The security model of the Web

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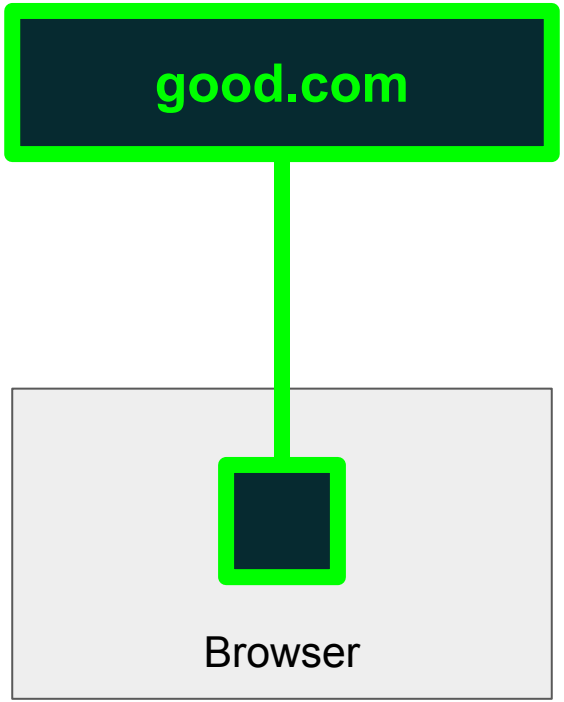
Attack models

Attack models

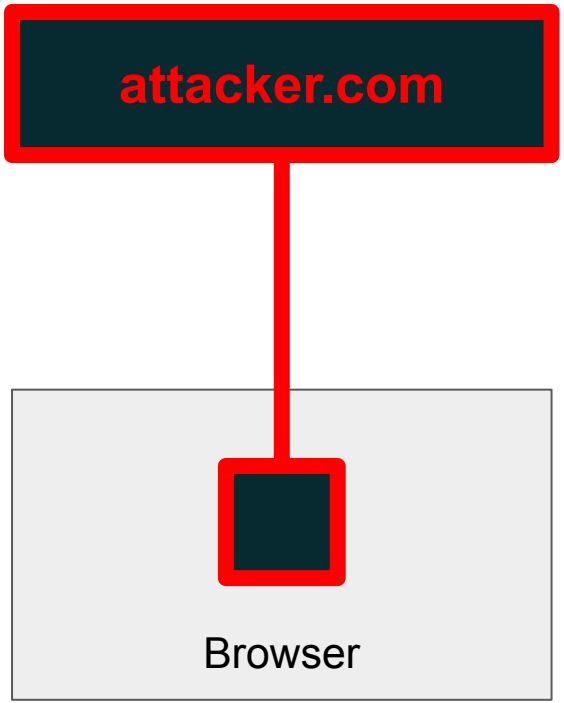
- Malicious server attacks the browser
- Server attacks other open web sites
- Malicious client attacks server
- Network attacks
- Web script injection attacks

Attack models: Ideal situation



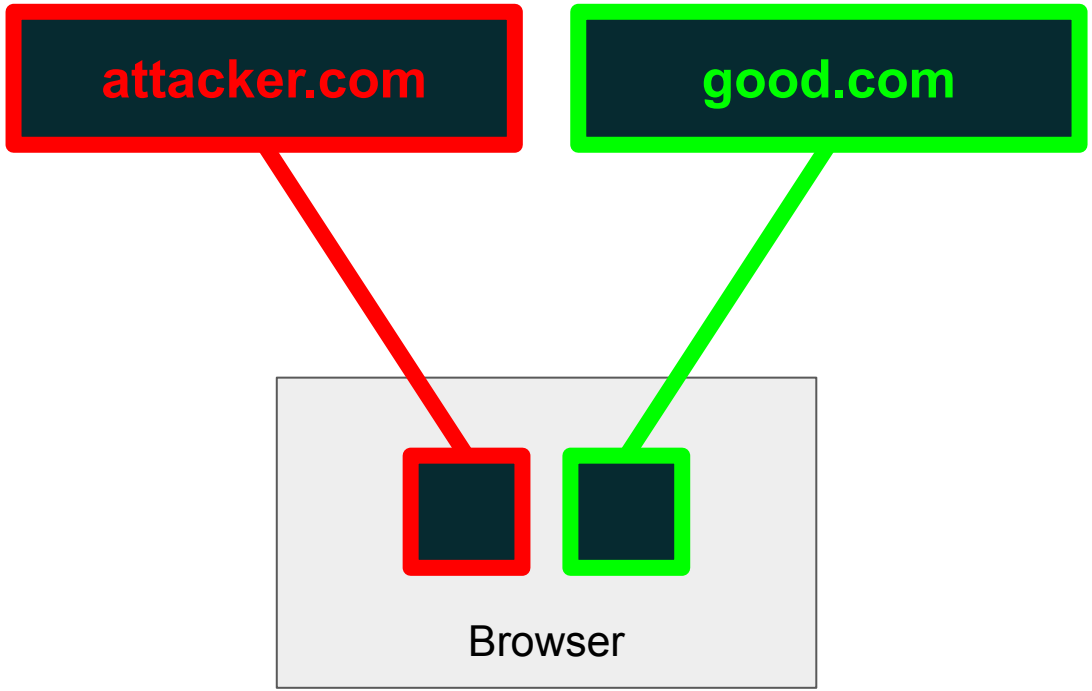
Attack models: Malicious server attacks the browser

- Example attack:
  - Drive by downloads
- Browser should protect the users local device from malicious web content
- Safe API design (no general-purpose only site-specific access)
  - File system API
  - Networking API
  - GUI API



