Fully Specified Algorithms for JOSE and COSE

(proposed specification)

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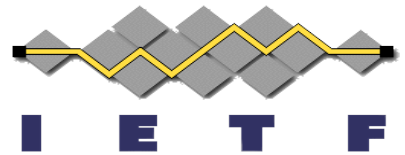
Fully Specified vs. Polymorphic Algorithms



The IANA algorithm registries for JOSE and COSE contain two kinds of algorithm identifiers:

- Fully Specified – Those that fully determine the cryptographic operations to be performed
  - Including any Curve, KDF, Hash Function, etc.
  - Examples: RS256, ES256K, ES256 (in JOSE)
- Polymorphic – Those requiring info beyond the identifier to determine the cryptographic operations to be performed
  - Such as the cryptographic key with a curve
  - Examples: EdDSA, ES256 (in COSE)

Why It Matters

Many protocols negotiate supported operations using just “alg”

- RFC 8414 (AS Metadata) uses negotiation parameters like:
  `"token_endpoint_auth_signing_alg_values_supported": ["RS256", "ES256"]`
- OpenID Connect negotiates using “alg” and “enc” values
- WebAuthn and FIDO2 negotiate using COSE “alg” numbers

This doesn’t work for polymorphic algorithms:

- With “EdDSA”, you don’t know which of Ed25519 or Ed448 are supported!
- WebAuthn contains this definition as a result:

  -8 (EdDSA), where crv is 6 (Ed25519)

Proposed Solution

Create spec registering fully specified algorithm values for all algorithms currently using polymorphic values, such as:

- “ES25519” - Edwards-curve Digital Signature with Ed25519 curve
- “ES448” - Edwards-curve Digital Signature with Ed448 curve
- “ESP256” - ECDSA using P-256 curve and SHA-256 (for COSE)
- “ESP384” - ECDSA using P-384 curve and SHA-384 (for COSE)
- etc.

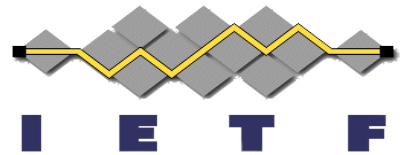
Updating Polymorphic RFCs

The spec would add “Updated by” to existing RFCs registering polymorphic algorithm identifiers

- RFC 8037: CFRG Elliptic Curve Diffie-Hellman (ECDH) and Signatures in JSON Object Signing and Encryption (JOSE)
- RFC 9053: CBOR Object Signing and Encryption (COSE): Initial Algorithms
- etc.

Gives implementers notice of fully specified alg choices

Updating Designated Expert Instructions



- The RFC would also update the instructions to the designated experts for the JOSE and COSE algorithm registries
- It would instruct the experts not to approve any more polymorphic algorithm identifier registrations
- This would prevent the problem from getting worse

Should it be a BCP?

- Should this specification be a Best Current Practices document?
- It would make using fully specified algorithm identifiers a Best Current Practice