

# Equivalent Key Recovery Attacks against HMAC and NMAC with Whirlpool Reduced to 7 Rounds

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another work from **ASK 2013**

# HMAC-Whirlpool

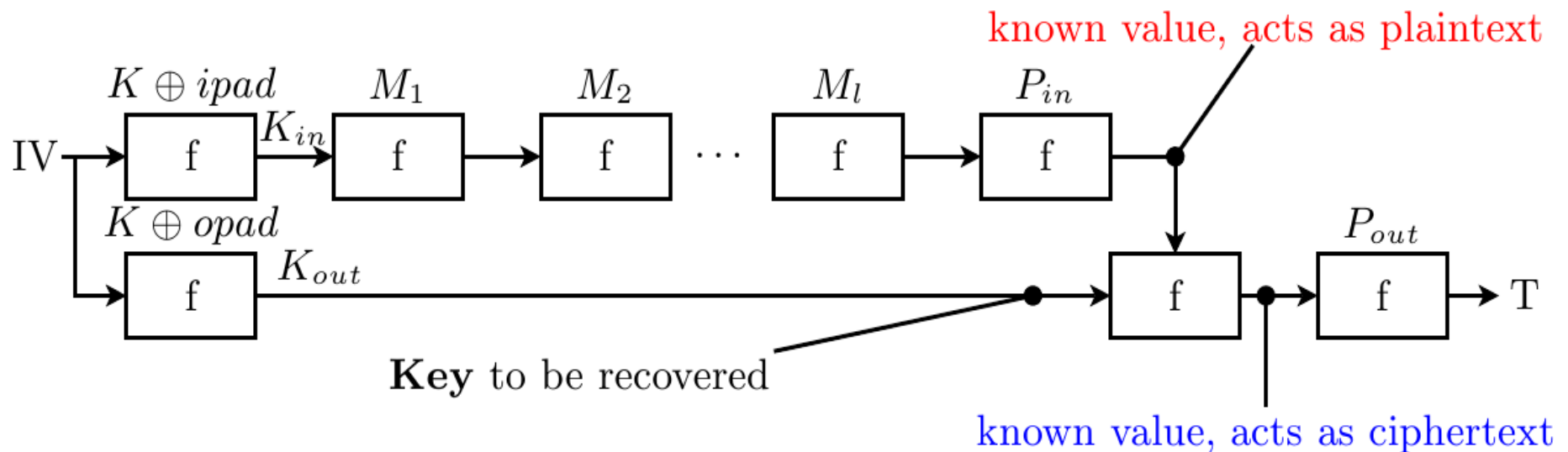
- HMAC:  $H(K \oplus \text{opad} || H(K \oplus \text{ipad} || M))$ , designed by Mihir Bellare, Ran Canetti and Hugo Krawczyk in Crypto 1996; standardized by ANSI, IETF, ISO, NIST from 1997.
- Whirlpool: 512-bit hash function designed by Barreto and Rijmen in 2000, standardized by ISO/IEC, follows Miyaguchi-Preneel mode, i.e.,  $f(h, M) = E_h(M) \oplus h \oplus M$ , with AES-Like compression function.

# The Best Attack

- Yet to be presented, by Guo-Sasaki-Wang-Wu at Asiacrypt 2013, works for Whirlpool reduced to 6 out of 10 rounds
- Equivalent with chosen plaintext attack on the underlying AES-like block cipher

# How it worked ?

Filter plaintext for structured collisions



# New Attack

Convert most recent chosen plaintext attacks on reduced AES to known plaintext attack.

+ Combine with the attack framework by Guo et al.

=> Equivalent keys (including  $K_{in}$  and  $K_{out}$ ) Attack for HMAC-Whirlpool reduced to **7** rounds, **more** rounds than all existing collision/preimage attacks against Whirlpool.