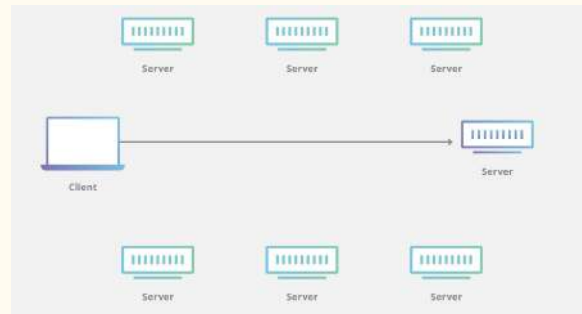# Is anycast a threat to privacy?
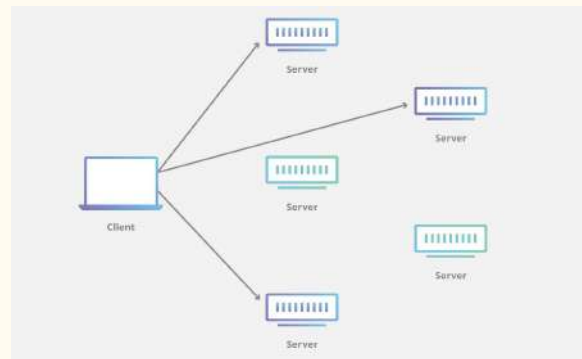
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Hugo Pascual

Anycast has an special behaviour

- IP packets routing and addressing method
- Operation and good practices described in RFC 4786 and RFC 7094 among others
- Main characteristics
  - **Network decide the destination server**
  - Load distribution
  - Attack mitigation
  - Low level protocol operation, application agnostic

Unicast (one-to-one)

Anycast (one-to-any)

Legislation Compliance

- Privacy - fundamental right protected by the Human Rights Declaration, but…
- … Personal data is a valuable resource
  - Commercially
  - Strategically
- International regulations for the data protection
  - General Data Protection Regulation (GDPR)
- GDPR
  - Strict requirements for the control of international transfers of personal data.

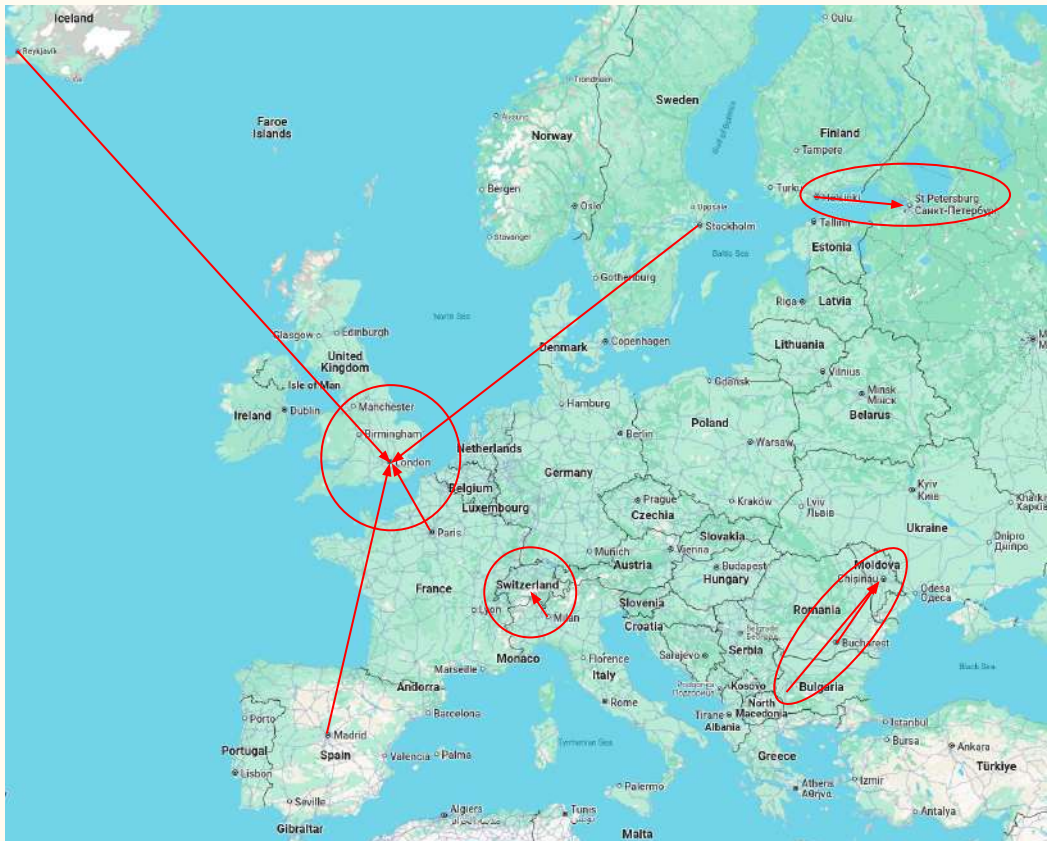https://incountry.com/blog/the-2021-data-regulation-recap/

