Bridging the Gap between Privacy Incidents and PETs

Shannon Veitch, Lena Csomor, Alexander Viand, Anwar Hithnawi, Bailey Kacsmar

ETH zürich

UNIVERSITY OF ALBERTA

Development of Privacy Enhancing Technologies (PETs)

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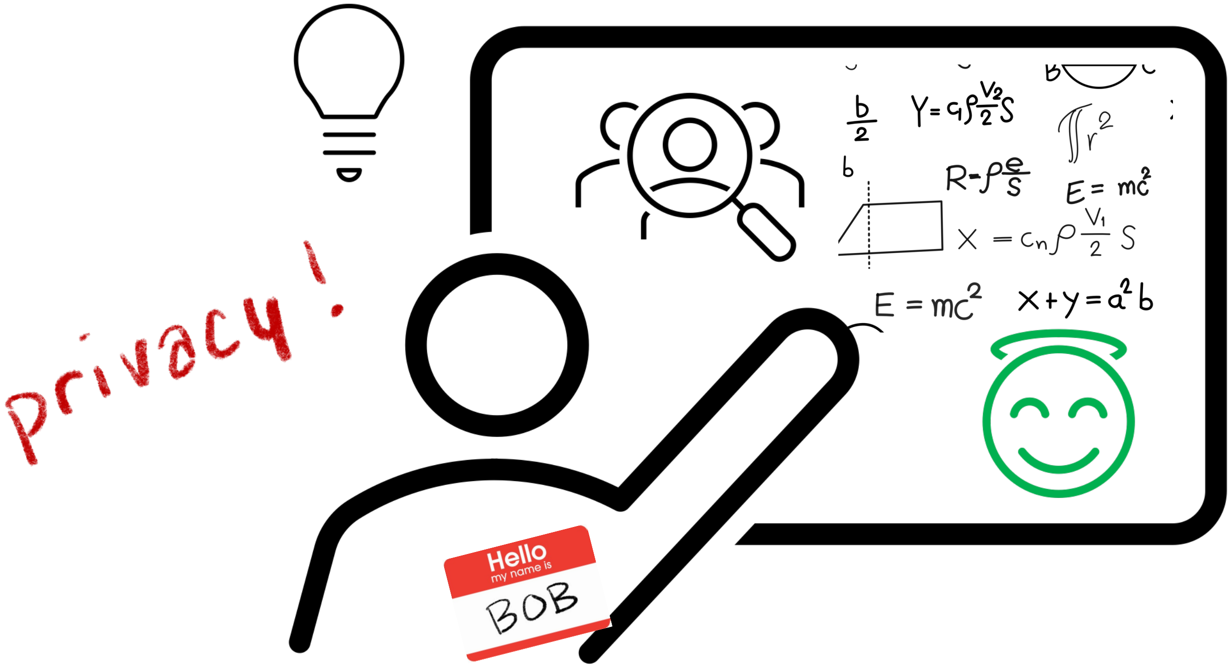

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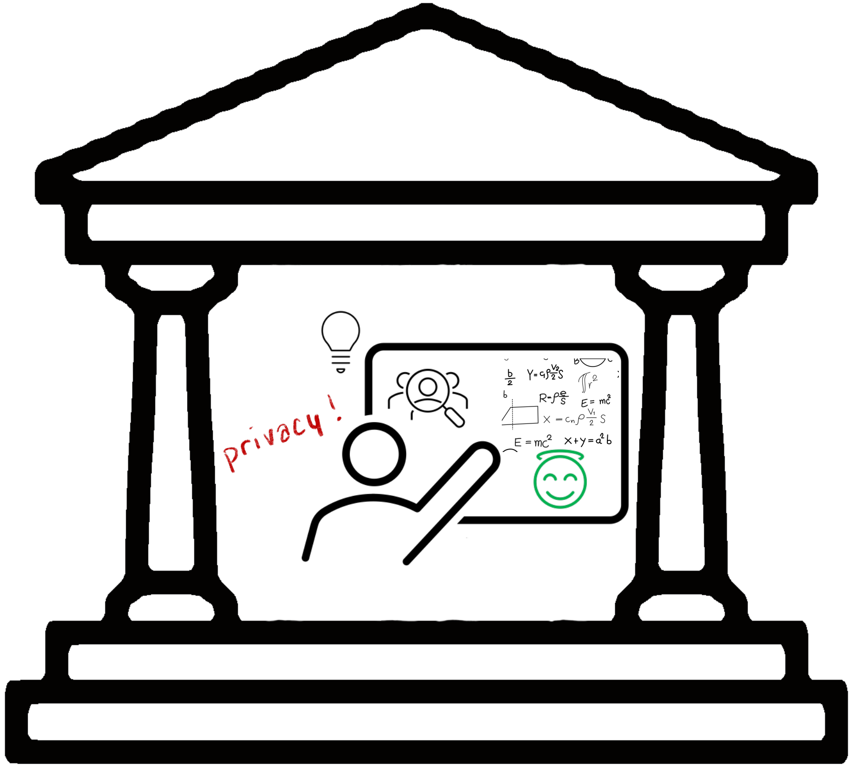

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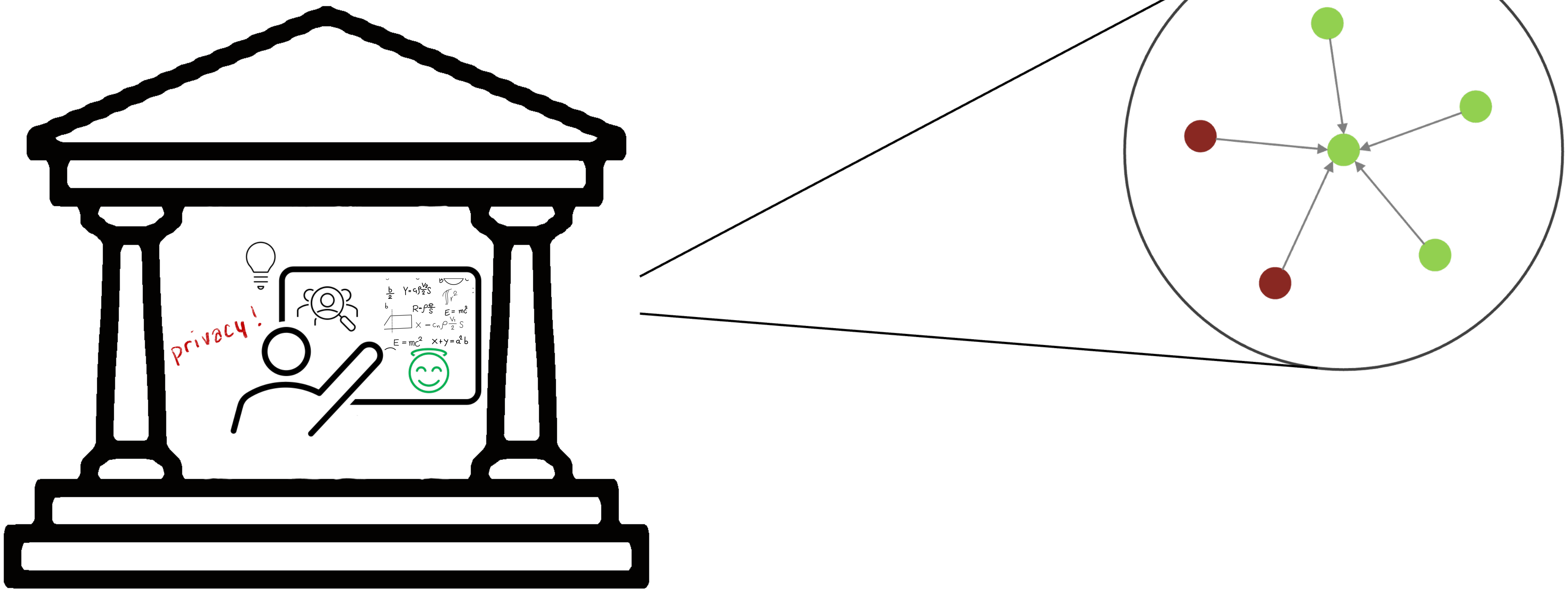

