When Security Meets Compatibility

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Your challenge:

Motivate as many web servers as possible to
migrate to a new protocol version.

Eventually, remove client support for the old insecure version.

The sooner the better.

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Outreach

Documentation

Enlist CDNs and hosting providers

Browser UI

Security-sensitive breaking changes...

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  - Warning fatigue

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- Can be **urgent**
  - React to new attacks or vulnerabilities
- Can introduce **risk**
  - Warning fatigue
- Might be subject to a **lowest common denominator effect**
  - If users move to different browsers or platforms, they may not be protected

When security meets compatibility

The process of breaking the web

The science of outreach

Experimentation with implementation

When security meets compatibility

The process of breaking the web

> Assessing the damage

> Approval from the powers that be

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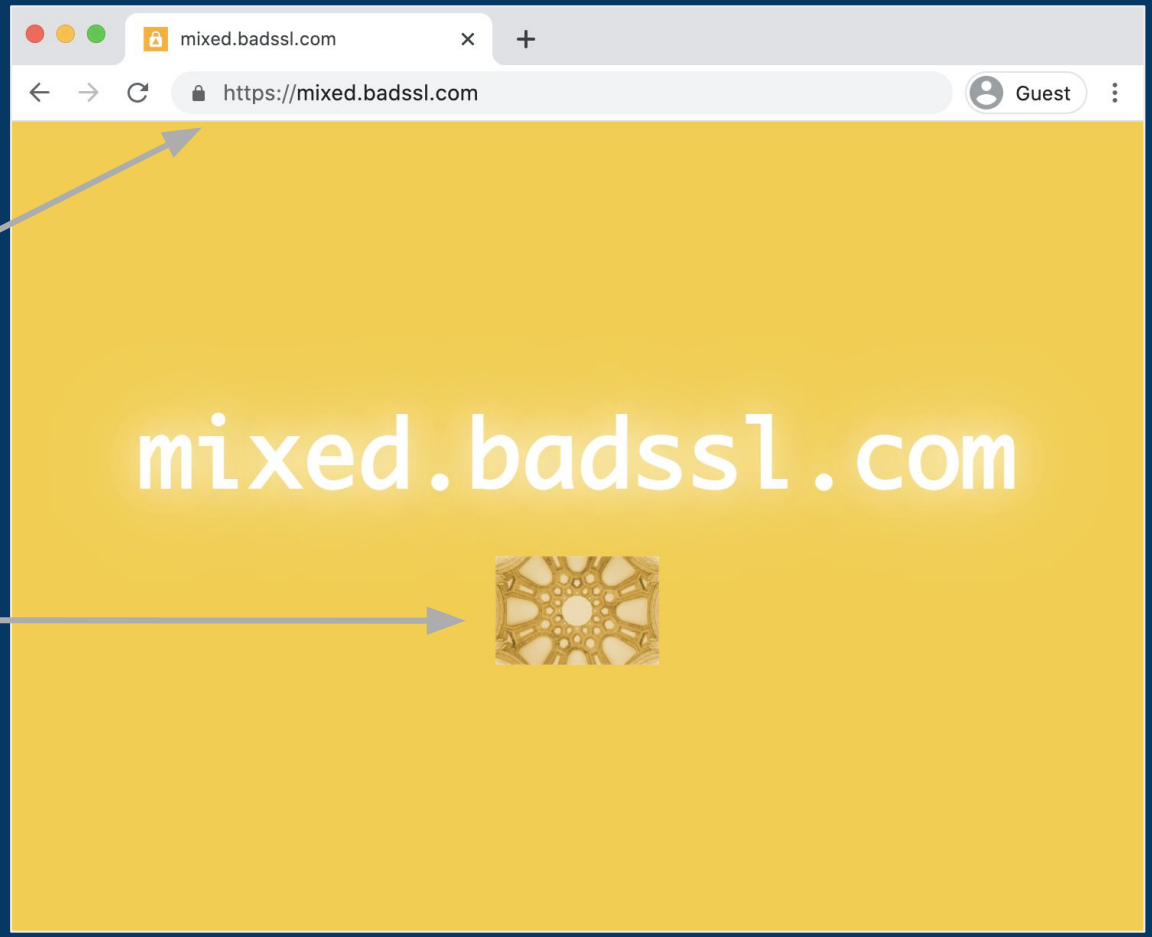
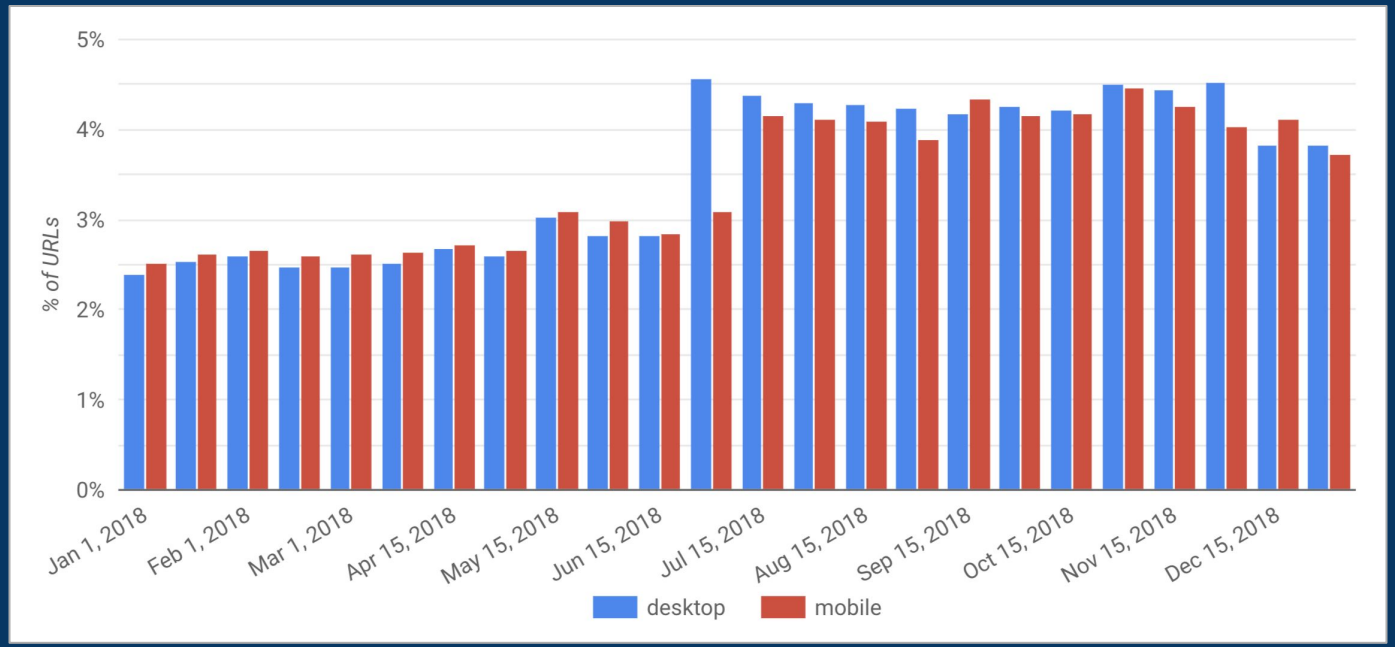
Measuring web incompatibility

