~~VOPRF~~ POPRF

draft-irtf-cfrg-voprf

Davidson, Faz-Hernandez, Sullivan, Wood — IETF 112 Online — CFRG

Updates
Draft -08

Major

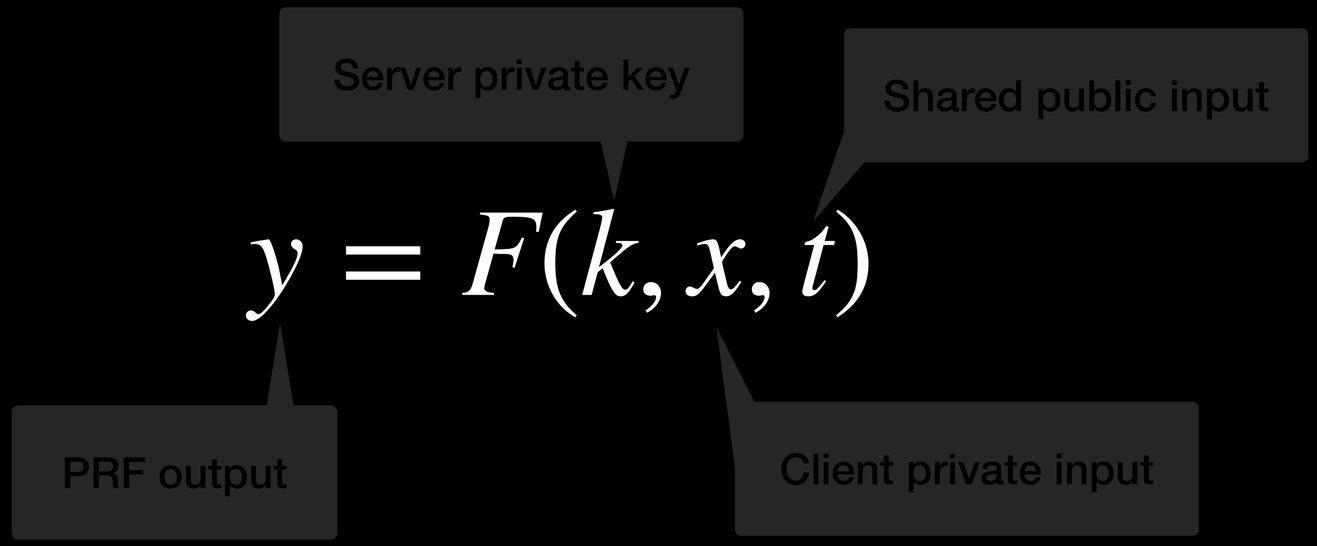
- 2HashDH OPRF to 3HashSDHI POPRF

Minor

- Update P-384 suite to use SHA-384 instead of SHA-512
- Update test vectors and improve editorial clarity