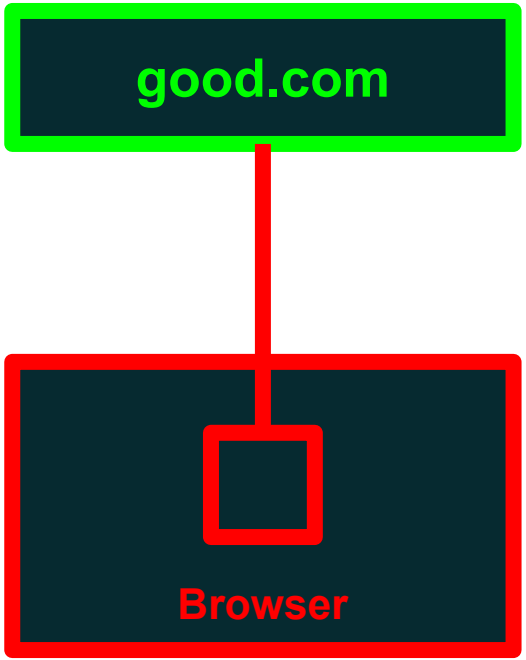
Attack models: Server attacks other open web sites

- Example attacks
  - CSRF
- Countermeasures
  - Same-origin policy



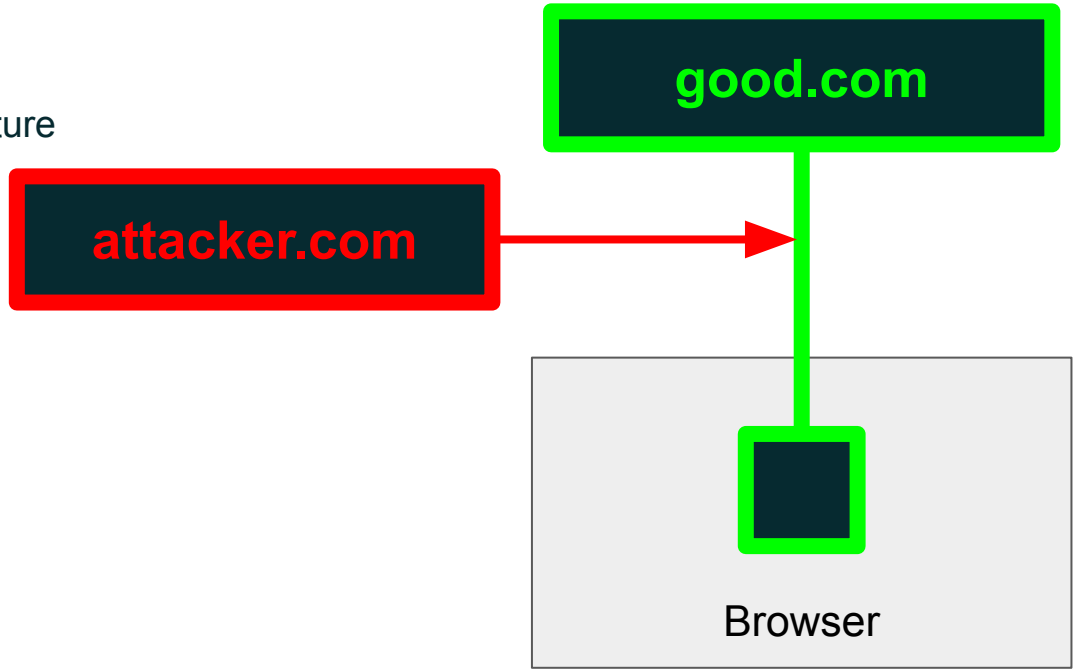
Attack models: Malicious client attacks server

- Example attacks:
  - SQL injection
  - Path injection
  - Command injections
- Countermeasures:
  - Access control
  - Defensive coding



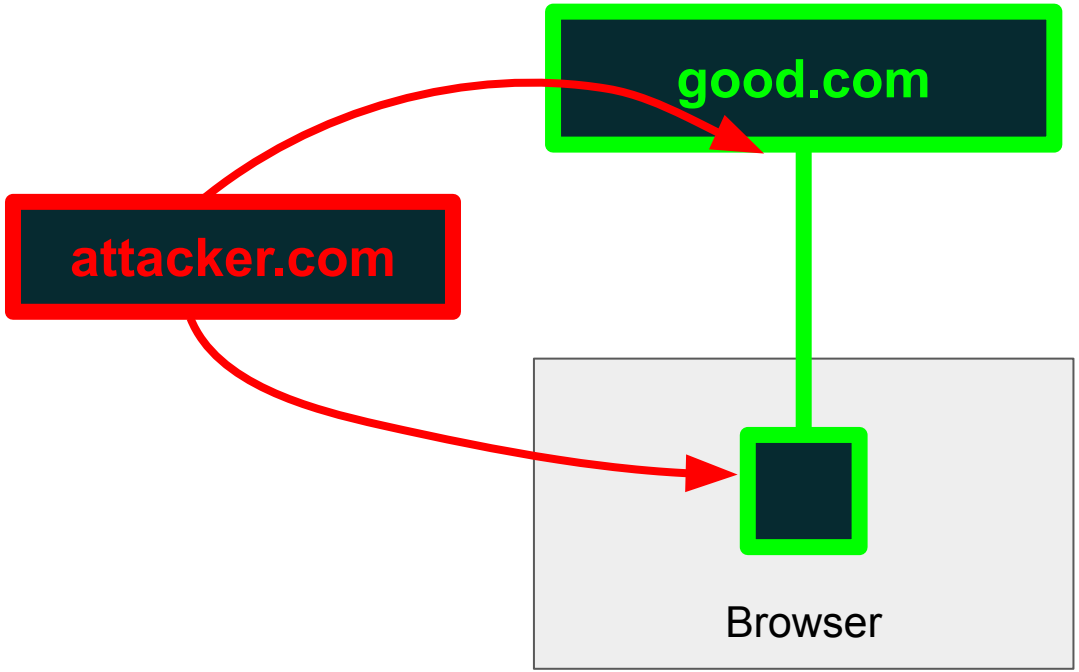
Attack models: Network attacks

- Example attacks:
  - SSL stripping
  - Attacks on public key infrastructure
- Countermeasures:
  - TLS/HTTPS



