2 February 2025

The CHERI Alliance

Getting security embedded into electronic systems

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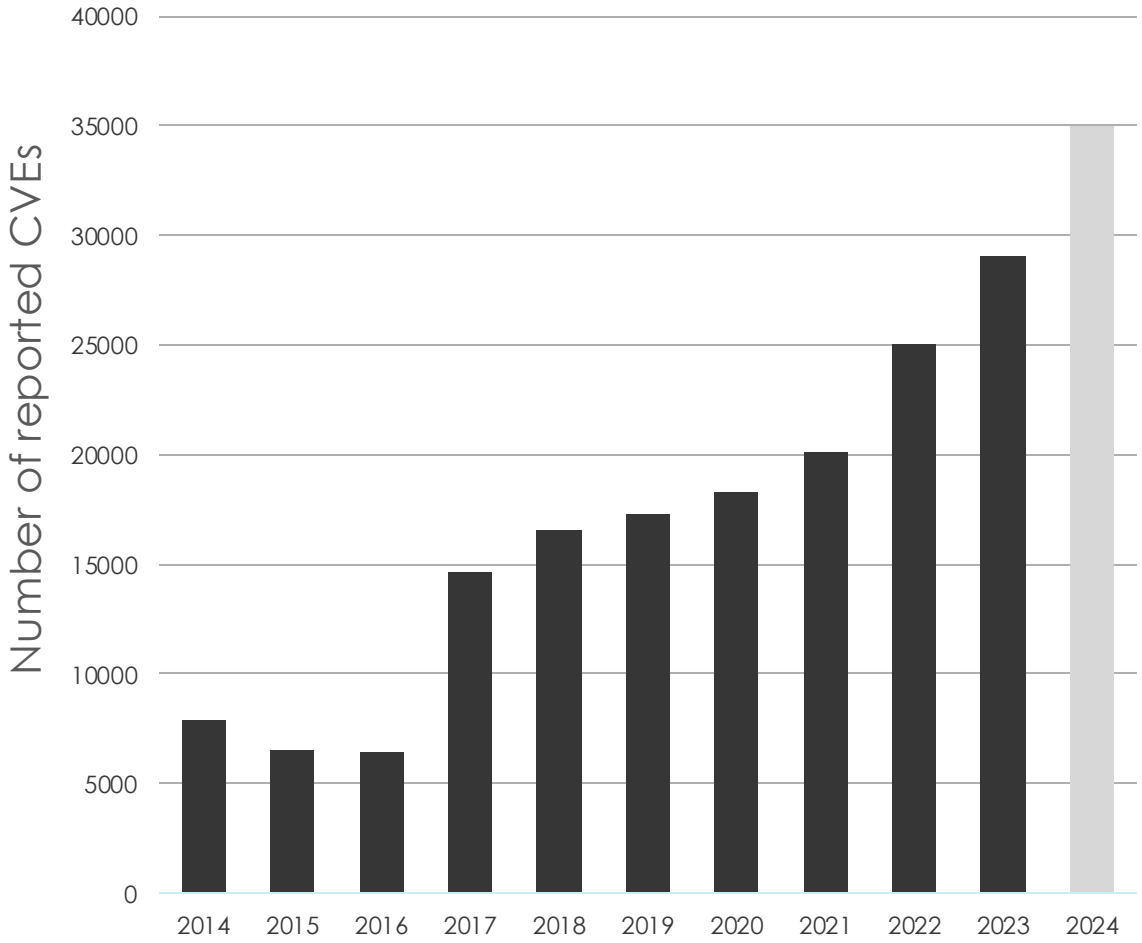
lowRISC – Founding Member of the CHERI Alliance

