"The journey to a more secure future"

Professor John Goodacre

The Digital Security by Design Challenge

8th March 2022

In Partnership

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embedded

CYBER WALES

Are we heading towards a cyber disaster ?

- The connected device phenomena does not have the same maturity of “PC” market towards maintaining cybersecurity

- Benefits from digitalization will be significantly damaged unless products and services can become more secure

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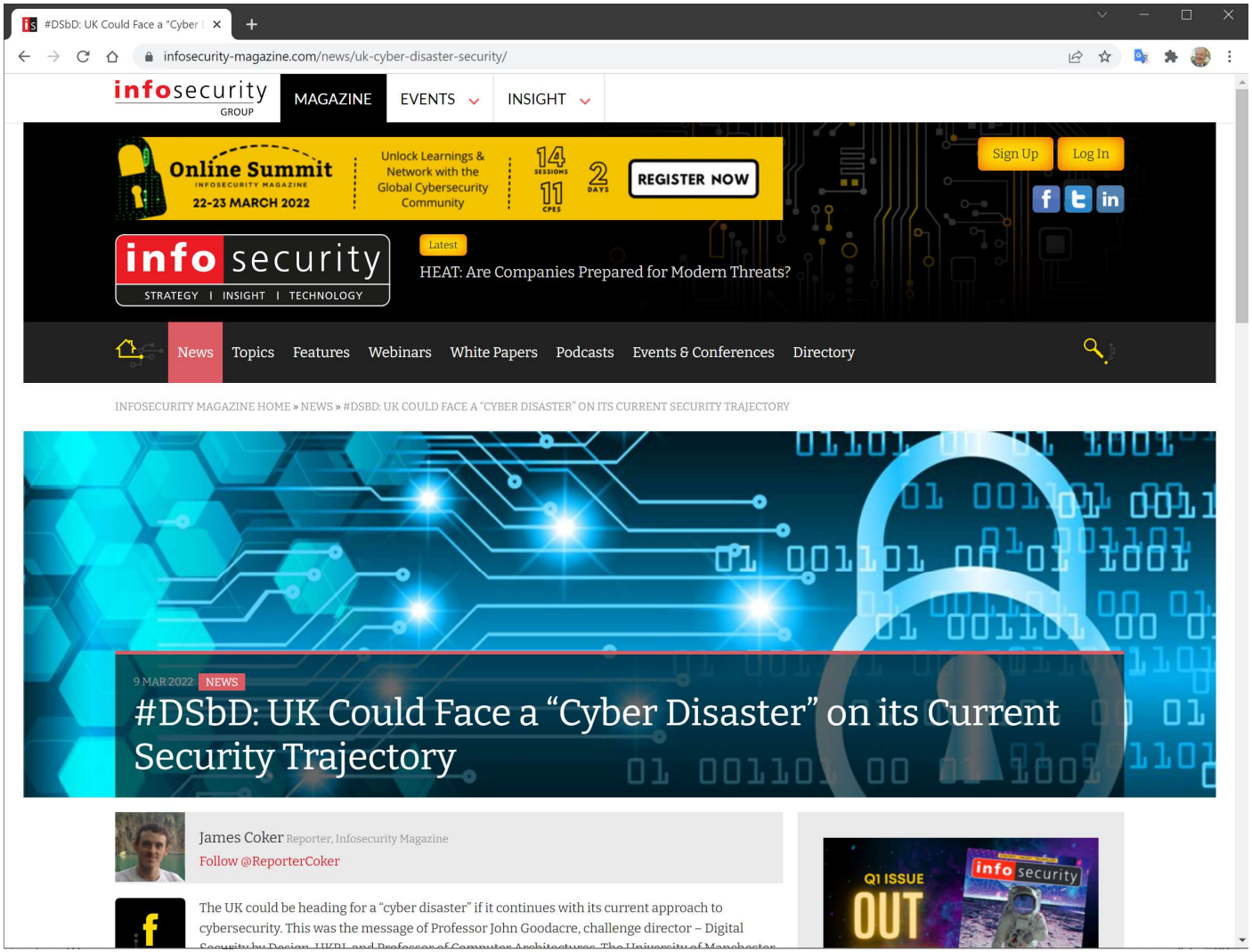
…always watch what you say!



