Fetch Metadata Request Headers

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Fetch Metadata - TL;DR

- Allow servers to **protect themselves** from canonical cross-origin attacks
  - CSRF, XSSI, timing attacks, clickjacking, Spectre

- The browser sends information about the request's **context** in HTTP headers
  ➡️ The server makes security decisions based on the source and context of the request

- Fetch Metadata shipped in Chrome 76
  ➡️ Currently piloting resource isolation at Google

Fetch Metadata - Recap

New **HTTP request headers** sent by the browser:

- `Sec-Fetch-Site` Which website generated the request?

  `same-origin, same-site, cross-site, none`

- `Sec-Fetch-Mode` The Request *mode*, denoting the type of the request

  `cors, no-cors, navigate, nested-navigate, same-origin`

- `Sec-Fetch-User` Was the request caused by a user gesture?

  ?1 if a navigation is triggered by a click or keypress

Fetch Metadata – Example

https://site.example

```
fetch("https://site.example/foo.json")
```

```
GET /foo.json
Host: site.example
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: cors
```

https://evil.example

```
<img src="//site.example/foo.json" />
```

```
GET /foo.json
Host: site.example
Sec-Fetch-Site: cross-site
Sec-Fetch-Mode: no-cors
```

Fetch Metadata - Resource Isolation

Basic idea

Block cross-site requests [`Sec-Fetch-Site: cross-site`]

Unless:

- It's a non state-changing [!POST] **navigational request**
  `Sec-Fetch-Mode: navigate` *or* `Sec-Fetch-Mode: nested-navigate`
- The action/servlet is **whitelisted** for cross-site traffic (e.g. a CORS endpoint)

- **Prevents** attacks based on the attacker forcing the loading of the resource in an attacker-controlled context

```python
# Resource Isolation
def allow_request(req):
  # Allow requests from browsers which don't send Fetch Metadata
  if not req['sec-fetch-site']:
    return True

  # Allow same-site, same-origin, and browser-initiated requests
  if req['sec-fetch-site'] in ('same-origin', 'same-site', 'none'):
    return True

  # Allow simple (non-state changing) navigations from anywhere
  if req['sec-fetch-mode'] in ['navigate', 'nested-navigate']
     and req.method in ['GET', 'HEAD']:
    return True

  return False
```

Fetch Metadata – Policy Configurations

Many common attacks can be mitigated by blocking certain cross-site requests

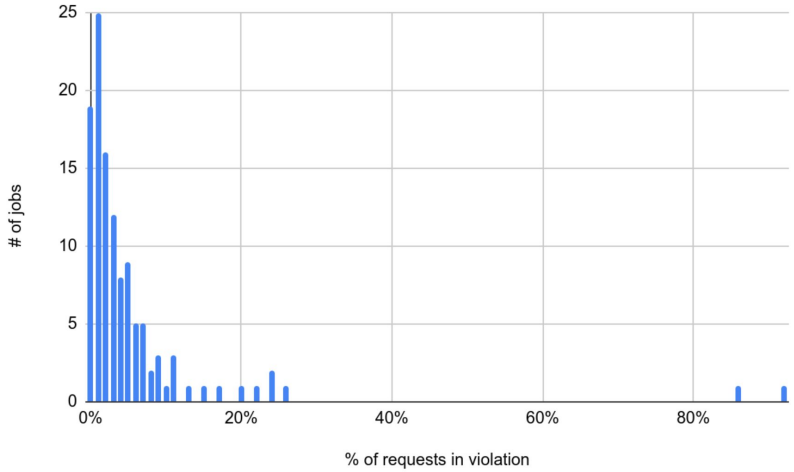
	site	mode	user	method
Resource Isolation	**'cross-site'**	**NOT '(nested-)navigate'**		
CSRF	'cross-site'			POST
XSSI / JSON hijacking	'cross-site'			
Timing attacks	'cross-site'	NOT '(nested-)navigate'		
Spectre	'cross-site'			
Navigation Isolation	**'cross-site'**	**'(nested-)navigate'**		
Clickjacking	'cross-site'	**'(nested-)navigate'** .		
XSS (reflected)	'cross-site'	**'(nested-)navigate'**		