“There are around 771 billion web pages viewed in Chrome every month (not counting other Chromium-based browsers). So seriously breaking even 0.0001% still results in someone being frustrated every 3 seconds.”

- “Blink Principles of Web Compatibility”



Mixed content



% of HTTP Archive URLs with mixed images in 2018

https://chromestatus.com/metrics/feature/timeline/popularity/614

Too common to block outright => autoupgrade to HTTPS instead

Measuring HTTPS autoupgrading

How much does it decrease breakage compared to blocking outright?

We have to actually roll it out to know.

Measuring HTTPS autoupgrading

Are http:// and https:// the same resource?

Analyze crawled resources to gain confidence.

Measuring HTTPS autoupgrading

Does a particular broken resource actually “count”?

Who knows?!

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Intent to Remove: <feature name>

Body:

Primary eng (and PM) emails
@chromium.org preferred over @google.com

Summary
Give a high-level description of your change.

Motivation
Explain why this feature should be removed.

Interoperability and Compatibility Risk
Describe the degree of interoperability and compatibility risk. For a feature that is also supported in some other engine, do they support eventual removal?

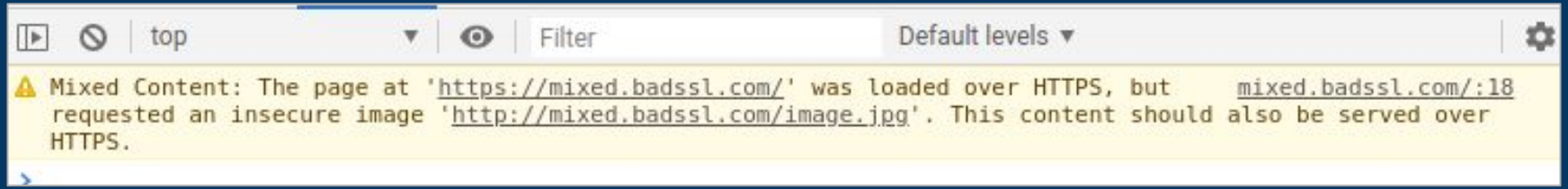
Edge: Supported/not supported, positive/neutral/negative to removal
Firefox: Supported/not supported, positive/neutral/negative to removal
Safari: Supported/not supported, positive/neutral/negative to removal

Please include links where possible.

Alternative implementation suggestion for web developers
If this feature goes away, what other techniques can developers use to achieve the same effects?

Usage information from UseCounter
How much of the web are you going to break? How seriously will the removal break sites?
If possible, please link to usage details on chromestatus.com/metrics (example link)
If you haven't instrumented this feature yet, say so.

Entry on the feature dashboard
The feature dashboard is used to keep track of web-facing changes in Blink (and V8) that matter to developers. Make sure your change has an entry if you think it merits outreach to developers (e.g inclusion in the Chromium Blog Beta posts). If there's no entry, please explain why you think this change doesn't need one (e.g. "small change", "fits under an existing entry"). You may be asked to create one.


top
Filter
Default levels
Mixed Content: The page at 'https://mixed.badssl.com/' was loaded over HTTPS, but requested an insecure image 'http://mixed.badssl.com/image.jpg'. This content should also be served over HTTPS.
mixed.badssl.com/:18

Incompatible changes are feasible, if they’re carefully measured and considered.

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“Make Notifications Great Again: Learning How to Notify in the Age of Large-Scale Vulnerability Scanning” Cetin et al.

“You’ve Got Vulnerability: Exploring Effective Vulnerability Notifications” Li et al.