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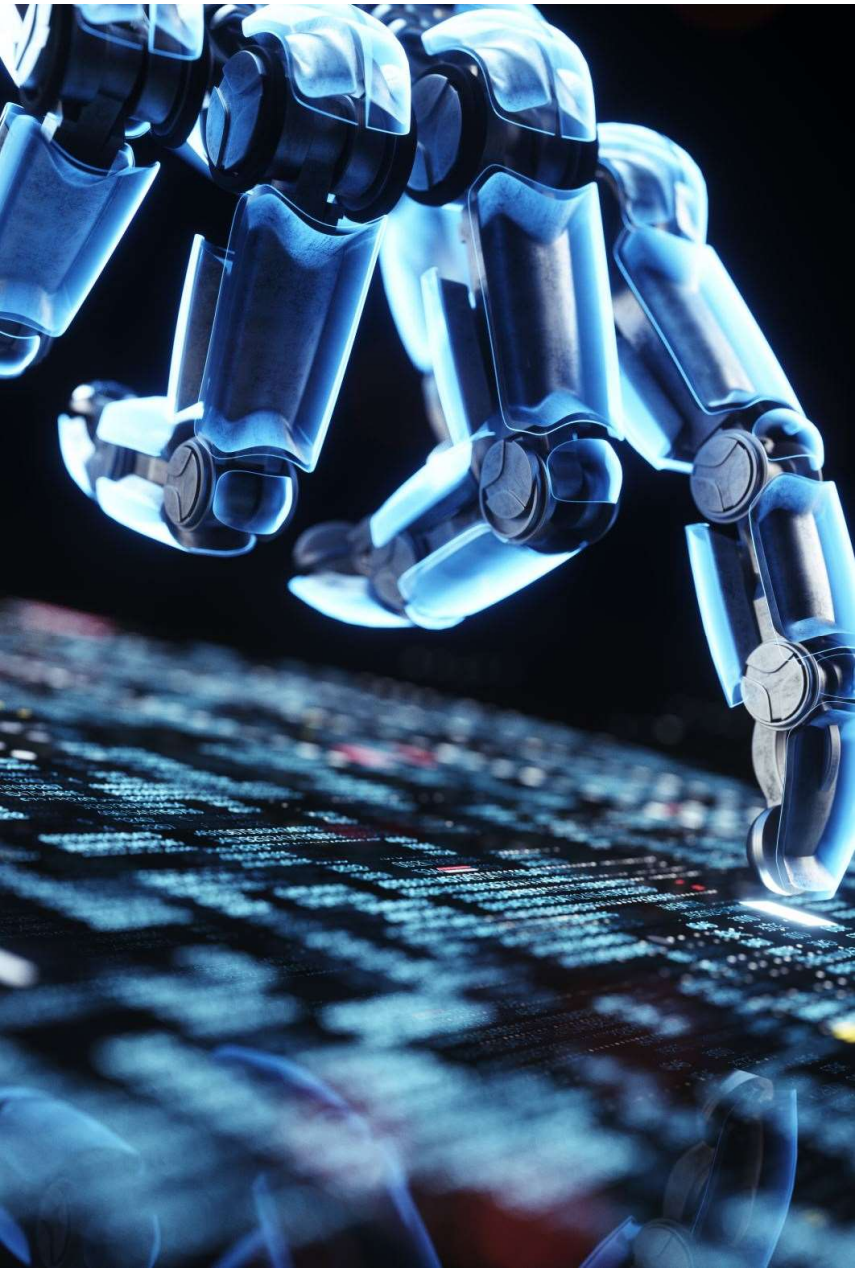

Cyber security today

- Focused on mitigations and keeping up with the patches
  - Primary responsibility falls to those using rather than those building systems
  - Costly, disruptive, with no defence against flaws and errors.
- Today's technology has developed during a period where performance and cost are more important than cyber security
- There is increasing need for business to ask the questions:
  - How can technology providers provide more secure products by default ?
  - How can technology itself offer more protection by design ?

Can we actually “prevent computer security vulnerabilities” with today’s solutions ?

- Will being alerted to abnormal bandwidth remove the vulnerability in the computer?
- Will blocking some sites remove the vulnerability that some another site is trying to use?
- How can watching trends prevent a vulnerability?
- Will looking at reports and the cost of risk prevent a vulnerability?

