Nowhere to Hide

Using Transparency Logs to Secure Your Supply Chain with Sigstore

Google Open Source Security Team

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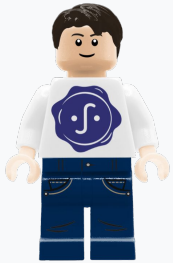
Who am I?

Google Open Source Security Team, aka GOSST

- Software Engineer & Manager at Google
- Focused on making open-source software more secure
- Bribable with LEGO
- Self-proclaimed expert chef



Agenda

01 What is Supply Chain Security?

02 Intro to Sigstore

03 Sigstore's Usage of Transparency Logs

04 Real-World Learnings

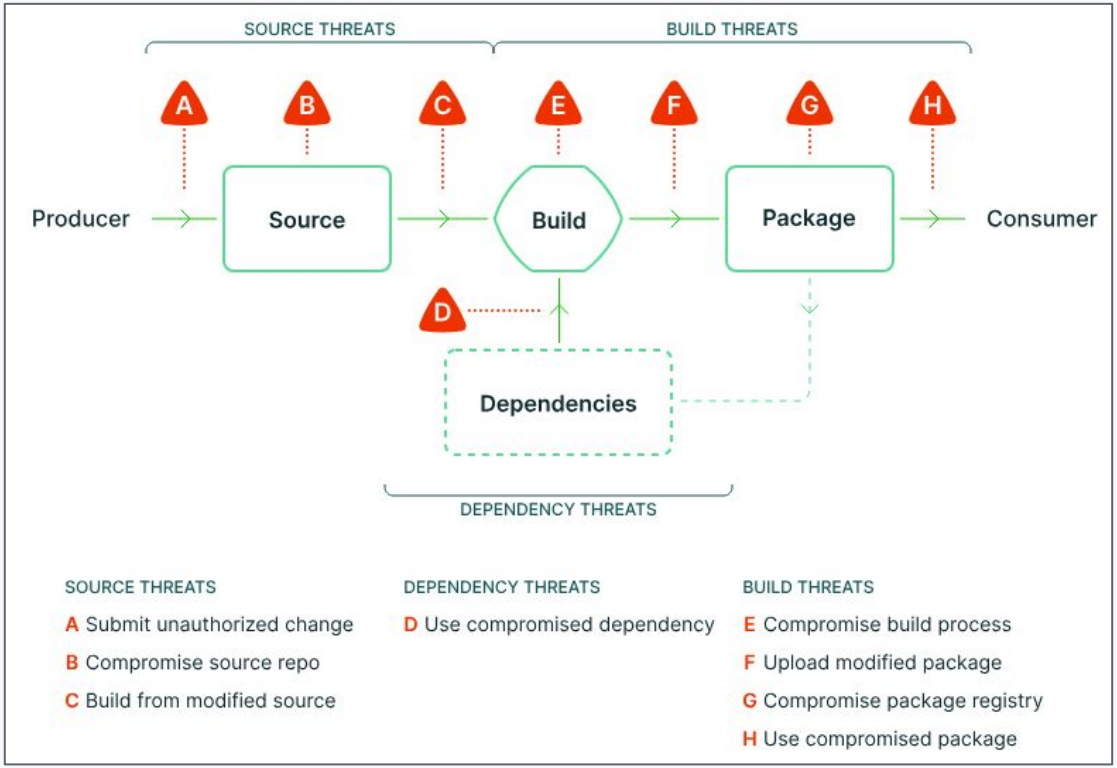
05 What's Next

01

What is Supply Chain Security?