Anycast send personal data out of EU

Example of flows outside EU

- Russia
- Moldova
- Switzerland
- United Kingdom

Clear risk to data protection and privacy of the users!!
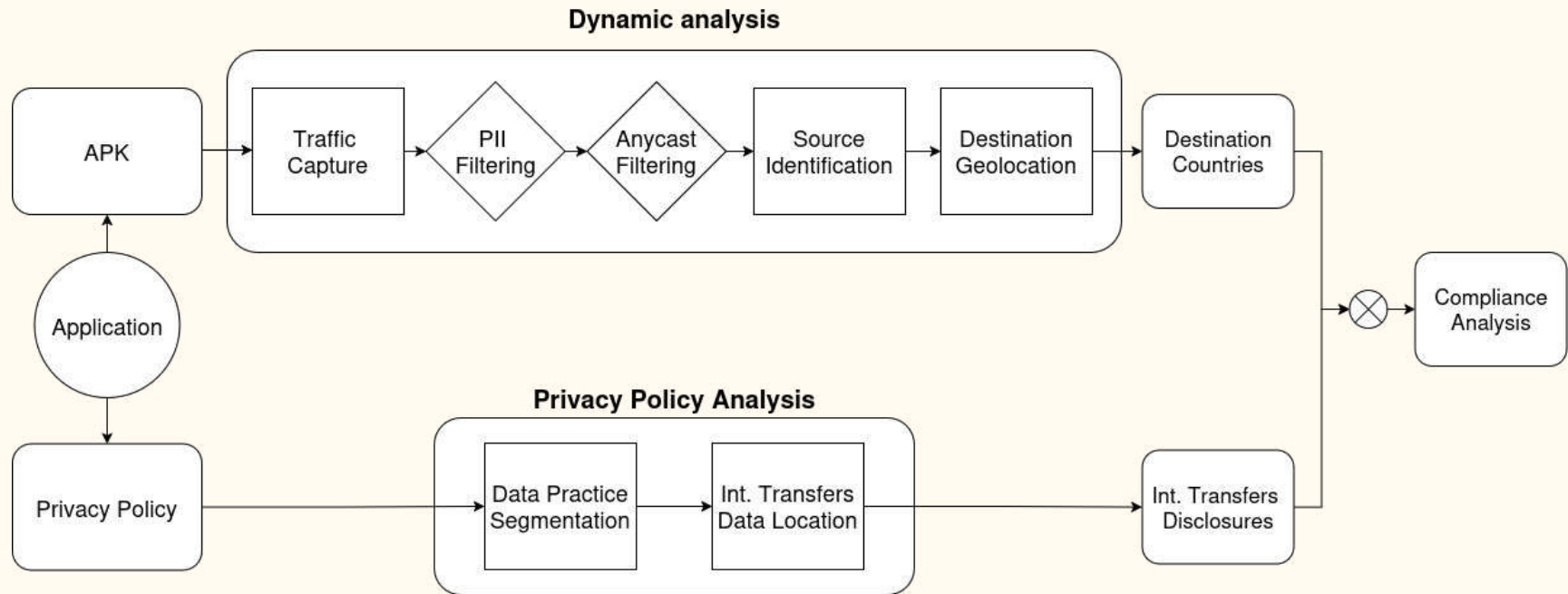
Hunter is how we geolocate the destination server