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How to prevent computer security vulnerabilities

Try it free Learn more ›

- Staying on top of bandwidth usage with alerts when devices exceed thresholds
- Blocking users from visiting suspected and confirmed unsafe sites
- Setting unblocked lists and blocked lists to override category based filters
- Applying Web Bandwidth checks
- Filtering Internet activity by day, category and URL to reveal trends, spikes and irregularities
- Completing with detailed reporting tools to let you analyze browsing activity and demonstrate the effectiveness of web security
- Identifying risks with our [redacted]nline software to tell you where it is and places a dollar value to the risk of it being there

Why Does DSbD Exist?

- 2018: UKRI asked industry "what are your challenges ISCF could help solve?
- Described a failure in market dynamics that was stopping industry from introducing new technology to block vulnerabilities
- Funding announced Jan 2019
  - Programme designed in collaboration

Press release

'Designing out' cyber threats to businesses and personal data

On Data Privacy Day, Business Secretary Greg Clark announces measures for the UK to become a world leader in the race against some of the most damaging cyber security threats.

From: Department for Business, Energy & Industrial Strategy, Innovate UK, UK Research and Innovation, The Rt Hon Greg Clark MP, and Margot James

Published: 28 January 2019

ISCF DSbD Challenge Vision

By 2025, the ISCF Digital Security by Design challenge aims to **overcome the market failures** and **radically update the foundation of the insecure digital computing infrastructure** that underpins the entire economy. A new and secure computer hardware approach, proven in at least two major industrial markets, will protect against at least half of known and associated future technological vulnerabilities

Working up for the first time from the central hardware of a digital device

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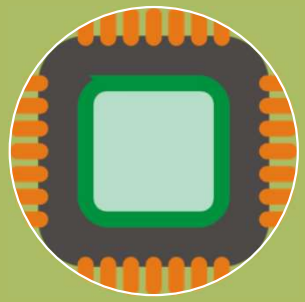
DSbD is an initiative supported by the UK government to transform digital technology and create a resilient, and secure foundation for a safer future.

Approach: Cross-Cutting Activities



Enabling Technology

Prototype Platform

Deliver a proven secure-by-default hardware evaluation board and system software

Technology Sector

Collaborative R&D

To enable market use, tooling and processes to utilise the new security capabilities; ecosystem enablement

Industry Sector

Business-led Demonstrators and Technology Access Programme

Sector defined applications showcase impact and move the accepted norm

1. DSbD Enablers → 2. Technology Developers → 3. End Markets

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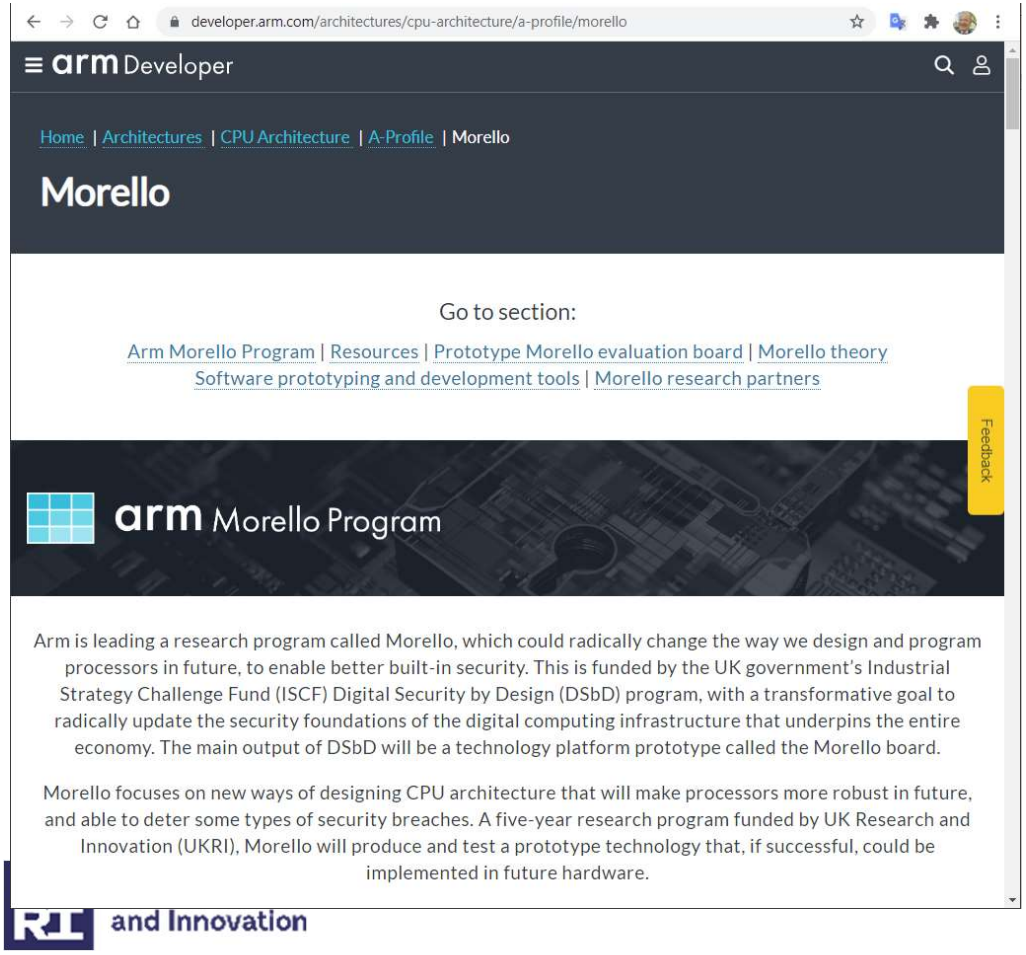
Realizing the Technology Platform Prototype



