

NuCypher

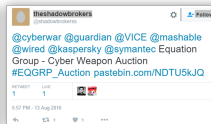
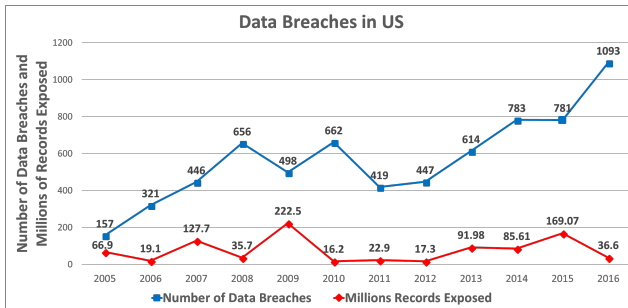
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Problem

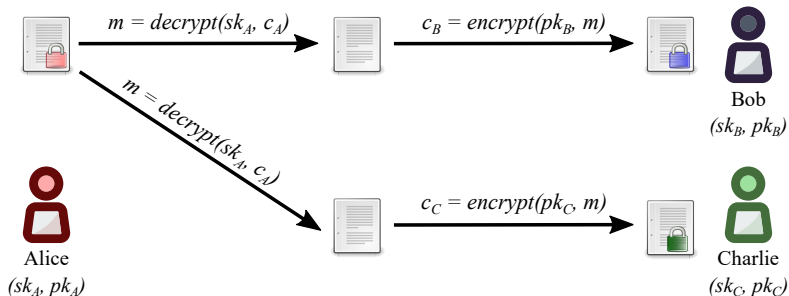
Data Breaches



Source:

<https://www.statista.com/statistics/273550/data-breaches-recorded-in-the-united-states-by-number-of-breaches-and-records-exposed/>

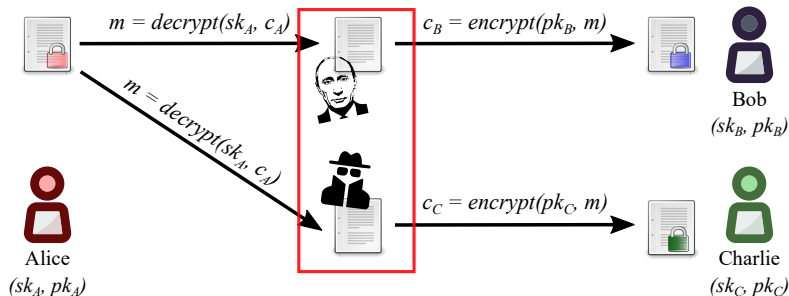
Public Key Encryption (PKE)



Limitations

- Decryption required before sharing
- Not scalable
- Complex access revocation

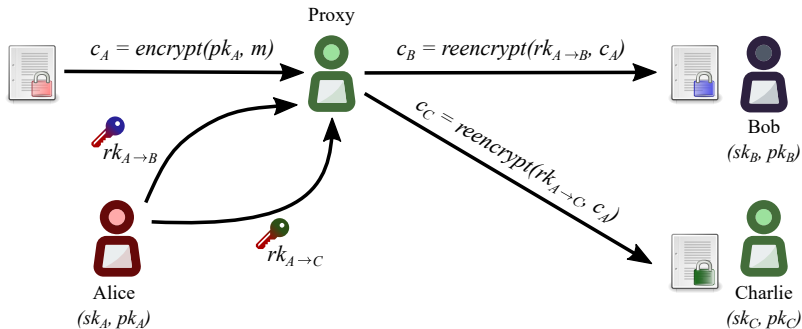
Public Key Encryption (PKE)



Limitations

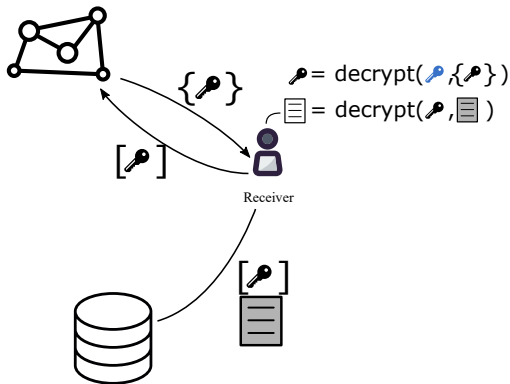
- Decryption required before sharing
- Not scalable
- Complex access revocation

What is proxy re-encryption (PRE)



Solution

Proxy Re-encryption + KMS

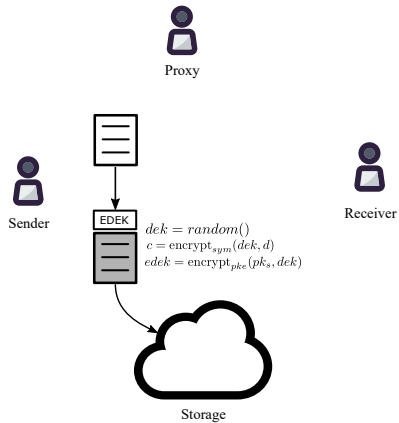


Advantages

- Data not decrypted to facilitate sharing
- Scalable and performant
- Access revocation through re-encryption key deletion

