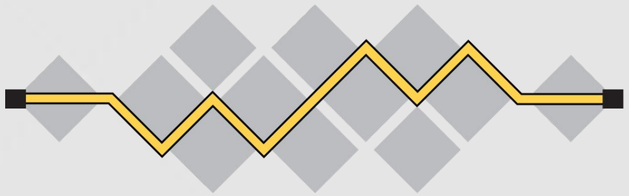


IP Geolocation IAB Workshop Report



IETF®

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presented by Lee Howard

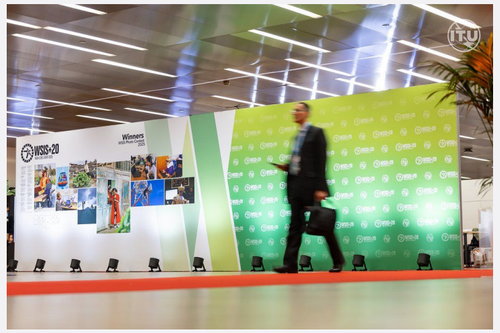
May 2026

IAB
Internet Architecture Board



- The Internet Architecture Board provides **long-range technical direction** for Internet development, ensuring the Internet continues to grow and evolve as a platform for global communication and innovation.
  - Providing **architectural guidance and early technical foresight.**
- Responsibilities include
  - Architecture and Standards **Process Oversight** (including Appeal Handling)
  - **Liaison Coordination** including contact point and cooperation with ICANN, IANA, ITU-T, ISOC etc.
  - Active participation in **Internet Governance**
  - **Outreach**
  - Organize pre-standardization **Workshops**





IAB Workshop

- Focused, invite-based forum to examine specific Internet architecture topics
- Brings together experts across communities (IETF, research, operators, industry, policy)
- Based on position papers, with emphasis on discussion over presentations
- Aims to improve understanding, not to make decisions
- Produces a report capturing key insights, gaps, and trade-offs
- Feeds into future IETF/IRTF work (BoFs, WGs, research directions)
- Used for early-stage exploration of complex or cross-cutting issues.

IAB
IP Geolocation Workshop Details

- Virtual workshop held on December 3-5, 2025
  - **30 accepted submissions, 67 participants**
  - Report: https://datatracker.ietf.org/doc/draft-iab-ip-geo-workshop-report/
  - Material including recordings: https://datatracker.ietf.org/group/ipgeows/about/

- Each day focused on a different area:
  - **Current use cases** for publishing, discovering, and consuming IP address geolocation data
  - **Areas for improvement**, to update or replace IP geolocation mechanisms
  - **Future directions** that satisfy the use cases without relying on geolocating IP addresses

IP Geo
Why are we talking about it?

IP addresses were not designed to carry geographic meaning...

... but geolocating IP addresses is a widespread practice that has become engrained into how many functions of the web and Internet work today

IP Geo
Why is it used?

- Optimizing user experience & network behavior
  - Language / regional settings
  - Relevant nearby content
  - Optimizing network routes and server selection (CDNs)

- Enforcement
  - Legal/compliance requirements
  - Contractual requirements
  - Disaster relief & law enforcement

IP Geo
Why is it used?

Localized and Relevant Content	Targeted Advertising
Improved search Results for “pizza near me”, unexpected language/currency	Localized advertisements, high volume of geolocation queries
Network Optimization and CDN Selection	**Content Rights Management and Licensing**
Route traffic to closest DC/edge, location as heuristic, can lead to suboptimal routing and increased latency	Licensing for streaming, contractual compliance
Fraud Detection and Security	**Regulatory and Legal Compliance**
Risk assestment, security alerts	Gambling, Taxation, Law enforcement

IP Geo
What are the current mechanism?

- RFC 8805 defines the CSV geofeed format
  - IP subnets to location (country, region, city) - independent stream
- RFC 9632 adds discovery and authentication
  - via RPKI - standard track
- IP geolocation provider services add significant amounts of other metadata, and have notions of confidence in location and reputation
- Current mechanisms don't handle the reality that a single IP doesn't always map to a single location

IP Geo
What does it represent?