Press release

Confronting cyber threats to businesses and personal data

British businesses and the public are set to be better protected from hostile cyber-attacks and online threats like disinformation and cyber-bullying.

From: Department for Business, Energy & Industrial Strategy, Department for Digital, Culture, Media & Sport, Home Office, UK Research and Innovation, The Rt Hon Andrea Leadsom MP, and Matt Warman MP

Published: 18 October 2019

- Leading technology firm Arm is working with government to strengthen cyber security measures for businesses and the public
- £36 million investment will help make the UK a world leader in tackling many forms of cyber threats to online products and services
- Around a third of businesses report having cyber security breaches or attacks in the last 12 months – with cyber threats constantly evolving

EPSRC Competition

- £10M Academic Research funding
  - £7M from ISCF/DSbD
  - £3m from DCMS
- Building long-term skills and thought leadership
- The EPSRC call covered 3 areas:
  - Capability enabled hardware proof and software verification
  - Impact on system software and libraries
  - Future implications of capability enabled Hardware

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Active Projects

AppControl: Enforcing Application Behaviour through Type-Based Constraints
Dr Wim Vanderbauwhede (University of Glasgow)

CapableVMs
Dr Laurence Tratt (King's College London) & Dr Jeremy Singer (University of Glasgow)

CAPcelerate: Capabilities for Heterogeneous Accelerators
Dr Timothy Jones (University of Cambridge)

CapC: Capability C semantics, tools and reasoning
Dr Mark Batty (University of Kent)

CAP-TEE: Capability Architectures for Trusted Execution
Dr David Oswald (University of Birmingham)

CHaOS: CHERI for Hypervisors and Operating Systems
Dr Robert Watson (University of Cambridge)

CloudCAP: Capability-based Isolation for Cloud-Native Applications
Prof Peter Pietzuch (Imperial College London)

HD-Sec: Holistic Design of Secure Systems on Capability Hardware
Professor Michael Butler (University of Southampton)

SCorCH: Secure Code for Capability Hardware
Dr Giles Reger (The University of Manchester)
Prof Daniel Kroening (University of Oxford)

Department for Digital, Culture Media & Sport

EPSRC
Engineering and Physical Sciences Research Council

ESRC – Discribe Hub+

Digital Security is more than just technology

- Routes to adoption: readiness levels
- Routes to adoption: barriers for business
- Regulatory challenges: barriers and enablers
- Social, Cultural and Commercial sector differences

