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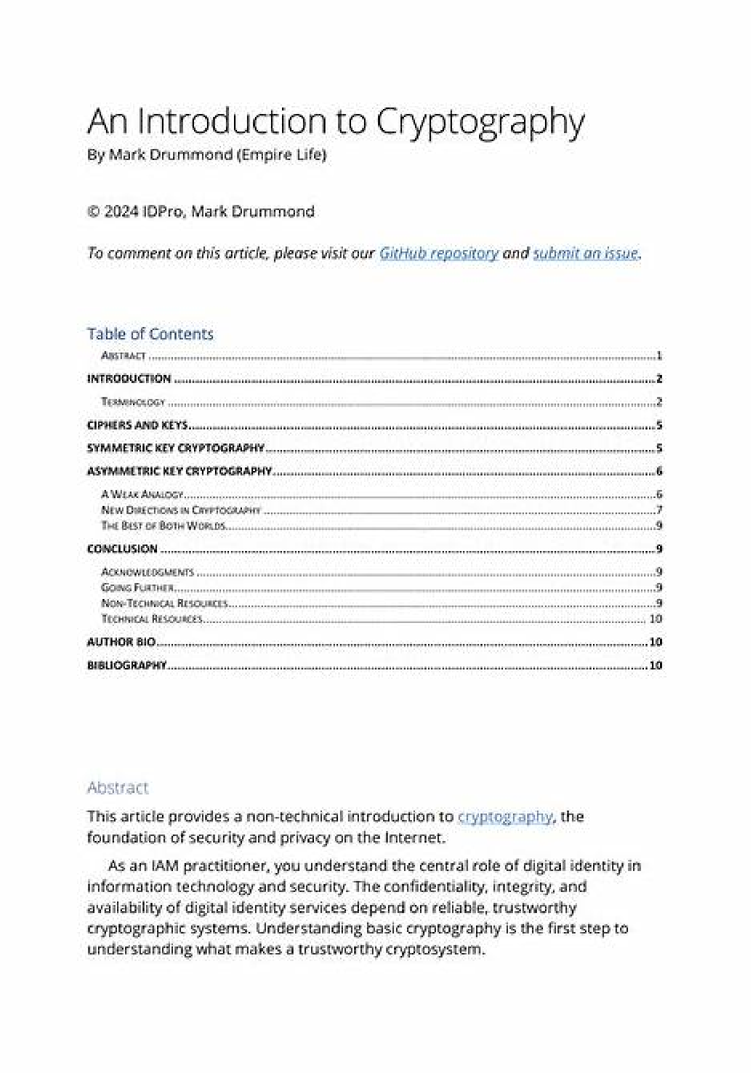

An Introduction to Cryptography

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Abstract

This article provides a non-technical introduction to cryptography, the foundation of security and privacy on the Internet.

As an IAM practitioner, you understand the central role of digital identity in information technology and security. The confidentiality, integrity, and availability of digital identity services depend on reliable, trustworthy cryptographic systems. Understanding basic cryptography is the first step to understanding what makes a trustworthy cryptosystem.

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WGU Introduction to Cryptography HNO1 Sample Questions (Q47-Q52):

NEW QUESTION # 47
(What are the primary characteristics of Bitcoin proof of work?)

- A. Easy to produce and difficult to verify
- B. Difficult to produce and difficult to verify
- C. Difficult to produce and easy to verify
- D. Easy to produce and easy to verify

Answer: C

Explanation:
Bitcoin's proof of work (PoW) is designed so that finding a valid block is computationally difficult, but checking validity is computationally easy. Miners must repeatedly hash candidate block headers (double SHA-256) with different nonces until they find a hash value below a network-defined target.
This trial-and-error search requires significant work and energy because the probability of success per attempt is extremely low at current difficulty levels. However, verification is straightforward: any node can hash the block header once (or a small number of times) and confirm the resulting hash meets the target threshold and that the block contents follow protocol rules. This "hard to produce, easy to verify" property is essential: it makes it expensive for attackers to rewrite history or outpace honest miners, while allowing all participants-even low-power devices-to validate blocks efficiently.
Therefore, the primary characteristic of Bitcoin proof of work is that it is difficult to produce and easy to verify.

NEW QUESTION # 48
(Which attack maps hashed values to their original input data?)

