Veracity Technology Spearhead

Enabling end-to-end veracity within value exchange ecosystems

Provenance Injection for Privacy

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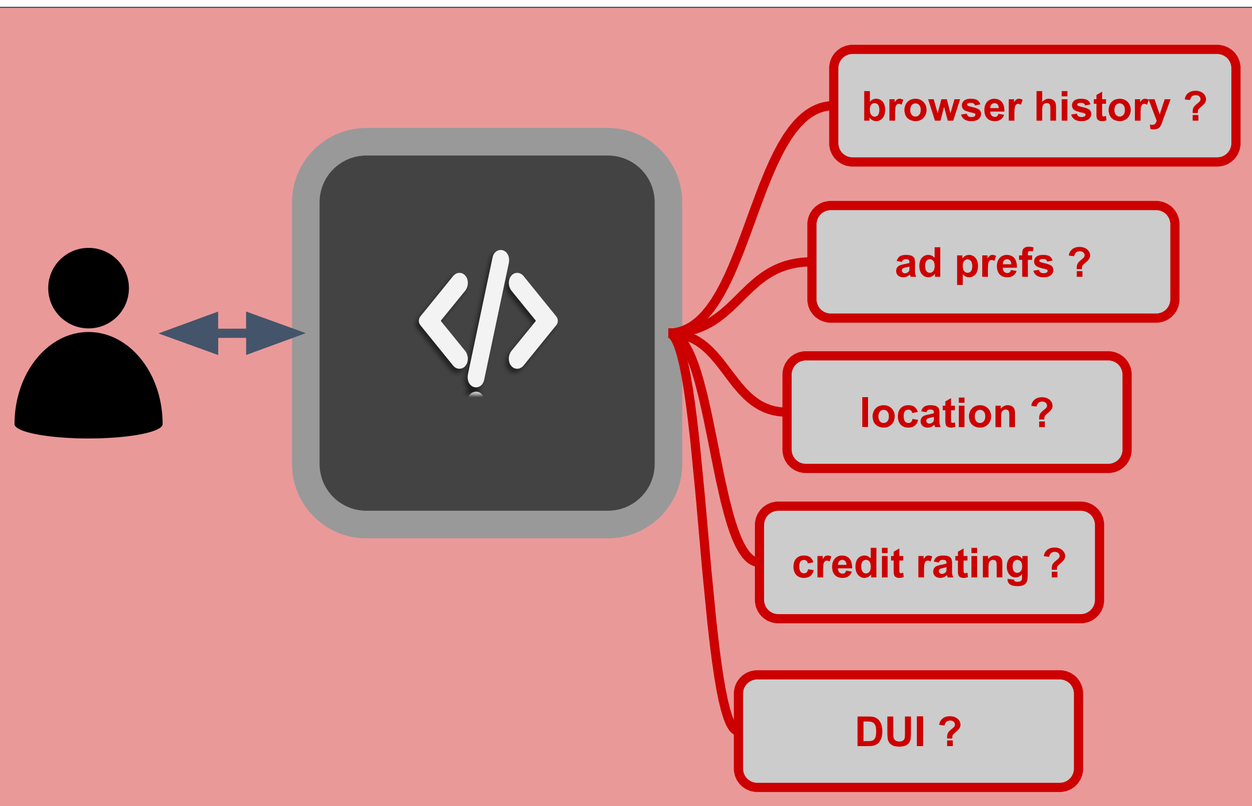