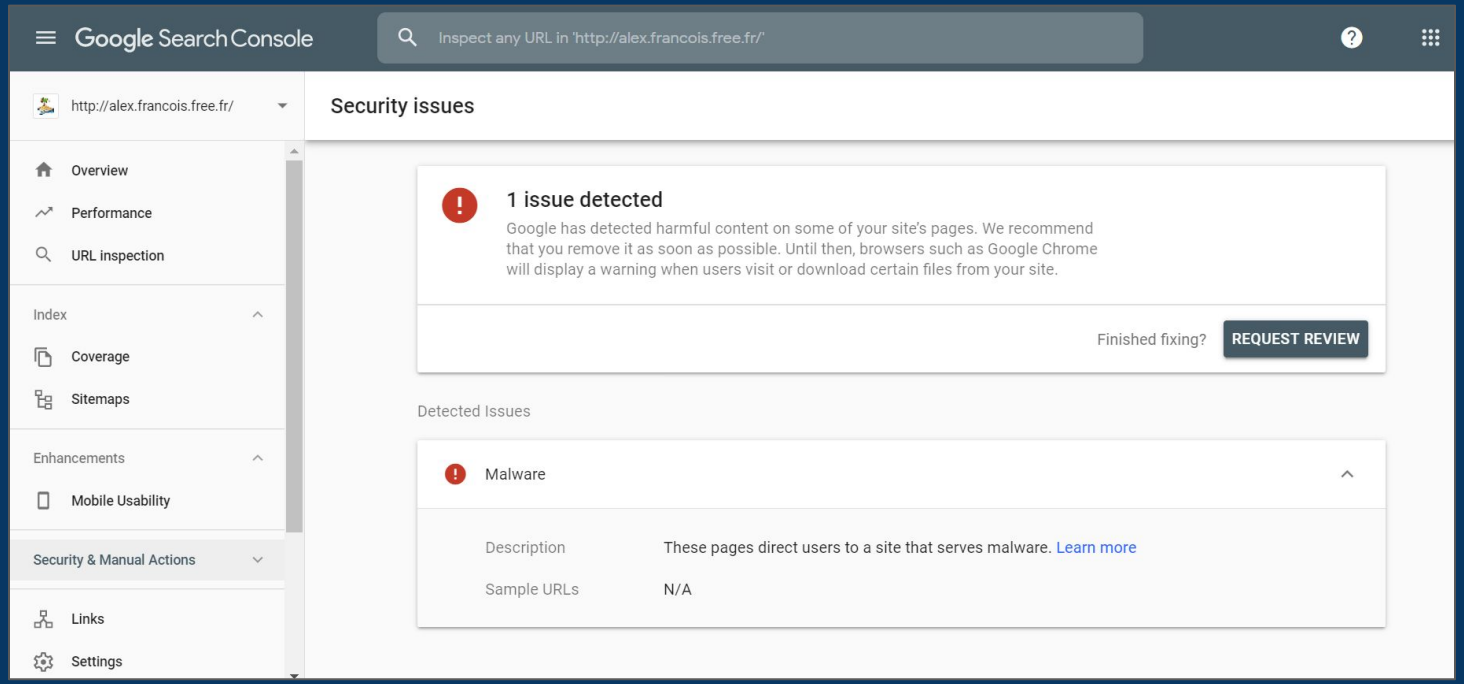
“Remedying Web Hijacking: Notification Effectiveness and Webmaster Comprehension” Li et al.

“Didn’t You Hear Me? Towards More Successful Web Vulnerability Notifications” Stock et al.

“Hey, You Have a Problem: On the Feasibility of Large-Scale Web Vulnerability Notification” Stock et al.

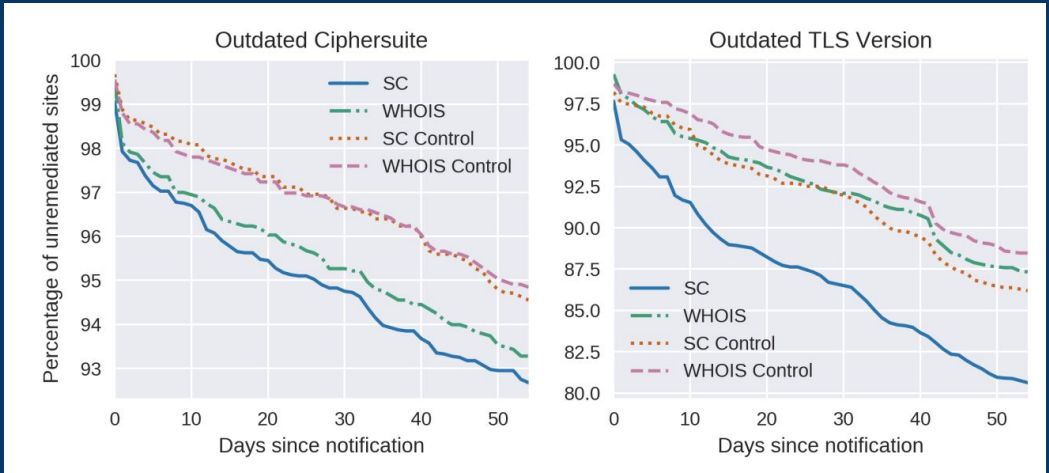
“Do Malware Reports Expedite Cleanup? An Experimental Study” Vasek et al.

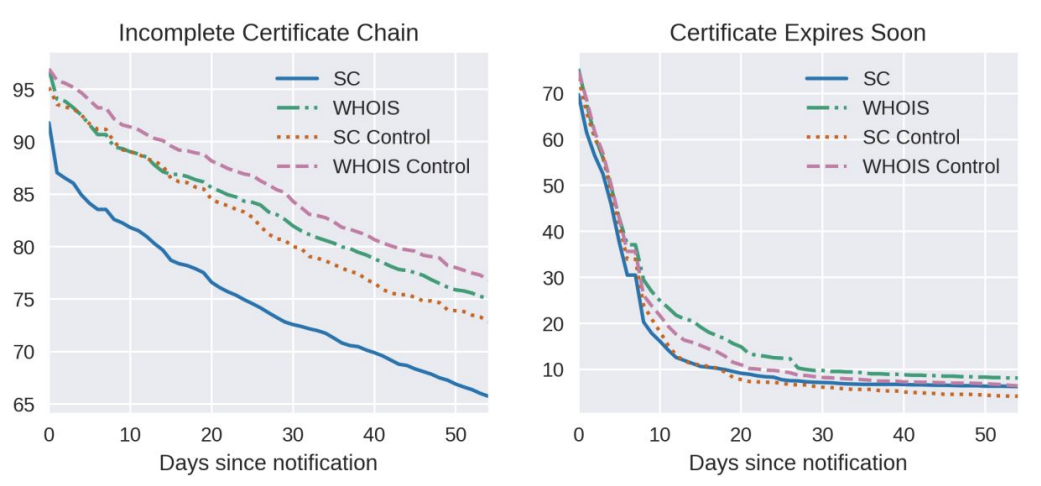
“The Matter of Heartbleed” Durumeric et al.



vs.

