COMPOSITE CRYPTO FOR PKIX AND CMS

IETF LAMPS 114

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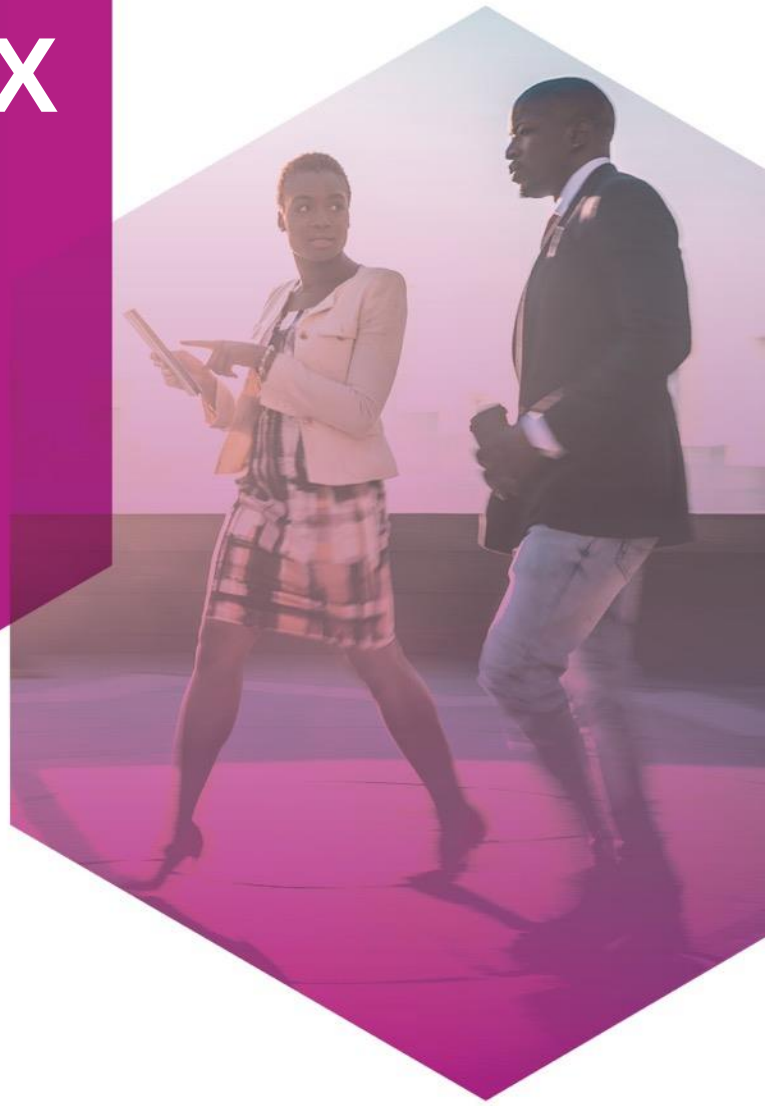

Composite crypto for PKIX and CMS

Outline

Main points

- Composite-keys and Composite-sigs are ready for WG adoption.

Outline

- Status of composite Keys and Sigs drafts
  - Ready for WG adoption!
    - Rough consensus …
    - … and running code
- Composite KEM -00
- IETF 115 hackathon: PQ X.509?

Composite drafts

```
CompositePublicKey ::= SEQUENCE SIZE (2..MAX)
                       OF SubjectPublicKeyInfo
```

draft-ounsworth-pq-composite-keys-02

- Defines composite public and private keys
- Usable anywhere in PKIX that uses pub / priv keys.

Ready for WG Adoption

```
CompositeSignatureValue ::= SEQUENCE SIZE (2..MAX)
                            OF BIT STRING
```

draft-ounsworth-pq-composite-sigs-07

- Defines composite signatures
- Usable anywhere in PKIX that uses signatures.

Ready for WG Adoption

NEW!!

draft-ounsworth-pq-composite-kem-00

- Defines composite as a KEM (Key Encapsulation Mechanism)
- Useable anywhere that accepts KEMs.
- Takes any combination of KeyTrans, KeyAgree, KEM components

Rough consensus …

Authors group

- Entrust
- CableLabs
- D-Trust
- DigiCert
- Cisco

Other Positive reviews

- Panos K. (AWS)
- François Rousseau
- ISARA
- Carl Wallace
- Michael Richardson

… and running code

Implementation	Interop Tested	Licensing	
		Proprietary	Open Source
Entrust PKIaas/Toolkits	YES	YES	
Bouncy Castle	YES		YES
Open Quantum Safe / Open SSL	In Progress		YES
OpenCA libPKI (in progress)	TBD		YES
CableLabs / DOCSIS PKI	TBD	YES	
Botan crypto library (ICA D-TRUST)	TBD		YES
ISARA?		YES	

IETF 115 hackathon: PQ X.509?

- What?
  - Cert / CRL validation
  - CMS SignedData
- Algs?
  - Dilithium
  - Falcon
  - SPHINCS+
  - Composite
- Why?
  - Sync up pre-standards OIDs and wire encodings.
- Implementations to test against?
  - Entrust toolkit
  - Bouncy Castle
  - Open Quantum Safe / OpenSSL
  - Others ? !

Interaction with non-composite approaches

- Ex.: draft-becker-guthrie-noncomposite-hybrid-auth-00
- Complementary
  - Non-composite (often) makes more sense for negotiated protocols.
  - Composite (often) makes more sense for non-negotiated protocols.
  - May even be combined: ex.: the PQ part of non-composite could itself be composite for greater algorithm certainty.

LAMPS Milestones

- These LAMPS milestones would be accomplished by adopting pq-composite-keys and pq-composite-sigs:

Dec 2021 Adopt draft for dual signature in CMS
Dec 2021 Adopt draft for dual signatures in PKIX certificates
Dec 2021 Adopt draft for public keys for hybrid key establishment in PKIX certificates

- (and this one when we get pq-composite-kem published)

Dec 2021 Adopt draft for hybrid key establishment in CMS

WG Adoption?

- We propose that the following are ready for WG Adoption
  - draft-ounsworth-pq-composite-keys-02
  - draft-ounsworth-pq-composite-sigs-07

Which would meet the LAMPS Milestones (Dec 2021) mentioned above.

Composite KEMs

Encrypt for a recipient with either a composite pub key, or multiple encryption certs.

draft-ounsworth-pq-composite-kem-00

- BRAND NEW!!

- Contains two things that need crypto review:
  1. Transformations so everything can be a treated as a KEM:
     - KeyTrans -> KEM
     - KeyAgree -> KEM
  2. “Combiners” to combine multiple component shared secrets
     - SS = C(SS1, SS2, .., SSn, CT1, CT2, .., CTn)
     - This seems to be a hot area of research, so probably needs to be modular / agile.