Agenda

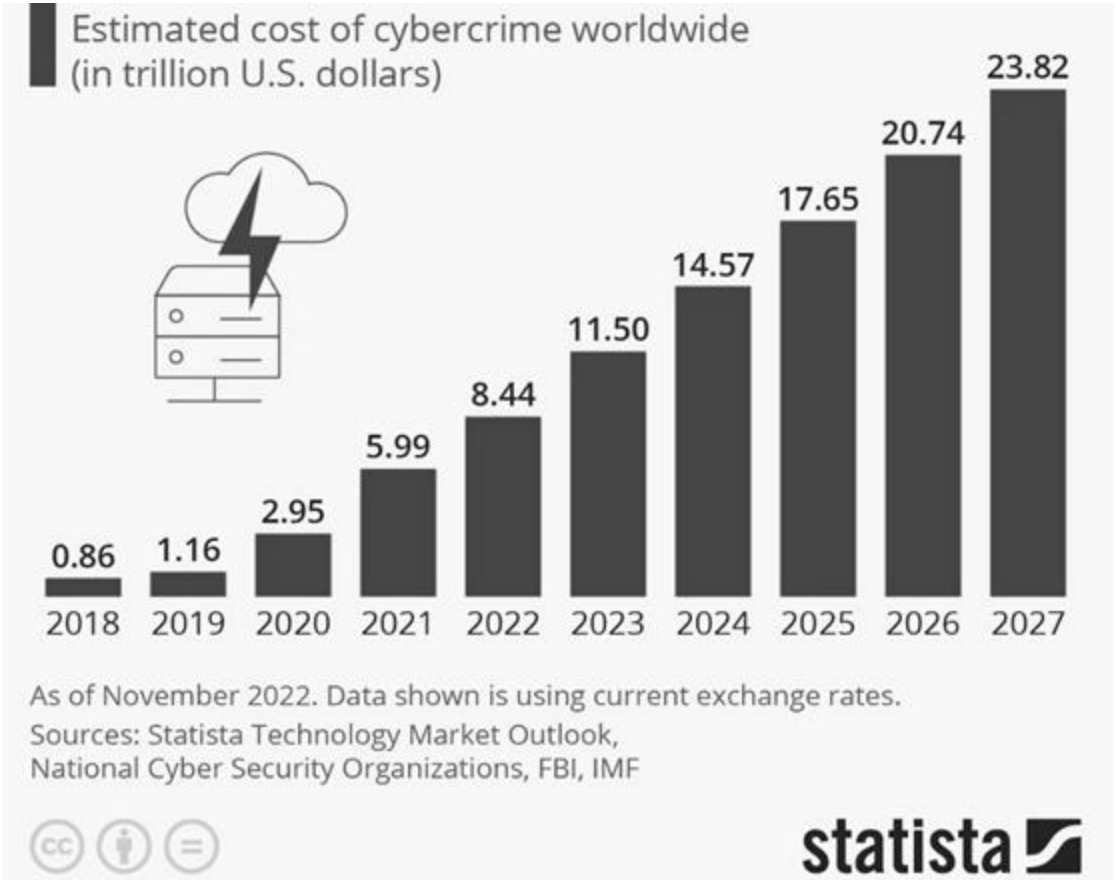
- The memory safety problem
- CHERI technology
- The CHERI Alliance

