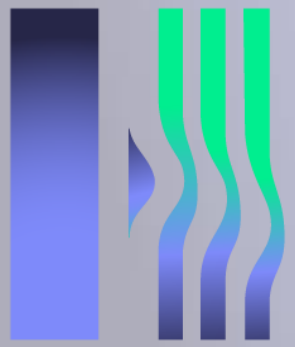


The HAPKIDO Project

Dr. Gabriele Spini, TNO

Part 1:
HAPKIDO, present and past

The Hapkido Project | Dr. Gabriele Spini

HAPKIDO

The project in a nutshell 1/2

- Hybrid Approach to quantum-safe Public-Key Infrastructure Development for Organizations
- Goal: study migration to hybrid quantum-safe PKIs in all aspects

- Technical
  - Provide proof-of-concept of PKI for different sectors/applications/use cases
  - Provide migration roadmap
- Fundamental
  - Study cryptographic security of combiners
- Policy and management
  - Governance study
  - Societal impact assessment
  - Raising awareness

HAPKIDO

The project in a nutshell, 2/2

- 5-year project, started in fall 2021
- Financed by Dutch Research Council
- Involves Dutch organisations, international ambitions
- 4 sectors as per project proposal:
  1. Telecommunications
  2. Public sector
  3. Healthcare
  4. Financial

The Consortium

Great challenges demand great teams

CWI

- Cryptographic research

TU Delft

- Policy & Management

Microsoft

- TSP, Moving to higher TRL

kpn

- TSP, test lab

Logius
Ministerie van Binnenlandse Zaken en Koninkrijksrelaties

- Digital government, policy authority “PKI govt”

ZYNYO.

- Provider of digital identification & signing services

TNO

- Coordination, PoC development

The focus so far: document electronic signatures

- For this first phase of project:
  focus on PKIs for digital signing of (PDF) documents

- Often legally binding, regulated in e.g. eIDAS
- Relevant standards: ETSI (e.g. PAdES)

- Free and open source signing software provided by European Commission (not QS)

- Motivation:
  - Less studied than e.g. PKI used for TLS (same certificate format, other challenges)
  - Relevant to consortium partners

The Progress so far

Management-and-policy track

- Three main lines of work:

- Societal impact assessment
  - Report soon to be finished

- Governance
  - Identified challenges in transition to QS PKI for public sector: https://dl.acm.org/doi/10.1145/3543434.3543644

- Serious game to raise awareness
  - Requirements identified, moving to next phase

