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LIGHTWEIGHT CRYPTOGRAPHY FOR IOT SECURITY

Privacy and Security in IoT (CO2)

In today's connected world, security is not an option – it's a necessity. Let's safeguard the digital age together.

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INTRODUCTION

The Internet of Things (IoT) refers to a network of interconnected devices such as sensors, smart appliances, and wearable systems that continuously collect and exchange data. As IoT systems increasingly interact with the physical world, ensuring **security and privacy** becomes a critical requirement rather than an optional feature.

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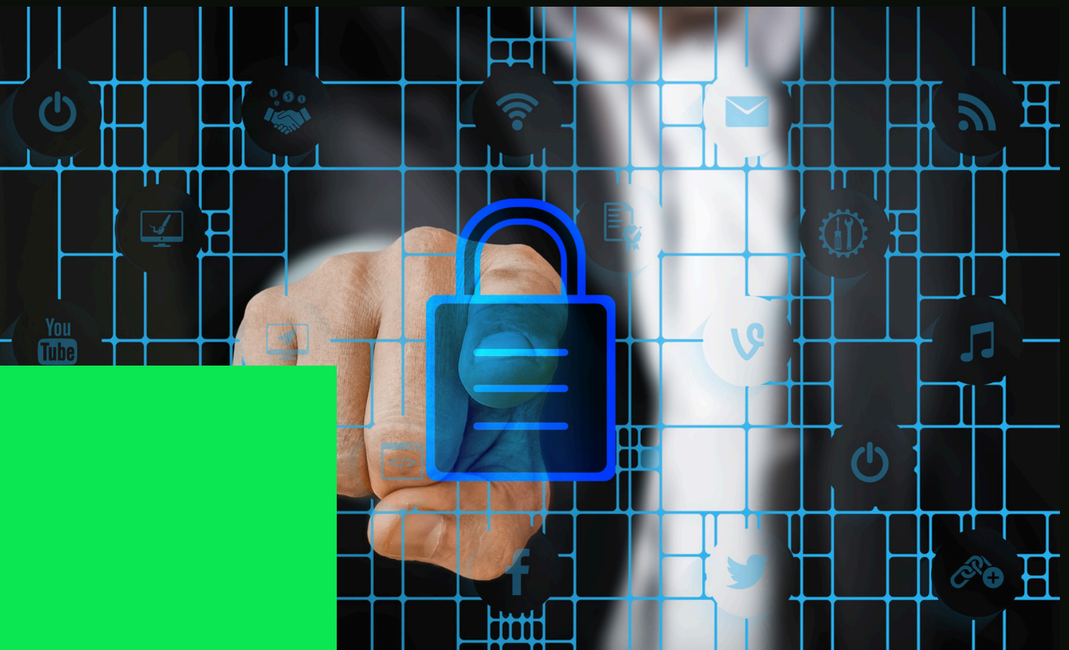
WHY IOT DEVICES ARE VULNERABLE?



•IoT devices are typically designed to be **low-cost, compact, and energy-efficient**. Due to these constraints, they operate with:

- Limited processing power
- Restricted memory capacity
- Low battery availability

•These factors make IoT systems more vulnerable to security attacks.

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ROLE OF CRYPTOGRAPHY IN IOT

•Cryptography forms the backbone of IoT security by ensuring:

- Confidentiality of data
- Integrity of transmitted information
- Authentication of devices

•Without cryptographic protection, IoT communication channels can be easily exploited.

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LIMITATIONS OF TRADITIONAL CRYPTOGRAPHY

Conventional cryptographic algorithms such as RSA and standard AES were designed for powerful computing systems. When implemented in IoT devices, they result in **high computational overhead**, increased energy consumption, and reduced device lifespan.

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NEED FOR LIGHTWEIGHT CRYPTOGRAPHY

To address the limitations of traditional cryptographic techniques, **lightweight cryptography** has been introduced. It aims to provide adequate security while operating efficiently within constrained IoT environments