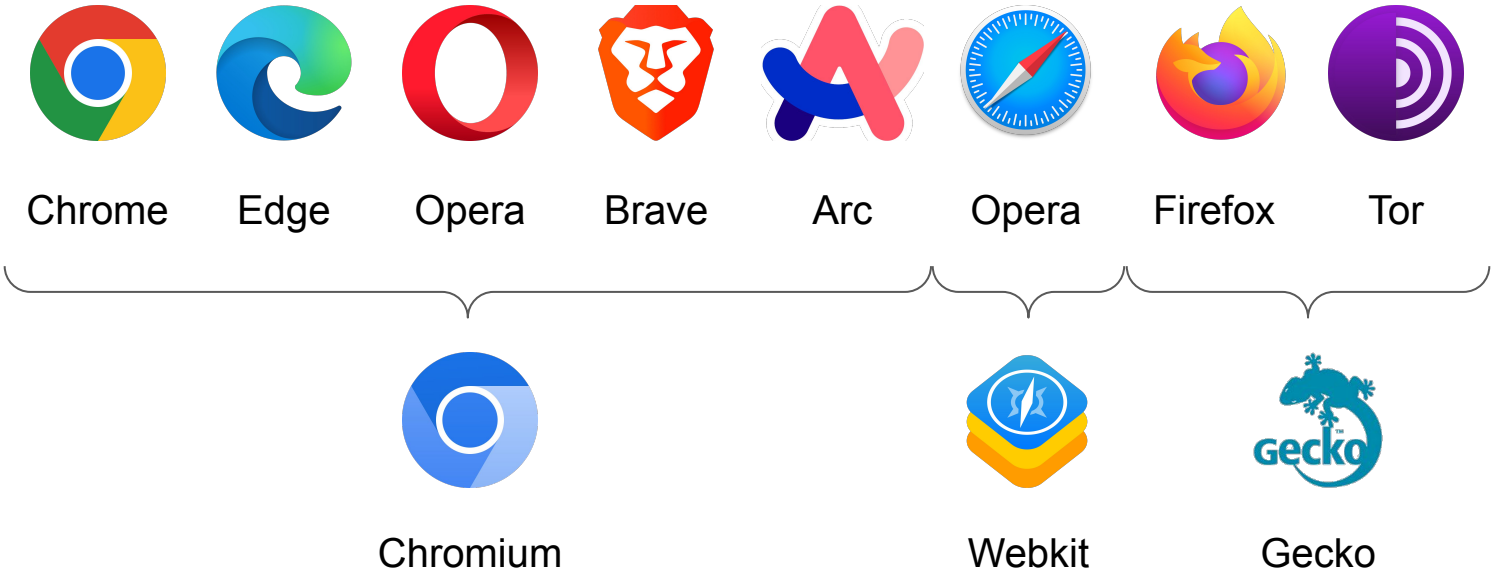
Attack models: Web script injection attacks

- Example attacks:
  - Inject a script: XSS
  - Distributing a malicious ad
  - Hacking a website that hosts a widely used script



Browser

Major browsers



https://dev.to/caffiendkitten/how-do-browser-make-websites-3709

https://developer.chrome.com/blog/inside-browser-part1/

https://www.lambdatest.com/blog/browser-engines-the-crux-of-cross-browser-compatibility/