Software Development Lifecycle

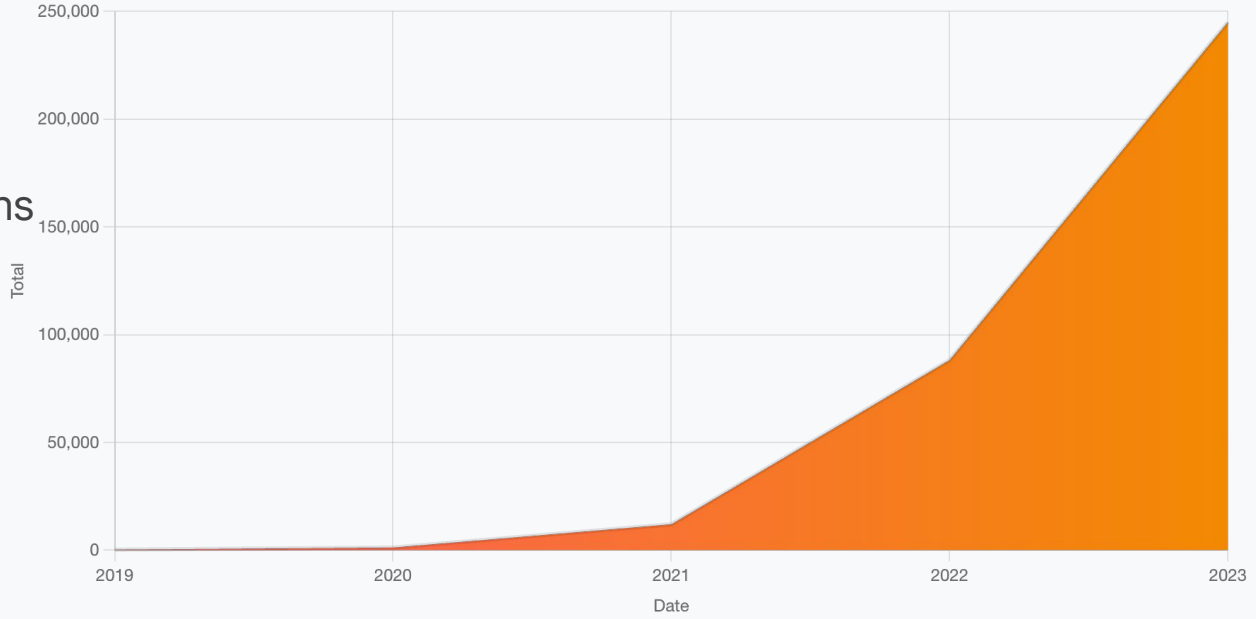
Threats to Mitigate



Source: https://slsa.dev/spec/v1.0/threats-overview

Supply Chain Attacks on the Rise

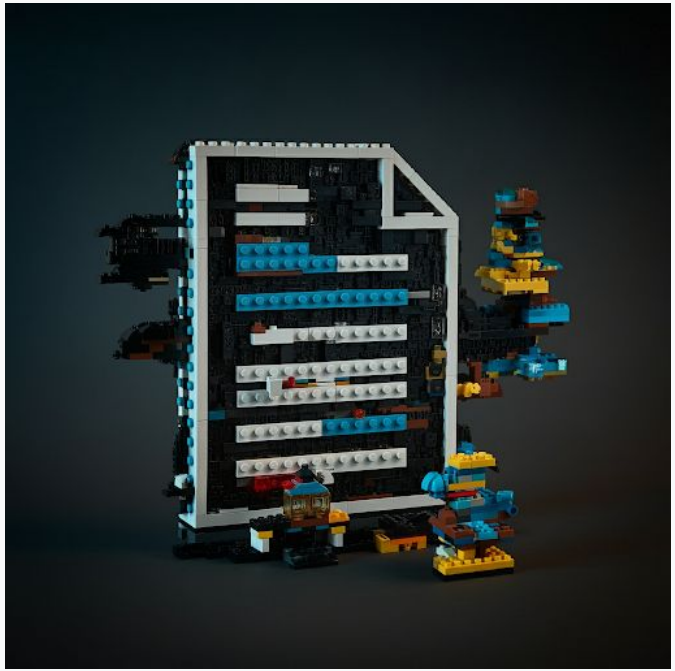
- Dependency confusion
- Typosquatting
- Malicious code injections
- Compromised build processes
- Major incidents: xz, Solarwinds, log4shell



Source: https://www.sonatype.com/state-of-the-software-supply-chain/open-source-supply-and-demand