UKRI Economic and Social Research Council

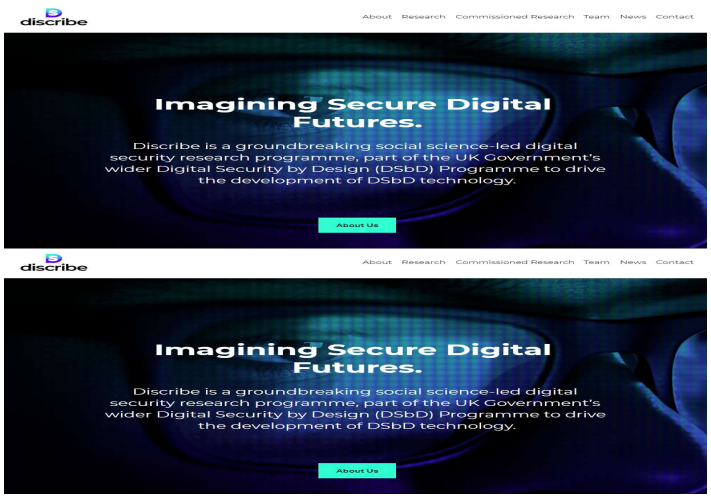
discribe

- **Hub+:** Acts as a hub-and-spoke network brokerage, develop agile, multidisciplinary networks between activities and stakeholders
- **Core Research** area include Adoption, Readiness, Regulation and Policy, and Across Contexts
- **Devolved Small Project Research Budget:** Started funding commercially-focused social science research on barriers to adoption

Seeks to understand the behavioural and adoption challenges in digital security, to investigate what it means to be secure and the commercial challenges of moving beyond the current security paradigms.

Funding: £3.5 million

https://www.discribehub.org



Development of the DSbD Software Ecosystem

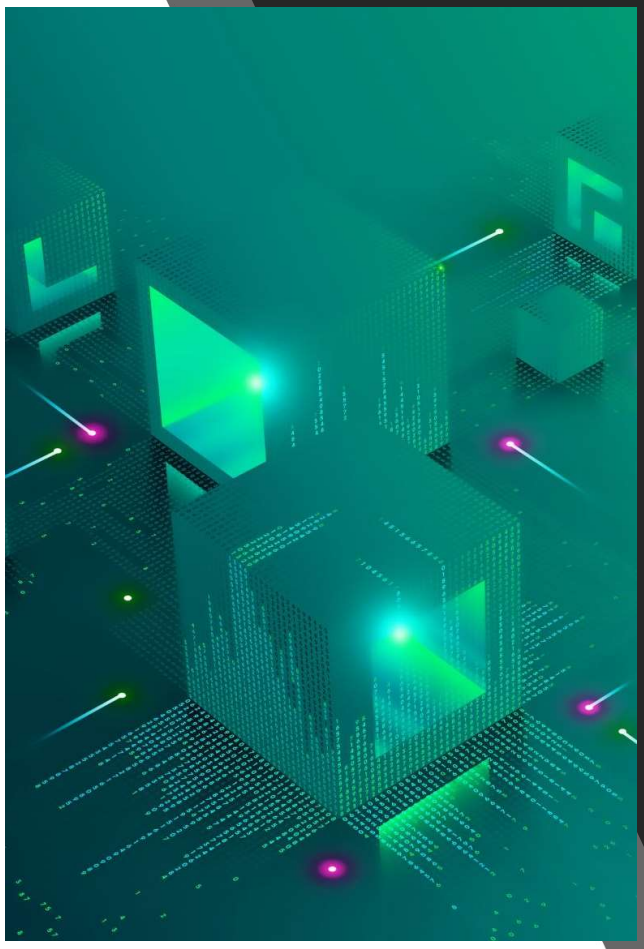
Objective: Expand beyond the enabling Technology Platform software ecosystem and fund several additional **technology sector** projects to investigate and further enable DSbD technologies across developer environments, tools, OS, runtimes, frameworks and libraries

- **Initial SME focused Projects Completed**
  - 10 projects focused on design investigations
  - Provided feedback into the technology maturity
  - Discovered new and exciting ways to increase the security of their products.
- **Collaborative R&D Projects** starting Q2’22
  - Projects focused on extending and maturing the software ecosystem for developers wanting to use DSbD technologies
  - Will be provided with the prototype hardware

Business-led Demonstrator Activities

Objective: To develop demonstrators showcasing the use, adoption and impact of DSbD technologies within an **industry sector**

