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The fragility of AES-GCM authentication algorithm

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Abstract: A new implementation of the GHASH function has been recently committed to a Git version of OpenSSL, to speed up AES-GCM. We identified a bug in that implementation, and made sure it was quickly fixed before trickling into an official OpenSSL trunk. Here, we use this (already fixed) bug as a real example that demonstrates the fragility of AES-GCM's authentication algorithm (GHASH). One might expect that incorrect MAC tag generation would only cause legitimate message-tag pairs to fail authentication (which is already a serious problem). However, since GHASH is a "polynomial evaluation" MAC, the bug can be exploited for actual message forgery.

Category / Keywords: AES-GCM, GHASH, polynomial evaluation MAC, message forgery, OpenSSL

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