The memory safety problem

Software vulnerabilities are causing increasing risk

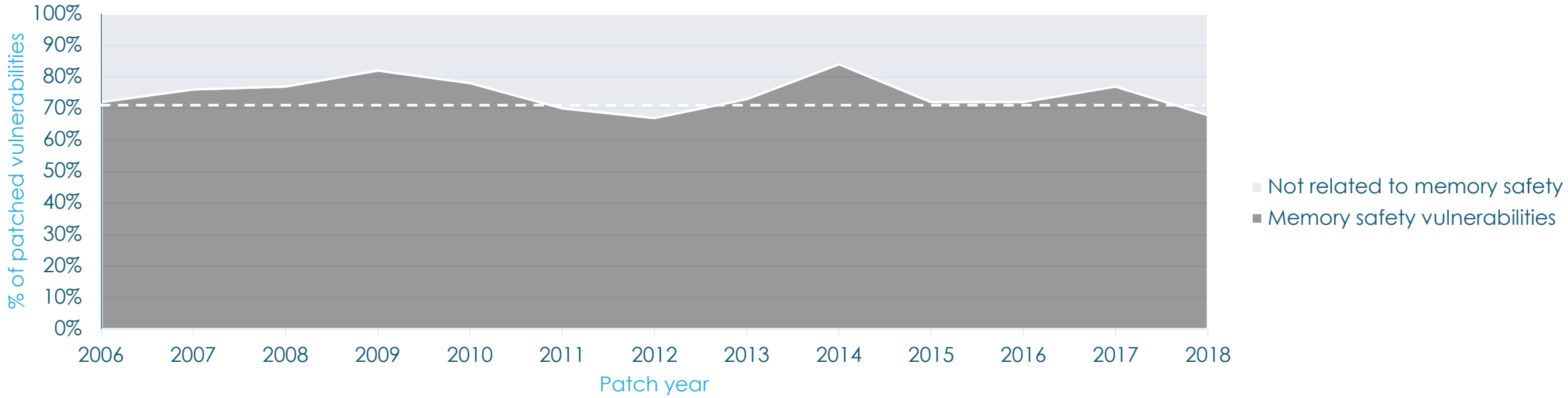


Source: Mitre



The main problem is (the lack of) memory safety

- Memory abuse (e.g. buffer overflows) is the main attack vector
- Constant ratio of over the past 20 years



Source: Trends, challenge, and shifts in software vulnerability mitigation - Microsoft 2019

Possible solutions for memory safety

✗ Use “memory safe” languages like Rust or .Net

- Requires rewriting trillions of lines of C/C++ code
- Possible for new code, but no compartmentalisation

✗ Use “coarse-grained” techniques like stack “canaries”

- Helpful, but they statistically leave too many holes
- Hacking techniques already developed

✓ Use “fine-grained” techniques like CHERI

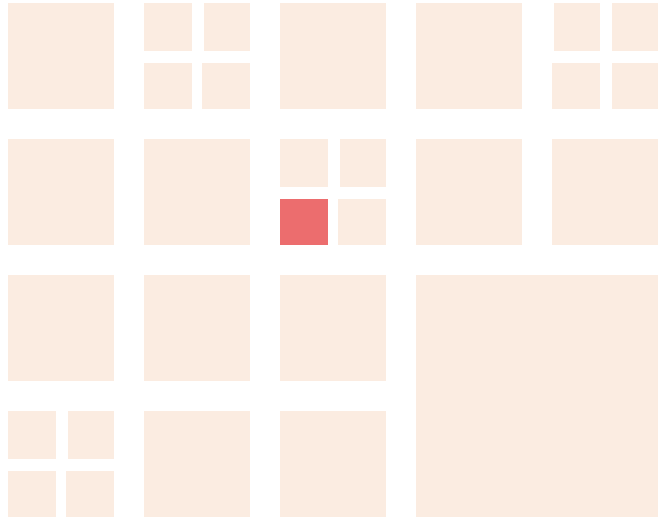
- Best option, but needs new hardware

CHERI technology

Capability
Hardware
Enhanced
RISC
Instructions

CHERI

- Benefits
  - Deterministic, fine-grained **memory protection**
  - Scalable **compartmentalization**
- An architectural solution
  - Works with existing software
  - Protects software with hardware
  - Extension of conventional hardware ISAs