- **THG Holdings PLC, Manchester** will demonstrate and test the benefits of DSbD technology, to improve the security of **e-commerce** and enable the increased productivity and development of future world-leading services and products.
- **100% IT based in Newbury** will develop a demonstrator that will make it harder to attack and infiltrate **network infrastructure** or endpoints and remotely take control or extract sensitive information
- **Beam Connectivity, in Cirencester** will demonstrate and review the use of DSbD technologies for cyber critical and safety critical applications in the **automotive sector**
- **Southern Gas based in Horely** seeks to deliver an Internet of Things (IoT) demonstrator in the utility industry to deliver an enhanced security solution for applicability in **critical national infrastructure**
- **ICETOPE based in Rotherham** will work with industry standard bodies to address the lack of cooperation between Information Technology (IT) and Operational Technology (OT) in the **data centre**.



What's Next..

- **We need the Cyber Security discussion to extend into requiring technology providers to prioritize their products and services to build-in security by default**
- **We need the technologies that can protect software vulnerabilities from exploitation by design**
- **We need the technology providers to understand the new techniques and technologies that can help overcome the commercial and performance barriers to building in that security**

DIGITAL SECURITY
BY DESIGN

Join us on an exploration of computing developments over the decades

21 Feb - 10 Mar 2022

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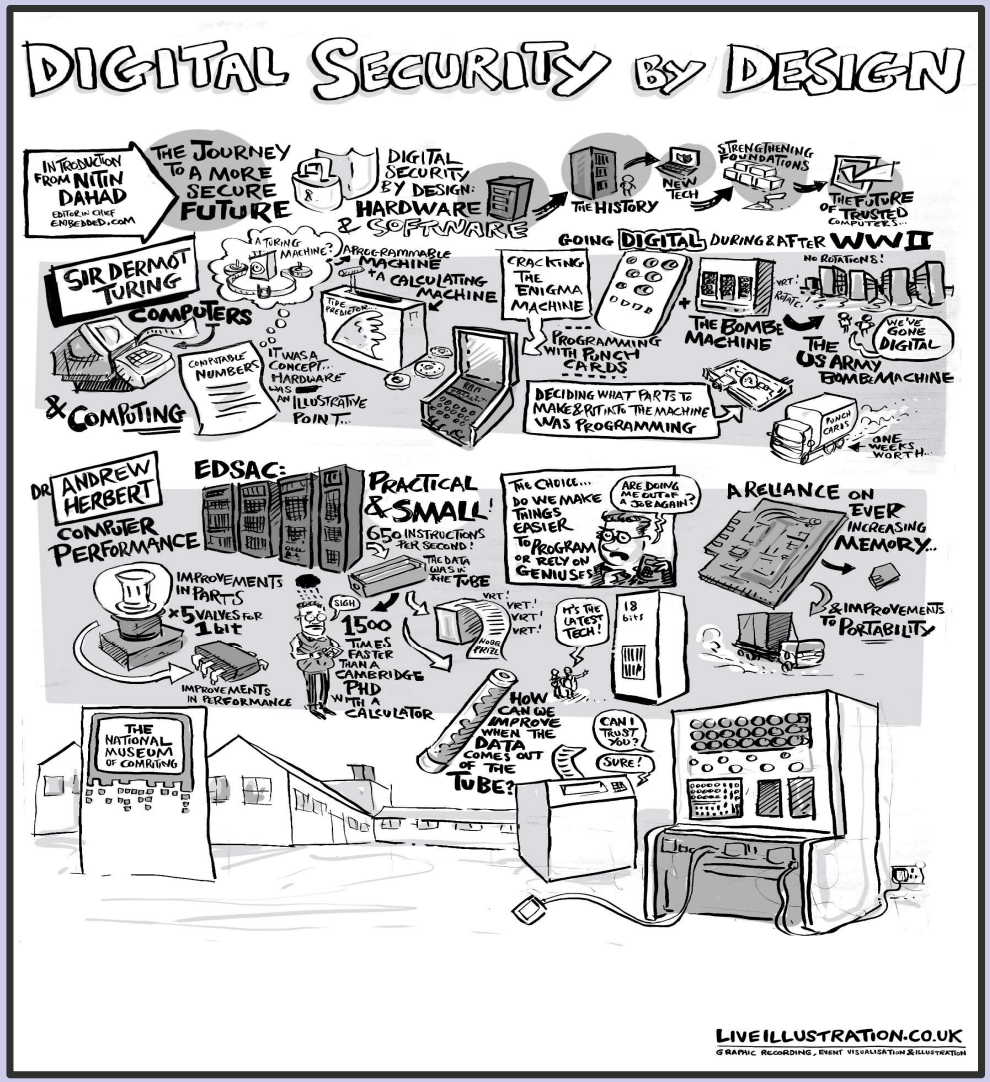
CYBER WALES