- Method for identifying different anycast server locations.

- Focus on search from different starting zones.

- Works with ping, traceroute and public knowledge.

Hunter: Tracing anycast communications to uncover cross-border personal data transfers, https://doi.org/10.1016/j.cose.2024.103823
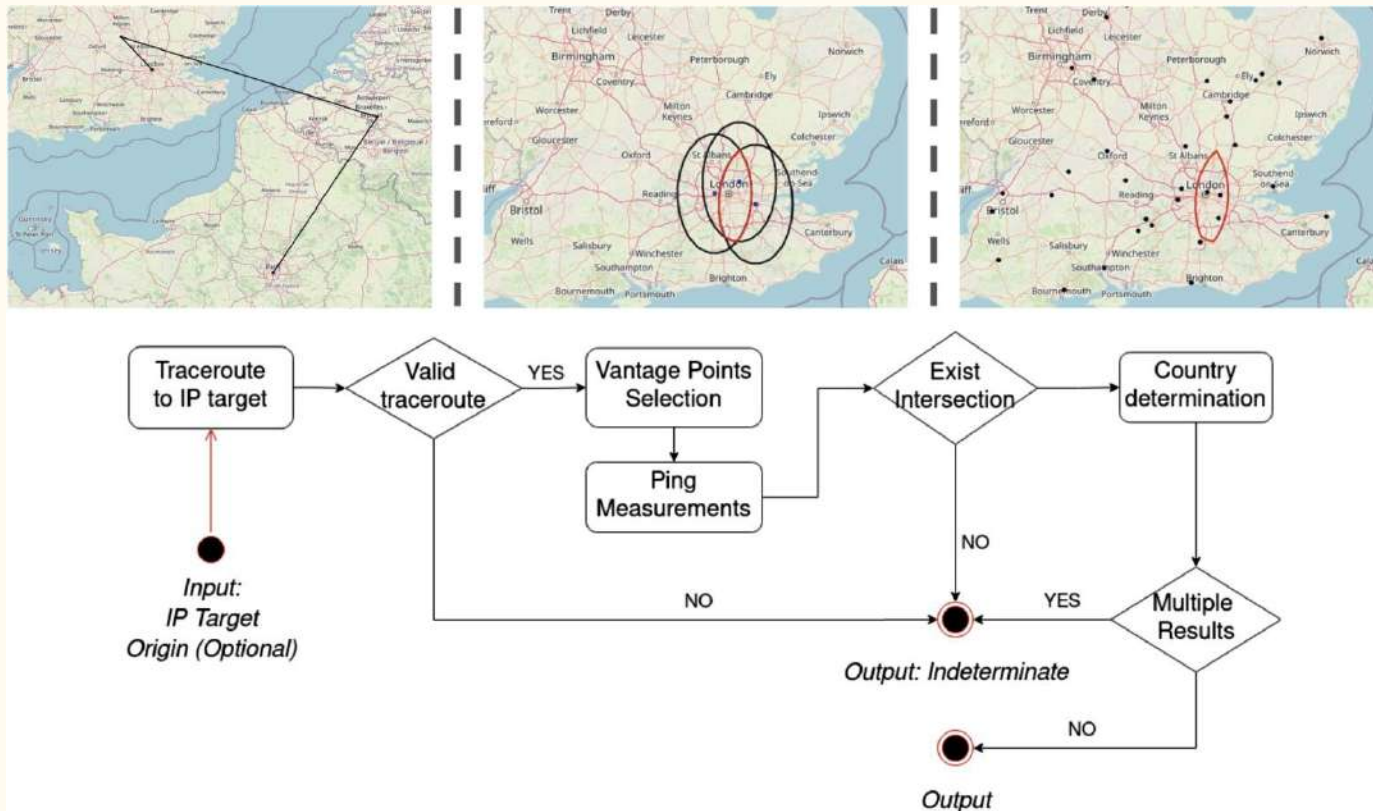
Experiment setup