Need for Trusted Artifacts

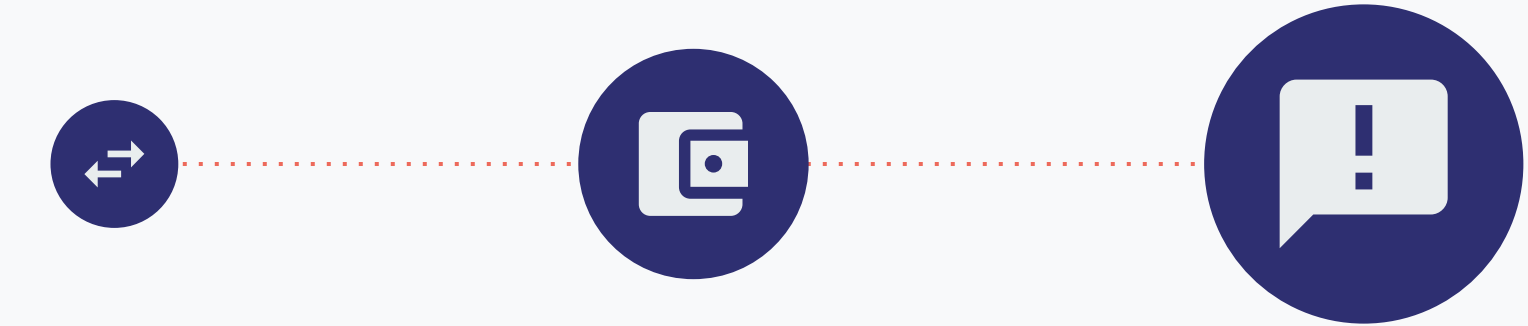
- Build provenance
- SBOMs
- Vulnerability scan results
- VEX
- Artifacts themselves
- Project policies
- ... and more!



Source: Gemini

Solution: Signatures!

Problem: Key Management is Hard



Problem: Signing is Uncommon in OSS

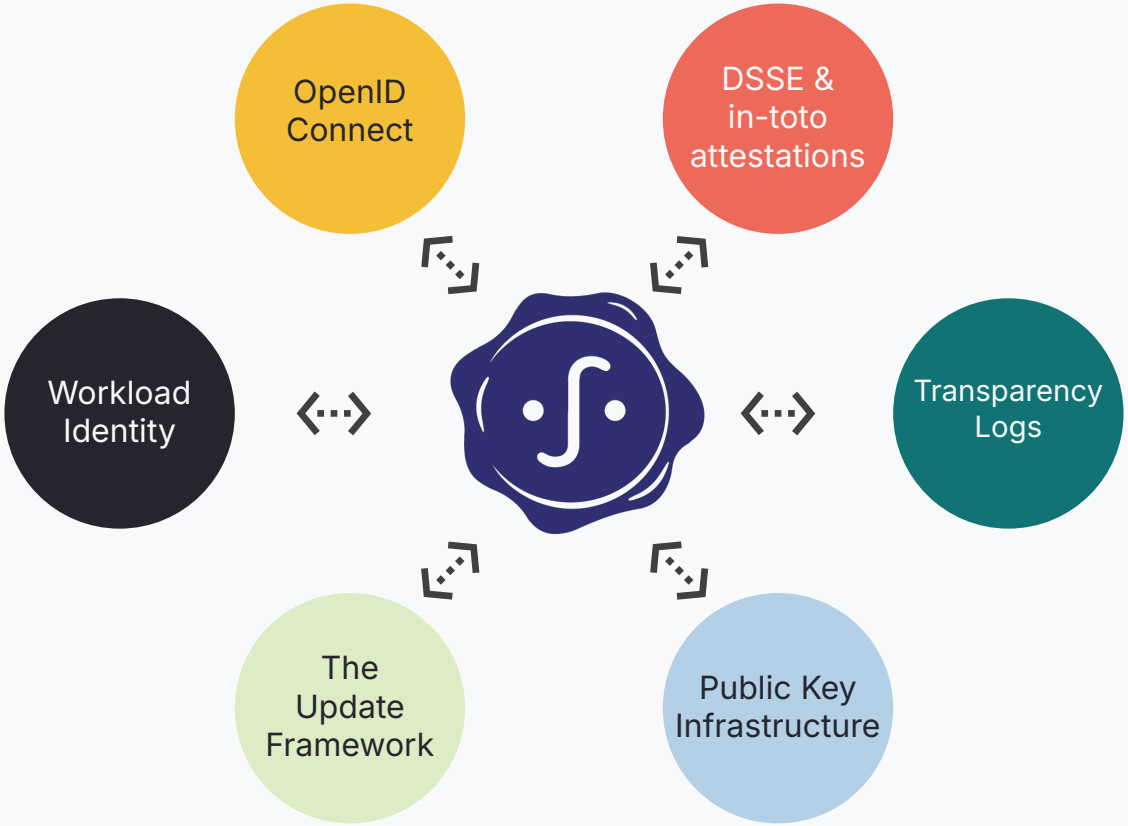
- Key management
- UX
- Lack of registry support
- Developers just don't care! (And they shouldn't have to!)