WHOIS emails





Down and to the right faster is better

Google Security Blog

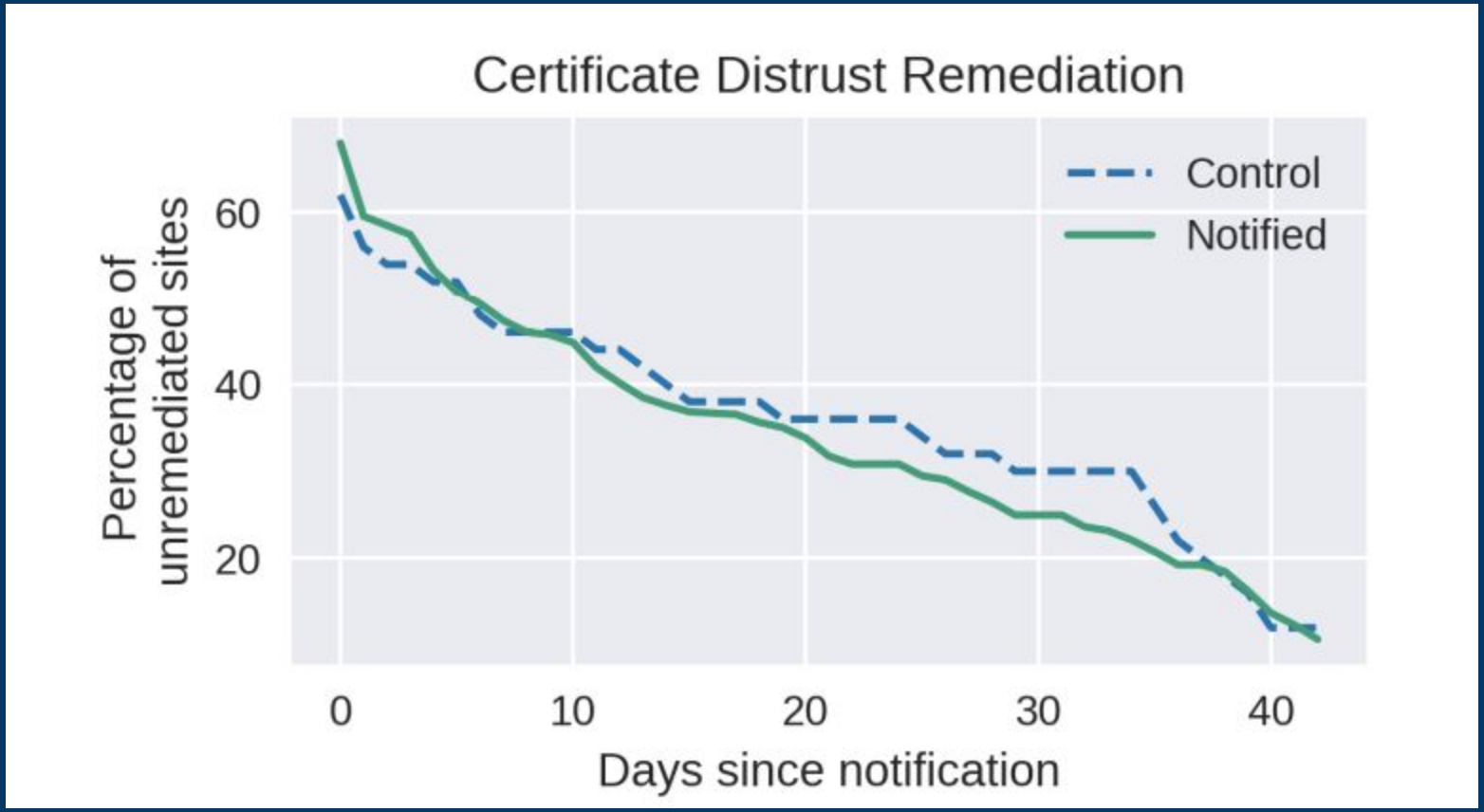
The latest news and insights from Google on security and safety on the Internet

Distrust of the Symantec PKI: Immediate action needed by site operators

March 7, 2018

Posted by Devon O'Brien, Ryan Sleevi, Emily Stark, Chrome security team

***Update October 17, 2018**: Chrome 70 has now been released to the Stable Channel, and users will start to see full screen interstitials on sites which still use certificates issues by the Legacy Symantec PKI. Initially this change will reach a small percentage of users, and then slowly scale up to 100% over the next several weeks.*


Certificate Distrust Remediation
Control
Notified
Percentage of unremediated sites
60
40
20
0
10
20
30
40
Days since notification

Targeted outreach isn’t a standalone strategy for motivating server operators to remediate security risks.

Fixing HTTPS Misconfigurations at Scale: An Experiment with Security Notifications.

Eric Zeng, Frank Li, Emily Stark, Adrienne Porter Felt, Parisa Tabriz

Workshop on the Economics of Information Security (WEIS), 2019.

