribution, InMarket's LCI, GroundTruth Projected Visits and Azira are projected. For nine of the visit numbers coded across the fourteen cohort A seed products, Arrivalist's arrival counts among them, the basis is not disclosed ◆ ◆. Placer.ai's population visit estimates are extrapolations from a device panel; it also exposes raw panel counts ◆. The US statutes read for this paper define precise geolocation by a radius of 1,750 feet, or 1,850 feet in California ◆. The Network Advertising Initiative (NAI) treats two or fewer decimal places as imprecise, Google caps bid-request coordinates at 0.01 degrees, and OpenRTB 2.6 has no rule on truncating coordinates ◆ ◆ ◆. Apple quantises approximate location to a region with a typical radius of about five kilometres. Google documents Android's approximate location as accurate to within about 3 square kilometres ◆ ◆. Nine cohort A products document a general visit-measurement method and eight of them claim lift. Six of the eight use a matched or synthetic control and two a randomised or holdout control; the ninth reports exposed-only visits with no lift claim ◆. In one undated PlaceIQ case, the same campaign showed 29% lift against a holdout and 310% against the open population ◆.

The definitions

- Location advertising: buying, targeting or measuring media on where a device or person was. Location intelligence: analytics about places and movement sold outside media, to retail, real estate, finance and the public sector. The same vendors and panels often serve both. The buying tasks differ, so the cohorts differ.
- Cohorts, by the output the buyer purchases. A is visit measurement and attribution. B is location audiences and targeting. C1 is foot-traffic and visit analytics, and C2 is raw movement data. D is geofencing and visit-detection SDKs and APIs, scored but not banded. Place-only datasets and maps or places APIs are listed, not scored.

- Observed visit: a panel device detected inside a defined place under stated dwell and accuracy rules.
- Projected visit (also "modelled", "estimated", "extrapolated", "normalised"): an observed count scaled to a population by a model. A projected number is never called observed here, whatever the vendor calls it.
- Declared visit: a visit taken from transactions, loyalty records, Wi-Fi log-ins or door counters.
- Inferred location: a location taken from a bid request, an IP address or a user-declared field.
- Panel: the devices a vendor observes through SDK or first-party supply in a stated period and geography, reported as US monthly devices with location observations unless the vendor defines it otherwise.
- Precise location: a fix that can place a device within a small radius, recorded with the vendor's threshold and the statutory one. Coarse location: ZIP, city, designated market area (DMA) or an operating-system "approximate" fix. Truncated coordinates are coarse.
- Place: a point of interest drawn as a polygon (a building or parcel footprint) or a radius geofence, recorded with its dwell rule and accuracy filter. A visit to a chain aggregates places.
- Visitation: visits counted or projected after exposure. Incremental lift: the difference against a control that was not exposed, coded randomised or holdout, matched or synthetic, or none.
- Every number carries two fields: its measurement basis (observed, projected, declared, inferred) and its use stage (planning, in-flight, post-campaign, or analytics outside media).

FOUR KINDS OF LOCATION NUMBER, AND HOW THE NUMBERS SOLD WERE CODED



Cohort A counts follow verifier E's correction (LOC-E-F29): Arrivalist's spend lift is declared (card data) while the basis of its arrival counts is not stated, and the declared card-sales numbers Foursquare, InMarket and Cuebiq sell beside visits are added. Several vendors appear in both samples; do not add the two. A number is observed only when the source documents detection of panel devices in defined places; GroundTruth's 'observed' rests on its own label, with no dwell or accuracy rule published.

> **Four of the 13 cohort A products that sell a visit number say which kind it is, and all four sell a projected number.** The brief's four kinds of location number, and the counts when the numbers opened were coded under question Q1: a sample of 16 numbers vendors sell or publish (stream C) and the 20 numbers sold by the cohort A products (stream E, after verification). In cohort A, the basis is not stated for 9 of 20 numbers; the four products that state a visit basis (Foursquare, InMarket, GroundTruth, Azira) each sell a projected visit count, three of them next to an observed one.
>
> Units: count of numbers coded · Scope: numbers opened in vendor documentation, US, at the cutoff · Sources [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [5] [21] [22] [23] [24] [25] [26] [27] [28] [11]
>
> Codes describe what the documentation states, not what a delivered report contains. A number coded "not disclosed" may be projected; the vendor does not say.

A company can have rows in several cohorts, and evidence is not inherited between them. Foursquare's 2026 product menu lists Attribution, Audience and Proximity for marketers, a Geospatial Intelligence Platform, and the Places API and Movement SDK for developers ◆. Placer.ai sells an Analytics Platform, Enrichment and a Data Marketplace, and its advertising page offers to measure lift without naming a separate measurement product ◆. The product register holds 86 rows, 29 of them listed and 10 historical (chapter 13).

Four kinds of number

Most of the cohort A record is projection or silence, under the Q1 coding rule registered on 24 October 2026. A number is coded observed only when the source documents detection of panel devices for the places and period reported. It is coded projected when any scaling, extrapolation, normalisation or estimation to a population is documented, or when the vendor's own term implies one. Transactions, loyalty records, Wi-Fi and counters make a number declared, and bid requests, IP addresses and user-declared fields make it inferred. A number whose basis is not stated is coded not disclosed, and that gap is scored under method disclosure.

Foursquare Attribution, InMarket LCI's projected store visits, GroundTruth Projected Visits and Azira's extrapolated total visits are documented as projected. GroundTruth Observed Visits, Azira's observed visits and InMarket's exposed device visits are documented as

observed ◆. Arrivalist MediaInsights' spend lift is declared, from card transactions, but the basis of its arrival counts is not stated ◆. For Blis, Reveal, Adsquare, Cuebiq, Vistar, Kochava, Lifesight and Precisely the basis is not disclosed ◆. Unacast's pages name no attribution product in the sources screened ◆.

The projections are documented to different depths. Foursquare's 2022 method post describes census weighting of the panel to the national population and projection of visit volumes on match rates by platform and partner ◆. InMarket's console defines Overall Projected Store Visits as exposed device visits multiplied by an "ND Device / DMA Size Ratio", in undated text from the NinthDecimal era ◆. Azira counts each observed device as 1/P(Detection) devices, extrapolates only above about 1,000 observed visits and caps the multiplier at 20x ◆. GroundTruth applies the visitation of a per-campaign panel of impressed devices to all impressed devices. The projection appears once a campaign reaches about 40 Observed Visits and 350,000 impressions, and GroundTruth reports no uncertainty for it ◆.

Foot-traffic products show the scaling outright. Placer.ai's documentation scales 74.8 thousand panel device visits to one Michigan grocery store to an estimated 2.4 million ◆. That implies a scale factor of about 32 ◆. Its API keeps raw panelVisits apart from extrapolated visits ◆. Arrivalist's 2021 Lee County analysis scaled 492,897 panel trips to 9,861,477 projected US adult trips, a factor of 20.0 ◆. Unacast defines its machine-learning visits as an estimate of "unique people with a stay at a location in a day", produced by a model with more than 150 features ◆. This paper therefore codes the basis of any dashboard "visits" figure before quoting it.

Observed counts have their own bias. GroundTruth calls Observed Visits a "raw" observed count ◆. Its help centre says observed visits "may be lower than actual visits" because not all users are trackable ◆.

Declared numbers mostly enter as sales. Foursquare documents over 2 billion annual card transactions mapped to places across 450+ US chains ◆. InMarket's Retail Sales Lift add-on uses card transactions from a subset of the same exposed and control users ◆, and Arrivalist names Visa, Mastercard and Discover as its card sources ◆. Exposure can be inferred as well as location. Vistar's DOOH cases infer exposure from ad-log timestamps, device location, venue type and screen location ◆. Adsquare infers it from the proximity of mobile advertising IDs to screen coordinates while an ad is live, with no radius stated ◆. GroundTruth's 2021 help centre says its CTV-to-store visits rely on TapAd converting IP addresses to mobile ad IDs ◆. Foursquare and Cuebiq document linear-TV-to-visit measurement without naming the viewing-data supplier ◆. None of the cohort A documentation opened names Samba, the TV data company where the author works, as a source of TV exposure data ◆.

Where the observations come from

MRC's 2017 Location-Based Advertising Measurement Guidelines list GPS, Wi-Fi, IP, cell trilateration, registration, beacon, panel and bid-request location as sources. They rate beacons within metres, GPS at 10-100 m, Wi-Fi at 30-100 m and cell at ZIP or neighbourhood level, and they call mobile IP generally neither accurate nor precise ◆.

Those ratings date from March 2017 ◆, before Apple's iOS 13 and Google's Android 10 permission changes of September 2019 ◆ ◆.

SDK and panel supply is disclosed in units that do not compare, and mostly without dates ◆. Placer's help centre describes tens of millions of US devices from hundreds of partner apps, about 7% of the US population. Its September 2024 deck gives 30 million active devices from 500 SDK apps on one slide and 25 million-plus on another, with neither figure defined by period ◆. InMarket names its own apps, a partner SDK app network and unnamed third-party sources, with no proportions ◆. Foursquare names GPS pings from its own consumer apps and vetted third parties ◆, and it retired its City Guide app on 15 December 2024 ◆. In the sources screened, no US location vendor discloses a panel series on one definition that spans a pre-2021 and a post-2023 figure ◆. Chapter 2 tests H1 on that record.

Bidstream location arrives in the OpenRTB 2.6 Geo object. It carries latitude and longitude, a type (1 GPS or location services, 2 IP address, 3 user-provided), an accuracy in metres, the seconds since the fix and the IP location service used. The specification says coordinates should be passed only when they match the accuracy of the stated type, and that a postal-code centroid should not be passed ◆. Two 2015 vendor studies measured how often the field was usable. Thinknear's vendor-run Q1 2015 index found location on 62% of ad requests and put 37% of located impressions within 100 m ◆. Placed's 2015 analysis found that less than 1% of the business visits its panel observed generated an ad-request location within 100 m ◆. This paper does not read either as a description of 2026 supply. Azira documents a blend of SDK integrations and location from the bid requests of over 100,000 apps, with no proportions ◆. InMarket's GeoLink scores the location carried in ad requests before bidding ◆. The FTC's January 2025 Mobilewalla order is the only regulator record found in the audiences stream that documents bidstream as a cohort B source ◆. Google's exchange sends only IP-derived location, capped at 0.01 degrees ◆. Under Google's Authorized Buyers guidelines, any precise location a buyer receives by other means may be used only to bid on that impression ◆.

The one IP-geolocation accreditation found in the MRC communications screened has lapsed. MRC moved Digital Envoy's NetAcuity service from hiatus to non-accredited in January 2020, and no IP-geolocation service was on MRC's lists on 24 October 2026 ◆. Platform changes touch IP location only at the edges. iCloud Private Relay maps to a roughly city-level area by default but covers only Safari, DNS and insecure HTTP traffic, leaving HTTPS in-app traffic untouched ◆. Chrome's IP Protection was confined to Incognito third-party contexts and is being withdrawn ◆. Some vendors refuse IP outright. GroundTruth says it rejects centroids and carrier-IP locations ◆, and Simpli.fi says it does not use IP because of truncation ◆.

Telco and first-party sources are named more often than they are described. T-Mobile's app-based segments have been on Vistar's DSP since May 2025, and on 5 October 2026 Vistar announced enhanced, location-enriched segments available only through it ◆. Per AdExchanger, it combines mobile location data with app installation and usage that T-Mobile infers from network requests ◆. Blis's 2024 strategic report cites partnerships with telco providers across North America, the UK and Europe ◆. Among the suppliers screened, only Quadrant documents a first-party server-to-server route with explicit counts, which are global. Outlogic says "No Bidstream Data" but gives no count ◆. "Opt-in" and

"consented" are claims about the consent route. Adsquare's signals are "sourced from vetted partners with explicit, auditable consent", with no route named ◆. No cohort B product documents a primary source, so H4 is unresolved on the documentation read ◆. The dated clarification of its rule does not change that reading (chapter 6).

Precise and coarse

The 2017 MRC guidelines separate accuracy, meaning closeness to the true location, from precision, meaning the number of decimal places, and require vendors to disclose both ◆. They equate two decimal places with about one kilometre, four with about ten metres and five with about one metre, and warn that decimal count must not be equated with accuracy ◆. The table sets out the boundaries in the rules read for this paper, as current when they were read in October 2026.

RULE	WHERE PRECISE ENDS	EVIDENCE
Maryland, Oregon, Washington (precise location information), Connecticut, Virginia	Radius of 1,750 feet	◆ ◆ ◆ ◆ ◆
California, Civil Code 1798.140(w)	Radius of 1,850 feet	◆
The five FTC location orders	Coarse data excluded, for example ZIP code or census block with a radius of at least 1,850 feet	◆ ◆
NAI guidance (February 2020)	Two or fewer decimals, an area at least a 500 m-radius circle, or a non-unique descriptor is imprecise	◆
Google Authorized Buyers	IP-derived only, 0.01 degrees	◆
Prebid	Two decimals, only when a rule denies transmitPreciseGeo; the default is allow	◆
OpenRTB 2.6	No truncation or rounding rule	◆
Apple iOS 14 approximate location	Region with a typical radius of about 5 km	◆
Android 12 approximate location; Google Play Data safety	About 3 square kilometres; precise is less than 3 square kilometres	◆ ◆

Two decimal places is the recurring line, but the bodies attach different distances to it. NAI's 500 m radius is about 6% smaller than the 1,750-foot (533 m) statutory radius ◆. Washington's geofencing ban uses a third distance: a boundary of 2,000 feet or less around in-person health care providers ◆. The operating-system definitions differ in kind as well as size, because Apple states a radius and Google an area ◆ ◆. Apple says apps cannot opt out of a user's approximate choice, and region monitoring needs full accuracy ◆. Android 12 lets users set approximate accuracy for any app, whatever it requests ◆. The paper codes operating-system approximate fixes and truncated coordinates as coarse. Because OpenRTB sets no truncation rule, the precision of a bid request's coordinates is the sender's choice, and their decimal count does not show their accuracy ◆ ◆.

Places, polygons, radii and dwell

The 2017 guidelines define a geofence as either a point-radius or a boundary (polygon). They define a physical visit as the intersection of device location and place, using speed or

longitudinal analysis to exclude drive-bys, and note that geofences generally cannot represent multi-storey buildings ◆. Vendors fill in the rest themselves, and the rules differ.

PRODUCT	PLACE	VISIT OR STOP RULE	EVIDENCE
Placer.ai	Device signals matched to a geofenced POI	From 1 minute of dwell since 31 March 2024; at most once per person per POI per day	◆
Foursquare Visits feed	Venue, with place shapes in dense locations	A stop of at least two minutes; the Movement SDK FAQ says there is "no standard minimum dwell time"	◆
Unacast machine-learning products	Polygon	Multiple pings within 50 m for longer than 60 seconds	◆
Radar SDK	Circles of 10 to 10,000 m, polygons or isochrones	Stopped after 140 seconds within 70 m (Responsive and Continuous presets on iOS, all presets on Android); dwell thresholds configurable	◆ ◆
GroundTruth	Blueprints polygons, 4.8 million across the US and Canada; 12-metre radial fence where none exists	Named tests, no numeric threshold	◆ ◆
Adsquare	2D POI polygons, "no fuzzy radius logic"	Not stated	◆

GroundTruth asserts, without citing a study, that radial geofences measure visits "with up to 75% inaccuracy" ◆. No cohort B documentation opened states a fix-accuracy threshold with a method or a detection error statistic. The only numeric precision claim found is Azira's unexplained "within 3 meters of precision" ◆. Disclosed attribution windows run from 4 days (Vistar with Foursquare, for DOOH) to a 30-day look-back (Simpli.fi), and window choice alone moves a visit count materially ◆. AdCP, a protocol for agent-driven buying, uses the same vocabulary. AdCP v3.2.6 (23 October 2026) represents point-based proximity as a radius, a travel-time isochrone or a buyer-supplied GeoJSON polygon, and identifier-based places, as schema only ◆. The author co-leads AgenticAdvertising.org's Signals & Measurement working group, where his cell-grid RFC, AdCP issue #5969, was open when read ◆. Chapter 10 treats that as a declared interest.

Visitation is not lift

A visit rate among exposed devices says nothing about what the ad caused until it is compared with a control. MRC's 2017 location guidelines contain no provision on visit lift, incrementality or control groups ◆. GroundTruth's Observed Visits is the plainest case of visitation. It is an exposed-only count with no control group, crediting a visit within 14 days of exposure by last touch ◆. GroundTruth's Cost Per Visit model bills on those verified visits ◆.

The comparator decides the size of the number. PlaceIQ's undated A/B case for a national big-box retailer reports a Place Visit Rate of 2.75% for exposed devices against 2.13% for a standing 10% holdout, a 29% lift. Against the open population the rate is 0.67%, a 310% "open lift". The same campaign shows a 10.7-fold larger lift when the comparator changes ◆.

Of fourteen cohort A seed products, nine document a general visit-measurement method and eight of them claim lift. Six of the eight use a matched or synthetic control (Foursquare, InMarket, Reveal, Adsquare, Cuebiq, Arrivalist), two a randomised or holdout control

(Azira, Blis), and GroundTruth reports exposed-only visits with no lift claim ◆. Blis's Smart Holdout Groups balance target and control ZIP codes by machine learning, and Blis does not describe the assignment as randomised ◆. Vendor names for these designs overstate them. Cuebiq describes "causal machine learning to simulate a randomized control trial" with behaviourally matched controls ◆. InMarket calls its synthetic control causal ◆. Foursquare's product page says "incremental lift" for an output its blog and metrics page call "behavioral lift" ◆. Under this paper's rules a matched or synthetic comparison is correlation, whatever the vendor calls it, and the vendor's term is reported beside the code.

On those counts H3 reads contradicted: seven of the nine documented methods are not holdouts, and excluding GroundTruth, six of eight are matched or synthetic ◆. The dated clarification of 24 October 2026 fixed the decision tree and did not by itself move the verdict. The author's glossary line that footfall attribution is "correlated and modeled by default" is H3's registered rival hypothesis, not evidence, and Azira and Blis are exceptions to it ◆. Chapter 5 codes each product, chapter 4 asks whether the projected visits agree with ground truth, and chapter 12 turns these definitions into questions a buyer can ask.

CHAPTER 2

Who supplies the data

Several US location vendors changed hands in 2025 and 2026, two of them to a carrier. T-Mobile bought Vistar Media and Blis in early 2025, ZeroToOne.AI bought GroundTruth in March 2026, and Infillion announced in September 2026 that it was buying Foursquare. Near Intelligence went through Chapter 11. Whether the supply underneath shrank after Apple's and Google's permission changes cannot be read from the record: no vendor in the sources screened discloses a US panel series on one definition from before 2021 to after 2023, so H1 is unresolved.

IN SHORT

T-Mobile US completed its purchases of Vistar Media on 3 February 2025 and Blis on 3 March 2025, for US$621 million and US$180 million in cash ◆. ZeroToOne.AI announced on 25 March 2026 that it had acquired GroundTruth ◆. Infillion, which already owns Gimbal, announced on 18 September 2026 that it would acquire Foursquare; by 24 October 2026 participants described the deal as done, but no closing record or date was found ◆. Gravy Analytics trades as Unacast, Precisely owns PlaceIQ and Rezolve AI owns Bluedot ◆ ◆ ◆. Near Intelligence filed for Chapter 11 in December 2023 and sold substantially all its assets to a Blue Torch vehicle; that Azira is that business is this review's inference ◆ ◆ ◆. Vendors' panel and scale figures use incompatible units, and none forms a US series on a constant definition from before 2021 to after 2023, so H1 is unresolved on the sources screened ◆. Some vendors document sources other than their own SDKs, but no figure shows a market-wide contraction or substitution ◆ ◆ ◆.

The ownership map at the cutoff

The table records who owned each business on 24 October 2026, when the pages and registries were read, and the event that put it there. Each event carries one class under shared rule 11, with dates from the source that settles it; an event whose completion no opened source states is recorded as announced (question Q3) ◆ ◆.

BUSINESS	OWNER OR STATUS AT THE CUTOFF	EVENT CLASS	DATES	EVIDENCE
Vistar Media	T-Mobile US	Acquisition, completed	Agreed 20 Dec 2024; closed 3 Feb 2025; US$621m cash	◆ ◆
Blis	T-Mobile US ("part of T-Ads" on Blis's homepage)	Acquisition, completed	Agreed 18 Feb 2025; closed 3 Mar 2025; US$180m cash	◆ ◆ ◆

BUSINESS	OWNER OR STATUS AT THE CUTOFF	EVENT CLASS	DATES	EVIDENCE
Foursquare	Infillion, by participants' statements	Acquisition, announced; closing unverified	Announced 18 Sep 2026; no closing date found	◆ ◆
Gimbal	Infillion	Not dated in this review	n/a	◆ ◆
GroundTruth (formerly xAd)	ZeroToOne.AI	Acquisition, announced as completed	Announced 25 Mar 2026; counsel confirmed 24 Apr 2026	◆ ◆ ◆
Gravy Analytics and Venntel	Trade as Unacast	Merger, announced; structure and completion not stated	Announced 29 Nov 2023	◆
Unacast's Aggregated Location Insights business	Pine59	Management buyout, completed per the buyer	Announced 1 Sep 2026	◆
PlaceIQ	Precisely; product sold as "Precisely Audiences"	Acquisition, completed	Agreed 19 Jan 2022; completed Feb 2022	◆ ◆
Bluedot	Rezolve AI	Acquisition, completed (related party)	Agreed 4 Feb 2025; closed 20 Feb 2025	◆
Near Intelligence	Liquidated; assets to BTC Near Holdco LLC; Azira as successor is inferred	Insolvency	Chapter 11 8 Dec 2023; deregistration filed 28 Mar 2024	◆ ◆ ◆
Outlogic (formerly X-Mode)	Digital Envoy	Acquisition, then rebrand	Reported 5 Aug 2021	◆ ◆
Hivestack	Perion	Acquisition, completed	Closed 12 Dec 2023; US$100m cash at closing	◆
Place Exchange	Broadsign	Acquisition, announced as completed	Announced 25 Nov 2025	◆

Carriers and holding companies

T-Mobile owns two of the businesses in the map, and its FY2025 10-K puts the fair value of consideration at US$617 million for Vistar and US$174 million for Blis, after excluding payments that settled preexisting relationships ◆. The filing calls Blis "a provider of advertising solutions"; the location characterisation comes from Blis's own pages, and T-Mobile states that Blis's results to 31 December 2025 were not material ◆. Lamar Advertising received US$115.1 million in cash at the Vistar closing for its 20% stake, with up to a further US$15.1 million in escrow, per its 8-K exhibit of 20 February 2025 ◆. Blis's About page, modified 8 October 2026, still calls it an "Independent DSP" and does not mention T-Mobile ◆.

The carrier brings its own data, described mostly as app data. Since 10 September 2025 the Blis DSP has carried T-Mobile's US app ownership and engagement data, which Blis says it combines with movement patterns and transactions ◆. On 5 October 2026 Vistar announced enhanced T-Mobile segments for DOOH, available only through Vistar, whose signal list now adds "location insights" ◆ ◆. AdExchanger reported the same day that T-Mobile's data for Vistar includes mobile location data, and that for users who opted into location tracking T-Mobile can detect proximity to OOH ads; T-Mobile tied the exclusivity to tightening regulation of location data and mobile device IDs ◆.

Infillion would hold two location product families if the Foursquare deal has closed: the Gimbal Location Platform, an SDK sold to app owners for their own users' data, and Foursquare's attribution, audience, places and SDK products ◆. Infillion also bought Catalina (closed February 2026) and MediaMath (out of bankruptcy in 2023, for US$22 million) ◆. Infillion's release says leadership will join "after the transaction closes", while Foursquare's homepage read "Foursquare has joined Infillion" on 24 October 2026 ◆. Business Insider reported Dennis Crowley's account that equity holders received $0 ◆. This paper records the event as announced, with completion resting on participants' statements ◆. ZeroToOne.AI disclosed no seller, price or closing record for GroundTruth, and its release names debt-financing advisers ◆.

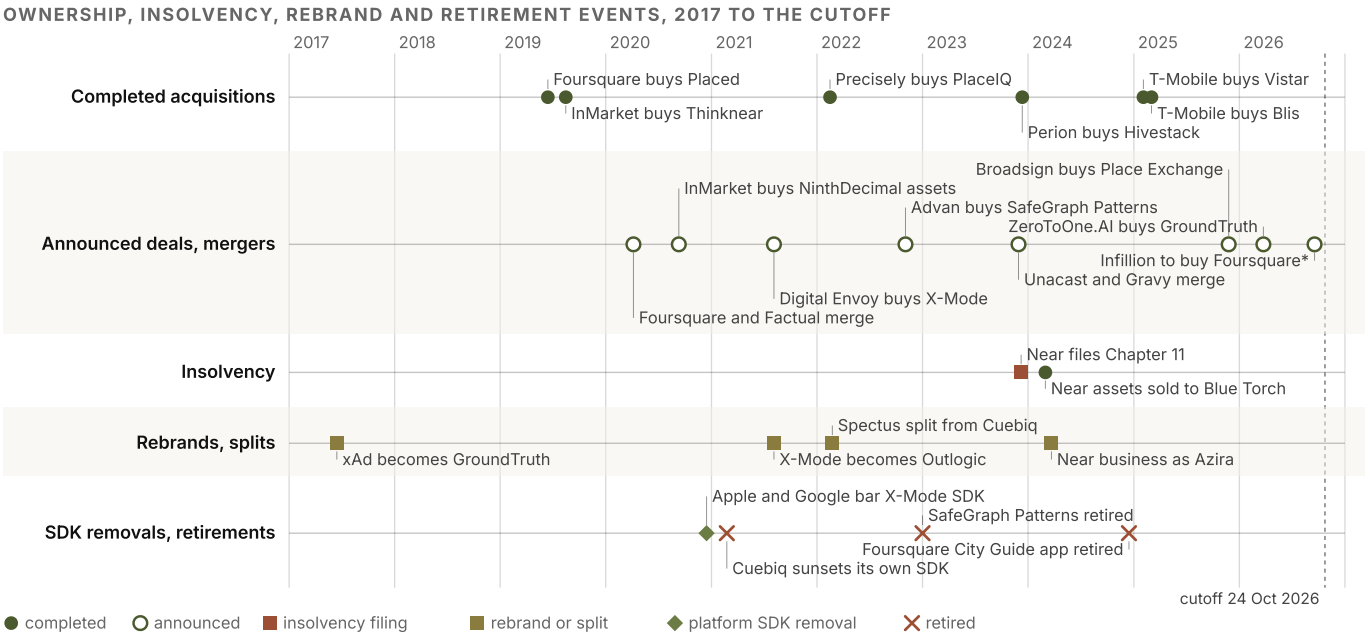
The Unacast and Gravy combination is harder to read. Gravy Analytics, Inc., whose subsidiary is Venntel, opens its September 2026 privacy policy as "Gravy Analytics, Inc. dba 'Unacast'", and gravyanalytics.com redirects to unacast.com ◆. On 1 September 2026 Pine59 said it was "the new home of Unacast's former Aggregated Location Insights business" after a management buyout led by two Unacast co-founders and its former CTO ◆. Unacast's own pricing page still listed the machine-learning foot-traffic datasets and the Location Insights platform on 24 October 2026, and no Unacast statement of the sale was found in the sources opened ◆ ◆.

Near Intelligence and Azira

Near Intelligence's collapse is coded as an insolvency ◆. It listed on Nasdaq through a SPAC combination completed on 23 March 2023 ◆. Its 10-Q for the first half of 2023 reported revenue of US$33.2 million, a net loss of US$36.9 million and substantial doubt about its ability to continue as a going concern ◆. It filed Chapter 11 petitions in Delaware on 8 December 2023, with a stalking-horse credit bid of not less than US$50 million from BTC Near Holdco LLC ◆. The court approved the sale of substantially all its assets to that buyer on 22 February 2024, the sale closed on 1 March, and a Form 15-12G deregistration was filed on 28 March 2024 ◆.

Azira operates as Azira LLC in Pasadena and claims 13 trillion location signals and 43 million points of interest. No filing, registry record or Azira statement opened names Near, so the lineage from Near's assets to Azira is this review's inference ◆. The Chapter 11 plan was a plan of liquidation, so on that inference Azira is the buyer's business, not a reorganised Near ◆ ◆.

Consolidation since 2019, by class



Each event is dated by the source that settles it (shared rule 11). * Infillion announced on 18 September 2026 that it would acquire Foursquare; by 24 October Foursquare's homepage and its co-founder said the deal had happened, but no closing release, filing or date was found. Broadsign's release says it has acquired Place Exchange; ZeroToOne.AI's says it has acquired GroundTruth; neither gives terms. Near's plan of liquidation took effect on 27 March 2024 and its equity was cancelled. The X-Mode SDK removal (December 2020) is dated from trade press, with no platform statement. Cuebiq kept an open-source SDK after retiring its own. Kochava's data business moved to Collective Data Solutions after June 2023; the move is undated and not plotted.

> **Five companies were sold or agreed to be sold in 2025 and 2026, among them Vistar, Blis, GroundTruth and Foursquare.** Acquisitions, mergers, the Near insolvency, rebrands, splits, SDK removals and product retirements in the location universe since 2017, from filings, releases and trade reports (stream D, corrected by its verifier and the review rounds). T-Mobile completed its purchases of Vistar Media on 3 February 2025 and of Blis on 3 March 2025, transferring US$621 million and US$180 million in cash.
>
> Units: dates · Scope: companies and products in the vendor universe, 2017 to the cutoff · Sources [29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40] [41] [42] [43] [44] [45] [46] [47] [48] [49] [50] [51] [52] [53] [54] [55] [56] [57] [58] [59] [60] [61] [62] [63] [64]
>
> Events are classified, not counted as market exits; no event found documents a failure of a location metric as its cause. Funding rounds, marketplace listings and regulatory orders are in other figures and tables.

Q3 is a coding question, and its rule reads no event as evidence that location data or a method failed unless a source establishes the cause. Foursquare bought Placed from Snap in June 2019, for US$66.9 million of purchase consideration in Snap's filing ◆. Telenav sold Thinknear to inMarket on 16 August 2019 for a 14.5% member interest valued at US$15.6 million ◆. InMarket bought NinthDecimal's assets in a deal reported on 10 September 2020, not in 2019 as the seed list had it ◆. Advan Research bought SafeGraph's Patterns business in November 2022, a product retirement for SafeGraph ◆. Qualcomm acquired Skyhook, an early Wi-Fi positioning supplier, in May 2022 ◆. Media and Games Invest agreed in January 2020, through its subsidiary gamigo, to buy substantially all the assets of Verve Wireless, and renamed itself Verve Group SE on 13 June 2024, a rebrand ◆.

Neither merger in the record has a completion date in the sources opened. Foursquare and Factual announced theirs on 6 April 2020 ◆. Unacast and Gravy announced theirs on 29 November 2023 with no structure stated ◆. Cuebiq's clean room was split out as Spectus in February 2022, a restructuring ◆. On 24 October 2026 spectus.ai redirected to cuebiq.com; whether Spectus has been folded back is an inference from the redirect, not an established event ◆.

Several events touch supply directly. Apple and Google barred apps from using X-Mode's SDK in December 2020, which this review found only in trade reporting ◆. Cuebiq announced on 23 February 2021 that it was sunsetting its proprietary SDK in favour of a clean-room product, keeping an open-source version ◆. Foursquare retired its City Guide app on 15 December 2024 and the web version on 28 April 2025 ◆. Its consumer apps supply the check-ins it uses as visit ground truth and its first-party panel ◆, and the retirement page does not say whether City Guide contributed to that panel ◆. Lifesight's 2026 homepage names no footfall or location product, coded as a pivot by inference ◆. Arity announced on 16 October 2026 that it would acquire INRIX's assets, expected to close in 2026 ◆.

Panels in incompatible units

Every scale figure found carries its own definition. The table keeps each with its date and unit as published ◆; none forms a US series on one definition from before 2021 to after 2023 ◆.

VENDOR	FIGURE AS PUBLISHED	UNIT AND DATE	EVIDENCE
SafeGraph	28,914,920 opted-in devices, by carrier	One release, July 2020; not a monthly series	◆
InMarket	"About 100 million unique devices" sending location each year	FTC complaint, January 2024; each year from 2016	◆
InMarket	"200 million+ Location-based consumers" and other figures	Current pages, no period	◆
Foursquare	100 million monthly US devices; 500 million worldwide; 250 million US devices of "aggregated coverage"	May 2019; April 2020; September 2026	◆
Placer.ai	"Over 20 million active devices" to "roughly 30 million mobile devices"	May 2022 to September 2026; one monthly basis	◆
Gravy and Unacast	More than 17 billion signals from around a billion devices daily; "more than 1 billion monthly devices across 180+ countries"	FTC release, December 2024; product page, undated; global	◆
Advan	"45M U.S. & 65M global devices"	At access, 24 October 2026; no period	◆
GroundTruth	95 million "active monthly users"	June 2017; no current US figure	◆
Blis	"370m opted-in global planning and measurement panel"	August 2021; global	◆
Near	1.6 billion "unique user IDs"	March 2023; no geography	◆

The figures cannot be read as trends. Foursquare's 100 million US devices in 2019 and 250 million in 2026 look like growth, but the 2026 term is undefined and may include partner or bidstream data ◆. Placer's own figures range from about 7% to about 9% of the US population, and only a city fact sheet gives a monthly basis ◆ ◆. Placer also restates its

history when it changes its model, so its series read at two dates can differ for the same past period ◆.

Where the supply comes from

Several vendors document sources other than an SDK of their own, without proportions ◆ ◆. Unacast says it chose to license data "instead of collecting location data through our own SDK", from aggregators representing SDKs across tens of thousands of apps ◆. Azira's measurement panel blends SDK integrations with bidstream location from the bid requests of over 100,000 apps ◆. Foursquare names its own apps and vetted third-party partners, plus card transactions mapped to places ◆. Foursquare also infers TV exposure by joining viewership data with ad run-logs ◆, without naming the viewing-data supplier; no opened cohort A documentation names Samba, the TV data company where the author works ◆. Placer documents background location from partner apps that carry its SDK, and no source opened documents bidstream use ◆.

Regulators' records describe aggregation too ◆. The FTC alleged that Gravy collected no data directly from consumers and bought from suppliers who may draw on the mobile advertising marketplace ◆. Its Mobilewalla order bans collecting data from real-time bidding exchanges for purposes other than taking part in the auctions, which documents an allegation, not an admission ◆.

Foursquare adjusts its projection weights for technical changes such as an OS update and names iOS 13 among the causes of step changes in raw visits; the documentation opened gives no size or direction for them ◆. Cuebiq's CEO cited privacy and security risk for the SDK sunset; the article, not Cuebiq, linked the move to Apple's tracking changes ◆. Chapter 3 dates the permission changes themselves.

Marketplaces and resale

Location data also moves through marketplaces. Foursquare documented AWS Data Exchange from 13 November 2019 and Snowflake from 8 February 2021 ◆. Placer delivers through its API, bulk feeds, private Snowflake sharing and the Bloomberg Terminal; this review found no public marketplace listing for Placer in the searches logged ◆. Outlogic licenses an "Observation Panel", attribution data and audiences through Snowflake, AWS S3, a REST API, Eyeota and Adsquare ◆. Datarade's foot-traffic category, headed "40 Foot Traffic Data Providers" on 24 October 2026, adds sellers not in the seed list, with self-reported figures ◆. At least three location sellers screened, Unacast, Veraset and Complementics, also sell links between mobile advertising IDs and hashed emails or IPs ◆. Marketplace discovery is incomplete: this review found no Databricks listing for five named vendors in the searches logged, and the universe sweep did not screen the Snowflake Marketplace or AWS Data Exchange search pages ◆ ◆.

H1, coded by the rule

H1 states that SDK-sourced precise location supply to US vendors contracted after the 2019 to 2021 permission changes and that vendors substituted other sources. The registered rule

needs either two vendors' series falling on a constant definition, or a filing or official statement attributing a supply reduction to a named platform change, and at least one vendor documenting a shift of primary source away from SDK supply. Vendor commentary without a figure does not support on its own, and absence of a comparable series is unresolved, not contradicted. Foursquare's iOS 13 note gives neither a size nor a direction ◆. In the filings, statements and vendor pages opened, no US vendor discloses a series on one definition that spans a pre-2021 and a post-2023 figure, so H1 is unresolved on this evidence ◆. Cuebiq's partial SDK sunset is a documented shift away from own-SDK supply, with no panel figure ◆. Read literally, InMarket's flat 100 million devices a year from 2016 would count against contraction for that vendor, but it is one rounded allegation, not a series ◆. The absence holds only for the sources screened. Two vendors' disclosed US series on one definition from before 2021 to after 2023, or a filing attributing a supply reduction to a named platform change, would let the rule decide it (chapter 13).

CHAPTER 3

What Apple and Google changed

Between 2019 and 2021 Apple and Google split background location from foreground use, added a one-time grant and let users hand apps an approximate location instead of a precise one. Google Play also put background location under review and now bars the sale of device location. The platforms' own pages date each change. What the changes did to US SDK supply is another matter. In the sources screened, no filing, official statement or independent measurement puts a number on it. The one platform figure found counts permission choices, and the vendors that name a change give no size.

IN SHORT

Apple shipped Allow Once in iOS 13 on 19 September 2019 and approximate location in iOS 14 on 16 September 2020 ◆ ◆. App Tracking Transparency (ATT) became mandatory with iOS 14.5 on 26 April 2021 ◆. Android 10 (3 September 2019) separated background location, Android 11 (from 8 September 2020) added a one-time grant and Android 12 (pushed to AOSP on 4 October 2021) added approximate location ◆ ◆ ◆. Google Play's policy, read on 24 October 2026, prohibits selling device location and never permits it solely for advertising or analytics ◆ ◆. The later changes are narrower: privacy manifests enforced from 1 May 2024, a WWDC24 model that ties Always authorization to a session started in the foreground, Private Relay for Safari and insecure app traffic, and Chrome's IP Protection, listed for retirement on 17 October 2025 ◆ ◆ ◆ ◆. The December 2020 removal of X-Mode's SDK from both app stores rests on trade reporting, not on a platform statement ◆. Google's statement that over half of Android 10 users chose "While app is in use" is the only effect figure a platform attributes to a change, and it measures grants, not supply ◆. Foursquare, Near and a trade article on Cuebiq name platform changes without a figure, which the Q4 rule codes asserted ◆ ◆ ◆. In the sources screened, nothing attributes a quantified change in US SDK-sourced location supply to a named Apple or Google permission change ◆.

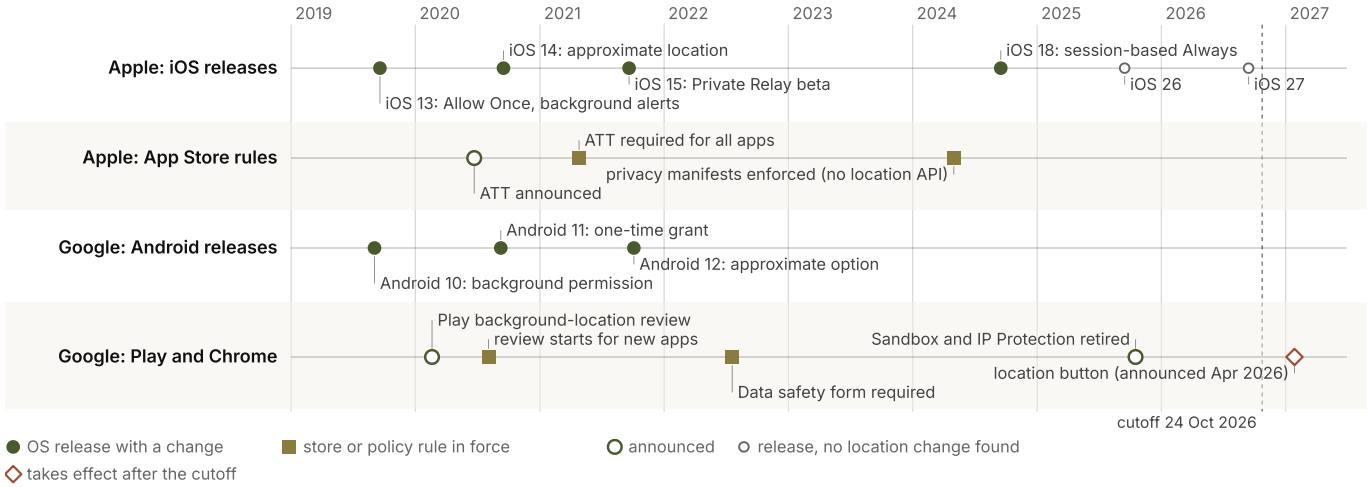
How the changes are dated

The registered Q4 rule dates a change only from the platform's own documentation, and keeps announcement, release and enforcement dates apart. It codes an effect documented when a filing, official statement or independent measurement attributes it to the change, asserted when vendor commentary names the change without a figure, and coincident when a disclosed series moves at the same time with no attribution. A change whose effect

no source attributes carries no code, and that absence is not evidence of no effect ◆. The platforms' pages are the settling record for dates. They are the platforms' own statements, and this paper does not treat them as independent evidence of what a change did ◆.

