Kohaku Hardware Signer: First Post-Quantum Secure Element Implementation

Simon Masson, Renaud Dubois
ZKNox

Account Abstraction Hub

November 19th, 2025 – Buenos Aires, DevConnect

ZKNOX team

Nicolas Bacca
20^+ years experience (10^+y web3)
Security and hardware specialist
Prev. Ledger cofounder/CTO

Renaud Dubois
20^+ years experience (3^+y web3)
Cryptographer
Prev. Ledger, Thales

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  (secure enclaves, hardware wallets),
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  (TEE, HSMs),
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`https://zknox.eth.limo/`

`https://github.com/zknoxhq/`

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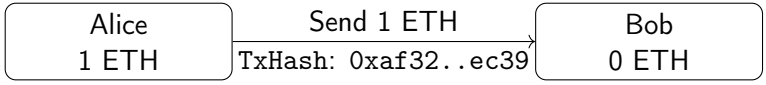

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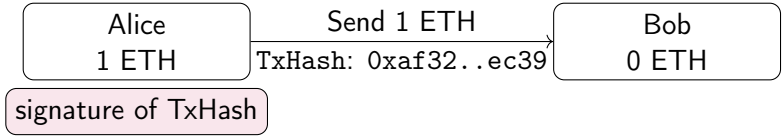

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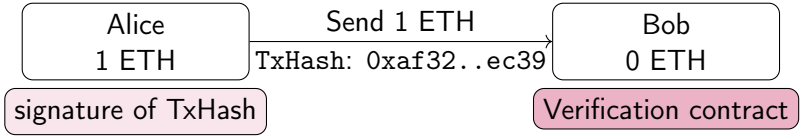

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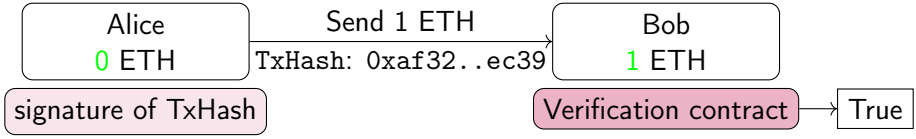

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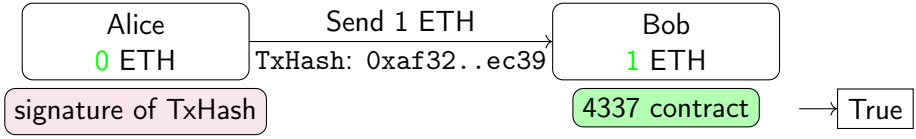

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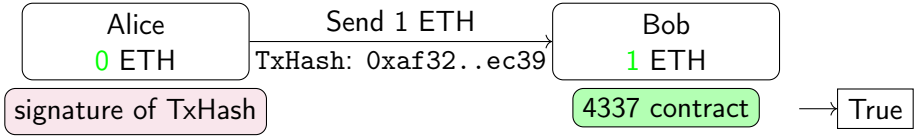

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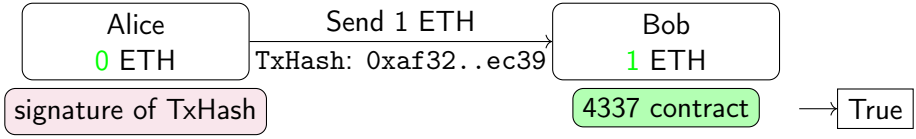

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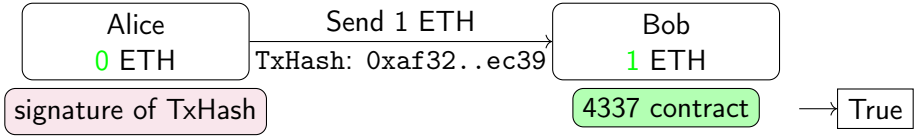

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This work:

- smart account with hybrid ECDSA+MLDSA verification,
- same user experience, but hardware and post-quantum security.