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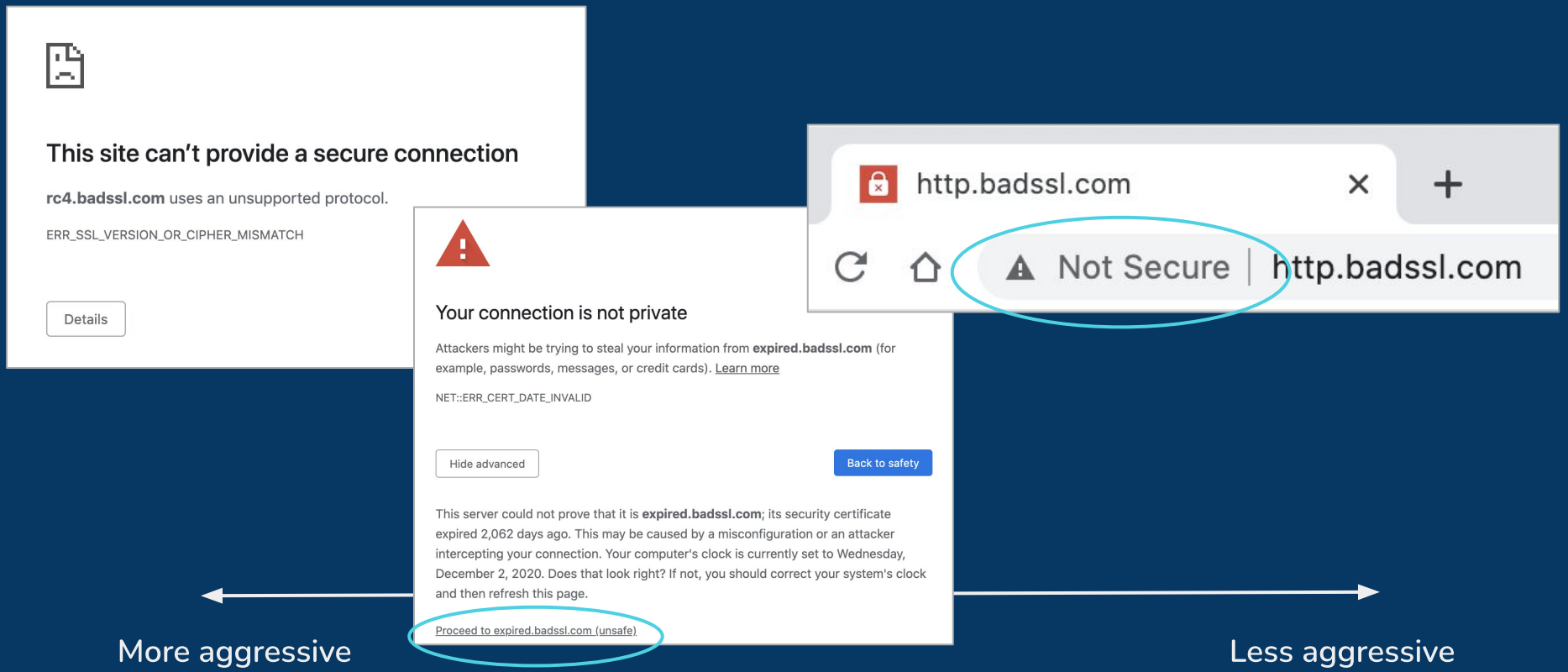

This site can't provide a secure connection
rc4.badssl.com uses an unsupported protocol.
ERR_SSL_VERSION_OR_CIPHER_MISMATCH
Details
Your connection is not private
Attackers might be trying to steal your information from expired.badssl.com (for example, passwords, messages, or credit cards). Learn more
NET::ERR_CERT_DATE_INVALID
Hide advanced
Back to safety
This server could not prove that it is expired.badssl.com; its security certificate expired 2,062 days ago. This may be caused by a misconfiguration or an attacker intercepting your connection. Your computer's clock is currently set to Wednesday, December 2, 2020. Does that look right? If not, you should correct your system's clock and then refresh this page.
Proceed to expired.badssl.com (unsafe)
http.badssl.com
Not Secure
http.badssl.com
More aggressive
Less aggressive