PLATFORM	CHANGE	ANNOUNCED	RELEASED OR EFFECTIVE	ENFORCED	EVIDENCE
Apple	iOS 13: Allow Once, background tracking alerts, Wi-Fi and Bluetooth protections	3 June 2019	19 September 2019	n/a	◆
Google	Android 10: ACCESS_BACKGROUND_LOCATION, allow only while in use	Not stated	3 September 2019	n/a	◆
Google	Play background-location approval	19 February 2020	Projected 3 August 2020 (new apps), 2 November 2020 (existing)	Existing apps deferred to 2021 on 8 September 2020	◆
Google	Android 11: one-time grant, Allow all the time only in Settings	Not stated	Rollout from 8 September 2020	n/a	◆
Apple	iOS 14: approximate location	22 June 2020	16 September 2020	n/a	◆
Apple	App Tracking Transparency	22 June 2020; deferred 3 September 2020	26 April 2021 (iOS 14.5)	26 April 2021	◆
Apple	iCloud Private Relay (public beta, iCloud+)	Not stated	20 September 2021 (iOS 15)	n/a	◆
Google	Android 12: approximate location	Not stated	AOSP 4 October 2021	n/a	◆
Google	Play Data safety section	6 May 2021	Visible 26 April 2022	Mandatory after 20 July 2022	◆
Apple	Privacy manifests and required-reason APIs	WWDC23; "spring 2024" on 7 December 2023; dated 29 February 2024	Warnings from 13 March 2024	Uploads rejected from 1 May 2024	◆
Apple	WWDC24 authorization model (CLServiceSession)	WWDC24	iOS 18, 16 September 2024	n/a	◆
Google	Privacy Sandbox and IP Protection retirement	17 October 2025	No dates given	n/a	◆ ◆

APPLE AND GOOGLE LOCATION-PERMISSION AND POLICY CHANGES, 2019 TO 2027



Dates are from the platforms' own pages: release dates for OS changes, effective dates for store rules, announcement dates where nothing took effect. iOS 26 and iOS 27: no change to the location permission found in the Apple pages screened. Privacy manifests gate required-reason APIs, none of which is a location API. Google's 2020 background-location review was projected for 3 August 2020 for new apps; enforcement for existing apps was deferred to 2021. Android 13 to 16 were not screened. Chrome's IP Protection, listed for retirement on 17 October 2025, applied only to third-party requests in Incognito; whether it reached Stable is not established. The Play location button applies to apps targeting Android 17 from 27 January 2027.

> **Most platform location-permission changes date from 2019 to 2021; Apple's last was in iOS 18, and Google's next documented change takes effect in January 2027.** Apple and Google location-permission and policy changes since 2019, from the platforms' release notes, developer pages and policy posts (stream G, corrected by its verifier). No filing, platform statement or independent measurement in the sources screened attributes a quantified change in US SDK location supply to any of these changes.
>
> Units: dates · Scope: Apple and Google platform documentation, 2019 to the cutoff · Sources [65] [66] [67] [68] [69] [70] [71] [72] [73] [74] [75] [76] [77] [78] [79] [80] [81] [82] [83] [84] [85] [86] [87] [88] [89] [90] [91] [92] [93] [94]
>
> Timing is not effect: a coincidence in time between a platform change and a vendor's supply is recorded as a coincidence (Q4 rule). Google Play's ban on selling device location has no settled start date and is not plotted.

Apple

Apple announced a one-time location option and background-use information on 3 June 2019 and shipped them in iOS 13 on 19 September 2019, as Allow Once, background tracking alerts and Wi-Fi and Bluetooth protections against location inference ◆.

iOS 14, released on 16 September 2020, let users give an app approximate location instead of precise. Apple's WWDC20 session says apps cannot opt out. A reduced-accuracy fix is quantised to a region with a typical radius of about five kilometres, a couple of kilometres in dense cities and ten or more in rural areas, recomputed about four times an hour. Region monitoring requires full accuracy ◆. Under this paper's definitions (Chapter 1), an approximate fix is coarse location ◆. This review found no Apple statistic on how many users choose it ◆.

ATT is a tracking rule, not a location permission. Apple announced it on 22 June 2020 as an iOS 14 requirement, deferred it on 3 September 2020 to "early next year" and made it mandatory for all apps on 26 April 2021 with iOS 14.5. Apple's definition of tracking includes sharing user or device data with data brokers ◆.

Privacy manifests followed. Apple introduced them, with SDK signatures and required-reason APIs, at WWDC23. On 29 February 2024 it dated the requirement: warning emails from 13 March 2024 and, from 1 May 2024, rejection of uploads that use a required-reason API without an approved reason. Tracking domains declared in a manifest are blocked unless the user has granted ATT permission ◆. Whether any location API is a required-reason API is not established here, because the category list could not be read ◆. Radar's iOS SDK manifest, last changed on 1 June 2024, shows what a location vendor declares: precise and coarse location collected and linked to the user, tracking set to false, and purposes limited to app functionality and analytics ◆. That is the vendor's own declaration.

At WWDC24 Apple introduced CLServiceSession. Under it, Always authorization is effective only while the app holds a session started in the foreground, and approximate location is delivered only every 15 to 20 minutes. iOS 18 shipped on 16 September 2024 ◆. The 2020 figure of four recomputations an hour and the 2024 figure for delivery are both Apple's, and this review does not reconcile them ◆ ◆. iOS 26 shipped on 15 September 2025 and iOS 27 on 14 September 2026. Apple's Core Location change log lists no change after June 2024, and the Apple pages screened show no change to the user-facing location permission in either release. The WWDC25 and WWDC26 session listings were not opened ◆.

iCloud Private Relay acts on IP, not on the location permission. It shipped as a public beta with iOS 15 on 20 September 2021 for iCloud+ subscribers who enable it. It replaces the client IP with a relay IP that maps by default to a roughly city-level area, chosen from a four-character geohash of roughly 800 km2, or only to country and time zone. It covers Safari, DNS queries and insecure HTTP app traffic, and leaves HTTPS in-app traffic and its IP geolocation untouched ◆. No Apple adoption figure was found, so the share of traffic affected is unknown ◆.

Google

Android 10, released on 3 September 2019, made background location a separate permission, ACCESS_BACKGROUND_LOCATION, and let users allow location only while an app is in use. Apps targeting Android 9 or lower had background access added automatically. Wi-Fi and Bluetooth scanning began to require fine location for apps targeting Android 10, and MAC addresses were randomised by default ◆.

Android 11 began rolling out on 8 September 2020. It added a one-time grant, "Only this time", and removed the background option from the runtime dialog, so "Allow all the time" can be set only in Settings. Apps targeting Android 11 must request background location separately, and unused apps have their permissions reset ◆. Android 12, pushed to AOSP on 4 October 2021, lets users grant only approximate location even when an app asks for precise, in the dialog or in Settings for any app. Google documents approximate location as accurate to within about 3 square kilometres ◆.

Google Play moved alongside the OS. On 19 February 2020 it announced that background location would need approval, with a projected timeline, subject to change, of 3 August 2020 for new apps and 2 November 2020 for existing ones. On 8 September 2020 it said it would not enforce the policy for existing apps until 2021 ◆. The final 2021 date was not read from a Google page ◆. The current policy limits all device location, foreground and

background, to functions central to the app's core purpose, never permits it solely for advertising or analytics, and reserves background access for critical features ◆.

The Play policies, as read on 24 October 2026, list device location as personal and sensitive user data and prohibit selling it, where a sale is a transfer to a third party for money. Developers must ensure their SDK providers do not sell it. The Permissions policy adds "Don't sell device location" ◆. The pages carry no last-updated dates, so when the sale clause entered is not established ◆. The FTC's January 2024 complaint records a paid SDK market: the X-Mode SDK sat in more than 300 apps, and X-Mode paid developers per device whose location it collected ◆.

The Data safety section was pre-announced on 6 May 2021, shown to users from 26 April 2022 and mandatory after a grace period ending 20 July 2022. Declarations must cover data collected through third-party SDKs and location inferred from IP address. They define approximate location as an area of at least 3 km2 and precise location as less than that ◆. The labels are self-declared, and the threshold differs from the radius definitions in state laws (Chapter 7) ◆.

On the buying side, Google's Authorized Buyers guidelines (last updated 15 May 2026) state that Google does not share precise location through the programme. Precise location a buyer receives by other means may be used only to bid on that impression and kept no longer than that needs. Program Data may not be sold, and non-aggregated Program Data may be kept for at most 18 months ◆. The guidelines bind Google's exchange only ◆. Prebid coarsens coordinates only when a rule or privacy module denies precise geo, its default is to allow, and its Android mobile SDK sets no precision limit by default ◆. Chapter 6 takes up bidstream-derived location.

Chrome's IP Protection was designed for Incognito mode only, for third-party requests to listed domains, through a two-hop proxy whose IPs represent coarse location with a public city-level geofeed. Google said it would reach Chrome Stable no sooner than July 2025 ◆. On 17 October 2025 Google announced the retirement of the Attribution Reporting API, Protected Audience and Topics on Chrome and Android, of SDK Runtime and of IP Protection, among others, with no retirement dates. CHIPS, FedCM and Private State Tokens continue ◆. Google's documentation classed IP Protection by 14 August 2026 as scheduled for phase-out with no date, and whether it ever reached Stable is not established ◆.

The X-Mode SDK removal

In December 2020 Apple and Google barred apps in their stores from using X-Mode's SDK. This review found the event only in trade reporting, from AdExchanger in February 2021, and opened no statement by either platform ◆. Under the Q4 rule the date therefore stands as reported, not as documented by the platforms. It is coded a platform SDK removal under Q3, not a regulatory event ◆. The FTC's January 2024 complaint against X-Mode Social and Outlogic does not mention the removal ◆. Chapter 7 covers the order.

What sources attribute to the changes

SOURCE	CHANGE NAMED	WHAT IT STATES	Q4 CODE	EVIDENCE
Google, 19 February 2020	Android 10 location options	Over half of users select "While app is in use"; many apps asking for background location did not need it	Documented, for permission grants; no vendor panel	◆
Foursquare methodology documentation	iOS 13, OS updates	Names iOS 13 among causes of step changes in raw visits and reweights to offset them; no size	Asserted	◆
Near Intelligence S-4/A, February 2023	iOS 14 approximate location, iOS 14 and 15 opt-in measures, Android 12	Lists them under "key trends around the lack of precise location data"; no figure for its own supply	Asserted	◆
Trade article on Cuebiq, 23 February 2021	ATT, set beside the move by the article	Cuebiq sunsets its proprietary SDK for a clean room; its CEO cites privacy and security risk	Asserted; the link to ATT is the article's	◆
Working-paper abstract, April 2022	ATT	Collection frequency from iOS devices fell for one multi-app provider	Documented for direction only (independent measurement); no size	◆
SafeGraph sampling rate, academic reading	None	Dips 2020-2021 and recovers in 2022; authors cite the pandemic	Coincident at most	◆
Telenav 10-Ks, FY2019 and FY2020	None	No mention of iOS 13 or location permissions	No effect coded	◆

The one figure a platform attaches to a change is about choices. Google said on 19 February 2020 that on Android 10 "over half of users select 'While app is in use'" when offered the new options ◆. It describes user decisions, not the volume of observations reaching SDK vendors, and cannot be turned into a supply change. No equivalent Apple figure was found ◆.

Vendors that name a change give no size. Foursquare adjusts its normalised-visit weights for "changes to how we calculate a visit in our SDK due to an OS update", and names iOS 13 as one cause of step changes in raw visits ◆. Near's registration statement treats the platform changes as market trends and attributes no change in its own supply to them ◆. Cuebiq's sunset of its proprietary SDK in February 2021 is a documented partial shift away from its own SDK supply, with no panel figure. The ATT link comes from the article, not from Cuebiq ◆.

The independent evidence is thin and indirect. An April 2022 working-paper abstract, using data from more than 7 million iOS and Android devices, reports that collection from iOS devices fell after ATT, both because devices went unobserved and because observed devices sent fewer pings. It names no vendor and gives no size in the abstract read ◆. In this paper's reading it attributes a direction to ATT, which is a tracking rule rather than a location permission ◆. SafeGraph's residing-device sampling rate fell from 8.1% in 2019 to 7.2% in 2020 and 6.6% in 2021, then rose to 8.5% in 2022. The authors attribute the fall to the pandemic and do not discuss the permission changes, so the series is at most coincident with them ◆.

The bounded finding

In the sources screened by the cutoff, this review found no filing, official platform statement or independent measurement that attributes a quantified change in US SDK-sourced location supply to a named Apple or Google permission change. Telenav, which sold its Thinknear advertising business to inMarket under an agreement dated 8 August 2019, does not mention iOS 13 or location permissions in its FY2019 and FY2020 10-Ks. EDGAR full-text searches for 10-Ks pairing location data with ATT, iOS 13 or background location returned no location vendor ◆ ◆. The search has limits. Foursquare, Placer.ai, InMarket, GroundTruth and Blis are private and file no 10-K or 10-Q reports, the filings these searches covered (Placer Labs has filed Form D notices of private offerings), and the stream that ran these searches did not screen vendor blogs ◆. Under the Q4 rule, an absence of attribution is not evidence of no effect.

The absence matters for H1. No US vendor in the sources opened discloses a panel series on one definition from before 2021 to after 2023, so H1 is unresolved on this evidence (Chapter 2) ◆. Published validation has the same gap in time. Every independent SafeGraph ground-truth comparison found uses data from 2018 to 2020, so it describes panels before or during the changes, not at the cutoff (Chapter 4) ◆.

What the documentation does establish is where the changes reach. The OS permissions govern what an SDK may collect, and approximate grants deliver coarse location by design ◆ ◆. Radar's SDK, for example, requests an accuracy level from the OS, and what it receives depends on the device, the environment and the user's choice ◆. The IP measures cover Safari and insecure app traffic for subscribers who opt in, and Incognito third-party requests in Chrome, which is being withdrawn ◆ ◆. Outside Google's exchange, bid requests may carry device coordinates under each exchange's own terms, and Prebid coarsens them only when a publisher rule or privacy module denies precise geo ◆ ◆. A buyer can ask a vendor which permission level its panel devices granted, and whether its source mix changed after 2020, with figures (Chapter 12).

CHAPTER 4

Do the numbers match the ground?

The test that would settle it is missing from the record screened. In the sources screened by the cutoff, no independent study compares a vendor's projected retail visits with door counts or transactions across many places and months, and no vendor publishes a held-out validation with error statistics on the pages opened. The independent checks that exist are narrow and old: a 2018 polling-place audit of SafeGraph's panel, park and trail counts from 2018 to 2021, and one trail-site check of Placer.ai. H2 is unresolved overall, with adverse historical evidence for SafeGraph's 2018 panel.

IN SHORT

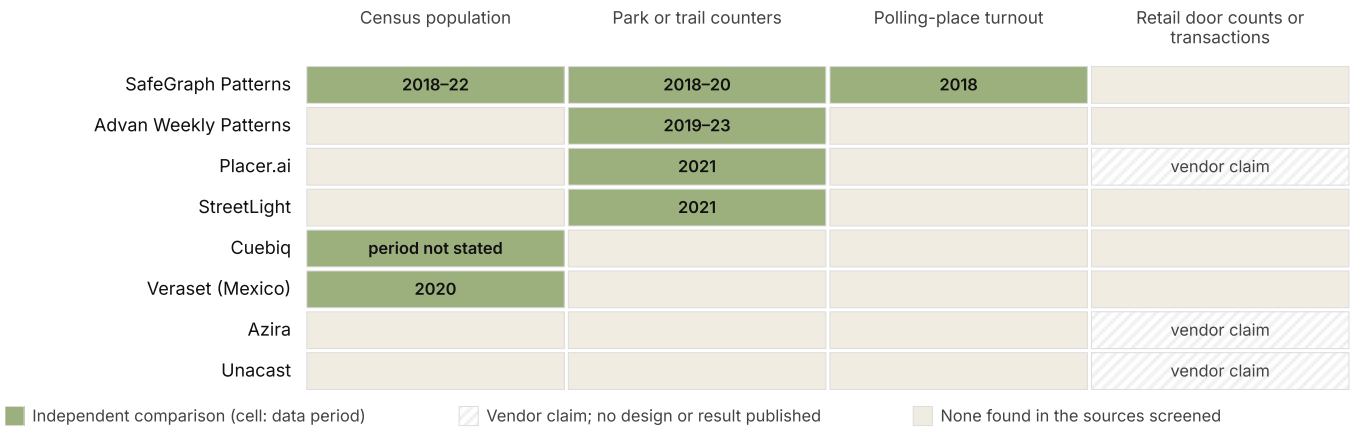
In the sources screened by the cutoff, this review found no independent comparison of any named vendor's projected retail visits with door counts or transactions across many places and months, and no vendor publishes a held-out validation with error statistics on the pages opened ◆. Census comparisons show SafeGraph's device counts tracking population closely at county level and less closely at tract level; they test who is in the panel, not whether visits are counted correctly ◆. A 2018 audit against North Carolina's voter file found lower coverage at polling places with older and with more non-white voters ◆. In Yellowstone, SafeGraph visits at the two most-visited points of interest correlated with official monthly visits at 0.85 and 0.88; at one Minnesota recreation area, Placer.ai's total ran 30.5% above trail counters in a comparison that is not like for like ◆ ◆. Every independent SafeGraph ground-truth comparison found uses 2018-2020 data, so published validation does not describe the panels as they were at the cutoff ◆. Azira's vendor-asserted correlation of 0.85 and median absolute percent error of 10%, the only such comparison in the cohort A documentation opened, comes with no design, sample, period or places ◆. The bidstream accuracy series found are vendor-run and date from 2014 to 2019, and no peer-reviewed measurement with published statistics was found ◆ ◆ ◆. In randomised Facebook benchmarks, matching and regression methods mostly overstated lift ◆. H2 is unresolved overall, with adverse historical evidence for SafeGraph's 2018 panel and use ◆.

H2 says that published visit estimates from US location-measurement and location-intelligence products agree with independent ground-truth counts (door counters, transactions, official visitor counts) within the error the vendor states. Its registered rule counts two kinds of test: a comparison with a published method by a party without a

financial interest, and a vendor comparison with a held-out design and published method. Support is recorded per product and per place type, and it does not carry to a different panel vintage. Absence of accessible comparisons codes as unresolved, not contradicted (Chapter 13).

MRC's 2017 location guidelines set the industry's own bar: they encourage first-party "ground truth" validation and set a general expectation of less than 5% error on primary reported characteristics, with disclosure above that ◆. Projected visits, as Chapter 1 defines them, are observed panel counts scaled to a population by a model. Placer.ai's visit numbers are projections of this kind, and its own example scales 74.8 thousand panel visits to 2.4 million ◆. Studies the searches did not surface could exist ◆.

INDEPENDENT COMPARISONS OF PANEL COUNTS WITH GROUND TRUTH, BY REFERENCE TYPE



Cells give the period of the data compared. SafeGraph: county and tract populations 2018–2022 (Li et al.; urban-tract r-squared fell from 0.651 to 0.375), NPS and counter series 2018–2020 (Liang et al., Kupfer et al.), in-person turnout at 558 North Carolina polling places in 2018 (Coston et al.; SafeGraph supplied the data and feedback). Advan: NPS visitation 2019 to January 2023, by visual check. Placer.ai and StreetLight: one Minnesota trail site, summer 2021, 30.5% and 43.5% above counters, not like for like. Vendor claims: Placer.ai names transactions and store revenues as references without results; Azira reports a 10% median absolute error with no design; Unacast an R-squared of 91.6% against one unnamed retailer. A 2016 NBER paper links device foot-traffic proxies to firm-level sales without naming the vendor; it is not place-level.

> **No independent comparison with retail door counts or transactions was found for any named vendor; the third-party checks that exist use census, park and polling-place counts.** Each panel or vendor against four kinds of reference count. A third-party comparison is one with a published method by a party other than the vendor; it counts as independent only where its funding is stated, and four of the studies charted (Kupfer, Leslie, Choi, UW 2022) state none. The retail column holds only vendor claims. The third-party comparisons that exist are historical and narrow: the newest data end in January 2023, so no comparison covers a panel vintage sold at the cutoff.
>
> Units: data period of each comparison · Scope: comparisons found in the sources screened by the cutoff; US unless marked · Sources [95] [96] [97] [98] [99] [100] [101] [102] [103] [104] [105] [5] [106] [14] [107]
>
> Absence is bounded to the searches logged in stream B and its verifier. Agreement with census population validates coverage, not visit counts. H2 stays unresolved overall (LOC-B-F31).

Who is in the panel

Census comparisons test who is in a panel, not whether its visits are counted correctly ◆. SafeGraph's own 2019 analysis (a vendor blog and notebook) imputed each device's demographics from its home census block group and compared them with national census totals (r = 0.99 for education and income), and compared device counts with county population (r = 0.97; a block-group correlation of 0.176 per Li et al. 2024). It concluded the panel was "well-sampled across demographic categories" and did not test bias in place-specific visit inferences ◆.

An independent census comparison for 2018-2022 put SafeGraph's monthly sampling rate at 7.5% on average, with monthly values from 4.5% to 14.5% across the national, urban and rural series. In 2019, device counts tracked population closely by county (Pearson r 0.986 urban, 0.934 rural) and moderately by tract (r above 0.683 urban, above 0.830 rural), and the urban-tract fit weakened to r-squared 0.375 by 2022 ◆. Hispanic residents were under-represented from March 2020 to July 2021, low-income and low-education groups slightly under-represented, more so during the pandemic, with the pattern reversed at state level in 2022, and most group biases fell within about plus or minus 0.05; rural units were sampled at higher rates than urban ones at tract and block-group level from April 2019 ◆.

Aggregate flows agree with other aggregates, but no ground truth exists for them. SafeGraph-derived county population flows for March-May 2020 correlated with pre-pandemic commuting flows from the American Community Survey (ACS) at 0.974 to 0.985, and with another vendor's mobility indices in five metros at 0.92 or above. The authors state that no ground truth exists for these flows ◆.

Other panels show bias that changes with place and source. The only Veraset coverage study found, a June 2026 preprint on 2,478 Mexican municipalities, finds users concentrated in larger, wealthier and better-connected places, with spatially clustered bias that differs from Facebook's single-app data ◆. Two 2025 preprints find bias in all ten US cities studied but specific to each city, and find that multi-app UK datasets do not necessarily reduce bias relative to single-app sources; the US authors say this raises serious questions about general debiasing approaches ◆. For Cuebiq, a 2017 Federal Highway Administration case study found biases by traveller age and income, and a 2022 University of Washington analysis of 11 metros found the direction of racial bias varying by metro ◆.

Polling places: coverage bias by place

SafeGraph's 2018 panel under-covered polling places with older and more non-white voters. An independent audit tested its point-of-interest data (about 47 million US devices) against North Carolina's 2018 general-election voter file. Polling places with older and with more non-white voters had lower coverage: rank correlations of coverage with the share of voters over 65 of -0.14 ($p < 0.001$) and with the share of non-white voters of -0.11 ($p = 0.0067$) ◆. Election-day traffic tracked turnout in rank (0.383, $p < 0.001$), but place-level estimates were noisy: the root-mean-squared error was 1,375 voters, and polling places that registered 20 marginal SafeGraph devices had roughly 300 to 2,300 actual voters ◆.

Allocating a resource by SafeGraph traffic rather than by actual voters would have under-allocated by 37% to the oldest and most non-white group of polling places and over-

allocated by 33% to the youngest and whitest group (both $p < 0.05$) ◆. This is the adverse evidence in the H2 reading. It covers SafeGraph's 2018 panel and this use, not other products or later vintages ◆.

Parks, trails and one Placer.ai check

Most of the independent ground-truth comparisons found use parks and trails, which keep official counts ◆. A peer-reviewed study of six western national parks compared SafeGraph records with National Park Service (NPS) statistics for 2019-2020 and concluded that device data capture visitation patterns at finer granularity; the abstract read reports no correlation statistic ◆. In Yellowstone, SafeGraph Patterns visits from January 2018 to November 2020 correlated with NPS monthly visits at $r = 0.88$ and 0.85 for the two most-visited points of interest, with a trail counter's daily counts at 0.76 (2018) and 0.77 (2019), and with park-wide gate vehicle counts at 0.79 in 2019 but 0.47 in 2020, when the compared facility imposed indoor capacity limits ◆. The same study found only 40 of the 80 SafeGraph points of interest inside the park valid, visitor demographics imputed from the ACS differing significantly from the visitor survey on education and income, and no way to assign a home block group to short-term international visitors, 23% of visitors per NPS surveys ◆. Inference: a correlation shows that two series rise and fall together; it does not show that their levels agree.

One later panel has a park check. A 2025 preprint using Advan Weekly Visit Patterns (about 35 million US devices from about 1,000 apps) for January 2019 to January 2023 reports a Pearson correlation of 0.875 with NPS visitation for the ten most-visited parks, a comparison the authors call qualitative and based on visual inspection ◆.

In the only third-party comparison of Placer.ai found, a University of Minnesota Extension case study whose funding is not stated (April 2024) at one recreation area, Placer.ai estimated 13,233 visits and StreetLight 14,544 for 29 May to 6 September 2021, 30.5% and 43.5% above the 10,138 recorded by trail counters. The authors found no statistically significant difference, but the comparison is not like for like: polygons differ, counters cover only the cross-country trails, and events are handled differently ◆. The platforms showed weekends 7 times busier than weekdays, against 2.1 times in the counter averages ◆. Placer.ai's inferred visitor demographics differed significantly from the intercept survey's: 30.8% with a bachelor's degree or higher and 21.8% with household income over US$100,000, against 62% and 61% ◆.

Vintage and restatement

Every independent SafeGraph ground-truth comparison found uses data from 2018-2020, before or during the iOS 13 and 14, App Tracking Transparency and Android 12 changes. The only later third-party comparisons are the Advan park series and the Minnesota case, neither with its funding stated, so published validation does not describe the panels as they existed at the cutoff ◆. The panels moved in the meantime: SafeGraph's sampling rate peaked at 13.4% in May 2022 and dropped to 4.9% in July 2022, a fall the authors say "may relate" to a data-provider disruption ◆. A working-paper abstract (April 2022) reports that one multi-app provider's iOS data collection fell after App Tracking Transparency (Chapter 2) ◆.

Vendors also change the past. Placer.ai's Data Version 2.0 (31 March 2024) updated all historical data from 1 January 2017, and its accuracy page says de-biasing adjustments happen "usually no more than once a year" and "can sometimes impact previously run numbers". A Placer.ai series read at two dates can differ for the same past period ◆.

What vendors say about their own accuracy

The vendor record is assertions without method. Of the documentation opened on 24 October 2026 for the fourteen cohort A products, only Azira's undated white paper reports a comparison with an independent reference: a vendor-asserted median absolute percent error of 10% and a correlation of 0.85 between extrapolated visits and "ground truth sales data and foot traffic counters", with no study design, sample, period or places disclosed ◆. No product publishes such a comparison as a documented study ◆.

VENDOR	WHAT IT PUBLISHES	REFERENCE NAMED	STATISTIC AND METHOD	EVIDENCE CLASS
Azira	White paper, undated	Sales data and foot-traffic counters	Correlation 0.85, median absolute percent error 10%; no design, sample, period or places	Vendor assertion ◆
Placer.ai	Home page and help centre	Baseball attendance, transactions, store revenues, conference attendees, vehicle counters	"+92% accuracy" on the home page; no result, sample or statistic	Vendor assertion ◆
Unacast	Two posts	One unnamed clothing retailer; 2019 plant headcounts	R-squared "of 91.6% or higher", no places, period or holdout; four of five plants "within 20%"	Vendor assertion ◆
GroundTruth	Audit posts, 2017-2019	Receipts from 10,000 matched panelists	"94.4% visit accuracy"; no report, period, method or error statistic	Commissioned ◆
Foursquare	Trend check	Public financial statements, transaction trends	No places, period or statistic	Vendor assertion ◆
InMarket	Validation statements	Comscore; unnamed "truth sets"	No report, date or scope	Vendor assertion ◆
Huq (Germany)	Footfall page, 6 August 2026	"Hundreds of authoritative external sources"	Median MAPE 14.5%; references, sites and period unnamed	Vendor assertion ◆

Several of these measure something other than visit counts. GroundTruth's audit checks whether recorded visits are confirmed, not whether visit counts match a reference, and its help pages later claim "99% accurate as verified by Numerator" ◆. Unacast's plant comparison uses headcount rather than visits ◆. Advan's 2019 "99.5% accuracy of geofences" is a claim about geofence geometry ◆. GroundTruth asserts, without a cited study, that radial geofences measure visits "with up to 75% inaccuracy" ◆. Foursquare's "Third-party verified" item is a Forrester Total Economic Impact study commissioned by Foursquare (June 2022), not a validation ◆. Its visit model trains on check-ins, and a 2013 third-party study of 244 users, funding not stated, found check-ins covered about 10% of the places users visited, with about 75% of check-ins matching no GPS-detected visit ◆.

Third-party and production uses do not fill the gap. A site-selection vendor's blog reports that Placer.ai visit trends and six chains' SEC-reported traffic or transaction figures "agreed on direction 9 times out of 12" across 12 retailer-quarter comparisons ◆. The Federal Reserve Bank of Chicago's weekly retail index lists SafeGraph and Advan Research among

its sources and benchmarks to Census retail sales; that is documented production use, not a published validation of visit counts ◆. Geopath reports that its reach model aligns with its own mobile input data to within ±5%, which is not a comparison with an independent count (Chapter 9) ◆. Under the registered rule, a vendor comparison without a held-out design or published method leaves a product unresolved ◆.

Bidstream location: historical and vendor-run

The public series on bidstream location accuracy found in the sources screened are vendor-run and date from 2014 to 2019 ◆ ◆ ◆. Thinknear's Location Score Index reported in 2014 that 34% of location-bearing impressions were within 100 metres of the user, and its Q1 2015 edition, on more than one billion impressions, put 37% within 100 m and 10% beyond 100 km ◆. A May 2016 edition put 32% within 100 m, the lowest industry score since tracking began ◆. Placed's 2015 analysis of exchange bid requests against its own panel found that 27% carried any location, that 91% of observed business visits generated no ad request and that about 73% of bid requests occurred in transit ◆. Location Sciences, which sold a verification product, said in September 2019 that only 14% of 550 million impressions it verified carried high-quality GPS signals ◆. Cuebiq's 2017 paper cites a 2015 MMA report for "less than 33%" of exchange location data being accurate within 100 metres; neither the stream nor its verifier could read the report ◆.

Verification vendors have their own interests. Location Sciences' 2019 verification of Blis was a paid engagement; in March 2021 Location Sciences stated that Blis threatened legal action after Verify reported "data manipulation", and Adweek reported that Blis denied the allegations ◆. This review found no peer-reviewed measurement of bidstream location accuracy with published statistics, on web searches only; the ACM, IEEE, USENIX and PETS databases were not searched directly. The 2017 ADINT study showed that ads bought for about US$1,000 could localise a device to about 8 metres once it stayed about 5 minutes ◆. Google's Authorized Buyers documentation (updated 17 September 2026, read on 24 October 2026) says its bid-request location comes only from IP geolocation, with latitude and longitude precision limited to 0.01 degrees ◆. The author's essays argue that a mobile impression's location carries real error; that is his position, not evidence. His geographic cell-grid proposal, AdCP issue #5969, which he opened and which was open when read on 24 October 2026, sits in the AgenticAdvertising.org working group he co-leads and has a stake in the answer ◆.

The causal benchmarks

Agreement with ground truth is one question; whether a visit lift is causal is another, coded under H3 in Chapter 5. In the randomised benchmarks, observational methods miss the experimental lift, usually by overstating it ◆ ◆ ◆. Fifteen US Facebook campaigns run as randomised trials in 2015 found matching and regression methods on rich individual data mostly overestimating lift, and in half of the studies purchase lift was off by a factor of three across all methods. Two coauthors are affiliated with Facebook and the study runs on Facebook's own data; the two Kellogg academics declare no financial interest ◆. Across 663 Facebook experiments, median RCT lifts of 29%, 18% and 5% by funnel stage compared with 173%, 176% and 64% from stratified propensity-score matching, and the authors conclude they could not reliably estimate a campaign's causal effect ◆.

Randomisation does not make the problem easy. Across 25 field experiments with US retailers and brokerages, the median confidence interval on return on investment was over 100 percentage points wide, and informative experiments can need more than 10 million person-weeks [◆]. A randomised experiment with 1.6 million customers of a major retailer on Yahoo! measured a 5% purchase increase from online ads, 93% of it in stores, while a cross-sectional observational estimate on the same data understated the effect, with a negative bias three times the experimental effect [◆]. Ghost ads and geo experiments, both from Google-affiliated authors, are randomised designs with published methods that location attribution can borrow [◆]. Randomised field experiments of location-targeted promotions also exist, with store-level outcomes [◆]. Inference: none of the benchmarks screened tests visit lift measured by a location panel; the nearest ones measure in-store purchases matched by customer record and promotions redeemed on location [◆] [◆].

H2, coded

H2 stays unresolved overall, and no single verdict is given across products and data vintages [◆]. SafeGraph's 2018 panel carries adverse historical evidence for one place type and use [◆]. Placer.ai has one third-party trail-site check, funding not stated, that is not like for like, and Advan one visual park comparison [◆] [◆]. For the other products in the sources screened, the record holds coverage studies, vendor assertions or nothing [◆]. No product meets the supported branch: no independent comparison, and no held-out vendor comparison with a published method, tests a named product against an error the vendor states [◆] [◆].

What study would settle it

One way to close the current retail gap would be an independent study with this design; the registered rule would also accept a vendor-run comparison with a held-out design and a published method. Take a named product's projected weekly visits for a few hundred retail places of more than one type, and the door counts or transactions for the same places and weeks, supplied by the retailers. Fix the model version before the data arrive and hold out places and later weeks. Report error in levels as well as correlation in patterns, by place type, region and income band, with the vendor's stated error alongside. Repeat after the next model restatement.

The study table lists the 26 study records coded from independent, academic, commissioned and vendor work, one row per study and outcome, with design, sample, sponsor, vintage and uncertainty.

Study evidence table

Outcome measures are deliberately not pooled: different outcomes are different quantities. Sort by any column; sponsorship is shown so a vendor-funded result is never read as independent.

Full records with limitations and source passages are in data/study-evidence.csv.

STUDY	YEAR	DESIGN	SAMPLE	SETTING	FORMAT / CHANNEL	OUTCOME MEASURE	HEADLINE RESULT	UNCERTAINTY	SPONSOR	GENERALISABILITY	SRC
Coston et al. 2021, polling-place bias audit	2021	Panel visits compared with official in-person turnout per polling place; election-day traffic adjusted for non-election traffic; placebo distribution	558 polling places	North Carolina, 2018 general election (data October-November 2018)	SafeGraph panel, about 47 million US devices as described	Place-level coverage and its correlation with voter age and race	Rank correlation of marginal traffic with turnout 0.383; RMSE 1,375 voters; coverage falls with share of voters over 65 (-0.14) and non-white (-0.11); policy simulation under-allocates 37% to the oldest, most non-white group	p<0.001 and p=0.0067 for the coverage coefficients (labelled preliminary); placebo p=0.024	Academic (NSF GRFP, Stanford HAI and RISE); SafeGraph supplied the data, answered questions and gave feedback	One state, one election day, a special place type, 2018 panel vintage; adverse evidence for that panel and use only	[99]
Li et al. 2024, SafeGraph against census population 2018-2022	2024	Monthly residing-device counts compared with census population at county, tract and block-group level; demographic bias from imputed home composition	US counties, tracts and block groups, 60 monthly releases	US, 2018-2022	SafeGraph residing-device counts	Sampling rate and agreement with census population	Average sampling rate 7.5% (monthly range 4.5-14.5%; overall trend peak 13.4% May 2022, low 4.9% July 2022); 2019 county r 0.986 urban, 0.934 rural; tract r above 0.683 urban, 0.830 rural; urban-tract r-squared 0.651 (2018) to 0.375 (2022)	Correlations reported without intervals in the passages read	Academic authors; funding not recorded in the source record	Validates coverage against population, not visit counts; SafeGraph lineage only	[95]

STUDY	YEAR	DESIGN	SAMPLE	SETTING	FORMAT / CHANNEL	OUTCOME MEASURE	HEADLINE RESULT	UNCERTAINTY	SPONSOR	GENERALISABILITY	SRC
Kang et al. 2020, multiscale mobility flows	2020	Origin-destination flows derived from the panel compared with pre-pandemic ACS commuting flows and Descartes Labs indices	US county flows, weekly and daily, March-May 2020	US, March-May 2020	SafeGraph panel (described as about 10% of the population; weekly active devices from over 22 million to 13 million)	Agreement of inferred flows with survey commuting flows	Pearson r 0.974-0.985 for inferred population flows, 0.915-0.961 for raw visitor flows; at least 0.92 with Descartes Labs in five metros	Not stated; the authors say no ground truth exists for these flows	Academic authors; funding not recorded in the source record	Flows, not place visits; pandemic period	[96]
Kupfer et al. 2021, six western national parks	2021	Social Distancing Metric visitation patterns compared with National Park Service visitation statistics	6 national parks	Western US, 2019-2020	SafeGraph Social Distancing Metric	Park visitation patterns	Qualitative agreement: device records 'can effectively capture park visitation patterns'; no coefficient in the abstract	Not reported in the abstract	Academic authors; abstract only read (funding not stated: independence not established, round 3 R3-11)	Parks, not retail; abstract only	[97]
Liang et al. 2022, Yellowstone visitor counts	2022	POI visit series compared with NPS monthly visits, a calibrated trail counter and gate vehicle counts; POI validity check against Google Maps	2 POIs for correlations; 80 POIs checked	Yellowstone National Park, 2018-2020	SafeGraph Patterns and Core Places	Correlation of visit series with official and counter series; POI validity	Monthly r 0.88 and 0.85 with NPS visits; daily r 0.76 and 0.77 with a trail counter 700 m away; daily r 0.79 (2019) and 0.47 (2020) with gate counts; 40 of 80 POIs valid	p<0.001 for the monthly correlations	Academic authors	Strongly seasonal park series inflate correlations; levels not compared; not retail	[98]
Leslie et al. 2025, Advan and NPS visitation	2025	Weekly panel visits aggregated by sector compared with NPS visitation by visual inspection	10 most-visited national parks	US, January 2019 to January 2023	Advan Weekly Patterns (raw visit counts; about 35 million devices, about 10% sample, as described)	Agreement of park visit series	Pearson r 0.875	None; the authors call the comparison qualitative	Academic authors; data bought through a Dewey subscription (funding not stated: independence not established, round 3 R3-11)	Parks only; newest ground-truth data point found (January 2023)	[100]

STUDY	YEAR	DESIGN	SAMPLE	SETTING	FORMAT / CHANNEL	OUTCOME MEASURE	HEADLINE RESULT	UNCERTAINTY	SPONSOR	GENERALISABILITY	SRC
Choi 2024 (University of Minnesota Extension), Detroit Mountain	2024	Platform visit totals compared with automated trail counters and an intercept survey at one recreation area	1 site; survey n=116	Detroit Mountain Recreation Area, Minnesota, 29 May-6 September 2021	Placer.ai and StreetLight (vehicle trips times three passengers)	Visit totals, weekend ratio, visitor demographics	Placer.ai 13,233 (+30.5%) and StreetLight 14,544 (+43.5%) against 10,138 counter visits; weekend/weekday 7x on the platforms v 2.1x on counters; platform demographics differ from the survey	Authors report no statistically significant difference in totals	University extension case study; no funder or data arrangement stated (funding not stated: independence not established, round 3 R3-11)	One site; polygons differ, counters cover only the cross-country trails, events handled differently; not like for like	[101]
FHWA 2017 (RSG), locational app data for origin-destination analysis	2017	App location data compared with a smartphone GPS household travel survey	Not stated in the record	US, 2017	Cuebiq app location data	Demographic and trip-length bias	Biases in traveller age and income; trips longer than 9 miles over-represented	Not stated in the record	Federal Highway Administration (government report)	Travel survey, not visits; 2017 vintage	[104]
University of Washington bigdata4mobility 2022, Cuebiq sampling bias	2022	Device counts compared with block-group population by race, assuming no bias within block groups	11 metropolitan statistical areas	US MSAs; data vintage not stated	Cuebiq dataset (named in the title)	Device-to-population bias by group	Los Angeles: other race groups -9.60% against white -1.04%; pattern reversed in Boston and Seattle	Not stated	University research project (funding not stated: independence not established, round 3 R3-11)	Coverage, not visits; period not stated	[103]
Cabrera et al. 2026, representativeness of GPS mobility data in Mexico	2026	Two sources' coverage compared with the 2020 census	2,478 municipalities	Mexico; Veraset data 15-22 March 2020; 2020 census benchmark	Veraset multi-app data and Facebook data	Coverage bias	Multi-app data concentrate users in larger, wealthier, more digitally connected places; Facebook coverage higher and more even	Model-based; not recorded in this review	Academic preprint; UK ESRC funding (ES/Y010787/1), no conflict declared, public code (full text read 24 October 2026)	Non-US; coverage, not visits	[105]
Ten-city US data-production bias preprint 2025	2025	Tract-level models of data production against census demographics	10 US cities	US; period not stated on the abstract page	Mobility data, vendor unnamed	Data produced per resident by tract characteristics	Bias in all ten cities, specific to each; wealth, ethnicity and education predict data production	Not read (abstract)	Funding not stated	Vendor unnamed; cannot be attributed to a product	[108]