Compartmentalization prevents contagion

CHERI and the UK

- Initiated by a project from

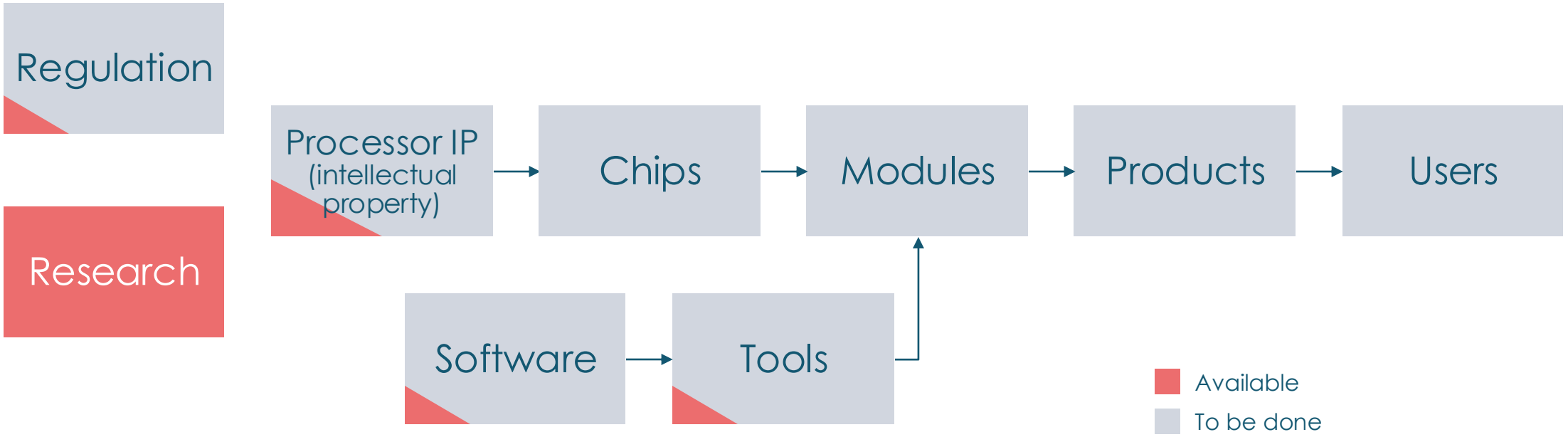
- Originally developed by

- Matured for 14 years
- Supported by

Getting CHERI adopted

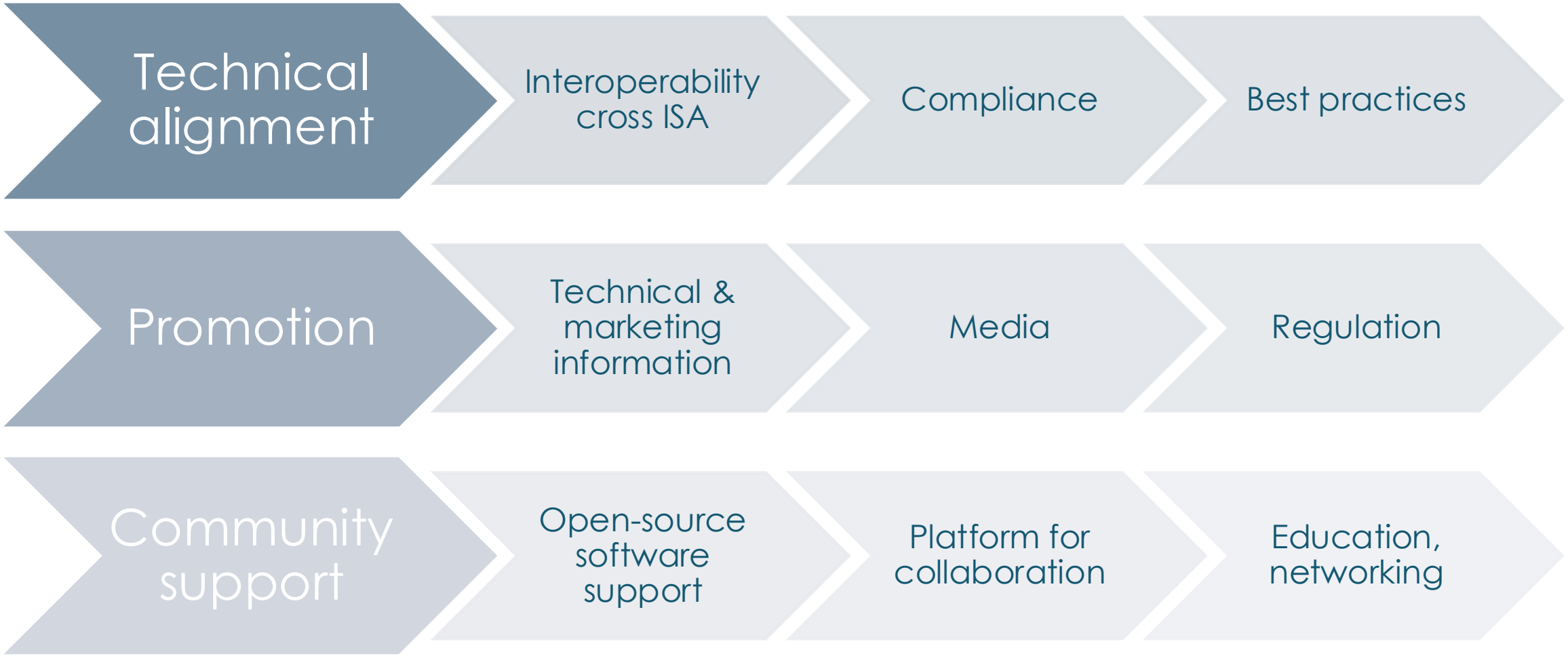
Show benefits
Make it easy to adopt
Highlight risks (lack of security / upcoming regulations)