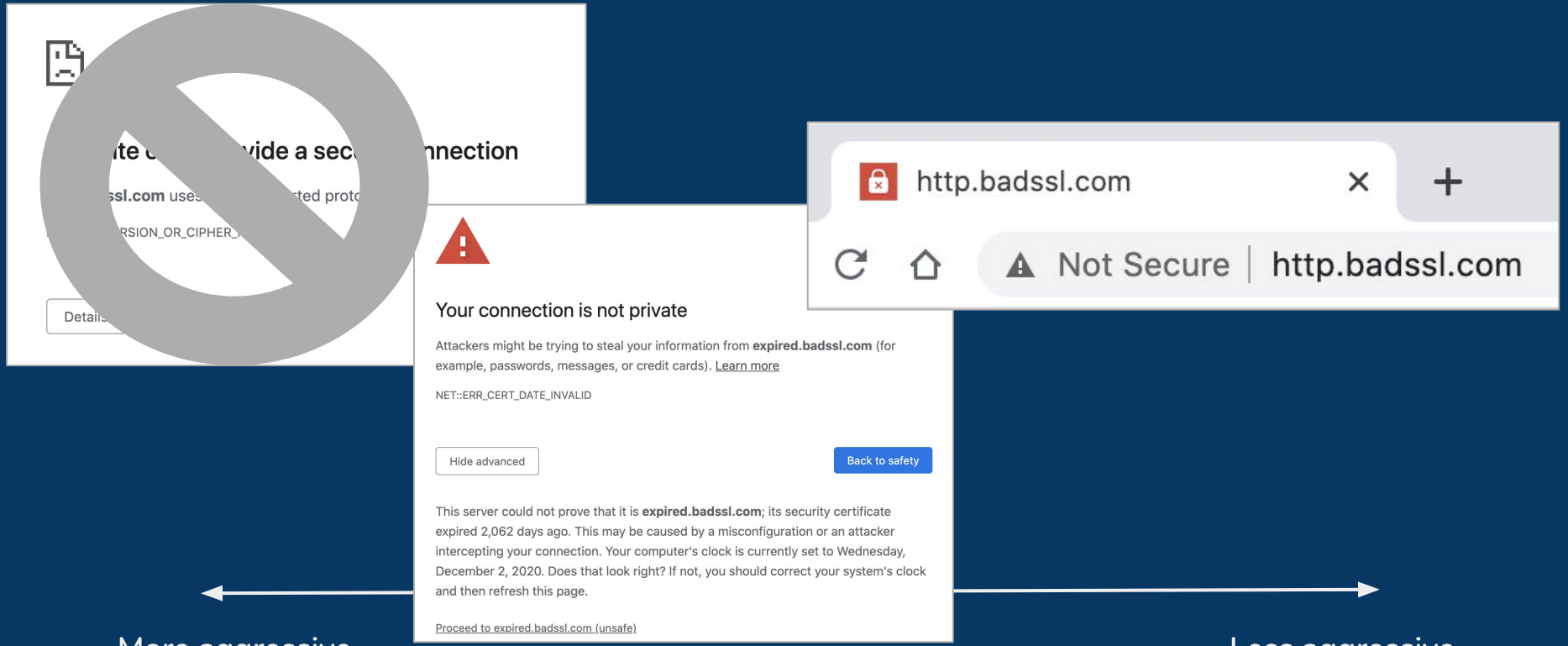
Choosing a deprecation UI

What types of sites affected

How often the warning appears

Risk to user

How quickly servers will remediate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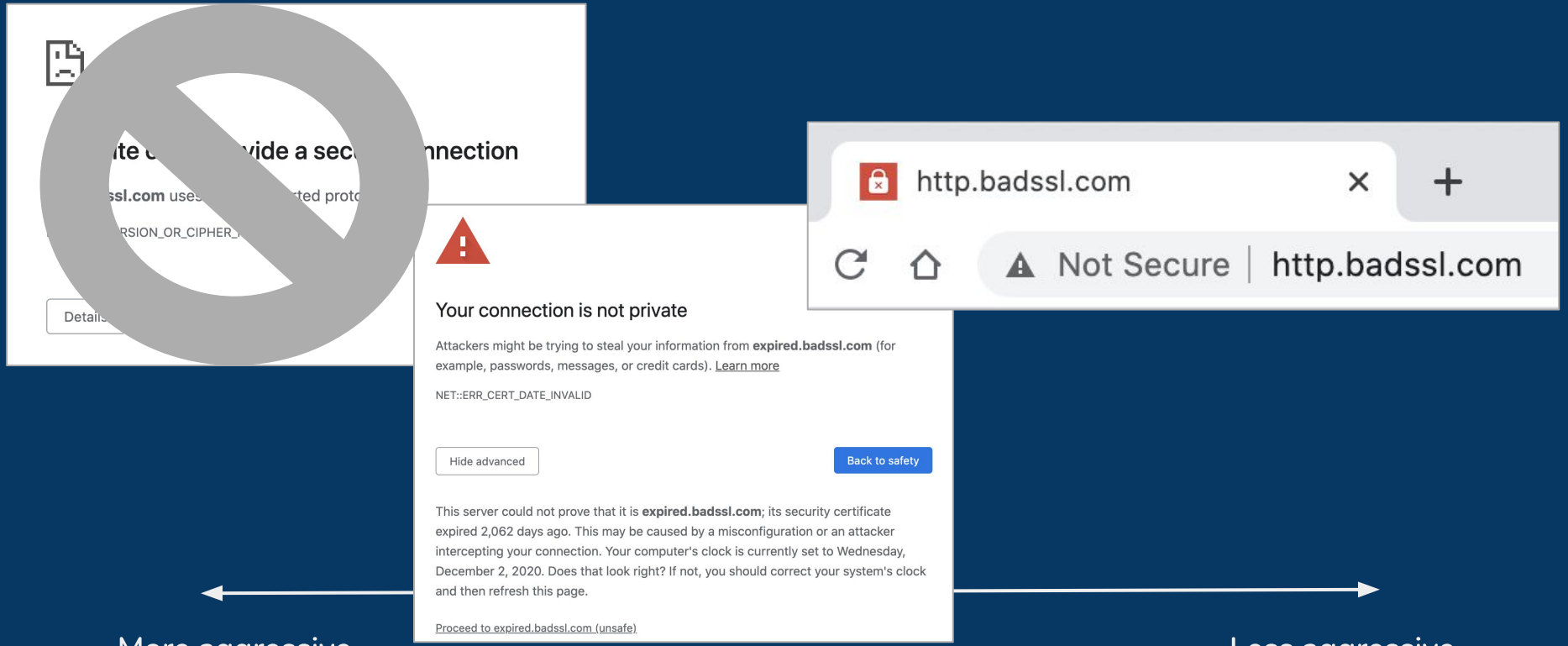
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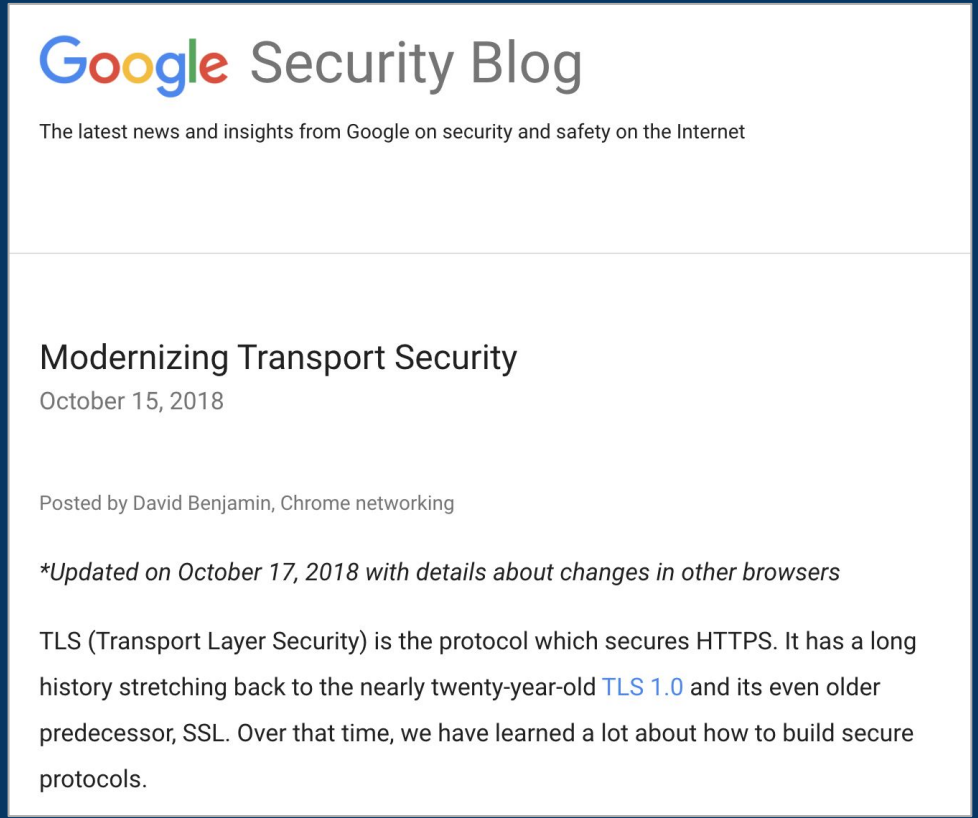
Proceed to expired.badssl.com (unsafe)
More aggressive
Less aggressive
Faster remediation
Less warning fatigue