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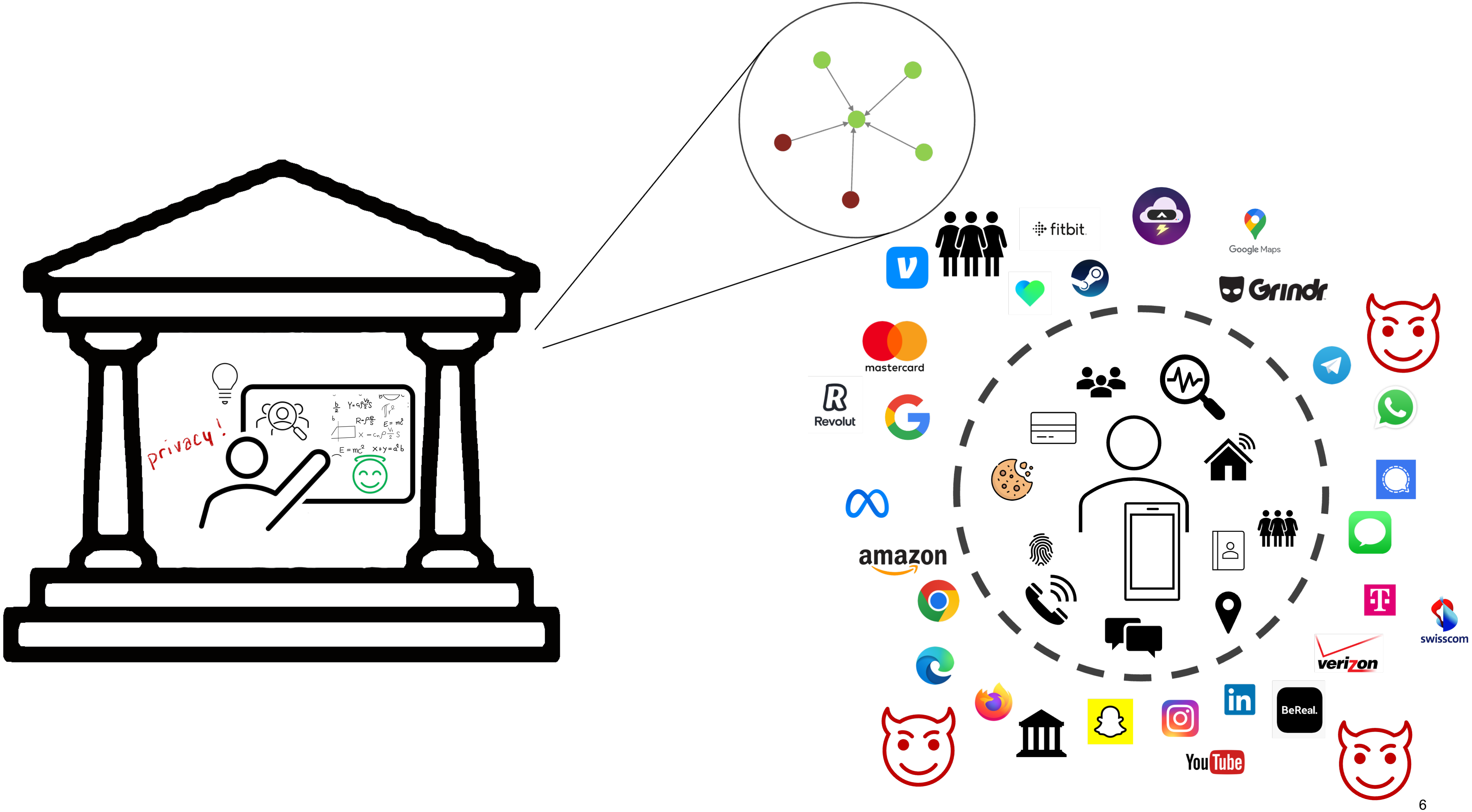
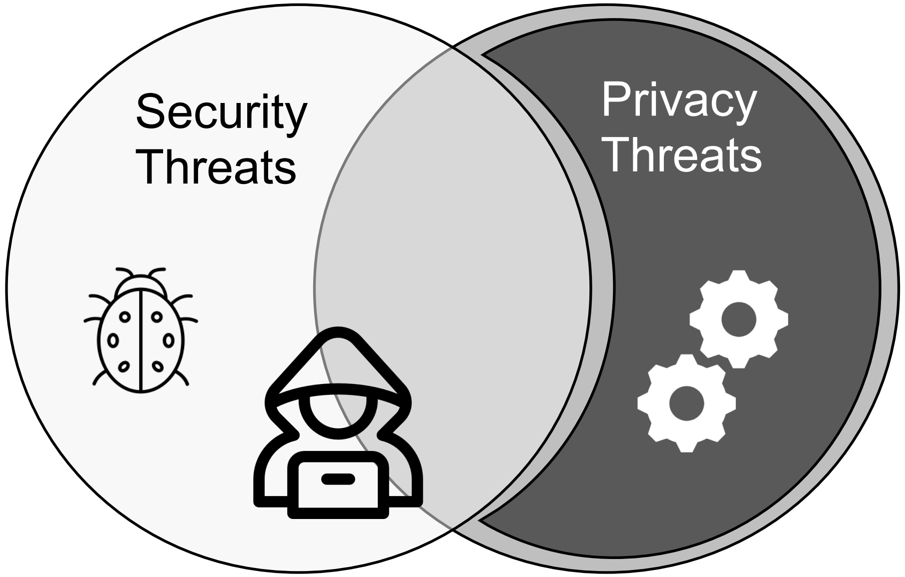


Scope

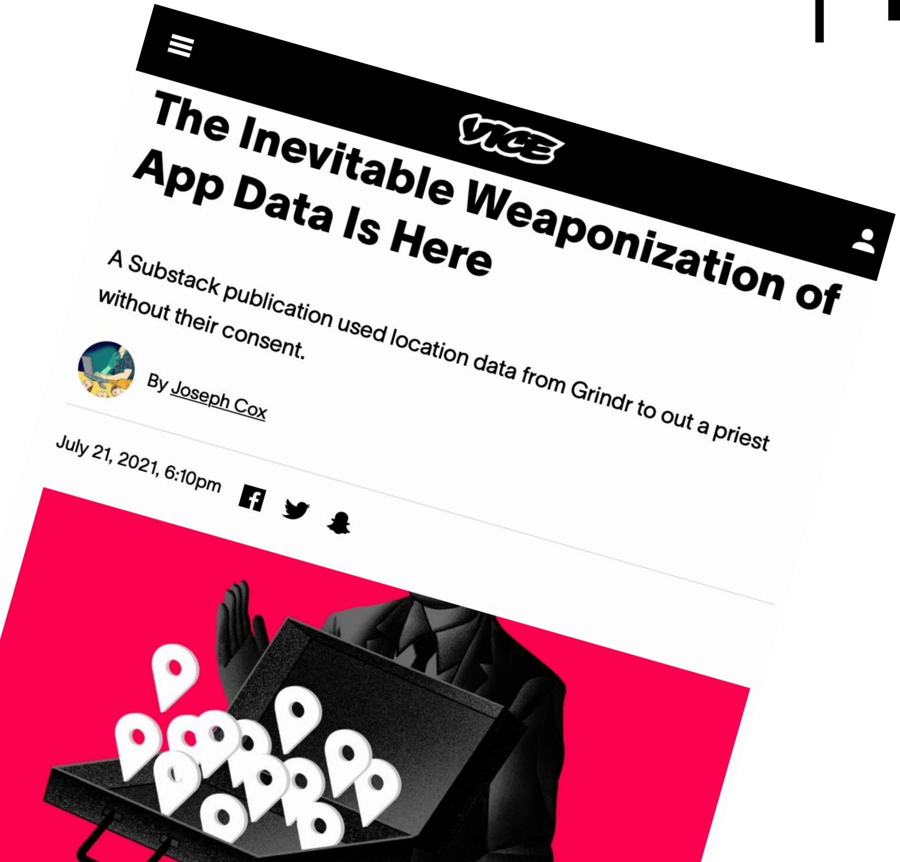


Westin's Definition of Privacy (1967)

An entity's **ability to control** how, when, and to what extent personal information about it is communicated to others

We are interested in the **harms** (consequences) caused by privacy violations.

Threat Models in Real Life?



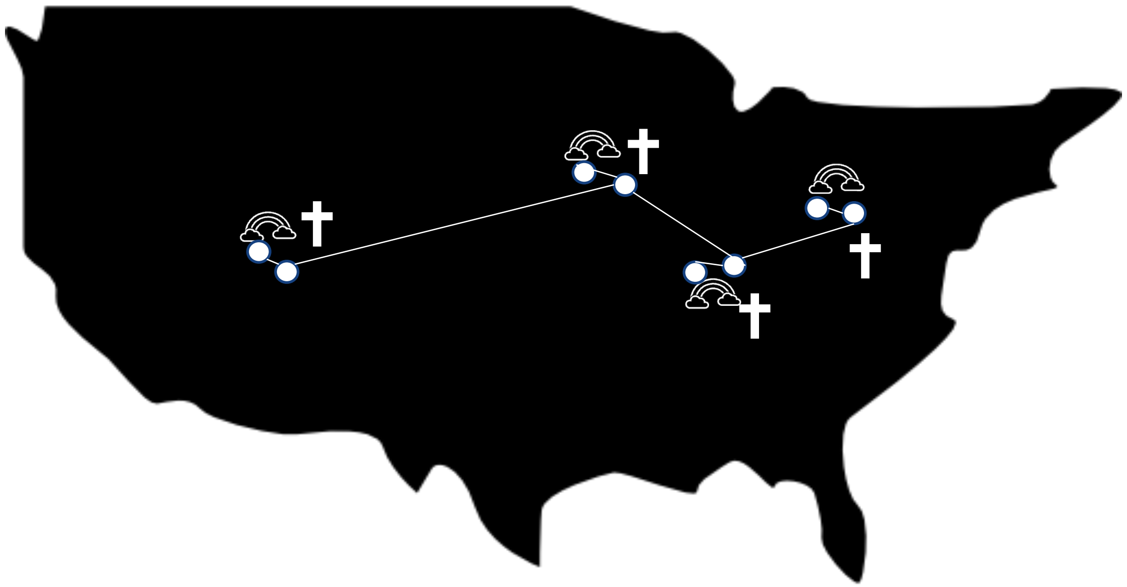
VICE

The Inevitable Weaponization of App Data Is Here

A Substack publication used location data from Grindr to out a priest without their consent.

By Joseph Cox

July 21, 2021, 6:10pm



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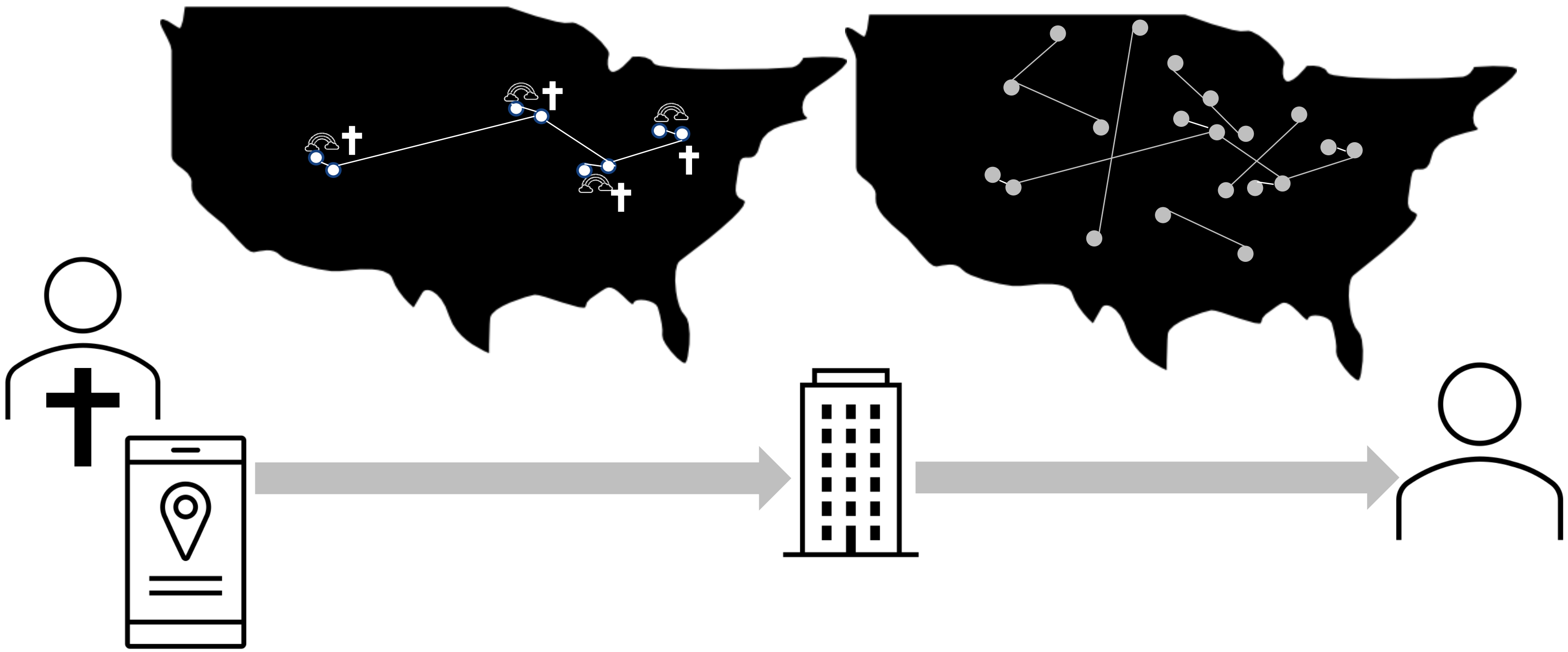