STUDY	YEAR	DESIGN	SAMPLE	SETTING	FORMAT / CHANNEL	OUTCOME MEASURE	HEADLINE RESULT	UNCERTAINTY	SPONSOR	GENERALISABILITY	SRC
UK four-dataset population-coverage preprint 2025	2025	Population coverage indicators for four app datasets against the 2021 census	4 datasets	UK, 2021 census	Single-app and multi-app mobile phone datasets	Coverage bias	Multi-app datasets do not necessarily reduce bias against single-app sources; phone data cover more of the population than national surveys	Not read (abstract)	Funding not stated	Non-US; coverage, not visits	[109]
App Tracking working paper (Bocconi abstract), supply after ATT	2022	iOS against Android ping frequency around Apple's ATT change, with matching and placebo tests	More than 7 million iOS and Android devices	Not stated in the abstract	One multi-app location data provider (unnamed)	Frequency of data collection from iOS devices	Collection from iOS devices decreases after the policy change, through devices becoming unobserved and fewer pings; more pronounced for visitors to privacy-sensitive places	Magnitudes not given in the abstract	Funding not stated; data presumably from the provider	One unnamed provider; abstract only	[110]
Gordon, Zettelmeyer, Bhargava and Chapsky 2019	2019	Observational lift methods benchmarked against randomised controlled trials	15 RCTs; 500 million user-experiment observations; 1.6 billion impressions	US Facebook advertising campaigns, 2015	Online ads; purchase and other online outcomes	Error of observational lift against experimental lift	Matching and regression methods mostly overestimated lift; in half of the studies purchase lift was off by a factor of three across all methods	Per-study confidence intervals in the paper (not charted here)	Academic-Facebook collaboration on Facebook data; two coauthors affiliated with Facebook; the Kellogg academics declare no financial interest	Online outcomes, not panel-detected store visits	[111]
Gordon, Moakler and Zettelmeyer 2023, 'Close Enough?'	2023	Double machine learning and stratified propensity-score matching against RCTs	663 RCTs; more than 5,000 user features	Facebook advertising experiments	Online ads; funnel outcomes	Median lift by method and funnel stage	Median RCT lift 29% / 18% / 5% (upper, middle, lower funnel) against DML 83% / 58% / 24% and SPSM 173% / 176% / 64%	Abstract only; per-experiment error statistics not read	Facebook experiment data; authors' affiliations as given in the paper	Online outcomes, not panel-detected store visits	[112]

STUDY	YEAR	DESIGN	SAMPLE	SETTING	FORMAT / CHANNEL	OUTCOME MEASURE	HEADLINE RESULT	UNCERTAINTY	SPONSOR	GENERALISABILITY	SRC
Lewis and Rao 2015, the unfavourable economics of measuring returns	2015	Power analysis of randomised field experiments with sales outcomes	25 field experiments; US$2.8 million of spend	Yahoo!, major US retailers and brokerages, before 2015	Online display ads; individual sales	Precision of return-on-investment estimates	Median confidence interval on ROI over 100 percentage points; individual sales coefficient of variation about 10; more than 10 million person-weeks needed for an informative test	As stated (interval widths)	Authors former Yahoo! employees, as acknowledged	Sales, not visits; visit outcomes are more frequent, which changes the power arithmetic	[113]
Lewis and Reiley 2014, online ads and offline sales	2014	Individual-level randomised experiment with matched retailer purchase records; observational estimators run on the same data	1.6 million retailer customers	Yahoo!, one major US retailer, before 2014	Online display ads; in-store and online purchases	Purchase lift; bias of observational estimators	5% purchase lift, 93% of it in stores and 78% from people who never clicked; a cross-sectional estimator showed a negative bias three times the experimental effect	As reported in the paper (abstract read)	Yahoo! research	Purchases matched by customer record, not visits detected by location; the bias runs opposite to the overestimates above	[114]
Johnson, Lewis and Nubbemeyer 2016, ghost ads	2016	Ghost-ad control (counterfactual exposure logging) against PSA and intent-to-treat designs	One retailer's display retargeting campaign	Online display, before 2016	Display retargeting; website visits and purchases	Lift and cost of measuring it	Website visits +17%, purchases +11%; equal precision at least an order of magnitude cheaper; PSA experiments invalid under performance-optimising algorithms	As reported in the working paper	Authors affiliated with Rochester, Netflix and Google	Method demonstration; not applied to store visits measured by a location panel	[115]
Placer.ai visitation accuracy page		Vendor statement of testing against customers' first-party data and public sources; no method, sample or holdout	Not stated	US; undated	Placer.ai projected visits	Agreement with MLB attendance, transactions, store revenues, conference attendance and vehicle counters	No statistic published	None	Vendor	Not assessable	[102]

STUDY	YEAR	DESIGN	SAMPLE	SETTING	FORMAT / CHANNEL	OUTCOME MEASURE	HEADLINE RESULT	UNCERTAINTY	SPONSOR	GENERALISABILITY	SRC
Unacast ground-truth post, five manufacturing plants	2021	Vendor comparison of average workday foot traffic with 2019 employee counts from online sources	5 plants	US; 2019 reference; post published 25 February 2021, updated 5 August 2024	Unacast foot-traffic estimates	Agreement with headcount	'All other data matched within 20%', the Everett plant the only outlier; values only in an image	None	Vendor	Headcount is a proxy, not visits; five sites	[14]
Unacast foot-traffic accuracy statement		Vendor statement of fit against one unnamed nationwide clothing retailer's foot traffic	Not stated	US; undated	Unacast foot-traffic estimates	Fit to a retailer's foot traffic	R-squared 'of 91.6% or higher'	None; no places, period, sample or holdout stated	Vendor	Not assessable	[106] [14]
Azira white paper, extrapolated visits against ground truth	2025	Vendor assertion of comparison with 'ground truth sales data and foot traffic counters'; no study design, sample, period or places disclosed	'Millions of campaigns' (as stated)	Undated white paper (c. 2025)	Azira extrapolated total visits	Error of extrapolated against actualised visits	Median absolute percent error 10%; correlation 0.85	None	Vendor	Not assessable; vendor assertion	[5]
Huq footfall accuracy statement	2026	Vendor statement of regression testing against 'hundreds of authoritative external sources' (not named)	Not stated	Germany; post of 6 August 2026	Huq footfall estimates	Error against ground truth	Median MAPE 14.5%	None; sites and period not stated	Vendor	Non-US; references unnamed	[116]
Advan geofence accuracy guarantee	2019	Vendor quality assurance of geofence geometry by manual review	1.2 million locations of 1,541 brands	US; 11 June 2019	Advan geofences	Geofence accuracy	99.5% accuracy guaranteed	None	Vendor	Geometry, not visit counts	[117]

STUDY	YEAR	DESIGN	SAMPLE	SETTING	FORMAT / CHANNEL	OUTCOME MEASURE	HEADLINE RESULT	UNCERTAINTY	SPONSOR	GENERALISABILITY	SRC
Azira visit confidence scoring	2025	Vendor method description: polygons drawn from satellite imagery and POI data, with a confidence score	Not stated	US; 2025 documentation	Azira visit detection	Visit confidence	No error statistic	None	Vendor	Method description only	[5]
Cuebiq 2017 benchmark paper, citing MMA 2015	2017	Second-hand citation of an industry report gated behind a member login	Not stated	US; 2015 report cited in a 2017 vendor paper	Exchange-collected (bidstream) location	Accuracy within 100 metres	'Less than 33%' accurate within 100 m	None; sample and method untraced	Vendor citing an industry body's vendor-sourced figure	Not assessable	[118]

CHAPTER 5

How visit lift is measured

Most US visit-lift products compare exposed devices with a modelled or matched control, not with a group held out from the campaign. Of the nine cohort A products that document a default method, seven use no holdout, so H3 is contradicted. The comparator decides the number: one campaign reported 29% lift against its holdout and 310% against the open population. Every product that documents the basis of its visit totals projects them, though three also report observed counts.

IN SHORT

Of fourteen cohort A seed products, nine document a general visit-measurement method that governs their ordinary reporting, on documentation read on 24 October 2026 ◆. Six use a matched or synthetic control (Foursquare, InMarket, Reveal, Adsquare, Cuebiq, Arrivalist), two a randomised or holdout control (Azira's PSA holdout and Blis's geographic holdout), and GroundTruth reports exposed-only visits with no lift claim ◆. Seven of the nine documented methods are non-holdout; of the eight that claim lift, six are matched or synthetic, so H3 is contradicted under either count ◆. One undated PlaceIQ case reports a 29% lift against a standing holdout and a 310% "open lift" against the open population for the same campaign ◆. Azira is the only vendor whose opened public pages disclose numeric minimum-sample and significance rules ◆. Disclosed attribution windows run from 4 days to a 30-day look-back ◆. Where the basis is documented, visit totals are projected (Foursquare, InMarket, GroundTruth Projected Visits, Azira), with observed counts alongside at GroundTruth, Azira and InMarket; for nine visit numbers, Arrivalist's arrival counts among them, the basis is not disclosed ◆. No opened cohort A documentation names Samba, the author's employer, as a source of TV exposure data ◆. Among the products opened, only GroundTruth states a payment model, Cost Per Visit ◆.

H3 asks whether the visit-lift numbers that US location-attribution products report rest, by default, on randomised or held-out control groups. The rival hypothesis, from the author's glossary, is that footfall attribution is correlated and modelled by default; it is a hypothesis, not evidence. The registered test codes each cohort A product's documented default as randomised or holdout (ghost ads, PSA holdouts and geo-experiments included), matched or synthetic, or exposed-only, and H3 is contradicted when more than half of the products with a documented default use a matched or exposed-only design (chapter 13). A clarification dated 24 October 2026, written after extraction, fixed the decision tree: below four codable products, or at exactly half, the reading is unresolved, a product-wide method

description counts as the default even without the word "default", geographic holdouts count as holdouts, and a product that makes no lift claim is reported in a separate strict count. The clarification did not move the verdict; better sources did. This chapter uses the paper's terms from chapter 1: visitation counts visits after exposure, lift is a difference against a control, and a matched comparison is not causal evidence.

What each product counts

Visit definitions are thin in the public record. GroundTruth's Observed Visits counts a user's visit to the brand or "drive-to" location within 14 days of exposure to a GroundTruth ad, credited by last touch, and shows only visits verified after a 7-day period; its help centre says observed visits "may be lower than actual visits" ◆. Its places are Blueprints, polygons traced from satellite and street-view imagery in in-store, on-lot and retail-block layers; one GroundTruth article of 25 February 2026 counts "4.8M Blueprints" and another of 3 March 2026 "over 5 million" ◆ ◆. GroundTruth asserts, without a cited study, that radial geofences measure visits "with up to 75% inaccuracy" ◆. Azira draws polygons by hand from satellite imagery and builds its panel from SDK integrations and bidstream location signals from the bid requests of over 100,000 apps, with no panel size and no SDK-to-bidstream split stated ◆. Under this paper's definitions, location taken from a bid request is inferred location ◆. Adsquare matches lat/long to 2D POI polygons with "no fuzzy radius logic" ◆. Foursquare Attribution documents no visit-definition thresholds ◆, and Blis publishes no visit definition and no source for its footfall outcome ◆.

Where the basis is documented, the visit totals are scaled. Foursquare weights its panel to census block groups and applies "projection weighting" that scales matched panelists to each publisher's delivered impressions ◆. InMarket's console defines Overall Projected Store Visits as exposed device visits rated up by a device-to-DMA ratio, and Incremental Projected Store Visits as that total multiplied by the LCI Lift; only "Exposed Device Visits" are panel observations ◆. An incremental visit in an LCI report is therefore a projection multiplied by a matched-control lift ◆ ◆. GroundTruth's Projected Visits applies the visitation of a per-campaign panel of impressed devices to all impressed devices, appears once a campaign usually reaches 40 Observed Visits and 350,000 impressions, and reports no uncertainty ◆. Azira projects total visits by a Poisson detection model in which each observed device stands for 1/P(Detection) devices, only above about 1,000 observed visits and with the multiplier capped at 20x ◆. Across cohort A, the basis of the visit numbers is not disclosed for Blis, Reveal, Adsquare, Cuebiq, Vistar, Kochava, Lifesight and Precisely ◆. Chapter 4 covers how such numbers are validated.

H3: the default control is modelled

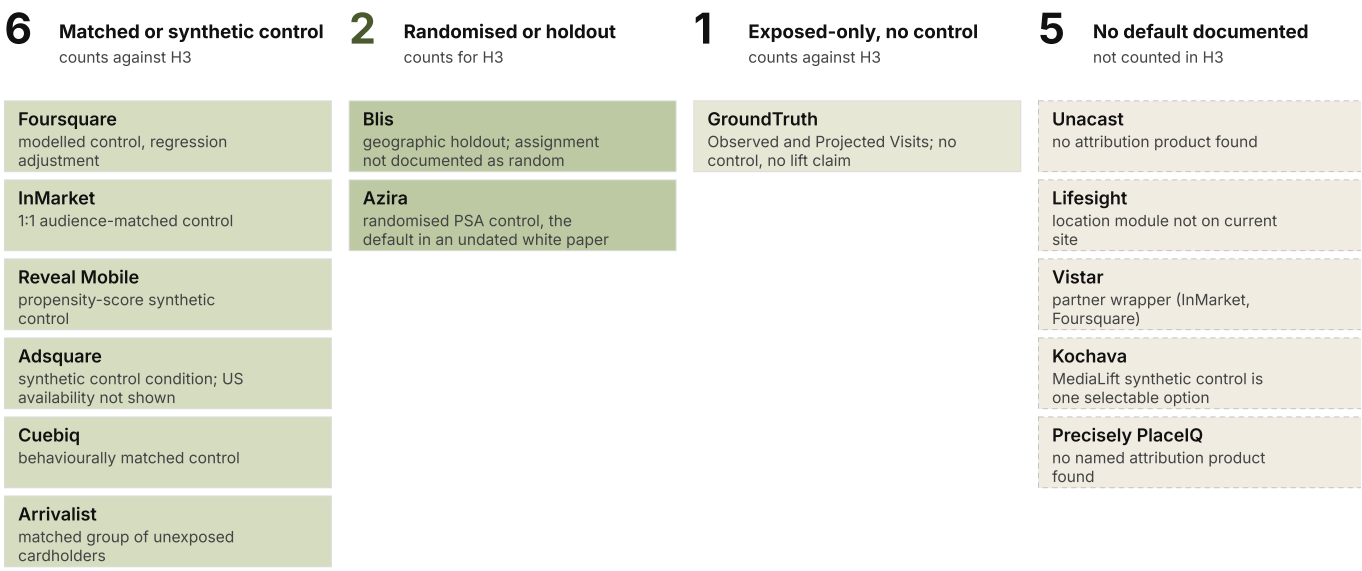
Nine of the fourteen seed products document a general method; five document none ◆. Vistar is a partner wrapper, Kochava lists MediaLift synthetic control as one selectable option, Precisely and Unacast have no named attribution product, and Lifesight's location module is not on its current site ◆. Under the clarified rule, D is 9 and N is 14.

PRODUCT	VENDOR'S DESCRIPTION OF THE COMPARATOR	H3 CODE	WINDOW	DOCUMENTED MINIMUMS AND UNCERTAINTY	VISIT BASIS
Foursquare Attribution	"Modeled control group" on 10+ attributes; 2022 post: regression adjustment to a synthetic control, then difference-in-differences ◆	Matched or synthetic	14-day example window plus 7 days of reconciliation ◆	Feasibility score, no numeric minimum or significance rule ◆	Projected ◆
InMarket LCI (also Campaign Incrementality)	1:1 audience-matched control on eight traits (undated console); synthetic control from historical visitation (July 2026 post) ◆ ◆	Matched or synthetic	Two weeks after versus two weeks before exposure ◆	10 million or 25 million impressions; standard error; ">95%" confidence (legacy console, read once, now behind a sign-in) ◆	Projected ◆
Reveal Net Lift Study (OOH)	Synthetic control by propensity-score matching from a "persistent panel of 60M US DAUs" ◆	Matched or synthetic	Not stated	Confidence intervals and p-values; no level stated as a rule ◆	Not disclosed ◆
Adsquare Attribution	Simulated "Synthetic Control Condition" in place of control groups; US not named as a market ◆	Matched or synthetic	Not stated	None stated ◆	Not disclosed ◆
Cuebiq measurement	Behaviourally matched control ◆; "causal machine learning to simulate a randomized control trial" ◆	Matched or synthetic	Not stated	None stated ◆	Not disclosed ◆
Arrivalist MediaInsights	Matched control of cardholders not exposed ◆	Matched or synthetic	Not stated	None; headline statistics render as zero placeholders ◆	Spend lift declared; arrivals not stated ◆
Azira Measurement	Randomised PSA holdout on 10-15% of impressions; synthetic control as the alternative ◆	Randomised or holdout	7 days (QSR), 14-30 days (auto) ◆	About 1,000 observed visits and 100,000 exposed devices; 99% intervals; two-tailed t-test ◆	Observed and projected ◆
Blis Smart Holdout Groups	Machine-balanced pairs of zip codes, one control and one target, with unserved buffer zones ◆	Holdout (assignment not documented as random)	Not stated	None stated ◆	Not disclosed ◆
GroundTruth Observed and Projected Visits	No control ◆	Exposed-only, no lift claim	14 days, last touch, plus 7-day verification ◆	Projected Visits shown from about 40 Observed Visits and 350,000 impressions; no uncertainty ◆	Observed and projected ◆

Seven of the nine documented methods are non-holdout, so M + E is 7 against a threshold of more than 4.5, and H3 is contradicted ◆. In the strict lift-claim count, which drops GroundTruth because it makes no lift claim, six of eight are matched or synthetic, and H3 is contradicted there too ◆. Adsquare's US availability is unconfirmed; dropping it leaves six non-holdout methods of eight ◆. Blis's pair designation is not documented as random ◆, and coding it as a matched geographic design would make the count eight of nine without changing the reading. The rival line does not hold for every product: Azira and Blis

document holdouts [◆]. Vendor documentation can lag practice, and a randomised design available on request does not count as the default under H3 [◆]. No randomised or holdout option appears in Foursquare's opened documentation [◆], and every lift design InMarket and its partners describe is matched or modelled [◆].

COHORT A PRODUCTS BY DOCUMENTED DEFAULT CONTROL DESIGN FOR VISIT LIFT



H3 is contradicted when more than half of the products with a documented default use a matched or exposed-only design. Documented defaults: 9; non-holdout: 7 of 9 (77.8%). Excluding GroundTruth, which reports visits without a lift claim, 6 of 8 are matched or synthetic. A matched comparison is not causal evidence under this paper's rules, whatever the vendor calls it.

> **Seven of the nine documented cohort A visit-measurement methods use no randomised or holdout control; of the eight that claim lift, six use a matched or synthetic control.** The 14 cohort A products in the register, by the control design their documentation gives as the general method for visit measurement, eight of them with a lift claim (final wording of LOC-E-F28, every code re-derived on 24 October 2026). Six use a matched or synthetic control and one reports exposed-only visits; of the two holdout designs, Azira's randomised PSA control is documented as its default in an undated white paper, and Blis's geographic holdout is machine-balanced, with no documented random assignment. Five products document no default.
>
> Units: products · Scope: cohort A products in the product register, US, at the cutoff · Sources [119] [119] [120] [17] [17] [121] [6] [6] [122] [19] [19] [123] [124] [20] [5] [125] [21] [26] [22] [23] [24] [25] [27]
>
> Codes describe documented defaults, not the design of any delivered study; a vendor may run a holdout on request. The count is bounded to the 14-row register.

Vendors describe these designs in stronger terms than the designs support. Foursquare's product page calls its output "incremental lift" while its blog and metrics page call it "behavioral lift" [◆], a term no opened page defines [◆]. InMarket calls its synthetic-control Visit Lift causal [◆]. Adsquare says its model "removes reliance on traditional control groups" [◆]. Under this paper's codes, language that describes a matched or synthetic design as simulating or replacing a randomised trial does not move it out of the matched class [◆].

The two holdouts

Azira's methodology page (footer 2025) is the only cohort A document opened in stream C that names a randomised control as the default: 10-15% of impressions serve public-service creative as a PSA holdout ◆. Its own Domestos case from Rize, Turkey reports an exposed footfall rate of 1.672% against a control rate of 1.168%, presented as a 43% increase in store traffic, without stating the control design, window or dates ◆. A buyer therefore cannot tell from that published result which of Azira's two designs produced it ◆. The Google-affiliated authors of ghost ads designed the method to measure lift without PSA controls, which they say become invalid under performance-optimised delivery ◆.

Blis announced the US rollout of Smart Holdout Groups on 11 July 2024 and the global release on 9 October 2024, and says footfall lift is "Only available in the US" ◆. Areas are scored on seven data points including demographics, household characteristics and income, similar areas are paired with one designated control and one target, and buffer zones built from Blis movement data are left unserved and unmeasured ◆. On its product page, launch releases and technology page, Blis publishes no visit definition, outcome source, minimum sample, significance rule, confidence interval or projection method for it, and states that its measurement "can be independently verified" ◆. The geographic experiment is a published design: Google's 2011 method assigns non-overlapping regions at random to treatment or control ◆. Blis's documents do not say its designation is random ◆. The 55% "store visit uplift (control vs exposed)" in Blis's US restaurant case was published on 12 September 2019, about five years before Smart Holdout Groups were announced ◆.

The comparator decides the number

On one PlaceIQ campaign, changing the comparator multiplies the lift by 10.7. In that undated case for a national big-box retailer, exposed devices visited at a Place Visit Rate of 2.75% against 2.13% for a standing 10% holdout never served a PlaceIQ ad, a 29% lift; against the open population, at 0.67%, the same campaign shows a 310% "open lift" ◆. The document says how the holdout is maintained but not how it is selected, and it does not show whether PlaceIQ, now owned by Precisely, runs the design today ◆. Precisely's audience product page documents no named PlaceIQ attribution product ◆.

Published lift figures rarely carry the comparator's rate. Foursquare's linear-TV QSR case reports 1.32% behavioral lift with 3.4M+ incremental and 58.9M total attributed store visits, and its product page reports a "23% lift in in-store visits among exposed users versus the control group", none with exposed and control rates, sample, period or control construction ◆. InMarket reports 121 of 126 TikTok campaigns with "statistically significant lift" (2024; a footnote gives a base of 121) and a 26% incremental visit lift against a 23% benchmark for an unnamed dining chain (2026), with no design, base or uncertainty beyond its own descriptions ◆. Vistar's Foursquare-measured retail case (August 2021 to January 2022) reports a 6.51% lift in visitation "compared with non-exposed consumers" without describing the control ◆. Simpli.fi, which is not a seed product, defines its 31.76% "Geo-Conversion Lift" as the difference between visitors who received an ad and visitors who did not, with no matching described ◆. Cuebiq's benchmarks show how vintage and definition move the norm: its 2017 paper put retail uplift at 10-30% ◆, while its 2022 report, on 2020-21 campaigns, put the medium retail band at 1.01-7.61% ◆.

In the academic record, observational estimates miss experimental lift by wide margins, and not always in the same direction. On 15 US Facebook campaigns run as randomised trials, matching and regression methods mostly overestimated lift relative to the experiments ◆. Across 663 Facebook experiments, median randomised lifts of 29%, 18% and 5% by funnel stage compared with 83%, 58% and 24% from double machine learning and 173%, 176% and 64% from stratified propensity-score matching ◆. Those are online outcomes on platform data, not store visits ◆. In a randomised Yahoo! experiment with 1.6 million retail customers, a cross-sectional observational estimator showed a negative bias three times the size of the experimental effect, so it understated the effect ◆.

Samples, significance and windows

Azira is the only vendor whose opened public pages disclose numeric minimum-sample and significance rules: about 1,000 observed visits and 100,000 exposed devices, 99% confidence intervals and a two-tailed t-test ◆. InMarket's LCI console states minimums of 10 million impressions for mobile app and 25 million for mobile web or desktop per measured dimension, a standard error and a ">95%+" confidence rule ◆, but stream C placed that glossary behind a sign-in and could not verify it from a public route ◆. Reveal discloses confidence intervals and p-values without a numeric minimum, Vistar states only that it requires "enough scale", and Foursquare, Cuebiq, Adsquare, Blis, Simpli.fi and GroundTruth state none on the pages opened ◆. Foursquare releases reports once results are "statistically viable", a criterion it does not define ◆. Scale matters: across 25 randomised retail and brokerage experiments, the median confidence interval on return on investment was over 100 percentage points wide, and informative experiments can need more than 10 million person-weeks ◆.

Windows vary as much as controls. Disclosed windows run from 4 days (Vistar with Foursquare, DOOH) through 7 days for QSR and 14-30 days for auto (Azira), 14 days plus a 7-day verification lag (GroundTruth), two weeks before and after exposure (InMarket), to a 30-day look-back (Simpli.fi) ◆. In one 2017 Cuebiq campaign, 37% of exposed visitors arrived within 2.6 days and 14% between 10.5 and 13 days, so the window alone moves a visit count materially ◆.

A formula that does not compute

Azira's white paper defines lift as (exposed rate - control rate) / control rate, then computes incremental visits as "Exposed Group Lift * Exposed Group Devices" ◆. Read literally, that multiplies a relative lift by a device count. Under the paper's own definition, incremental visits are (exposed rate - control rate) x exposed devices ◆. InMarket's console has a related problem: it gives two denominators for LCI Lift on the same page, "Visits" in the glossary and "(Exposed Visits + Control Visits)" in the calculations ◆. A buyer who recomputes a reported incremental figure needs the formula actually applied.

TV to visit

No opened cohort A documentation names Samba as a source of TV exposure data ◆. The author is employed by Samba, so this finding records only what the measurement vendors'

documentation says ◆. Foursquare infers TV exposure by joining viewership data with ad run-logs and names no viewing-data supplier ◆. Cuebiq takes linear TV exposure from broadcast partners' impression logs at household level, without naming them ◆. GroundTruth's help centre (2021, not since updated) says CTV-to-store visits rely on TapAd converting IP addresses to mobile ad IDs, an extra match before the location step ◆. Blis's privacy centre lists Samba TV among its ad-effectiveness partners with Cuebiq, Foursquare, InMarket, Kochava and Lifesight, and no source says which, if any, supplies Smart Holdout Groups' footfall outcomes ◆. Samba TV's consumer site refers business visitors to samba.com, which this review did not open ◆. CTV or TV is a named channel for Foursquare, InMarket, Azira, Blis, Cuebiq and Arrivalist; a listed channel is a claimed capability, not evidence of production measurement in it ◆.

Who pays

GroundTruth is the only product whose opened pages state a payment model: Cost Per Visit, introduced in spring 2017, under which "marketers only pay for ads that result in a store visit"; among the other thirteen products the opened pages state no payer or fee ◆. A November 2024 case reports an auto dealers' association paying "only for verified visits" for "over 1,200 visits" in a month, with no cost, impressions or control ◆. Inference: under Cost Per Visit the seller of the media also counts the exposed-only visits it bills on, and this review found no independent audit of that billing ◆. Vistar's activation guide says its partner studies "require a feasibility test and have varying minimums and costs", and that it offers device ID passback for free ◆. Foursquare documents no pricing ◆. InMarket's visit-lift measurement reaches buyers through partner platforms (TikTok from 2024, Reddit for all US advertisers from 12 November 2024, Vistar for US DOOH, Basis from 27 May 2026) as well as its own console and exports ◆. Its Maestrø beta, announced on 18 June 2026, includes a fully managed "Guaranteed iROAS" offer ◆; inference: a vendor that guarantees a return and measures it sits on both sides of the guarantee ◆.

No lift, incrementality or attribution metric of a location product is recorded in the 35 MRC communications from January 2020 to October 2026 screened by name or on the current lists; both MRC location accreditations on record since 2020 covered data sets ◆. MRC's 2017 location guidelines contain no provision on visit lift, incrementality or control groups ◆. Foursquare's Visits data-set accreditation was granted in 2020, suspended in October 2022 and revoked in December 2022, and its own 2020 release said Attribution had not been audited or accredited ◆. Chapter 8 has the assurance record.

What would change the reading

H3 would move if the matched-default vendors documented a randomised or holdout control as their ordinary design, or if Azira and Blis published results that state which design produced them. A buyer can ask for the same things now: the control's construction and visit rate beside the exposed rate, the window, the minimum sample and significance rule, whether the visit totals are observed or projected, and the formula that turns a lift into incremental visits. Chapter 12 turns these into questions.

CHAPTER 6

How location audiences are built

A location audience is a set of devices that a vendor says were at a place, or are at one when the ad is served. Vendors document the shapes they draw and the time windows they use. The documentation opened gives no current source mix, no fix accuracy with a method and no test of whether a segment reaches the people it names. On that record H4, the registered test of bidstream against SDK sourcing, cannot be decided.

IN SHORT

Foursquare Audience qualifies devices on past visits, with high, medium and low frequency buckets and a look-back of up to 18 months; Foursquare Proximity is a real-time radius with no look-back ◆ ◆. No cohort B documentation opened by 24 October 2026 states a fix-accuracy threshold with a method or a detection error statistic ◆. H4 is unresolved: in the documentation opened, no product documents a primary source; Foursquare and InMarket disclose several sources without naming a primary one, and Azira and GroundTruth disclose blends without proportions ◆. Bidstream appears as a documented source in the FTC's Mobilewalla order, on Azira's data page, in GroundTruth's help centre and on Vistar's partner page for GroundTruth ◆ ◆ ◆. Sensitive-place handling sits in vendor privacy documents as self-attested policy, alongside FTC orders that impose programmes on InMarket, Mobilewalla, and Kochava with Collective Data Solutions ◆. In the documentation opened, this review found no independent on-target or accuracy validation of a location audience with a published design ◆. T-Mobile's enhanced, location-enriched audience segments, announced on 5 October 2026, are available for out-of-home (OOH) targeting only through Vistar Media, which T-Mobile owns; its app-based segments have been there since May 2025 ◆ ◆.

How a device qualifies

The segment rules opened state a place geometry (a polygon or a radius) and a time window, and some state a frequency count; this chapter reads each rule on those terms (chapter 1). Foursquare Audience, live in 2026, builds segments from past visitation with location-specific frequency buckets and a recommended look-back of 3 to 6 months, and is sold off the shelf on The Trade Desk, LiveRamp and DV360 ◆. Its minimum segment size is 5,000 devices in the FAQ and 10,000 on the requirements page, and it is priced at US$1.50 CPM "in most scenarios", against US$0.75 for Proximity ◆.

PRODUCT	WHAT QUALIFIES A DEVICE	TIME WINDOW AND FREQUENCY	EVIDENCE
Foursquare Audience	Past visits to a place	3 to 6 months recommended, up to 18; high, medium and low frequency buckets	◆ ◆
Foursquare Proximity	Inside a radius geofence, validated against the impression's lat/long	Real time, no look-back	◆
GroundTruth Ads Manager	Target Locations (city to business address or lat/long); Target by Audience (historic visitation); Target Neighborhoods (trade-area lookalikes); Target On-Premise (In Store, On Lot, Retail Block, Radial)	On-Premise is real time and mobile only; Target by Audience uses historic visitation	◆ ◆
Adsquare ID-Precise Audiences	Mobile advertising ID (MAID) segments from "verified visits, offline purchases"; home and work at postcode level	Look-backs of 14, 30, 90 and up to 180 days	◆
Adsquare Geo-Contextual Audiences	No device ID; a postcode, H3 cell or polygon	Scored by the hour	◆
Simpli.fi Addressable Geo-Fencing	Any device seen within parcel plat lines, up to one million addresses per campaign	Up to 30 days, "variable recency settings"	◆
InMarket GeoLink	Block-level geo-audiences, point-of-interest geofences, past store visitors	Geofences in real time; retargeting on past visits	◆

Precision is asserted by geometry, not by a threshold. The one numeric figure found is Azira Audiences' "within 3 meters of precision", with no method. GroundTruth On-Premise is "strictly inside the physical building walls", Simpli.fi uses parcel plat lines, Adsquare offers "precise polygons or custom radii" alongside postcode and H3 cells, and GroundTruth also sells coarse ZIP, state and DMA options ◆. GroundTruth names the tests it applies to each location signal and visit, among them stale, outlier, drive-by speed and open-store hours, and rejects centroids and carrier-IP locations, but publishes no numeric threshold for dwell, horizontal accuracy or speed ◆. Foursquare Proximity is delivered where "your ad platform is able to validate that a user is within the radius boundaries of the geofence by matching the lat/long of the impression" ◆. This paper infers, from that wording alone, that delivery rests on the coordinate carried in the bid request.

GroundTruth and InMarket also sell catalogues built by models. Since ZeroToOne.AI's acquisition, GroundTruth sells "Predictive AI Audiences" from the acquirer's model, built from visitation, interests, transactions, digital engagement and demographics. They are marketed at "over 90%" predictive accuracy with no published definition, and the catalogue went from an "initial" 40 segments in June 2026 to "1,500+" in October 2026 ◆. InMarket sells 10,000+ syndicated segments and GeoType personas built by machine learning on 1,000+ attributes ◆. A Vistar-hosted GroundTruth page states one example segment with both a frequency and a window: "Visitors who visited general clinics at least 1 time in the past 120 days nationwide" ◆.

Where the location comes from: H4

H4 is unresolved: in the documentation opened, no cohort B product documents a primary source of location ◆. H4 says that location-based audience and targeting products sold in the US at the cutoff rest mainly on bidstream or IP-derived location rather than on SDK- or panel-observed location. As registered, it is unresolved if fewer than four cohort B products

document a primary source or if the bidstream-or-IP and SDK-or-panel counts are equal, and blends without proportions are excluded from both counts. A clarification dated 24 October 2026, written after extraction in response to external review rounds 2 and 2b, counts only products documenting one of those two families as primary (b for bidstream or IP, s for SDK or panel), makes H4 unresolved if b + s is below four or b equals s, and lists products with other primary sources, blends without proportions or no source separately. It is a substantive change to the population, and H4 is unresolved under both readings (chapter 13). A verifier's two SDK-primary codes do not stand after review ◆.

PRODUCT	SOURCES ITS OWN DOCUMENTS NAME	H4 CODE	EVIDENCE
Foursquare Audience	Its own apps, with opt-in precise or background location; SDK and API partners that "may license data to us"; data suppliers, brokers and ad networks	Several sources, primary not established	◆ ◆
InMarket Audiences	Its own apps (CheckPoints, ListEase, Key Ring, Subscription Stopper, Out of Milk), a partner SDK app network, unnamed "trusted & certified third-party sources"	Several sources, primary not established	◆ ◆
Azira Audience	"premium SDK, bid-stream, and verified consumer transactions"	Blend, proportions not disclosed	◆ ◆
GroundTruth Ads Manager	Privacy policy: SDKs and scripts, publishers, service providers, consumer data resellers. Help centre: WeatherBug, direct app partnerships, SDK integrations and the bid-stream	Blend; one proportion, from 2018	◆ ◆
Blis	Stream F could not read the product pages; the audience page read for the profile names no collection route; the company notice names GPS and IP-derived location from data partners, SSPs, exchanges and clients	Not disclosed for the product	◆ ◆ ◆
Adsquare, Mobilewalla, Simpli.fi, Reveal, Precisely Audiences	"Vetted partners", third-party ad-tech providers, GPS or "anonymized mobile signals", with no collection route	Route not stated	◆ ◆ ◆ ◆ ◆
Broadsign Ads (registered; US availability unconfirmed, so outside the count)	Native Touch data "pulled from active application SDKs and APIs"	SDK via a named partner; outside the count	◆

GroundTruth's only proportion, "90% of our location signals" from WeatherBug, app partnerships and SDK integrations, sits in a help article last edited in April 2018 ◆. GroundTruth's privacy policy, effective 2 April 2026, does not use the words bid request or bidstream ◆. The regulator records describe both routes before the orders. The InMarket complaint described collection through InMarket's own apps and through third-party apps using its SDK ◆, and the FTC alleged that Mobilewalla collected bidstream data, an allegation rather than a finding ◆.

Bidstream, where it is documented

The FTC's Mobilewalla order (Docket C-4811), issued 13 January 2025 and announced as final on 14 January on a 4-1 vote, bars Mobilewalla from collecting or retaining information it accesses in online advertising auctions for any purpose other than participating in them. It is the only regulator record in stream F that documents bidstream as a cohort B location source ◆. Mobilewalla's business notice, updated 9 January 2026, says all its data comes from third-party ad-tech information providers and names the movement-data fields (MAID, latitude and longitude, IP, timestamp) without saying whether they come from

SDKs or bid requests ◆. The same notice says Mobilewalla sold personal information to clients and ad-tech partners in the last year, and its site sells Audience Segments and "Location-Based Marketing" with no stated precision class ◆.

Azira's privacy policy, updated 6 August 2025, names bid requests it receives when acting as a DSP, alongside third-party providers, data brokers and app-collected movement data ◆. InMarket's GeoLink applies a machine-learned "Location Score" to the location carried in ad requests before bidding, so InMarket's targeting uses bidstream location as a filtered input alongside SDK data ◆. Blis's August 2021 press kit cited "18 billion" ad requests a day and a "Smart Pin" filter that discards about 80% of raw location data ◆. Simpli.fi says it uses "GPS data paired with plat lines" and rejects IP because of truncation, without saying where the GPS fixes come from ◆.

OpenRTB 2.6 lets a request state whether its location came from GPS, IP or the user, with accuracy in metres and the age of the fix ◆. Google's Authorized Buyers documentation, last updated 17 September 2026, says bid-request location comes only from IP geolocation, with lat and lon limited to 0.01 degrees ◆. Thinknear's vendor-run index put 32% to 37% of location-bearing impressions or location data within 100 metres of the user in its 2014 to 2016 editions, and a reseller deck advertising the Q4 2017 index shows 37% on an unlabelled slide (chapter 4) ◆ ◆.

Sensitive places: vendor policies and FTC orders

None of the cohort B product pages opened describes sensitive-place suppression, but vendor privacy documents do. Foursquare commits to the Network Advertising Initiative (NAI) enhanced standard and lists 13 sensitive-place categories. Mobilewalla says it does not knowingly collect visits to places of worship, shelters, treatment centres or reproductive health clinics, and Azira describes a programme that removes sensitive locations from its datasets. These are self-attested statements with no verified enforcement ◆. GroundTruth's help-centre guidelines, updated 28 September 2026, define Consumer-Protected places (1-mile minimum; no device-level collection), Healthcare-Protected places (0.4-mile minimum for healthcare ads in WA, NY, CT, NV and CA; visits not tracked) and Prohibited places (no location targeting; visits not measured), each with a published category list ◆. GroundTruth's privacy notice that it "may sell your sensitive personal data" is a state-law disclosure and does not show that it sells sensitive-place visits ◆.

InMarket's FTC order, final on 1 May 2024, prohibits it from selling or licensing precise location data, as the order defines it, and, separately, from using, selling, licensing, transferring or sharing any product that categorises or targets consumers on sensitive location data ◆. Its sensitive-location ban covers the locations InMarket's own programme identifies, in nine categories; the order excludes coarse data at a radius of at least 1,850 feet and runs 20 years from issuance ◆. Mobilewalla's order covers ten categories with only a conversion exception and no direct-relationship consent exception ◆. The FTC's 4 May 2026 release on the Kochava settlement says Collective Data Solutions "has taken over Kochava's data broker business" and will be barred from selling sensitive location data without affirmative express consent ◆. On 24 October 2026, Collective Data Solutions' own site offered data feeds including "precision location (protected by Privacy Block)", audience targeting and competitor conquesting ◆. InMarket documents its own sensitive-place handling only as company-level statements, among them suppression of sexual and

reproductive healthcare providers and NAI membership ◆. At 30 June 2026 InMarket's privacy policy says it does not sell precise geolocation "in the plain language sense", while its state-law notice says it "sold (or shared for interest-based advertising)" coarse and precise geolocation to third-party partners and uses precise location to build audience segments ◆. This paper does not assess compliance with any order ◆; chapter 7 reads the orders and H5.

