



**OpenSSF Community Day**  
NORTH AMERICA 2026

# The Architecture of Accountability: Transparency in Software

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# Motivating "Transparency"



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# Making a "claim"

1. Make a statement
2. Record that statement
3. Be held accountable for it
  - a. Can't take it back
  - b. Someone will verify it
4. Another party will rely on that claim

# Bank Account Transactions

- How do I audit all deposits and withdrawals from my bank account?
- Can someone steal money without me noticing?
- Can my bank take money out without me noticing?

ACME GLOBAL BANK  
Account Holder: SARAH J. MILLER

Monthly Bank Transaction  
Statement Period: October 1, 2023 - October 14, 2023

DATE	DESCRIPTION	TRANSACTION ID	AMOUNT (USD)	BALANCE (USD)
01 Oct 2023	Opening Balance	(N/A)	+\$4,450.75	\$2,450.75
02 Oct 2023	Direct Deposit: Galactic Bounty Reward	ACH12345	+\$4,200.00	\$6,650.75
03 Oct 2023	Withdrawal: Kraken-Taming Permit Fee	ATM78901	-\$300.00	\$6,350.75
04 Oct 2023	Purchase: 1,000 Rubber Ducks (Bulk)	POS45678	-\$145.67	\$6,205.08
05 Oct 2023	Payment: Time Machine Insurance	DBT90123	-\$19.99	\$6,185.09
07 Oct 2023	Transfer to 'Buy-a-Small-Island' Fund	TRF34567	-\$1,500.00	\$4,685.09
08 Oct 2023	Transfer to 'Dragon Hoard' Fund	POS12346	-\$88.42	\$4,596.67
10 Oct 2023	Purchase: Cat-Sized Hoverboard	DBT67890	-\$212.33	\$4,384.34
12 Oct 2023	Utility Bill: Alien Communication Tower	POS78901	-\$55.20	\$4,329.14
12 Oct 2023	Gas: Rocket Fuel (Premium 91 Octane)	POS45679	-\$114.50	\$4,214.64
13 Oct 2023	Dinner: The Gilded Unicorn Steakhouse (Main Horn-Cut)	DBT12345	-\$29.99	\$4,184.65
14 Oct 2023	Subscription: Unsubscribe Button Optimization Service	(N/A)		\$4,184.65

# Logging into a Website

- How do I verify no one has my password?
- How about for every website I log into?
- What about if the site is compromised?
- Privacy concerns?



From theverge.com

# Vim is Better than Emacs

- An obviously true statement
- Can I be wrong?
- Who is verifying this?



Emacs



Vim

# Defining "Transparency"



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# Discoverability & Auditability

# Claimant Model

"There is a **Claimant** that makes a **Claim** that is relied upon by a **Believer** as a precondition to take an action they would not have taken if the claim was false. Claims are represented by signed **Statements**. The veracity of a Claim can be verified by a **Claim Verifier**, who will notify a **Claim Arbiter** of any false Claims." - [Claimant Model](#)

# Claimant Model - Bank Transactions

<b>Claimant</b>	The bank
<b>Claim</b>	There exists a list of all deposits and withdrawals for a given bank account
<b>Believer</b>	Owner of bank account
<b>Statement</b>	A record of a transaction on a bank account
<b>Verifier</b>	Owner of bank account
<b>Arbiter</b>	Bank owner, the government

# Claimant Model - Logging into websites

<b>Claimant</b>	The website?
<b>Claim</b>	All successful login attempts are recorded
<b>Believer</b>	The website
<b>Statement</b>	A record of the website, timestamp & username
<b>Verifier</b>	Human behind the username
<b>Arbiter</b>	Online forums, etc

# Claimant Model - Logging into websites

<b>Claimant</b>	The user
<b>Claim</b>	All login attempts are recorded
<b>Believer</b>	The website
<b>Statement</b>	A record of the website, timestamp & username
<b>Verifier</b>	Human behind the username
<b>Arbiter</b>	Online forums, etc

# Claimant Model - Vim > Emacs

<b>Claimant</b>	Me
<b>Claim</b>	Vim is better than Emacs <-- This is not falsifiable
<b>Believer</b>	Text editor enthusiasts
<b>Statement</b>	The sentence
<b>Verifier</b>	???
<b>Arbiter</b>	???

