SHA-3 update

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SHA-3 Competition

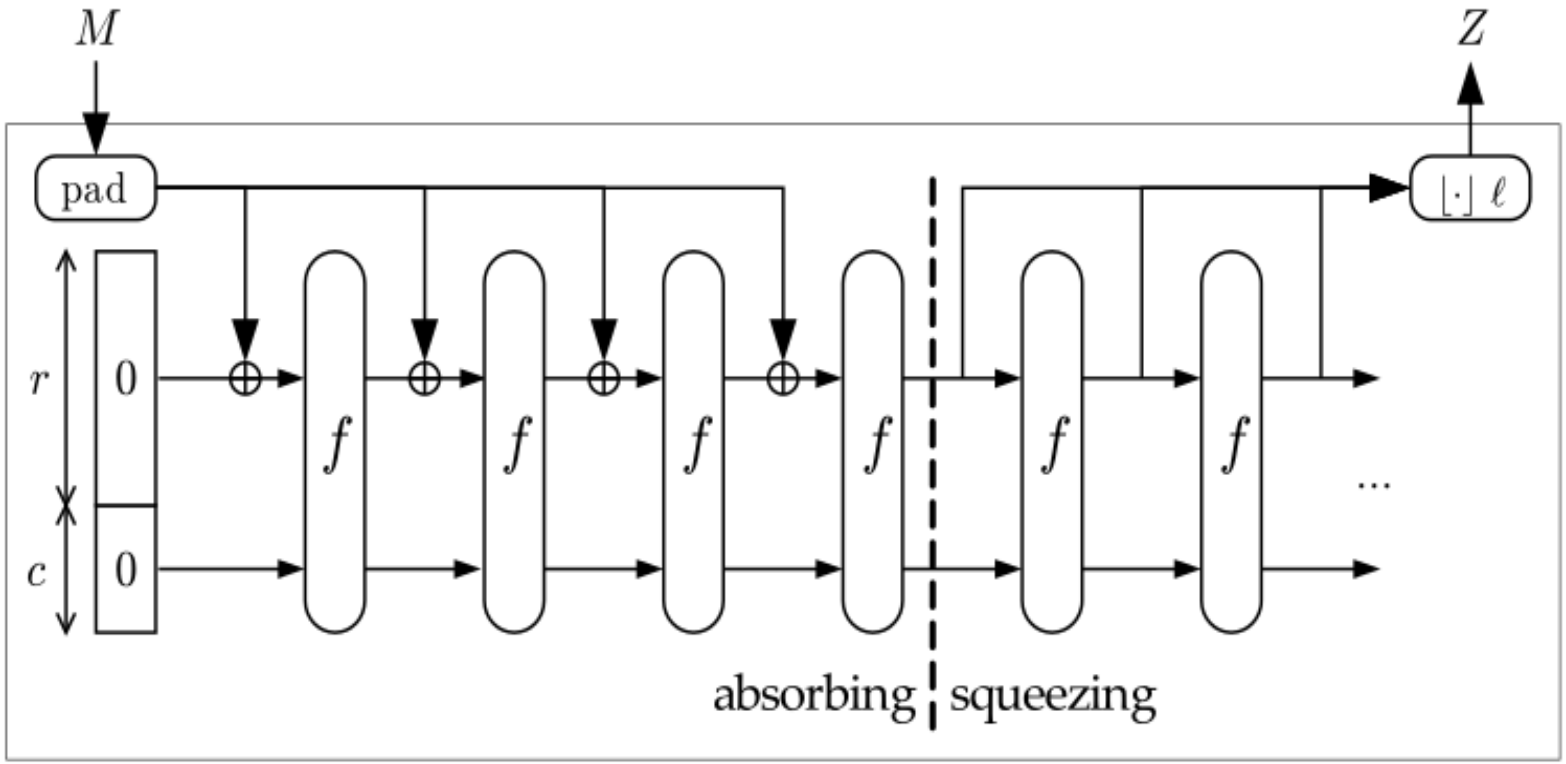
11/2/2007	SHA-3 Competition Began.
10/2/2012	*Keccak announced as the SHA-3 winner.*

Secure Hash Algorithms Outlook

- SHA-2 looks strong.
- We expect Keccak (SHA-3) to co-exist with SHA-2.
- Keccak *complements* SHA-2 in many ways. Keccak is good in different environments.

Keccak is a sponge - a different design concept from SHA-2.

Sponge Construction



sponge

Sponge capacity corresponds to a security level: s = c/2.

NIST

SHA-3 Selection

- We chose Keccak as the winner because of many different reasons and below are some of them:
  - It has a high security margin.
  - It received good amount of high-quality analyses.
  - It has excellent hardware performance.
  - It has good overall performance.
  - It is very different from SHA-2.
  - It provides a lot of flexibility.

Keccak Features

- Keccak supports the same hash-output sizes as SHA-2 (i.e., SHA-224, -256, -384, -512).
- Keccak works fine with existing applications, such as DRBGs, KDFs, HMAC and digital signatures.
- Keccak offers flexibility in performance/security tradeoffs.
- Keccak supports tree hashing.
- Keccak supports variable-length output.

Under Consideration for SHA-3

- Support for variable-length hashes
- Considering options:
  - One capacity: c = 512, with output size encoding,
  - Two capacities: c = 256 and c = 512, with output size encoding, or
  - Four capacities: c = 224, c = 256, c=384, and c = 512 without output size encoding (preferred by the Keccak team).
- Input format for SHA-3 hash function(s) will contain a padding scheme to support tree hashing in the future.
- NIST will standardize 224, 256, 384 and 512 alternative hashes to the 4 hash sizes of SHA-2.

Other Features for standardization considerations

- NIST will look into the possibility of standardizing another authenticated encryption scheme using Keccak permutation (the Duplex mode) in the future.

- NIST will also look into the possibility of using smaller permutations of Keccak for lightweight applications in the future!

Comments

NIST's Crypto Toolkit:
http://csrc.nist.gov/groups/ST/toolkit/index.html.

Thanks to the security area directors for this presentation opportunity!

Any comments/questions?

Discussion mailing list: Hash-forum@nist.gov

Comments for NIST: internal-hash@nist.gov