State laws change what vendors sell, by the vendors' own account. GroundTruth says that for locations in Maryland, Oregon, Virginia, New Jersey and Connecticut, from dates it gives between 1 October 2025 and 1 October 2026, visit tracking, On-Premise and Neighborhood targeting, radius targeting below 1 mile and audience building from new precise location signals are unavailable ◆. Foursquare requires a separate New York, Washington and Connecticut set with a minimum 3,000-foot radius for national Trade Desk Proximity segments, "to follow state privacy laws" ◆. The statutes read for this paper define precise geolocation by a radius of 1,750 or 1,850 feet ◆, so both vendors' minimums are wider than those radii.

Activation routes and channels

GroundTruth Ads Manager documents six channels: mobile, CTV and OTT, desktop and tablet, audio, digital out-of-home (DOOH) and direct mail. Azira's Advance DSP also documents six, so the two tie for the widest documented channel set among the products opened ◆. Azira, Vistar and Simpli.fi activate through their own platforms, while Foursquare, Adsquare, Reveal and Mobilewalla name external DSPs or marketplaces ◆. Foursquare's eligible-platforms page lists 26 activation platforms for Audience, including Meta, TikTok, Roku, Spotify and Vistar Media, and Vistar says over 2,300 Foursquare audiences are available in its DOOH DSP ◆. InMarket claims activation on "any" DSP and names one external DSP, Basis ◆. Blis activates through its own DSP and, from 17 June 2025, PMG's Alli Marketplace ◆. Outside its own platform, the only named route for GroundTruth audiences is Vistar's programmatic DOOH integration ◆. On The Trade Desk, Vistar's taxonomy is available through auction packages and private marketplaces, and third-party audiences must contain mobile device IDs ◆.

The accuracy statements that travel with these segments are vendor assertions without method. They include GroundTruth's "over 90% predictive accuracy", Foursquare's "industry's most accurate location-based datasets", InMarket's 3.7x against Wordstream display benchmarks, and Azira's 80-90% addressability. InMarket also says its data is "Comscore verified and Location Sciences certified" but publishes no certificate or scope ◆. Location Sciences audited several InMarket audiences in the first half of 2020 and rated them "Optimal"; the certifier's announcement does not say who paid for those audits, and no later audit or renewal was found ◆. In March 2021 the same certifier stated that Blis had threatened legal action after its Verify product reported "data manipulation"; Adweek reported that Blis denied the allegations ◆. Chapter 11 scores cohort B on this record.

Geofencing for local advertisers

Geofencing and geo-conquesting reach US local advertisers through at least three routes with different mechanics ◆. GroundTruth Ads Manager sells real-time On-Premise and "Pure Geographic" delivery to anyone inside a boundary, plus retargeting of a competitor's

past visitors, with no minimum spend ◆ ◆. Simpli.fi's Addressable Geo-Fencing turns up to one million street addresses into parcel-level fences drawn from property-tax and land-survey records, then follows "any device seen within those plat lines" with mobile, video and CTV ads for up to 30 days through a cross-device graph ◆. Reveal's Geofencing Solutions captures MAIDs at "your locations, competitor locations, and audience hotspots" for The Trade Desk, LiveRamp, Basis and social platforms, and names no source of device location ◆. In Simpli.fi's case studies a visit counts when a served device later enters a Conversion Zone around the store, an exposed-only design, and "Geo-Conversion Lift" compares visitors who received an ad with visitors who did not, with no matching described ◆. Under this paper's rules that is a visitation comparison, not incremental lift (chapter 5).

Telco data enters DOOH targeting

Vistar's own guide documents DOOH audience targeting from "aggregated and anonymized location data" plus third-party partners: Epsilon, Eyeota, InMarket and Affinity Answers ◆. T-Mobile's app-ownership and engagement segments have been on Vistar's self-service DSP since 6 May 2025 ◆. On 5 October 2026, Vistar announced enhanced T-Mobile segments that add "location insights", available only through the Vistar DSP; T-Mobile turns them into area-level audience scores that Vistar matches to screens ◆. Vistar's older T-Mobile partner page describes the segments as "built from app ownership data" from devices on T-Mobile's network ◆. AdExchanger, relaying T-Mobile's account, reported that its data for Vistar also includes mobile location data used to estimate inventory impressions, and for users who opted into location tracking T-Mobile can detect proximity to OOH ads and retarget on other channels ◆. T-Mobile's Jess Zhu attributed the exclusivity to tightening regulation of location data and mobile device IDs ◆. The same carrier owns Blis, whose DSP has carried T-Mobile US app data since 10 September 2025 ◆ ◆.

Vistar's wording and its legal notice point in different directions. The audience guide says DOOH targeting works "without ever relying on personal information", while the Services Privacy Notice says Vistar receives device location histories tied to device identifiers and sells and shares personal information ◆. On an undated page, Broadsign Ads names its mobility supplier and route: Native Touch data from "active application SDKs and APIs", collected once phones enter defined boundaries and turned into six targeting groups and over 190 personas per screen, with no panel size, consent route or region ◆. Broadsign's measurement page, by contrast, shows its partners as logos and documents no provider ◆. GroundTruth's DOOH product, launched through Place Exchange on 9 October 2025, captures mobile device IDs within viewing range of a screen when an ad plays and reuses them for retargeting ◆. Chapter 9 sets out the DOOH sources in full.

A buyer can ask each seller for the segment rule (geometry, dwell, window and frequency), the source mix behind it and any on-target test (chapter 12).

CHAPTER 7

What the law now forbids

Five FTC orders now bind the US location data companies they name, and only one, InMarket's, bans selling precise location data as such. The other four bar selling or using sensitive location data, and the X-Mode and Gravy orders do not ban selling precise location as such. Five states have since banned the sale of precise geolocation itself: Maryland, Oregon, New Jersey (from 30 June 2026), Virginia and, from 1 October 2026, Connecticut. At the cutoff three of the five ordered companies still document current offers of precise location to third parties, so H5, the regulatory-withdrawal hypothesis, is contradicted. This review reads product sets, not compliance, and nothing in it finds that any company breached its order.

IN SHORT

The FTC's orders against X-Mode/Outlogic and InMarket (April 2024) and against Gravy Analytics with Venntel and Mobilewalla (January 2025) run 20 years; the Kochava order, entered by a federal court on 25 June 2026 after almost four years of litigation, runs ten ◆◆◆◆◆◆. InMarket's order bans selling or licensing precise location data, as it defines it; the X-Mode and Gravy orders do not ban the sale of precise location, and the Mobilewalla and Kochava terms reach sensitive location data ◆◆◆◆◆. Gravy told Norway's regulator that an intruder, who contacted it on 4 January 2025, obtained "some files"; the "millions of smartphones" figure is the intruder's claim ◆◆. Maryland (1 October 2025), Oregon (1 January 2026), New Jersey (30 June 2026), Virginia (1 July 2026) and Connecticut (1 October 2026) ban the sale of precise geolocation defined by a 1,750-foot radius; Washington bans geofences around in-person health care, and California defines precise geolocation by 1,850 feet ◆◆◆◆◆◆◆. In the searches logged, the one state attorney-general lawsuit against an alleged location data broker found for 2023 to 2026 is Texas's against Allstate and Arity ◆. Under the registered rule H5 is contradicted: Outlogic, Collective Data Solutions for Kochava and Gravy trading as Unacast document precise-location offers, Mobilewalla does not state the precision of what it licenses, and InMarket documents no such product ◆.

Five orders, one sale ban

Only the InMarket order bans selling precise location data; the other four reach sensitive location data ◆◆◆◆◆. The table reads each from the FTC's own record or, for Kochava, the court order.

ORDER	DATES	WHAT IT BANS	EXCEPTION	CLEAN-UP	TERM
X-Mode Social and Outlogic (C-4802)	Proposed January 2024; issued 11 April 2024; final 3-0-2, announced 12 April	Selling, licensing, transferring, sharing, disclosing or using sensitive location data (seven categories of Sensitive Locations); not precise location as such	Direct-relationship consent	Historic Location Data deleted in 60 days unless consented, or deidentified or rendered non-sensitive within 90; Data Products deleted in 90	20 years
InMarket (C-4803)	Issued 29 April 2024; final 3-0-2, announced 1 May 2024	Selling or licensing precise Location Data for any valuable consideration; products that categorise or target consumers on sensitive location data (nine categories)	Carve-out for compliance use	Own-app Historic Location Data deleted in 90 days unless the consumer consents to retention; third-party data deleted, deidentified or rendered non-sensitive in 120; segments built on it deleted in 120	20 years
Gravy Analytics and Venntel (C-4810)	Complaint and proposed order 3 December 2024; issued 13 January 2025; final 5-0, announced 14 January	Selling, disclosing or using sensitive location data (eight categories, adding military installations); not precise location sold to commercial customers	Direct-relationship consent; security, federal national-security and federal law-enforcement emergency uses fall outside Location Data	Historic Location Data deleted in 60 days unless, within 90, consent records are obtained or the data deidentified or rendered non-sensitive	20 years
Mobilewalla (C-4811)	Issued 13 January 2025; final 4-1, announced 14 January, Commissioner Holyoak dissenting	Using or selling sensitive location data (ten categories); collecting or retaining ad-auction data for any purpose other than taking part in the auction	Conversion to non-sensitive or non-location data only; no consent exception	Historic Location Data deleted in 90 days; Data Products in 120	20 years
Kochava and Collective Data Solutions (D. Idaho, 2:22-cv-00377)	Announced 4 May 2026 (Commission vote 2-0); entered 25 June 2026	Selling, sharing or disclosing sensitive location data without affirmative express consent, in the FTC's description	Consent limited to data used for a service the consumer directly requested	Historical Location Data deidentified or rendered non-sensitive in 90 days unless consent records are obtained	10 years

FTC LOCATION ORDERS: WHAT EACH BANS, AND WHAT EACH COMPANY DOCUMENTS AT THE CUTOFF

	What the order bans	Sensitive categories	Coarse carve-out	Term	Issued or entered	H5: still sells precise
X-Mode Social / Outlogic (C-4802)	sensitive only	7	1,850 ft	20 years	11 Apr 2024	yes
InMarket Media (C-4803)	all location data	9	1,850 ft	20 years	29 Apr 2024	no product found
Gravy Analytics, Venntel (C-4810)	sensitive only	8	1,850 ft	20 years	13 Jan 2025	yes
Mobilewalla (C-4811)	sensitive only	10	1,850 ft	20 years	13 Jan 2025	precision unstated
Kochava, Collective Data Solutions	sensitive only	5	1,850 ft	10 years	25 Jun 2026	yes
General Motors, OnStar (C-4828)	to CRAs, 5 years	n/a	not coded	20 years*	13 Jan 2026	n/a

Bans sale of all location data · Bans sale of sensitive location data only · Bans disclosure to consumer reporting agencies
H5: documents selling precise geolocation · H5: sells lat/long, precision not stated · H5: no such product documented
Not applicable (outside H5)

The coarse carve-out is the orders' example of data that is not location data (a zip code or census block with a radius of at least 1,850 feet; InMarket also excludes data deleted within 48 hours); it is not a threshold for precise. Mobilewalla is also barred from collecting or retaining auction data for any other purpose. Kochava's order was entered by the District of Idaho and bars sale and disclosure, not the defendants' own use. The X-Mode and Gravy orders also require a record of prior consent for collecting, using or disclosing any location data.
* GM/OnStar: a 20-year order with a five-year ban on disclosing geolocation and driver-behaviour data to consumer reporting agencies and a consent requirement for third-party disclosure; GM is outside H5's five companies. H5 is coded from each company's own current pages; compliance with the orders is not assessed.

> **Only InMarket's order bans selling location data outright, and three of the five ordered companies still document selling precise geolocation.** The five FTC location orders of 2024–2026 and the GM/OnStar order of January 2026, from the orders and the FTC's releases, with each ordered company's documented product set at the cutoff coded against H5 (final wording of LOC-H-F23). Outlogic, Collective Data Solutions for Kochava, and Gravy Analytics trading as Unacast document the sale or licensing of precise geolocation to third parties; Mobilewalla documents licensing device-linked latitude and longitude without stating its precision; InMarket documents no such product. Under the preregistered rule, H5 is contradicted.
>
> Units: order terms; categories; feet; years · Scope: FTC orders on location data, January 2024 to the cutoff, US · Sources [126] [127] [128] [129] [130] [131] [132] [133] [134] [135] [136] [125] [137] [138] [139] [140] [141] [142] [143] [144] [145] [146] [147] [148] [149] [150]
>
> Sensitive-location category counts are the numbered items in each order's definition and are not comparable across orders as a measure of strictness. Status-sensitive: product pages read in October 2026.

None of the orders defines "precise" by a radius. All five instead exclude coarse data, giving zip code or census block location with a radius of at least 1,850 feet as the example ◆. The Kochava order also leaves out of Precise Location Data any data used for security purposes, federal national security, or a law-enforcement response to an imminent risk of death or serious bodily harm ◆. The Gravy order puts its national-security carve-out in the definition of Location Data instead ◆.

The orders reach supply as well as sales. X-Mode/Outlogic and Gravy must run a Supplier Assessment Program, and from 90 days after the effective date neither may collect or use Location Data without a record of the consumer's consent ◆ ◆. InMarket must run a Sensitive Location Data Program and an SDK Supplier Assessment Program that confirms consent for SDK-supplied data ◆. Mobilewalla's case was the first in which the FTC alleged that collecting consumer data from real-time bidding exchanges was unfair; that documents an allegation that bidstream was among Mobilewalla's sources, not an admission or a finding ◆. Gravy and Venntel neither admit nor deny the allegations ◆.

Kochava fought for almost four years

Kochava's order came after almost four years of federal litigation ◆. The FTC sued in the District of Idaho on 29 August 2022, and the court granted Kochava's first motion to dismiss, with leave to amend, on 4 May 2023 ◆. The complaint described a data sample covering more than 61 million unique mobile devices in one week ◆. The First Amended Complaint followed on 5 June 2023, and the court denied the motion to dismiss it on 3 February 2024 ◆. Kochava then moved its data-broker business into a subsidiary, Collective Data Solutions (CDS), and a Second Amended Complaint naming CDS was filed on 15 July 2024. The court denied the motion to dismiss that one on 3 February 2025, and the stipulated order was announced on 4 May 2026 and entered on 25 June 2026 ◆. The former kochava.com/collective address now serves an app product page with no Collective content ◆.

Connected cars sit outside H5

On 14 January 2026 the FTC announced a final order against General Motors and OnStar, proposed on 16 January 2025, that bans GM for five years from disclosing consumers' geolocation and driver-behaviour data to consumer reporting agencies ◆. It is a connected-vehicle case and lies outside the five companies H5 covers ◆.

What Gravy confirmed about its breach

The Gravy incident is a security incident, not an enforcement action ◆. In an undated notice to Norway's Datatilsynet, Gravy Analytics, a Unacast subsidiary, said the intruder told it on 4 January 2025 of unauthorised access to its AWS cloud storage, apparently through a misappropriated access key ◆. It said the intruder obtained some files whose contents and personal-data status were under investigation, that it was still assessing whether the incident was a reportable personal data breach, and that its data-processing platform was operational again by 9 January 2025 ◆. Unacast's Texas registration, submitted on 9 January 2026, adds that a small subset of copied data, "covering primarily a few days around New Year's 2025", was briefly posted on a dark web forum ◆.

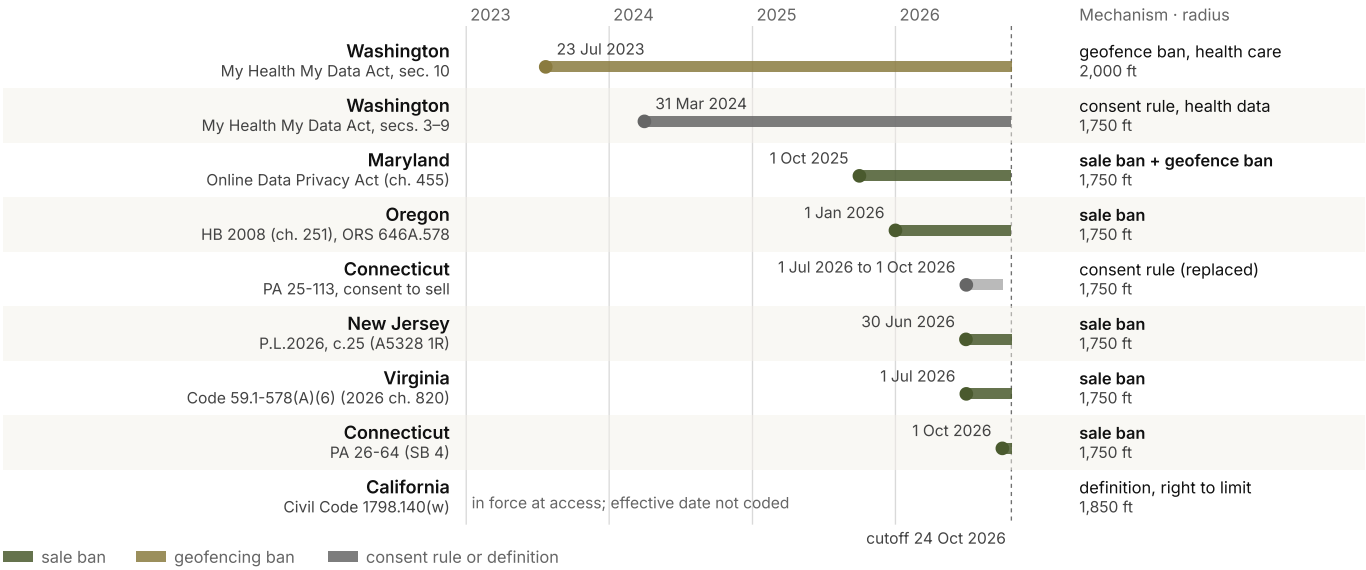
The widely cited scale, "several terabytes" and "historical location data of millions of smartphones", is the hacker's claim on a closed-access Russian-language forum, first reported by 404 Media ◆. In the sources read, the only other figure is security researcher Baptiste Robert's statement that his copy of the leaked dataset held more than 30 million location data points, by a method he did not publish ◆. 404 Media found much of the location data was inferred from IP addresses ◆.

Five states now ban the sale

Five states ban the sale of precise geolocation, New Jersey among them since 30 June 2026 ◆; Washington bans geofences around health care; California defines the term and runs a deletion system ◆ ◆ ◆ ◆ ◆ ◆.

STATE	INSTRUMENT	WHAT IT BARS	RADIUS	EFFECTIVE
Maryland	Online Data Privacy Act (2024 ch. 455, SB 541)	Sale of sensitive data, which includes precise geolocation, with no consent exception; geofences within 1,750 feet of mental health or reproductive or sexual health facilities	1,750 ft	1 October 2025 ◆
Oregon	Oregon Laws 2025 ch. 251 (HB 2008), amending ORS 646A.578	Sale of personal data that identifies a consumer's or linked device's present or past location, or of data on a consumer known to be under 16	1,750 ft	1 January 2026 ◆
New Jersey	P.L.2026, c.25 (A5328 1R), amending P.L.2023, c.266	Sale of sensitive data, including precise geolocation, by any controller regardless of consumer count; sale or licensing of sensitive data by data brokers and data collectors, with ten listed exemptions	1,750 ft	30 June 2026, immediately; the public registry follows after 270 days ◆
Virginia	Code 59.1-578(A)(6), added by 2026 Acts ch. 820 (SB 338)	Selling or offering for sale precise geolocation data, with no consent exception	1,750 ft	1 July 2026 ◆ ◆
Connecticut	Public Act 26-64 (SB 4)	Sale of any consumer's precise geolocation data by a controller or third party, replacing the consent-to-sell rule in force from 1 July 2026	1,750 ft	1 October 2026 ◆
Washington	My Health My Data Act (2023 ch. 191, ESHB 1155)	Geofences around in-person health care entities to identify or track consumers, collect consumer health data or send messages	2,000 ft geofence; 1,750 ft precise location	Geofence ban 23 July 2023; health-data duties 31 March 2024 ◆
California	Civil Code 1798.140(w) and (ae); Delete Act	Precise geolocation is sensitive personal information; data brokers register each January and process DROP deletion requests	1,850 ft	DROP from 1 August 2026 ◆

STATE RULES ON PRECISE GEOLOCATION, BY EFFECTIVE DATE



Bars run from the effective date to the cutoff. Maryland's ban covers sensitive data, which includes precise geolocation, with no consent exception; section 2 of its chapter makes section 14-4612 apply only to processing from 1 April 2026, which does not postpone the ban. Connecticut's PA 26-64 replaced the consent-to-sell rule of PA 25-113 and requires data brokers to register before selling from 1 January 2027. California defines precise geolocation at 1,850 feet and gives a right to limit its use, but bans no sale. Colorado, New Hampshire, Montana and other states were not opened. A law in effect has no documented effect until a source shows one.

> **5 states ban the sale of precise geolocation, all from dates between October 2025 and October 2026, each at 1,750 feet.** US state rules on precise geolocation opened in stream H, with the corrections of its verifier and the review rounds applied: Virginia's Code 59.1-578(A)(6) (effective 1 July 2026) and Connecticut's Public Act 26-64 (effective 1 October 2026) ban the sale of precise geolocation, joining Maryland (1 October 2025), Oregon (1 January 2026) and New Jersey (P.L.2026, c.25, 30 June 2026). Washington's My Health My Data Act bans geofences of 2,000 feet or less around health care entities and has done so since 23 July 2023.
>
> Units: effective dates; feet · Scope: state statutes opened by the cutoff, US · Sources **[151] [152] [153] [154] [155] [156] [157] [158] [159] [160] [161]**
>
> Only the states listed were opened; other states with precise-geolocation definitions were not swept. Virginia's effective date rests on the legislature's bill history; each act's coverage thresholds and exemptions apply.

Maryland's ban is subject to the act's coverage thresholds and exemptions, and a clause that limits one section to processing from 1 April 2026 does not postpone the sale ban [◆]. Virginia still requires consent for other processing of precise geolocation [◆]. Washington treats precise location that could indicate an attempt to obtain health services as consumer health data [◆].

GroundTruth says that for locations in Maryland, Oregon, Virginia, New Jersey and Connecticut, visit tracking, radius targeting below one mile and audience building from new precise signals are unavailable, and attributes this to state precise-geolocation laws [◆]. For national segments on The Trade Desk, Foursquare requires a separate New York, Washington and Connecticut set with a minimum 3,000-foot radius "to follow state privacy laws" [◆]. Placer names Washington's act and Nevada's SB 370 as reasons it withholds reports on in-person health care locations [◆]. All three are vendor assertions [◆ ◆ ◆].

What state attorneys general have done

Texas has brought the only state attorney-general lawsuit against an alleged location data broker found for 2023 to 2026, in the researcher's 14 searches and the verifier's 8 ◆. On 13 January 2025 the Attorney General announced a suit in Montgomery County against Allstate, two Allstate insurers and three Arity entities, under the Texas Data Privacy and Security Act, the Texas Data Broker Law and the Insurance Code ◆. The state alleges that Arity paid app developers to embed its SDK, naming Life360, and collected location and driving-behaviour data from over 45 million consumers without notice or consent; it calls the suit the first enforcement by a state attorney general under a comprehensive privacy law ◆. The petition pleads a Data Broker Law count against Arity, and the case remains in litigation ◆. Arity sells an advertising product, Arity Audiences, and on 16 October 2026 announced an agreement to buy substantially all of INRIX's assets ◆. In those searches no state attorney-general lawsuit against an advertising-technology company over location data was found ◆.

The other state actions found concern a carmaker, Google and one advertiser ◆. Texas sued General Motors and OnStar on 13 August 2024 over driving data that included GPS coordinates, and Arkansas, Nebraska and Iowa followed between February 2025 and February 2026; all four suits are allegations ◆ ◆. California's Attorney General and four district attorneys settled with GM for US$12.75 million over sales of location and driving data to Verisk and LexisNexis Risk Solutions, with final judgment entered on 12 May 2026 ◆. State attorneys general have settled with Google over deceptive location tracking at least six times between October 2022 and October 2025, from Indiana's US$20 million to Texas's US$1.375 billion, which also resolves incognito-browsing and biometric claims ◆. In 2017 Massachusetts bound Copley Advertising not to geofence at or near Massachusetts health care facilities to infer health status, after Copley had geofenced reproductive-health and methadone clinics in other states ◆. California's March 2025 sweep of the location data industry is an investigation, not a lawsuit ◆.

What the registries show

The data broker registries record what companies declare ◆. In California's file of 603 registrants that operated as data brokers in 2025, 115 self-report collecting precise geolocation, among them Collective Data Solutions, Outlogic, InMarket, Mobilewalla, Unacast and Venntel; Kochava Inc. is not listed ◆. Unacast and Venntel also answer yes to past-year sale or sharing with the federal government and other state governments ◆. On 24 October 2026 the Texas register's 456 records included Outlogic, Collective Data Solutions, Unacast and Venntel but not Mobilewalla, InMarket or Kochava ◆. Vermont's revised statute requires disclosure of precise-geolocation collection from 1 January 2027, and Connecticut requires data brokers to register from the same date ◆ ◆. A registration is a filing about collection in a past year, not evidence of what a company sold at the cutoff or an assurance of compliance ◆ ◆.

H5 is contradicted

H5 predicted that the five ordered companies would no longer sell precise-location or sensitive-location data products in the US at the cutoff. A clarification dated 24 October

2026, added after extraction following external review, sets precedence: one verified current US offer to sell or license precise location data to third parties contradicts H5, a current public offer is the test rather than proof of a sale, and a statutory notice of sales in the past twelve months is not on its own a current offer, and continued licensing is not a finding of an order breach ◆. The verdict does not depend on the clarification, because the original contradicted branch is met ◆.

COMPANY AT THE CUTOFF	WHAT ITS OWN PAGES DOCUMENT	READING
Outlogic (X-Mode)	It may "receive and sell the precise latitude and longitude coordinates of your mobile device"; data to license through data exchanges, platform partners or direct, via Snowflake, AWS S3 and a REST API; audiences through Eyeota and Adsquare; filtering of sensitive health-based locations in specific states	Precise offer ◆
Collective Data Solutions (Kochava)	"Data Feeds: License premium data including ... precision location (protected by Privacy Block)", with Privacy Block marketed as blocking health clinics, religious institutions and schools	Precise offer ◆ ◆
Gravy Analytics dba Unacast (with Venntel)	Location Data, Foot Traffic Data and MAID-to-hashed-email linkages; device-level location data for the US and abroad; Venntel sells location products to national-security buyers	Precise offer ◆ ◆
Mobilewalla	Movement data with MAID, latitude and longitude, IP and timestamp; personal information sold to clients and ad-tech partners in the past year; no precision class for what is sold	Unclear ◆ ◆
InMarket	Does "not sell (in the plain language sense of that word) or license to customers" precise geolocation, while its state-law notice lists precise geolocation "sold (or shared for interest-based advertising)" to Third Party Partners	No such product ◆

Unacast's offer survived a split. On 1 September 2026 Pine59 announced it had taken over Unacast's former Aggregated Location Insights business in a management buyout, yet Unacast's own pages still market device-level location data on 24 October 2026 ◆ ◆. InMarket's reading rests on its home page and privacy policy, the only InMarket pages read for H5 ◆.

The contradiction is about product sets, not breaches ◆. Because the X-Mode and Gravy orders do not ban selling precise location outside sensitive places, Outlogic's and Unacast's offers are not on their face outside those orders, and compliance with any order is not assessed ◆ ◆ ◆. Each of the companies that sells documents some sensitive-location suppression, from Outlogic's state filtering to CDS's Privacy Block and Unacast's PrivacyCheck, and each is the company's own statement ◆ ◆ ◆. Outlogic and InMarket also appear on the signatory page, last updated March 2025, of the NAI's Precise Location Enhanced Standards, a self-regulatory code ◆. Chapter 6 reads the audience products these companies sell, and chapter 11 scores the regulatory record under the privacy-posture dimension.

The instruments read

The instrument lists the state laws and registries read for this chapter. Each row describes the primary text as read; none is legal advice.

Rules and governance instruments

Official sources only for the rule text; industry guidance is marked as practice, not law. Nothing here is legal advice.

Machine-readable copy: data/rules.csv.

JURISDICTION	INSTRUMENT	WHAT IT REQUIRES	EFFECTIVE	SCOPE	LAW OR PRACTICE	SRC
Maryland	Online Data Privacy Act of 2024 (Ch. 455, SB 541)	Controller may not sell sensitive data, which includes precise geolocation data; no geofence within 1,750 ft of mental health or reproductive or sexual health facilities for consumer health data	2025-10-01	controllers subject to the act	sale ban + geofencing ban	[152]
Oregon	Oregon Laws 2025 ch. 251 (HB 2008), amending ORS 646A.578	Controller may not sell personal data accurately identifying a consumer's or linked device's present or past location within 1,750 ft, or personal data of a consumer under 16	2026-01-01	controllers subject to ORS 646A.570-589	sale ban	[153] [154]
Washington	My Health My Data Act (2023 c 191, ESHB 1155), sec. 10	Unlawful to implement a geofence (2,000 ft or less from perimeter) around an in-person health care entity to identify or track consumers, collect consumer health data or send them messages	2023-07-23	any person	geofencing ban	[151]
Washington	My Health My Data Act (2023 c 191), secs. 3-9	Consumer health data (including precise location information, 1,750 ft, that could indicate an attempt to obtain health services) collected or shared only with consent or as necessary for a requested service	2024-03-31 (small businesses 2024-06-30)	regulated entities and small businesses	consent rule	[151]
Connecticut	Public Act 25-113 (SB 1295), sec. 9 amending CGS 42-520	Controller shall not sell the sensitive data of a consumer (includes precise geolocation data) without the consumer's consent (superseded for sale by Public Act 26-64 from 1 October 2026)	2026-07-01	controllers subject to CTDPA	consent rule	[155]
Connecticut	Public Act 25-113 (SB 1295), sec. 15 amending CGS 42-529a	No collection of a known minor's precise geolocation unless strictly necessary, with a signal shown for the duration	2026-07-01	controllers offering online services to minors	collection limit	[155]
Virginia	Consumer Data Protection Act, Code 59.1-575 (definitions)	Precise geolocation data (1,750 ft) is sensitive data; the sale ban is in 59.1-578(A)(6), listed separately	2023-01-01 (not read here)	controllers subject to VCDPA	consent rule (by definition only)	[162]
California	CCPA/CPRA, Civil Code 1798.140(w) and (ae)	Precise geolocation (radius 1,850 ft) is sensitive personal information subject to the right to limit use; no sale ban	current at access	businesses subject to CCPA	definition + limit-use right	[161]
California	Delete Act data broker registry and DROP	Data brokers register January 1-31 each year; must process DROP deletion requests from 2026-08-01	2026-08-01 (DROP processing)	registered data brokers	registry + deletion mechanism	[163]
New Jersey	P.L.2026, c.25 (A5328 1R), amending P.L.2023, c.266	No controller may sell sensitive data, including precise geolocation, regardless of consumer count; no data broker or data collector may sell or license sensitive data (ten listed exemptions)	2026-06-30 (immediately; public registry provision after 270 days)	Controllers, data brokers and data collectors; precise geolocation within 1,750 feet	sale ban	[156]

JURISDICTION	INSTRUMENT	WHAT IT REQUIRES	EFFECTIVE	SCOPE	LAW OR PRACTICE	SRC
Virginia	Code 59.1-578(A)(6), added by 2026 Acts ch. 820 (SB 338)	A controller shall not sell or offer for sale precise geolocation data concerning a consumer	2026-07-01	controllers subject to VCDPA	sale ban	[157]
Connecticut	Public Act 26-64 (SB 4), secs. 14 and 15 amending CGS 42-520 and 42-521	No controller and no third party shall sell any consumer's precise geolocation data (communications content and utility smart-meter data excepted)	2026-10-01	controllers and third parties subject to CTDPA	sale ban	[159]

CHAPTER 8

Who checks the numbers

On 24 October 2026 none of the eleven accredited and under-review lists of the Media Rating Council (MRC) carried a US visit or visit-lift metric, so H6 is contradicted on that reading. Two location data sets held MRC accreditation from 2020, Foursquare's and GroundTruth's, and both lost it. MRC's only location standard dates from March 2017 and says nothing about lift. The rest of the assurance on offer is self-regulation, specification text and vendor statements, and Geopath, which publishes the US out-of-home audience currency, is on no MRC list opened.

IN SHORT

MRC's only location-specific standard is the Location-Based Advertising Measurement Guidelines, final Version 1.0 of March 2017, with no later update on MRC's index on 24 October 2026 ◆. The text contains no provision on visit lift, incrementality or control groups ◆. MRC's September 2018 presentation reported one accredited location service among six applicants, unnamed ◆. Foursquare's Visits data set was accredited in July 2020 and revoked in December 2022 ◆. GroundTruth's data set was accredited in July 2021 and later revoked after it withdrew, in a month the records leave unconfirmed ◆. Both covered data sets, not a lift or attribution metric ◆. On 24 October 2026 no visit, visitation, foot-traffic or location-determination metric was on any of MRC's six accredited or five under-review lists, so under the registered rule H6 is contradicted on that reading ◆. The Network Advertising Initiative's (NAI) precise-location enhanced standards had four signatories on a page last updated March 2025: Cuebiq, Foursquare, InMarket and Outlogic ◆. InMarket and Outlogic are under FTC orders ◆ ◆. OpenRTB 2.6 sets no rule on truncating coordinates, so exchanges and publisher configuration set precision ◆ ◆ ◆. Geopath appears on no MRC list opened, and MRC's out-of-home accredited list is empty ◆.

What the 2017 guidelines require

MRC issued the Location-Based Advertising Measurement Guidelines in draft for 30 days of public comment in November 2016 and finalised them on 29 March 2017, sponsored with IAB and the Mobile Marketing Association (MMA). MRC's standards index on 24 October 2026 lists them as issued March 2017 with no later update ◆. They cover how device and user location is assigned for physical visitation and ad exposure on mobile and static devices, including desktop and connected TV, and treat place measurement as the reference

for visitation and targeting. They are guidance and a benchmark for voluntary third-party audit, not a certification ◆.

The text separates accuracy, closeness to the true location, from precision, the number of decimal places, and requires both to be disclosed. A geofence is either a point radius or a boundary polygon. A physical visit is the intersection of device location and place, with speed or longitudinal analysis to exclude drive-bys, and the guidelines note that geofencing generally cannot represent multi-storey buildings ◆. Two decimal places of latitude and longitude place a device within about one kilometre, four within about ten metres and five within about one metre. The text warns that decimal count must not be equated with accuracy, encourages first-party ground-truth validation and sets a general expectation of less than 5% error on primary reported characteristics, with disclosure above that ◆.

On sources, the guidelines list GPS, Wi-Fi, IP, cell trilateration, registration data, beacons, panels and ad or bid-request location, and characterise mobile IP as generally neither accurate nor precise. Bid-request location should pass validation edit rules, and zip, DMA or state centroids should not stand for precise location unless reported at market level. Vendors using ad or bid-request data should disclose the active devices they observe daily, weekly or monthly and the number of measured visits ◆. Projections need a fully disclosed universe, and mixed assignment methods should be disclosed by share, along with whether assignment is probabilistic or deterministic ◆. The guidelines also require clear opt-in for location collection and a privacy policy stating why location is collected and how it is shared ◆.

The guidelines recommend annual third-party certification of every digital location-based measurement product used in buying and selling, without requiring it. Conformance to them ("built to MRC guidelines") and MRC accreditation are therefore distinct states, and only accreditation appears on MRC's lists ◆.

What they leave out

The 2017 text has no occurrence of "lift", "control group" or "incremental". MRC treats foot traffic as an outcome, and incrementality including randomised controlled trials, in its separate Outcomes and Data Quality Standards of September 2022, which require foot-traffic outcomes to follow the 2017 location guidelines ◆. The location standard governs how a visit is counted, and whether advertising caused it falls under the general outcomes standard ◆. In the 35 MRC communications from January 2020 to October 2026 screened by name for nine location vendors, and on the current lists, no lift, incrementality or attribution metric of a location product is recorded ◆. Of the nine cohort A products that document a general visit-measurement method, seven use no holdout; of the eight that claim lift, six use a matched or synthetic control (chapter 5) ◆.

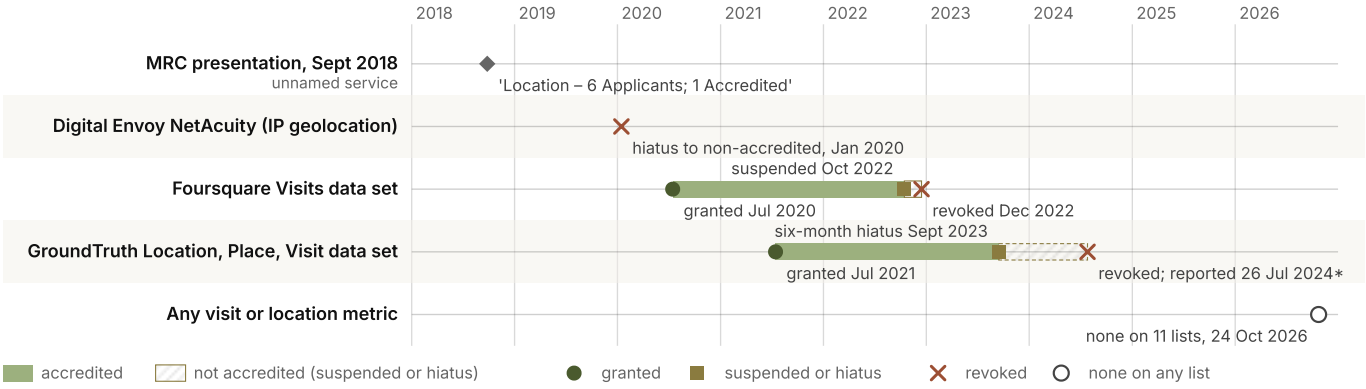
The accreditation record

MRC's own 2017 text noted that some US location products had then been "accredited by the MRC in some fashion", without naming them ◆. Its September 2018 presentation reported one accredited location service among six applicants, also unnamed ◆. The records

screened name three location services, and the table adds Epsilon's outcomes entry, which is not a visit metric ◆ ◆ ◆ ◆.

SERVICE	SCOPE IN MRC'S RECORD	GRANTED	ENDED	EVIDENCE
Unnamed location service	One of six applicants accredited	By September 2018	Not stated	◆
Digital Element NetAcuity (Digital Envoy)	IP geolocation	Not in the records screened	Moved from hiatus to non-accredited, January 2020	◆
Foursquare (formerly Placed) Visits data set	Location information reported in Visits data set	July 2020	Suspended October 2022; revoked December 2022	◆ ◆
GroundTruth Location, Place, and Visit data set	Data set	July 2021	Hiatus at its request, September 2023; revoked after withdrawal, reported 26 July 2024, month unconfirmed	◆ ◆
Epsilon Correlated Outcomes (online and offline)	Desktop, mobile web, mobile in-app; not a visit metric	Continued 1 October 2025	Current	◆

MRC ACTIONS ON LOCATION AND VISIT METRICS, 2018 TO 24 OCTOBER 2026



* MRC's communication of 26 July 2024 reports GroundTruth's accreditation revoked after its withdrawal from the process; the row is labelled February inside the April–June report, so the effective month is unconfirmed. MRC's September 2018 presentation (slide 9, ACA Executive Forums) reports one accredited location service among six applicants without naming the service or the metric (corrections ledger R2-114). Lists opened on 24 October 2026: 6 accredited-services lists and 5 services-under-review lists; visit or location entries found: 0.

No visit or location metric is on any of MRC's eleven lists; both visit data sets MRC accredited, in 2020 and 2021, have since lost accreditation. Every MRC action on a location, place, visit or IP-geolocation metric found in MRC's communications from January 2020, plus MRC's September 2018 presentation, and the state of its lists on 24 October 2026. Foursquare's Visits data set was accredited in July 2020, suspended in October 2022 and revoked in December 2022; GroundTruth's Location, Place, and Visit data set was accredited in July 2021, went on a six-month hiatus at its request in September 2023 and was reported revoked in July 2024. Foursquare said its Attribution product was not audited.

Units: dated MRC actions · Scope: MRC accredited-services and services-under-review lists and communications, US · Sources [164] [165] [166] [167] [168] [169] [170] [171] [172] [173] [174] [175] [176] [177] [178] [179] [180] [181]

Communications before January 2020 were not screened apart from the September 2018 presentation (LOC-NFA-S01), which names no service. Status-sensitive: lists read on 24 October 2026.

