

From: Carlos Aguilar <carlos2831@gmail.com> via pqc-forum@list.nist.gov
To: yang.yu0986@gmail.com
CC: pqc-forum@list.nist.gov
Subject: RE: [pqc-forum] [New Paper] Shorter Hash-and-Sign Lattice-Based Signatures
Date: Monday, July 04, 2022 05:28:59 AM ET

Thank you, these results are great! I have not found what can be expected on the number of signatures/verifications per second.

Have you a constant time implementation that can provide such results? Or an educated guess?

Thanks,

Carlos

De : YANG YU <yang.yu0986@gmail.com>

Date : 04/07/2022 03:31 (GMT+01:00)

À : pqc-forum <pqc-forum@list.nist.gov>

Objet : [pqc-forum] [New Paper] Shorter Hash-and-Sign Lattice-Based Signatures

Dear all,

We would like to share with you our recent paper "Shorter Hash-and-Sign Lattice-Based Signatures" available at <https://eprint.iacr.org/2022/785>, which will be presented at CRYPTO 2022.

In this work, we propose techniques to reduce the size of hash-and-sign lattice-based signatures. When applied to Falcon-512, one approach yields 410-byte signatures with the same verification key size. The other approach yields 425-byte signatures and 576-byte verification keys, further improving upon the $|sig| + |vk|$ record of Falcon-512. The bit security in both cases is almost unchanged compared to the original scheme.

More concretely, there are three strategies explored and analyzed in the paper for reducing the size of hash-and-sign lattice-based signatures:

1. Improved efficient coding of Gaussian vectors.
2. Ellipsoidal Gaussian sampling.

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The first one reduces the signature size without any security loss and can directly apply to any scheme where a Gaussian vector is output on a public channel. It can be generalized to any non-uniform distribution with minimal overhead and can be implemented efficiently with off-the-shelf libraries.

The other two strategies are tailored for hash-and-sign signatures over NTRU lattices, and one will typically want to apply one or the other in combination with the first one. They present trade-offs between signature size and bit security. To this end, we conduct extensive cryptanalytic work to see how far we can go.

Finally, two takeaways are that:

1. We can achieve hash-and-sign lattice-based signatures at the NIST-I security level that are 4.9 times smaller than Dilithium2 signatures.
2. This results in lattice-based signature size intermediate between those of RSA-2048 and RSA-4096, with much faster signing and comparable verification performance.

Any questions, comments and suggestions welcome!

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Thomas Espitau, Mehdi Tibouchi, Alexandre Wallet, Yang Yu

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From: Mehdi Tibouchi <mehdi.tibouchi@normalesup.org> via pqc-forum@list.nist.gov
To: Carlos Aguilar <carlos2831@gmail.com>
CC: pqc-forum@list.nist.gov
Subject: Re: [pqc-forum] [New Paper] Shorter Hash-and-Sign Lattice-Based Signatures
Date: Tuesday, July 05, 2022 02:43:38 AM ET

Dear Carlos,

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We do not have an implementation, but the proposed techniques should have little impact on performance: encoding/decoding is negligible, and the FFT multiplications are not affected by the modified sizes of certain variables, so if you apply the techniques to e.g. Falcon-512, you should get basically the same speed as the original scheme.

More precisely, referring to strategies 1–3 in the previous email, doing 1+2 should have basically no effect on either signing or verification, whereas doing 1+3 has basically no effect on signing, but would have a moderate effect on verification efficiency, since using a smaller q requires replacing the full NTT used in Falcon verification by some other multiplication algorithm (partial NTT, FFT or Karatsuba/Toom-Cook may all be suitable depending on the shape of q and the target platform). The difference should be fairly small still.

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Subject: Re: [pqc-forum] [New Paper] Shorter Hash-and-Sign Lattice-Based Signatures
Date: Tuesday, July 05, 2022 05:44:33 AM ET

That's quite nice!

Thank you for your reply

Best,

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Le mar. 5 juil. 2022 à 08:43, Mehdi Tibouchi <mehdi.tibouchi@normalesup.org> a écrit :

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From: Doge Protocol <dogeprotocol1@gmail.com> via pqc-forum@list.nist.gov
To: pqc-forum@list.nist.gov
CC: mehdi.t...@normalesup.org <mehdi.tibouchi@normalesup.org>, pqc-...@list.nist.gov <pqc-forum@list.nist.gov>, carlo...@gmail.com <carlos2831@gmail.com>
Subject: Re: [pqc-forum] [New Paper] Shorter Hash-and-Sign Lattice-Based Signatures
Date: Tuesday, July 05, 2022 12:30:36 PM ET

Is an implementation in the works? If so, any timeline for an implementation, so that performance can be quantitatively measured?

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