# The Hash Function Hamsi

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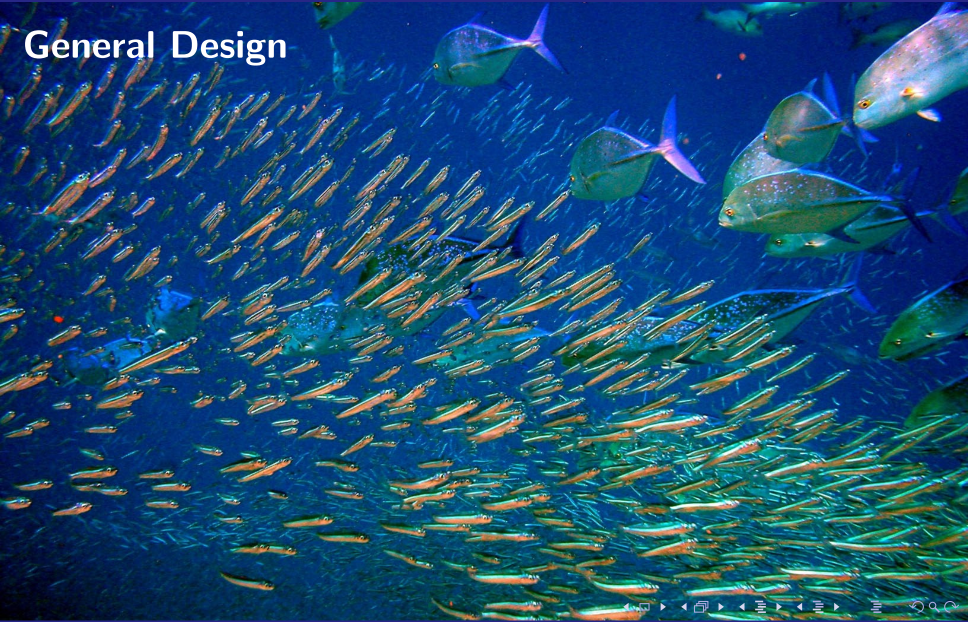
# Outline

# General Design



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  - Chaining value has the same size as the digest length.
  - Hamsi-256/512 is mainly intended for users who want 128/256-bit security

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  - Independent of the chaining variable

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- Alternative option: Concatenate-Permute-XOR
  - Expanded message is XORed into the state → Wide-pipe

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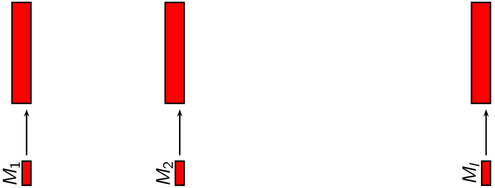

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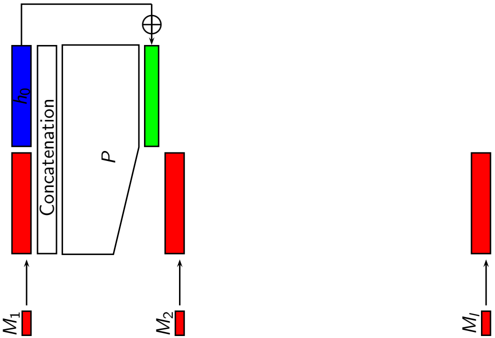

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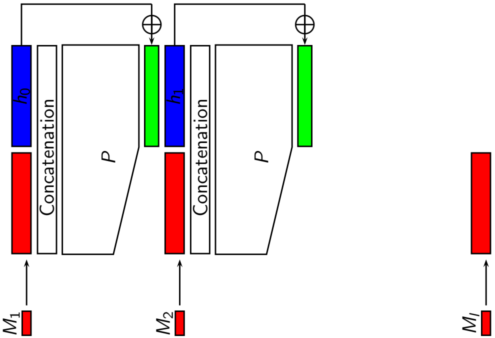

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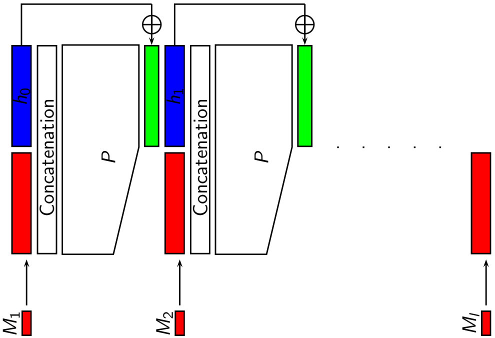

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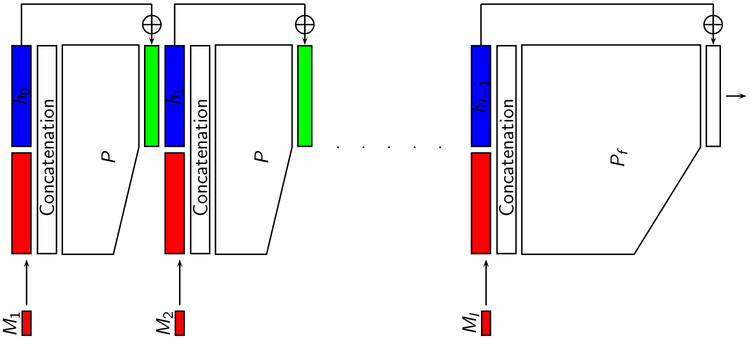