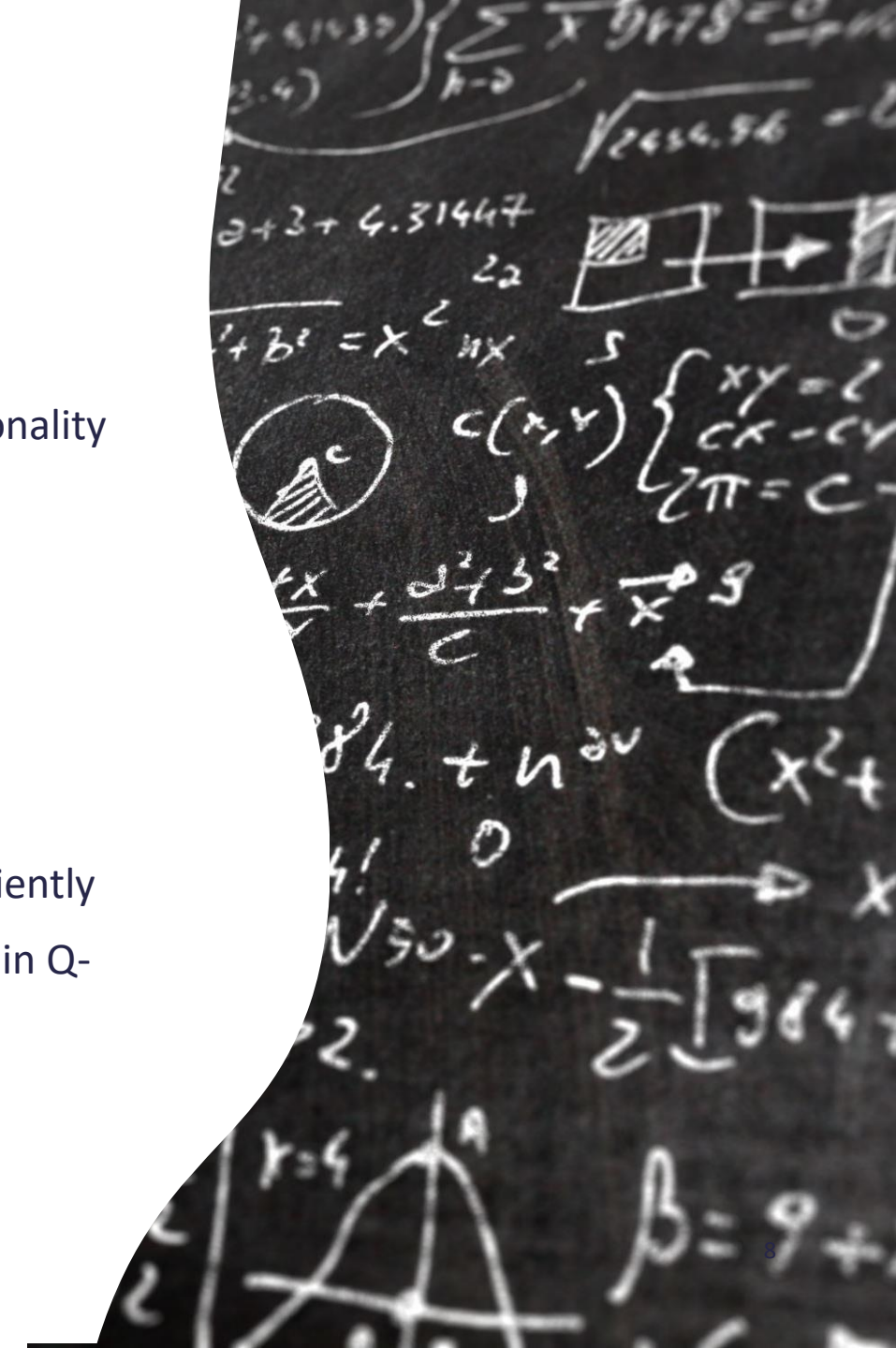
The Progress so far

Cryptographic track

- Focus on cryptographic combiners
  - Combine several cryptographic schemes into one, having same functionality
  - Secure if at least one component secure

- Especially for KEM combiners, often no security proof in Q-ROM

- A first result:
  - Compiler to turn adaptive oracle-based schemes into static ones, efficiently
  - Consequence: construction of KEM combiner from PRF proven secure in Q-ROM
  - https://eprint.iacr.org/2022/773



The Progress so far

Technical track

- First PoC due end 2023

- Some first observations:
  - Hybrid certificates standardized by ITU-T since 3 years, but not yet commonly implemented in free certificate-management tools:
    need to pay or implement own tool
  - Little crypto agility for e.g. of document-signing software: multiple schemes not taken into account
  - Need to collaborate to upgrade standards

Part 2:
The Future of HAPKIDO

HAPKIDO

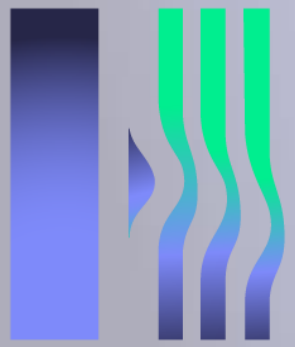
Looking forward: 2023

- First PoC version
- Societal impact assessment, including dissemination video
- Requirement analysis
- Report on quantum-safe cryptographic combiners

HAPKIDO

Looking forward: 2024 and beyond

- More PoCs with different applications
- Awareness-creation game
- Massive Online Open Course
- Self-assessment tool
- Enrich website https://tno.nl/hapkido



Thank you for your attention!

Interested? gabriele.spini@tno.nl

Dr. Gabriele Spini