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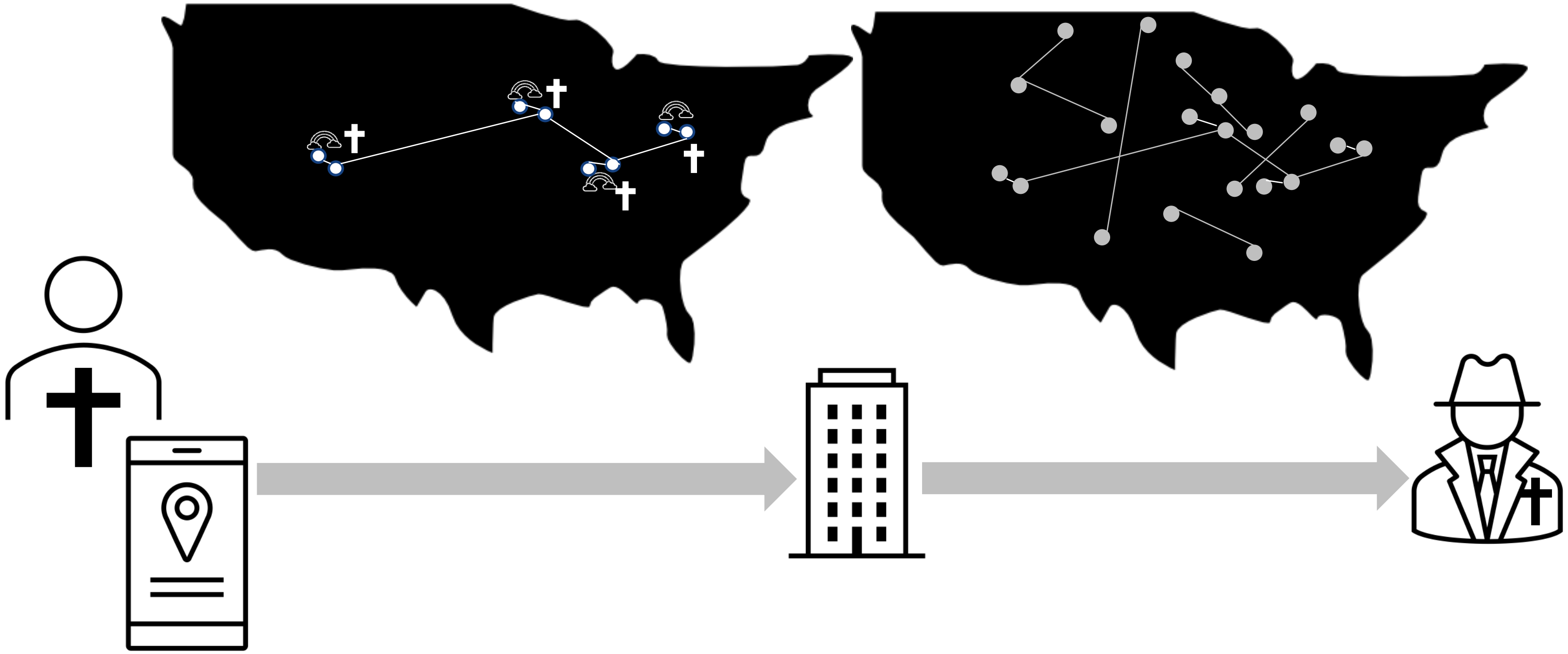

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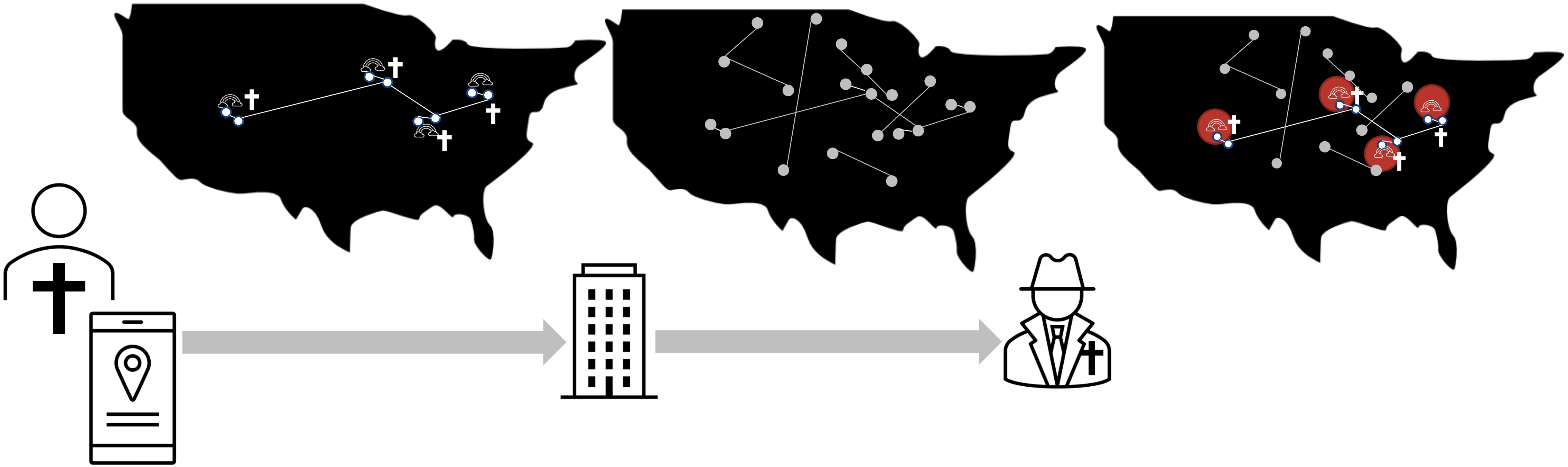

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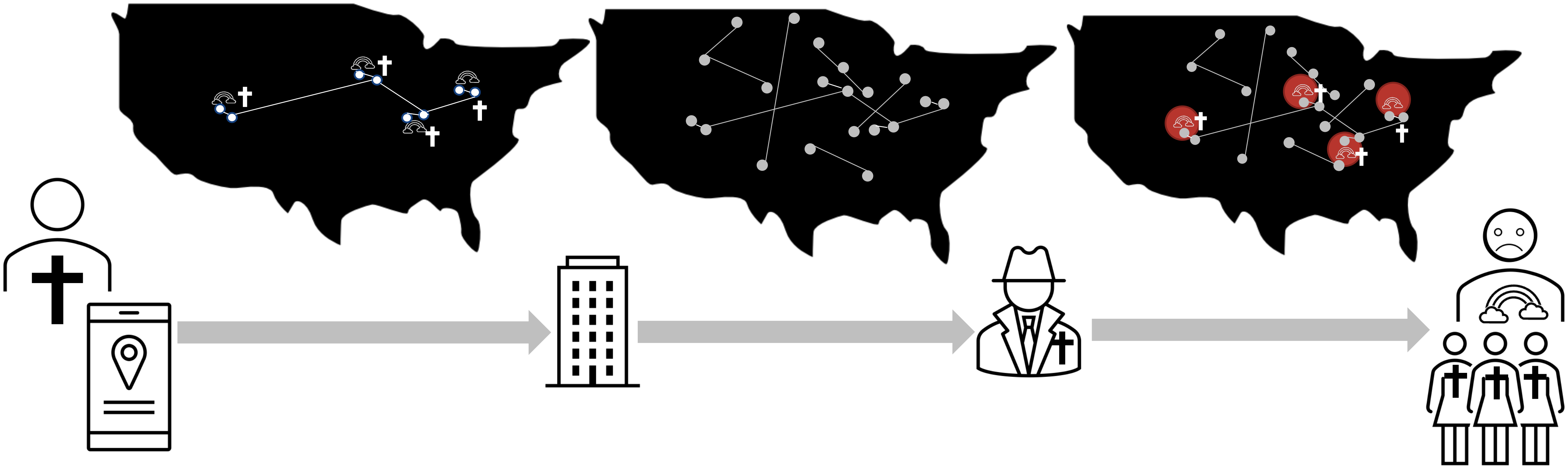
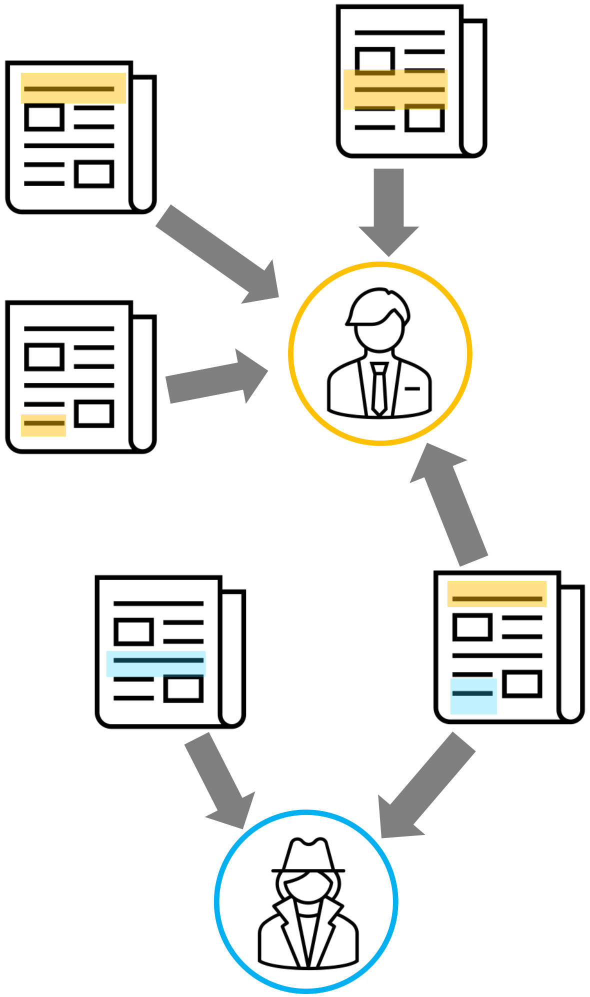
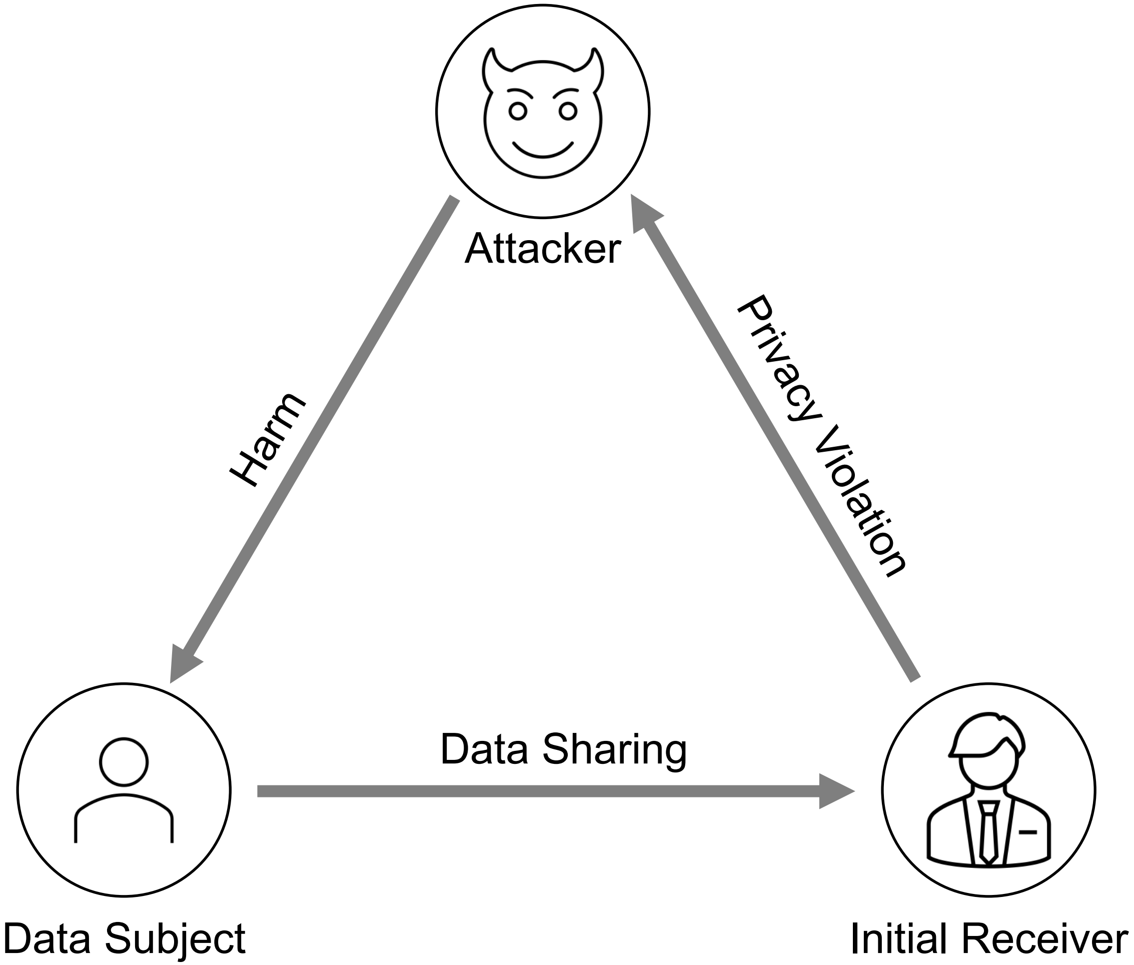