Functionality Differences

POPRF Update



Functionality Differences

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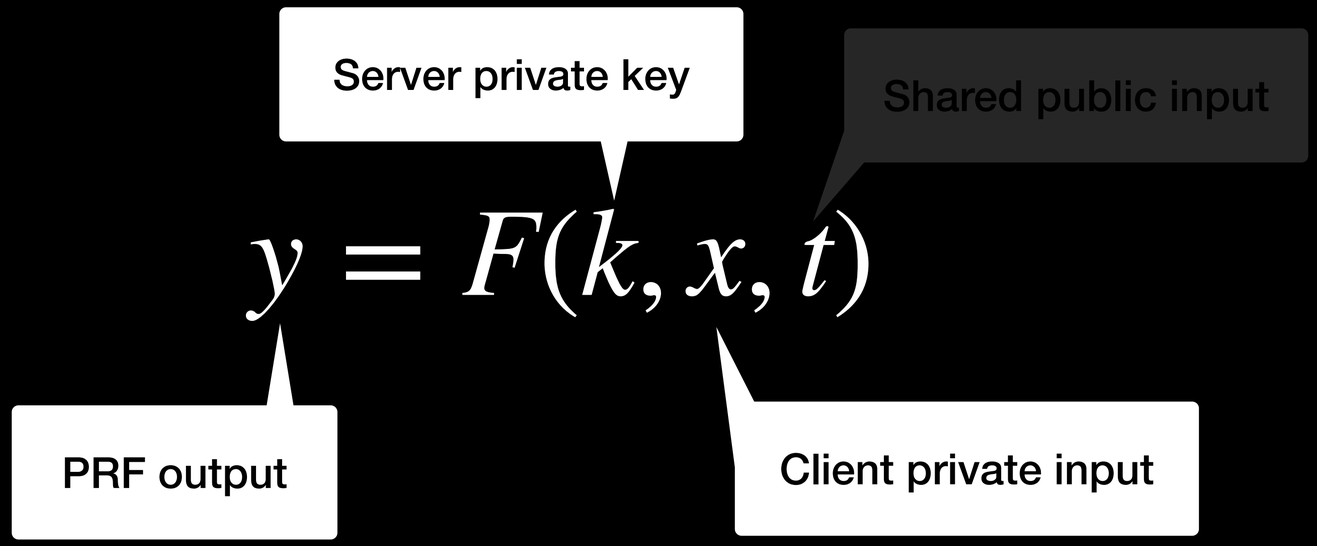
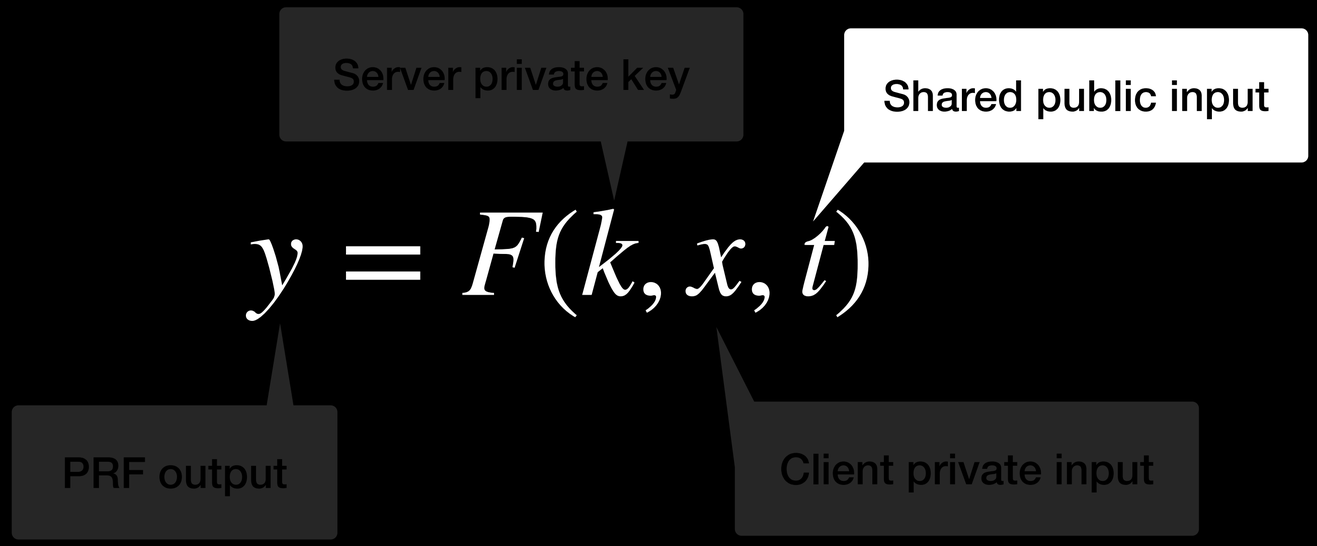