The browser

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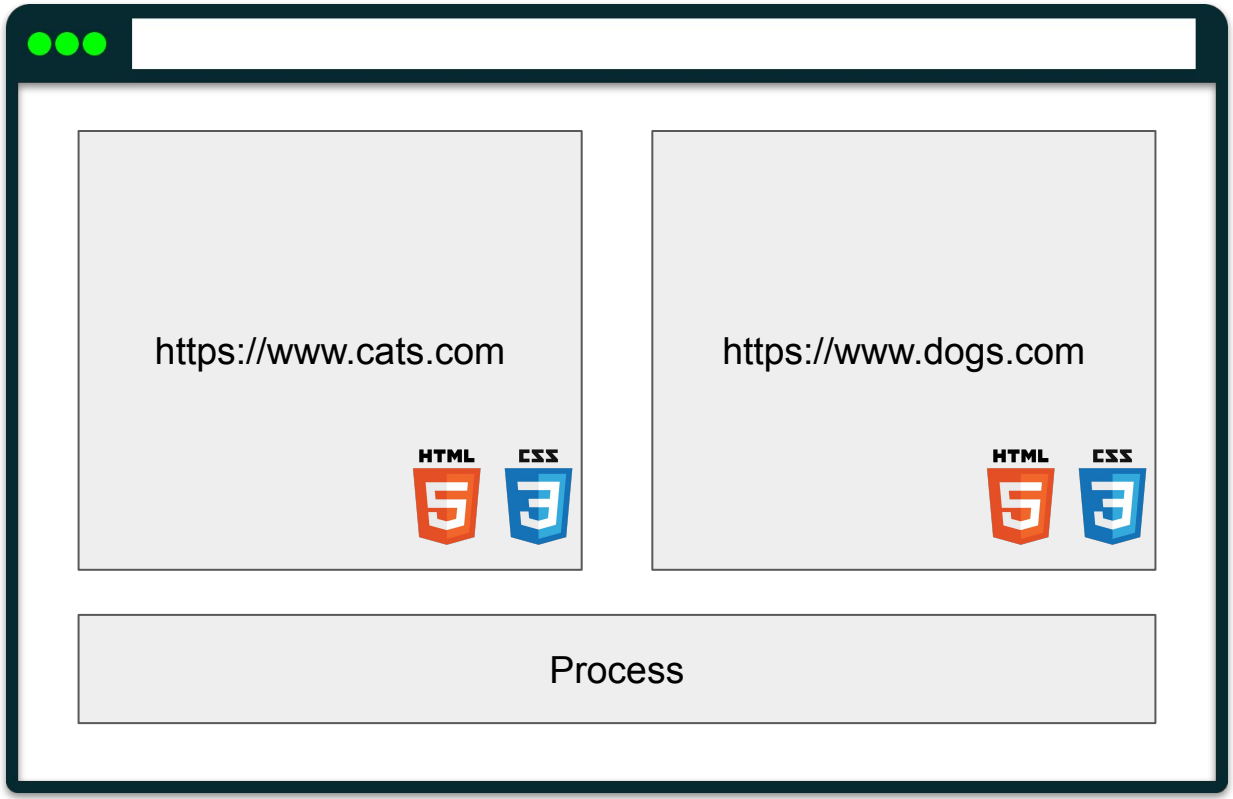
