Hi all,

We would like to thank Oscar Garcia-Morchon, Ludo Tolhuizen and Sauvik Bhattacharya for pointing out a mistake in our submission.

In the submission, we claimed that hybrid attacks are no better than lattice reductions under core sieving model. This is not correct for LAC192 under classic core sieving model. Under this model, hybrid attacks takes roughly $2^{278}$ operations, which exceeds the pure lattice reduction at 286 bit operations. This is because in LAC192 parameters, we have used a very sparse secret/error distribution from fixed hamming weight ternary distribution (i.e., 128 +/-1s, 768 0s). We overlooked the fact that hybrid attack is more efficient for this sparse secret. We have given a revised estimation for our parameter set:

In summary,
* the analysis of LAC128 and LAC256 remain intact.
* the security of LAC192 against quantum computers also remains unchanged.
* the security of LAC192 against classical computers dropped to 278 from 286.

This revision does not affect the security category that each parameter set is aiming for, thanks to the adequate security margin we have build in.

Regards,
Zhenfei (on behalf of the LAC team)
Dear LAC team,

could you maybe clarify how was the cost of the hybrid attack estimated? In particular, some schemes assume for simplicity (and/or conservativeness) a collision probability of 1 (NTRUprime maybe?), though it can sometime be *much* lower according to https://eprint.iacr.org/2016/733.pdf.

Unfortunately the link to Thomas Wunderer' script seems dead, I'll poke him to see if it can be dug up... Cross-checks would be valuable.

More nitpicky: are the calls to Nearest-plane algorithm costed to 1, or to ~d^2 (or maybe something else) ?

Best regards
-- Leo Ducas

Le mardi 23 avril 2019 14:10:27 UTC+2, zhenfei zhang a écrit :

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Visit this group at https://groups.google.com/a/list.nist.gov/group/pqc-forum.
Hi Leo,

For conservative purpose
* the cost of NP is set to 1
* the probability of collision is also 1

We take the usual approach of estimating the cost.
1. cut the lattice basis $B$ into two sublattices with basis $B_1$ and $B_2$, with $\dim(B_1) = \ell$, $\dim(B_2) = \dim(B) - \ell$
2. find the best $\ell$ such that
   a. $BKZ(B_1) = \text{Search}(B_2)$
   b. BDD can be solved with reduced $B_1$ (under GSA assumption) and NP algorithm

// note Wunderer suggested GSA is different for q-array lattices; our analysis didn't take this into account

In both classic and quantum setting, the cost of search is set to the square root of the entropy. The cost of BKZ is estimated by either classical core sieving or quantum core sieving model.

Zhenfei

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On Tue, Apr 23, 2019 at 12:42 PM Leo Ducas <leo.ducas1@gmail.com> wrote:

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Thanks for the prompt and precise answer Zhenfei,

// note Wunderer suggested GSA is different for q-array lattices; our analysis didn't take this into account

Could you elaborate a bit more? Do you mean that you use a straight GSA line rather than a broken line: flat for q vectors followed by the GSA slope? Or something more subtle?

Best regards
-- Leo
--
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> Could you elaborate a bit more? Do you mean that you use a straight GSA line rather than a broken line: flat for q vectors followed by the GSA slope? Or something more subtle?

My bad. It is still a flat then slope line.

I meant to say that we didn't use the formula (2) and (3) of A.2 from https://eprint.iacr.org/2016/733.pdf. We used John Schanck's script https://github.com/jschanck/estimator. The precise formular is https://github.com/jschanck/estimator/blob/fbf5f7181a6583dd22927fc4a1c69501214f6c29/estimate.gp#L101

Zhenfei

On Tue, Apr 23, 2019 at 1:57 PM Leo Ducas <leo.ducas1@gmail.com> wrote:

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Zhenfei Zhang
Cryptography Engineer
W: zhenfei@algorand.com
P: zhangzhenfei@gmail.com
https://www.algorand.com
https://zhenfeizhang.github.io
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Dear LAC team,

In your LAC code, is `ecc_bytes' calculated by $\frac{m*t+8-1}{8}$?
According your description, the byte length of error correcting code is 18 in LAC128 because of t is 16.

However, on ‘Constant-time BCH Error-Correcting Code’ (eprint.iacr.org/2019/155.pdf), their ecc is only 31 bytes for 29 bits error.
BCH(511, 264, 59)
$\frac{9*29+8-1}{8}=33!=31$

Best regards,
JongHyeok Lee