Analysis of Past Privacy Incidents



- Over 100 articles: The New York Times VICE
- Privacy-based Attack Model
- Inductive Collection of Context

Defining a Privacy-based Attack



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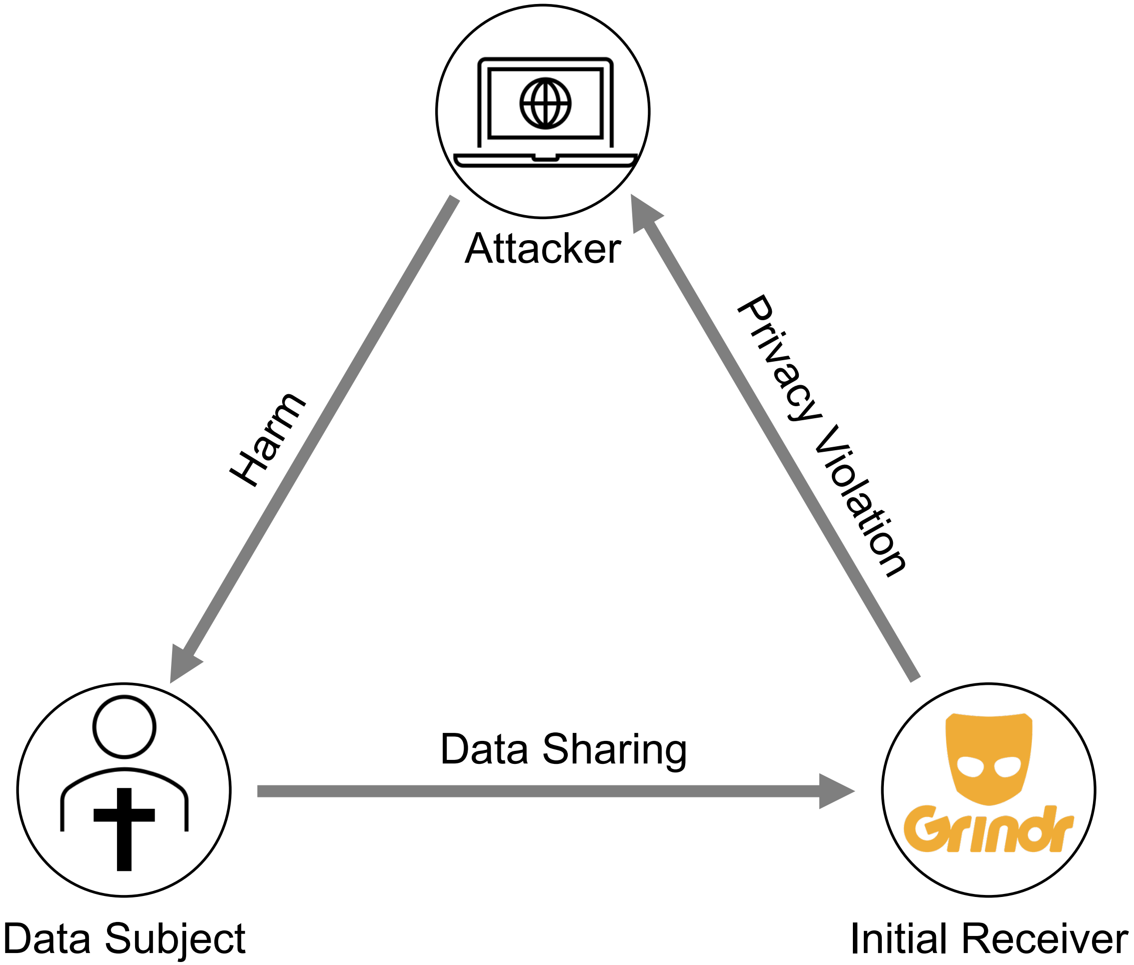

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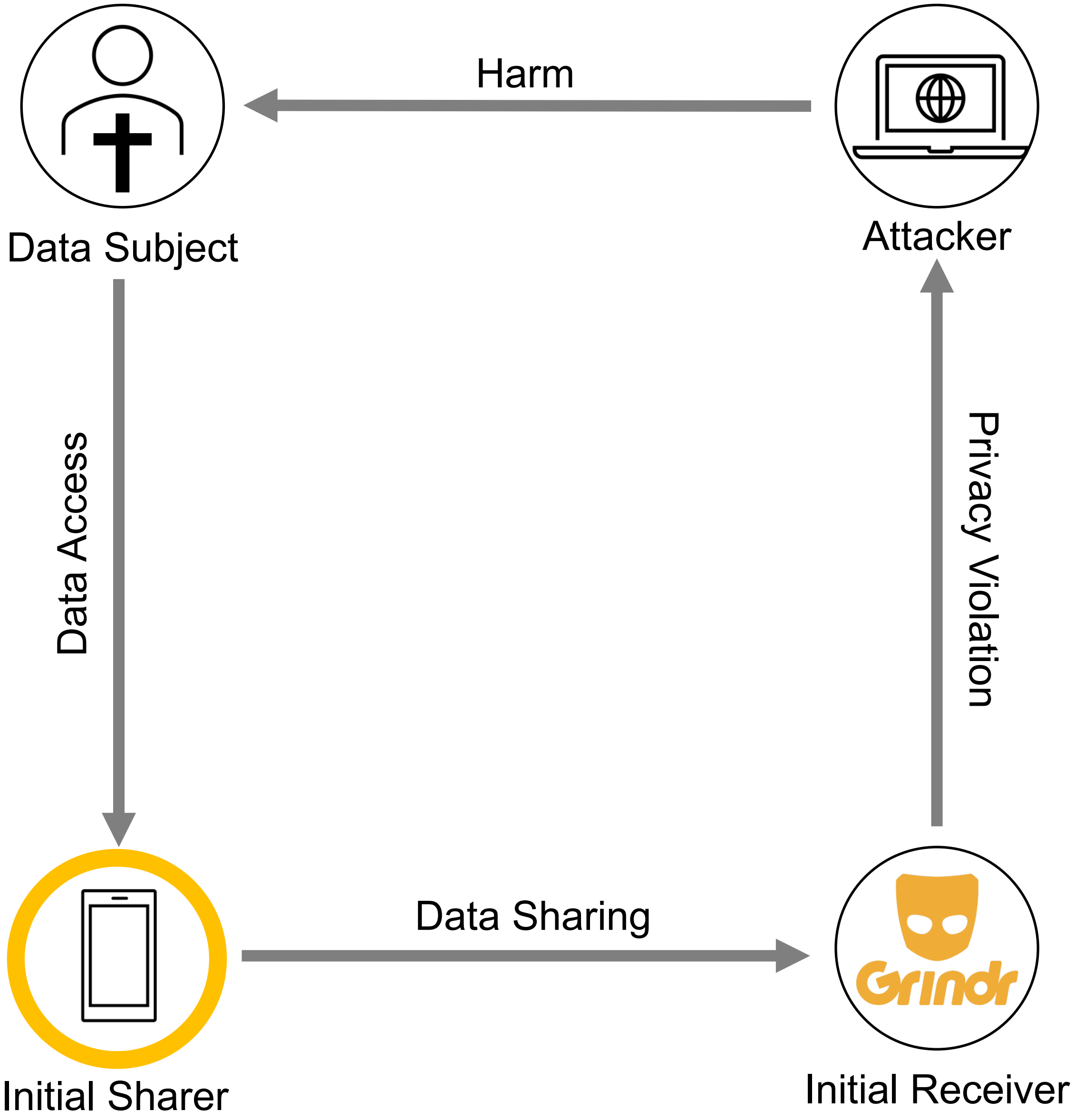