Experiment results

- 5,759 Android Apps (>100,000 downloads)
  - 4,278,823 intercepted connections
    - 242,497 contains personal data
- 80.74% of personal data has anycast destination
  - 200 IPs
  - 960 apps
  - 195,786 connections
  - 20 third party libraries (TPL)
- Potential irregularities
  - 98.65% apps
  - 90% Third Party Libraries

N	TP-library	Connections	Privacy Policy Found	Presence on Apps with 10M+ downloads	Countries Mentioned in Policy	Destination Countries Observed
1	Unity Ads	35072	YES	100-1000	US, CA, JP, NZ, KR, CH, GB	GB, CH
2	BidMachine SDK for Android	9200	YES	10-100	US	US, GB, RU, UA, RS
3	Google Mobile Ads (GMA) SDK	6978	YES	100-1000	None	GB, CH, RU, UA, RS
4	Adjust SDK	3470	YES	100-1000	None	US
5	Appodeal SDK for Android	3127	YES	-	US	GB, CH, RU, RS
6	Chartboost Monetization SDK	1068	YES	10-100	US	GB, CH
7	MobSDK	568	NO	-	None	GB
8	AdColony SDK	430	YES	10-100	US	GB
9	AppLovin SDK	405	YES	100-1000	None	US, GB
10	Kochava V4	278	NO	1-10	None	GB, CH
11	OneSignal	233	YES	10-100	US	GB, CH, RS
12	bugsnag-android	178	YES	10-100	US	GB
13	New Relic Mobile for Android	178	YES	10-100	None	US, GB, CH
14	Official Mixpanel Android SDK	85	NO	10-100	None	GB, CH
15	Dynatrace OneAgent SDK	73	YES	10-100	US	GB, UA
16	Airship SDK	38	YES	10-100	US, FR, DE, GB, SG, IN	GB
17	Sentry Android	32	YES	10-100	US, DE, CA	GB, CH, RU, RS
18	EmarsysSDK	16	YES	-	None	GB
19	Fyber FairBid SDK	10	NO	1-10	None	GB
20	Leanplum SDK FCM Module	4	YES	1-10	US	GB

Anycast and Third-party Libraries: A Recipe for a Privacy Disaster?,
https://doi.org/10.1109/MCOM.006.2400576

Conclusions

- The use of anycast to send personal data poses a serious risk to privacy and data protection.
- Responsible
  - They are not aware of these transfers of personal data abroad.
  - No measures to fix this situation
- Obstacles to audit the services responsibles and their privacy practices
- Technical measures are needed to correct this situation.

How to prevent this behaviour?

- Solution with these characteristics
    - Application agnostic
    - No protocols headers changes
    - Non dependant on pathings changes in the network
- Privacy compliance is an use case but can be used in…
    - Applications with content restrictions
    - Definition of flexible regions
    - Safe pathings on abroad countries or regions

Questions?

- Hugo Pascual Adán, hugo.pascual.adan@upm.es
- Articles
    - Hunter: Tracing anycast communications to uncover cross-border personal data transfers, https://doi.org/10.1016/j.cose.2024.103823
    - Anycast and Third-party Libraries: A Recipe for a Privacy Disaster?, https://doi.org/10.1109/MCOM.006.2400576

Is anycast a threat to data protection?

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Hugo Pascual Adán