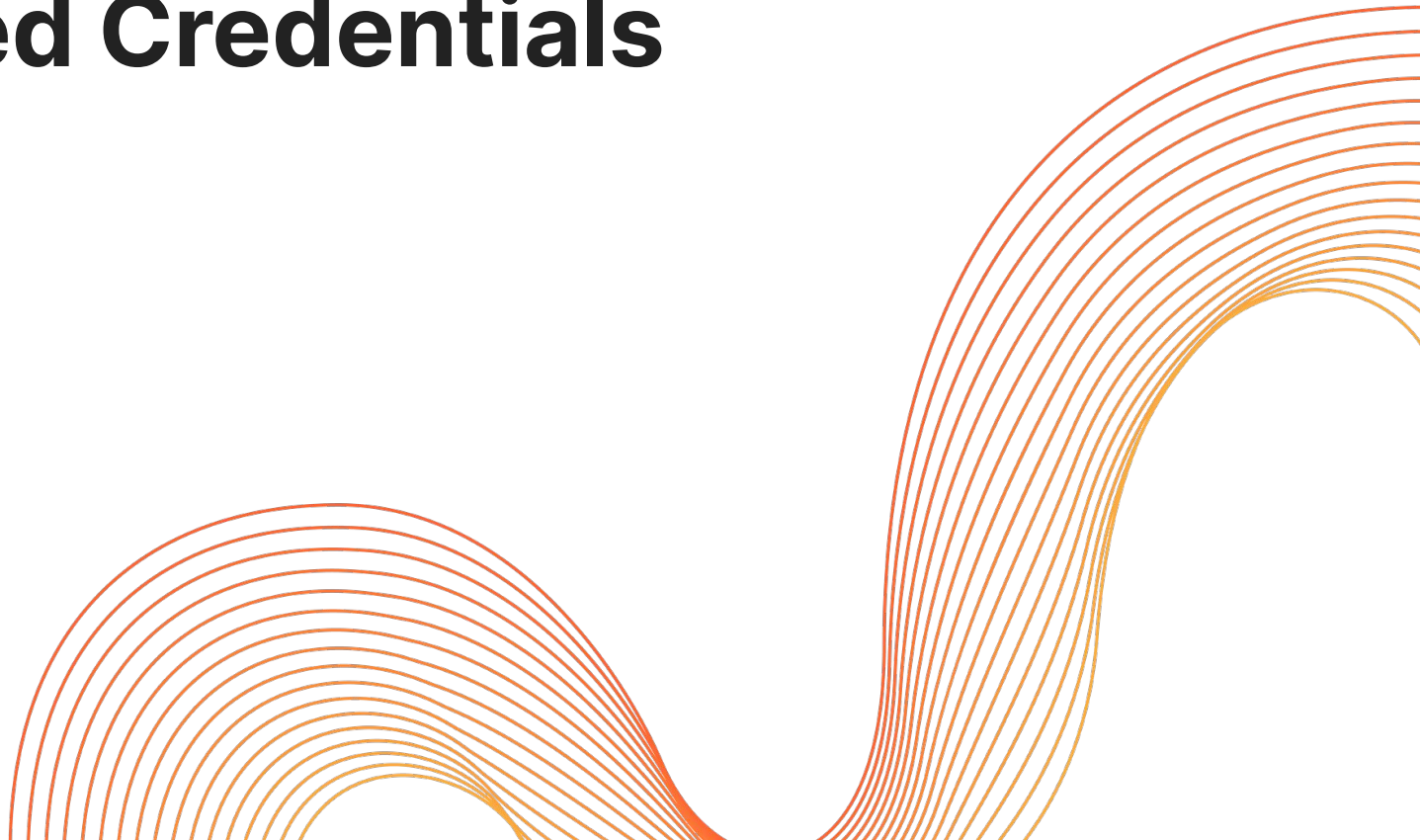
Delegated Credentials



Problems

Certificate keys live near the public Internet

Certificate revocation is broken

Deploying new signature algorithms is hard

CAs can be unreliable

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Certificate keys live near the public Internet

- To achieve fast handshake times certificate keys are stored close to where the connection is terminated
- Sometimes those keys can leak (e.g. Heartbleed and Cloudbleed)
- We can’t make the speed of light faster
- Can we reduce the harm of a leak?

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Certificate revocation is broken

- Certificate revocation does not work well in practice
- OCSP / OCSP Stapling is not used by all browsers
- Even when it is used, can take up to 10 days
- Browser specific revocation lists do not always include all revoked certs
- Can we make certificate lifetimes shorter?

CAs can be unreliable

- To switch to short-lifetime certs we need to be able to reliably issue certs
- Studies have found that CA uptime can be poor
- If certs have a short lifetime, and CAs are not reliably up, we could have outages

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Deploying new signature algorithms is hard

- To experiment with new signature algorithms we need to coordinate between browsers, servers, and CAs.
- We keep signature algorithms alive for years for backwards compatibility.

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Enter Delegated Credentials

- Instead of terminating a TLS handshake with the private key of a certificate, we can issue a delegated credential.
- The delegated credential:
  - has a public / private key pair
  - And a lifetime of less than seven days
  - Is signed by the certificate
  - And can be used in place of the certificate’s private key to sign the TLS handshake

Benefits

- Certificate long-term private keys can be stored far from the edge
- Have very short lifetimes (can be as short days or even hours)
- Are “minted” by the certificate owner, without the help of the CA
- Can use any signature algorithm the client and server support, not just those supported by the CA

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Formal Analysis

- Extended the TLS 1.3 model
- Proves the protocol meets the same guarantees as TLS*
- Didn’t find any issues
- Hard to publish