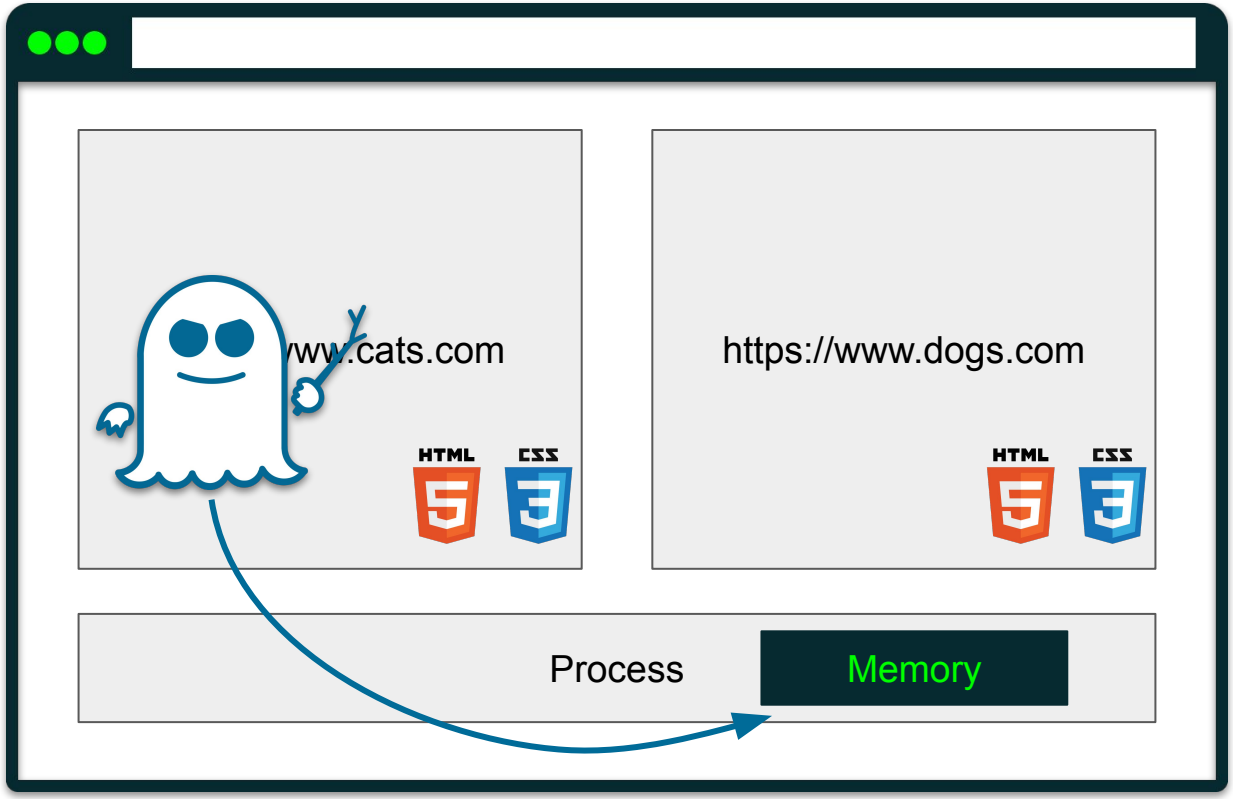
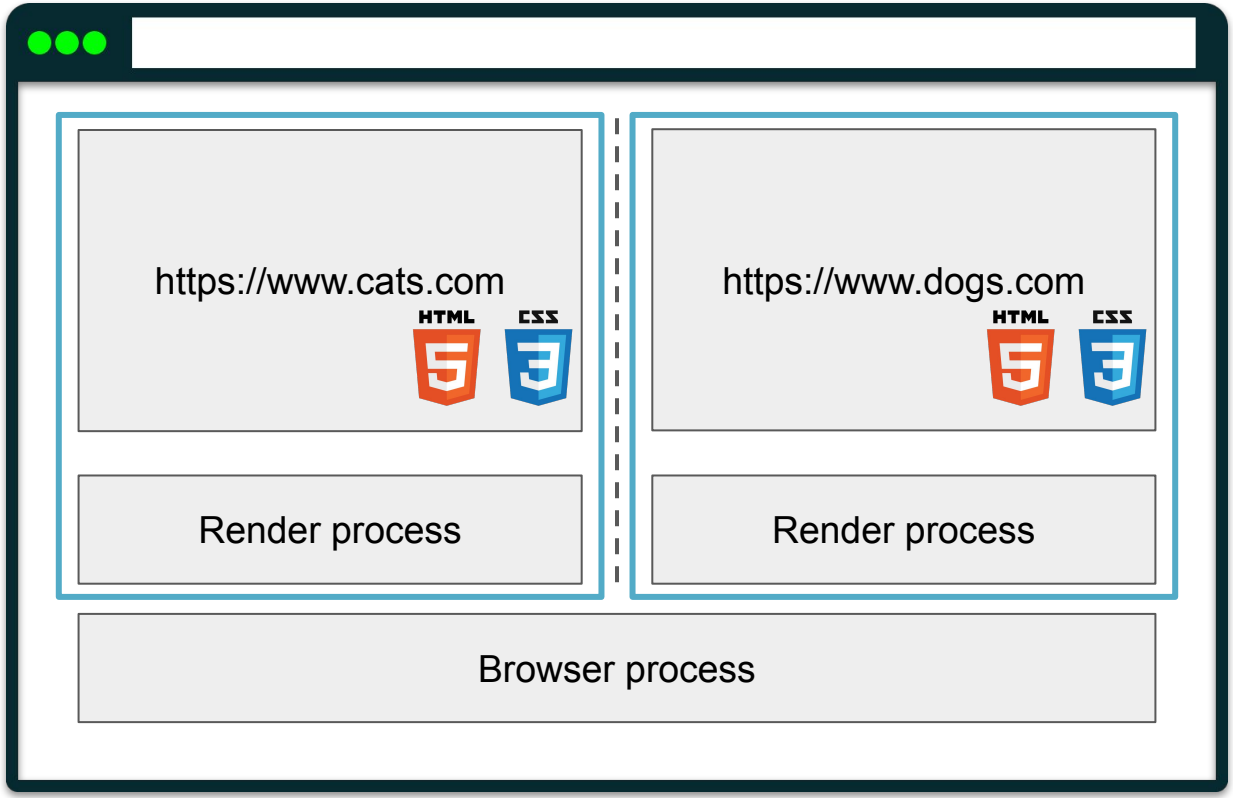

