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**Deprecate modification of 'secure' cookies from non-secure origins  
draft-west-leave-secure-cookies-alone-04**

Abstract

This document updates [RFC6265](#) by removing the ability for a non-secure origin to set cookies with a 'secure' flag, and to overwrite cookies whose 'secure' flag is set. This deprecation improves the isolation between HTTP and HTTPS origins, and reduces the risk of malicious interference.

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## [1.](#) Introduction

[Section 8.5](#) and [Section 8.6 of \[RFC6265\]](#) spell out some of the drawbacks of cookies' implementation: due to historical accident, non-secure origins can set cookies which will be delivered to secure origins in a manner indistinguishable from cookies set by that origin itself. This enables a number of attacks, which have been recently spelled out in some detail in [\[COOKIE-INTEGRITY\]](#).

We can mitigate the risk of these attacks by making it more difficult for non-secure origins to influence the state of secure origins. Accordingly, this document recommends the deprecation and removal of non-secure origins' ability to write cookies with a 'secure' flag, and their ability to overwrite cookies whose 'secure' flag is set.

## [2.](#) Terminology and notation

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [\[RFC2119\]](#).

The "scheme" component of a URI is defined in [Section 3 of \[RFC3986\]](#).

## [3.](#) Recommendations

This document updates [Section 5.3 of \[RFC6265\]](#) as follows:

1. After step 8 of the current algorithm, which sets the cookie's "secure-only-flag", execute the following step:
  1. If the "scheme" component of the "request-uri" does not denote a "secure" protocol (as defined by the user agent),

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and the cookie's "secure-only-flag" is "true", then abort these steps and ignore the newly created cookie entirely.

2. Before step 11, execute the following step:

1. If the newly created cookie's "secure-only-flag" is not set, and the "scheme" component of the "request-uri" does not denote a "secure" protocol, then abort these steps and ignore the newly created cookie entirely if the cookie store contains one or more cookies that meet all of the following criteria:

1. Their "name" matches the "name" of the newly created cookie.
2. Their "secure-only-flag" is set.
3. Their "domain" domain-matches the "domain" of the newly created cookie, or vice-versa.

Note: This comparison intentionally ignores the "path" component. The intent is to allow the "secure" flag to supercede the "path" restrictions to protect sites against cookie fixing attacks.

Note: This allows "secure" pages to override "secure" cookies with non-secure variants. Perhaps we should restrict that as well?

3. In order to ensure that a non-secure site can never cause a "secure" cookie to be evicted, adjust the "remove excess cookies" priority order at the bottom of [Section 5.3](#) to be the following:

1. Expired cookies.
2. Cookies whose "secure-only-flag" is not set and which share a "domain" field with more than a predetermined number of other cookies.
3. Cookies that share a "domain" field with more than a predetermined number of other cookies.
4. All cookies.

Note that the eviction algorithm specified here is triggered only after insertion of a cookie which causes the user agent to exceed some predetermined upper bound. Conforming user agents MUST

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ensure that inserting a non-secure cookie does not cause a secure cookie to be removed.

#### 4. Security Considerations

This specification increases a site's confidence that secure cookies it sets will remain unmodified by insecure pages on hosts which it domain-matches. Ideally, sites would use HSTS as described in [RFC6797] to defend more robustly against the dangers of non-secure transport in general, but until adoption of that protection becomes ubiquitous, this deprecation this document recommends will mitigate a number of risks.

#### 5. References

##### 5.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/[RFC2119](#), March 1997, <<http://www.rfc-editor.org/info/rfc2119>>.
- [RFC3986] Berners-Lee, T., Fielding, R., and L. Masinter, "Uniform Resource Identifier (URI): Generic Syntax", STD 66, [RFC 3986](#), DOI 10.17487/RFC3986, January 2005, <<http://www.rfc-editor.org/info/rfc3986>>.
- [RFC6265] Barth, A., "HTTP State Management Mechanism", [RFC 6265](#), DOI 10.17487/RFC6265, April 2011, <<http://www.rfc-editor.org/info/rfc6265>>.

##### 5.2. Informative References

- [COOKIE-INTEGRITY] Zheng, X., Jiang, J., Liang, J., Duan, H., Chen, S., Wan, T., and N. Weaver, "Cookies Lack Integrity: Real-World Implications", n.d., <<https://www.usenix.org/system/files/conference/usenixsecurity15/sec15-paper-zheng.pdf>>.
- [RFC6797] Hodges, J., Jackson, C., and A. Barth, "HTTP Strict Transport Security (HSTS)", [RFC 6797](#), DOI 10.17487/[RFC6797](#), November 2012, <<http://www.rfc-editor.org/info/rfc6797>>.

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## **Appendix A. Acknowledgements**

Richard Barnes encouraged a formalization of the deprecation proposal. [[COOKIE-INTEGRITY](#)] was a useful exploration of the issues [[RFC6265](#)] described.

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