“TLS 1.0 and 1.1 will be disabled altogether in Chrome 81”



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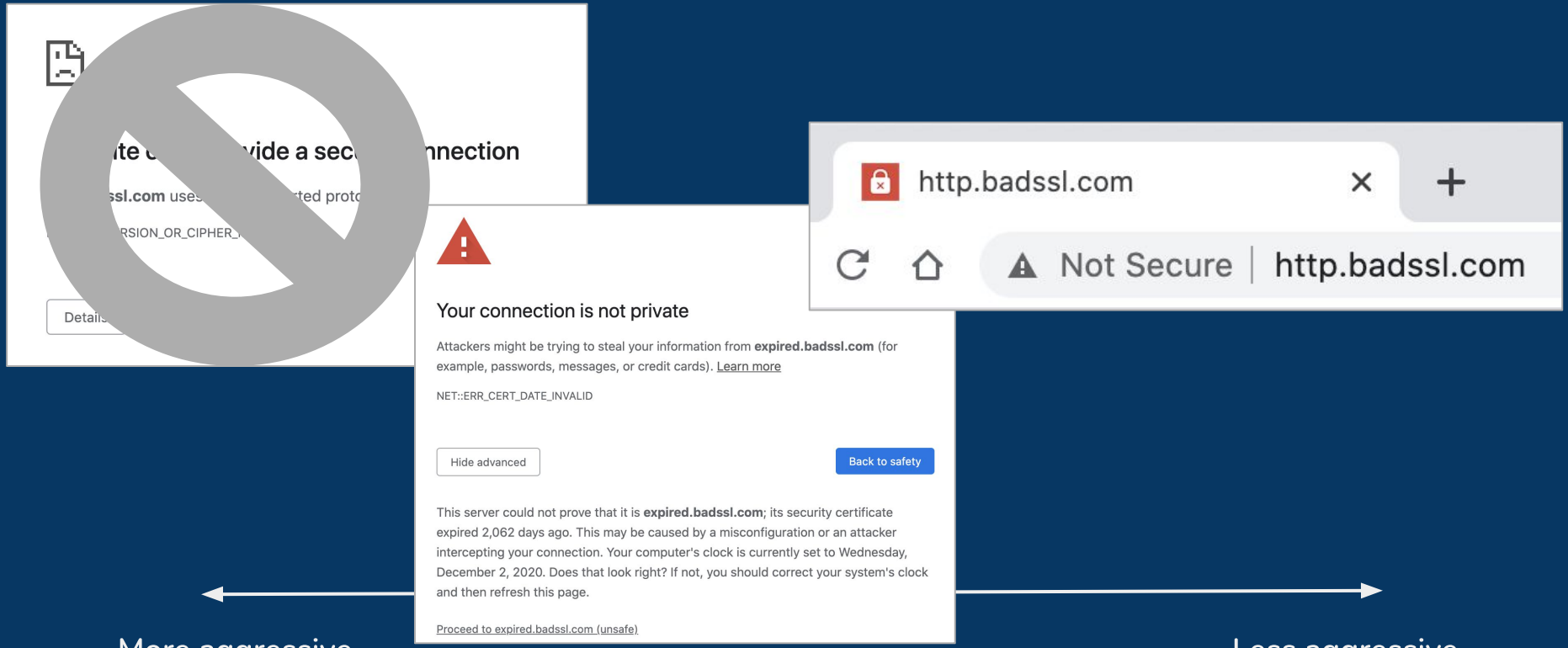
Modernizing Transport Security