https://www.cats.com
HTML
CSS
https://www.dogs.com
HTML
CSS
Process

The browser

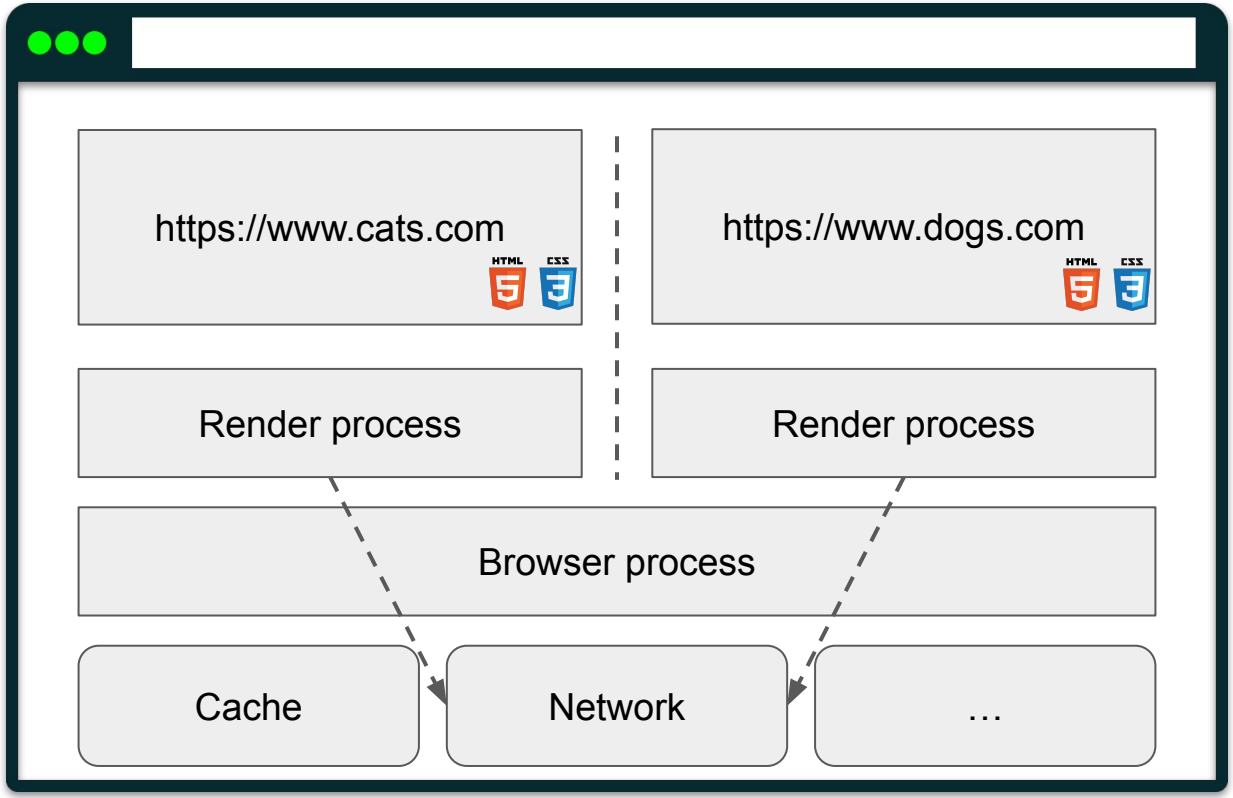

www.cats.com
HTML
CSS
https://www.dogs.com
HTML
CSS
Process
Memory

The browser

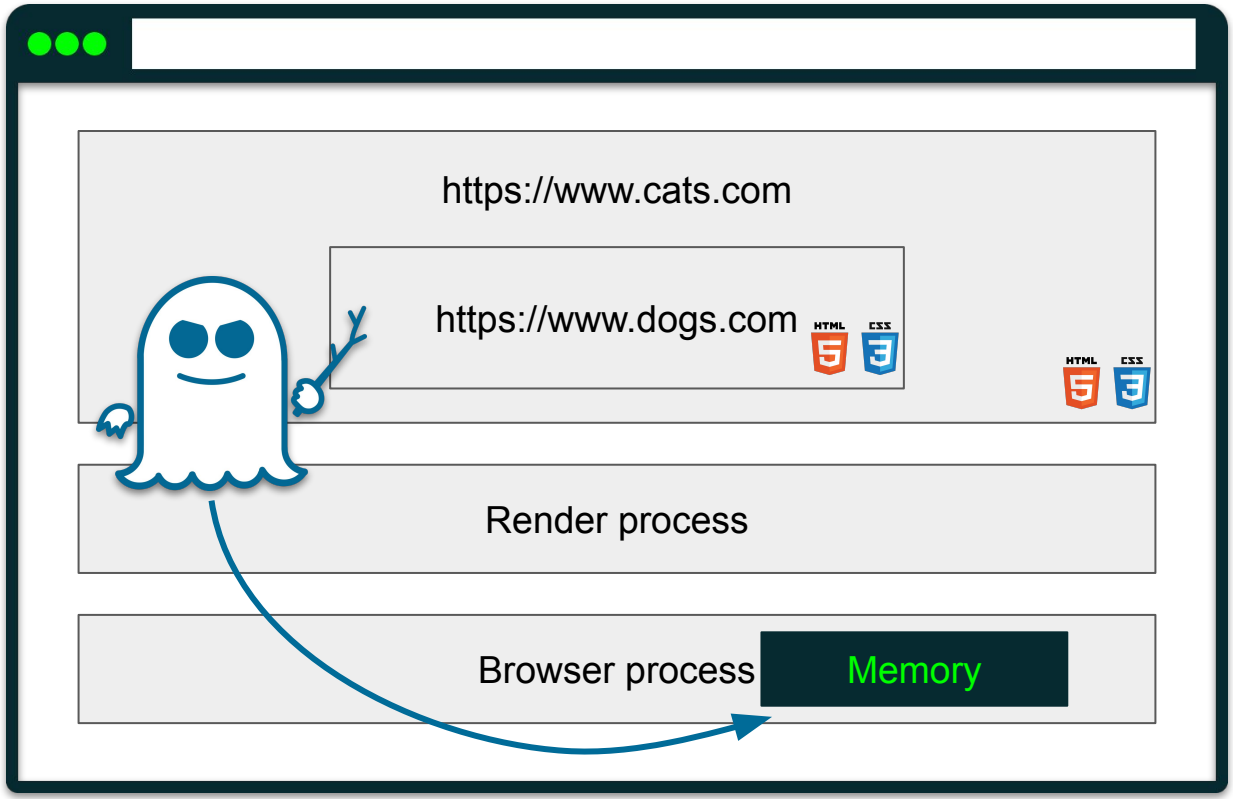


https://security.googleblog.com/2018/07/mitigating-spectre-with-site-isolation.html
https://www.chromium.org/Home/chromium-security/site-isolation/