# Building Blocks for a Transparent System

- Append-only list of statements, i.e. "log"
- Prove inclusion in the list to a Believer
  - Inclusion means that a Verifier can actually verify the claim
  - No inclusion means the statement shouldn't be relied upon
- Auditability for the Verifier
  - Efficiently verify that all relevant claims are correct

# Real-World Examples

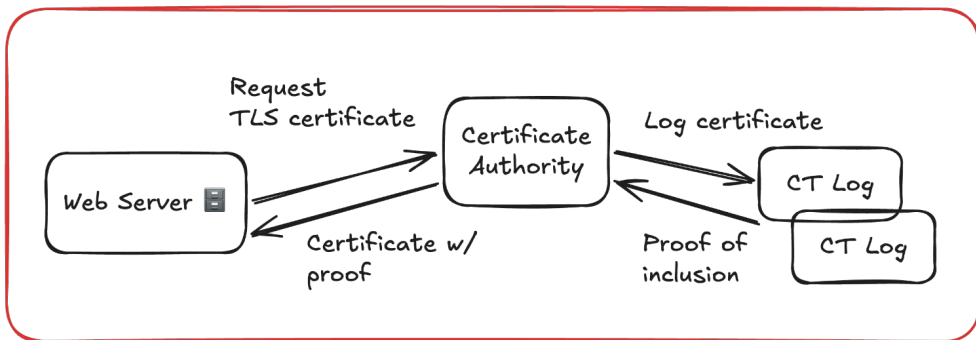


# Certificate Transparency

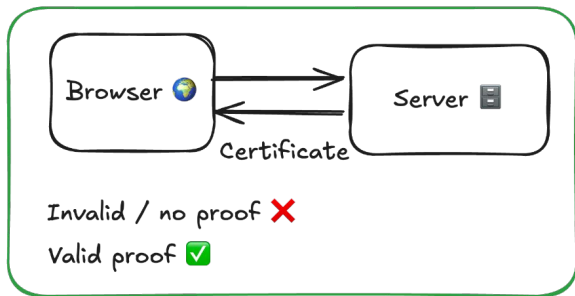


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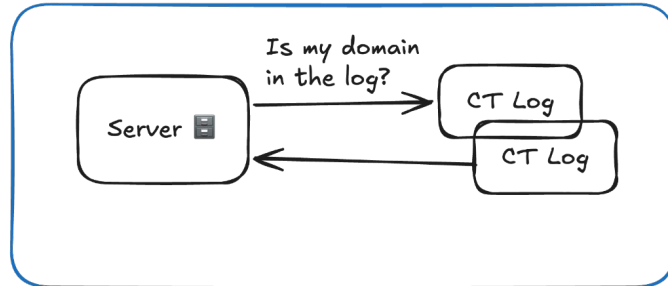
# Claimant