- When a claim is made about location, is it:
  - Physical user location?
  - Network egress location?
  - Network infrastructure location?
  - Regulatory jurisdiction?
- No ontology to describe what the mappings are claiming

IP Geo
Gaps & Issues: Architecture

- IP ≠ Location
  - IP addresses were not designed to represent physical location
  - No stable or one-to-one mapping to users or geography
- Accuracy limitations
  - Frequent errors due to dynamic addressing, proxies, and mobility
  - Reduces overall effectiveness of geolocation-based services
- Privacy concerns
  - Passive inference of location without user knowledge or consent
  - No inherent mechanism for user control or opt-out

IP Geo
Gaps & Issues: Architecture

- Gaps in standardization
  - Protocol evolution does not account for geolocation dependencies
  - Deployments (e.g., IPv6, privacy proxies) require workarounds
- Incorrect assumptions
  - Physical proximity ≠ network proximity or performance
  - Can lead to suboptimal routing and service decisions
- Misuse in security
  - Used for access control or compliance despite unreliability
  - Difficult to validate; unsuitable as a security signal

IP Geo
Gaps & Issues: Geofeed

- Limited expressiveness
  - Cannot represent multiple locations per IP
  - No way to indicate confidence/uncertainty levels
- Inconsistent naming & identity
  - Variations in city/region names (typos, languages)
  - Geopolitical ambiguities in region definitions
- False precision
  - IPs mapped to specific cities despite broader actual scope
  - Overstates accuracy of location data
- Incorrect or stale data
  - Entries may be outdated or intentionally inaccurate
  - No standard TTL or refresh mechanism

IP Geo
Gaps & Issues: Geofeed

- Network architecture challenges
  - CGNAT, mobile, satellite networks map users to gateway locations
  - Geolocation reflects infrastructure, not end-user position
- Degrading accuracy at finer granularity
  - High accuracy at country level (>95%)
  - Significant drop at city/coordinate level
- “Digital sinkholes”
  - Missing data defaults to central locations
  - Large volumes of IPs mapped to a single arbitrary point

IP Geo
Gaps & Issues: Ecosystem

- Proprietary and fragmented ecosystem
  - Providers use different formats and opaque methodologies
  - No standard mechanism for validation or correction
- Lack of feedback loops
  - ISPs cannot reliably correct errors in third-party databases
  - Errors persist across multiple providers
- Delayed updates
  - Database updates are asynchronous and often manual
  - Location changes (e.g., IP transfers) may take weeks/months to reflect
- IPv4 secondary market impact
  - Frequent global transfer of address blocks
  - Legacy location data persists, causing misidentification

IP Geo
Gaps & Issues: Location & Privacy

- Border ambiguity
  - IP geolocation unstable near country or timezone borders
  - Can lead to inconsistent or incorrect service behavior
- IP as sensitive identifier
  - IP addresses enable tracking and correlation of user activity
  - Considered PII in many contexts; geolocation increases sensitivity
- No user consent or intent
  - Inference is passive with no explicit user approval for how location is used
- Tension with privacy tools
  - VPNs/proxies obscure IP → reduce geolocation accuracy → can degrade service behavior relying on location
- Workarounds create trade-offs
  - Some privacy systems preserve coarse location (e.g., via geofeeds)
  - Balances usability, compliance, and privacy, but remains imperfect

IP Geo
Why Change?

- This isnt going away!
- Geofeeds have gaps to improve
- Satellite networks and privacy proxy networks are "stretching" the current models
- Regulatory requirements are adding pressure for accuracy
- Bar for security and privacy is increasing

IP Geo
Directions of Change?

- Update geofeed format details
  - express infra or user; multiple locations; dynamic; granularity; tools; measurement; reliability
- Build new mechanisms that don't rely on implicit signals, but are both more authenticated and based on user consent
  - Example HTTP headers

- Geolocation is not going away, but we have the opportunity to drive better designs for the ecosystem

IP Geo
Next Steps

- We need more collaboration!
- New solutions
  - Need to think about - transition, ossification, privacy
  - No solution can be on-size-fits-all
- Workshop involved many stakeholders not normally at IETF
  - Regular conversations on how to evolve this space across the groups would help
- What shape should this discussion take?

thank you.