Post-quantum signature candidates

Standard	**FN-DSA**	**ML-DSA**	**SLH-DSA**
Name	Falcon	Dilithium	Sphincs
FIPS	203	204	205
Family	Lattice	Lattice	Hash
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Public key			
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We implement ML-DSA (Dilithium) following EIP 8051

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Two precompiles:

- ML-DSA-NIST: using the hash function SHAKE256 (compliant to NIST)
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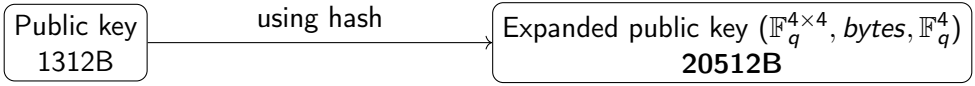

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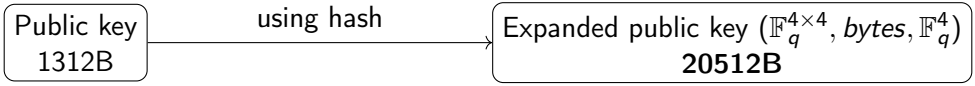

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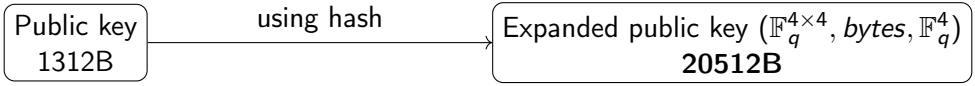

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Verifier cost: **5** calls to hash (SHAKE256 or KECCAK256) and **9** NTTs.

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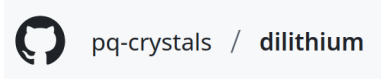

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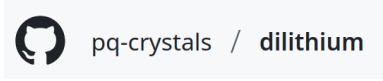

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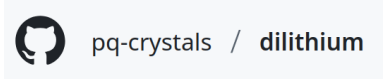

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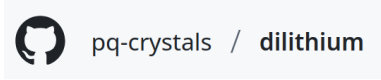

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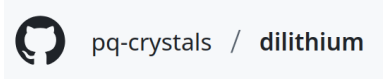

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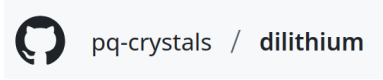

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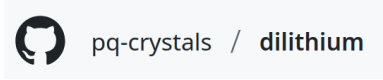

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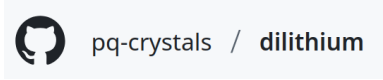

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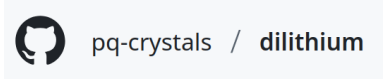

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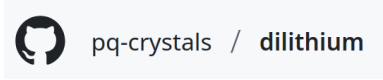

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- Soon on other HW...

Demonstration

Let's see how it works in practice

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Kohaku

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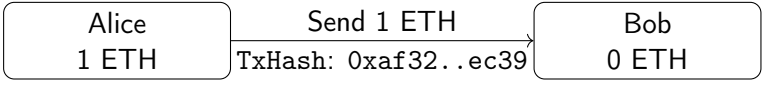

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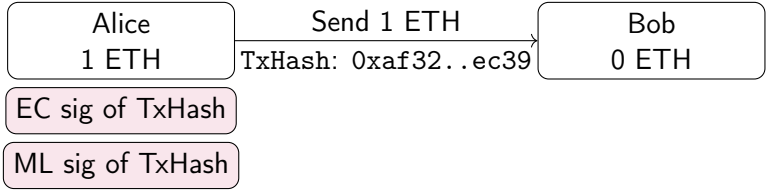

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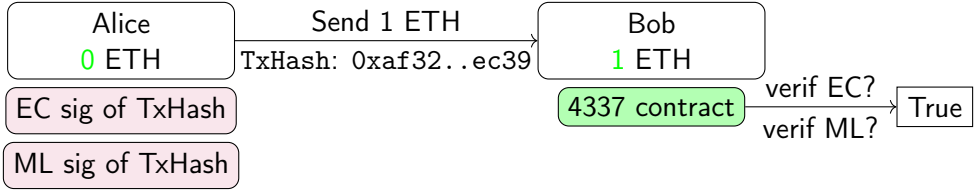

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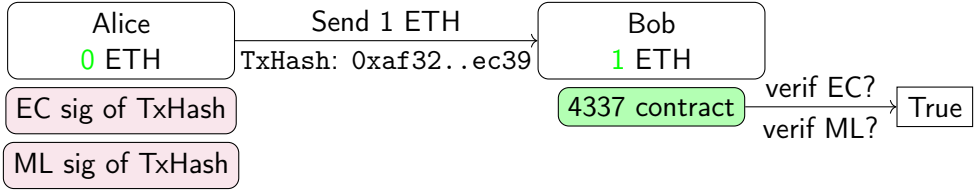

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