# Believer



# Verifier

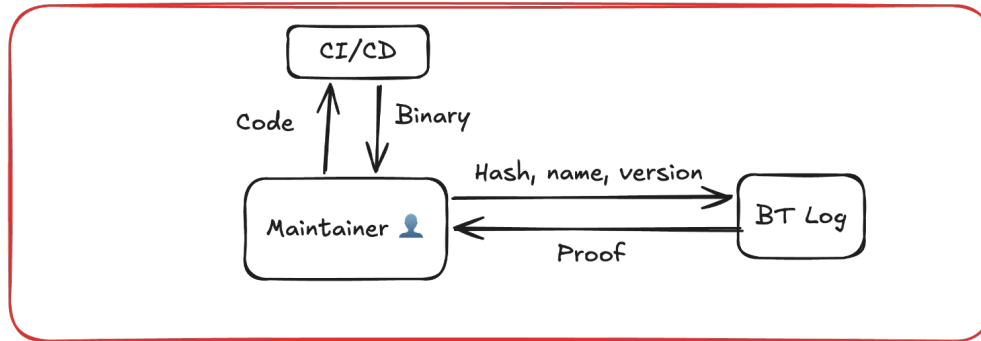


# Binary Transparency

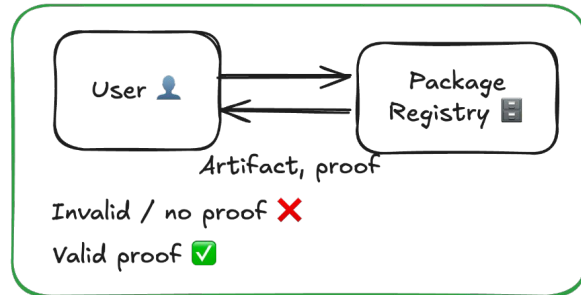


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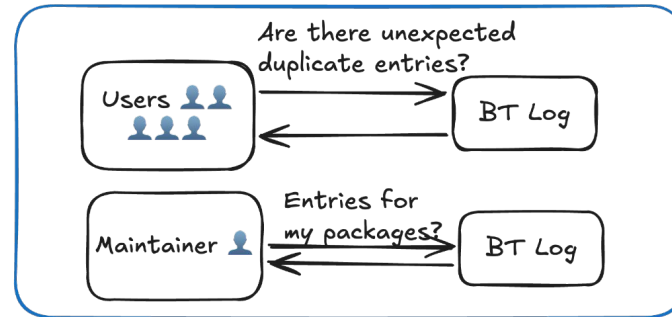
## Claimant



## Believer



## Verifier



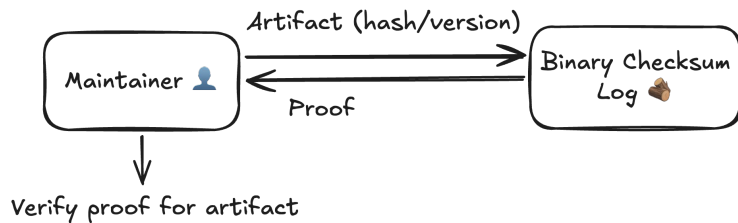
# Binary Transparency

- Sigstore for key/identity usage transparency
- Go checksum database
- Android Pixel firmware transparency
- F-Secure USB Armory Drive



# Binary Transparency

- Future work
  - More package registries: Registry & developer can guarantee that the same package that was uploaded is also distributed globally to all users



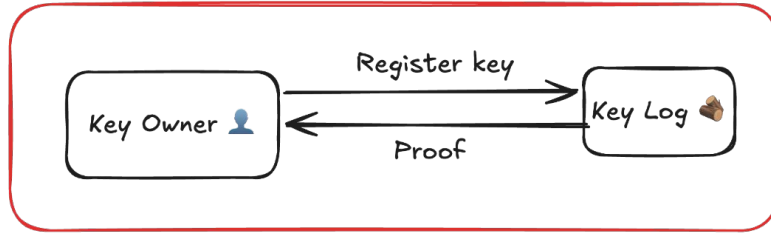
# Binary Transparency

- Future work
  - More package registries: Registry & developer can guarantee that the same package that was uploaded is also distributed globally to all users
  - Web resource transparency
    - Web-based Code Assurance and Transparency (Freedom of the Press Foundation)
    - Web Application Integrity, Consistency, and Transparency (Cloudflare/Mozilla)