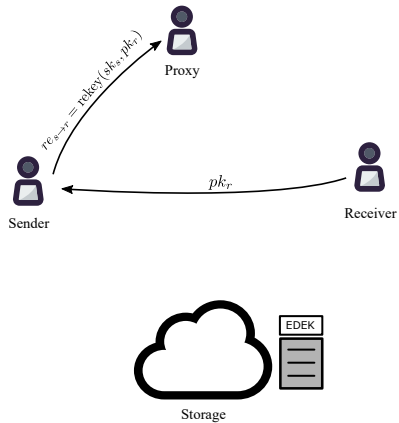
Centralized KMS using PRE

Encryption



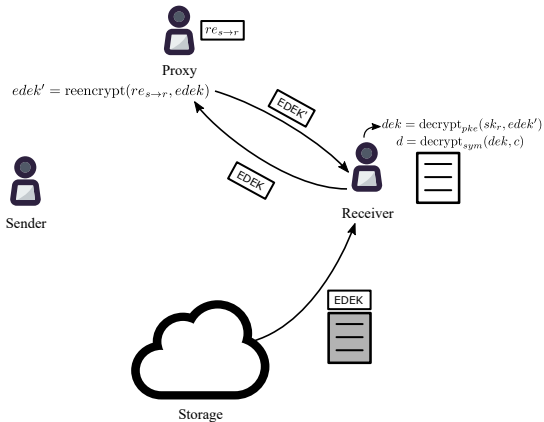
Centralized KMS using PRE

Access delegation



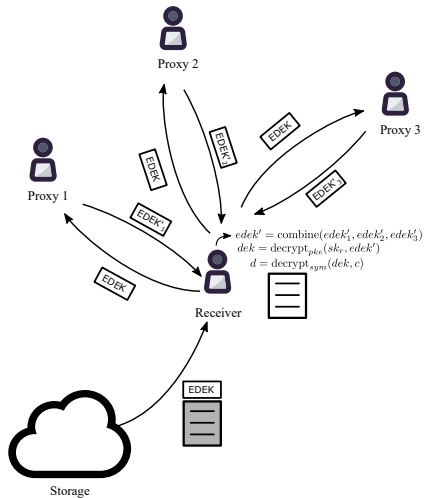
Centralized KMS using PRE

Decryption



Decentralized KMS using PRE

Using threshold split-key re-encryption (Umbral)



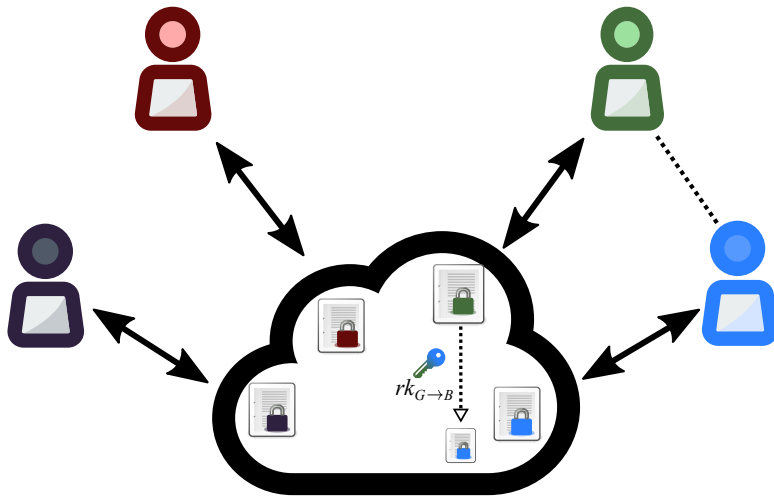
Decentralized KMS: Token

Purpose

- Splitting trust between re-encryption nodes (more tokens = more trust and more work)
- Proof of Stake for minting new coins according to the mining schedule
- Security deposit to be at stake against malicious behavior of nodes