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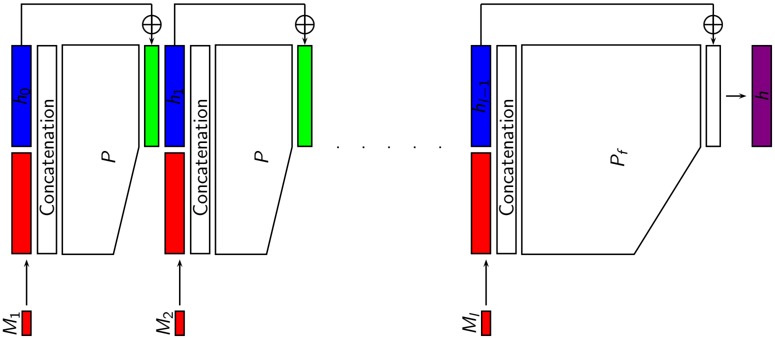

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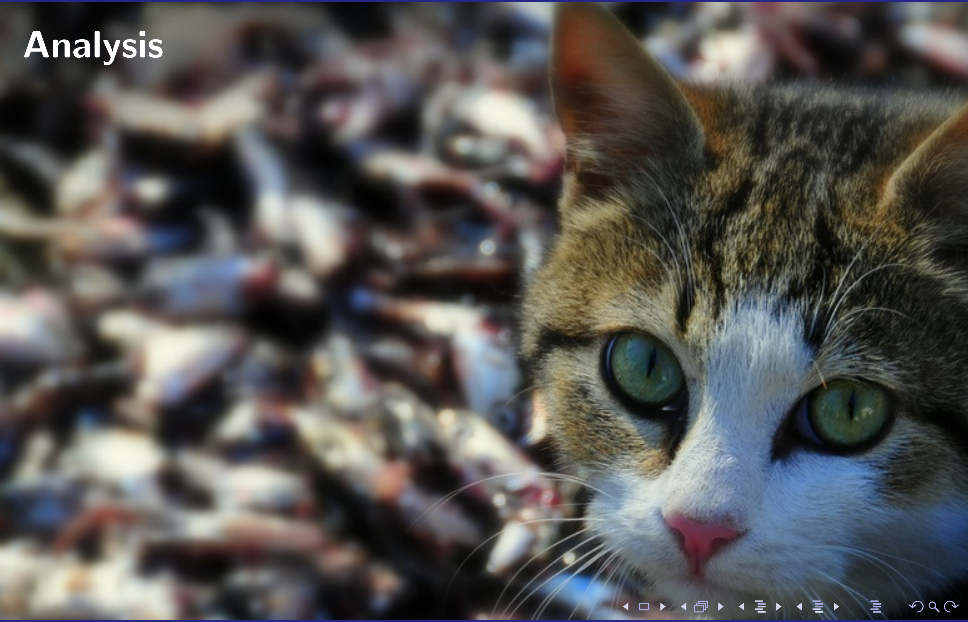

# Analysis of the Compression Function

- "On the pseudorandomness of Hamsi," J.P. Aumasson
- "Near Collisions for the Compression Function of Hamsi-256," I. Nikolic
- "Zero-sum distinguishers for reduced Keccak-f and for the core functions of Luffa and Hamsi-256," J.P. Aumasson, W. Meier
- "New Pseudo-Near-Collision Attack on reduced round of Hamsi-256," M. Wang et al.
- "Message Recovery and Pseudo-Preimage Attacks on the Compression Function of Hamsi-256," Ç. Çalik, M.S. Turan
- "Differential Distinguishers for the Compression Function and Output Transformation of Hamsi-256," J.P. Aumasson et al.

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  - Message expansion is bypassed by avoiding differences in the message.
- Pseudo-collisions are much harder to construct.

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- Hamsi is a narrow-pipe design.
  - If first message is more than a few kilo bytes then there are faster generic attacks.

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- Moderate speed for long messages.
- Among the best performers for short messages.

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- As reported in many papers Hamsi has a good performance in FPGA and ASIC implementations.

# Hardware Performance

- "Developing a Hardware Evaluation Method for SHA-3 Candidates," Integrated Systems Laboratory of the ETH Zurich.
- "Fair and Comprehensive Methodology for Comparing Hardware Performance of Fourteen Round Two SHA-3 Candidates using FPGAs," Kris Gaj et al.
- "Fair and Comprehensive Performance Evaluation of 14 Second Round SHA-3 ASIC Implementations," Xu Guo et al.
- "Evaluation of Hardware Performance for the SHA-3 Candidates Using SASEBO-GII," K. Kobayashi et al.
- "Uniform Evaluation of Hardware Implementations of the Round-two SHA-3 Candidates," S. Tillich et al.

# Conclusion

- Hamsi has some unique design features.
- Received a fair amount of attention from cryptanalysts.
- It has attractive software/hardware performance.

# More information:

[http://homes.esat.kuleuven.be/ okucuk/hamsi/]