The Arm Architecture: The Path to the Future of Computing

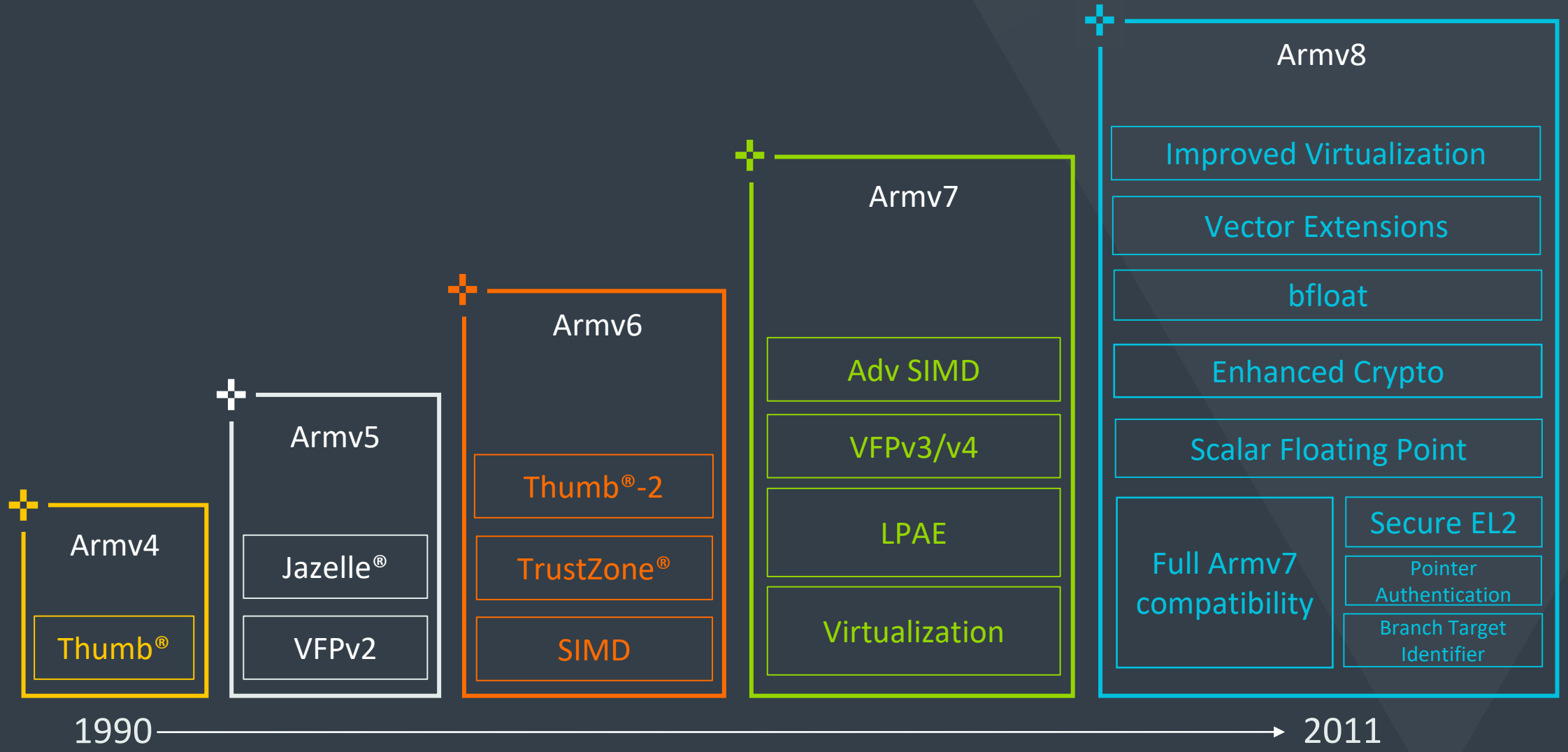
Next Generation Arm Architecture:Armv9

PC Cluster Workshop in Kashiwa 2021

Toshinori Kujiraoka, OEM Sales & APAC HPC at Arm

June 18, 2021

The Arm Architecture: Continually Innovating and Evolving

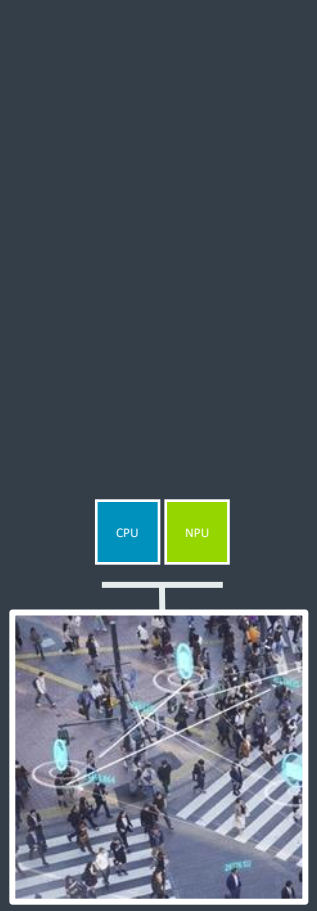


Arm at All Stages in a Connected World

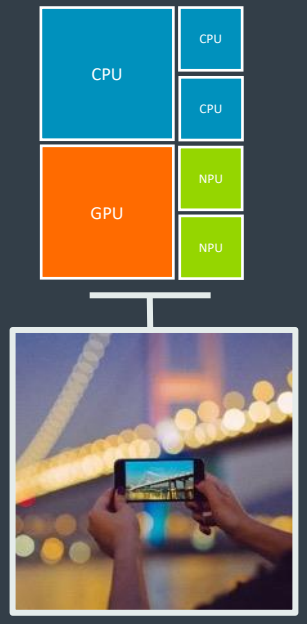
100%

of shared data
will be processed securely on an Arm-based system *at the endpoint, edge or cloud*