- A. Dictionary
- B. Birthday
- C. Rainbow table
- D. Brute-force

Answer: C

Explanation:
A rainbow table attack uses large, precomputed tables that link hash outputs back to likely original inputs (typically passwords). Instead of storing every password#hash pair directly (which would be huge), rainbow tables store chains created by alternating hash operations with reduction functions, allowing attackers to reconstruct candidate plaintexts that produce a given hash. This makes cracking fast,ifthe target hashes are unsalted and use a known, fast hash function. Salt defeats rainbow tables because the attacker would need separate tables for each salt value, which becomes infeasible when salts are unique and sufficiently large. A dictionary attack is related but typically computes hashes on the fly from a wordlist rather than using precomputed chain structures. A birthday attack targets collisions, not mapping to original data. Brute-force tries all candidates without precomputation.
Because the question explicitly describes mapping hashed values back to original data via a precomputed approach, the correct choice is Rainbow table.

NEW QUESTION # 49
(What is used to randomize the initial value when generating Initialization Vectors (IVs)?)

- A. Nonce
- B. Algorithm
- C. Plaintext
- D. Key

Answer: A

Explanation:
An IV (Initialization Vector) is a value used to ensure that encrypting identical plaintext under the same key produces different ciphertexts, preventing pattern leakage. In many secure designs, the IV must be unique (and often unpredictable) per encryption operation. A common way to ensure uniqueness is to incorporate a nonce-a "number used once." A nonce can be random, pseudo-random, or a counter-based value depending on the mode and security requirements. For example, CTR mode uses a nonce combined with a counter to produce unique input blocks; GCM uses a nonce/IV to ensure unique authentication and encryption behavior. The encryption key should remain stable across many operations and should not be used as the "randomizer" for IV generation; mixing key material into IV creation in an ad hoc way can create reuse or correlation issues. Plaintext and algorithm do not provide the needed uniqueness property. The nonce concept is specifically about ensuring one-time uniqueness of the starting value so that IV reuse does not repeat keystream blocks (stream modes) or reveal plaintext equality (CBC/CTR). Therefore, the correct choice is Nonce.

NEW QUESTION # 50
(What is an attribute of RC4 when used with WEP?)

- A. 512-bit key
- B. 256-bit key
- C. 40-bit key
- D. 128-bit key

Answer: C

Explanation:
In classic WEP deployments, RC4 was used with what is commonly called "40-bit WEP" (also labeled "64-bit WEP" because it combines a 40-bit secret key with a 24-bit IV to form a 64-bit RC4 seed). The key attribute emphasized in many foundational descriptions of WEP is this 40-bit shared secret length, which was originally chosen due to export restrictions and legacy constraints. Although "104-bit WEP" (sometimes called "128-bit WEP," again counting the 24-bit IV) also existed, the option set here points to the historically standard and widely referenced attribute: a 40-bit key when RC4 is used in WEP.
Importantly, WEP's security failure is not only about key size; the 24-bit IV is too small and repeats frequently, and WEP's key scheduling vulnerabilities combined with IV reuse allow attackers to recover the secret key with enough captured frames. Still, among the given options, the correct attribute is the 40-bit key.

NEW QUESTION # 51
(Why should an administrator choose lightweight cryptography?)

- A. The payload requires complex rounds of encryption.
- B. The embedded system has limited resources.
- C. The desktop is in a secure area of the building.
- D. The data requires minimal protection due to the sensitivity level.

Answer: B

Explanation:
Lightweight cryptography is designed for constrained environments-devices with limited CPU, memory, storage, bandwidth, and power (battery). Examples include IoT sensors, smart locks, RFID tags, embedded controllers, and industrial devices.
Administrators choose lightweight algorithms and protocols to maintain reasonable security while fitting strict resource budgets and real-time constraints.
The goal is not "weaker security because data is unimportant," but rather efficient security that can still meet threat models under constraints. Option B captures this: embedded systems often cannot afford the computational cost of heavy cryptographic primitives (large key sizes, complex modes, frequent handshakes) or may struggle with latency and energy consumption. Option A is irrelevant because physical security of a desktop doesn't remove the need for cryptography in communications or storage. Option C is the opposite of lightweight design. Option D is a poor justification; security design should be based on risk, and lightweight cryptography is not merely for "minimal protection," but for practical deployability under constraints. Therefore, the correct reason is limited resources on embedded systems.

NEW QUESTION # 52
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