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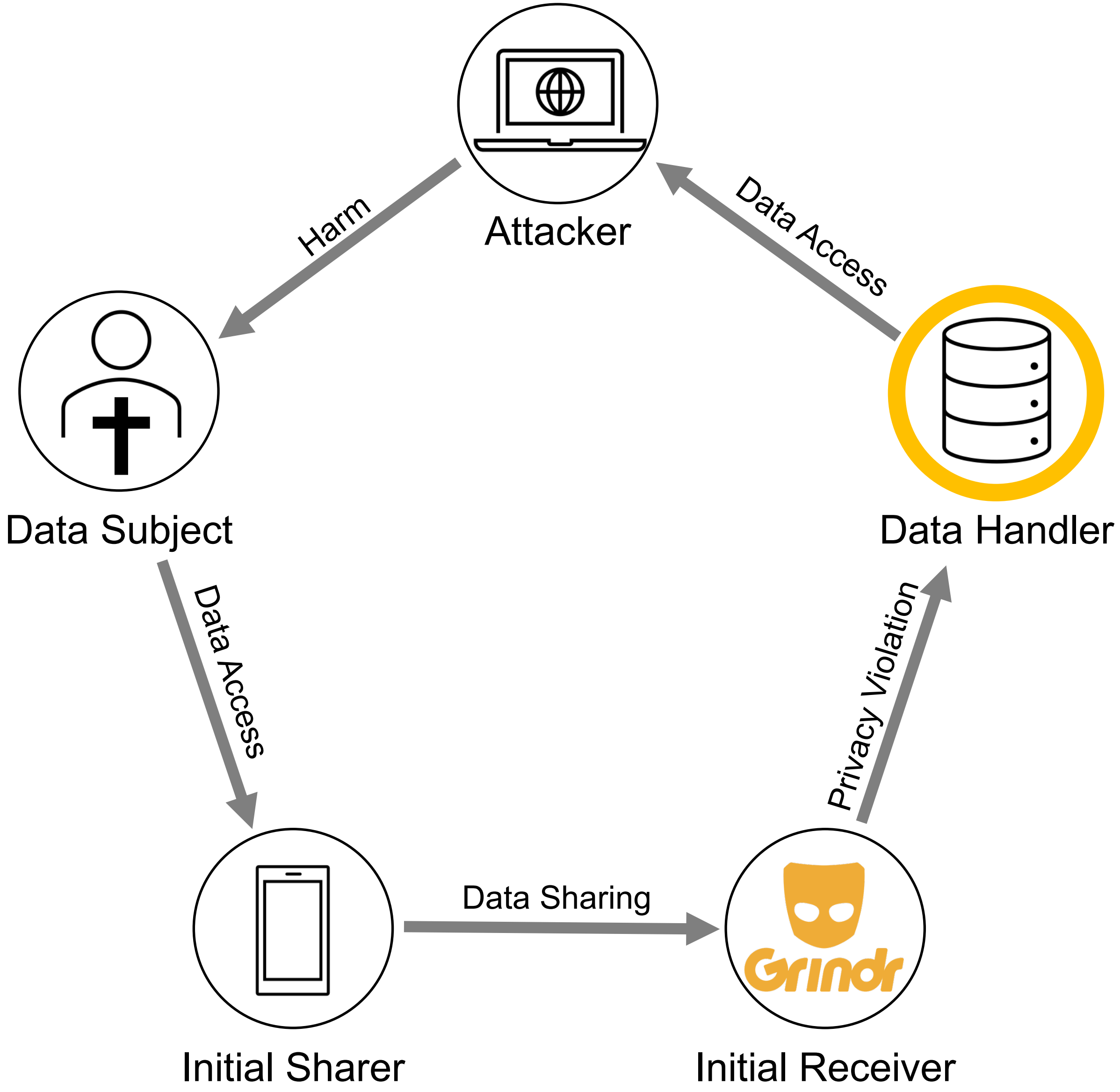

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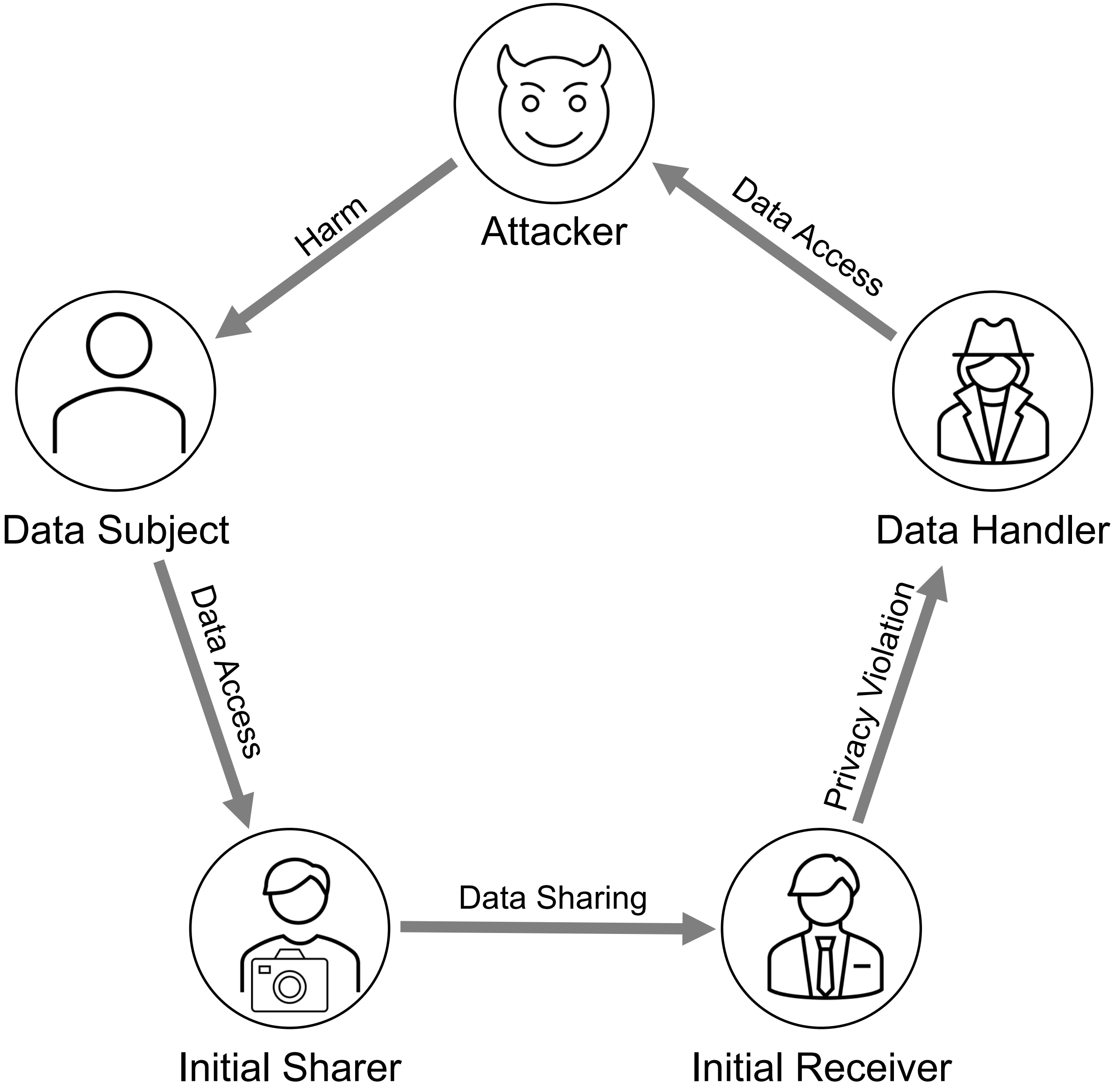

Data Subject	Initial Sharer	Data Sharing →	Initial Receiver	Privacy Violation →	Data Handler	Data Access →	Attacker	Harm →
Public Person	Stranger	unvoluntary	Stranger	Accuracy	Stranger	Financial	Stranger	Financial
Common Person	Personal Connection	voluntary	Personal Connection	Use	Personal Connection	Legal	Personal Connection	Social
	Gov	necessary	Gov	Disclosure	Gov	Existing	Gov	Mental
	Company	unknowing	Company	Collection	Company	Physical	Company	physical
	Self					Public		Legal Prosecution
								Mass Surveillance
								Targeted Ads

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		Self				Same as IR	Public	Same as IR	Legal Prosecution		Messages	
								Same as DH	Mass Surveillance		Personal Info	
									Targeted Ads		Location	
											Medical	