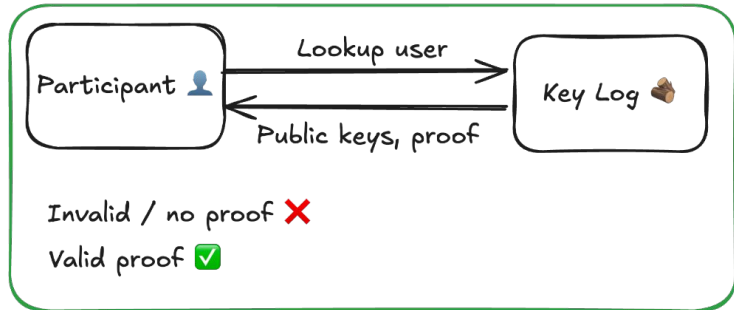
# Key Transparency



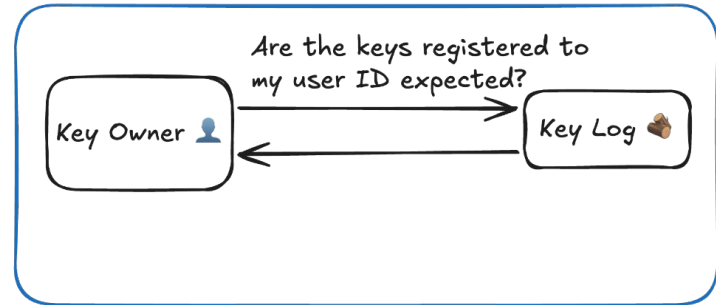
## Claimant



## Believer



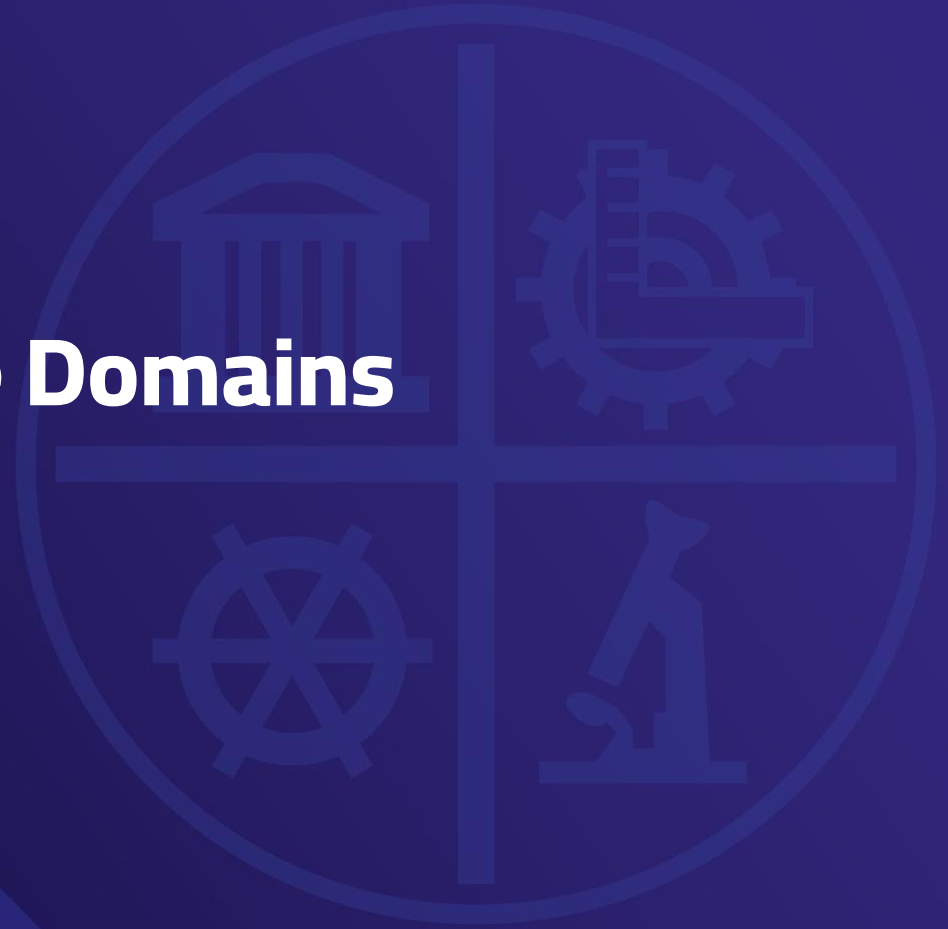
## Verifier



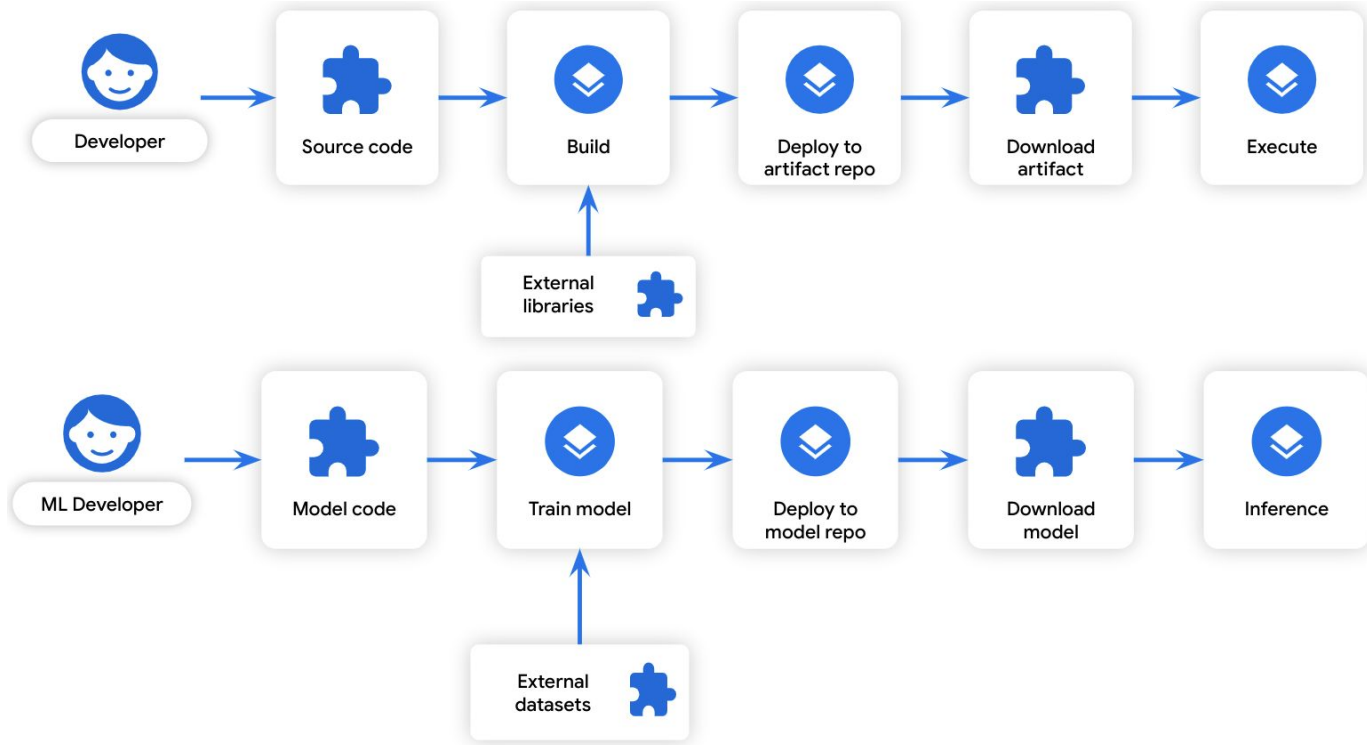
# Key Transparency

- Messaging applications for end-to-end encryption
  - Apple Messages for iMessage Contact Key Verification
  - WhatsApp
  - Signal
  - Proton Mail
- age public key server
  - <https://keyserver.geomys.org/>