Resource Isolation - Google Internal Pilot

- **Large scale** (400+ services/products) **Resource Isolation experiment** enabled
- **Report-only**: Apply, but don’t act on the policy (don't reject requests)
- Log the policy result along with relevant metadata:
  - `Sec-Fetch-*` headers, HTTP method, response code, relevant response headers, ...
  - Presence of `Access-Control-*` headers means an endpoint has legitimate cross-site traffic

Resource Isolation – Pilot Results

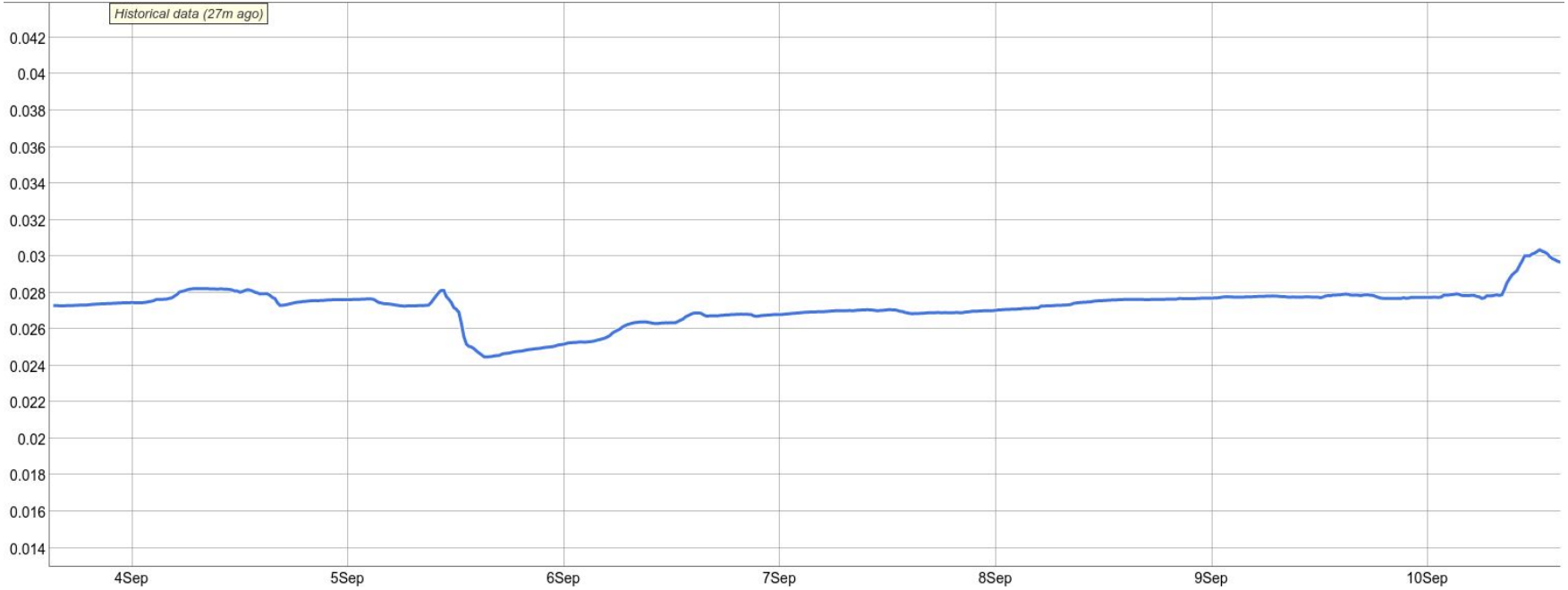
- Almost **70%** of ~400 services serving text/html **compatible without changes**
- **30%** need **whitelisting** of endpoints serving legitimate CORS / cross-site traffic



- Some policy violations across services due to browser bugs (mostly fixed)