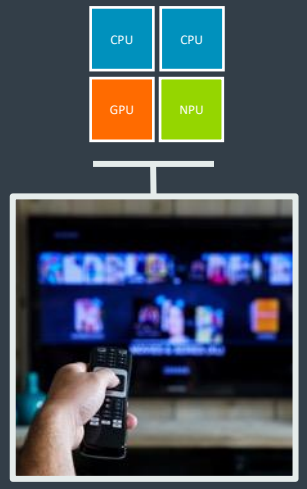
Specialized Processing Is the Key to Compute Innovation



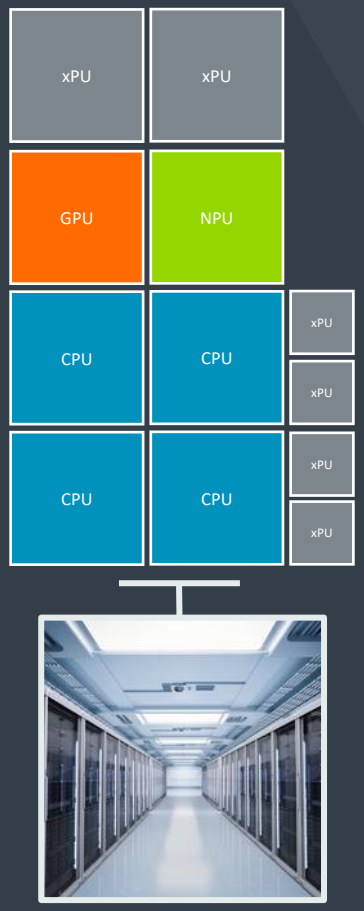
IoT



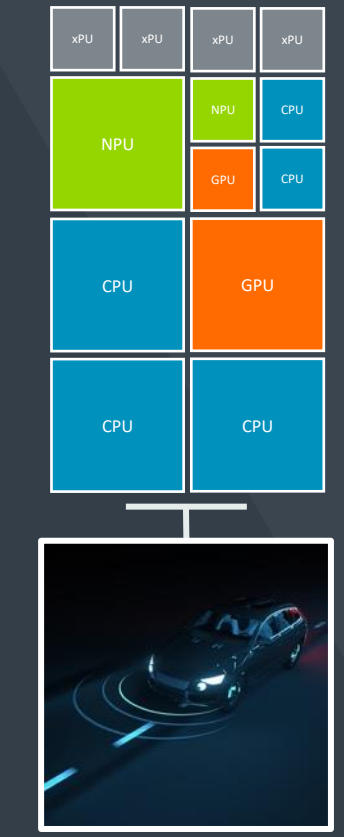
Mobile



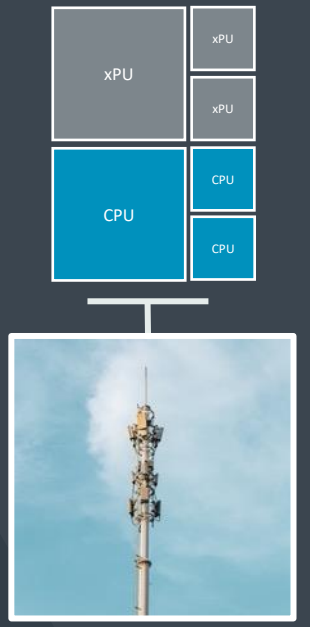
Home



Server



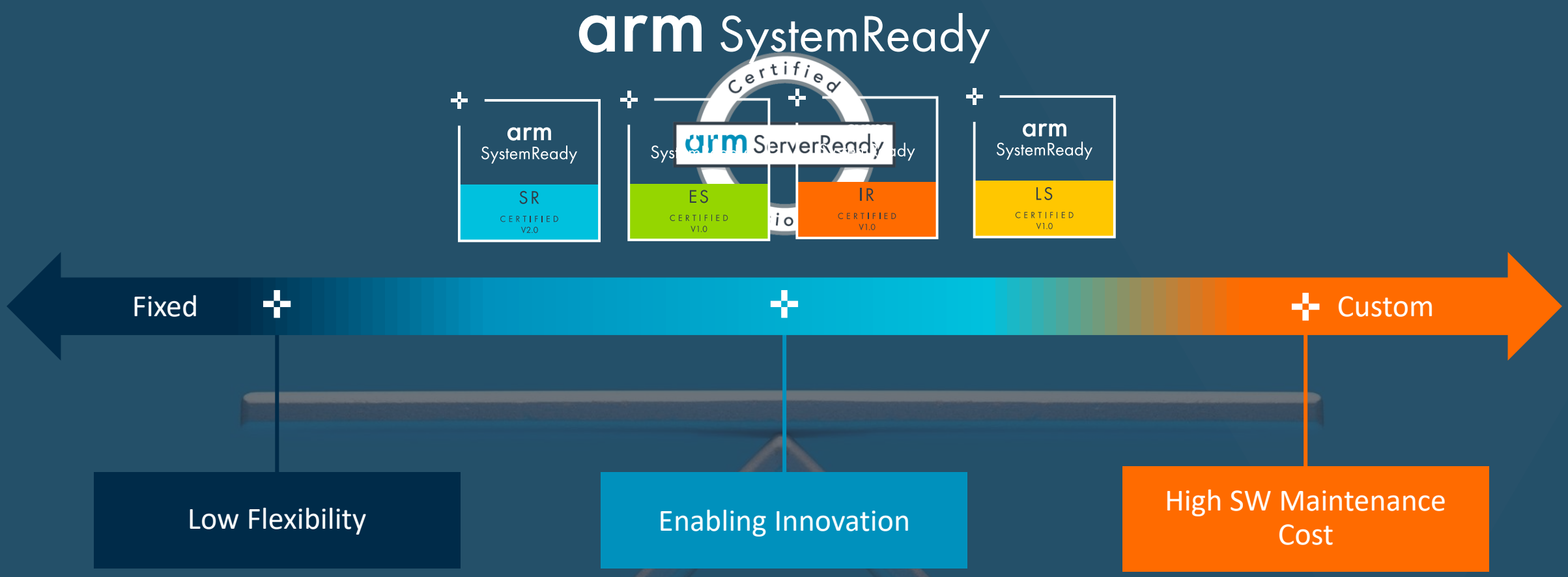
Automotive



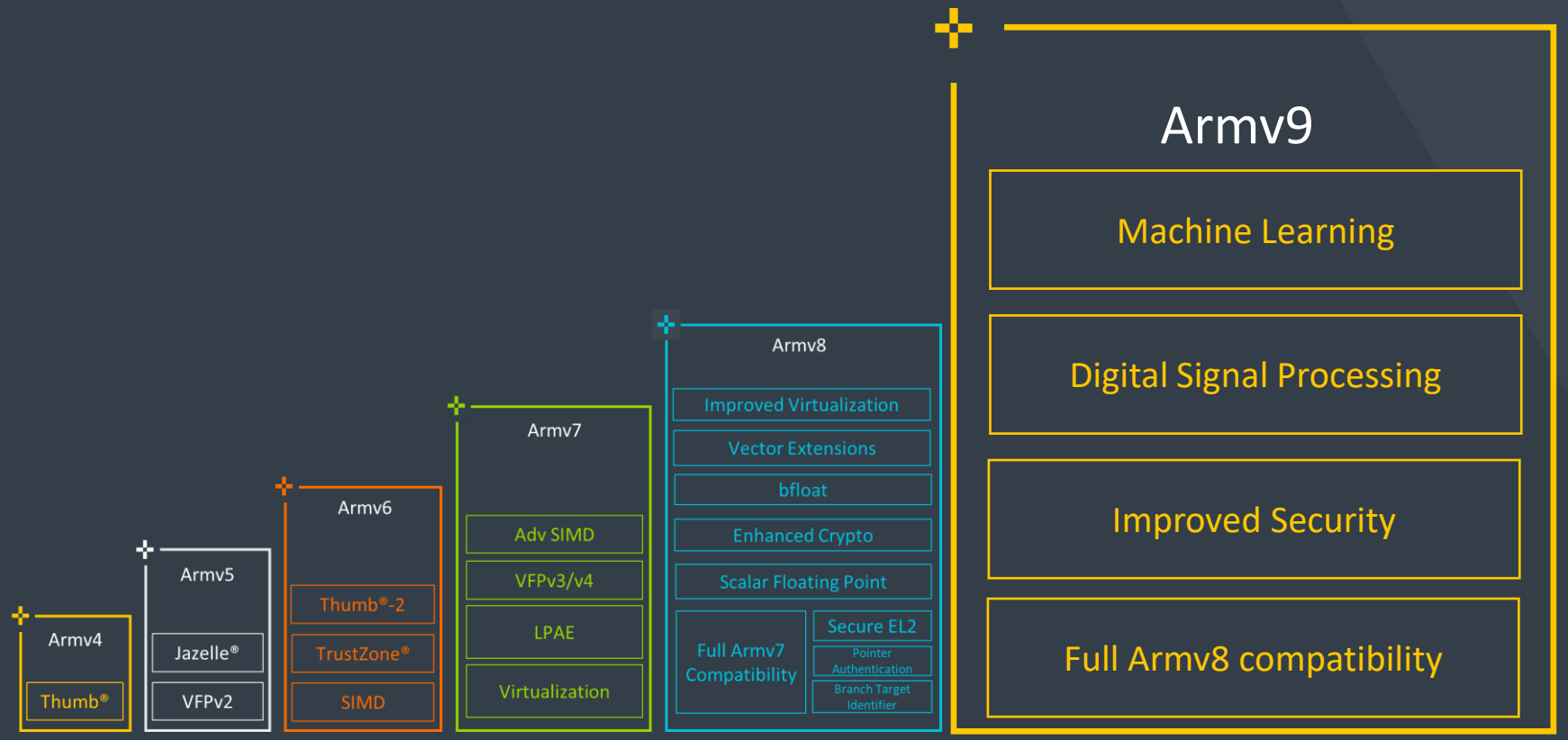
Networking

Specialized processing everywhere

A Balance of Standardization for Partner Success

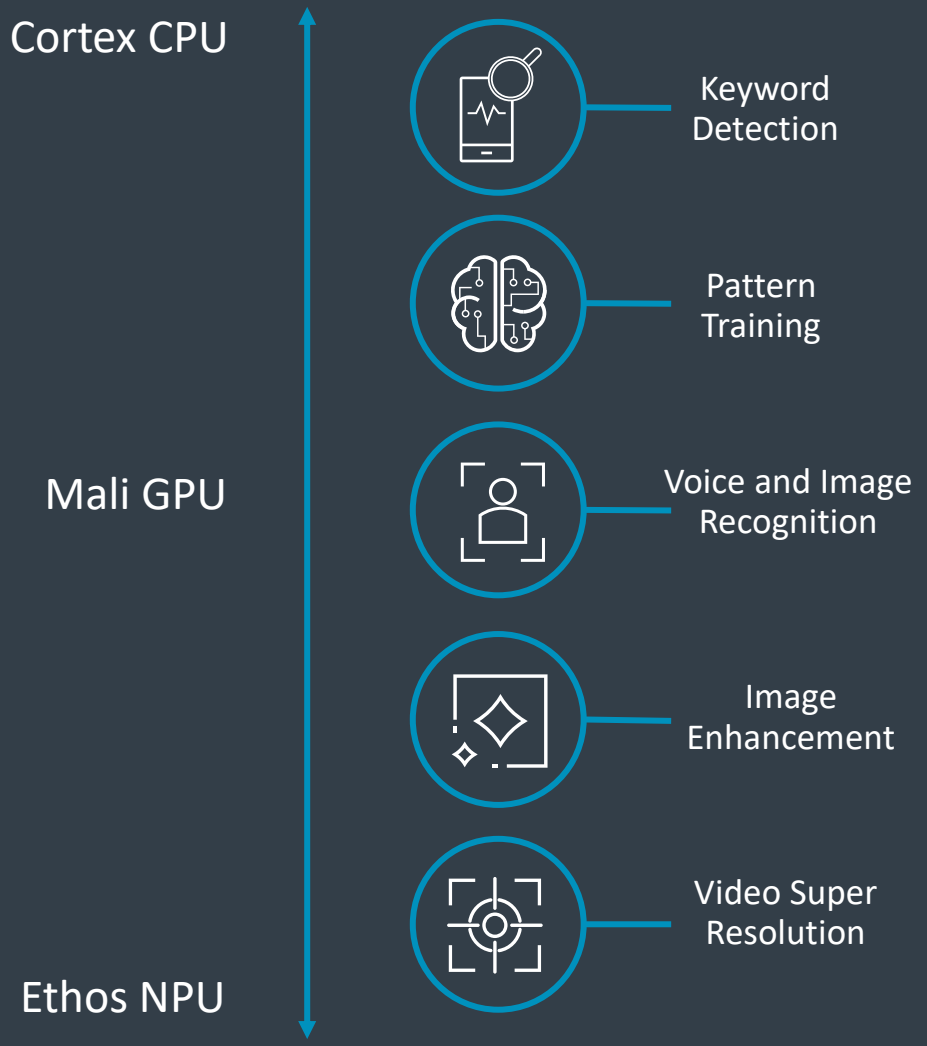


Introducing Armv9: The Secure Architecture for All Workloads



Powering the next 300 billion chips

Enabling Global ML Ubiquity



