how to do it right...

A Leakage-Resilient Mode of Operation for Block-Ciphers

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crypto'08 rump session

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- Want security against all side-channels: leakage function adaptively and adversarially chosen.

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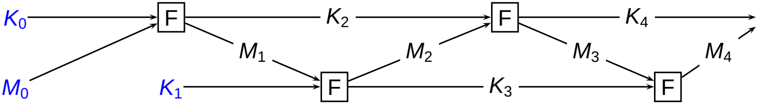
- Only computation leaks information: f gets as input only the part of the state that is actually accessed to compute M_i.

Leakage Resilient Stream cipher.

- PRF F : $\{0,1\}^\kappa \times \{0,1\}^n \to \{0,1\}^{\kappa+n}$ e.g. $\mathsf{F}(K,X) = AES(K,0\|X)\|AES(K,1\|X)$
- Secret key is K_0, K_1, M_0, output is $M_0, M_1, \ldots$
- i'th round: $(K_{i+2}, M_{i+1}) = \mathsf{F}(K_i, M_i)$.



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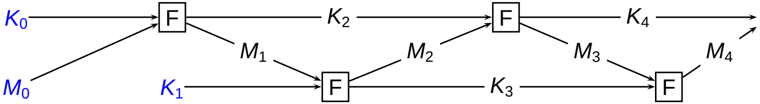

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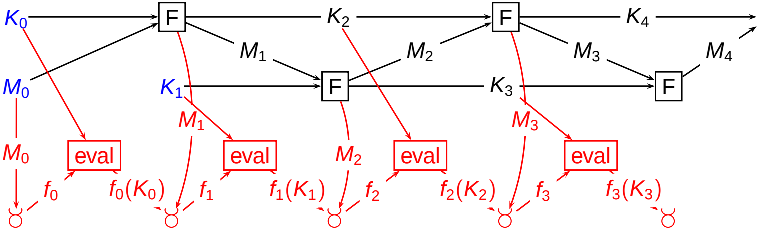

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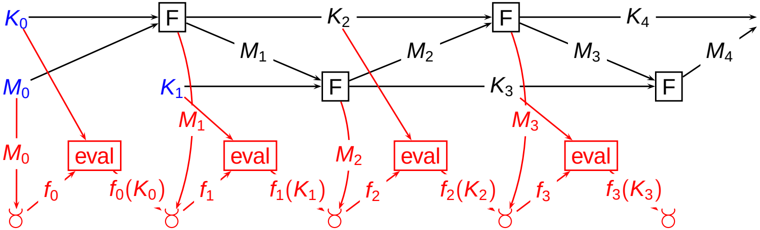

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- Security: M_ℓ is pseudorandom given $M_1, \ldots, M_{\ell-1}$ and $f_0(K_0), \ldots, f_{\ell-1}(K_{\ell-1})$.

Tools

- (from [DP'08]) For any PRG $\mathsf{G} : \{0,1\}^m \to \{0,1\}^n$ and any function $f : \{0,1\}^m \to \{0,1\}^\lambda$: $\mathsf{G}(S)$ has high HILL pseudoentropy even given $f(S)$.
- (new) Any weak PRF is seed compressible.