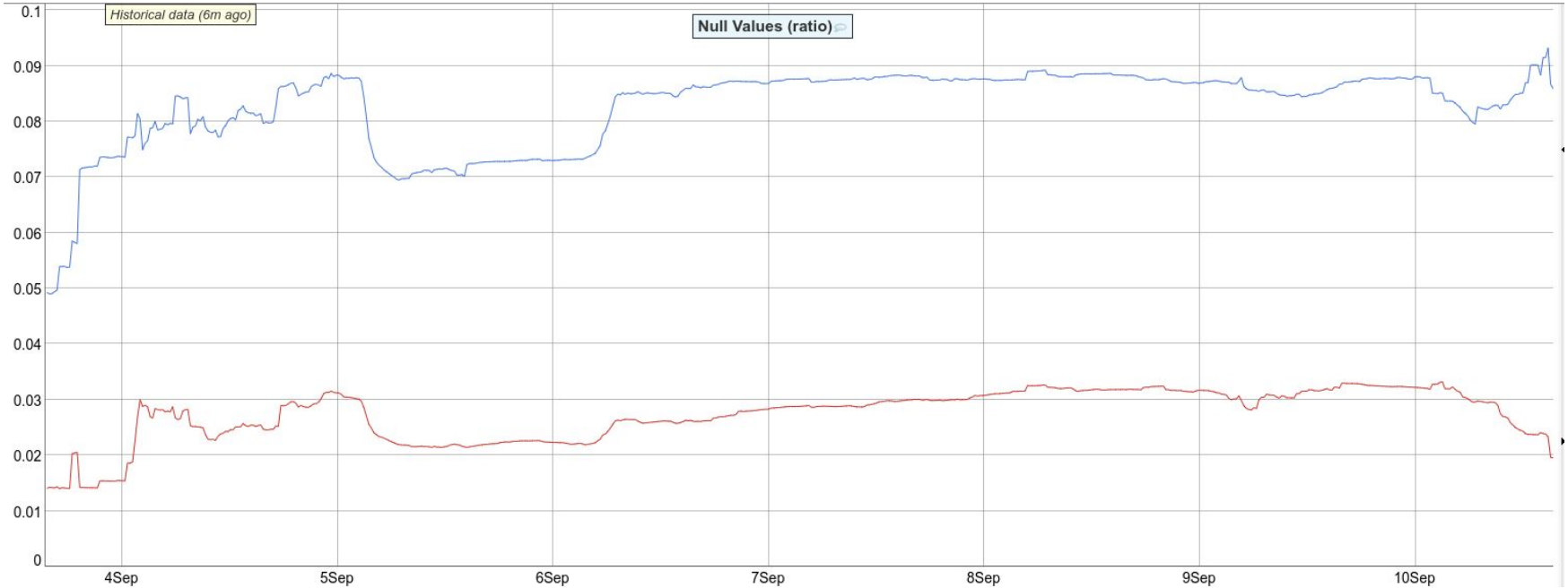
Resource Isolation – Pilot Results

Most valid cross-site endpoints whitelisted - violations occur for <3% of traffic