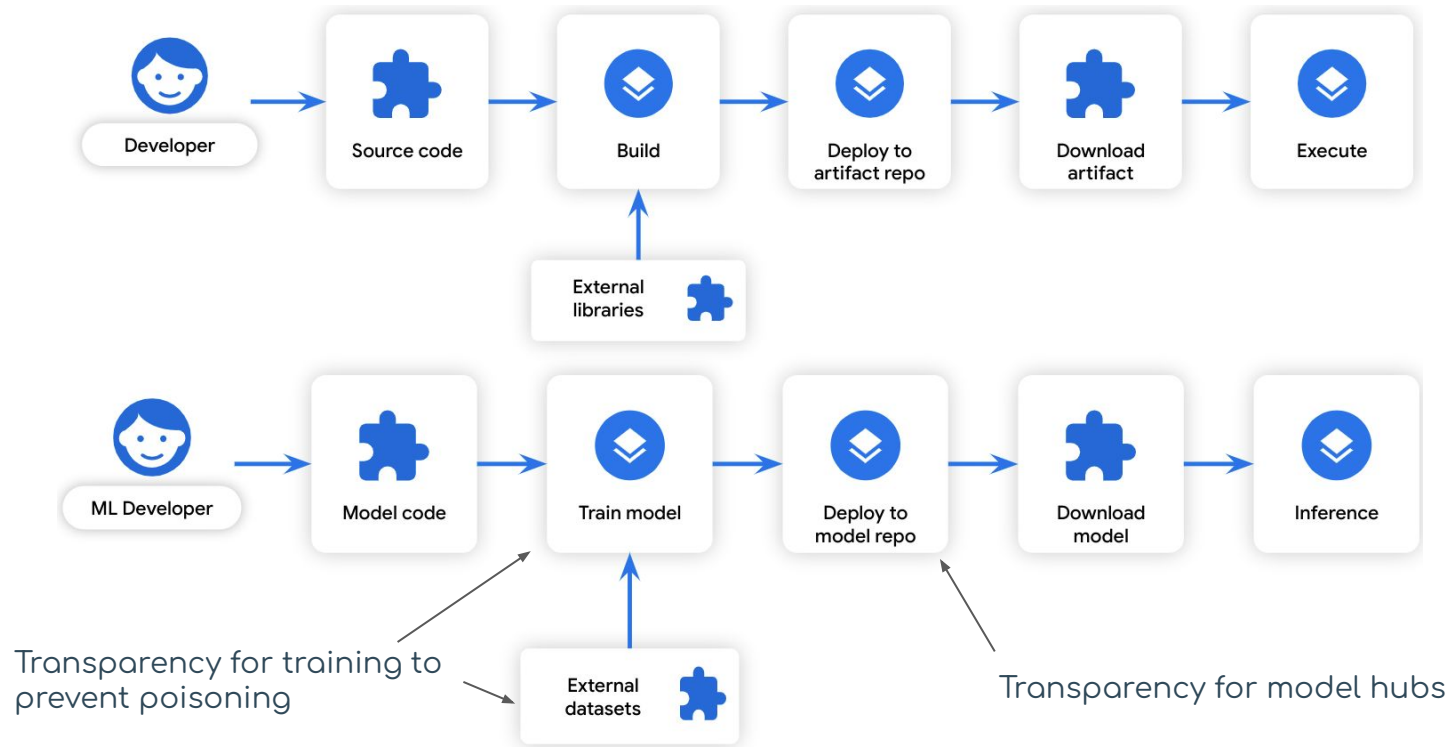
# Future Domains



# AI Model Transparency



<https://security.googleblog.com/2023/10/increasing-transparency-in-ai-security.html>



<https://security.googleblog.com/2023/10/increasing-transparency-in-ai-security.html>

# News Transparency



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# News Transparency

- Commit to article revisions
  - Research: <https://dl.acm.org/doi/abs/10.1145/3579534>
- Content authenticity
  - C2PA



# Getting Involved



# Getting Involved

- Learn more: <https://transparency.dev/>
- Slack: <https://transparency.dev/slack/>
- Standards: <https://github.com/C2SP/C2SP>
- Implementation: <https://github.com/transparency-dev/tessera>

**Thank you!**



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