Creating a rogue CA certificate

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We have identified a vulnerability in the Internet Public Key Infrastructure (PKI) used to issue digital certificates for secure websites. As a proof of concept we executed a practical attack scenario and successfully created a rogue Certification Authority (CA) certificate trusted by all common web browsers. This certificate allows us to impersonate any website on the Internet, including banking and e-commerce sites secured using the HTTPS protocol.

Our attack takes advantage of a weakness in the MD5 cryptographic hash function that allows the construction of different messages with the same MD5 hash. This is known as an MD5 "collision". Previous work on MD5 collisions between 2004 and 2007 showed that the use of this hash function in digital signatures can lead to theoretical attack scenarios. Our current work proves that at least one attack scenario can be exploited in practice, thus exposing the security infrastructure of the web to realistic threats.

This successful proof of concept shows that the certificate validation performed by browsers can be subverted and malicious attackers might be able to monitor or tamper with data sent to secure websites. Banking and e-commerce sites are particularly at risk because of the high value of the information secured with HTTPS on those sites. With a rogue CA certificate, attackers would be able to execute practically undetectable phishing attacks against such sites.

The infrastructure of Certification Authorities is meant to prevent exactly this type of attack. Our work shows that known weaknesses in the MD5 hash function can be exploited in realistic attack, due to the fact that even after years of warnings about the lack of security of MD5, some root CAs are still using this broken hash function.

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Further details:

- Detailed explanation
- Slides from the 25c3 presentation
- Demo site (set your system date to August 2004 before clicking)

Colliding certificates:

- Real certificate
- Rogue CA certificate

This work was presented at the 25th Chaos Communication Congress in Berlin on December 30, 2008.

For press or general inquiries, please contact the team at md5-collisions@phreedom.org

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