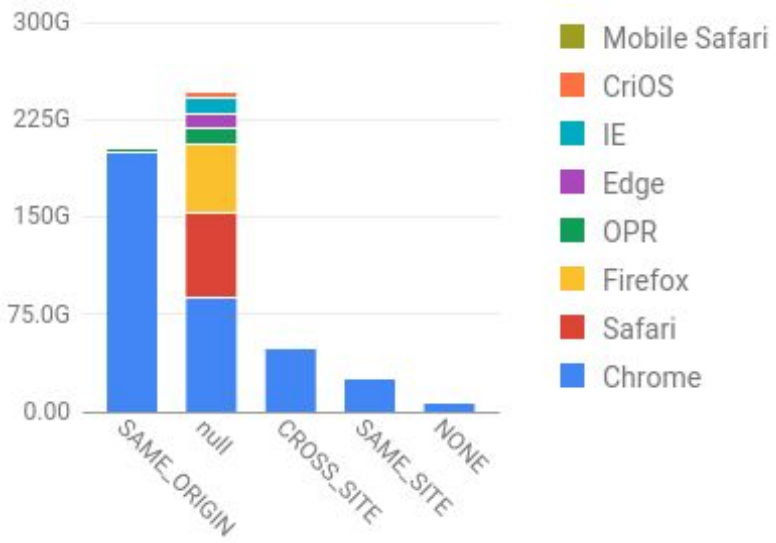
Resource Isolation - Pilot Results

Missing Sec-Fetch-[Site|Mode] headers can indicate browser bugs



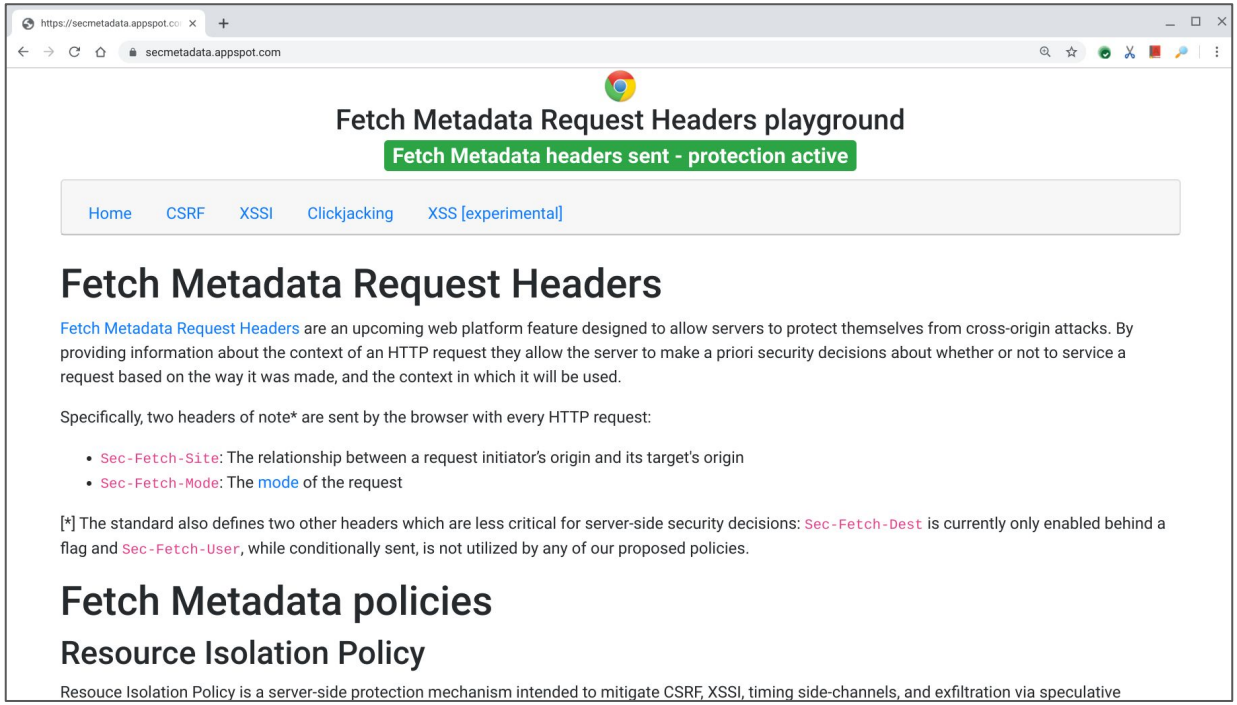
Next steps: what would be *awesome*?

- **Cross-browser support**
- Consistent / Complete implementation (Web Platform Tests)



Fetch Metadata - Playground

https://secmetadata.appspot.com



Fetch Metadata - Discussion

- Overlap with Sec-Same-Origin
- Resource Isolation can be used to deploy CORP
- `Vary` headers on Sec-Fetch-Site force separate cache for same-origin traffic