IPv6GEO – GEO Information in IPv6 Packet Headers

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ntroduction

IPv6 addresses give routing coordinates - not geographical location

A large class of IPv6 sources want to expose geographical location to IPv6 destinations

Not a GEOPRIV consideration – this is only for sources that willingly submit themselves for active surveillance

Proposal: include GEO information in an IPv6 Destination Option

Obvious security implications:

- Confidentiality – can GEO info be concealed from unauthorized listeners?
- Authentication – is the source who it claims to be?
- Integrity – is the source telling the truth about its location?

Pv6GEO IPv6 Destination Option

Encoded the same as for any IPv6 Destination Option

"GEO Type" field tells type of IPv6GEO encoding. Type 0 includes:

- Latitude
- Longitude
- Altitude
- Timestamp

Simple algorithm for minimal encoding

Sources can include option selectively (i.e., not necessarily for every IPv6 packet)

Destinations that do not recognize the option ignore it

IP securing mechanisms (e.g., IPsec) can be used for confidentiality, authentication and data integrity

- Still need assurance that source is telling the truth about its location

Why Include GEO Information at the IP layer?

Additional layer of authentication (source not only *who it claims to be*, but also *where it is supposed to be*)

Convergence of dynamic routing protocols (e.g., form links based on geographic proximity)

Geolocation of mobile nodes in fielded deployments:

- Expeditionary teams providing emergency response coordinates, humanitarian support vectors, etc.
- First-responders in search-and-rescue over wide geographic areas
- Unmanned Air System (UAS) fleet coordination

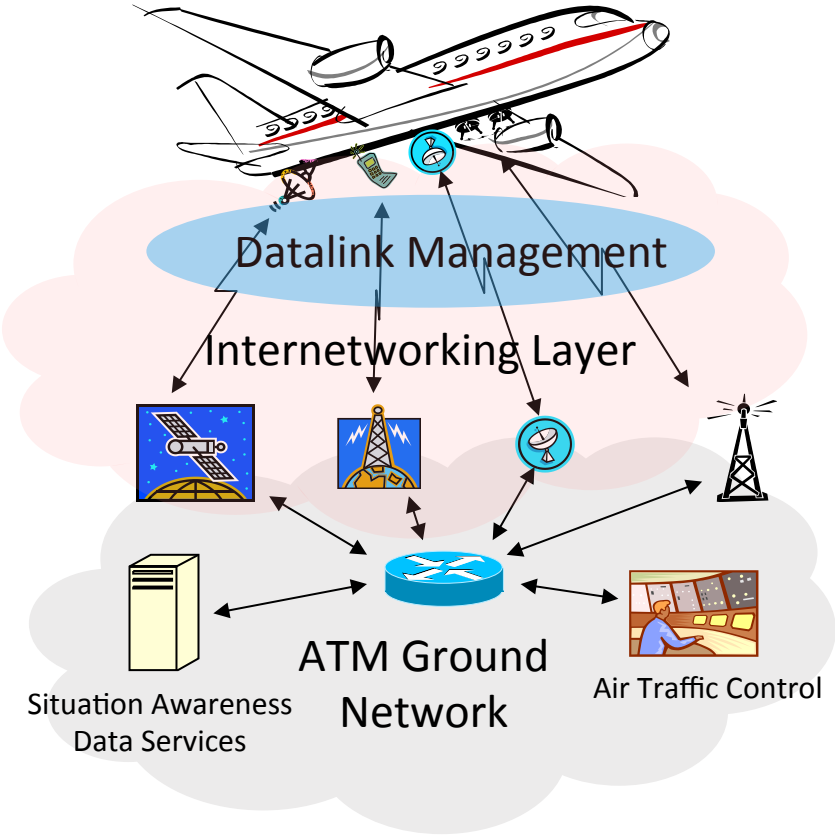
Geolocation of enterprise assets:

- Fixed network elements (servers, proxies, gateways, etc.)
- Mobile corporate enterprise users (on-campus and off-campus (i.e., VPN))

Air Traffic Management and Fleet Tracking

Air Traffic Management and Fleet Tracking

- Aircraft have many links with varying cost, performance, availability profiles
- Not all links available during all phases of flight
- Not all links encode geo information at the link-layer
- Wide variety of applications – not all of which are geo-aware
- **IPv6 layer is only commonality**



Draft Status

draft-skeen-6man-ipv6geo-01 currently in I-D repository

Candidate -02 addresses issues raised on 6man list:

- http://linkupnetworks.com/ipv6geo/draft-skeen-6man-ipv6geo-02.txt

Issue Tracker for change log and open issue status:

- http://linkupnetworks.com/ipv6geo/Issue-Tracker.txt

mplementation Status

Linux kernel implementation

Can be enabled on per-packet basis by application socket option

Can be applied system-wide without application direction

Currently uses Experimental IPv6 Destination Option number

Related Documents

Several works are investigating IPv6 extension header considerations

Considerations within an enterprise different than for Internet?

Recommendations for middleboxes vs. end-to-end principles?

Documents:

- "IPv6 Extension Headers in the Real World" (https://datatracker.ietf.org/doc/draft-gont-v6ops-ipv6-ehs-in-real-world/)
- "Recommendations on Filtering of IPv6 Packets Containing IPv6 Extension Headers" (https://datatracker.ietf.org/doc/draft-gont-opsec-ipv6-eh-filtering/)
- "Implementation Guidelines for parsing IPv6 Extension Headers" (https://datatracker.ietf.org/doc/draft-kampanakis-6man-ipv6-eh-parsing/)

Next Steps

- Submit updated draft?
- 6man working group item?
- IANA assigned Destination Option code?