>90%

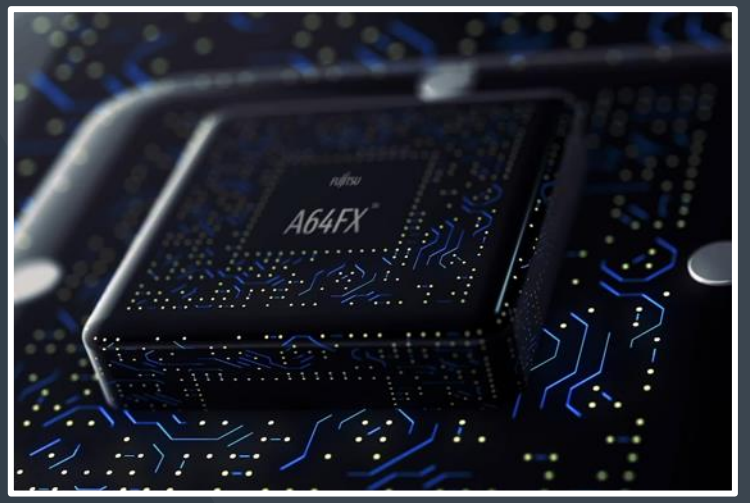
Of top businesses surveyed report having ongoing investment in AI (1)

>90%

Of new enterprise apps will embed ML by 2025 (2)

(1) NewVantage, 2020
(2) IDC FutureScape, 2020

Extending Vector Processing for DSP, ML and xR Workloads



$$A = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{pmatrix},$$

$$B = \begin{pmatrix} b_{11} & b_{12} & \cdots & b_{1p} \\ b_{21} & b_{22} & \cdots & b_{2p} \\ \vdots & \vdots & \ddots & \vdots \\ b_{n1} & b_{n2} & \cdots & b_{np} \end{pmatrix}$$

Securing the Future

6 Trillion
US Dollars

Anticipated cyber crime damages by 2021 (1)