MRC granted Foursquare's accreditation in July 2020, suspended it in October 2022 and revoked it in December 2022, per its communications of 13 October 2020 and 24 January 2023. Because of the 2018 slide, the 2020 grant is not established as the first location accreditation ◆. Foursquare's 2020 release said Attribution "has not been audited or accredited by the MRC" ◆.

GroundTruth's accreditation came in July 2021, as MRC recorded on 20 October 2021, and covered a data set, not a visit-lift or attribution metric ◆. In September 2023 MRC granted a six-month hiatus at GroundTruth's request, during which the service was not accredited. MRC later recorded the accreditation as revoked "due to withdrawal from the MRC accreditation process", in a row labelled February inside its April to June 2024 communication of 26 July 2024 ◆. The effective month is unconfirmed ◆. GroundTruth's own pages still present the accreditation as current. Its August 2021 release carries no hiatus or revocation notice, and a comparison page last modified on 9 November 2023 says in the present tense that GroundTruth is "Accredited by the Media Rating Council (MRC)" for its place, location and visitation datasets ◆.

Digital Envoy's NetAcuity, the only other MRC-accredited location-determination service found in the communications screened, became non-accredited in January 2020 after Digital Envoy chose not to proceed with a new audit. No IP-geolocation service was on MRC's lists on 24 October 2026 ◆. Epsilon's Correlated Outcomes is the only accredited outcomes metric on MRC's digital list. Its letter cites impression, invalid-traffic and data-integration standards, not the location guidelines, and does not define offline outcomes as store visits, so it does not satisfy H6 ◆.

H6, coded by the rule

Under the registered rule, H6 is contradicted on MRC's lists as read on 24 October 2026 ◆. H6 states that at least one US footfall or visit-measurement product holds current MRC accreditation of its visit or visit-lift metric at the cutoff. The registered rule codes it contradicted when MRC's lists at the cutoff carry no accredited visit, visitation or visit-lift metric for any product. Lapsed or withdrawn accreditations are reported with their dates and do not change the verdict, and audits in progress confirmed by MRC are reported separately.

On 24 October 2026, none of MRC's six accredited-services lists and none of its five under-review lists carried a visit, visitation, foot-traffic or location-determination metric. The closest entries under review are Kevel's "Conversions and incrementality" and Kroger's attributed and incremental sales. MRC's April to June and July to September 2026 communications record no location or visit action ◆. The rule dates the verdict to the cutoff, 24 October 2026; a later change will be logged as a dated correction (chapter 13).

Read vendor by vendor, the lists give the same answer. On 24 October 2026 Blis, Foursquare, GroundTruth, InMarket, Placer, Unacast and Vistar appeared on neither MRC's accredited nor its under-review digital list ◆ ◆ ◆ ◆ ◆ ◆ ◆. InMarket's assurance claims (Comscore verification, Location Sciences certification and a Forrester TEI study) are not accreditations ◆. Location Sciences' certification of InMarket audiences dates from 2020, and no later audit, renewal or report was found, although InMarket's 2026 data page still

says "Location Sciences certified" ◆. Placer's documented certifications are information-security ones ◆.

Self-regulation: the NAI

The NAI's Precise Location Enhanced Standards were first issued on 22 June 2022 with Cuebiq, Foursquare and PlaceIQ as signatories, and reissued as "Updated and effective October 2024". The signatory page in the PDF, last updated March 2025, shows four logos: Cuebiq, Foursquare, InMarket and Outlogic. Within US activities the standards bar using or transferring activity correlated to a known sensitive point of interest (11 definitive and 2 non-definitive categories), and uses for law enforcement, national security or bounty hunting, subject to exceptions ◆. PlaceIQ, an initial signatory, is not among the four ◆.

NAI's 2020 Code defines precise location information as data from technology able to determine a device's actual physical location with reasonable specificity, and requires opt-in consent for its use in tailored advertising. NAI's February 2020 guidance describes three ways to make location imprecise: two or fewer decimal places, an area at least as large as a circle of 500 m radius, or a non-unique general descriptor of the place ◆.

Two of the four signatories are under FTC orders ◆ ◆. InMarket's order, finalised in May 2024, bars it from selling or licensing precise location data and from products that categorise or target consumers on sensitive location data ◆. The X-Mode order binding Outlogic, issued in April 2024, bars uses of sensitive location data and does not ban the sale of precise location data as such ◆. Outlogic's own site says the company may "receive and sell the precise latitude and longitude coordinates" of a device ◆. Foursquare's privacy policy says that, as a participant in the standards, it does not use or share activity correlated with 13 listed sensitive-place categories, a vendor statement ◆. Unacast cites NAI membership "in good standing" with "annual reviews", a self-regulatory status with no public product-scoped result ◆. Chapter 7 covers the orders.

Who sets coordinate precision

The specification does not. OpenRTB 2.6's Geo object carries latitude and longitude as floats, a type for the source (1 GPS or location services, 2 IP address, 3 user-provided), accuracy in metres, seconds since the fix and the IP location service. Coordinates should be passed only if they match the accuracy of the stated type, and a postal-code centroid should not be passed. The 2.6 text has no rule on truncating or rounding coordinates ◆.

Precision is set downstream. Google's Authorized Buyers documentation, last updated 17 September 2026, states that its bid-request location comes only from IP geolocation and that Google limits latitude and longitude to 0.01 degrees, a description of its own exchange ◆. Prebid's documented coarsening happens only when a publisher rule or a configured privacy module denies the transmitPreciseGeo activity. Prebid Server then truncates to two decimals and masks part of the IP address. The default is allow, and the Prebid Mobile Android SDK sets no precision limit by default ◆. Across these documents two decimal places is the recurring boundary between precise and coarse, but the bodies attach different distances to it. NAI's 500 m radius is about 6% smaller than the 1,750-foot radius in several

state laws ◆. MRC's 2017 text warns that decimal count must not be equated with accuracy ◆. In this paper's reading, a two-decimal rule therefore bounds precision, not accuracy.

OpenRTB remains the baseline in production: Google documents bid requests whose geo type is always IP, with coarse accuracy ◆. Hierarchical geographic cells are not part of AdCP at the cutoff versions. Issue #5969, which proposes them, was opened by the author and was open with milestone 3.4.0 when read on 24 October 2026 ◆. It is a declared interest and a rival framing, not evidence, and chapter 10 records the protocol states and the author's role in the working group.

IAB guidance

IAB's location-data guidance found by the cutoff runs from the gated Mobile Location Data Buyer's Guide (July 2014) and the February 2016 Mobile Location Data Guide for Publishers to the April 2017 Location-based Marketing Playbook for Retailers. The playbook is buyer-facing. It asks whether device data come "through panels or pass through ad exchanges" and how store-visit-lift control groups are selected. No IAB or IAB Tech Lab location guide later than April 2017 was found in the sources screened ◆. Verve is among the playbook's listed contributors, and Verve Group is the author's former employer [1]. Media and Games Invest agreed in January 2020 to buy substantially all of Verve Wireless's assets and renamed itself Verve Group SE in June 2024 ◆.

IAB published a Digital Out-Of-Home (DOOH) Measurement Guide on 8 July 2025, behind a free-account gate. IAB's blog of that day says it covers attribution through "synthetic control groups and matched market testing". The blog does not mention MRC, Geopath or OpenRTB ◆. Under this paper's rules a matched comparison is not causal evidence.

Geopath: a currency without MRC accreditation

On 24 October 2026 MRC's out-of-home accredited list was empty, its only out-of-home service under review was JCDecaux's Proof of Plays metric, and Geopath appeared on no MRC list opened. In the sources screened, the US out-of-home audience currency is not MRC-accredited ◆. Geopath publishes the audience estimates US out-of-home trades on, as annual planning datasets. The 2026 dataset went into preview on 30 September 2026 and, per its 19 October post, becomes the default transactional planning dataset on 12 November 2026, after the cutoff ◆. It is a not-for-profit governed by a tripartite board of advertisers, agencies and media companies. Its own page says it was established in 1934 as the Traffic Audit Bureau for Media Measurement, which conflicts with the 1933 in the author's essay ◆.

Geopath did help write MRC's standard for the medium: the Out-of-Home Measurement Standards, final December 2025, were developed with DPAA, Geopath and OAAA, and they name mobile location among deterministic inputs and require services to ascertain the accuracy of third-party data ◆. Geopath's methodology overview says it is not designed to provide a comprehensive statistical validation and reports no confidence intervals ◆. Its reach and frequency model is self-reported to align with observed data within ±5%, with no provider, sample or validation method named ◆. In March 2026 Geopath and the OAAA announced an Ipsos-supported pilot in the second half of 2026, a transition beginning in 2027 and full adoption in 2028 ◆. Chapter 9 reads its data sources.

What assurance covers

For location in the US, the MRC record holds a 2017 standard with no lift provision, two revoked data-set accreditations and no current visit metric ◆ ◆ ◆ ◆ ◆ ◆. Everything else a buyer is shown is a different kind of assurance: NAI self-regulation, exchange documentation, vendor certifications and pages that still describe a revoked accreditation ◆ ◆ ◆ ◆. A buyer can ask for the MRC letter and check its date, metrics and environments against the current list. Chapter 11 scores independent assurance on that basis, and chapter 12 turns it into questions.

CHAPTER 9

Out-of-home runs on mobility data

US out-of-home trades on an audience currency built from smartphone location panels, and the programmatic sellers on top of it add more mobility data for targeting and attribution. Geopath names its sources, but its panel figures date from 2023 documentation and its own pages say they offer no comprehensive statistical validation. Three of six US DOOH products and currencies coded name their location sources, and only Geopath states a panel size. No DOOH footfall product or case screened documents a randomised or holdout control. Geopath and the OAAA have picked Ipsos to support a pilot of a successor system, and no document found by the cutoff says what data it will use.

IN SHORT

Geopath's 31 May 2023 methodology names MotionWorks device panels, Teralytics/Streetlytics and HERE for roadways, and Claritas among its demographic sources, with no proportions ◆. Its pages describe more than 100 million unique US devices a month culled to seven to ten million qualified devices a week, a documentation-dated figure with no observation vintage ◆ ◆. A 19 October 2026 post names Bentley Systems as roadside data provider, and the 2026 Planning Dataset becomes the default on 12 November 2026, after the cutoff ◆ ◆. Geopath's likelihood-to-see impressions are opportunity-to-see counts adjusted by a visibility model ◆, its ±5% accuracy claim compares a model with the mobile data it was trained on ◆, and on 24 October 2026 it appeared on no MRC list opened ◆. An Ipsos-supported pilot was announced to launch in the second half of 2026, with transition from 2027 and full adoption in 2028; no document on the pilot's data sources was found by the cutoff ◆ ◆. Of six US DOOH products and currencies coded under Q2, three name their location sources and one states a panel size ◆. Of six DOOH footfall-attribution products or cases screened, none documents a randomised or holdout control ◆. OpenRTB's qty object carries a DOOH impression multiplier and the measurement vendor's domain, but no field for its mobility source ◆. T-Mobile has owned Vistar since 3 February 2025, and since 5 October 2026 its enhanced segments, now with "location insights", have been sold for DOOH only through the Vistar DSP ◆ ◆.

The currency and its inputs

Geopath's methodology documentation, published on 31 May 2023, names MotionWorks device panels, Teralytics/Streetlytics and HERE Maps for roadways, HERE Maps for vehicle travel, and government agencies, MotionWorks and Claritas for demographics, without proportions ◆. Under the Q2 coding rule Geopath is coded source disclosed ◆. Geopath says it was established in 1934 as the Traffic Audit Bureau for Media Measurement and is a not-for-profit governed by a tripartite board of advertisers, agencies and media companies ◆. It is a currency body, not an accreditor or verifier ◆.

The documentation is a set of Confluence pages ◆. A "Mobile Device Location & Movement Patterns" page says source data from multiple location SDK aggregators cover more than 100 million unique US devices a month and that Intermx culls them to a sample of seven to ten million qualified devices a week ◆. Each record carries a device ID, a UTC timestamp, coordinates and horizontal precision in metres, and imprecise sightings are removed under no stated numeric threshold ◆. The Mobile Device Panel page of the same date describes a weekly panel of GPS-sighted devices active about eight hours a day with a consistent Census Block Group home, culled by Standard Data ◆. A Movement Patterns page records AirSage origin-destination matrices for the 2019-2020 methodology and a 2021 expansion contracted to Standard Data ◆. These device counts are a documentation-dated disclosure with no stated observation vintage, not a current audited panel count ◆. Whether MotionWorks still supplies the panel in 2026 is not stated in any document found ◆.

The dataset in use at the cutoff has no published source list later than 2023 ◆. Geopath's 2026 Planning Dataset went into preview on 30 September 2026, and its 19 October 2026 post names Bentley Systems as roadside data provider and credits "updated data sources" without listing them ◆. That dataset becomes the default transactional planning dataset on 12 November 2026, a plan at the cutoff ◆ ◆. This review found no statement of sources later than the 2023 list for the dataset in use at the cutoff ◆.

US DOOH CURRENCY AND SSP PRODUCTS: MOBILITY SOURCE AND PANEL DISCLOSURE

	Source named in own documentation	Kind of source named	Panel size with a period
Geopath audience currency	yes	SDK or device panel	yes
Vistar Media attribution	yes	SDK or device panel	count, no period
Vistar Media audience targeting	yes	panel, bidstream, other	not stated
Place Exchange PerView	not stated	device IDs, origin unstated	not stated
Broadsign foot-traffic studies	not stated	device IDs, origin unstated	not stated
Perion (Hivestack) footfall lift	not stated	device IDs, origin unstated	not stated

Stated in the documentation · SDK or device panel · A count with no period or definition · Several kinds, incl. bidstream · Not stated · Device data, origin not stated

Geopath: MotionWorks device panels, Teralytics/Streetlytics and HERE for roadways, in documentation of 31 May 2023, with 7–10 million qualified devices weekly drawn from more than 100 million US devices monthly and no observation period stated; its 19 October 2026 post names Bentley Systems as roadside provider. Vistar attribution names InMarket ('nearly 200M+ permission-based users', no period) and Foursquare/Placed; Vistar's partner pages name GroundTruth first-party, third-party and bidstream data and Adsquare mobile location data. Talon is excluded (coded only from a UK-hosted global page); Route (UK) and COMMB (Canada) are attributes; GroundTruth's attribution on Place Exchange names its own data but is a partner product.

> **Three of six US DOOH products name their mobility source, and only Geopath states a panel size with a period.** Question Q2 coding of US DOOH audience currency, SSP and measurement products: the mobility source named in the product's or operator's own documentation, the kind of source, and whether a panel size is stated with a period (final wording of LOC-I-F23). A partnership announcement establishes a relationship, not a dependence. Place Exchange, Broadsign and Perion describe device data without naming where it comes from.
>
> Units: coding · Scope: US DOOH currency, SSP and network products, documentation read by the cutoff · Sources [182] [183] [184] [185] [186] [23] [187] [188] [189] [190] [191] [192] [193] [194] [195] [196]
>
> Geopath's figures are documentation-dated (2023), not a current audited panel count; its 2026 dataset becomes the default on 12 November 2026, after the cutoff.

What a Geopath impression is

A Geopath impression is a projected, visibility-adjusted estimate ◆. Its core outputs are likelihood-to-see impressions, audience composition, and reach and frequency ◆. Opportunity-to-see counts are adjusted by its proprietary visual acuity index (VAI) model for the probability of noticing the unit ◆. Composition comes from treating a device's longest-dwell location as its home and applying census-block demographics, computed as an annual average by hour of day ◆. The VAI model's inputs and parameters are not on the pages read ◆. Under the Q1 coding the impressions are projected: panel observations scaled to a population and adjusted for visibility ◆. Route's eye-tracking adjustment is the Great Britain counterpart of the VAI ◆.

Geopath's reach-and-frequency approach, introduced with its 2023 data release, is "centered around observed mobile location data from smartphone applications and connected cars" and is self-reported to align with that data "with ±5% accuracy" ◆. The "observed data" is the same mobile-derived panel measure the model is trained on, so the ±5% is agreement between a model and its own input, not with an independent count ◆. The page names no provider, sample size or validation method ◆. Geopath's methodology overview says it is not designed to provide a comprehensive statistical validation and

reports no confidence intervals ◆. In the sources screened by the cutoff, this review found no independent validation of Geopath reach and frequency ◆.

On 24 October 2026, MRC's Out-of-Home accredited list was empty, the only OOH service under review was JCDecaux's Proof of Plays metric, and Geopath appeared on no MRC list opened ◆. MRC's Out-of-Home Measurement Standards (final December 2025, developed with DPAA, Geopath and OAAA) treat location data as foundational where persons are not measured directly ◆. They require services to ascertain the accuracy of third-party data, with disclosure when a source cannot be independently verified, and name "mobile location" among the deterministic inputs for adjusting likelihood-to-see to audience ◆. Chapter 8 sets out the standards record.

The Ipsos pilot

On 31 March 2026, Geopath and the OAAA announced that their modernisation "began in early 2025" and that Ipsos had been selected to support an industry pilot launching in the second half of 2026 ◆. The pilot is to be followed by a transition to a next-generation framework beginning in 2027 and "full adoption in 2028"; the release names no data sources ◆. Between that release and the cutoff, this review found no Geopath or Ipsos document describing the pilot's data sources, panel or method in the sources screened ◆. Ipsos's 12 May 2026 session page mentions the pilot without method, and Geopath's 30 September 2026 dataset post does not mention it ◆.

Ipsos already recruits and processes the sample for Route, Great Britain's out-of-home currency for adults 15+ ◆. Route combines passive GPS tracking of a recruited, consented sample of c.7,000 participants a year with volumetric counts and Lumen eye-tracking, and uses no third-party smartphone SDK panel ◆. Route is an international attribute and earns no US score, and no document found says whether the US pilot will follow its design ◆ ◆. No COMMB methodology page with data sources could be read by the cutoff, so Canada's currency is coded not disclosed ◆.

Which sellers name their sources

Programmatic is a minority of DOOH spend on WOO's figures. Its study, aggregated by PwC and announced on 5 June 2026, puts global programmatic DOOH at about US$1.4 billion of revenue in 2025, 7% of total DOOH expenditure, with the Americas (not US-only) at US$670 million and 14.2% penetration ◆. The data were submitted by 11 SSPs, and PwC "has not independently verified the information which it received from respondents"; the announcement says nothing about audience or mobility data ◆.

PRODUCT	MOBILITY SOURCE NAMED	PANEL SIZE WITH PERIOD	Q2 CODE
Geopath (currency)	MotionWorks panels, SDK aggregators; roadway and demographic suppliers	7–10M qualified devices weekly, in 2023 documentation	Source disclosed ◆ ◆ ◆
Vistar attribution	InMarket SDK data; Foursquare and Placed	Not stated	Source disclosed ◆ ◆
Vistar audience targeting	Partner pages: GroundTruth, Adsquare, Foursquare, PlaceIQ, T-Mobile	Not stated	Source disclosed; dependence not documented ◆ ◆

PRODUCT	MOBILITY SOURCE NAMED	PANEL SIZE WITH PERIOD	Q2 CODE
Place Exchange PerView	"Daily updated mobile data", provider unnamed	Not stated	Not disclosed ◆
Broadsign measurement	Partner logos only	Not stated	Not disclosed ◆
Perion (Hivestack)	"Anonymised device-level location data"	Not stated	Not disclosed ◆

Of these six US products and currencies, three name their location sources in their own or the operator's documentation, and only Geopath states a panel size with a period ◆. A not-disclosed code means not readable in public documentation at the cutoff, not independence from mobility data, and gated buyer pages may disclose more ◆. Two products outside the six name a source. Broadsign Ads' audience targeting, registered but outside this US count because its US availability is unconfirmed, names Native Touch data "pulled from active application SDKs and APIs" ◆. GroundTruth's DOOH attribution with Place Exchange uses GroundTruth's own "location and purchase data" ◆. Broadsign announced its acquisition of Place Exchange on 25 November 2025, and Perion completed its acquisition of Hivestack on 12 December 2023 ◆ ◆.

Vistar documents its partners in a public directory ◆. The directory, read on 24 October 2026, tags 18 partners for US audience segments and six USA-tagged foot-traffic partners: Accretive, Arrivalist, Cuebiq, Foursquare, InMarket and Spotzi ◆. Its partner pages describe GroundTruth's data as "first-party data, third-party partnerships, and bid stream data", Adsquare's as including "mobile location data" and InMarket's as "200M+ location-based users", with no proportions or precision class ◆. Under the Q2 rule a partnership announcement establishes the relationship, not the dependence ◆. InMarket's "nearly 200M+ permission-based users" has no period, geography or definition of users, and the same page gives two transaction figures, ~$122B+ and $2.5T+ ◆.

Exposure is inferred from where a device was, and the documents opened state no full rule for it. Place Exchange describes a "patented process of capturing exposed mobile IDs for consumers in the viewshed of every screen at the time of ad play" and names no provider for them ◆. GroundTruth counts a DOOH view when a device enters a screen's mapped viewshed "for the appropriate amount of time", with no time stated ◆. Adsquare, in an interview, describes inferring exposure from the proximity of mobile advertising IDs to screen coordinates while an ad is live, with no radius stated ◆. Vistar's 2022 case says exposure for studies uses "ad log timestamps, device location, venue type and screen location", and Vistar publishes no distance, dwell or line-of-sight rule ◆.

The multiplier in the bid

OpenRTB 2.6 carries the audience estimate into the auction in its qty object ◆. Its multiplier is the quantity of billable events deemed to occur ("a DOOH opportunity may be considered to be 14.2 impressions"), with a source type and, for vendor-provided values, the measurement vendor's domain ◆. AdCOM lists the source types as unknown, measurement vendor, publisher and exchange ◆. Neither document records the vendor's mobility source, panel or method, and neither enumerates multiplier vendors; one web search for a vendor list found none ◆. In The Trade Desk, Vistar's audience impressions are "the result of

impression multiplier calculations provided by SSPs & media owners", which its guide says "are commonly sourced from verification partners like Route and Geopath", while plain impressions count ad plays ◆. Geopath and Route are currency bodies, not verifiers ◆. Inference: a bid can carry a panel-derived audience count without saying which panel produced it ◆.

Footfall attribution without a holdout

Of six DOOH footfall-attribution products or cases screened (four US, one UK, one global), none documents a randomised or holdout control: none is randomised or holdout, one asserts a matched control, two use unexposed comparisons and three do not disclose a control ◆. With three of six undisclosed, fewer than four document a design, so H3's decision tree applied to this DOOH subset alone gives unresolved ◆. H3 itself is tested on cohort A, which Chapter 5 reads as contradicted: seven of nine documented methods are non-holdout ◆. H3's dated clarification of 24 October 2026 fixed that decision tree and by itself did not move the verdict.

Hivestack's study for Zoom Media UK and Gillette (London, November 2022, 115 screens) compared devices seen in a screen geofence while the ad played with devices in the same geofence when it did not ◆. It reported a "2.12x lift" and 8,574 "Modeled incremental walk-ins", scaled by the ratio of an unnamed data partner's phone access to the GB population ◆. That is a non-randomised time-split comparison, not a holdout ◆. Perion's current page offers footfall lift "comparing exposed audiences with a matched control group" without a provider or matching method, and an undated Perion blog names Foursquare, Cuebiq, PlaceIQ and Adsquare as pre-integrated providers ◆. Broadsign's Decathlon case reports "a 46% total increase in store footfall" and "an incremental 8 percentage point lift" against "non-exposed control groups"; only the second is described as incremental, and the control's formation is not disclosed ◆.

Vistar documents no attribution method of its own at the cutoff ◆. Its activation guide says it "works with trusted industry leaders" for studies that "require a feasibility test and have varying minimums and costs", and vistarmedia.com/measurement returned HTTP 404 ◆. It has sold foot-traffic studies through rotating third parties since at least January 2019 ◆. In two OAAA-hosted cases measured by Foursquare, Target's reported a 6.51% visitation lift over a four-day look-back "compared with non-exposed consumers", and Jack in the Box's an 8.8% lift, neither describing the control ◆. Whether the 533,000 Target visits are observed or projected is not stated, and Vistar's visit basis is coded not disclosed ◆ ◆. GroundTruth's Place Exchange release calls "more than half" of a national retailer's more than 42,000 exposed-consumer visits incremental with no control design described ◆. On 24 October 2026 no Vistar metric was found on MRC's accredited or under-review lists ◆.

The channel's guidance recommends matched designs and mentions holdouts as an aid. IAB's July 2025 DOOH Measurement Guide, gated on IAB's site but publicly retrievable as a PDF and read in the final live sweep, recommends synthetic-control and matched-market or matched-store tests for incrementality and says combining synthetic models with geographic holdouts can reduce contamination of the control group ◆ ◆. That is guidance, not evidence that any of the six products above uses a holdout by default. Vistar's material does contain a randomised design, in a creative test ◆. Its 23 September 2026 study with Omnicom Media and Annalect randomised 7,200 consumers in the Netherlands to a control

creative or one of three store-locator placements and measured stated visit and purchase intent, which is declared, not a visit ◆. The author earlier worked at Hearts & Science, an Omnicom Media agency.

A model on a model?

The author's essay "Measurement, on the Street's Terms" argues that a DOOH footfall or lift study is "a model on a model" [2]. This chapter treats that as a rival framing to test. Where the layers are documented, it mostly holds. The audience behind a multiplier is a projected, visibility-adjusted estimate ◆. Exposure is inferred from device proximity to a screen ◆ ◆. Several documented visit bases are projected, as in Hivestack's modelled walk-ins and the projected store visits of Foursquare Attribution and InMarket LCI ◆ ◆.

Two limits apply. Some inputs are panel observations, not models: InMarket's exposed device visits and GroundTruth's Observed Visits are coded observed ◆. And for Vistar the basis is not disclosed, while Place Exchange, Broadsign and Perion do not name their sources, so for those products the framing can be neither confirmed nor rejected from public documents ◆ ◆.

The carrier in the stack

T-Mobile US agreed on 20 December 2024 to acquire Vistar Media and completed the deal on 3 February 2025, transferring US$621 million in cash ◆. At the 13 January 2025 announcement the parties described more than 1.1 million digital screens from nearly 370 OOH media owners ◆. Lamar received US$115.1 million at closing for its 20% stake ◆. T-Mobile also completed its acquisition of Blis on 3 March 2025 ◆.

T-Mobile's app-ownership and engagement segments have been on Vistar's self-service DSP since 6 May 2025, and on 5 October 2026 Vistar announced enhanced segments that add "location insights", available exclusively through the Vistar DSP ◆. Whether those insights are network-derived or app-permission location is not stated ◆. AdExchanger, relaying T-Mobile's account, reported that the data include mobile location used to estimate inventory impressions, and that for users who opted into location tracking T-Mobile can detect proximity to OOH ads and retarget on other channels ◆. T-Mobile tied the exclusivity to tightening regulation of location data and device IDs, and called DOOH measurement "on our road map to look into for next year" ◆. Those are an interested party's statements, relayed by trade press ◆.

Vistar's own documents disagree about what it handles. Its audience guide says DOOH targeting works "without ever relying on personal information", while its Services Privacy Notice (1 July 2026) says it receives device location histories tied to device identifiers and sells and shares personal information ◆ ◆. On California's 2026 Data Broker Registry, Vistar declared "Yes" to collecting precise geolocation, after declaring "No" in the 2025 file ◆. The FCC's US$80,080,000 forfeiture against T-Mobile concerns its carrier location programme before Vistar was acquired, not Vistar; the carriers' certiorari petition was distributed for the 6 November 2026 conference, after the cutoff ◆.

AdCP v3.2.6, the agentic buying protocol, accepts Geopath-prefixed venue IDs and gives geopath and route as example measurement_source values, and its foot_traffic metric carries no field declaring the control design ◆ ◆. The author's RFC #5969 for geographic cells (21 July 2026) is open in the AdCP working group he co-leads and has no protocol state ◆; chapter 10 treats it as a declared interest.

CHAPTER 10

Can an agent buy by place?

An agent can describe a place in AdCP in far more detail than any agent has been shown to buy one. Version 3.2.6 carries administrative geography, radius and polygon proximity, store catchments, named places, DOOH venue identifiers, per-venue delivery and a foot-traffic metric. In the sources screened, the furthest any location signal gets in open-protocol agent-driven buying is one implemented connector, built on an earlier beta, that maps countries, regions and DMAs into Google Ad Manager. No interoperability test result is public, and the vendor releases that claim geo-targeted agentic buys name no field. Under the registered rule, H7 is unresolved.

IN SHORT

At AdCP v3.2.6, the stable release of 23 October 2026, the targeting overlay represents countries, ISO 3166-2 regions, metros, postal areas, point-based proximity, store catchments and identifier-based named places, as schema representation and nothing more ◆. Delivery reporting represents DOOH plays, a per-venue breakdown, a measurement_source and a foot_traffic metric qualified by methodology, with no field for the control design ◆. Geographic cells are in neither v3.2.6 nor v3.3.0-beta.0, and the author's proposal for them is open ◆. The only implemented connector found, Prebid Sales Agent v2.0.0, is built against AdCP 3.1.0-beta.3; it maps administrative geography into Google Ad Manager and refuses postal areas ◆. On 24 October 2026 none of the 34 agents in AAO's public registry showed a passing geo or DOOH conformance test ◆. The vendor releases that claim geo or venue targeting in agentic AdCP buys name no field and no protocol version ◆. IAB Tech Lab's AAMP components carry geography only as coarse codes, and ARTF 1.0 has no standard intent to change or add a geographic field ◆ ◆. The location vendors' agent interfaces found sit outside agent-driven buying ◆. H7 is unresolved ◆.

The test

H7 asks whether location signals (geo targeting fields, geographic cells, venue identifiers or visit metrics) reach documented production use in agent-driven buying by the cutoff. Shared rule 12 records five states for each protocol and version: schema representation, an implemented connector, a demonstrated interoperability test, documented production use and a demonstrated transaction. H7 is supported when at least one location signal reaches documented production use or a demonstrated transaction in an agent-driven buying workflow, with the protocol, version and signal recorded. It is contradicted when a source

documents that a location signal was dropped, could not be carried, or failed in such a workflow or an interoperability test, and no location signal reaches documented production use. Anything short of both is unresolved, and the highest state reached is reported. Membership, working-group roles, proposals and announcements earn no state (Chapter 13).

The protocols screened are AdCP (the Ad Context Protocol), IAB Tech Lab's AAMP (Agentic Advertising Management Protocols) components and ARTF (the Agentic Real Time Framework) 1.0, with OpenRTB 2.6 as the non-agentic baseline ◆ ◆. The screen also covered location vendors' own agent interfaces, including servers built on MCP (the Model Context Protocol), through which AI assistants call outside tools ◆. Versions and statuses below were read on 24 October 2026, the cutoff ◆ ◆.

INTERESTS

The author opened the geographic cell proposal that this chapter codes and co-leads the working group in which it was raised ◆. Two of the 34 agents in the public registry of AgenticAdvertising.org (AAO), read below, are his own, and neither carries a geo or DOOH result ◆. He also made the dated ruling, after extraction, on how H7's contradicted rule treats a connector that refuses a field by design; it is reported with the verdict below. None of these earns a state.

What AdCP can represent

AdCP's latest stable release at the screen was v3.2.6, published on 23 October 2026 ◆. Its media-buy targeting overlay represents administrative geography: countries, regions as ISO 3166-2 codes, metros in the nielsen_dma, uk_itl1, uk_itl2, eurostat_nuts2 or custom systems, and postal areas, each with a matching exclusion field. It represents geo_proximity as a radius, a travel-time isochrone or a buyer-supplied GeoJSON polygon, and store_catchments drawn from a synced store catalog ◆. All of this is schema representation, which shows that a value can be expressed and nothing more ◆.

Identifier-based geo_places entered through PR #6093, merged on 15 August 2026, first published in the pre-release 3.2.0-beta.0 on 17 August and first stable in 3.2.1 on 1 October 2026 ◆. It keys each place by a stable ID in a declared system (geonames, google_ads, microsoft_ads or an owner HTTPS URI) and a place type drawn from administrative units plus airport. Its registered vocabulary therefore names cities and neighbourhoods, not store-level points of interest, and the PR defers place-level forecasting and delivery breakdowns ◆.

DOOH has its own identifiers. Placements accept venue_id, screen_id and openooh_venue_type identifiers and authority-prefixed external IDs, with geopath:30961 as the schema's example. DOOH placements declare slot and loop durations, and the experimental static-OOH panel identifiers accept a Geopath Spot ID scheme ◆. Delivery reporting has a top-level plays count and a dooh_metrics block of loop plays, screens used, screen time, share of voice achieved, calculation notes and a per-venue venue_breakdown ◆. A measurement_source slug lists geopath and route among its examples, and an

experimental ooh_metrics block tiers estimated impressions as currency_measured or seller_modeled (Chapter 9) ◆.

Visits travel without their control design. The foot_traffic metric is defined as incremental visits over baseline and qualified by an attribution_methodology of panel_based, deterministic_purchase, probabilistic or modeled. No field declares the control design, on a search of the v3.2.6 schema source for holdout, ghost, control-group and randomisation terms ◆. On this review's reading, a foot_traffic value received through AdCP cannot tell a buyer whether its baseline was randomised, held out or matched, which is the distinction H3 turns on (Chapter 5) ◆.

Cells earn no state

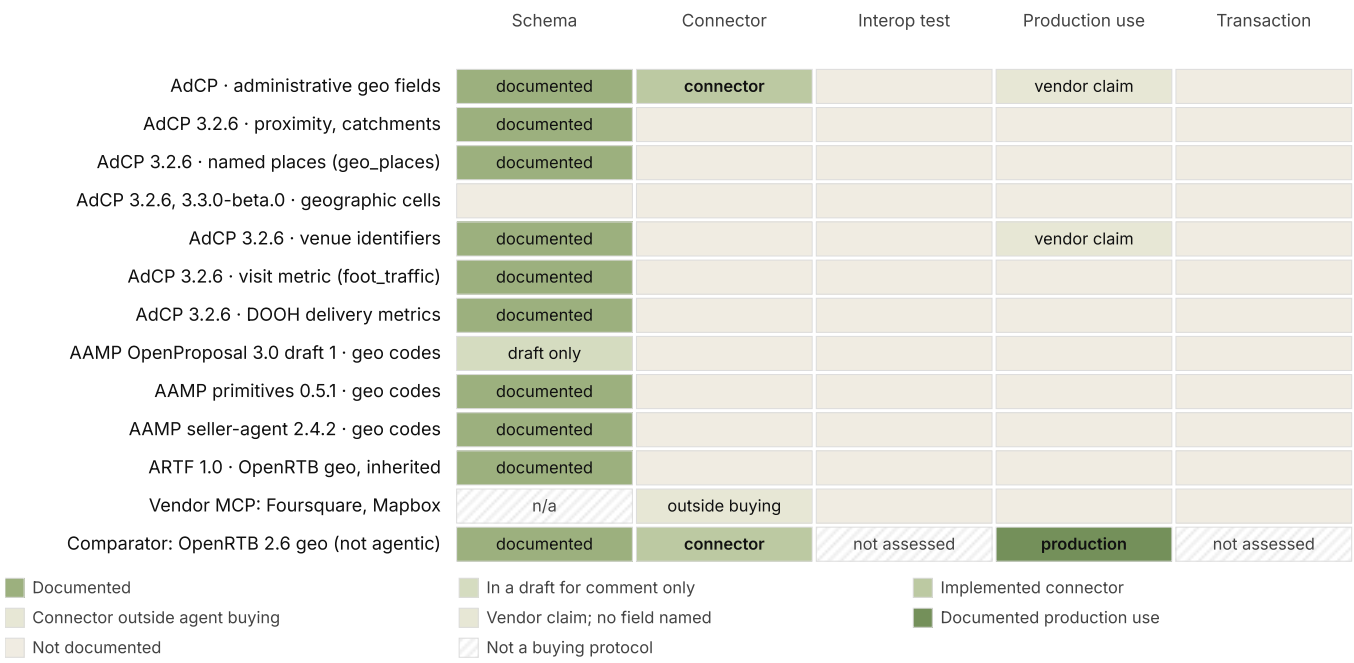
Hierarchical geographic cells are in no AdCP version current at the cutoff. Issue #5969 proposes geo_cells and geo_cells_exclude with an h3, s2, geohash or custom cell-system enum. The paper's author opened it on 21 July 2026, and it is open on milestone 3.4.0 with the labels rfc and needs-wg-review ◆. Its companions, #6013 on conversion and #6014 on cell-grain delivery reporting, are open on the same milestone. A GitHub search on 24 October 2026 found no geo_cells pull request, and neither v3.2.6 nor v3.3.0-beta.0 contains the field ◆. Under the brief's rules the proposal earns no state, whatever its standing in the working group the author co-leads ◆.

One connector, on an earlier beta

In the protocols, repositories and registry screened on 24 October 2026, the highest state any location signal reaches in open-protocol agent-driven buying is an implemented connector ◆. The registry lists registered agents, not every AdCP deployment. Prebid Sales Agent v2.0.0, released on 1 July 2026, is built against AdCP spec 3.1.0-beta.3 (adcp Python SDK 5.7.0) rather than 3.2.6. It translates geo_countries, geo_regions and geo_metros, Nielsen DMA only, with their exclusions, into Google Ad Manager targetedLocations ◆. It rejects geo_postal_areas with an explicit error, "not implemented in GAM static mapping". The targeting manager read has no handling for geo_proximity, store_catchments or geo_places, an absence bounded to that one file ◆. The release predates geo_places by about seven weeks, since geo_places was first published on 17 August 2026 ◆ ◆.

Code shows a connector exists. It does not show use, and no source opened shows a production buy that exercised this mapping ◆ ◆.

LOCATION SIGNALS AGAINST THE FIVE PROTOCOL STATES, 24 OCTOBER 2026



Schema states are read at AdCP 3.2.6 (23 October 2026). The only implemented connector, the Prebid Sales Agent v2.0.0, is built on AdCP 3.1.0-beta.3: it maps countries, regions and Nielsen DMA metros into Google Ad Manager and rejects postal codes. geo_places first shipped in the pre-release 3.2.0-beta.0 (17 August 2026). No agent in the AAO registry passed a geo or DOOH storyboard. Geographic cells are a proposal (#5969) by the author, in a working group he co-leads: a declared interest, and no state. The vendor claims (PubMatic, Broadsign) name no field. Membership and announcements earn no state (shared rule 12).

> **No location signal has a public interoperability test; administrative geo reaches an implemented connector, on AdCP 3.1.0-beta.3, and geographic cells reach no state.** Each class of location signal in the agentic protocols current at the cutoff, against the five states: schema representation, implemented connector, demonstrated interoperability test, documented production use and demonstrated transaction (stream J, corrected by its verifier). OpenRTB 2.6 is the non-agentic baseline: Google documents IP-derived, coarse geolocation in its live bid requests. H7 is unresolved under its registered rule.
>
> Units: state · Scope: AdCP 3.2.6 and 3.3.0-beta.0, AAMP components, ARTF 1.0, location-vendor MCP servers · Sources [197] [198] [199] [200] [201] [202] [203] [204] [205] [206] [207] [208] [209] [210] [211] [212] [213] [214] [215] [216] [217] [218] [219] [220]
>
> The author co-leads AdCP's Signals & Measurement working group and wrote the geographic-cell proposal; neither earns a state. The registry is live data, read on 24 October 2026.

No public test passes

A conformance storyboard pass is the nearest public analogue to an interoperability test, and none is public for location ◆ ◆. In AAO's public registry on 24 October 2026, none of the 34 agents shows a passing geo or DOOH conformance test ◆. The geo storyboards (geo_region_targeting, geo_region_all_values_support, geo_region_exclusion_support and geo_place_targeting) appear only on two agents graded on AdCP 3.2.6, goTom Sandbox and Publink, and both are untested at zero of zero steps ◆. AdCP's sales_dooh specialism tests a seller exposing a venue_id and reporting plays and dooh_metrics, and no registered agent declares it ◆ ◆. The 11 agents with a verified badge hold it in spec mode only, none in the live-traffic mode ◆. These are public compliance records as read on 24 October 2026, the cutoff; they change as agents are regraded ◆.

What vendors claim

The strongest public claims of location signals in agent-driven AdCP buys are vendor releases that record neither the signal nor the protocol version ◆. PubMatic and Butler/Till, on 15 December 2025, describe an AdCP-enabled CTV campaign for Clubtails "delivering geo-targeted, premium CTV inventory" without naming a field or a geographic unit. Broadsign, on 27 May 2026, describes a Netherlands OOH campaign in which agents using AdCP informed audience and venue targeting, without naming identifiers or delivery metrics ◆. Both are vendor assertions, and neither reaches documented production use of a named location signal under H7's rule ◆.