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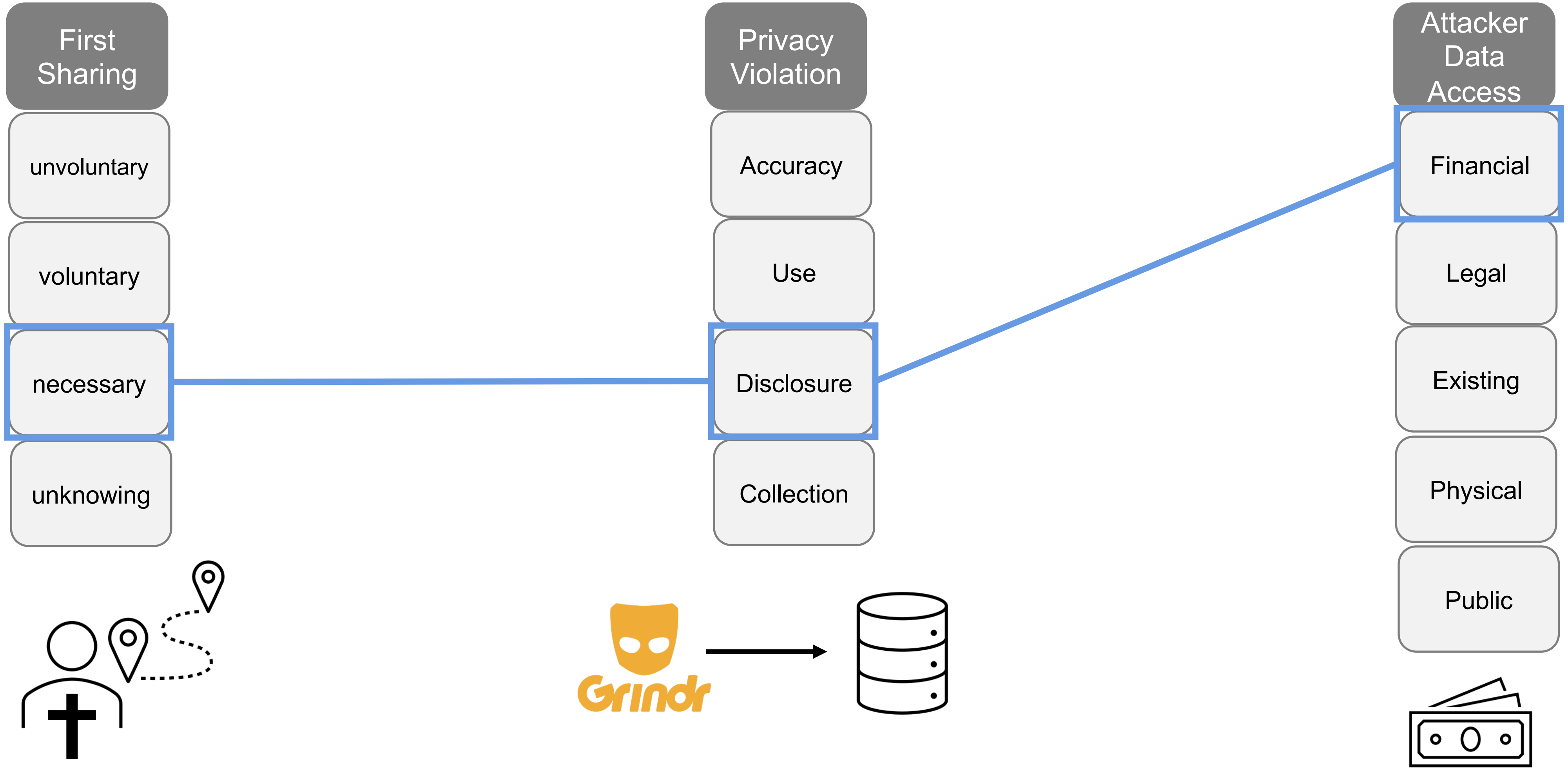

First Sharing
- unvoluntary
- voluntary
- necessary
- unknowing

Privacy Violation
- Accuracy
- Use
- Disclosure
- Collection

Attacker Data Access
- Financial
- Legal
- Existing
- Physical
- Public

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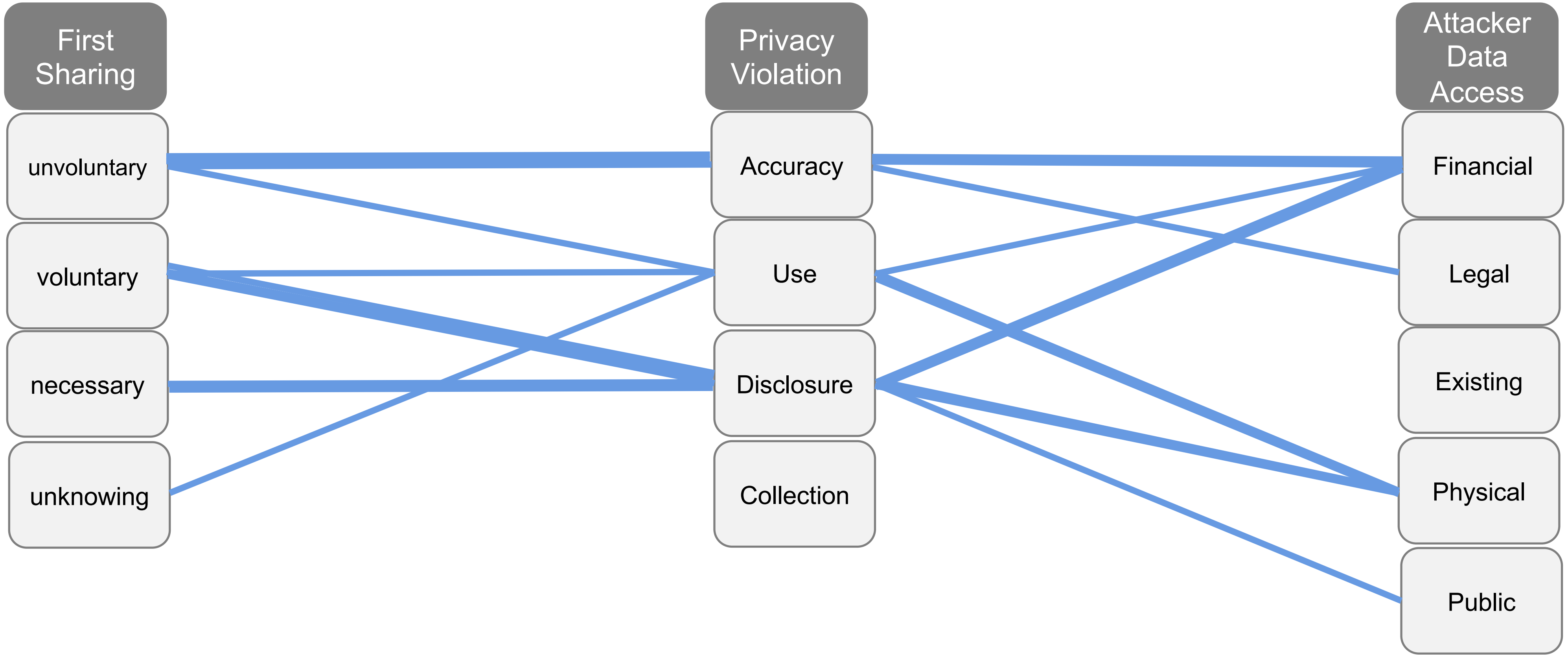

First Sharing

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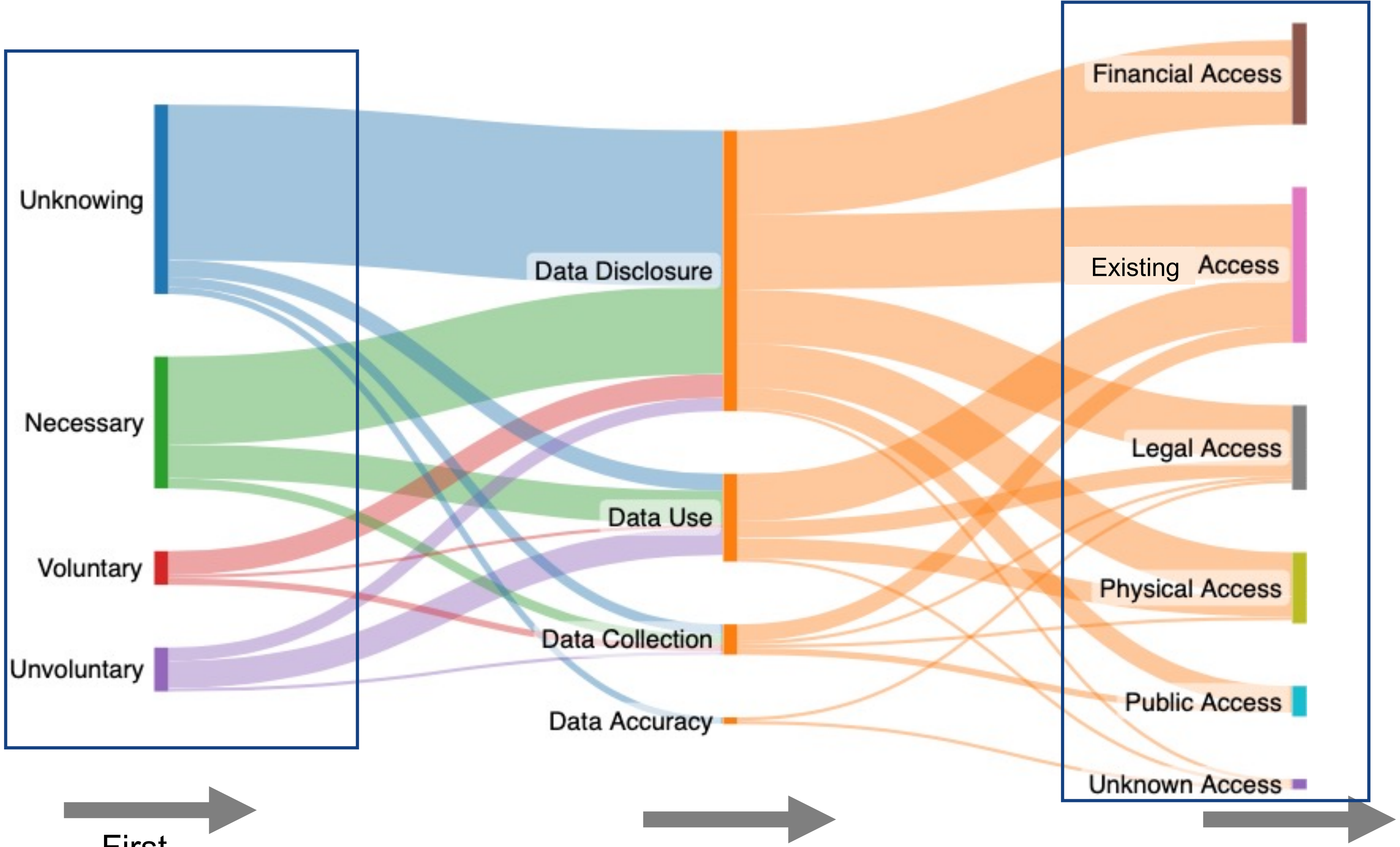
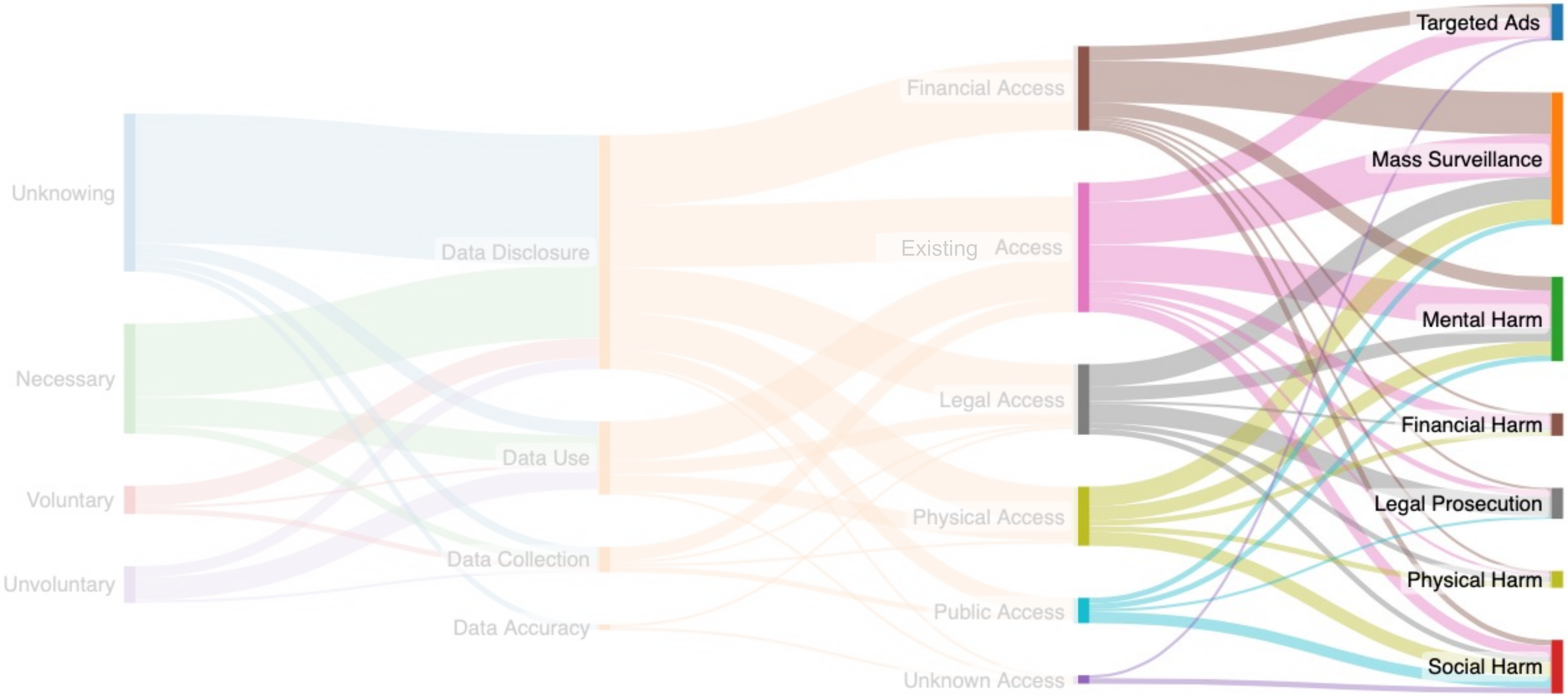