How to stimulate the industry?



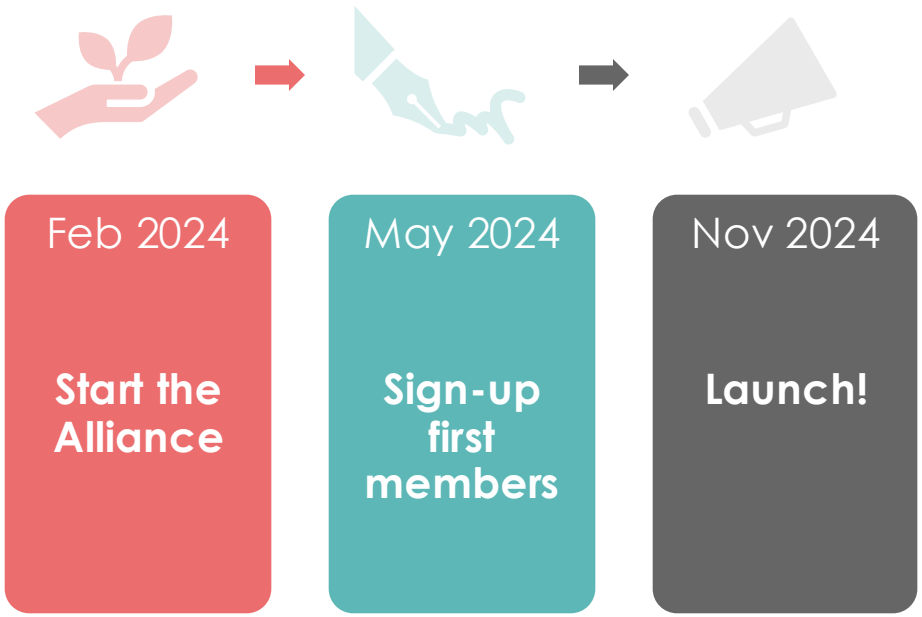
The CHERI Alliance

Role of the CHERI Alliance



An independent entity

- ISA-agnostic
  - CHERI could be added to Arm, x86, MIPS, RISC-V, …
- Worldwide reach
- Not just one company
  - Need broad industry adoption
  - Need a community
- Financed by the industry*



* with financial support from

Department for Science, Innovation, & Technology

Founding members of the CHERI Alliance

CHERI and the UK

- Largely developed by University of Cambridge
  - Involvement of many other UK universities
- Strong local expertise
  - E.g. CHERI design teams located in Bristol, Cambridge, …
- Support by

[dstl]

National Cyber Security Centre
a part of GCHQ

Department for Science, Innovation, & Technology

UK Research and Innovation

Benefits for members

Demonstrate security leadership

Network, collaborate and exchange

Accelerate adoption of CHERI

Share promotion costs

Activate the community

Join us!

CHERI

THANK YOU

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