Use Cases

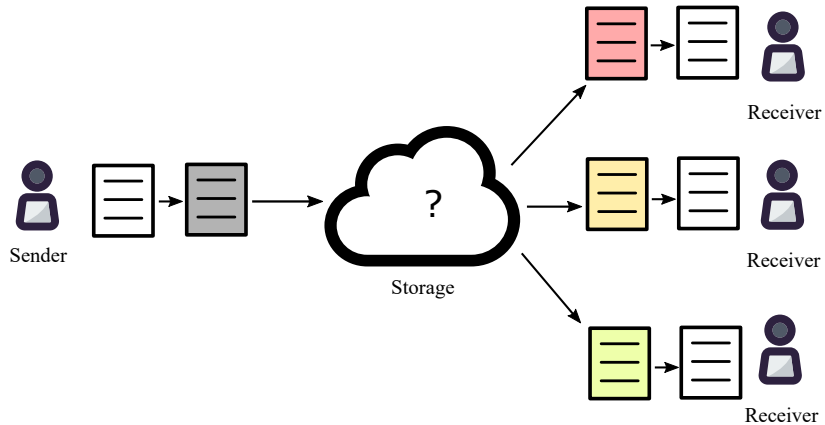
Multi-tenant, Multi-source Encrypted Data Lake



Encrypted Data Lake

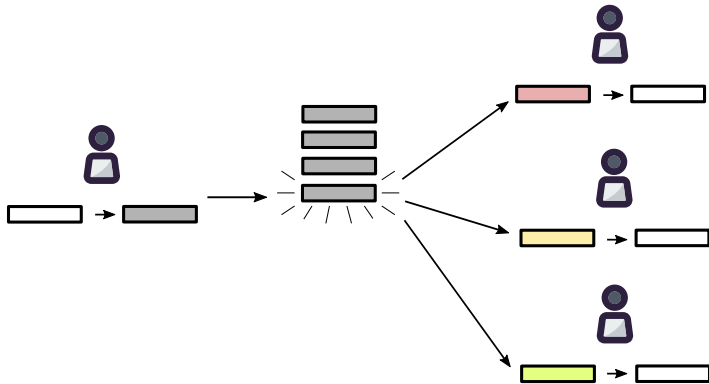
Use Cases

Encrypted file sharing



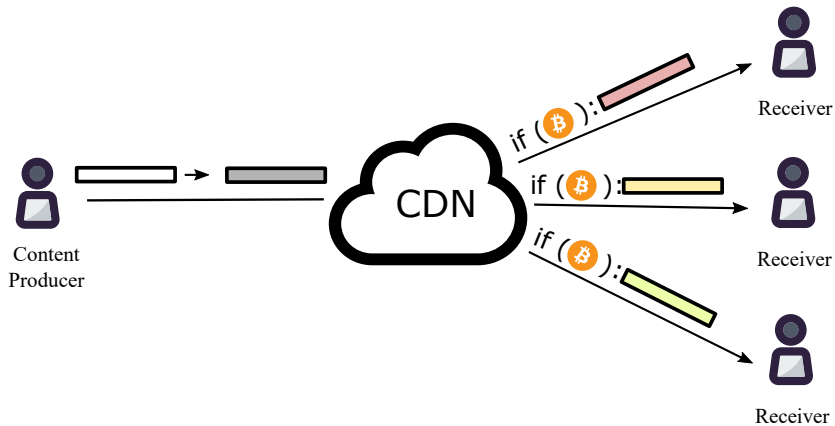
Use Cases

Encrypted multi-user chats



Use Cases

Decentralized Access-Controlled Content



Early Users

Decentralized Marketplaces



Decentralized Databases



Medical Data Sharing



Other



Competing Technology

Data Masking and Tokenization

- Less secure for data with underlying patterns
- Reduce the value of data by obfuscating it

Multi-Party Computation

- Slow Performance

Fully Homomorphic Encryption

- Slow Performance
 - ▶ NuCypher has made investments in this area

Investors

1kx

AMINO Capital

BASE



Blockchain Partners Korea

CoinFund

compound



DHVC

FIBIG
CAPITAL

FIRST MATTER



Kenetic
Capital



POLYCHAIN
CAPITAL

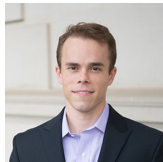
Satoshi•Fund

semantic
capital



Team

Founders



Advisors



9 employees

More Information



Website: <https://nucypher.com>

Whitepaper: <https://www.nucypher.com/whitepapers/english.pdf>

Github: <https://github.com/nucypher>

Discord: <https://discord.gg/7rmXa3S>

Email: derek@nucypher.com

Appendix: Umbral – Threshold Proxy Re-Encryption

Designed by: David Nuñez, University of Malaga, NICS Lab

- “Umbral” is Spanish for “threshold”
- PRE properties: Unidirectional, single-hop, non-interactive
- It follows a KEM/DEM approach:
 - ▶ UmbralKEM provides the threshold re-encryption capability
 - ▶ The DEM can be any authenticated encryption (currently ChaCha20-Poly1305)
- IND-PRE-CCA security
- Verification of re-encryption correctness through Non-Interactive ZK Proofs
- Code: <https://github.com/nucypher/pyUmbral/>
- Documentation (WIP): <https://github.com/nucypher/umbral-doc>