First Sharing

Privacy Violation

Attacker Data Access

Against which **consequences of privacy violations** might a user require protection?



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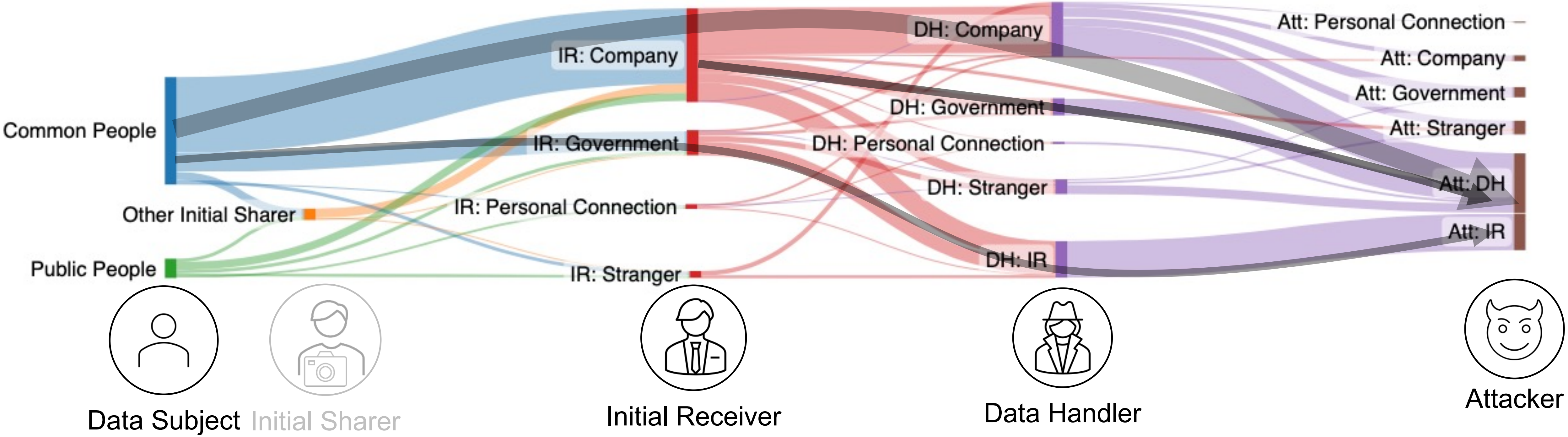
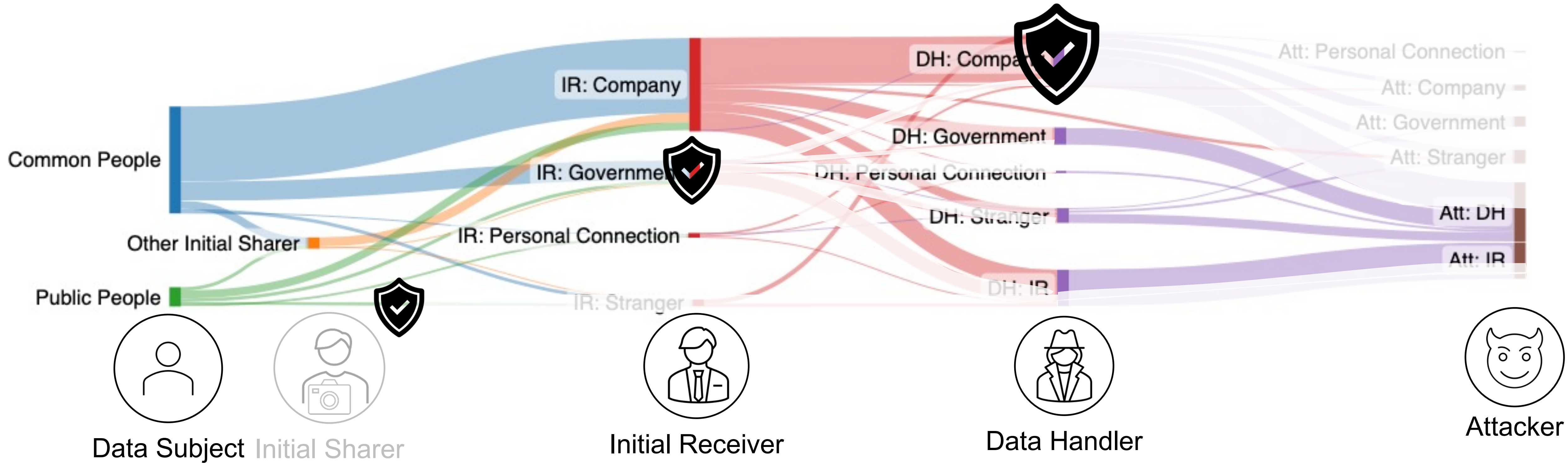
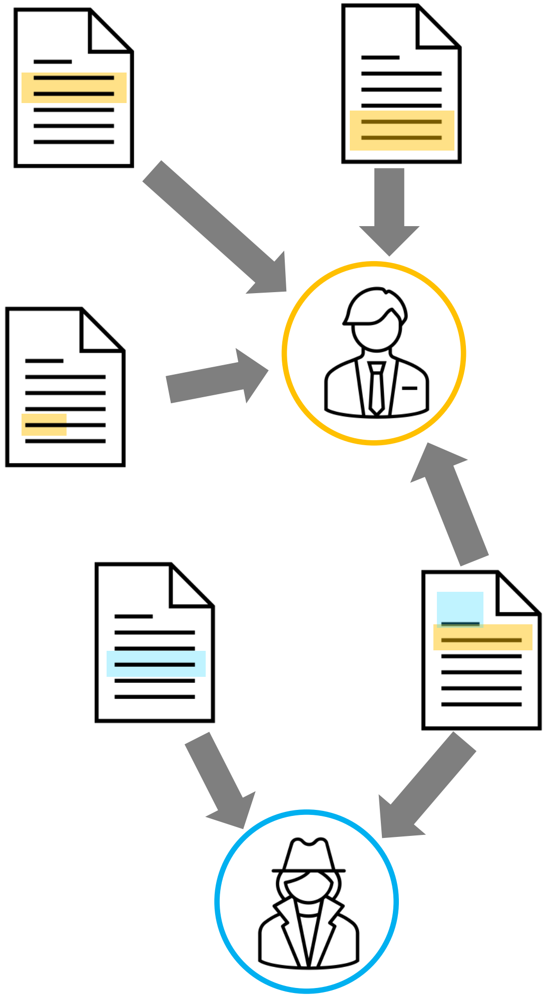


Impact of PETs?