Outside the open protocols, proprietary DOOH seller agents reached over MCP, from VIOOH and Displayce, claim geographic and proximity handling. They name no fields and report no transaction ◆. InMarket announced Maestrø in beta on 18 June 2026 as an agentic optimisation layer that feeds InMarket outcomes to AI agents, with an Open Access route "Built on MCP". No public MCP server or AdCP agent for InMarket was found, so it is an announcement, not a documented protocol implementation ◆.

AAMP and ARTF stay coarse

IAB Tech Lab's AAMP components represent geography only as coarse codes at schema level ◆. OpenProposal 3.0 draft 1, published for comment on 22 September 2026, gives the targeting envelope a settable geo object with an allowed[] list of geo codes. The pre-release iab-agentic-primitives 0.5.1 gives packages geo_targets as ISO 3166-2 codes, and its linear-TV quotes use Nielsen DMA codes ◆. The reference seller-agent 2.4.2 carries geo_targets in its media kit. A grep of its ad-server clients found no mapping of geo_targets into Google Ad Manager geo targeting, although its GAM model declares a geoTargeting field ◆.

ARTF 1.0, released on 12 November 2025, carries location only inside the embedded OpenRTB 2.x BidRequest that agents receive ◆. None of its eight mutation intents is specific to geography. An ARTF agent can read device.geo and could activate a location-derived audience segment by segment ID, but it has no standard intent to change or add a geographic field ◆.

The baseline is further along

The non-agentic baseline opened here is further along than the agentic evidence screened ◆. OpenRTB 2.6 defines a Geo object (lat, lon, type, accuracy, lastfix, ipservice, country, region, metro, city, zip, utcoffset), DOOH venue types and a qty impression multiplier ◆. Google Authorized Buyers documents production bid requests in which geo type is always IP (2) and accuracy reflects coarse IP-based geolocation. That is documented production use of coarse, inferred location, not device-observed location (Chapter 1, Chapter 2) ◆. It is one exchange's documentation of its own system, and other exchanges may pass GPS fixes ◆.

Vendors' agent interfaces sit outside buying

Among location vendors, this review found agent interfaces only outside agent-driven buying ◆. Foursquare publishes an MCP server, created in January 2025 and last pushed in April 2025, whose tools search places and snap coordinates to Foursquare place IDs. Mapbox publishes an MCP server (v0.16.0, 15 October 2026, with a hosted endpoint) for geocoding, point-of-interest search and isochrones ◆. Radar runs two MCP servers. Its public documentation endpoint serves search and retrieval, and an authenticated server announced on 14 October 2026, in pilot for enterprise customers by request, gives AI assistants read-only tools to query a customer's own location records. Neither is an advertising-transaction interface ◆. Placer lists a remote MCP server, "Pi for Placer MCP", as a per-account enterprise entitlement among its data delivery routes; its documentation page was last updated on 22 October 2026, and its launch date is not established ◆.

For GroundTruth, Blis, InMarket and Vistar Media, the searches of 24 October 2026 found no MCP server or AdCP agent, and none of them appears among the 34 agents in AAO's registry ◆. Private or unannounced agent interfaces would not appear in these sources ◆.

H7, coded by the rule

H7 is unresolved at 24 October 2026 ◆. Geographic cells reach no state. Proximity, store catchments, named places, venue identifiers, DOOH metrics and foot_traffic reach schema representation only, administrative geo reaches an implemented connector on AdCP 3.1.0-beta.3, and no interoperability test result is public ◆. The supported rule needs production use or a transaction with the signal and version recorded, and the two vendor-claimed agentic AdCP campaigns record no location field, so it is not met ◆.

The contradicted rule needs a source documenting that a location signal was dropped, could not be carried, or failed in an agent-driven buying workflow or interoperability test, with no location signal in documented production use. The Prebid connector's refusal of postal areas is the nearest candidate ◆. A clarification dated 24 October 2026, made by the author after extraction, rules that "could not be carried" requires an observed attempted workflow or interoperability test that failed or dropped the signal, and that a connector refusing a field by design, seen only in code, does not meet it. No attempted workflow was observed, so the clarification leaves the verdict unresolved ◆. Stream J read the refusal the same way, as a declared capability limit rather than a signal dropped or failed in a workflow ◆.

The rival framing is registered with H7: frequency and reach should be governed by place on a hierarchical cell grid. It comes from the author's essay and from #5969, and it is a design proposal ◆. The protocol-state evidence neither supports nor refutes it, and it moves no state ◆.

What would move the verdict

Support needs a named location signal in documented production use or a transaction in an agent-driven buy, with the protocol, version and field recorded. A source showing that the PubMatic or Broadsign campaigns passed geography or venue identifiers as AdCP fields

would be the shortest route ◆ ◆. Earlier states would show first: a passing geo or DOOH storyboard, a registered agent declaring sales_dooh, a badge in live-traffic mode, or a connector built on 3.2 that handles proximity or places ◆ ◆. A documented attempt in which a location signal failed or was dropped in an agent-driven buy would meet the contradicted rule, provided no location signal reached documented production use.

A buyer offered an agent-driven buy by place can ask which field carried the geography, at which protocol version, and whether a foot_traffic number came with its control design. Chapter 12 turns those into questions for sellers.

The register lists the protocol, registry and platform surfaces screened, with each one's status and the observable behind it.

AI and agentic capability map

Production functionality versus announcements. "Independently observable" means someone other than the vendor has documented the capability in use.

Machine-readable copy: data/agentic-map.csv.

PLATFORM / PRODUCT	CAPABILITY	STATUS	DATE	INDEPENDENTLY OBSERVABLE?	WHAT THE RECORD SUPPORTS	SRC
AdCP 3.2.6	Administrative geo targeting fields: geo_countries, geo_regions, geo_metros, geo_postal_areas (with exclusions)	LIVE	2026-10-23	Schema representation at 3.2.6; no public interoperability test result (geo storyboards untested on the two agents listing them); no field-level production use	PubMatic (December 2025; protocol version not recorded) and Broadsign (May 2026) describe geo- and venue-targeted agentic campaigns without naming a field, version or delivery metric	[197] [221] [200] [201]
Prebid Sales Agent v2.0.0 (AdCP 3.1.0-beta.3)	Connector mapping geo_countries, geo_regions and Nielsen DMA geo_metros into Google Ad Manager targeting; postal codes rejected; no proximity, catchment or place handling	LIVE	2026-07-01	Implemented connector in open-source code; built on the adcp SDK 5.7.0, which targets AdCP 3.1.0-beta.3, not 3.2.6	The only implemented AdCP geo connector found; no deployment result with a geo field is public	[198] [199]
AdCP 3.2.6	Point and polygon targeting: geo_proximity (radius, travel time, GeoJSON geometry) and store_catchments	LIVE	2026-10-23	Schema representation only; absent from the Prebid GAM targeting manager		[197] [198]
AdCP 3.2.6	Named places: geo_places and geo_places_exclude, keyed by geonames, Google Ads, Microsoft Ads or an owner URI	LIVE	2026-08-17	Schema representation only; geo_place_targeting storyboard untested on the two agents listing it	Place types are administrative units plus airport, not store-level points of interest; place-level forecasting and delivery breakdowns deferred	[202] [203] [200] [204]
AdCP 3.2.6 and 3.3.0-beta.0	Geographic cells (geo_cells)	ANNOUNCED	2026-07-21	No state: absent from the schema at 3.2.6 and 3.3.0-beta.0	Proposed by the author (issue #5969) in a working group he co-leads: a declared interest, not evidence	[205] [206] [207]
AdCP 3.2.6	Venue identifiers: venue_id, screen_id, openooh_venue_type, geopath:<id>; OOH panel id_type geopath	LIVE	2026-10-23	Schema representation only; no registered agent declares the sales-dooh specialism	A vendor describes venue targeting through AdCP without naming a field	[208] [209] [200] [210]
AdCP 3.2.6	Visit metric: foot_traffic with an attribution_methodology qualifier	LIVE	2026-10-23	Schema representation only	No field declares the control design; 'modeled' covers MMM, MTA and incrementality testing alike	[211] [212]

PLATFORM / PRODUCT	CAPABILITY	STATUS	DATE	INDEPENDENTLY OBSERVABLE?	WHAT THE RECORD SUPPORTS	SRC
AdCP 3.2.6	DOOH delivery metrics: plays, dooh_metrics (loop_plays, screens_used, venue_breakdown), measurement_source	LIVE	2026-10-23	Schema representation only; sales-dooh specialism defined, none declared		[211] [209] [200]
AAMP OpenProposal 3.0 draft 1	Targeting envelope geo.allowed[] of geo codes	BETA	2026-09-22	Schema representation in a draft only	No postal, DMA, lat/lon or venue terms in the document	[213]
AAMP iab-agentic-primitives 0.5.1	Package.geo_targets (ISO 3166-2); linear-TV QuoteRequest DMA codes	BETA	2026-08-10	Schema representation only	The README calls the library a pre-release	[214]
AAMP seller-agent 2.4.2	Media kit geo_targets; GAM model geoTargeting (unmapped)	LIVE	2026-08-17	Schema representation only; nothing writes geo_targets into GAM or FreeWheel targeting	Tag commit 2026-08-17; GitHub release 2026-08-18	[215]
ARTF 1.0	Geo fields inherited from the embedded OpenRTB 2.x BidRequest (device.geo, user.geo)	LIVE	2025-11-12	Schema representation, inherited; no geo-specific mutation intent	ACTIVATE_SEGMENTS can carry a segment built from location data, though not a geo field	[216]
OpenRTB 2.6 (baseline, not agentic)	Geo object, DOOH venue type, Qty multiplier	LIVE	2026-04-01	Documented production use: Google's exchange documents type=2 (IP), coarse geolocation in its bid requests	Comparator for the agentic protocols; Google documents its own exchange only	[219] [220]
Foursquare places MCP server	Place search and lookup tools (search_near, search_near_point, place_snap, place_details)	LIVE	2025-04-29	Implemented connector outside agent-driven buying	Not a buying protocol	[217]
Mapbox MCP server v0.16.0	Geocoding, POI search, isochrones (hosted MCP tools)	LIVE	2026-10-15	Implemented connector outside agent-driven buying	Not a buying protocol	[218]
Radar MCP server 1.0.0	Documentation search only (search_radar, query_docs_filesystem_radar, submit_feedback)	LIVE		No location tools	Public documentation endpoint; Radar also announced on 14 October 2026 an authenticated MCP server, in pilot for enterprise customers, with read-only tools over a customer's own location records. Neither is a buying interface.	[222] [223]
Pi for Placer MCP	Enterprise MCP server over Placer.ai data (per-account entitlement); documentation updated 22 October 2026	LIVE	2026-10-22	documentation page; connector directory listings	Not a buying protocol	[224]

CHAPTER 11

The Ground Quotient

The Ground Quotient (GQ) summarises what each location product documents in public, within its cohort. Across all five cohorts, the two weakest dimensions are the ones a buyer needs before treating a location number as fact: agreement with ground truth and independent assurance.

> **IN SHORT**
>
> 47 products are scored on 11 dimensions in five cohorts: 12 in visit measurement and attribution (A), 14 in location audiences and targeting (B), 10 in foot-traffic and visit analytics (C1), 7 in raw movement data (C2) and 4 in geofencing and visit-detection SDKs (D). The field GQ is 41 in A, 44 in B, 41 in C1, 38 in C2 and 54 in D, which is shown without bands by design. 1 product sits in the Most documented band, 18 in Well documented, 21 in Partly documented and 2 in Least documented. Independent assurance averages 1 in every cohort, and ground-truth validation is among the three lowest-scoring dimensions in A, B and C2. The GQ measures documented capability, not accuracy or performance.

What the quotient does

Each product was scored from 0 to 5 on the dimensions that apply to its cohort, against anchors fixed before scoring and amended once, before any cell was scored, after the second outside review (chapter 13). The quotient groups the cells into three. Depth is what the data and the number are: source transparency, the location fix and visit definition, ground-truth validation and, in cohort A only, causal design. Reach is where it works: coverage, data access, documented production volume and US availability. Standing is whether a buyer can trust and trade it: independent assurance, method disclosure and privacy and consent posture. A product's Raw score is 0.45 × Depth + 0.25 × Reach + 0.30 × Standing, each group the mean of its counted cells and renormalised if a group is missing. Cells that are n/e (no evidence) or n/a (outside the cohort's mask) are skipped, never counted as zero.

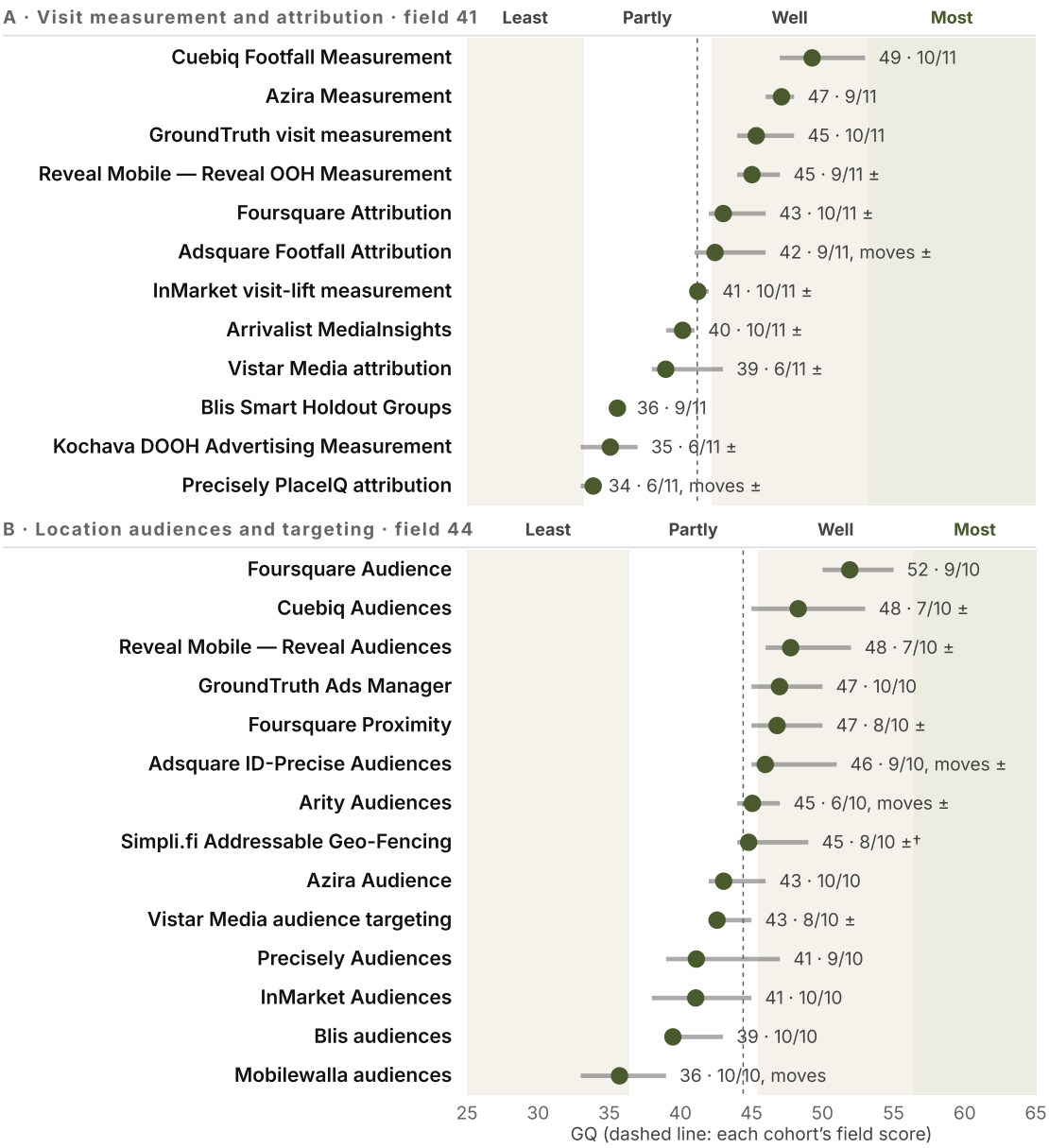
Raw is pulled toward the cohort's field mean in proportion to how thin the record is: Shrunk = (k × Raw + K × F) / (k + K), where k is the row's counted cells, F the mean Raw of the cohort's admitted rows and K, the prior strength, 4. The GQ is 100 × Shrunk / 5. K is an author-set heuristic, not a statistical estimate, and the tests below rerun the index without it. Bands come from the unrounded distance to the field mean, 20 × (Shrunk − F): Most documented at +12 or more, Well documented at +1 or more, Partly documented at −8 or more, Least documented below. A band needs at least 6 counted cells with every group represented, and a cohort shows bands only when 6 or more of its rows qualify. Cohorts A, B, C1 and C2 do. Cohort D has 4 rows and carries no bands by design.

Two rules shape the numbers and are the author's choices. Projection method, how panel visits are scaled to a population, is reported beside the matrix as a separate module and is not in the quotient: scoring it inside the GQ would have rewarded products that disclose nothing about their projections (chapter 13). Privacy carries a risk cap: a product whose location data was the subject of a regulator order, entered judgment or confirmed breach in the three years before the cutoff scores at most 1, and its uncapped score for current controls is published beside it. Seven products carry the cap. Without it, their GQs would be 2 to 5 points higher, three would move up a band, and two uncapped products, Placer.ai among them, would move down as their cohorts' field means rose ◆.

The field mean here is the mean of the cohort's Raw scores. That differs from the author's Contextual and Native Quotients, which pooled group scores, so a GQ is not comparable with a CQ or an NQ, and a score in one cohort is not comparable with a score in another.

The results

GROUND QUOTIENT (0–100) BY COHORT, WITH THE RANGE UNDER FOUR REWEIGHTINGS



Shaded zones: the Most, Well, Partly, Least documented bands, set per cohort. Each row: GQ · counted cells of applicable. Grey bar: range under the four reweightings; "moves": the band changes under at least one. Provisional: ± the band moves when missing evidence is filled; † a blind second scorer's scores move it.

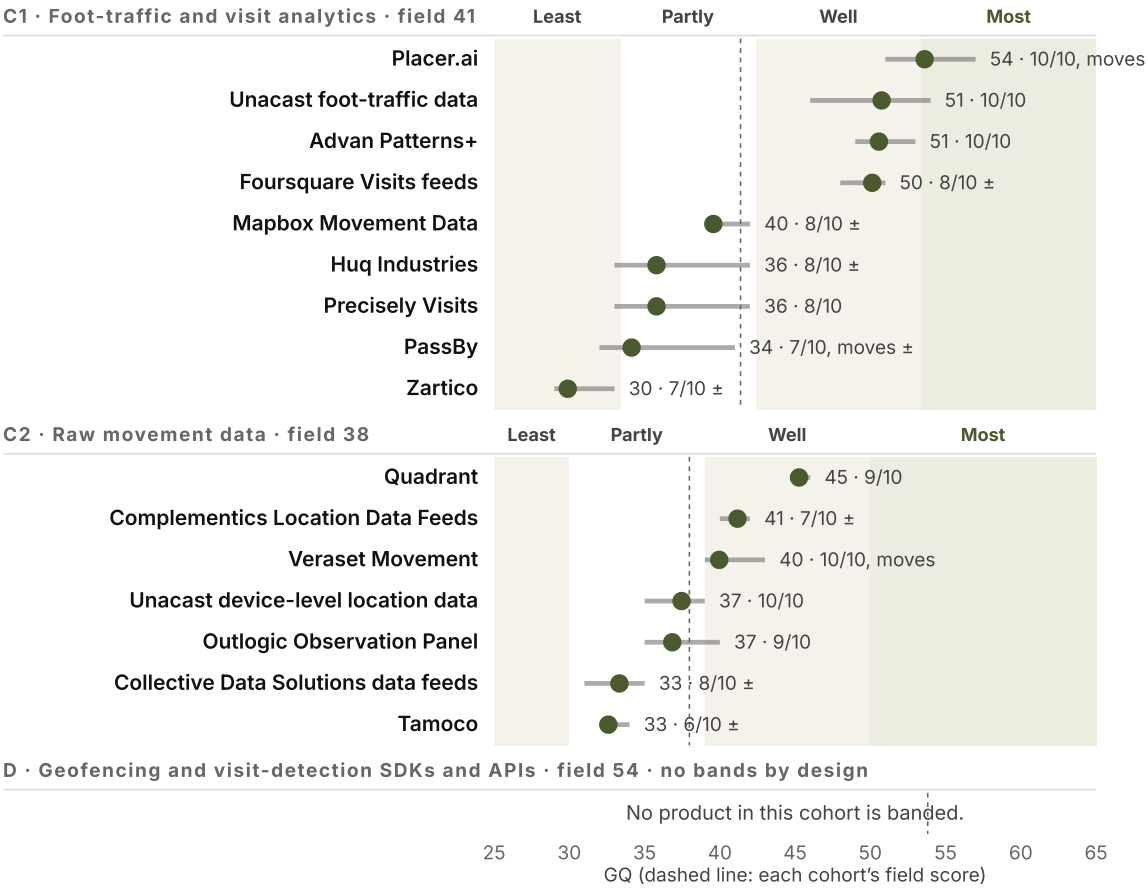
> **Read the band, not the rank: in visit measurement and in audiences, no product clears the most documented line.** The Ground Quotient for the banded products in cohorts A and B, one section per cohort; cohorts C1, C2 and D follow in the next figure, on the same axis. The Ground Quotient uses the band offsets of the author's Contextual Quotient, but its field mean is the cohort's mean Raw score rather than a pooled group mean, so the two do not read identically; neither construction validates it. Depth, Reach, Standing group means are combined 45/25/30 and shrunk toward the cohort's field mean (the mean Raw score of its admitted rows) with a prior strength of 4; bands come from the unrounded distance to that field score, and only verified or qualified cells count. A band needs at least 6 counted cells with one in every applicable group, in a cohort with at least 6 such rows. Across the

reweightings, positions move by up to 3 places within a cohort, and 34 of the 42 banded products in all cohorts keep their band under every weighting. GQ measures publicly documented capability within a cohort, not product performance.

Units: GQ points on a 0–100 scale, pulled toward the cohort field mean; shown rounded, plotted unrounded · Scope: 26 banded products in cohorts A and B, of 47 in the capability matrix; scores as of 24 October 2026

One initial scoring pass; 16 rows nearest a band line re-scored blind. The index inherits every limit of the dimension scores and is sensitive to the weights; the bands, not the positions, are the finding.

GROUND QUOTIENT (0–100) BY COHORT, WITH THE RANGE UNDER FOUR REWEIGHTINGS



Shaded zones: the Most, Well, Partly, Least documented bands, set per cohort. Each row: GQ · counted cells of applicable. Grey bar: range under the four reweightings; "moves": the band changes under at least one. Provisional: ± the band moves when missing evidence is filled; † a blind second scorer's scores move it. Not plotted, A to Z: Arity Geosight and Roadway Insights (thin record), Bluedot (cohort without bands), Foursquare Movement SDK (cohort without bands), Infillion — Gimbal (cohort without bands), Radar (cohort without bands). Their scores are in data/gq.csv.

> **In foot-traffic analytics and raw movement data, one product clears the most documented line; developer tools carry no bands by design.** The Ground Quotient for cohorts C1, C2 and D, continuing the previous figure on the same axis and under the same rules. Cohort D is scored but not banded, by design; its rows are listed under the chart. GQ measures publicly documented capability within a cohort, not product performance.
>
> Units: GQ points on a 0–100 scale, pulled toward the cohort field mean; shown rounded, plotted unrounded · Scope: 16 banded products in cohorts C1, C2 and D, of 47 in the capability matrix; scores as of 24 October 2026
>
> One initial scoring pass; 16 rows nearest a band line re-scored blind. The index inherits every limit of the dimension scores and is sensitive to the weights; the bands, not the positions, are the finding.

In cohort A the field GQ is 41; a product needs 42.2 for Well documented and 53.2 for Most documented. In cohort B the field is 44, with Well documented from 45.4. In cohort C1 it is 41, with Well documented from 42.4 and Most documented from 53.4. In cohort C2 it is 38. At these field means, a product scoring 5 on every applicable dimension would reach 84 in cohort A, not 100, because of the shrinkage.

The one product in the Most documented band is Placer.ai, in cohort C1, and it clears the line by less than a quarter of a point; under three of the four reweightings it is Well documented. Its band rests on documentation, not on accuracy: its US availability is backed by an independent record, and the one third-party comparison found for it, at a single trail site and with its funding not stated, put its estimate 30.5% above the counter ◆. That comparison scores 3, not 4, because a comparison with unstated funding is not independent under the rules. Placer.ai's population visit estimates are projections; it also exposes raw panel counts (chapter 1).

The capability matrix

Each cell scores one documented capability from 0 to 5 against fixed anchors; n/e means no evidence, n/a means the dimension does not apply to the cohort. Click a cell for its rationale, availability, evidence grade, date, sources and verification status. Rows are compared only within their cohort; cohort D is shown without bands by design. Projection method is a separate module shown beside the matrix; privacy shows the risk-adjusted value with current controls alongside.

5 documented in operational detail · 3 real but thin or narrow · 1 adjacent or incidental

0 documented absence · n/e insufficient evidence · n/a outside the cohort's mask

unverified: shown, counted as n/e

β beta · ann announced · ? unconfirmed · ret retired · ± provisional band: it moves when missing evidence is filled

† provisional band: a blind second scorer's scores move it

Product	GQ	Sources	Definition	Validation	Causal	Coverage	Access	Volume	US	Assurance	Disclosure	Privacy	Counted
A · VISIT MEASUREMENT AND ATTRIBUTION													
BANDED, BY GQ													
Cuebiq CUEBIQ FOOTFALL MEASUREMENT · SPECIALISTS	**49** WELL DOCUMENTE	3	3	1	2	1	3	1	4	n/e	3	4	10/11
Azira AZIRA MEASUREMENT · SPECIALISTS	**47** WELL DOCUMENTE	3	2	2	4	n/e	1	1	4	n/e	3	2	9/11
GroundTruth GROUNDTRUTH VISIT MEASUREMENT · AD TECH · ACTIVE; ACQUIRED BY ZEROTOONE.AI (MARCH 2026)	**45** WELL DOCUMENTE	3	2	2	1	n/e	3	2	4	1	3	3	10/11
Reveal Mobile REVEAL OOH MEASUREMENT · SPECIALISTS	**45**± WELL DOCUMENTE	3	1	n/e	2	1	3	3	4	n/e	2	3	9/11

Product	GQ	Sources	Definition	Validation	Causal	Coverage	Access	Volume	US	Assurance	Disclosure	Privacy	Counted
Foursquare FOURSQUARE ATTRIBUTION · SPECIALISTS · ACQUISITION ANNOUNCED BY INFILLION (PENDING OR CLOSED; CLOSING UNVERIFIED)	**43**± WELL DOCUMENTE	3	1	1	3	2	3	2	4	n/e	2	2	10/11
Adsquare ADSQUARE FOOTFALL ATTRIBUTION · SPECIALISTS	**42**± WELL DOCUMENTE	3	2	1	2	n/e	3	n/e	3	1	2	2	9/11
InMarket INMARKET VISIT-LIFT MEASUREMENT · SPECIALISTS · ACTIVE, INDEPENDENT	**41**± PARTLY DOCUMENTE	3	1	1	3	1	3	1	4	n/e	3	1	10/11
Arrivalist ARRIVALIST MEDIAINSIGHTS · SPECIALISTS	**40**± PARTLY DOCUMENTE	3	3	1	2	1	1	1	3	n/e	3	1	10/11
Vistar Media VISTAR MEDIA ATTRIBUTION · AD TECH · ACTIVE, SUBSIDIARY	**39**± PARTLY DOCUMENTE	2	1	n/e	n/e	n/e	3	n/e	3	n/e	1	2	6/11
Blis BLIS SMART HOLDOUT GROUPS · AD TECH · ACTIVE; ACQUIRED (COMPLETED 3 MARCH 2025)	**36** PARTLY DOCUMENTE	1	1	1	4	1	1	n/e	3	n/e	1	2	9/11
Kochava KOCHAVA DOOH ADVERTISING MEASUREMENT · AD TECH	**35**± PARTLY DOCUMENTE	1	1	n/e	n/e	n/e	1	n/e	3	n/e	2	2	6/11
Precisely PRECISELY PLACEIQ ATTRIBUTION · ENTERPRISE DATA	**34**± PARTLY DOCUMENTE	3 ?	1 ?	1 ?	n/e	n/e	n/e	n/e	1 ?	n/e	1 ?	2 ?	6/11
B · LOCATION AUDIENCES AND TARGETING													
BANDED, BY GQ													
Foursquare FOURSQUARE AUDIENCE · SPECIALISTS	**52** WELL DOCUMENTE	3	3	1	n/a	4	4	1	4	n/e	2	4	9/10
Cuebiq CUEBIQ AUDIENCES · SPECIALISTS	**48**± WELL DOCUMENTE	3	1	1	n/a	n/e	3	n/e	4	n/e	2	4	7/10
Reveal Mobile REVEAL AUDIENCES · SPECIALISTS	**48**± WELL DOCUMENTE	2	2	n/e	n/a	3	3	n/e	4	n/e	2	3	7/10

Product	GQ	Sources	Definition	Validation	Causal	Coverage	Access	Volume	US	Assurance	Disclosure	Privacy	Counted
GroundTruth GROUNDTRUTH ADS MANAGER · AD TECH	**47** WELL DOCUMENTE	3	3	1	n/a	4	3	1	4	1	2	3	10/10
Foursquare FOURSQUARE PROXIMITY · SPECIALISTS	**47**± WELL DOCUMENTE	2	3	1	n/a	1	4	n/e	4	n/e	2	3	8/10
Adsquare ADSQUARE ID-PRECISE AUDIENCES · SPECIALISTS	**46**± WELL DOCUMENTE	2	3	1	n/a	3	4	n/e	3	1	2	3	9/10
Arity ARITY AUDIENCES · ENTERPRISE DATA	**45**± PARTLY DOCUMENTE	3	1	n/e	n/a	n/e	n/e	1	4	n/e	2	3	6/10
Simpli.fi SIMPLI.FI ADDRESSABLE GEO-FENCING · AD TECH	**45**±† PARTLY DOCUMENTE	2	3	1	n/a	3	3	n/e	3	n/e	2	2	8/10
Azira AZIRA AUDIENCE · SPECIALISTS	**43** PARTLY DOCUMENTE	3	2	1	n/a	3	3	1	3	1	2	3	10/10
Vistar Media VISTAR MEDIA AUDIENCE TARGETING · AD TECH	**43**± PARTLY DOCUMENTE	3	2	1	n/a	1	3	n/e	3	n/e	2	2	8/10
Precisely PRECISELY AUDIENCES · ENTERPRISE DATA	**41** PARTLY DOCUMENTE	3	1	1	n/a	3	3	n/e	4	1	1	2	9/10
InMarket INMARKET AUDIENCES · SPECIALISTS	**41** PARTLY DOCUMENTE	3	2	1	n/a	3	3	1	4	1	2	1	10/10
Blis BLIS AUDIENCES · AD TECH	**39** PARTLY DOCUMENTE	3	1	1	n/a	3	3	1	3	1	2	2	10/10
Mobilewalla MOBILEWALLA AUDIENCES · SPECIALISTS	**36** LEAST DOCUMENTE	3	1	1	n/a	1	3	1	4	1	1	1	10/10
C1 · FOOT-TRAFFIC AND VISIT ANALYTICS													
BANDED, BY GQ													
Placer.ai SPECIALISTS · ACTIVE, INDEPENDENT	**54** MOST DOCUMENTE	3	3	3	n/a	4	4	1	5	1	2	4	10/10
Unacast UNACAST FOOT-TRAFFIC DATA · SPECIALISTS	**51** WELL DOCUMENTE	3	3	3	n/a	4	4	2	4	1	3	1	10/10
Advan ADVAN PATTERNS+ · SPECIALISTS	**51** WELL DOCUMENTE	3	2	3	n/a	3	4	1	5	1	3	3	10/10

Product	GQ	Sources	Definition	Validation	Causal	Coverage	Access	Volume	US	Assurance	Disclosure	Privacy	Counted
Foursquare FOURSQUARE VISITS FEEDS · SPECIALISTS	50± WELL DOCUMENTE	3 ?	3 ?	n/e	n/a	2 ?	4 ?	1 ?	3 ?	n/e	2 ?	3 ?	8/10
Mapbox MAPBOX MOVEMENT DATA · ENTERPRISE DATA	40± PARTLY DOCUMENTE	3	1	1	n/a	n/e	3	1	3	n/e	2	2	8/10
Huq HUQ INDUSTRIES · SPECIALISTS	36± PARTLY DOCUMENTE	1	1	2	n/a	n/e	3	n/e	3	1	1	1	8/10
Precisely PRECISELY VISITS · ENTERPRISE DATA	36 PARTLY DOCUMENTE	1	2	1	n/a	2	3	n/e	4	n/e	1	1	8/10
PassBy SPECIALISTS	34± PARTLY DOCUMENTE	1	1	1	n/a	n/e	3	n/e	3	1	1	n/e	7/10
Zartico SPECIALISTS	30± LEAST DOCUMENTE	1	1	1	n/a	n/e	1	1	3	n/e	1	n/e	7/10
NOT BANDED, A TO Z													
Arity ARITY GEOSIGHT AND ROADWAY INSIGHTS · ENTERPRISE DATA	38 THIN RECORD	2	n/e	n/e	n/a	n/e	n/e	1	3	n/e	1	n/e	4/10
C2 · RAW MOVEMENT DATA													
BANDED, BY GQ													
Quadrant SPECIALISTS	45 WELL DOCUMENTE	3	3	1	n/a	1	4	1	4	n/e	2	3	9/10
Complementics COMPLEMENTICS LOCATION DATA FEEDS · SPECIALISTS	41± WELL DOCUMENTE	2	2	n/e	n/a	1	n/e	1	4	n/e	2	3	7/10
Veraset VERASET MOVEMENT · SPECIALISTS	40 WELL DOCUMENTE	3	2	0	n/a	2	4	1	4	1	2	3	10/10
Unacast UNACAST DEVICE-LEVEL LOCATION DATA · SPECIALISTS	37 PARTLY DOCUMENTE	3	2	1	n/a	1	3	1	4	1	2	1	10/10
Outlogic OUTLOGIC OBSERVATION PANEL · SPECIALISTS	37 PARTLY DOCUMENTE	3	1	1	n/a	1	3	n/e	4	1	2	1	9/10
Collective Data Solutions COLLECTIVE DATA SOLUTIONS DATA FEEDS · SPECIALISTS	33± PARTLY DOCUMENTE	2	2	1	n/a	1	n/e	1	4	n/e	1	1	8/10

Product	GQ	Sources	Definition	Validation	Causal	Coverage	Access	Volume	US	Assurance	Disclosure	Privacy	Counted
Tamoco SPECIALISTS	**33**± PARTLY DOCUMENTE	2	1	1	n/a	n/e	n/e	1	n/e	n/e	1	3	6/10
D · GEOFENCING AND VISIT-DETECTION SDKS AND APIS													
NO BANDS IN THIS COHORT, A TO Z													
Bluedot DEVELOPER PLATFORMS	48 COHORT WITHOUT BANDS	2	2	1	n/a	4	4	n/e	3	n/e	2	2	8/10
Foursquare FOURSQUARE MOVEMENT SDK · DEVELOPER PLATFORMS	59 COHORT WITHOUT BANDS	3	4	2	n/a	3	4	n/e	3	n/e	3	3	8/10
Infillion GIMBAL · DEVELOPER PLATFORMS	52 COHORT WITHOUT BANDS	3	3	1	n/a	3	3	n/e	n/e	n/e	3	2	7/10
Radar DEVELOPER PLATFORMS · ACTIVE, INDEPENDENT	56 COHORT WITHOUT BANDS	3	4	2	n/a	4	4	1	4	1	3	3	10/10

How GQ is built. The Ground Quotient uses the band offsets of the author's Contextual Quotient, but its field mean is the cohort's mean Raw score rather than a pooled group mean, so the two do not read identically; neither construction validates it. Three groups: **Depth** (source transparency, location fix and visit definition, ground-truth validation, causal design), **Reach** (coverage, data access and integrations, documented production volume, us availability and coverage) and **Standing** (independent assurance, method disclosure, privacy and consent posture). Only verified or qualified cells count; an unverified cell counts as n/e, and n/a comes only from the cohort's applicability mask. Each group is the mean of the counted cells inside it, so an unscored dimension is not counted as a zero. Raw combines the groups at 45/25/30, renormalised over the groups present, and is shrunk toward the cohort's field mean, the mean Raw score of the cohort's admitted rows, thin rows included, with a prior strength of 4 against the row's own count of counted cells. A cohort is a set of products doing a comparable job; each has its own field mean and band lines, and rows are never ranked across cohorts. The weights and the prior strength are author-defined heuristics. Bands come from the unrounded distance to the cohort's field score (Most documented at +12 or more, Well documented at +1 or more, Partly documented at −8 or more, Least documented below that); only the displayed score is rounded. A row gets a band only with at least six counted cells and at least one in every applicable group, and only in a cohort with at least 6 such rows; the others show a score without a band and are listed apart, A to Z, with any missing group named. The three bars under each score are Depth, Reach and Standing in that order. GQ summarises publicly documented capability within a cohort, not product performance, and is not calibrated to buyer outcomes.

Read the band, not the rank. A · Visit measurement and attribution (12 rows, field GQ 41.2). Band lines: Most documented 53.2, Well documented 42.2, Partly documented 33.2, Least documented below. Under four reweightings (equal thirds, depth-led, reach-led, standing-led), with Raw and the field mean recomputed, no product sits in the top band (Most documented), while positions move by up to 3 places and by 0.7 on average. Of the 12 banded products, 10 keep their band under every weighting (Arrivalist, Azira, Blis, Cuebiq, Foursquare, GroundTruth, InMarket, Kochava, Reveal Mobile, Vistar Media); Adsquare, Precisely cross a band line under at least one. With a prior strength of 0 (Raw, no shrinkage), 2 and 8 instead of 4,

positions move by up to 0, 0 and 0 places. Deleting one counted cell at a time moves a score by up to 4 points up (Arrivalist, privacy and consent posture) or 5 down (Blis, causal design); 0 deletions would drop a row below admission and 18 would cost a row its band eligibility. In the missing-evidence scenarios (every n/e cell of a banded row filled with 1, then with 4, with the field and every other row frozen), 8 of the 12 banded rows with n/e cells change band (Adsquare, Arrivalist, Foursquare, InMarket, Kochava, Precisely, Reveal Mobile, Vistar Media; marked ±). **B · Location audiences and targeting** (14 rows, field GQ 44.4). Band lines: Most documented 56.4, Well documented 45.4, Partly documented 36.4, Least documented below. Under four reweightings (equal thirds, depth-led, reach-led, standing-led), with Raw and the field mean recomputed, no product sits in the top band (Most documented), while positions move by up to 3 places and by 0.6 on average. Of the 14 banded products, 11 keep their band under every weighting (Azira, Blis, Cuebiq, Foursquare, Foursquare, GroundTruth, InMarket, Precisely, Reveal Mobile, Simpli.fi, Vistar Media); Adsquare, Arity, Mobilewalla cross a band line under at least one. With a prior strength of 0 (Raw, no shrinkage), 2 and 8 instead of 4, positions move by up to 1, 0 and 0 places. Deleting one counted cell at a time moves a score by up to 5 points up (Arity, location fix and visit definition) or 5 down (Arity, source transparency); 0 deletions would drop a row below admission and 6 would cost a row its band eligibility. In the missing-evidence scenarios (every n/e cell of a banded row filled with 1, then with 4, with the field and every other row frozen), 7 of the 9 banded rows with n/e cells change band (Adsquare, Arity, Cuebiq, Foursquare, Reveal Mobile, Simpli.fi, Vistar Media; marked ±). **C1 · Foot-traffic and visit analytics** (10 rows, field GQ 41.4). Band lines: Most documented 53.4, Well documented 42.4, Partly documented 33.4, Least documented below. Under four reweightings (equal thirds, depth-led, reach-led, standing-led), with Raw and the field mean recomputed, the top band loses at most 1 of its 1 members, while positions move by up to 3 places and by 0.4 on average. Of the 9 banded products, 7 keep their band under every weighting (Advan, Foursquare, Huq, Mapbox, Precisely, Unacast, Zartico); PassBy, Placer.ai cross a band line under at least one. With a prior strength of 0 (Raw, no shrinkage), 2 and 8 instead of 4, positions move by up to 2, 0 and 0 places. Deleting one counted cell at a time moves a score by up to 3 points up (Arity, method disclosure) or 4 down (Placer.ai, privacy and consent posture); 4 deletions would drop a row below admission and 1 would cost a row its band eligibility. In the missing-evidence scenarios (every n/e cell of a banded row filled with 1, then with 4, with the field and every other row frozen), 5 of the 6 banded rows with n/e cells change band (Foursquare, Huq, Mapbox, PassBy, Zartico; marked ±). **C2 · Raw movement data** (7 rows, field GQ 38.0). Band lines: Most documented 50.0, Well documented 39.0, Partly documented 30.0, Least documented below. Under four reweightings (equal thirds, depth-led, reach-led, standing-led), with Raw and the field mean recomputed, no product sits in the top band (Most documented), while positions move by up to 1 places and by 0.3 on average. Of the 7 banded products, 6 keep their band under every weighting (Collective Data Solutions, Complementics, Outlogic, Quadrant, Tamoco, Unacast); Veraset crosses a band line under at least one. With a prior strength of 0 (Raw, no shrinkage), 2 and 8 instead of 4, positions move by up to 0, 0 and 0 places. Deleting one counted cell at a time moves a score by up to 5 points up (Veraset, ground-truth validation) or 4 down (Veraset, source transparency); 0 deletions would drop a row below admission and 6 would cost a row its band eligibility. In the missing-evidence scenarios (every n/e cell of a banded row filled with 1, then with 4, with the field and every other row frozen), 3 of the 5 banded rows with n/e cells change band (Collective Data Solutions, Complementics, Tamoco; marked ±). **D · Geofencing and visit-detection SDKs and APIs** (4 rows, field GQ 53.8). This cohort carries no bands by design; scores and coverage are shown. Deleting one counted cell at a time moves a score by up to 4 points up (Infillion, ground-truth validation) or 3 down (Radar, location fix and visit definition); 0 deletions would drop a row below admission and 0 would cost a row its band eligibility. **Missing evidence is not neutral:** every deletion case is in data/gq-missing-evidence.json, and every row's scenario scores, including a hypothetical 0-to-5 envelope reported separately and never used for the flag, are in data/gq.csv. These tests cover weights, prior strength and missing cells, not evidence grades, the scorer or the product sample. Every input is in the CSVs in the appendix, so the index can be recomputed on different weights.