Source: Gemini

02

Sigstore

Convergence of Industry Standards



Sigstore: Trust Foundation

Sigstore Overview

Projects (Open Source)

- **Rekor**: Transparency Log
- **Fulcio**: Code Signing CA
- SDKs & Clients
  - Cosign
  - sigstore-go
  - sigstore-java
  - sigstore-js
  - sigstore-python
  - sigstore-ruby
  - sigstore-rs
  - gitsign
- Supporting projects
  - helm-charts
  - scaffolding
  - policy-controller
- Trust root (TUF-based)

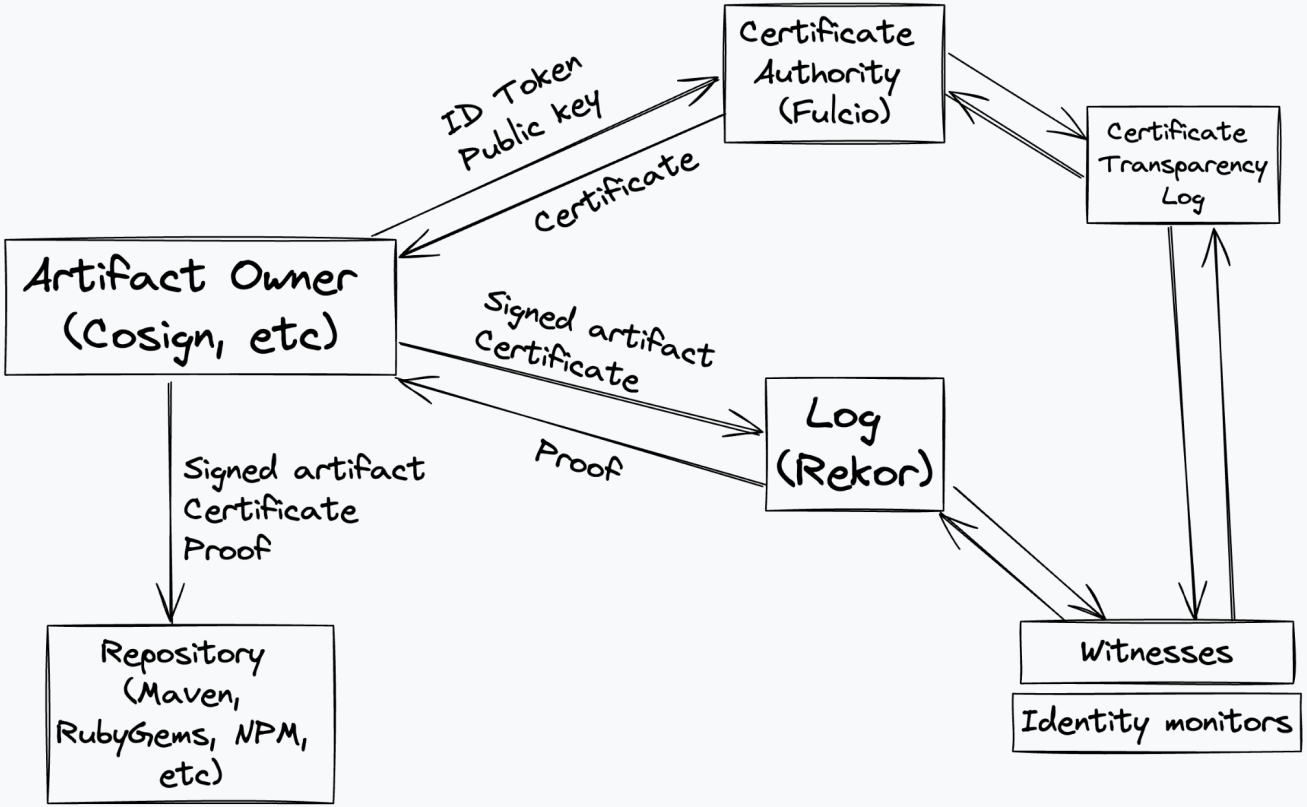
Services

- Public good instances (free to use!)
  - rekor.sigstore.dev
  - fulcio.sigstore.dev
  - oauth2.sigstore.dev
- Community-operated
  - Multi-vendor team
  - 24/7 oncall
  - Cloud hosted
  - Gitops-based infrastructure
- Productionized and running at scale since October 2022