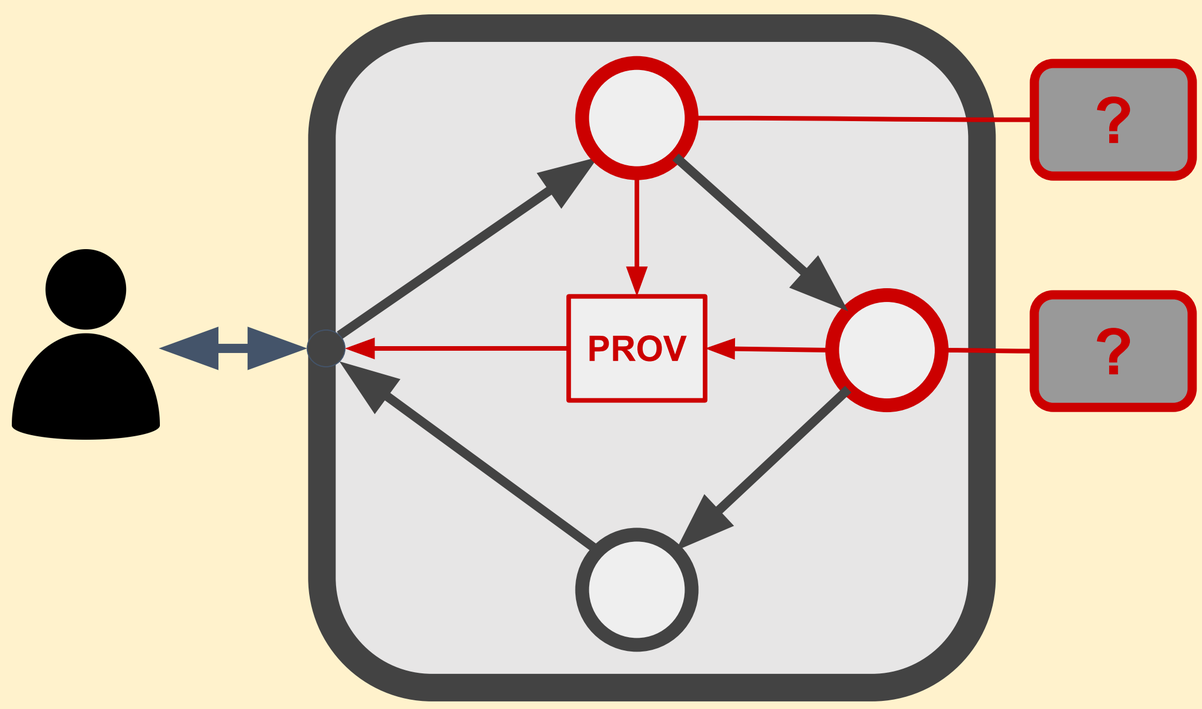
The Problem

Modern computing is done in a black box fashion – users have no or little knowledge how their data is being processed, and whether privacy is preserved.

Adding transparency manually is considered complex and prohibitively expensive.

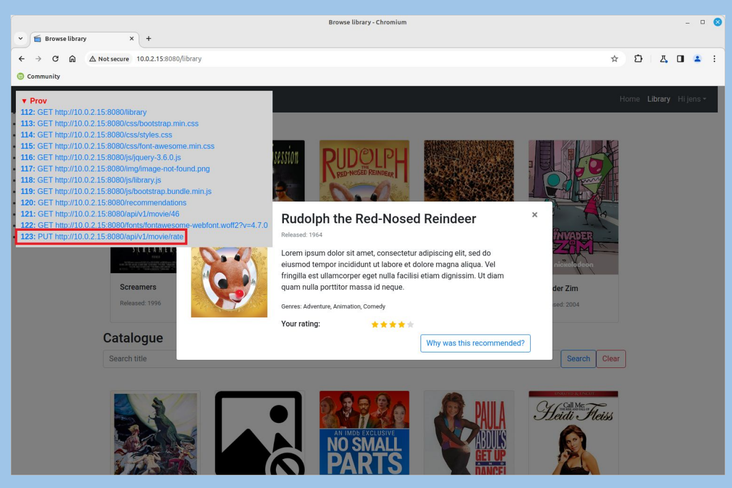
Our Approach: Use Bytecode Instrumentation to Add Provenance Automatically

- Compiled applications are instrumented to insert probes
- This does **not require code changes**, but can be achieved with small configuration changes
- At runtime, those probes **collect information** about actions persisting data, outgoing network calls, etc
- This information is encoded using W3C's **PROV-DM** standard
- This information is then attached to service responses using a dedicated **provenance HTTP header**, maintaining **compatibility with existing clients**
- Clients (like web browsers) can process this information, for instance, by **creating alerts for users**

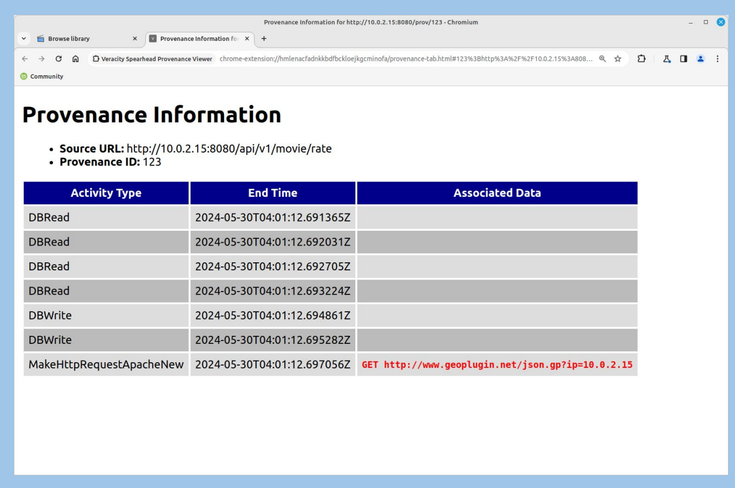


Evaluation

We implemented a prototype movie rating application that uses the user's IP address to perform geolocation **on the server side** when the user rates a movie. Using our instrumentation, and a Chrome browser extension we developed for viewing provenance data, the user can discover the server-side geolocation HTTP request.



1. Clicking a star to rate the movie adds an entry to the list of URLs with provenance information



Activity Type	End Time	Associated Data
DBRead	2024-05-30T04:01:12.691365Z	
DBRead	2024-05-30T04:01:12.692031Z	
DBRead	2024-05-30T04:01:12.692705Z	
DBRead	2024-05-30T04:01:12.693224Z	
DBWrite	2024-05-30T04:01:12.694861Z	
DBWrite	2024-05-30T04:01:12.695282Z	
MakeHttpRequestApacheNew	2024-05-30T04:01:12.697056Z	GET http://www.geoplugin.net/json.gp?ip=10.0.2.15

2. Clicking that URL shows server-side provenance data, including the outgoing geolocation HTTP request

For more information please email **jens.dietrich@vuw.ac.nz** .

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