Where the field is weak

Independent assurance averages 1 in every cohort, the floor for a scored cell. No product holds a current accreditation or an independent audit of its location metrics. On 24 October 2026 none of MRC's eleven lists carried a visit or location metric, and both visit data sets MRC once accredited, Foursquare's and GroundTruth's, have lost accreditation ◆. The products that score anything here score it for self-attestation or for a pending or historical record, which the rules treat as a flag, not a score.

Ground-truth validation is the lowest-scoring dimension in cohort C2, level with the lowest in B, and third-lowest in A, above only independent assurance and coverage. In the sources screened, no product documents an independent comparison of its visit counts with door counts or transactions across many places ◆. Where a vendor publishes an accuracy figure, it publishes no places, period or held-out design, so the cell stays at the vendor-claim anchor (chapter 4).

Documented production volume is the third weak dimension. Panel sizes are stated in incompatible units, often without a period, and bidstream reach is not a panel, so most volume cells are low or n/e (chapter 2).

The strongest cells are US availability in every cohort and data access outside cohort A: vendors document where they sell and how a buyer gets the data, in detail. That is what the caps are for. A detailed help page is vendor documentation, so it earns a 4 at most, and only two cells in the matrix score 5, both for US availability backed by an independent record.

How stable the bands are

The index was recomputed under four other weightings, three other prior strengths and every single-cell deletion.

Under the four reweightings (equal thirds; Depth-led 60/20/20; Reach-led 30/45/25; Standing-led 30/20/50), recomputing Raw and the field mean each time, the largest position change is 3 places in cohort A, 3 in B, 3 in C1 and 1 in C2; 34 of 42 banded products keep their band under all four.

Removing the shrinkage (K = 0, which reports Raw) changes 3 bands in cohort A, 1 in B, 6 in C1 and 1 in C2.

Deleting one counted cell at a time, with every other row and the field mean held fixed, changes a band in 33 of 104 cases in cohort A and 26 of 121 in B. Leaving out a low score raises a quotient: missing evidence is not neutral. The largest single-cell effect in cohort A comes from deleting Arrivalist's privacy and consent posture cell, a 1, which would raise its GQ from 40 to 44. That cell is the risk cap.

The missing-evidence scenarios test the opposite case. Each row's n/e cells are filled with 1, then 4, one row at a time with every other row and the field mean frozen. These are scenarios, not bounds. 23 products change band under one of them and are marked ± in the matrix as provisional. The rows nearest a band line were also scored a second time, blind (chapter 13); a band that the second scorer's scores would move is marked † in the matrix. Rows so marked: 1.

What the quotient is not

The GQ says how much of a product's capability is documented in public, and how well. It does not say whose visit counts are most accurate, which is the question chapter 4 could not answer from public evidence, and it does not say whose lift is causal. It rests on one initial scoring pass under published rules, a cell-by-cell verification of every counted cell by a separate AI verifier, and a blind second pass on the rows nearest a band line. No human second scorer was used.

The profiles

The paper profiles 8 companies in depth: five whose main row is in cohort A (Foursquare, InMarket, GroundTruth, Blis and Vistar Media), two in cohort C1 (Placer.ai and Unacast) and one in cohort D (Radar). Each profile has a SWOT in which every line cites its sources and is tagged as record, vendor documentation, vendor claim or inference.

Deep profiles — select a company

Each card shows the matrix scores as a bar strip. Open a company for its SWOT, what it sells, who buys it, how it earns, its verified capabilities with availability and evidence grade, performance evidence with sponsorship, limits, risks and fit. Pick a SWOT quadrant to isolate it and compare every profiled company on it. Each SWOT line is tagged record, vendor documentation, vendor claim or inference, and opportunities and threats are the author's reading of dated facts.

For each company, capabilities by dimension, performance evidence, financial record and timeline are in the web edition and in data/deep-profile-records.csv.

Blis

ACTIVE; ACQUIRED (COMPLETED 3 MARCH 2025)

Blis Holdco Limited (England and Wales, company 13974159; formerly Project Balloon Bidco Limited, renamed 8 January 2024), holding company of Blis Group Limited and its trading subsidiaries; principal trading company and data controller Blis Global Ltd (company 06455773; formerly Blis Media Limited 2012-2019 and Breeze Tech (UK) Ltd 2007-2012)

One of two holdout lift designs in cohort A, geographic and not documented as random; owned by T-Mobile since 2025.

STRENGTHS

Smart Holdout Groups withholds ads in control zip codes with buffer zones, a geo holdout rather than an exposed-only or synthetic comparison. VENDOR DOCUMENTATION [19] [123] [124]

T-Mobile US completed the acquisition on 3 March 2025, transferring US$180 million (US$174 million consideration at fair value; the rest settled preexisting relationships); Blis became wholly owned. RECORD [36] [225]

WEAKNESSES

No visit definition, footfall data source, minimum sample, significance rule or uncertainty is published for footfall lift. VENDOR DOCUMENTATION [19] [123] [124] [229]

Control areas come from matched pairs; Blis never states that designation within a pair is random. VENDOR DOCUMENTATION [123]

Not on MRC's accredited or under-review digital lists; no independent audit of the holdout method

Audited accounts show GBP 82.9m turnover in the year to June 2024, GBP 37.9m in the Americas, with an operating loss of GBP 7.7m. RECORD [226]

The only omnichannel DSP, by its own claim, combining T-Mobile's US app data with movement and transaction data, live since 10 September 2025. VENDOR CLAIM [227] [228]

The geo design measures DOOH, audio and CTV, where device-level controls are hard to build. VENDOR DOCUMENTATION [19] [229]

found. RECORD [171]

Last panel figure is 370m 'opted-in' devices, global and undefined, from August 2021; no current US panel. VENDOR CLAIM [230]

The only third-party location-data verification found (2019) was a commercial engagement, an 18-month deal, and the verifier later alleged data manipulation, which Blis denied. RECORD [231] [232] [233]

OPPORTUNITIES

UK app-usage lift on mobile-network data is offered; a page last modified April 2025 says 'coming soon' to the US, where the parent is a carrier. INFERENCE [19] [36]

With Vistar Media under the same parent since February 2025, a shared geo holdout for DOOH buys is a plausible next step. INFERENCE [234] [36]

Publishing the pair-assignment rule, including whether designation is random, and sample thresholds would let buyers judge whether lift reads as causal; Blis claims independent verifiability. INFERENCE [229] [123]

THREATS

Registered California data broker declaring precise-geolocation collection; DROP deletion requests must be processed from 1 August 2026. RECORD [163]

Its privacy notice lists precise GPS data and names SSPs and exchanges among its sources, a route state precise-geolocation laws are narrowing; the share is not stated. INFERENCE [235]

A listed verifier's 2021 regulatory announcement still records an unadjudicated data-manipulation allegation against Blis. RECORD [232]

Parent is a large US advertiser and data supplier; with no independent audit, buyers may question neutrality of in-platform lift. INFERENCE [234] [227] [171]

WHAT IS SOLD

An omnichannel demand-side platform built around geography rather than identifiers: planning (Audience Explorer, launched 2021, and the Blis AI planning assistant, June 2025), buying (Dynamic Audience Targeting, managed or self-service, on display, native, audio, online video, CTV and DOOH inventory) and measurement (Smart Holdout Groups: brand lift, footfall lift in the US only, app-usage lift in the UK only, sales lift and custom lift, all computed by comparing machine-balanced target and control zip codes or postal districts). Data layered in the platform includes T-Mobile Advertising Solutions' US app ownership and app engagement data (since 10 September 2025), other telco data (UK and Europe), movement data and transaction data.

WHO BUYS IT

Advertisers and media agencies (Blis: 'working with major agencies and their brands'; operates in 'more than 40 markets'). The buyer pays for media bought through the DSP, with measurement attached to Blis-bought campaigns. Named clients in vendor material are not reproduced (paper rule). Its parent is itself a large US advertiser; any conflict that creates is a reading, not a documented issue.

HOW IT EARNS

Media buying through the DSP. Blis says 'We do not mark up media' and its data fees are 'capped to not scale up for premium content' (vendor). The audited accounts recognise revenue 'on a monthly basis, based upon the level of impressions generated from each individual client campaign' and do not say whether turnover is gross media or net fees. Smart Holdout Groups pricing is not published; a free trial for a limited time was offered in the UK in October 2024.

BEST FIT

US advertisers buying omnichannel media through Blis who want an in-platform geo holdout read on store visits across channels without device IDs (DOOH, audio, CTV) and accept a vendor-run, unaudited method (LOC-BLIS-S07, S09, S10).

Buyers who want to activate audiences built from telco app data and coarse geography rather than device IDs, inside one DSP (LOC-BLIS-S10, S16).

POOR FIT

Buyers who need an accredited, independently audited or published-method visit-lift metric, or significance and uncertainty reporting (LOC-BLIS-S07, S26).

Measurement of media bought outside Blis, or data buyers who need raw visit data, segments exported to other DSPs or an API (LOC-BLIS-S07, S10, S29).

Uses that require a documented consent route for the location data and sensitive-place suppression at product level (LOC-BLIS-S11, S13).

Foursquare

ACQUIRED BY INFILLION (ANNOUNCED 18 SEPTEMBER 2026; COMPLETION REPORTED BY PARTICIPANTS; CLOSING DATE UNVERIFIED)

Foursquare Labs, Inc.

The first location data set MRC accredited (2020), revoked in 2022; lift rests on a modelled control; now part of Infillion.

STRENGTHS

Publishes the most detailed attribution pipeline seen in this review: tenure filters, block-group census weights, place weights, matched twin cohorts and impression-based projection. VENDOR DOCUMENTATION [236] [120]

Audience activates through 26 listed platforms spanning DSPs, social, CTV, audio and DOOH, with self-serve CPM pricing published (US$1.50

WEAKNESSES

Attribution's default control is modelled or matched; no randomised or holdout option is documented, so its 'incremental lift' is not causal under this paper's rules. VENDOR DOCUMENTATION [119] [120] [236]

MRC revoked the Visits data set's accreditation in December 2022 after an October suspension; Attribution was never audited or accredited. RECORD [167] [245]

Audience, US$0.75 Proximity). VENDOR DOCUMENTATION [237] [238]

Research Visits Feed documents a US first-party visit panel with SAG normalization weights, a two-minute dwell rule and history from July 2020. VENDOR DOCUMENTATION [239] [240] [241] [242]

NAI precise-location Enhanced Standards signatory (March 2025 list) with a published 13-category sensitive-place exclusion list. RECORD [243] [244]

No numeric minimum sample, significance rule, accuracy threshold or detection error is published; reports release when 'statistically viable', undefined. VENDOR DOCUMENTATION [246] [247] [248] [249]

Device figures change definition each time: 100M US monthly devices (2019), 25M opted-in panel (2020), 250M US devices of aggregated coverage (2026). RECORD [30] [38] [52]

OPPORTUNITIES

Infillion pairs Foursquare visits with Catalina purchase data in one platform, which could support sales-and-visit measurement at scale as the businesses integrate. INFERENCE [52] [51]

No location lift metric appears on MRC's Digital accredited list at 24 October 2026 (Out-of-Home list unreadable); a re-accredited visit metric would be rare in the market. INFERENCE [171] [167]

Proximity's documented NY, WA and CT radius rule shows Foursquare can productise state-law compliance, a selling point as more states restrict precise location. INFERENCE [237] [250]

THREATS

Infillion is evaluating Swarm and Superlocal's future after City Guide's December 2024 retirement; these apps supply Foursquare's first-party location and check-in ground truth. INFERENCE [52] [64] [236]

AdExchanger, citing Axios, reports Foursquare will sell to third parties 'for now, at least'; Infillion said the same of Catalina, whose data would eventually become exclusive. RECORD [51]

Foursquare already attributes raw panel step changes to OS updates such as iOS 13; further permission changes could shrink supply without warning. VENDOR CLAIM [240]

California registry lists Foursquare as a data broker collecting precise geolocation, exposing it to Delete Act deletion requests processed from August 2026. RECORD [251]

WHAT IS SOLD

Four buyer-facing lines on location data, plus place data. (1) Attribution: store-visit and sales-impact measurement of campaigns across digital, social, audio, linear and connected TV and OOH, reporting projected visits, 'incremental' or 'behavioral' lift against a modelled control, and sales metrics from card transactions (S19, S21, S23). (2) Audience: visitation-based segments for activation in 26 listed platforms (S30, S34). (3) Proximity: real-time radius geofences around Foursquare POIs delivered to DSPs (S31, S32). (4) Visits data feeds: a US-only, first-party Research Visits Feed with normalization weights for investors and researchers, a Standard Visits Feed of chain or category visits, and device-level Offline Conversions for partner attribution (S38, S39, S43); the documentation is live but no product named Visits appears on the 2026 menu

WHO BUYS IT

Advertisers, agencies and media sellers measuring store visits (Attribution; Infillion says Foursquare 'serves all agency holding companies' and measures for 'hundreds of brands', S11); advertisers buying through DSPs, social, CTV, audio and DOOH platforms (Audience, Proximity; S34); hedge funds, consultancies, asset managers, government and academic researchers (Research Visits Feed, S38); brands and agency data platforms (Standard Visits Feed, S39); app developers (Movement SDK, S45). No buyer is named here.

(S12, S36). (5) Movement SDK for app developers (S45). Listed, not scored: Places API and Places POI data (100M+ POIs; open-source and Pro/Premium tiers), the Geospatial Intelligence Platform (Spatial Workbench, H3 Hub, Desktop, Studio), Business Listings, and the Swarm and Superlocal consumer apps (S12, S44).

HOW IT EARNS

Self-serve CPM data fees for targeting: Audience US$1.50 CPM and Proximity US$0.75 CPM 'in most scenarios', with a 2M impressions a month minimum for managed service (S33). Attribution, Visits feeds, Places and SDK pricing are not published in the sources opened (Attribution report tiers are sold through sales, S21). Revenue is not disclosed in any filing; the only revenue figure found is the parties' 2020 merger claim of more than US$150M combined (S17).

BEST FIT

Buyers who want one vendor to target, geofence and measure store visits across many channels, and who accept a modelled control and projected visits (S19, S34).

Analysts who need a US first-party visit panel with documented weights and a three-year history at venue level (Research Visits Feed), and who will treat it as a projected index, not a count (S38, S40).

App developers who need venue-level visit detection and geofence events with marketing-platform integrations (S45, S50).

POOR FIT

Buyers who need causal lift with a randomised or holdout design by default, or published significance rules (S19, S24).

Buyers who require a currently MRC-accredited visit or lift metric (S02, S03).

Buyers who need disclosed source proportions or a stable, defined panel size over time (S11, S16, S17, S37).

GroundTruth

ACTIVE; ZEROTOONE.AI ANNOUNCED ON 25 MARCH 2026 THAT IT HAD ACQUIRED GROUNDTRUTH

xAd, Inc. (doing business as GroundTruth, per California's data-broker registry)

Observed and Projected Visits carry no control and no lift claim; an MRC accreditation that ended with withdrawal; acquired by ZeroToOne.AI (announced 25 March 2026).

STRENGTHS

WEAKNESSES

Satellite-traced three-layer polygons (in-store, on-lot, retail block), 4.8 million across the US and Canada, underpin targeting, visits and DOOH viewsheds; unmappable places fall back to 12-meter circles. VENDOR DOCUMENTATION [252] [253] [254] [255]

Documents observed and projected visits as separate metrics, with the 14-day window, last-touch credit, 7-day verification and projection thresholds stated. VENDOR DOCUMENTATION [6] [18]

Publishes three protected-location classes with category lists and states which targeting and measurement features each state rule switches off. VENDOR DOCUMENTATION [256]

Self-serve Ads Manager reaches six channels, including DOOH via Place Exchange and direct mail, with a $0 minimum in its own comparison. VENDOR CLAIM [122] [257]

MRC revoked accreditation of its Location, Place, and Visit data set after GroundTruth withdrew; no MRC listing at 24 October 2026. RECORD [169] [170] [171] [177]

Observed and Projected Visits are exposed-only with no control; a separate DOOH claim of incremental visits documents no control design. VENDOR DOCUMENTATION [6] [122] [257]

Projected Visits name no weighting variables, report no uncertainty and show no validation against door counts or transactions. VENDOR DOCUMENTATION [18]

Accuracy evidence is vendor-commissioned receipt-panel audits from 2017-2019 (10,000-panelist sample stated) and an undated 99% claim, with no method or report published. VENDOR CLAIM [258] [259]

No current US panel size; the only source proportion dates from 2018 and the bid-stream is an acknowledged source. VENDOR DOCUMENTATION [260] [261] [262]

OPPORTUNITIES

Re-entering MRC audit could restore the independent standing it held from July 2021 until its September 2023 hiatus. INFERENCE [168] [169] [170]

ZeroToOne.AI's March 2026 acquisition adds predictive audiences; a published holdout test of them would turn bare accuracy claims into evidence. INFERENCE [47] [263] [264]

DOOH attribution launched October 2025 through Place Exchange gives a measurement offer in a channel where buyers ask for outcomes. INFERENCE [257]

THREATS

Five state restrictions dated 1 October 2025 to 1 October 2026 already switch off visit tracking there; more states would widen gaps. INFERENCE [256]

Registered as a California data broker collecting precise geolocation, and saying it 'may sell your sensitive personal data', it sits where state laws are tightening. INFERENCE [251] [265] [256]

Selling media, defining the visit and billing per visit without independent audit invites buyer challenge to Cost Per Visit invoices. INFERENCE [258] [266] [170]

WHAT IS SOLD

Location-targeted media across mobile, CTV and OTT, desktop, audio, DOOH and direct mail, sold self-serve through Ads Manager and through a managed service, with visit measurement attached: Observed Visits (exposed users later detected inside a Blueprint polygon within 14 days, last-touch) and Projected Visits (an impressed-device panel scaled to all impressed devices). Buying models are CPM and a managed Cost Per Visit model. Targeting layers include geotargets, real-

WHO BUYS IT

Brands, agencies and small and mid-sized businesses buying local and national media, self-serve or managed; the acquirer claims 'more than 2,000 enterprise customers globally' (S11, S42, S08). No client is named in this profile.

time on-premise targeting, Neighborhoods, deterministic visit audiences, ZeroToOne.AI predictive audiences and Datonics third-party segments (S19, S20, S27, S38, S42, S46).

HOW IT EARNS

Media margin on CPM buys and pay-per-visit pricing under Cost Per Visit; a flat US$1.50 CPM upcharge for Datonics Premium Audiences; measurement is delivered with GroundTruth-served media rather than sold as a stand-alone fee in the sources opened (inference; S27, S38, S46). No revenue figure is published.

BEST FIT

Local and multi-location advertisers who want self-serve geotargeted media with a built-in visit count and accept exposed-only, vendor-defined visits (S19, S38, S42).

Advertisers who want to pay per visit and accept that the seller counts the visits (S27, S46).

POOR FIT

Buyers who need causal incrementality or an independent, accredited visit metric (S05, S19).

Cross-media measurement of media bought elsewhere; the metric covers GroundTruth-served ads only (S19).

Campaigns focused on Maryland, Oregon, Virginia, New Jersey or Connecticut, where visit tracking and on-premise targeting are switched off (S34).

InMarket ACTIVE, INDEPENDENT

InMarket Media, LLC (Delaware limited liability company; DBA InMarket)

The only one of five FTC-ordered companies whose order bans selling precise location outright; synthetic-control lift.

STRENGTHS

Own reward and list apps, a partner SDK network and unnamed third-party sources supply location; InMarket holds item-level receipts and claims closed-loop visit and sales attribution. VENDOR DOCUMENTATION [134] [267] [268]

An undated LCI glossary listed numeric minimums, a standard error and a confidence rule; the console now requires sign-in, so these are unverifiable publicly. VENDOR DOCUMENTATION [17]

Measurement reaches buyers through platform partners: TikTok, Reddit, Yahoo DSP (daily observed

WEAKNESSES

Every documented lift control is matched or synthetic (1:1 matched devices; a synthetic control model); no randomised or holdout default was found, despite 'causal' marketing. VENDOR DOCUMENTATION [17] [121] [11] [273]

The detailed method is an undated NinthDecimal-era console page; the dated 2026 description withholds the 'proprietary mechanics'. VENDOR DOCUMENTATION [17] [121]

No MRC accreditation or MRC-listed review on 24 October 2026, and Comscore validation of visits is

visits) and Basis, announced between October 2024 and May 2026, plus Vistar Media (undated partner page). VENDOR CLAIM [11] [269] [23] [270] [271]

One vendor for visit and sales lift: Retail Sales Lift uses a partner's card transactions from a subset of the same exposed and control users; CPG lift, receipts. VENDOR DOCUMENTATION [11] [272]

asserted without any published record. RECORD [171] [177] [274] [40]

Scale figures (about 200 million 'consumers', 110M monthly devices, 100M devices a year) use incompatible, undated definitions; no US monthly panel is disclosed. VENDOR DOCUMENTATION [275] [267] [274] [273]

Visit geometry, dwell and accuracy rules are undocumented for both measurement and audiences. VENDOR DOCUMENTATION [17] [268] [276]

OPPORTUNITIES

Maestrø (beta, 18 June 2026) offers MCP access to outcomes for agent-driven buying; if it reaches production use it would be an early location-outcome signal for agents. INFERENCE [273]

Publishing the current lift design, visit rules and a ground-truth comparison would separate InMarket from peers whose methods are equally thin. INFERENCE [17] [121]

Circana's acquisition of NCSolutions, which InMarket dates to mid-2025, opens CPG sales-lift buyers to its receipt-based incrementality, per InMarket's March 2026 pitch. VENDOR CLAIM [277] [272]

THREATS

FTC order C-4803 (29 April 2024; at least 20 years) bars selling precise location and targeting its identified sensitive locations; alleged breaches could reach federal court. RECORD [130] [132]

Its June 2026 policy reports state-law 'sale or share' of precise geolocation while denying plain-sense sale; regulators applying state sale bans could read this against it. INFERENCE [134] [130]

InMarket gives a Texas address in California's data-broker registry, yet no Texas registry entry was found on 24 October 2026; the legal requirement is unassessed. RECORD [251] [278]

Selling media and guaranteed iROAS while measuring the outcome invites buyer challenge to its claim of 'independent measurement free from media buying incentives'. INFERENCE [279] [273] [276]

WHAT IS SOLD

A real-time marketing and measurement platform with four lines: Audiences (InMarket Audiences / Audience Suite: 10,000+ syndicated location, intent and commerce segments, custom audiences, PMPs, GeoType personas, RMN and Lift Optimized Audiences); Activation (managed omnichannel media and the GeoLink self-serve platform with geo-audiences, geofencing and retargeting); Measurement (Campaign Incrementality for incremental visit and sales lift, still sold as LCI on other current pages; no opened source says Campaign Incrementality is LCI renamed, so the equivalence is this profile's inference; CPG Sales Lift incrementality on receipt data; Visit Stream daily observed-visit feeds; Unified Measurement, an

WHO BUYS IT

Brands and agencies buying US retail, QSR, dining, auto and CPG media (the vendor's own case studies), plus media platforms that offer InMarket measurement to their advertisers (TikTok, Reddit, Vistar Media, Yahoo DSP, Basis) (S10, S21-S25). No client is named in this profile.

MMM and scenario-planning layer calibrated on LCI results); and InSights. Maestrø (beta, June 2026) packages outcomes for agentic optimisation, including a guaranteed-iROAS managed offer (S08, S09, S10, S19, S25, S26).

HOW IT EARNS

Not disclosed in filings. The sources show media sales (managed activation and GeoLink self-serve), audience segments activated through DSPs and PMPs, measurement studies and dashboards, and a guaranteed-iROAS managed offer (S08, S19, S26). Pre-order, the FTC recorded revenue each time an advertiser used InMarket audiences on real-time bidding platforms and revenue shares paid to SDK app developers (S02 paragraphs 4, 11). No price or fee level was found.

BEST FIT

US brands in retail, QSR, dining and CPG that want visit and sales outcomes from one vendor, read as modelled incremental estimates, and that buy media on platforms where InMarket measurement is already integrated (S10, S15, S21-S25).

In-flight optimisation on daily observed-visit signals where directional reads are acceptable (Visit Stream, Yahoo DSP) (S10, S24).

POOR FIT

Buyers who need a randomised or holdout lift design by default, an MRC-accredited metric, or a published validation of visit counts (S11, S14, S32, S33).

Buyers who want to license raw precise location data: the order bars InMarket from selling or licensing it (S01).

Buyers needing audited segment accuracy at the cutoff: the only audit found is a commissioned 2020 one (S34, S35).

Placer.ai ACTIVE, INDEPENDENT

Placer Labs Inc. (Delaware corporation, per Form D and EDGAR)

The most-quoted foot-traffic dashboard: its population visit estimates are projections from a panel it also shows raw, with one third-party check found, funding not stated.

STRENGTHS

Delivery is broadly documented: a published API reference, CSV/Parquet feeds, Snowflake private sharing, Bloomberg Terminal distribution and an enterprise MCP server documented by October 2026. VENDOR DOCUMENTATION [280] [281] [282] [224]

WEAKNESSES

Its population visit estimates are projections from raw panel visits it also shows; no weighting targets, per-estimate uncertainty or projection validation is published. VENDOR DOCUMENTATION [3] [285] [288]

The only third-party check (funding not stated), at one Minnesota site in 2021, put Placer 30.5% above

The API and dashboard show raw panel visits beside projected visits, so buyers can see how thin the observed base is for a place. VENDOR DOCUMENTATION [3] [283]

Visit rules are documented: geofenced POIs, one visit per person per POI per day in the visits metric, dwell from one minute, per-category default duration segments. VENDOR DOCUMENTATION [284] [285] [283]

Sensitive-place suppression is documented per product and tied to named laws, Washington's My Health My Data Act and Nevada SB370. VENDOR DOCUMENTATION [286] [287]

partial counters; no significant difference. RECORD [101]

Panel size appears as 20M+, 25M+ at about 9%, about 30M at about 8%, and about 7% of the population, mostly without period or definition. VENDOR CLAIM [3] [289] [290] [291]

No MRC listing and no independent data-quality audit; its certifications cover information security, and the CSA STAR entry is a self-assessment. RECORD [171] [177] [292]

OPPORTUNITIES

An MCP server documented by October 2026 puts Placer analytics inside AI assistants, though nothing yet connects it to agent-driven media buying. INFERENCE [224]

Publishing raw-to-projected scale factors and validation statistics would turn "+92% accuracy" into evidence no rival screened here offers. INFERENCE [283] [293] [102]

Advertising pages and Placer's commissioned 2026 radio-campaign measurement show demand for campaign readings; a controlled design would make them causal evidence. INFERENCE [294] [291]

THREATS

The 2022 Senate inquiry over Planned Parenthood data shows how sensitive-place exposure draws scrutiny; state health-data laws already withhold Washington and Nevada locations. RECORD [295] [296] [286]

An unconfirmed ransomware leak-site claim from 12 October 2026 could become a documented breach if confirmed. INFERENCE [297]

De-biasing changes, usually at most yearly, can restate past figures (Data Version 2.0 restated all history to 2017), undercutting buyers who quote Placer series in valuations or reports. INFERENCE [102] [285]

WHAT IS SOLD

Subscription access to projected foot-traffic analytics for US places: visits, visitors, dwell time, hourly and daily patterns, visitor origins and True Trade Areas, inferred demographics and psychographics (licensed overlays), visitor journeys and cross-shopping, chain and industry rankings, retail-sales estimates, vehicle traffic at "traffic pins", migration trends, chain visit forecasts and CMBS feeds; delivered through a dashboard, a REST API, bulk feeds (including Snowflake private sharing), embeddable widgets, Bloomberg Terminal distribution and, as an enterprise entitlement, an MCP server. A freemium tier shows limited data. Advertising is one solution area (planning and campaign "lift" reading), with no separately named measurement product, though Placer has been

WHO BUYS IT

Retailers and restaurant brands, commercial real-estate owners and brokers, investors and finance firms, consumer-goods companies, civic bodies (economic development, tourism, parks) and agencies, as listed by Placer; US public-sector use is documented on public records in Utah and California (LOC-PLACER-S15, S16, S23, S25). Paid customers are vetted for an incorporated brick-and-mortar interest; no paid access for law enforcement or advocacy groups, per Placer (S19).

commissioned to measure a campaign's foot-traffic impact.

HOW IT EARNS

Subscriptions only (no one-time reports), priced by quote; unlimited properties within the subscription; a Customer Success Manager included (LOC-PLACER-S21). One public proposal (Utah, Sept 2024) priced a three-year economic-development subscription at US$34,000 rising to US$37,485 a year (S23). Revenue is not in any filing; Placer announced US$100 million ARR on 20 February 2024 (S20, S26).

BEST FIT

Relative comparisons of US places, chains and categories over time (rankings, year-on-year trends, trade areas) where projection bias is shared across the compared units (S01, S11).

Site selection, leasing and civic planning that need visitor origins and cross-shopping at scale without device-level data (S16, S23).

POOR FIT

Uses that need an observed or audited count of visits at one place, such as billing, rent clauses or official visitor statistics (S24, S35).

Causal campaign measurement: no named product, no documented control design (S16, S39).

Very small, dense or multistory places and low-traffic rural sites, where data can be flagged as partial or withheld (S06, S18).

Radar ACTIVE, INDEPENDENT

Radar Labs, Inc.

Geofencing infrastructure for app developers that says it does not sell location data.

STRENGTHS

Documents detection at parameter level: geometry limits, accuracy-based confidence, buffers, a 140-second, 70-metre stop rule in its tracking presets, dwell thresholds and server-side event generation. VENDOR DOCUMENTATION [298] [299] [300]

Eight documented SDK platforms plus a REST API, with Apache-2.0 client source and iOS, Android and React Native releases in October 2026. VENDOR DOCUMENTATION [301] [302] [303]

Privacy notice and DPA commit Radar to use SDK data only to serve its customers and not to sell it,

WEAKNESSES

No false-positive or false-negative rates for detection; published accuracy figures are generic ranges without sample, devices or period. VENDOR DOCUMENTATION [307] [308]

Volume is stated only as undefined per-day and installed-device counts (1B+ API requests a day, 300M+ installed devices), with no monthly or US figure. VENDOR CLAIM [309] [310]

Hospitals and places of worship are selectable place categories; whether they are detected is the customer's choice, and the only further control is a

with consent and client-directed sharing exceptions. VENDOR DOCUMENTATION [304] [305]

Short default retention for raw location updates (7 days) with per-project settings and immediate API deletion. VENDOR DOCUMENTATION [306]

customer-set per-state blocklist. VENDOR DOCUMENTATION [299] [311]

GLI and BMM certifications are claimed without a public certificate, scope or version; SOC 2 report is available only on request. VENDOR CLAIM [310] [306] [312]

OPPORTUNITIES

As US rules tighten on selling precise location, a documented no-sale processor model lets Radar sell detection rather than data to app owners. INFERENCE [304] [305] [313]

Regulated gaming adds licensed demand: an active Kentucky licence from February 2025 and claimed geo-compliance work for four of seven top US sportsbooks. INFERENCE [314] [315]

Publishing detection error rates under stated test conditions would let Radar lead a cohort that, in the sources screened, publishes none. INFERENCE [307]

THREATS

Engage competitor-visit audiences, and home and work inference surfaced as at-home and at-work states since July 2026, move Radar toward the sensitive uses state laws target. INFERENCE [316] [317] [318]

US$14.5M of TriplePoint venture debt (plus a US$1.5M undrawn commitment) matures 1 September 2028; no priced equity round has been announced since February 2022. RECORD [319] [320] [309]

Contract drift: the 2023 Terms describe a free tier the pricing page drops, and pair a broad SDK-data use right with deference to a narrower privacy notice. VENDOR DOCUMENTATION [321] [304] [322]

OS permission rules and Google Play's bar on geofencing foreground services limit background tracking; Radar's geofencing presets avoid foreground services, so trips and navigation feel it most. VENDOR DOCUMENTATION [300] [323]

WHAT IS SOLD

Developer location infrastructure sold to app and web owners about their own users: SDKs and APIs for geofencing (circle, polygon and isochrone geofences with entry, exit and dwell events), place visit detection against Radar's POI database for the chains or categories the customer enables (Enterprise plan), trip tracking with live ETAs and arrival detection, beacons, region (country and state) detection, fraud and spoofing checks, user insights (inferred home and work locations and, since July 2026, at-home, at-work, travelling and commuting states, enabled through Radar customer success), maps, geocoding, search and routing APIs, and the Reveal fraud-risk API. Since October 2025 these are packaged as three solutions: Protect (location verification and geo-compliance), Optimize (operations) and Engage (location-triggered messaging and first-party audiences). The scored

WHO BUYS IT

Product, engineering, operations, fraud and marketing teams at consumer apps and enterprises (the vendor names retail, restaurants, gaming, financial services, travel and logistics as industries), and regulated online gaming operators for geo-compliance. Vendor pages quote named customers; this profile does not name them as clients.

row covers the geofencing, place detection and trip tracking SDK and APIs; Maps, Reveal and the solutions are recorded as context and not scored.

HOW IT EARNS

Software subscriptions on annual commitments with usage billing: list prices start at US$0.04 per monthly tracked user for Protect and Optimize and US$0.02 for Engage, US$0.50 per 1,000 Core Maps calls and US$2.00 per 1,000 Premium Maps or Reveal calls, with negotiated volume discounts and no free tier (S04). Radar says it does not sell the data it collects (S29, S31, S32). No revenue figure is public.

BEST FIT

App owners who need geofence, place-visit or arrival events about their own consenting users, with configurable confidence, stop and dwell rules and server-side delivery to their stack (LOC-RADAR-S06, S07, S22).

Regulated operators needing state-level location verification and spoofing checks, subject to their own review of the claimed GLI and BMM certifications (LOC-RADAR-S10, S39, S46).

POOR FIT

Buyers of third-party audiences, panels or foot-traffic datasets: Radar sells no observations of other companies' users (LOC-RADAR-S29, S31).

Uses needing a published detection error rate or an independent accuracy benchmark (LOC-RADAR-S33; F08).

Programmatic geofenced ad buying: no DSP, SSP or bidstream route is documented (LOC-RADAR-S22; F20).

Unacast ACTIVE

Gravy Analytics, Inc. (Delaware), doing business as Unacast; affiliates Unacast, Inc. (Delaware, 2016) and Unacast AS (Norway, org. no. 913820746); subsidiary Venntel, Inc.

Owner of Gravy Analytics: an FTC order, a confirmed 2025 breach, and precise geolocation still sold.

STRENGTHS

The ML foot-traffic datasets, now operated by Pine59, publish a numeric dwell rule (multiple pings within 50 metres over 60 seconds), visit-length buckets and per-estimate confidence scores. VENDOR DOCUMENTATION [106] [324] [325] [326]

Device-level feed carries per-signal forensic flags on origin and accuracy, so buyers can filter signals; delivered by API or batch with up to three years of history. VENDOR DOCUMENTATION [327] [328] [329]

WEAKNESSES

No independent US validation; accuracy evidence is an undocumented R-squared of 91.6% against one unnamed retailer and a 2021 self-comparison at five plants and two stadiums. VENDOR CLAIM [106] [14]

Volume is stated only in incompatible global units (1 billion monthly devices, 70 billion daily signals, 600 million MAUs); no US monthly device count is published. VENDOR CLAIM [328] [330]

State registrations disclose precise-geolocation collection, sharing or sale to federal and other state governments (California), and one breach with a short narrative (Texas). RECORD [251] [278]

Sources are named only as SDK aggregators, WiFi and beacons, without proportions; FTC's complaint alleged suppliers may obtain data from other suppliers, the mobile advertising marketplace or apps. RECORD [137] [135]

OPPORTUNITIES

The order's consent-record and supplier-assessment duties could give buyers an auditable consent route, if Unacast publishes evidence of compliance. INFERENCE [135]

With aggregated foot traffic moved to Pine59 on 1 September 2026, Unacast can concentrate on device-level data, identity linkage and APIs it still sells. INFERENCE [326] [331] [332]

THREATS

Order C-4810 runs 20 years from 13 January 2025, or longer after any federal-court violation complaint, and bans selling or using Sensitive Location Data, with exceptions. RECORD [135]

Unacast's Texas filing says an intruder copied data from Gravy's AWS buckets in January 2025 and briefly posted a small subset on a dark web forum. RECORD [278] [333]

Buyers face unclear provenance: documentation now redirects to Pine59 while Unacast pages still sell the same foot-traffic packages, so contract counterparties may be ambiguous. INFERENCE [325] [332] [326]

WHAT IS SOLD

Device-level location data ("Global Location Data": timestamped coordinates with MAIDs, IP and forensic flags, by API or batch); foot-traffic outputs (on-demand Location Intelligence APIs for custom polygons: Area Visitors unique device counts, Observations, Trade Areas, Personas; machine-learning Foot Traffic Datasets and the Location Insights platform, which Pine59 now claims); consumer data enrichment (demographics, personas, MAIDs and hashed emails); Data Linkages (MAID to hashed email and to IP). Venntel sells location intelligence to government and risk buyers (context, not scored). Sources: S04, S05, S06, S08, S34.

WHO BUYS IT

Described by Unacast as retail, real estate, supply chain, insurance, telco, consultancies, government, software and ad-tech buyers, and investors (S03, S06); its policy lists advertising, attribution, market research, fraud detection, law enforcement and national security among customer uses (S02). No customer is named here.

HOW IT EARNS

Data licensing scoped "to your exact specifications" and API access (S06); Datarade lists usage-based pricing from "$1 / API call" (S33). No revenue figure is disclosed.

BEST FIT

POOR FIT

Data teams that want raw, device-level US and international movement observations with forensic flags and will run their own visit logic and compliance review (S04, S05, S10).

Analysts who accept projected visit estimates with a documented dwell rule and per-estimate confidence scores, and will check them against their own sales data (S15, S16).

Buyers who need an accredited or independently validated visit count (S37, S38, S16).

Buyers who must exclude any supplier under a recent FTC order or breach, or who operate in states that ban precise-geolocation sales (S25, S28, S02).

Buyers seeking campaign lift measurement: no named attribution product with a method was found (S04).

Vistar Media ACTIVE, SUBSIDIARY

Vistar Media Inc. (10-K; the privacy notice uses 'Vistar Media, Inc.')

The DOOH platform where telco data now meets screens: T-Mobile owned, with partner-run visit studies and exclusive network segments.