Community

- An OpenSSF project
- Vibrant community of 2,600+ members in Slack
- Community meetings
  - Biweekly project review / office hours
  - "SIGs" (e.g. clients, on-call, architecture docs)

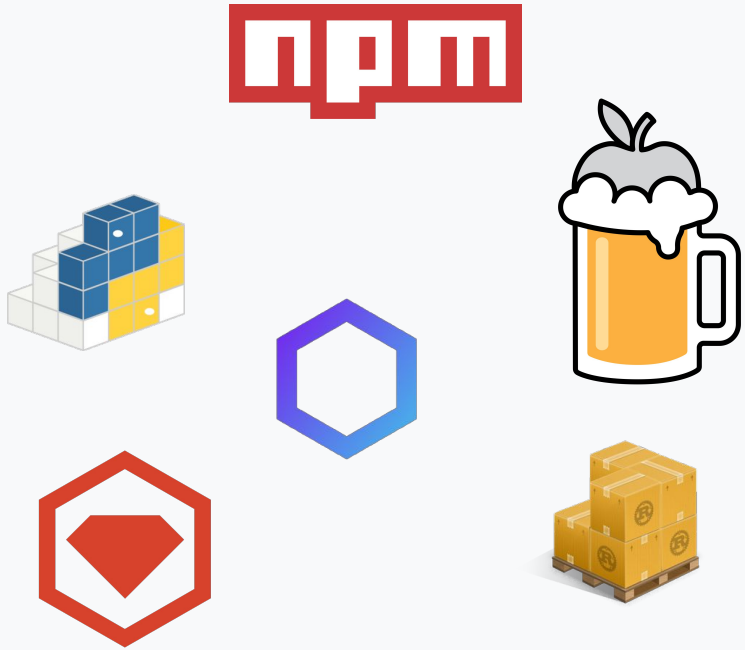
Sigstore Overview



Sigstore Adoption in Package Registries

Sigstore Adoption by Ecosystem

Ecosystem	State	Status
npm	Sigstore-signed SLSA provenance	GA LAUNCHED
PyPI	Trusted Publishing PEP 740 - Index Attestations	IN PROGRESS (Soon)
RubyGems	Trusted Publishing Signing & verification	IN PROGRESS
Maven Central	Signing (PGP & Sigstore)	GA LAUNCHED
GitHub Actions	Sigstore-signed SLSA provenance	GA LAUNCHED
Homebrew	Sigstore-signed SLSA provenance	BETA
Bazel Central Registry	Sigstore-signed SLSA provenance	RFC