5,400
Attacks

Per month on average targeted at IoT devices (2)

75.4 Billion
Connected IoT Devices

By 2025 (3)

Governments around the world see cyber crime as a leading threat to national security

PC Cluster Workshop in Kashiwa 2021

(1) 2019 Official Annual Cybercrime Report
(2) Symantec Internet Security Threat Report
(3) Statista

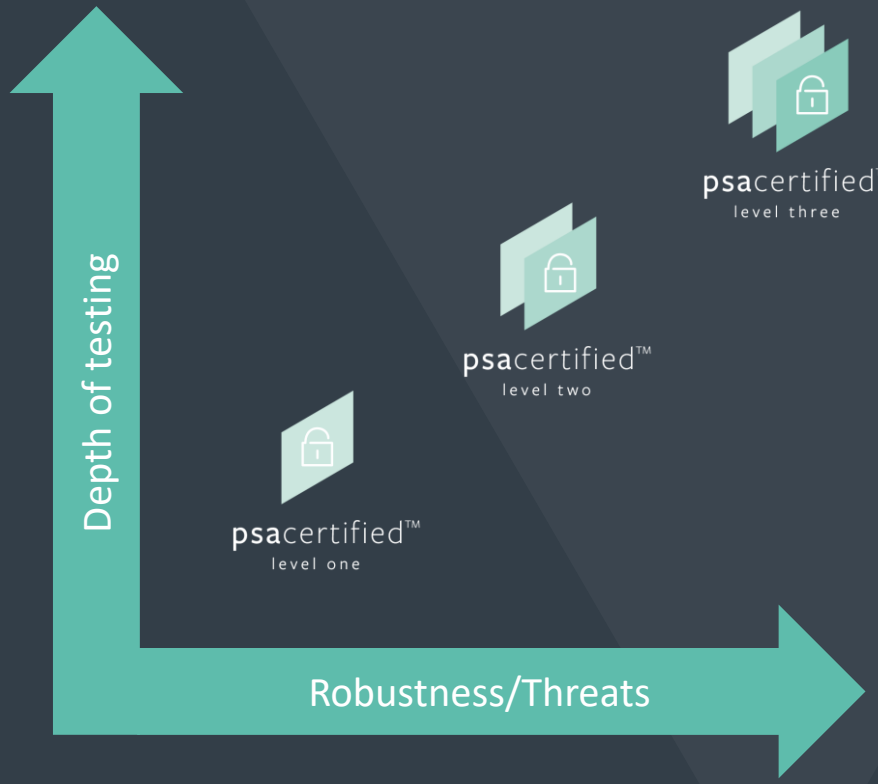
PSA Certified

Providing confidence in devices' security properties

- Standard security goals, threat models and architecture specifications
- Tiered certification scheme
- Regulation alignment
- >60 certified products from >35 partners