Analysis of PETs in the Literature



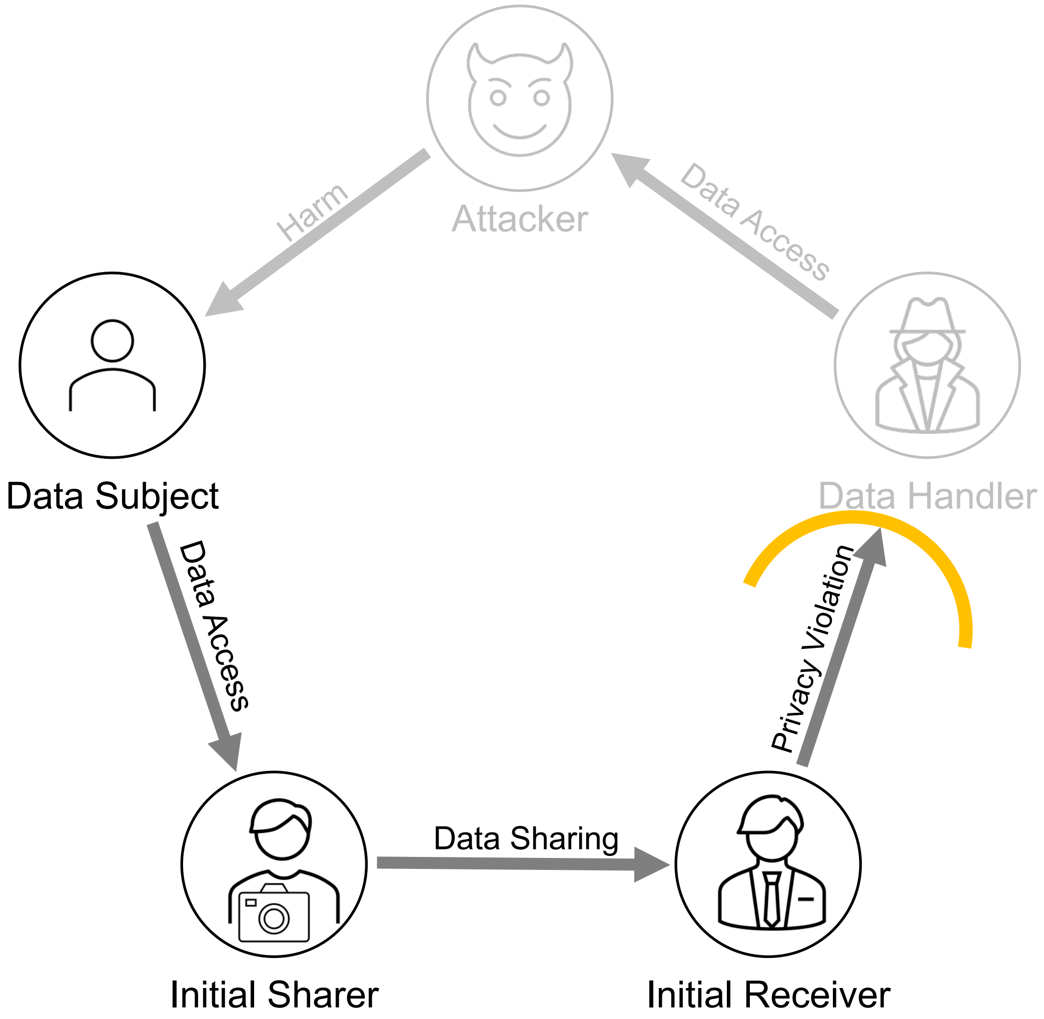
Focus on Alteration of Data Flow & Control

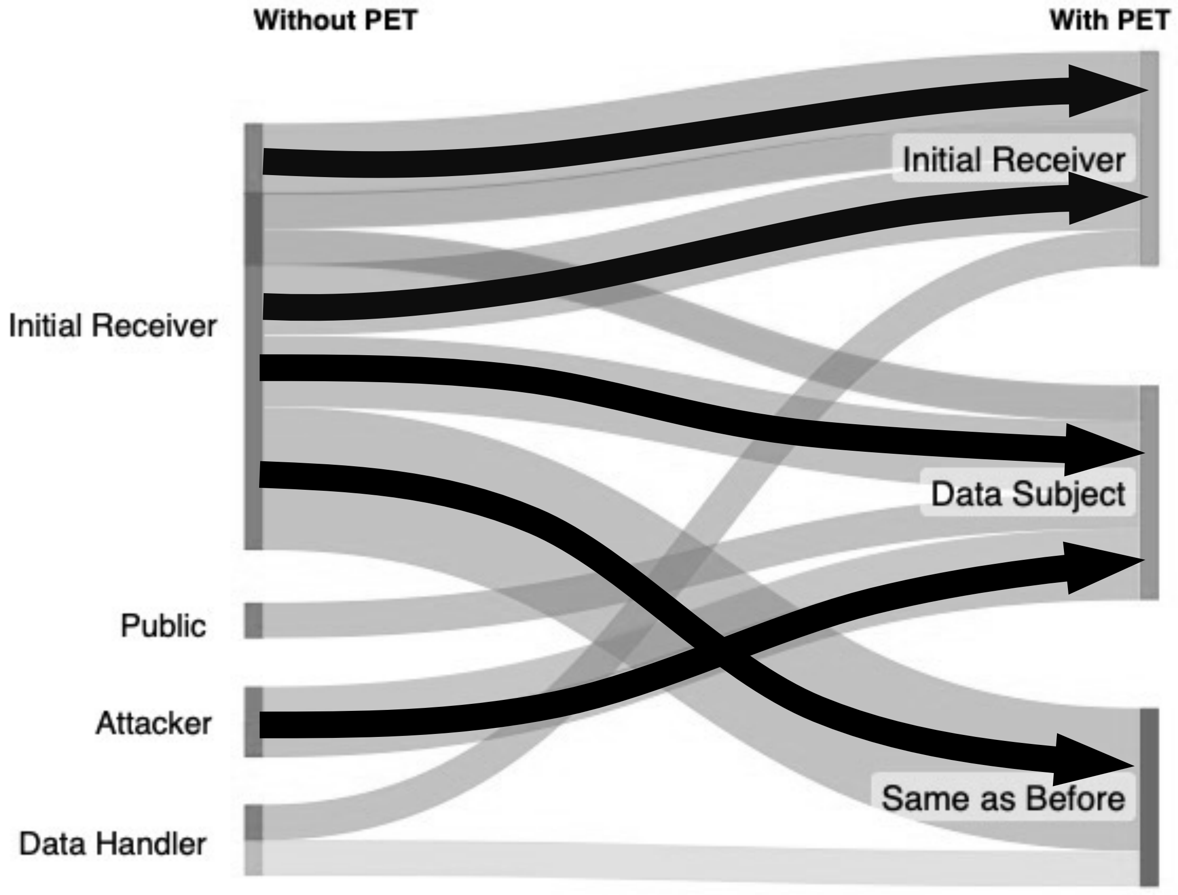
Compare to Real-World Attacks

Papers with Usenix Test of Time or Caspar Bowden Award

N = 103. 17 of which proposed new PETs with real-life privacy scenarios

Shift of Control



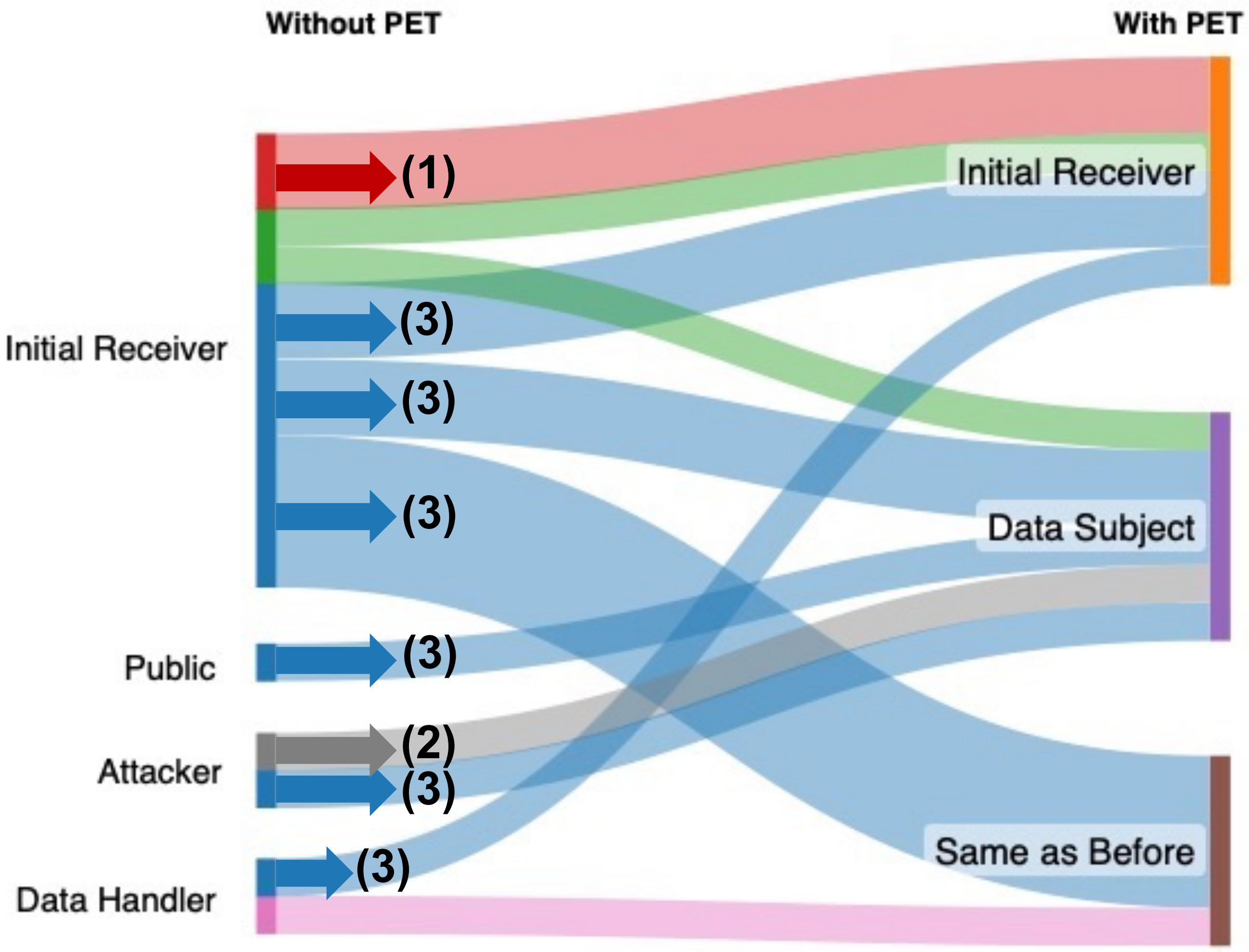


Alterations to the Data Flow

(1) Added flows

(2) Intercepted flows

(3) Narrowed flows



Discussion

Threat Modelling: Simple models which allow for analysis are at odds with the complexities of real-life data flows. *How can we capture the complexity of real-world systems in PETs development?*

Privacy Harms: *Are PETs more focused on protecting assets than avoiding consequences?* Focusing on harms caused to users provides new perspectives on trade-offs and trust.

The Role of PETs: Existing PETs are sometimes **adding** data flows (as opposed to intercepting them). *Is this behaviour truly enhancing privacy?*