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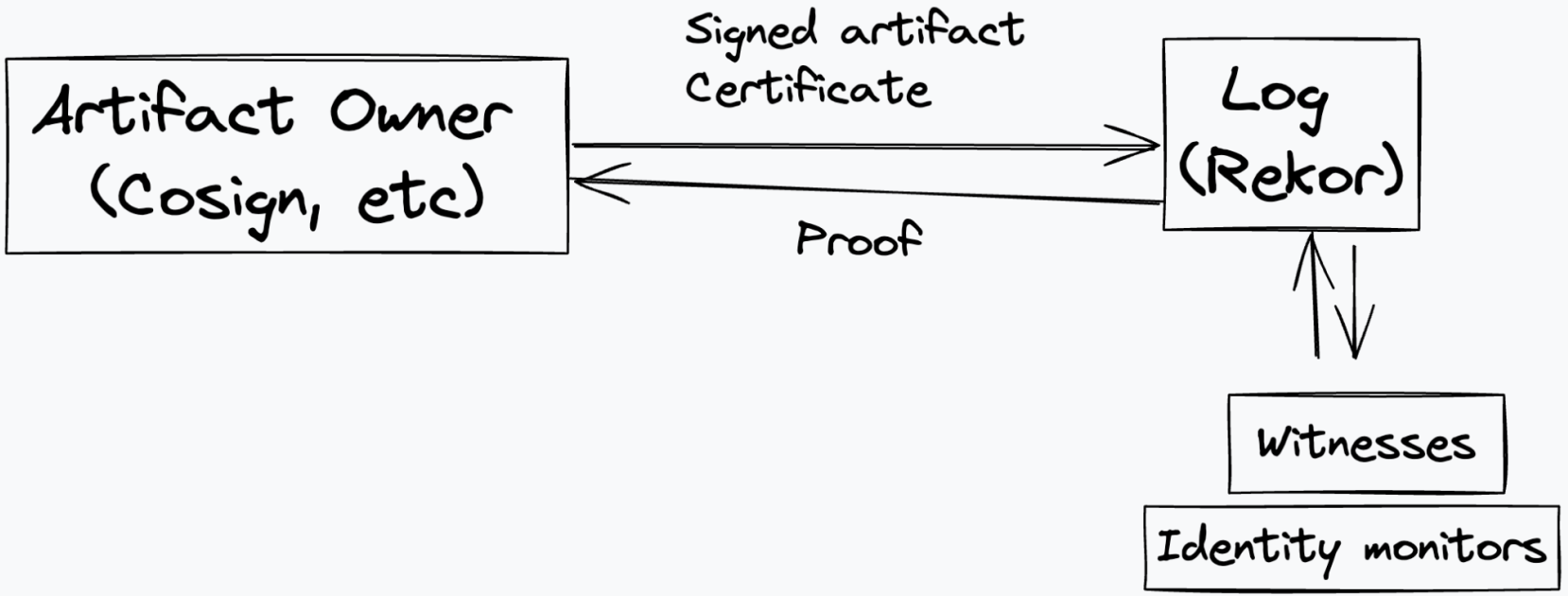
Rekor: Sigstore's Transparency Log