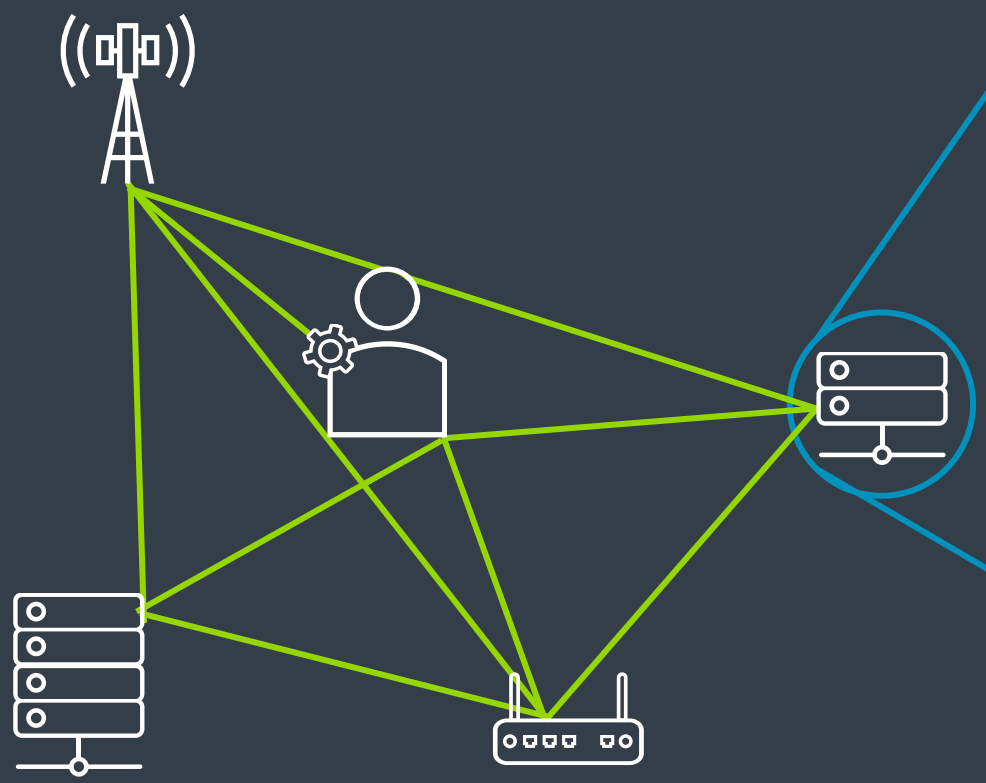
psacertified™

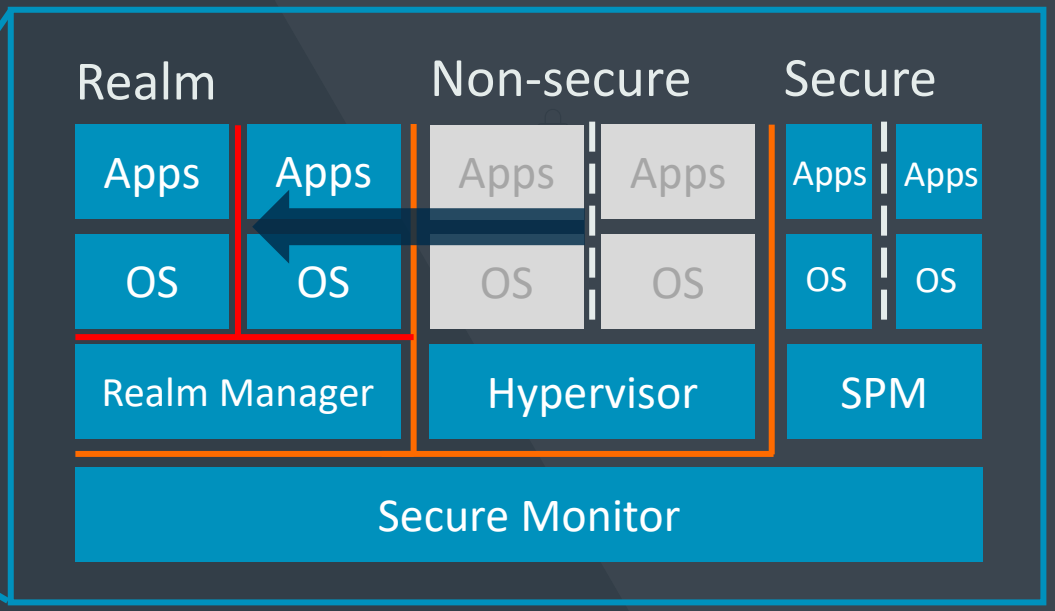
PSA Certified Levels



Arm Confidential Compute Architecture

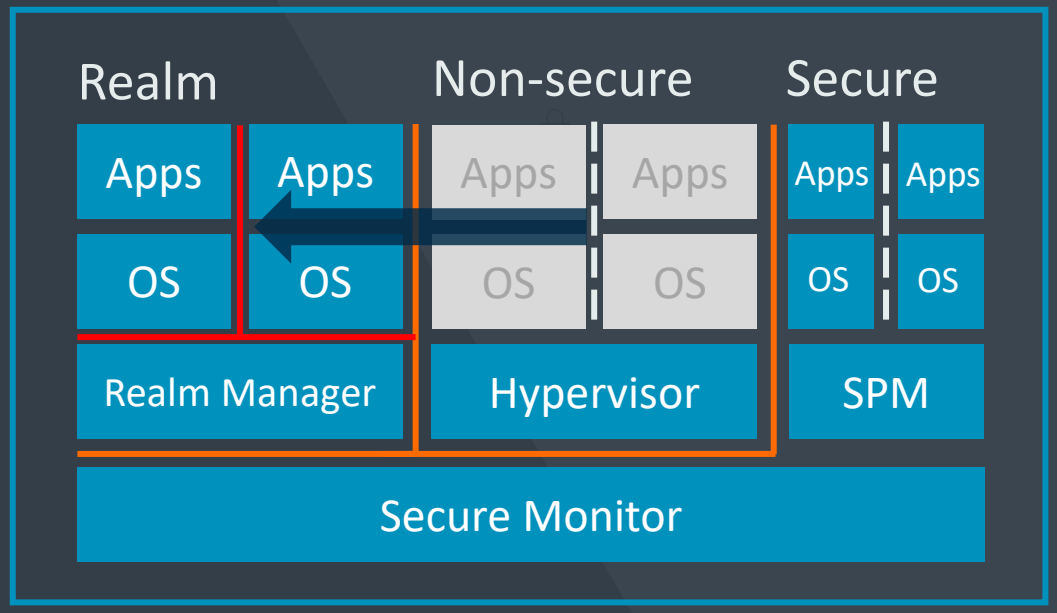
Rise of computing as a distributed utility requires us to re-evaluate trust relationships