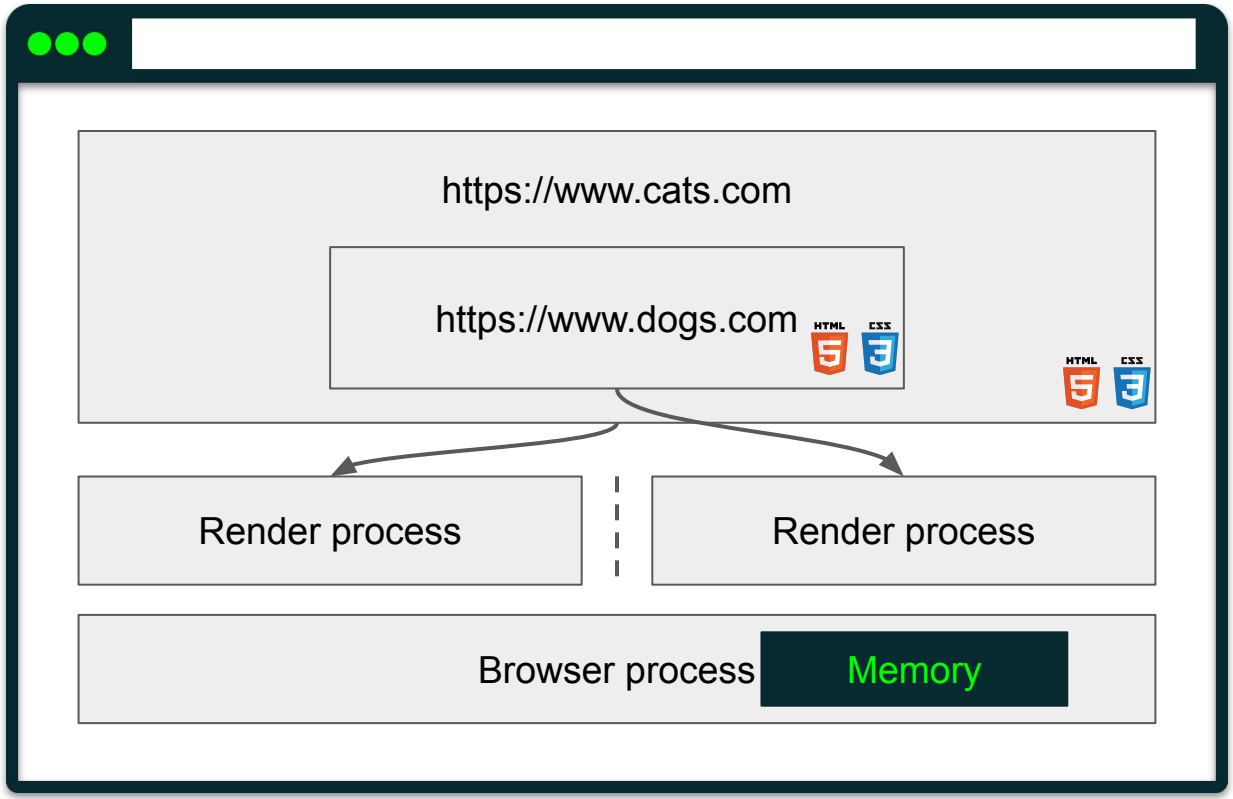
The browser


https://www.cats.com
https://www.dogs.com
Render process
Render process
Browser process
Cache
Network
…

The browser - iFrame



The browser - iFrame



The browser - Isolation

- CORB
- CORP
- SameSite cookie

Origin vs site

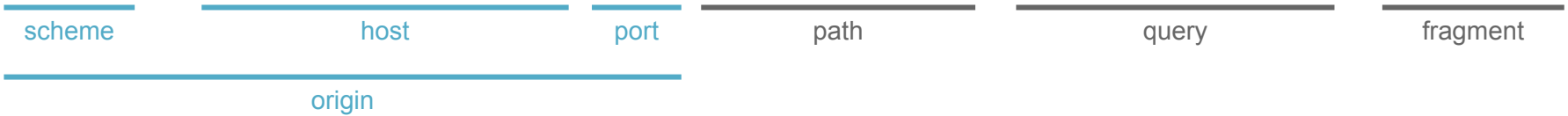
Definitions

https://www.euri.com:433/bootcamp?language=js#contact

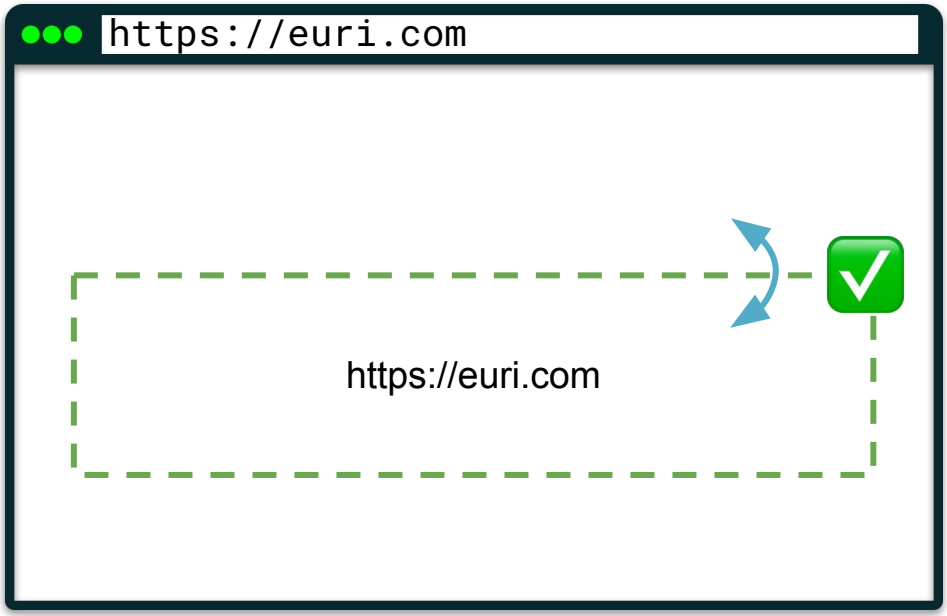
scheme | host | port | path | query | fragment