Rekor



Rekor Deep-Dive

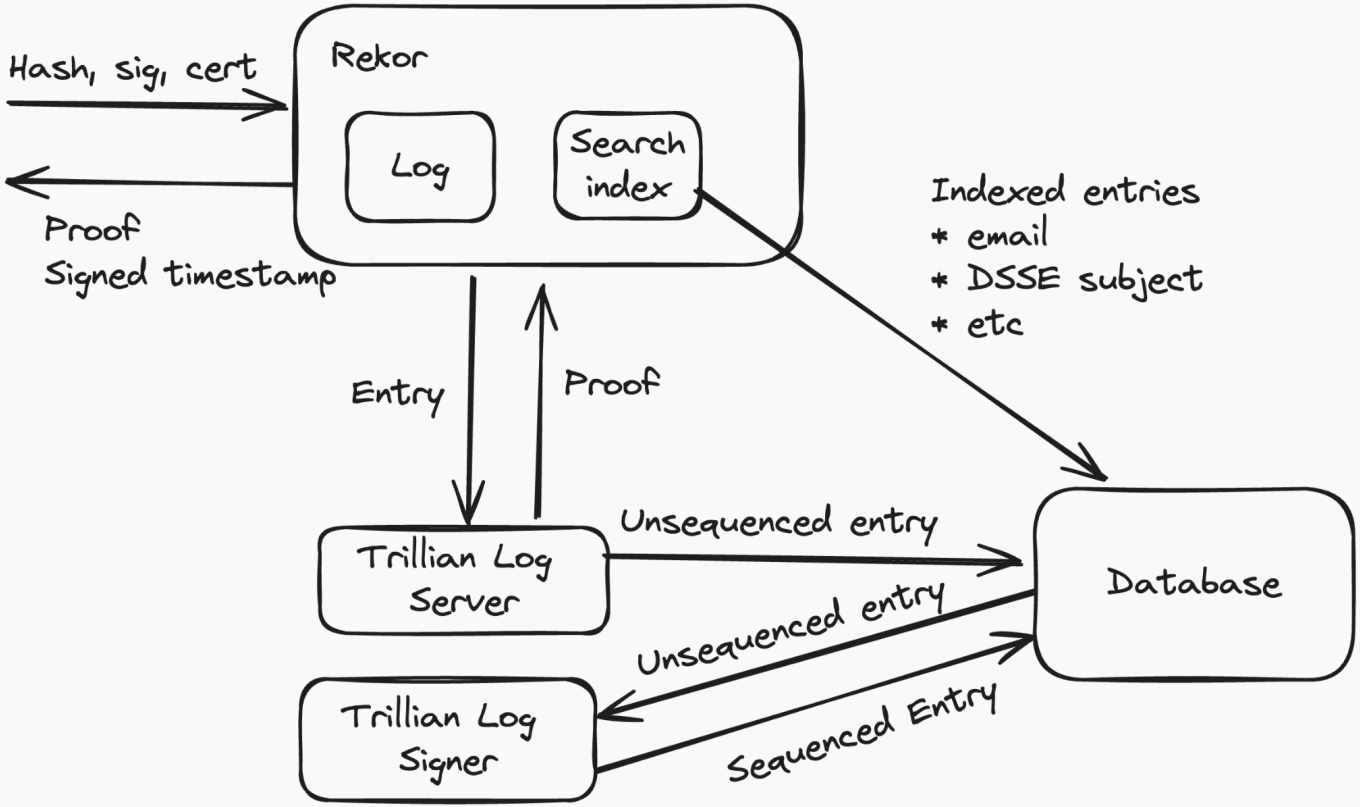
Request:

* Artifact Hash
* Signature
* Verifier
  * Certificate
  * Public key (RSA, ECDSA, Ed25519)
  * PGP public key
  * SSH public key

Response:

* Inclusion proof / checkpoint
* Signed Entry Timestamp
  * Log index
  * Log ID
  * Request body
  * Timestamp

Rekor Deep-Dive



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Real-World Learnings

API Design

Client vs Server Canonicalization

Double Duty: Proofs, Timestamping, Attestation Storage, and Search

Source: lego.com

Online Queries: Save the Proof

Redactable Content

Deployment

Cost:

Deployment, storage, SREs

Source: bricklink.com

Source: Gemini

Many Components

Source: Gemini

Lack of Batch Processing

Source: https://www.lego.com/en-us/product/the-bad-batch-attack-shuttle-75314
It's Clone Force 99, aka "the Bad Batch".....

Complex Sharding

05

What's Next

Tile-based log:
Trillian-Tessera
Lower cost
Simpler to maintain

Stronger offline proofs:
Proofs, and checkpoints,
and witness co-signatures,
oh my!

Source: lego.com

Batching:
Wait a second...

Simplified API:
Less types, less verifiers

More Logs!

More Log Operators

Logs by domain

Simplified Sharding

Thank you!

SigstoreCon: Nov 12, 2024
Salt Lake City

Community and Slack