Arm Confidential Compute Architecture introduces Realms – securing the application and data away from the host system

Confidential Compute in Action



Arm Confidential Compute Architecture introduces Realms – securing the application and data away from the host system

Memory Safety Problems Persist

Microsoft Security Response Center

- “~70% of the vulnerabilities addressed through a security update each year continue to be memory safety issues”

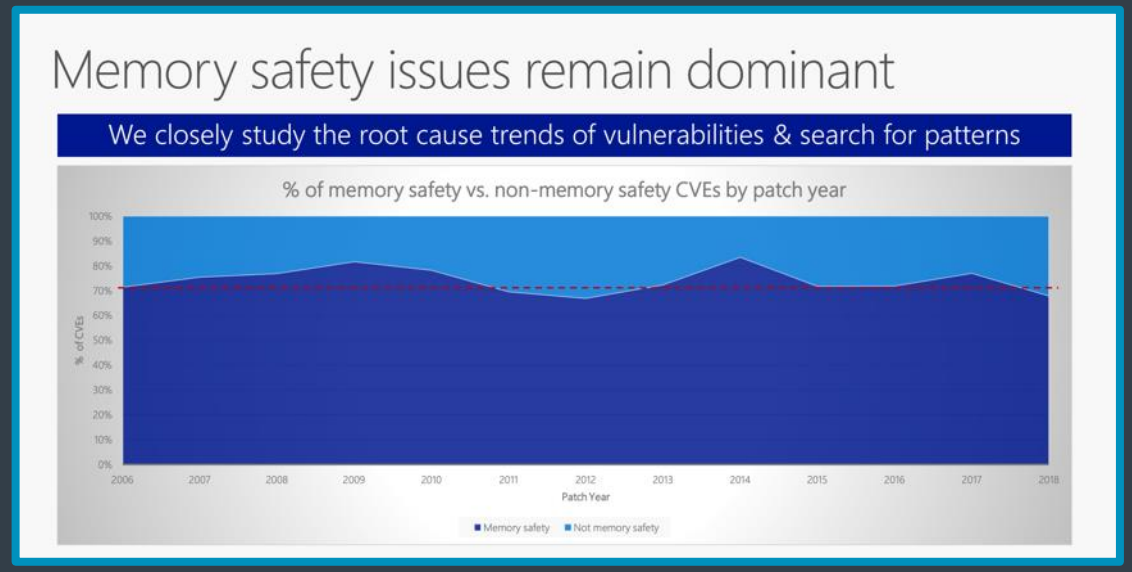
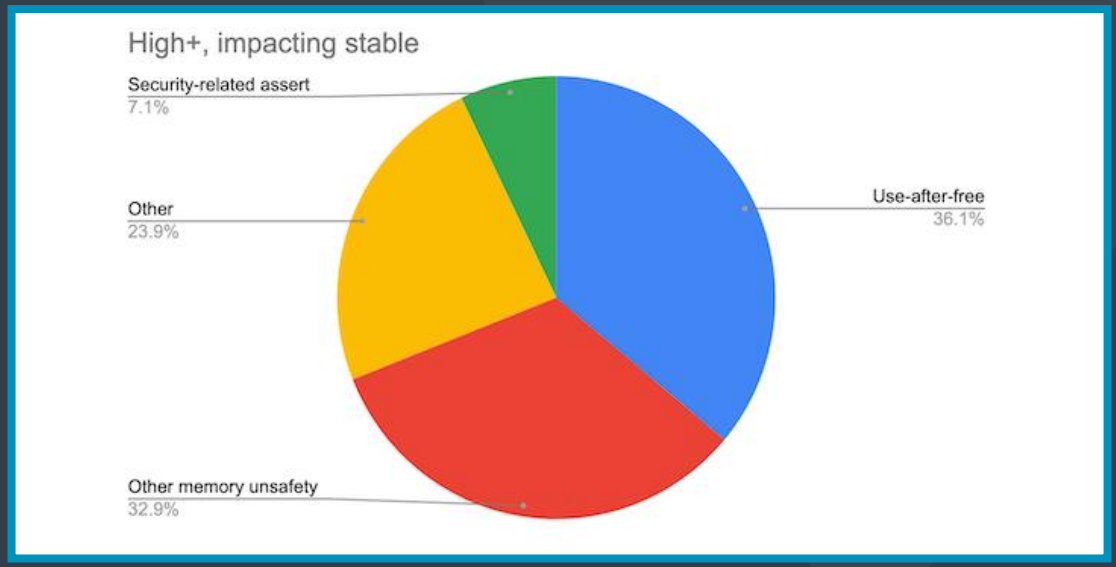