Cyber Scotland Week

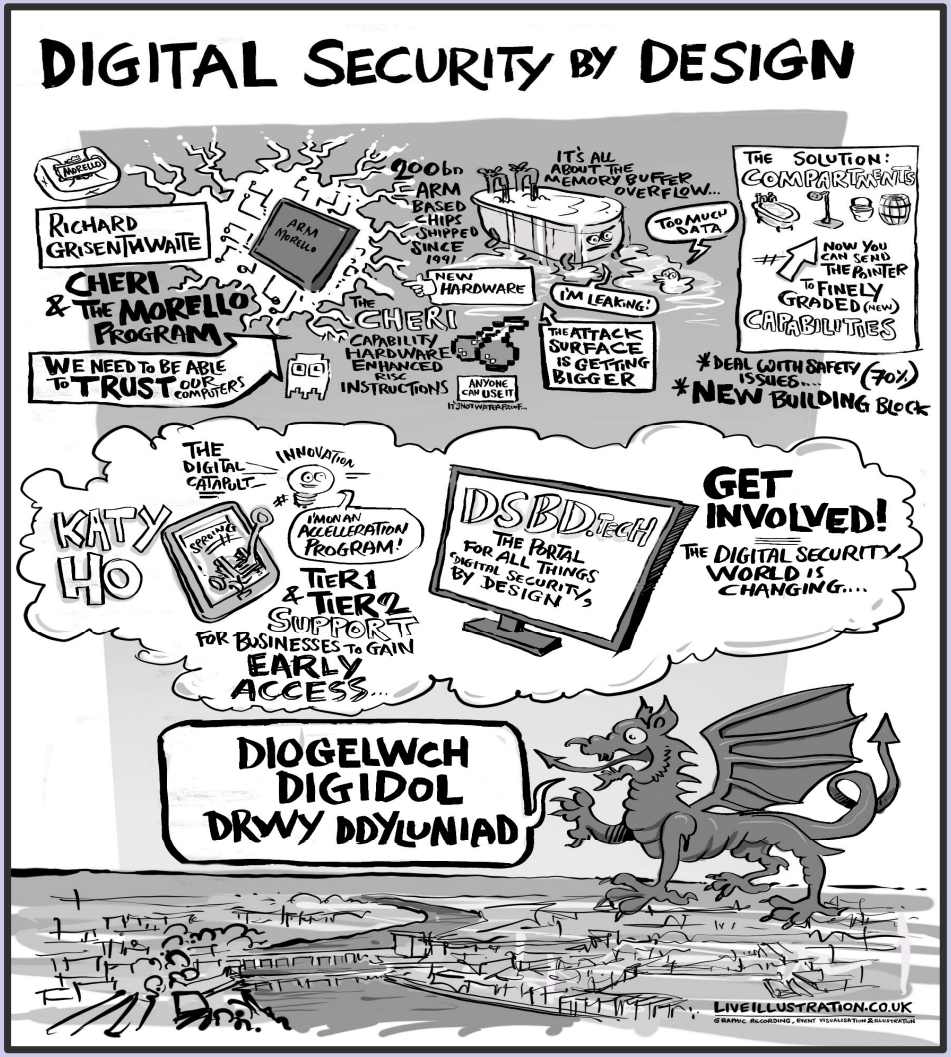
QUEEN'S UNIVERSITY BELFAST | CSIT CENTRE FOR SECURE INFORMATION TECHNOLOGIES

The History of Computers – Bletchley Park roadshow highlights here



New Technologies in Cyber Security – Glasgow roadshow highlights here

Strengthen the foundations & make the world more secure, Newport roadshow highlights here



The Future of Trusted Computers – Belfast roadshow highlights here