October 15, 2018

Posted by David Benjamin, Chrome networking

**Updated on October 17, 2018 with details about changes in other browsers*

TLS (Transport Layer Security) is the protocol which secures HTTPS. It has a long history stretching back to the nearly twenty-year-old TLS 1.0 and its even older predecessor, SSL. Over that time, we have learned a lot about how to build secure protocols.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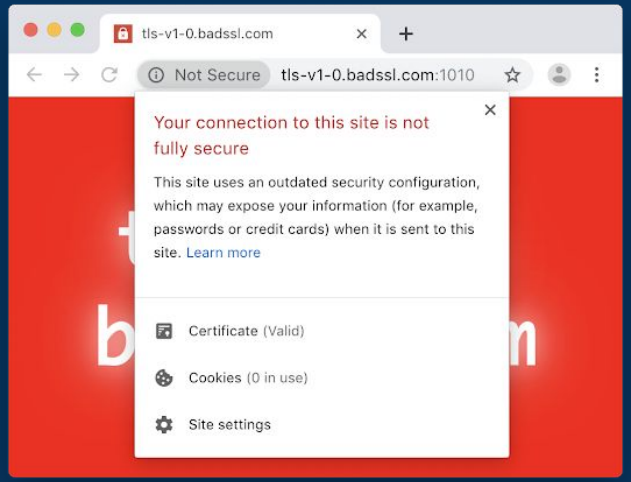
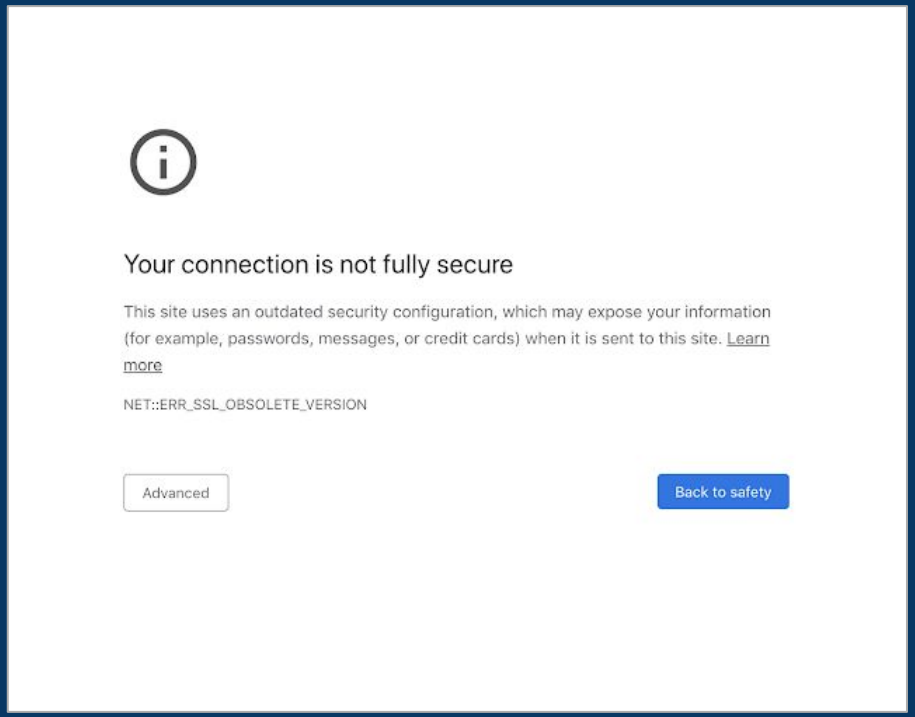
More aggressive
Less aggressive
Faster remediation
How much?
Less warning fatigue

Phase 1



Phase 2

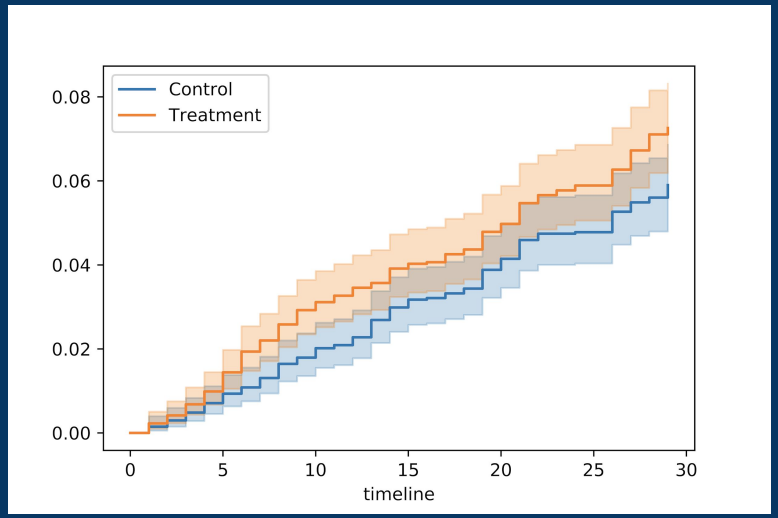


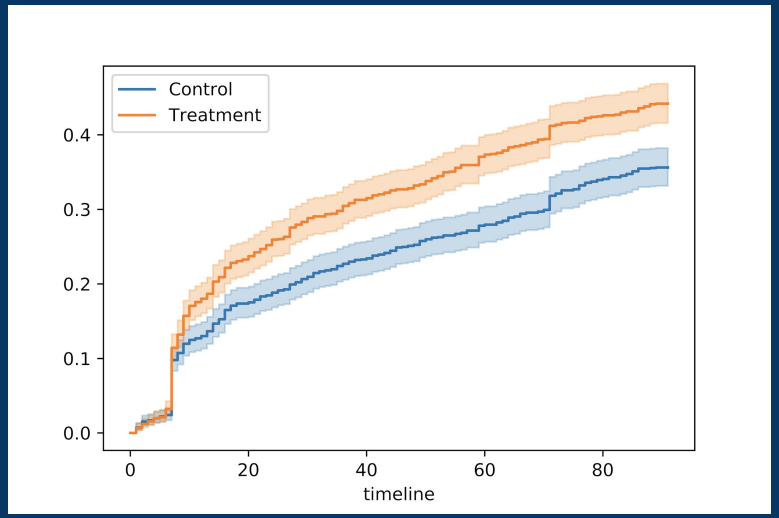
Warning UIs suppressed for control sites

Phase 1

Phase 2

Fraction of sites that have upgraded to modern TLS





Days since warning UI launched

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Incompatible changes are possible.

Security-motivated deprecations are an active research area.

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