Image: Matt Miller

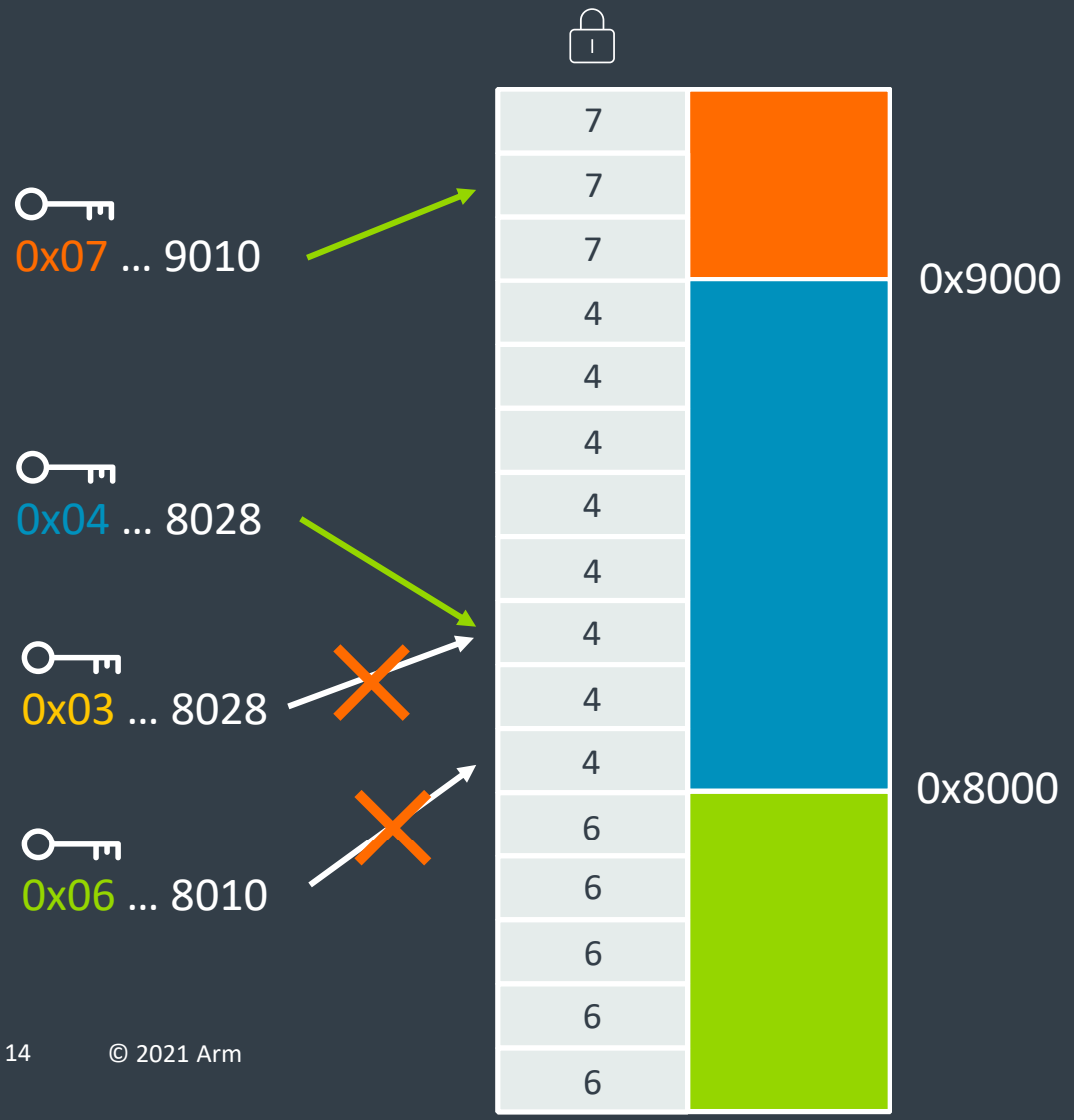
The Chromium Project

- “ … around 70% of our serious security bugs are memory safety problems.”



Working in Partnership to Improve Security

Memory Tagging Extensions – introduced in Android 11 and OpenSUSE



> *"…we look forward to seeing how MTE helps raise the bar for security across the industry."*
>
> **Dave Kleidermacher,**
> **VP, Android Security & Privacy at Google**

A New Architectural Foundation for Security

University collaboration on “CHERI” capability architecture

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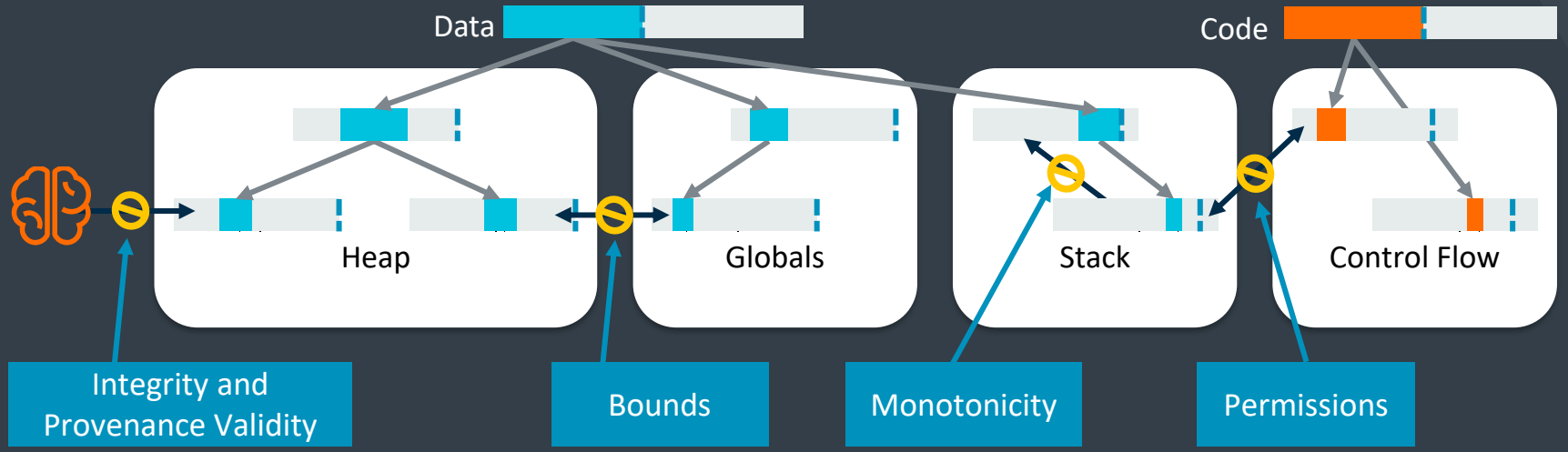

