NIST PQC STANDARDIZATION

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MITIGATE THE THREAT OF QUANTUM COMPUTERS

Standardize cryptosystems for classical computers believed to be resistant to attacks from both classical and quantum computers

PQC STANDARDIZATION PROCESS

TIMELINE

2016: Call for Submissions

2017 (Round 1):
69 out of 82 submission accepted

2019 (Round 2):
26 candidates

2020 (Round 3):
7 finalists
8 alternates

End 2021:
4/5 primitives selected

2022:
New call for Signatures

2022 – 2023:
Draft Standards

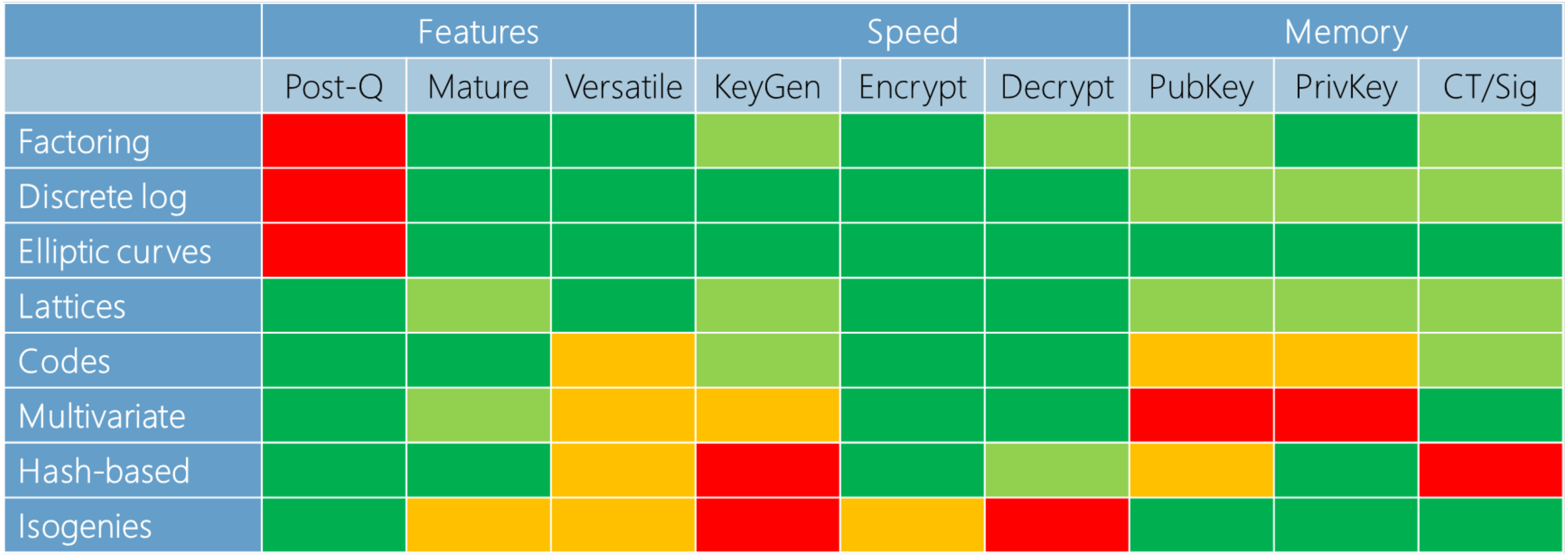
2022:
Round 4 for alternates

2024:
Standards Publication

ROUND 3 FINALISTS

	Signature		Encryption	
	Finalist	Alternate	Finalist	Alternate
Lattice	Dilithium Falcon		Kyber NTRU SABER	FrodoKEM NTRU Prime
Code			McEliece	Bike HQC
Multivariate	Rainbow	GeMSS		
Hash/Symmetric		Picnic SPHINCS+		
Isogeny				SIKE
Total	3	3	4	5

COMPARISON BETWEEN THE TYPES OF PRIMITIVES



OTHER PQC INITIATIVES

Migration zu
Post-Quanten-Kryptografie

Handlungsempfehlungen des BSI

Stand: August 2020

- NBV/BSI recommendations for early adopters
  - FrodoKEM
  - McEliece
- IEEE, ETSI, IETF, ISO, …
- Initiatives in other countries
- …

ATTACK ON RAINBOW
FEBRUARY 21, 2022

- Impact:
  - Still exponential complexity
  - Shift in parameters
  - Only impacts the multivariate schemes

Breaking Rainbow Takes a Weekend on a Laptop

Ward Beullens

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NEW CALL FOR PQC SIGNATURES
MAIN GOAL: DIVERSIFY THE SIGNATURE PORTFOLIO

- Little diversity in round 3
  - Both multivariate schemes suffered attack improvements (Rainbow and GeMSS)

- NIST might standardize the alternate signature candidate SPHINCS+

- Call opens shortly after coming NIST announcement
  - Submission deadline: January 2023

ISOGENY BASED KEY EXCHANGE BECOMING FASTER

MARCH 18, 2022: ~30% SPEED-UP

Efficient Algorithms for Large Prime Characteristic Fields and Their Application to Bilinear Pairings and Supersingular Isogeny-Based Protocols

Patrick Longa

Microsoft Research, USA
plonga@microsoft.com

IMPROVED DUAL LATTICE ATTACK
APRIL 4, 2022: BY MATZOV – ISRAEL

Report on the Security of LWE:
Improved Dual Lattice Attack

The Center of Encryption and Information Security – MATZOV*†
IDF

OPENSSH 9.0
APRIL 8, 2022 - HYBRID ENCRYPTION BY DEFAULT

- One of the first PQC in production
  - Mitigates *store-now-decrypt-later* attacks
- NTRU Prime - Alternate NIST candidate
  - Neither a conservative choice
  - Nor a NIST finalist

THANK YOU FOR YOUR TIME

TNO innovation for life

CWI