STRENGTHS

Since May 2025 Vistar has offered T-Mobile carrier-derived audience segments in its DSP; an enhanced set with location insights, announced 5 October 2026, is DSP-exclusive. VENDOR DOCUMENTATION [334] [335]

Vistar lists 18 USA-tagged audience partners and six USA-tagged foot-traffic partners, so buyers can bring an existing location vendor to DOOH. VENDOR DOCUMENTATION [189]

The parties described 1.1 million screens from about 370 media owners at the January 2025 announcement, a large DOOH supply base. VENDOR CLAIM [336]

Its taxonomy is activatable from The Trade Desk through auction packages and PMPs, and Vistar offers device ID passback free of charge. VENDOR DOCUMENTATION [337]

WEAKNESSES

Vistar publishes no visit definition, control design, minimum sample or uncertainty for attribution; one public lift case asserts an undescribed control, the other states no comparator. VENDOR DOCUMENTATION [337] [8] [9]

No Vistar metric or segment appears on MRC's digital accredited or under-review lists, and no independent validation was found. RECORD [171] [177]

No production volume is documented: no panel, no campaigns-measured count; partner figures such as 200M+ users carry no definition or period. VENDOR DOCUMENTATION [23] [334]

Its guide says targeting never relies on personal information, while its privacy notice describes receiving device location histories and selling personal information. VENDOR DOCUMENTATION [338] [339]

OPPORTUNITIES

T-Mobile told AdExchanger DOOH measurement is on its road map 'to look into for next year', which could give Vistar a carrier-based measurement product. INFERENCE [335]

Vistar's results were immaterial to T-Mobile in 2025 while advertising revenue grew from the Vistar and

THREATS

The D.C. Circuit denied review of T-Mobile's US$80.08 million FCC location-data forfeiture in August 2025; certiorari reaches conference on 6 November 2026. RECORD [340] [341]

Vistar declares precise-geolocation collection to California's 2026 data broker registry, after

Blis deals, leaving room to scale inside T-Ads. INFERENCE [36]

answering 'No' in 2025; DROP deletion requests apply from 1 August 2026. RECORD [163]

Partner InMarket has been barred since May 2024 from selling or licensing precise location data, as the order defines it, a constraint on one live US measurement route. INFERENCE [132] [23]

T-Mobile itself ties the Vistar-only exclusivity to tightening location and device-ID regulation, so further rules could narrow the carrier source. INFERENCE [335]

WHAT IS SOLD

A programmatic out-of-home platform: a DSP for buyers (managed or self-serve), an SSP, ad server, player and device-management software for media owners, and traditional OOH planning software (5 October 2026 release boilerplate, S04). For this paper two services matter. (1) Audience targeting for DOOH: buyers select screens using partner audience segments (18 USA-tagged audience partners, among them GroundTruth, Foursquare, PlaceIQ, InMarket and Adsquare) T-Mobile carrier-derived segments (app ownership and engagement, available through Vistar's self-service DSP since 6 May 2025; an enhanced set adding 'location insights', announced on 5 October 2026, is exclusive to the Vistar DSP), which T-Mobile turns into area-level audience scores that Vistar matches to screens; POI proximity targeting, weather and day-part triggers. (2) Attribution: foot-traffic, sales-lift, brand and online-conversion studies run by partners (six USA-tagged foot-traffic partners, including Foursquare, InMarket and Cuebiq), each subject to a feasibility test, plus free device ID passback of exposed devices.

WHO BUYS IT

Advertisers and agencies buying DOOH (the parties cited 'more than 3,000 brand partner advertisers' in January 2025, global) and media owners selling screens ('nearly 370'); buyers can also reach Vistar inventory through The Trade Desk. No buyer is named in this profile under the paper's naming rule.

HOW IT EARNS

Not disclosed. Vistar's results are not reported separately and were 'not material' to T-Mobile in 2025 (S01). The TTD guide says measurement studies 'have varying minimums and costs' and device ID passback is free (S15); no fee, take rate or data price was found.

BEST FIT

POOR FIT

DOOH buyers who want to choose screens by partner or carrier audience scores inside one DSP and accept vendor-described segment sources (LOC-VISTAR-S04, S13).

Buyers who already use a foot-traffic vendor (Foursquare, InMarket, Cuebiq and others) and want that vendor's method extended to DOOH exposure via Vistar device ID passback (LOC-VISTAR-S15).

Buyers who need a causal visit-lift estimate with a documented randomised or holdout control from the DOOH platform itself (LOC-VISTAR-S15, S19).

Buyers who need accredited or independently audited audience or visit metrics (LOC-VISTAR-S22, S23).

Buyers who must exclude health or other sensitive-place segments by documented rule (LOC-VISTAR-S09, S16).

CHAPTER 12

What to ask before you buy

Location data is sold as ground truth, and the public record does not support that description. Visit counts are documented projections or have no stated basis, visit lift mostly rests on matched comparisons, no independent multi-site validation of projected retail visits was found in the sources screened, and three companies under FTC location orders still document precise or device-level offers. A buyer can still use location well, by asking eight questions before the money moves.

IN SHORT

Of the seven registered hypotheses, three are contradicted and four are unresolved on the public record; none is supported. Lift is not measured against a holdout by default (H3 contradicted), FTC orders did not end the sale of precise location (H5 contradicted), and no visit metric holds MRC accreditation (H6 contradicted, as of 24 October 2026). Whether panels shrank and were replaced (H1), whether visit counts match the ground (H2), what location audiences are built from (H4) and whether agents can buy by place (H7) cannot be settled from public sources. The questions below turn those findings into a test a buyer can run on any vendor.

What the evidence says

The registered hypotheses read as follows at the evidence date.

- **Visit lift is mostly correlation.** Of fourteen cohort A products, eight document a general lift method and six of those eight use a matched or synthetic control; a ninth reports exposed-only visits with no lift claim ◆. Under this paper's rules a matched comparison is correlation, and the published randomised-trial literature shows observational ad-effect estimates missing the experimental result by a wide margin ◆ (chapter 4).
- **Visit counts are unchecked.** No independent multi-site comparison of any vendor's projected retail visits with door counts or transactions was found; the independent evidence covers parks, trails, census counts and polling places, mostly before 2021 ◆.
- **The orders did not end the trade.** Four of the five FTC location orders bar sensitive location data and leave the sale of precise location lawful under conditions, and three of the five ordered companies document current precise or device-level offers ◆. Five states ban the sale of precise geolocation outright, four of them from 2026 ◆ ◆ ◆ ◆ ◆ (chapter 7).
- **Nobody accredits the number.** No visit or location metric sits on MRC's lists ◆.
- **Supply is undocumented.** No vendor discloses a comparable panel series across the platform changes ◆, and too few audience products name their primary source to say whether bidstream or SDK data dominates ◆.

- **Agents can describe a place; production buying by place is not established.** In the protocols and registry screened, the furthest any location signal reaches in agent-driven buying is one implemented connector ◆.

The eight questions

The decision tool below gives each question the test that fits it, what the test assumes, where it fails and what it cannot tell you. It is written for a US buyer reading vendor documentation and contracts, not for a regulator.

Measurement decision tool

Pick the question a buyer is actually asking. The panel shows the test that answers it, the assumptions that inference needs, where it fails and what it still cannot tell you.

BUYER QUESTION	TEST THAT FITS	WHAT THE INFERENCE NEEDS	WHERE IT FAILS	WHAT IT CANNOT TELL YOU
Is this visit number observed, projected, declared or inferred?	Ask the vendor which kind each number is and, for a projection, the panel count it was scaled from, the weighting variables and the uncertainty per estimate. A dashboard label alone does not establish whether visits are observed or projected; ask for the basis of each number.	The vendor can separate panel-observed visits from scaled estimates and will show both.	When the documentation states no basis, which was the case for most visit numbers coded in this review.	Tell you whether the projection is accurate; that needs a comparison with ground truth.
Does the lift rest on a holdout or randomised control, or on a matched comparison?	Ask for the default control design, the share of impressions held out, the minimum sample and the significance rule. Ask for the same campaign against the holdout and against unexposed devices: the comparator can change the lift ten-fold.	A holdout or randomised control was set before the campaign and kept clean of exposure.	When the vendor reports a matched or modelled control by default, as most products with a documented method do. A matched comparison is correlation, not causal lift.	Tell you that the visits translated into sales, or that the result generalises to the next campaign.
Has anyone checked these counts against door counters or transactions?	Ask for an independent comparison against door counts, transactions or official visitor statistics for the place types you buy, with error statistics, places and period.	The comparison uses data from after the 2019 to 2021 permission changes and covers your place types.	In the sources screened, no independent multi-site retail comparison exists for any named vendor; the independent checks cover parks, trails, census counts and polling places, mostly before 2021.	Tell you the error for your stores; place-level error varies with panel coverage.
Where do the location observations come from, and how were people asked?	Ask for each source type (own apps, SDK partners, bidstream, telco, IP) with its share and precision class, and for the consent wording shown to users. A list of sources without proportions does not say which one carries the product.	The vendor discloses its supply and the consent route at the product level.	When the documentation says only "opt-in" or "proprietary", which is most of cohort B.	Prove the consent was valid; that is a legal question regulators have answered differently.
Is the vendor under an FTC order or a state law ban, and what does it still sell?	Read the order itself (what it bans: all precise location, or only sensitive locations) and the vendor's current product pages and state privacy notices. Check the data-broker registries in California, Texas, Oregon and Vermont.	The order's definitions and the vendor's public product set are both current.	When a buyer assumes an FTC order ended the sale of precise location: four of the five orders bar sensitive location data only, and three ordered companies still document precise or device-level offers.	Tell you whether the vendor complies with its order; this review does not assess compliance.

BUYER QUESTION	TEST THAT FITS	WHAT THE INFERENCE NEEDS	WHERE IT FAILS	WHAT IT CANNOT TELL YOU
Is the visit metric accredited?	Read MRC's accredited and under-review lists, not the vendor's page. A vendor page can outlive its accreditation.	MRC's lists are current on the day you read them.	Today: on 24 October 2026 no visit, visitation or location metric was on any of MRC's eleven lists, and both visit data sets MRC once accredited have lost accreditation.	Tell you whether lift is causal; MRC's location guidelines say nothing about control groups.
For a DOOH buy, which mobility data sits under the audience number?	Ask the screen network or SSP to name the mobility provider, the panel size and period, and whether the audience is Geopath's currency or the seller's own model.	The seller knows and will name its upstream data providers.	When the seller describes "mobile data" without a provider: half the DOOH products coded here name none.	Turn a modelled audience into an observed one; every DOOH audience figure is an estimate.
Can my buying agent carry this location targeting end to end?	Ask which protocol version and fields the seller's agent supports, and for a test result on those fields. Schema support in a specification is not a working connector.	Both agents implement the same protocol version.	Today: the only implemented connector found maps countries, regions and DMAs and refuses postal areas, and no public interoperability test of a location field exists.	Tell you that reach or frequency by place will reconcile across sellers.

What would change these readings

A few public documents would move the paper's conclusions more than any amount of vendor marketing:

- An independent comparison of a vendor's projected visits with door counts or transactions across many retail places and months, with error statistics and post-2021 data, would test H2 directly.
- A current MRC accreditation of a visit or visit-lift metric would reverse H6.
- A vendor disclosing a US panel series on one definition from 2019 to 2026 would let H1 be tested instead of left open.
- A product documenting a randomised or holdout control as its default, with minimum samples and uncertainty, would add to the two found; enough of them would change H3.
- A location signal in documented production use in an agent-driven buy, with the protocol version and field named, would support H7.

The author's positions, tested

Three positions in the author's own writing were registered as rival hypotheses, not evidence (chapter 1). His glossary line that footfall attribution is "correlated and modeled by default" matches what H3 found for the products that document a method. His essay on DOOH measurement calls outcome studies "a model on a model"; none of the DOOH attribution products screened documents a randomised or holdout control by default ◆, which is consistent with it, and half the US DOOH products coded name no mobility source for their audience numbers ◆ (chapter 9). His case for governing reach and frequency by place on a geographic cell grid is a proposal in a working group he co-leads; it reaches no protocol state and this paper does not test it (chapter 10).

CHAPTER 13

Method, limits and corrections

How the paper was built, what the checks caught and what could not be reached. It is published so a reader can check the paper rather than trust it.

IN SHORT

AI research agents worked from one brief and one set of rules. They produced 11 research workstreams (ten from the brief and one of enforcement records added after the second outside review), 1 vendor-universe sweep and 8 company profiles. A separate AI verifier, told to refute, checked each file. The research registered and logged 793 source records and put 502 claims in the ledger: 493 research claims, every one checked by a verifier or a review, and nine more. Eight are author syntheses that state the hypothesis readings and the effect of the privacy cap; the ninth is a legal finding added in the third review, New Jersey's 2026 sale ban, which a separate check read in the enacted statute but which no verifier file covers. Verifiers made 911 checks of claims, capability records, profile fields and table rows: 619 found the item supported as stated, 266 supported it with a correction and 26 contradicted it. Another AI model reviewed the evidence and the design twice before scoring, then the full paper, then the live edition, and every factual point it raised was checked at the primary source or against the paper's own data before anything changed. The corrections ledger holds 221 entries. 47 products were scored on 11 dimensions, and every counted cell was re-checked by a separate verifier. This is AI-assisted research with a documented process. It is not an external audit, not peer review and not independently validated.

What was fixed before the research

Three registers were written on 24 October 2026, before any research agent ran. The hypothesis register records 11 entries: seven hypotheses (H1 to H7) and four coded questions (Q1 to Q4). Each hypothesis states its population, comparator and observable outcome, and the rules for supported, contradicted and unresolved. Absence of accessible evidence yields unresolved, never contradicted. The product register lists every product scored, listed or historical, with the entity that sells it and the reason; it now holds 86 records, of which 29 are listed and 10 historical. The scoring rules fixed the cohorts, their applicability masks and anchors for every dimension, with numeric thresholds where a scale is measured.

Three things changed after the research and before any cell was scored, all logged and all dated. The product register was rebuilt from the vendor-universe sweep and the profiles: renamed products, new owners, products moved to the listed table and rows added

(Foursquare's Visits feeds, two raw-data feeds). Broadsign's audiences were registered on condition that US availability be established before scoring; it was not, and the row, scored in error in the first live edition, was removed in the final live sweep. The scoring rules were amended once, on 24 October 2026, after the second outside review. Projection method moved out of the quotient into a separate module; cohort C split into foot-traffic analytics (C1) and raw movement data (C2); causal design was reworded as causal capability; documented production volume replaced scale, with a lower-bound rule for daily figures and no generic annualisation; the assurance ladders were made monotone, with one independence test for every cohort; and privacy now reports current controls with the author's risk cap beside them. Four hypotheses received dated clarifications (H3, H4, H5 and H7). The original rules are kept in data/hypotheses.json next to each clarification, with its rationale and its effect on the verdict. No clarification changed a verdict: H3 moved from unresolved to contradicted because better sources coded more products, and every other reading is the same under the original and the clarified wording.

How the evidence was gathered

Each workstream agent read the shared rules, the brief and the registers, and wrote one structured file: sources with their publication, event and access dates, geography, period, funding and access limits; findings with the supporting passage and locator, evidence class, confidence, limitations and counterevidence; and data tables in which every row names its source, period and claim status. The rules require every cited source to be opened; a search snippet is a lead, not support. Where a page refused an automated fetch, agents retried with a browser user agent or the built-in browser and recorded the route. 67 registered source records were access-limited: partly readable, abstract only, metadata only, or not opened at all (one is a search-result lead kept for the trail). Claims resting on them say so.

Evidence classes follow the shared rules: direct record, independent measurement, commissioned measurement, vendor assertion, synthesis, inference, forecast and illustrative scenario. A vendor's own documentation is a vendor assertion, however technical. A study whose funding is unknown is not treated as independent, and a study with platform-employed coauthors is labelled as such. The author's own work is labelled and never counts as corroboration: 4 registered source records are the author's. Every absence claim is bounded to what was searched, and the searches are logged in each file.

How it was checked

Every workstream, profile and the review-added enforcement stream went to a separate verifier that had not seen the research process and was told to refute it. Verifiers opened the cited sources themselves and returned one of four verdicts per item. A claim's final wording is its verifier's or a review's correction where one exists; contradicted claims appear only in corrected form. Every research claim was checked. Of all 502 claims in the ledger, 314 stand as stated (the syntheses among them), 174 with a qualification and 14 contradicted.

THE PIPELINE, AND WHAT EACH STAGE PRODUCED OR REMOVED



What the process is not: two agents reading one source are not two measurements; a model checking a model is not an audit; a second AI scorer on 16 rows is not a human inter-rater test.

Every count on this figure is computed from the ledgers at build time (data/stats.json); the prose quotes the same values.

Research cutoff 2026-10-24. Every research claim marked independently checked was checked by a verifier or a review; author syntheses are listed separately, and contradicted claims appear only in their corrected wording.

> **Every stage was built to remove things, and the counts are computed, not typed.**
> The five stages of this project with the actual outputs of each. Every research claim in the ledger was checked by a verifier or a review; the nine other entries are eight author syntheses, which state the hypothesis readings and the privacy-cap effect, and one legal finding added in the third review (New Jersey's 2026 sale ban), read in the statute by a separate check but not covered by a verifier file. Every counted score cell was re-checked by a separate verifier, and the rows nearest a band line were scored a second time, blind. Corrections include all four outside review rounds.
>
> Units: counts · Scope: this research project, as of the cutoff
>
> Counts describe process volume, not evidence quality; a claim that survived verification is supported by its source, not proven true.

The research ran on two models. A usage limit stopped the first fan-out after nine workstreams and one verifier had finished; the remaining two workstreams and ten verifiers were rerun on a second model, and the finished files were kept.

There were two outside review rounds before scoring, both by another AI model run by the author. The first spot-checked the evidence and reviewed the design; it returned 119 items. The second, a follow-up in the same conversation, tested the proposed fixes, recounted H3 product by product and withdrew or narrowed ten of its own earlier items; it returned 37. Every factual item in both rounds was checked at its primary source by eight separate checks before any change. The reviewer was right on substance far more often than not, but several of its factual assertions were wrong when checked: among them the list of signatories to the NAI's precise-location standards, its statements that a filing, a state act, a registry and a breach notice to a regulator could not be opened, and its claim that per-agent compliance data in the AgenticAdvertising.org registry is private. Each item is logged in the corrections ledger with the check that settled it. The largest changes were to the scoring rules (above), to the H3 count, to the state-law record (Connecticut and Virginia now ban the sale of precise geolocation) and to the enforcement record, which gained the FTC's order against General Motors and OnStar, further state actions and the data-broker registries. A third round, on the full draft, returned 37 findings, and a final sweep of the published edition returned 28; each was checked at its primary source or against the paper's own data and is logged in the corrections ledger. The final sweep produced a corrected edition on 24 October 2026: it removed one product scored in error, corrected eight score cells and fixed two defects in the web page's evidence buttons.

How the products were scored

The scoring unit is a named product that serves a stated buying task, mapped to one record in the product register. There are five cohorts: visit measurement and attribution (A), location audiences and targeting (B), foot-traffic and visit analytics (C1), raw movement data (C2), and geofencing and visit-detection SDKs and APIs (D). Each has an applicability mask; causal design applies only to cohort A. n/a comes only from the mask, never product by product.

Each cell was scored from 0 to 5 against the dimension's anchors for that cohort, then capped by the evidence: vendor documentation caps a cell at 4 and vendor marketing at 3. A 0 means a source documents absence or failure; missing evidence is n/e, never 0. Seven AI scoring agents scored the rows in batches from the fixed rules and the verified evidence. A separate verifier for each batch re-opened every counted cell's sources and confirmed, corrected or rejected it: 397 counted cells, none left unverified. A product enters the matrix with at least four counted cells; none fell short. The numeric thresholds in the anchors, such as US places or monthly devices, are the author's assumptions, fixed before scoring.

The rows within two points of a band line were scored a second time, blind, by separate AI scorers given the rules and each row's cited sources and verified claims, but not the first scores, grades or rationales: sixteen rows and 166 cells in cohorts A, B, C1 and C2. The two passes matched exactly on 81.9% of the cells and within one point on 96.9% of the cells both scored (quadratic-weighted kappa 0.90). With every second-pass score substituted at once, one row changes band: Simpli.fi Addressable Geo-Fencing, from Partly to Well documented, which the matrix marks †. One material disagreement on a row whose band it would have moved was adjudicated by re-reading the rule: Kochava's causal design stays n/e, because its documentation offers a synthetic control as one of three report types rather than as the default. Both passes are published in data/second-pass.csv. The published scores started from the first pass and carry the later corrections, and the † marks that historical result only; it is not recomputed on the corrected matrix. Chapter 11 sets out the Ground Quotient, its field mean, bands and sensitivity tests. Its field mean is the mean of a cohort's Raw scores, which differs from the pooled construction of the author's Contextual and Native Quotients, so the numbers are not comparable across papers. The agreement figures compare the first scores as they stood when the second pass ran, before the third outside review and the final live sweep corrected some cells; data/second-pass.json keeps that snapshot, labelled as such, and the published matrix carries the later corrections.

Limits

The paper scores what is documented in public by the cutoff, not what products do in private. Pricing, contract terms, panel economics, adoption and market shares are almost never public, and the paper lists them as unanswered rather than estimating them. A vendor with a thin public record scores lower than its product may deserve.

Status-sensitive facts (accreditation, ownership, products on sale, laws, protocol versions and the agent registry) were read on 24 October 2026 and are dated in the text. The registered evidence freeze was 30 October 2026. The privacy dimension's three-year window moves with the cutoff, to 24 October 2023 through 24 October 2026; no qualifying event lies in the six days either side. The paper was published before that date, so, as with

the attention paper in this series, the author set the cutoff to 24 October 2026, the date the status-sensitive facts were read; the hypotheses, product register and scoring rules were not changed by the move. Anything that changes after the cutoff will be logged as a dated correction, not folded in silently.

The United States is the primary market. The US availability dimension counts documented US availability only; international breadth is recorded but earns nothing.

Several documents could not be read in full: InMarket's lift-methodology glossary (behind a sign-in), Oregon's data-broker register (behind search forms), and pages that refused automated access. Claims resting on summaries of them say so. IAB's DOOH Measurement Guide, gated on IAB's site during the research, was later found as a public PDF and read in full in the final live sweep of 24 October 2026.

Interests

The author has worked at Samba (TV measurement and advertising data) since May 2025. No cohort A documentation opened names Samba as a source of TV exposure data for TV-to-visit measurement; Foursquare and Cuebiq measure linear TV without naming their viewing-data supplier ◆ (chapter 5). He co-leads the Signals & Measurement working group of AgenticAdvertising.org, which maintains AdCP, one of the protocols assessed in chapter 10; a geographic cell-grid proposal he authored is open there and earns no protocol state in this paper. No Fluff Advisory, the author's firm, operates agents listed in that organisation's registry; in the registry data read for chapter 10, none declares a DOOH specialism or has a geo storyboard result ◆. Earlier employers include Verve Group, whose lineage includes Verve Wireless, a location-advertising company whose assets Media and Games Invest agreed to acquire in January 2020 ◆. Verve is credited as a contributor to IAB's 2017 location-marketing playbook cited in chapter 8 and shows no location product in the sources screened. The others are Hearts & Science and Lotame, which also shows no location product in the sources screened ◆. No vendor funded, reviewed or saw the paper before publication. Every vendor is scored under the same published rules. The author's own essays and glossary argue positions on location and DOOH measurement that this paper tests as hypotheses, not as evidence.

The claims

Every claim marked in the text is listed here with its evidence class, review outcome, confidence and supporting passages.

> The claim ledger lists the 406 claims marked in the text. The print edition leaves it out; it is listed in full in the web edition and in data/claim-ledger.csv, with each claim's evidence class, review outcome and confidence.

The corrections

Every substantive change after the verification passes, with what questioned it, what was checked, the verdict, the change and how it was verified.

The corrections ledger has 221 entries. The print edition leaves it out; it is listed in full in the web edition and in data/corrections-ledger.csv, with the original wording, the challenge, the evidence checked, the verdict, the change made, how it was implemented and how it was verified.

APPENDIX

Appendix: hypotheses, universe and downloads

The registered hypotheses and how they read

Each hypothesis was registered on 24 October 2026, before any research agent ran, with its rules for supported, contradicted and unresolved. Four were clarified after extraction; each clarification is dated and published next to the original rule in data/hypotheses.json.

	HYPOTHESIS	READING	BASIS	CHAPTER
H1	SDK supply contracted after the 2019–2021 permission changes and vendors substituted other sources	Unresolved	No comparable US panel series; no filing attributes a quantified supply change to a platform change ◆	2, 3
H2	Visit estimates agree with independent ground truth within the vendor's stated error	Unresolved overall; adverse for SafeGraph's 2018-vintage panel	No independent multi-site retail comparison found ◆	4
H3	Visit lift rests on randomised or holdout controls by default	Contradicted	Seven of nine documented methods are matched, synthetic or exposed-only ◆	5
H4	Location audiences rest mainly on bidstream or IP location	Unresolved	Fewer than four products document a primary source ◆	6
H5	FTC-ordered companies no longer sell precise or sensitive location data	Contradicted	Outlogic and Collective Data Solutions market precise-location offers; Gravy dba Unacast offers device-level data ◆	7
H6	A US visit metric holds current MRC accreditation	Contradicted (24 October 2026)	No visit or location metric on any of MRC's eleven lists ◆	8
H7	Location signals reach production use in agent-driven buying	Unresolved	Highest state: one implemented connector ◆	10

The four coded questions are answered in the chapters: Q1, what kind of number each product sells, in chapter 1; Q2, which mobility data sits under US DOOH audiences, in chapter 9; Q3, how the market consolidated, in chapter 2; Q4, what Apple and Google changed and what effects are documented, in chapter 3.

The vendor universe

Every company and product the research met, with owner, cohort, status and, for scored products, the matrix row. Listed and historical products are described, not scored.

Vendor universe

A reasoned sample, not a census: how it was assembled and what was left out is stated in the method chapter.

Machine-readable copy: data/vendor-universe.csv.

COMPANY / PRODUCT	LEGAL ENTITY / OWNER	HQ	SCOPE GROUP	FORMATS	BUYING ROUTES	MAIN GEOGRAPHIES	STATUS AT CUTOFF	SRC
Foursquare	Foursquare Labs, Inc.; acquisition by Infillion announced 2026-09-18, completion not confirmed	New York (per Infillion release dateline; HQ not stated on Foursquare page)	specialist	A attribution; B audience + Proximity geofencing; C Places POI data + Spatial suite; D Places API + Movement SDK	The Trade Desk, AWS named among '550+ integrated partners'	global; US	active; acquisition announced (pending)	[347]
Infillion	Infillion (private)	New York, NY (release dateline)	adtech	DSP, supply, data, creative; owns Gimbal (D) and Catalina; pending owner of Foursquare	Managed service, self-serve, 'Infillion Agent Connector'	US	active; acquirer	[602]
Gimbal (Infillion Gimbal)	Infillion	not stated	developer	D location SDK, geofences, iBeacon; first-party visit measurement and segmentation for app owners	REST API, CRM/analytics ingestion, engagement platforms	not stated	active (owned by Infillion; gimbal.com redirects)	[473]
Placer.ai	Placer Labs, Inc. (private)	not stated on pages opened	specialist	C analytics platform, enrichment, data marketplace; campaign lift use (A-like) without a named product	Dashboard, embeddable widgets, enrichment	US	active	[293]
InMarket	InMarket (private)	not stated on page	specialist	A Measurement (LCI lineage, 'Campaign Incrementality'); B Audiences; Activation; GeoLink self-serve	GeoLink; DSPs per workstream F	US	active	[133]
GroundTruth	ZeroToOne.AI (per GroundTruth's own footer)	not stated	specialist	A visit measurement; B Ads Manager, Predictive Audiences, real-world targeting	Self-serve, managed service, programmatic	US	active; acquired (ZeroToOne.AI, date not on page)	[489]
Blis	T-Mobile US, Inc. (completed 2025-03-03, US$180m)	not readable	adtech	B omnichannel DSP with geospatial targeting; A outcome measurement (not readable)	not readable	not readable	active; acquired by T-Mobile	[36]

COMPANY / PRODUCT	LEGAL ENTITY / OWNER	HQ	SCOPE GROUP	FORMATS	BUYING ROUTES	MAIN GEOGRAPHIES	STATUS AT CUTOFF	SRC
Vistar Media	T-Mobile US, Inc. (completed 2025-02-03, US$621m)	not stated	adtech	DOOH DSP/SSP/ad server (Cortex, Adstruc); B DOOH audience targeting; A attribution not named on homepage	Own DSP and SSP	global; US	active; acquired by T-Mobile	[36]
Reveal Mobile	Reveal Mobile, Inc. (owner not stated)	Raleigh, NC	specialist	A OOH measurement (foot traffic, brand, sales lift); OOH impressions; B OOH audience retargeting	Mira Console, managed service, enterprise API; DSPs/SSPs	US	active	[531]
Azira	not stated on page (successor to Near Intelligence per workstream D)	not stated on homepage	specialist	A Azira Measurement; B Azira Audience, Azira Campaigns (DSP); C Azira Insights, Azira One	Own DSP; data feeds	global; US	active	[458]
Unacast (incl. Gravy Analytics)	Unacast (owner not stated)	Ashburn, VA	specialist	C location data, foot traffic; identity graphing and Data Linkages (MAID-HEM-IP)	Data delivery; Datarade	global; US	active; merged with Gravy Analytics	[125]
Adsquare	not stated	Berlin; offices incl. New York	specialist	A attribution dashboard ('Validation'); B audiences (names per workstream F)	DSPs per workstream F	global; US office	active	[455]
Lifesight	not stated	not stated	adtech	MMM, incrementality testing, attribution; no location product	n/a	global	pivot (out of scope)	[481]
Cuebiq	Cuebiq Group, LLC	New York, NY (1460 Broadway)	specialist	A Footfall Measurement; B Cuebiq Audiences; C Data Platform (Spectus domain redirects here)	Cuebiq API; dashboard	US	active	[479]
Spectus	Cuebiq Group, LLC (presumed from redirect)	n/a	specialist	C clean-room data platform (historical brand?)	n/a	n/a	unconfirmed (domain redirects to Cuebiq)	[480]
Precisely (PlaceIQ)	Precisely Software Incorporated	not opened	enterprise	A/B/C PlaceIQ lines (Precisely Audiences per workstream F)	not opened	US	unconfirmed by U (page 403)	[421]
Kochava	Kochava Inc. (private)	not stated	adtech	A store/footfall visitation via Kochava Foundry; MMM; app measurement; Collective not named	Platform	global; US	active; data business moved to Collective Data Solutions (per FTC, workstream H)	[24]
Arrivalist	not stated	not stated	specialist	A destination media measurement; C visitor and spend intelligence	Platform	US	active	[609]
Samba	Samba TV	not stated	adtech	TV data; no location product seen on consumer site	n/a	US	not assessed (business site not opened)	[526]

COMPANY / PRODUCT	LEGAL ENTITY / OWNER	HQ	SCOPE GROUP	FORMATS	BUYING ROUTES	MAIN GEOGRAPHIES	STATUS AT CUTOFF	SRC
Locala	not stated	not stated	adtech	B adaptive advertising with store-visit claims; no named location product	not stated	not stated	active	[610]
Adsmovil	Adsmovil (founded 2011 by Alberto Pardo; 'minority-owned')	Miami, FL	adtech	US Hispanic media network; location data as a targeting signal	O&O and premium Hispanic inventory; CTV, video, display, audio, DOOH	US; Latin America	active	[611]
Mobilewalla	not stated	not stated	specialist	B audience segments; location-based marketing; telecom and consumer intelligence lead	DMPs/DSPs per workstream F	global	active (copyright 2025)	[141]
Simpli.fi	not stated on page (Blackstone/GTCR per workstream D)	not stated	adtech	B geo-fencing, addressable geo-fencing; Simpli.Hub multi-location	Own DSP	US	active	[612]
Outlogic	not stated on page (Digital Envoy per workstream D)	not stated	specialist	C Observation Panel and attribution data; B audiences	Snowflake; AWS S3 daily and hourly; REST API; Eyeota; Adsquare	global; US (Texas notice)	active	[128]
Lotame	not stated	not stated	adtech	Data and identity platform; no location product seen	n/a	global	out of scope	[524]
Verve Group	Verve Group, Inc.	not stated	adtech	Publisher and audience products; no location product seen	n/a	global	out of scope	[525]
SafeGraph	SafeGraph Inc.	not stated	specialist	C Places, Geometry, Address, Spend; no visit product	Integrations to buyer environments	global	active (visit data no longer sold; Patterns sold to Advan per workstream D)	[613]
Veraset	not stated	not stated	specialist	C Movement, Visits, Home & Work, Trips; MatchLink (HEM/IP); advertising audiences and attribution use	Orchestrator; data delivery	global; North America	active	[478]
Advan Research	not stated	not stated	specialist	C FIT, REI, REVEAL, SPENDVIEW, Patterns+	FTP, AWS S3, Google Cloud; dashboards	US (45M devices claimed)	active	[477]
Huq Industries	not stated	not stated (UK-framed)	specialist	C footfall, spend, catchment platform	Platform, free trial	UK; global claimed	active	[614]

COMPANY / PRODUCT	LEGAL ENTITY / OWNER	HQ	SCOPE GROUP	FORMATS	BUYING ROUTES	MAIN GEOGRAPHIES	STATUS AT CUTOFF	SRC
Arity	not stated on pages opened	not stated	enterprise	B Arity Audiences, Marketing Platform; C Geosight, Roadway Insights, Road Traffic Analytics; D Arity SDK	not stated	US	active; acquirer of INRIX assets (announced 2026-10-16)	[493]
INRIX	Arity (agreement announced 2026-10-16; close expected 2026)	not opened	enterprise	C transportation intelligence and mobility analytics	not opened	not opened	acquisition announced (pending)	[494]
Quadrant	Appen (per 'an Appen company')	not stated	specialist	C mobile location data, POI data, hashed-email data	Datarade; technical docs	global	active	[425]
Tamoco	not stated	not stated	specialist	C geospatial data; B audiences; A measurement; insights	Data catalog	global	active	[615]
Onemata	unknown	unknown	specialist	unknown	unknown	unknown	unconfirmed (domain shows Wix error)	[482]
PassBy	Passby Technologies Ltd	London, UK	specialist	C retail market intelligence (visits modelled); AI agents; feeds and API	Feeds & API; agents	UK; US phone listed	active	[616]
Zartico	Zartico, Inc.	not stated	specialist	C destination visitor intelligence; A marketing measurement for destinations	Platform	US	active	[617]
Radar	Radar Labs, Inc.	not stated	developer	D geofencing, maps, location verification (Protect), trips, fraud (Reveal); MCP server announced	SDKs, APIs, integrations, MCP	global; US	active	[390]
Bluedot	Rezolve AI plc (closed 2025-02-20)	Delaware and Australian entities	developer	D mobile location technology (geofencing)	not opened	US, Australia	acquired (bluedot.io redirects to rezolve.com)	[474]
Skyhook	Qualcomm Technologies (completed by May 2022)	Boston (historical)	developer	Wi-Fi positioning (now Qualcomm Terrestrial Positioning Service)	n/a	global	acquired (historical)	[476]
Complementics	ECONTEXT.AI LLC dba Complementics	not stated	specialist	C location feeds, POI visitation, audiences, app usage, identity (MAID-HEM-IP), consumer data	Direct delivery	global; US consumer data	active	[426]
Datastream Group	unknown	unknown	specialist	unknown (search lead: location feed)	unknown	unknown	unconfirmed (domain parked)	[483]
Plot Projects	unknown	unknown	developer	geofencing SDK (seed lead)	unknown	unknown	unconfirmed (403)	[484]

COMPANY / PRODUCT	LEGAL ENTITY / OWNER	HQ	SCOPE GROUP	FORMATS	BUYING ROUTES	MAIN GEOGRAPHIES	STATUS AT CUTOFF	SRC
Esri	Esri	not stated	enterprise	ArcGIS Business Analyst (demographic, spending, census data); no mobility panel named	Desktop, web, mobile apps	global; US	listed (platform, not a location-data product)	[618]
HERE	HERE	not stated	enterprise	Location data platform; HERE Anonymizer; maps and mobility services	Platform	global	listed	[619]
Mapbox	Mapbox	not stated	developer	D maps, navigation, search, Places API; C Movement Data	SDKs, APIs	global	active	[620]
Irys	unknown	not stated	specialist	C datasets (audience creation, behavioural analytics)	Datarade	not stated	listed on marketplace (unconfirmed)	[485]
Intuizi	unknown	not stated	specialist	C device signal data ('400mm+ Devices')	Datarade	global	listed on marketplace (unconfirmed)	[485]
DRAKO	unknown	not stated	specialist	C geolocation data	Datarade	not stated	listed on marketplace (unconfirmed)	[485]
Mobvista	Mobvista Inc. (HKEX: 1860)	not stated	adtech	Mobile user acquisition (Mintegral), analytics; no location product	n/a	global	out of scope	[621]
Precisely PlaceIQ attribution	Precisely		enterprise	A visit measurement		US	active	[622] [27]
Precisely Audiences	Precisely		enterprise	B audiences		US	active	[622] [421]
Broadsign Ads audiences	Broadsign		adtech	B audiences		US	active	[538] [538]
Advan Patterns+	not stated		specialist	C1 foot-traffic analytics		US	active	[477] [623]
Precisely Visits	Precisely		enterprise	C1 foot-traffic analytics		US	active	[624] [625]
Huq Industries	not stated		specialist	C1 foot-traffic analytics		US	active	[626] [614]
Unacast device-level location data	Unacast (Gravy acquired November 2023)		specialist	C2 movement data		US	active	[137] [328]

COMPANY / PRODUCT	LEGAL ENTITY / OWNER	HQ	SCOPE GROUP	FORMATS	BUYING ROUTES	MAIN GEOGRAPHIES	STATUS AT CUTOFF	SRC
Collective Data Solutions data feeds	Kochava Inc. (subsidiary; FTC v. Kochava, D. Idaho, Dkt. 101 and 138)		specialist	C2 movement data		US	active	[627] [145]
Unacast foot-traffic data			specialist	C1 foot-traffic analytics		US	active	[137] [331]

Downloads

Every dataset behind the paper, in CSV and JSON.

Downloads

The data files are in the data/ folder beside this PDF, in the package and on the web page. Open the HTML edition to use these as links.

The two other editions, then the data as CSV and JSON, UTF-8. The data files are the canonical files every chart, matrix and count in the paper was built from.

1	location-intelligence-2026.pdf — the print edition: A4, with page numbers and chapter bookmarks
2	location-intelligence-2026.md — the reading edition in Markdown, with numbered references
3	data/source-register.csv — every source with publication, event and access dates, type, geography, funding, access limits and reliability notes
4	data/claim-ledger.csv — every material claim with sources, passage locator, scope, evidence class, review outcome, confidence and final wording
5	data/capability-matrix-wide.csv — vendors × dimensions, scores only (0–5, n/e, n/a)
6	data/capability-matrix-long.csv — one row per cell with availability, evidence grade, date, rationale and sources
7	data/capability-dimensions.csv — the dimension definitions and anchors
8	data/gq.csv — Ground Quotient per vendor: group means, coverage, band, the reweightings and every dimension score
9	data/gq-method.csv — GQ groups, weights, shrinkage, field mean, band thresholds, and the reweighting, shrinkage and missing-evidence tests
10	data/gq-missing-evidence.csv — every scored cell turned into n/e one at a time, with the GQ before and after
11	data/swot.csv — every SWOT line for the profiled vendors with its basis (record, vendor documentation, vendor claim, inference) and sources
12	data/deep-profiles.csv — the deep-profile summaries: what is sold, buyers, earnings, dependencies, fit, limits
13	data/deep-profile-records.csv — every profiled capability, performance claim, financial figure and timeline event with sources
14	data/study-evidence.csv — studies with design, sample, sponsor and limits
15	data/corrections-ledger.csv — every change made after verification and challenge passes, with implementation and verification
16	data/vendor-universe.csv — the reasoned vendor sample with scope group, owner, formats, routes and status
17	data/agentic-map.csv — AI and agentic capabilities with status labels and observability
18	data/rules.csv — rules and governance instruments by jurisdiction
19	data/decision-tool.csv — the decision tool rows
20	data/product-register.csv — the product register: every scored or listed product with its purchased service, operating entity, owner, cohort, inclusion reason, aliases and US availability

21	data/hypotheses.csv — the hypotheses registered before extraction, with the rules for supported, contradicted and unresolved
22	data/figure-data.json — the canonical dataset behind every data figure
23	data/derived-checks.json — every derived number with its formula and inputs
24	data/stats.json — every count the prose and figures quote about the research itself, computed from the ledgers
25	data/second-pass.csv — the blind second scoring pass: one row per re-scored cell with both passes' scores, grades and reasons, and the adjudication of each material disagreement
26	data/second-pass.json — the same cells with both passes' sources, each re-scored row's band under both passes, and the agreement statistics' inputs
27	data/scoring-rules.json — dimension definitions, anchors, cell rules and the GQ definition, fixed before scoring

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Built from 11 research workstreams, a vendor-universe sweep and 8 company profiles, each checked by a separate AI verifier instructed to refute it, then two outside AI reviews whose every factual point was checked at its primary source. Every scored cell was re-checked by a separate verifier, and rows near a band line were scored again blind. The corrections ledger is published in full in chapter 13. AI-assisted research, not externally audited or peer reviewed.