Classic McEliece on the ARM Cortex-M4

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9 June, 2021

Cycle counts on `stm32f4-discovery` (at 168 MHz)

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- Encapsulation time is close to that of lattice-based finalists.
- Decapsulation time is 4–7 times as slow but still reasonably efficient.
- Can trade decapsulation speed for key generation speed by omitting control-bit generation.

Public key generation: previous implementations

- For non-f parameter sets, the task is to convert $H = [M| \quad T \quad]$ into $[I|M^{-1}T]$.

1. Previous AVX/SSE implementations mostly by Chou
    - `supercop-20200531` and later versions.
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   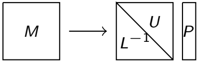

   $pk_i \leftarrow (U^{-1}(L^{-1}(PT_i)))$

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   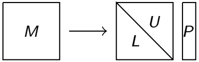

   Compute U^{-1} and L^{-1}, $M^{-1} \leftarrow U^{-1}L^{-1}P$, $pk_i \leftarrow M^{-1}T_i$

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- (new) Makes use of blocking to optimize multiplications by L^{-1} and U^{-1}.
- We use T_i's with 32/640 columns.
- Our implementation and (C) both support f parameter sets and decapsulation, while (RKK) does not.

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  - Want to reduce the number of memory accesses.
  - Divide pk into 4×96 blocks so that each piece of e can be reused.

https://github.com/pqcryptotw/mceliece-arm-m4