WHITE-BOX ATTACK RESISTANT CRYPTOGRAPHY

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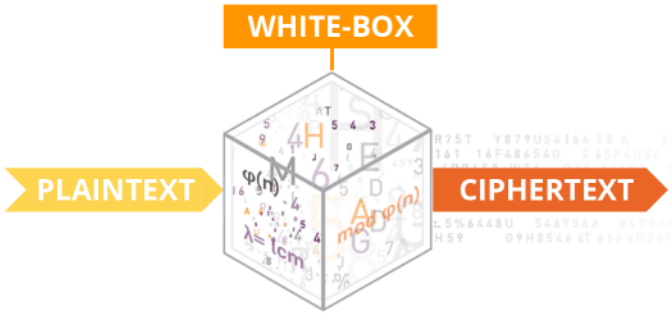
MOTIVATION

To execute cryptographic algorithms on untrusted platforms securely, in particular by protecting cryptographic material (e.g. encryption keys) from attacker observing such execution.

ATTACKER CAN

- trace the program flow
- see/modify program's memory
- change the program's logic
- induce faults

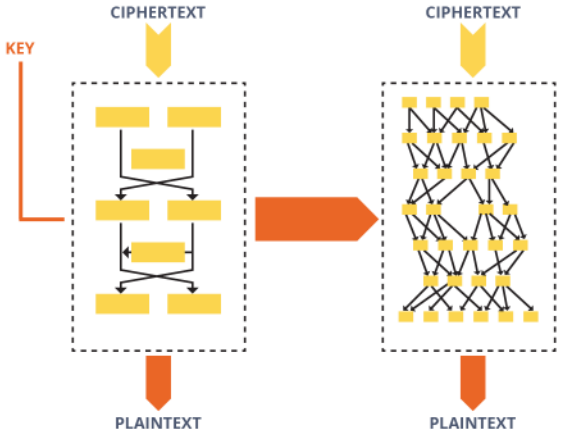


WHITE-BOX CRYPTOGRAPHY

To transform / re-implement a cryptographic algorithm in such a way that cryptographic assets remain secure even when subject to white-box attack.

TYPICAL USE-CASE

- DRM solutions, key-extraction would compromise the whole DRM system
- protection of licensing algorithm for software protection
- anti-cheating modules for games
- set-top boxes



STATE OF THE ART

The main focus is on white-box transformations of symmetric ciphers. Namely DES, AES.

- **DES:** several white-box schemes proposed, each of them broken
- **AES:**
  - 3 main white-box schemes proposed, each of them broken by algebraic analysis.
  - scheme using dual ciphers proposed, claiming its resistance to known attack, no cryptanalysis known.

RESULTS

- Proof that scheme using dual ciphers is not better than previous schemes, i.e. it is prone to algebraic cryptanalysis.
- Proposed a new symmetric encryption algorithm based on AES, with white-box transformations in mind. It fixes weak points of the white-box transformation with security at least as AES have.

CONTRIBUTIONS

- Implementation of 2 AES white-box transformations (default one, dual ciphers).
- Implementation of an algebraic attack on AES white-box transformation.
- Analysis of proposed improvements to new symmetric encryption algorithm based on AES.