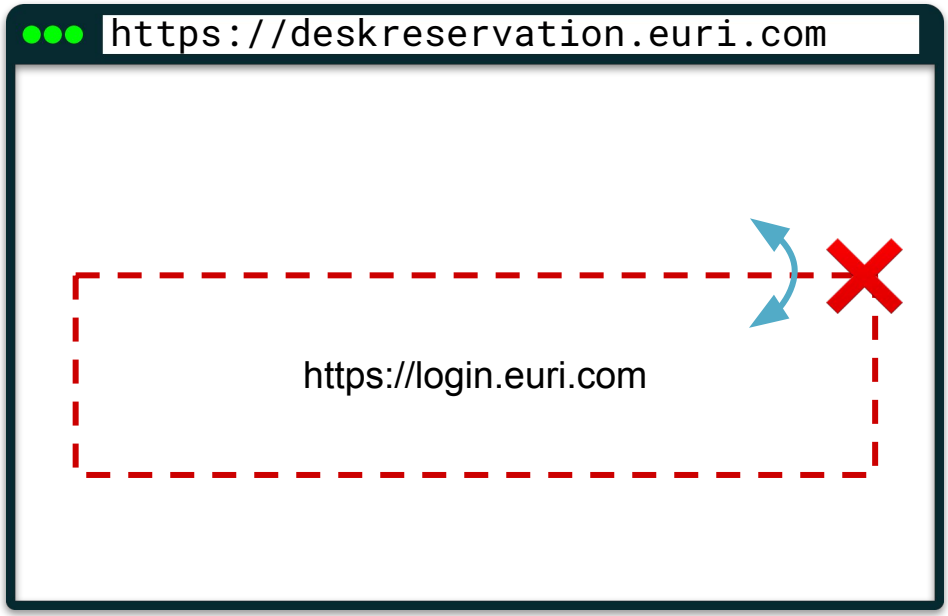
Origin

https://www.euri.com:433/bootcamp?language=js#contact



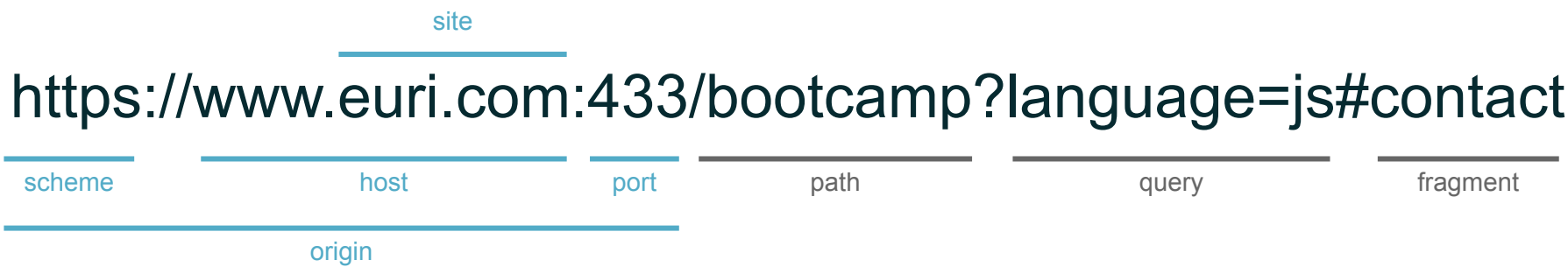
Same-origin policy





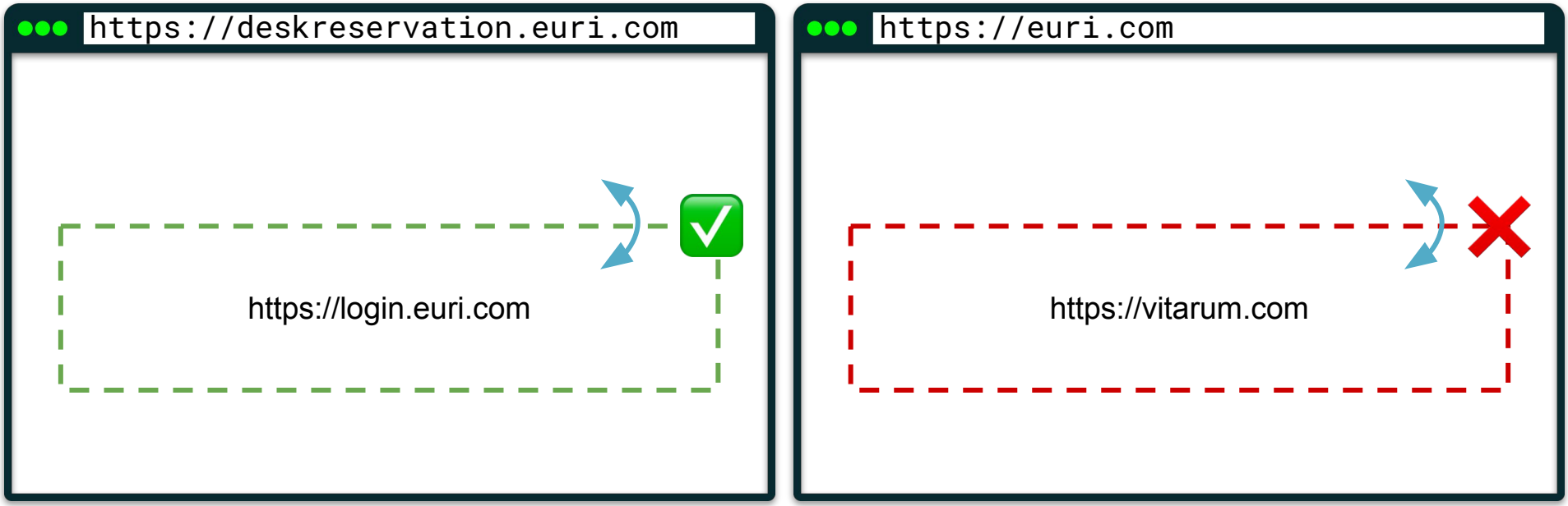
Site

- eTLD + 1
  - Example: euri.com, euri.co.uk
- Subdomains: cross origin but not cross site



https://developer.mozilla.org/en-US/docs/Glossary/eTLD

Same-site


https://deskreservation.euri.com
https://login.euri.com
https://euri.com
https://vitarum.com

Which are cross origin?

https://sec.euri.com/jobs

1. https://sec.euri.com/about
2. http://sec.euri.com/jobs
3. https://sec.euri.com:2800/jobs
4. https://app.euri.com/jobs

Which are cross site?

https://sec.euri.com/jobs

1. https://www.euri.com/jobs
2. https://app.euri.com
3. https://vitarum.com
4. https://app.sec.euri.com/jobs

Solutions

	Origin	Site
https://euri.com/jobs	(https, euri.com, 443)	euri.com
https://euri.com/about	(https, euri.com, 443)	euri.com
https://sec.euri.com	(https, sec.euri.com, 443)	euri.com
https://vitarum.com/jobs	(https, vitarum.com, 443)	viatrum.com

Key takeaways

Key takeaways

Browser isolation is important

Origins and sites are 2 different animals

Further reading

Chromium, **Site Isolation Design Document** (https://www.chromium.org/developers/design-documents/site-isolation/)

Google, **Google chrome the comic** (https://www.google.com/googlebooks/chrome/big_00.html)

Charles Reis, Alexander Moshchuk, and Nasko Oskov 2019, **Site Isolation: Process Separation for Web Sites within the Browser** (https://www.usenix.org/conference/usenixsecurity19/presentation/reis)