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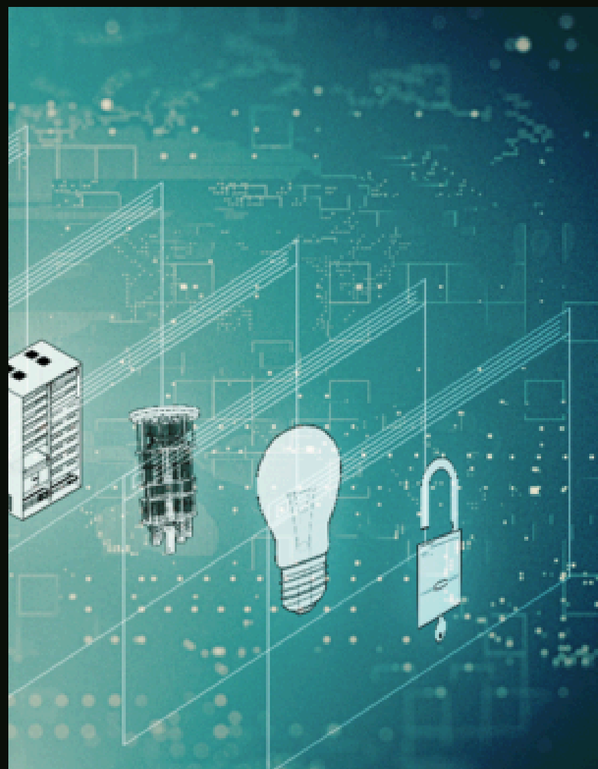
WHAT IS LIGHTWEIGHT CRYPTOGRAPHY?

Lightweight cryptography focuses on achieving **optimal security-performance balance**. It uses simplified mathematical operations, reduced key sizes, and efficient execution models suitable for resource-constrained devices.



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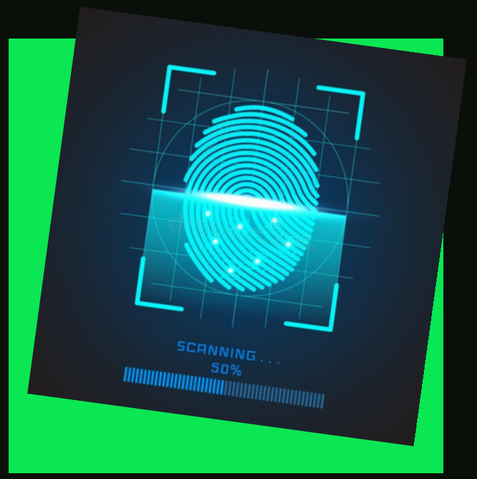
COMPONENTS OF LIGHTWEIGHT CRYPTOGRAPHY



•Lightweight cryptographic systems typically include:

- Lightweight encryption algorithms
- Lightweight hash functions
- Efficient authentication mechanisms

•These components work together to ensure secure communication.

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KEY MANAGEMENT IN IOT

• Effective key management is crucial for IoT security. Even the strongest cryptographic algorithm can fail if keys are poorly managed.

•Common approaches include:

- Pre-shared keys
- Dynamic key generation
- Secure key storage mechanisms

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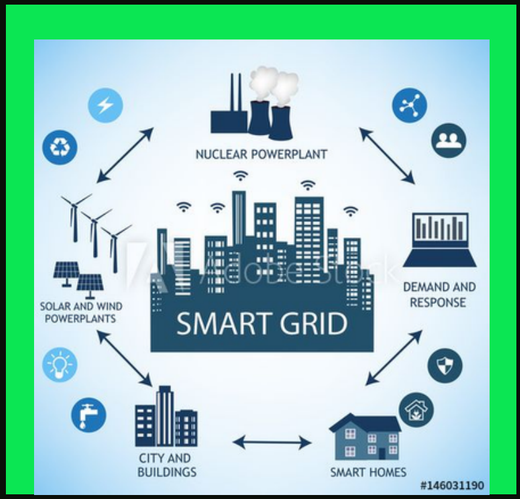
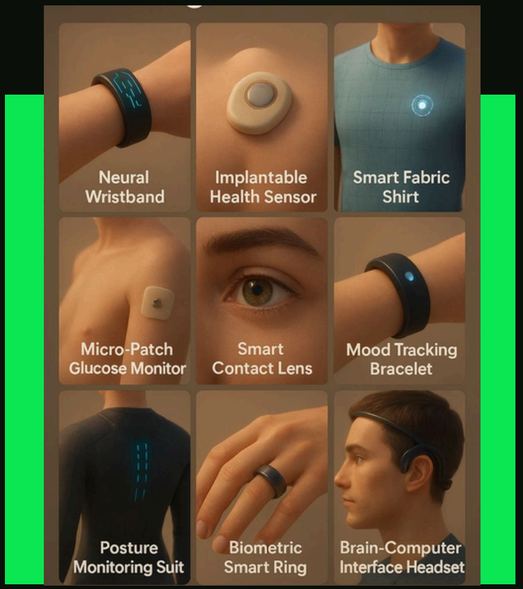
REAL-WORLD APPLICATIONS