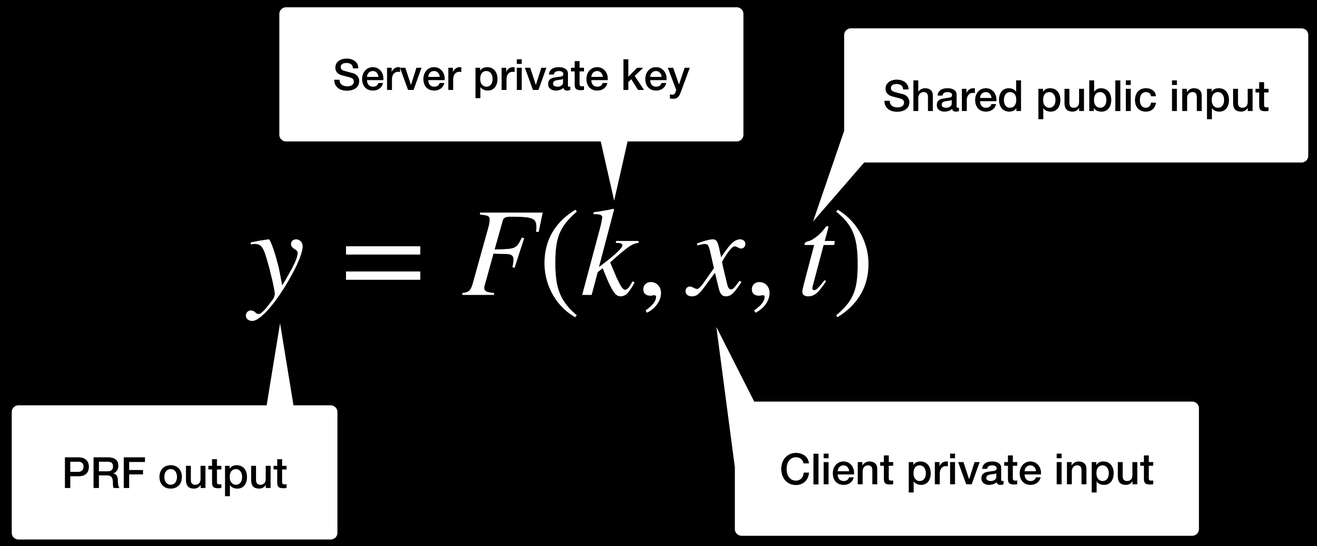
Functionality Differences

POPRF Update



Functionality Differences

POPRF Update



Functionality Differences

POPRF Update

$$y = F(k, x, \perp) \approx F(k, x)$$

POPRF with fixed public input is functionally an OPRF

Security Differences
POPRF Update

Formal security differences:

- 3HashSDHI has game-based security definition with reductions to q-DL in the AGM, not (yet) a proof that it satisfies the UC formalization from Jarecki et al.
- Identical security parameters for Cheon static-DH attack (best known complexity)

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High-level point: Confidence in both 2HashDH and 3HashSDHI, but formal differences may have implications for dependent applications (OPAQUE)

Open issue: UC analysis for 3HashSDHI POPRF (compatible with **2018/733**)

Deployment Differences
POPRF Update

2HashDH is threshold-friendly: servers can secret share the private key and *non-interactively* run the protocol transparently to the client

3HashSDHI is not threshold friendly: threshold implementation may require interactive, multi-round protocol between clients and servers

Open Questions

Threshold-friendly OPRFs

What current use cases require threshold-friendly OPRFs, and should this be specified functionality?

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If no, then only specify 3HashSDHI since it’s a generalization of 2HashDH

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Threshold-friendly OPRFs

What current use cases require threshold-friendly OPRFs, and should this be specified functionality?

If yes, then more questions:

Should we specify both 2HashDH and 3HashSDHI protocols?

Should these be separate cryptographic objects with distinct APIs?

What do we do about distributed key generation? (See FROST)

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