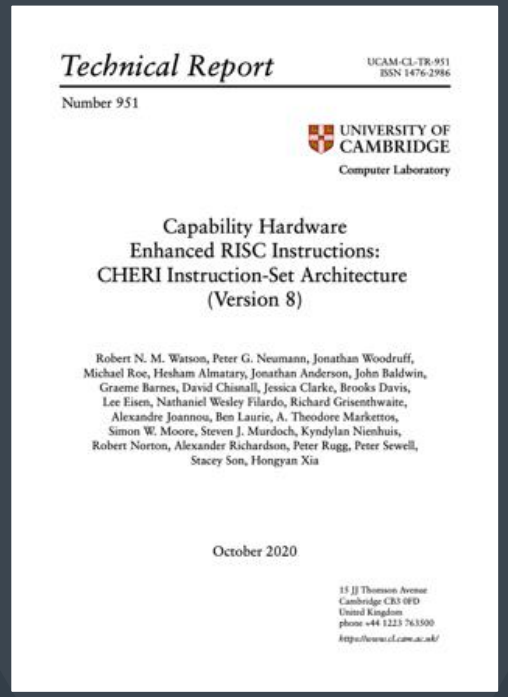

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Capability Hardware Enhanced RISC Instructions: CHERI Instruction-Set Architecture (Version 8)

Robert N. M. Watson, Peter G. Neumann, Jonathan Woodruff, Michael Roe, Hesham Almatary, Jonathan Anderson, John Baldwin, Graeme Barnes, David Chisnall, Jessica Clarke, Brooks Davis, Lee Eisen, Nathaniel Wesley Filardo, Richard Grisenthwaite, Alexandre Joannou, Ben Laurie, A. Theodore Markettos, Simon W. Moore, Steven J. Murdoch, Kyndylan Nienhuis, Robert Norton, Alexander Richardson, Peter Rugg, Peter Sewell, Stacey Son, Hongyan Xia

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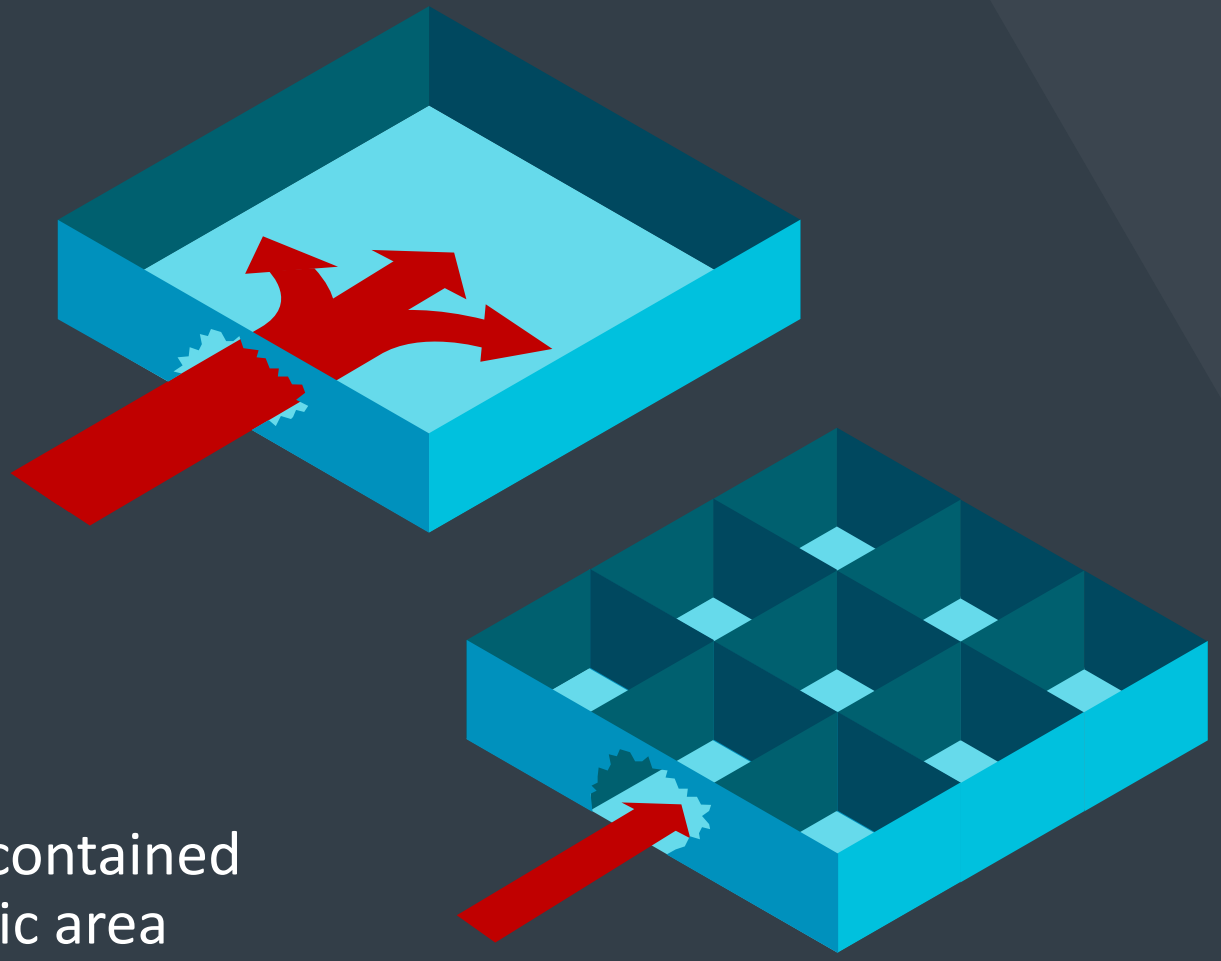
Morello: Major Program to Design New Processor Security

Digital Security by Design



Breach has full access

Breach is contained to a specific area

arm
Morello Program

UK Research and Innovation

Armv9: Trusted Compute for the Decade Ahead

Providing
the building blocks for the future of compute

Balancing
standardization for purpose-built systems

Addressing
partner requirements for ever-increasing specialized workloads

Creating
trust by protecting data and code throughout the network

Thank You
Danke
Gracias
谢谢
ありがとう
Asante
Merci
감사합니다
धन्यवाद
Kiitos
شكرًا
ধন্যবাদ
תודה

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