Smart Grids

IoT systems



Wearable & healthcare

quantum computing

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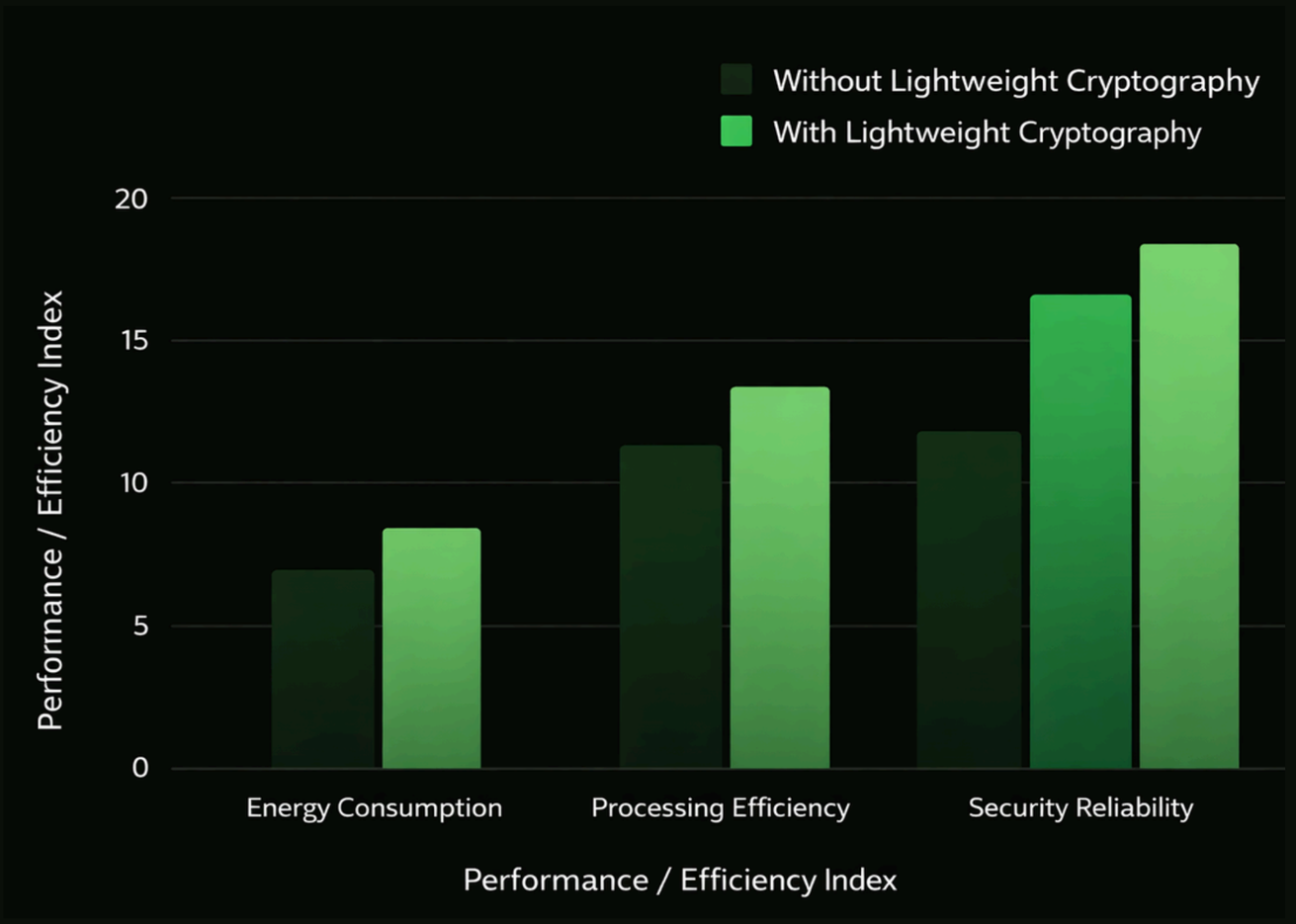
CHALLENGES AND FUTURESCOPE

Despite its advantages, lightweight cryptography faces challenges such as standardization, scalability, and resistance to advanced attacks.

Future research focuses on combining lightweight cryptography with **AI-assisted security** and hardware-based protection.



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CONCLUSION

Lightweight cryptography is essential for securing modern IoT systems. It is not about achieving maximum theoretical security, but about designing **efficient and practical security solutions** that fit IoT constraints

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CASE STUDY

Smart Healthcare Wearables secured using Lightweight Cryptography

Result: Secure patient data transmission, reduced power consumption, and extended device lifetime through efficient cryptographic design.

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BEST PRACTICES FOR INDIVIDUALS

Strong Passwords

Two-factor Auth

Avoid Suspicious Link

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THANK YOU!

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