

The UK Cyber Security Strategy 2011-2016

Annual Report

April 2016

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FOREWORD

By the Rt Hon Matthew Hancock MP Minister for the Cabinet Office and Paymaster General



Five years is a long time in cyberspace. When we published the UK's first Cyber Security Strategy, digital technology was already having a transformational impact on how we consume, share and save information. The pace of change has accelerated exponentially since then and will only continue to guicken. Technology is a huge force for good, an opportunity from which we can all benefit. In 2010, the Internet of Things was still in its infancy; in 2016, over six billion connected devices will be in use worldwide. enabling people to connect with people and governments and businesses to deliver better services. By 2020, that number is set to rise to over 20 billion.

But we are also living in an uncertain and insecure world - both real and virtual. The 2010 National Security Strategy identified cyber as one of the top threats to the UK. In response, the Government has invested £860 million since 2011 in a National Cyber Security Programme to:

- Tackle cyber crime and make the UK one of the most secure places in the world to do business in cyberspace.
- Make the UK more resilient to cyber attack and better able to protect our interests in cyberspace.
- Help shape an open, vibrant and stable cyberspace that supports open societies and
- Build the UK's cyber security knowledge, skills and capability.

We have made tangible progress against these vital objectives. In collaboration with our industry, academic and international partners, we have laid solid foundations for the future:

- We have significantly enhanced our national capabilities and technologies to defend ourselves against those who would do us harm.
- We have a national approach to incident response and secure information sharing on threats, through CERT-UK and the Cyber Security Information Sharing Partnership it hosts.
- Businesses of all sectors and sizes now have unprecedented levels of expert guidance and training available to help them manage their cyber risks.
- Government digital services are more secure than ever. We are building in security by design and taking robust action against attempts at online fraud.
- Working with critical national infrastructure owners and operators, we now have plans in place for managing cyber risk.
- Our police forces are actively tackling serious cyber crime, both at home and internationally.
- The UK is helping shape the international debate on the future of cyberspace.
- UK cyber security companies now have an increased market share internationally.

 And we are on a longer-term mission to ensure the UK has the right cyber skills and knowledge, with interventions at every level of the education system and cutting-edge research in cyber security.

But there is more to do. The 2015 National Security Strategy confirmed that cyber remains a top level threat to the UK's economic and national security. That threat is increasing in scale and complexity. It is also increasing at such a pace that we must run simply to stand still. The increased inter-connectedness of our everyday lives means that the range of targets is broader and the task of protecting them harder.

So we have announced that we will substantially increase our investment to £1.9 billion in protecting the UK from cyber attack and developing our sovereign capabilities in cyberspace. Our new Programme, led by a new National Cyber Security Centre, will mark a redoubling of our efforts to tackle the cyber threat. But we cannot do this alone. Everyone has a role to play in keeping our society safe. Continued, sustained and close collaboration between government, industry, academic and international partners is vital and we must accept our individual and collective responsibilities.

2016 will see the launch of the UK's second National Cyber Security Strategy. This will define our vision and ambition for the next five years. While we know the scale of the task ahead, we also know we are building on a good platform. This report highlights the current Programme's achievements over the past year and the wider impact of the Programme since its inception. We should be proud of the foundations we have jointly laid through our first National Cyber Security Programme. They have positioned us well for challenges ahead.

The Rt Hon Matthew Hancock MP

Minister for the Cabinet Office and Paymaster General

INTRODUCTION

- 0.1 Between 2011 and 2016, the Government funded a National Cyber Security Programme of £860 million to deliver the 2011 National Cyber Security Strategy. The Programme aimed to:
 - Tackle cyber crime and make the UK one of the most secure places in the world to do business in cyberspace.
 - Make the UK more resilient to cyber attack and better able to protect our interests in cyberspace.
 - Help shape an open, vibrant and stable cyberspace that supports open societies and
 - Build the UK's cyber security knowledge, skills and capability.
- 0.2 Working with industry, academic and international partners, we have made significant progress against these objectives. We have deepened our understanding of the cyber threat and increased our capabilities to detect and defend against it. We have worked with businesses in the UK's critical national infrastructure (CNI) and more widely to build their cyber resilience and raised public awareness of how to keep safe online.

- 0.3 We have grown our cyber security sector and increased our exports overseas. We have built strong international relationships in cyber security, enabling us to help shape the future of cyberspace. And we have started to build the cyber skills and knowledge the UK needs by putting in place interventions at every level of the education system and encouraging cutting-edge cyber security research.
- 0.4 Chapter One summarises activities undertaken during 2015-16 to deliver Programme objectives, focusing on initiatives launched during the year. It does not include those activities which have continued from previous years. These are summarised in Chapter Two, which also sets out the broader impact of the Programme since its 2011 launch. Programme highlights are included in the illustration on pages 8 and 9. Chapter Three then looks ahead to the new Cyber Security Strategy and Programme starting this year.
- **0.5** A breakdown of Programme spend is included in Annex A at the end of this report.

The UK Cyber Security Strategy

Key Achievements: 2011-2016

OBJECTIVE 1



MAKING THE UK ONE OF THE MOST SECURE PLACES IN THE WORLD TO DO BUSINESS ONLINE

10 Regional Information Sharing Groups and over 1750 organisations in CISP, the Cyber Security Information Sharing Partnership for Industry & Government

Cyber Essentials: Over 2000 Cyber Essentials and Cyber Essentials Plus certificates issued. Over 77,000 users have completed Cyber Essentials online training for small businesses

Guidance: a wide range now available, including "10 Steps to Cyber Security", "Cyber Attacks: Reducing the Impact" & "Small businesses: what you need to know about cyber security"

The cyber security sector has grown from £10 billion to over £17 billion and employs 100,000 people. Almost 80 companies are now listed in the Cyber Security Supplier to Government scheme

Cyber security exports: £1.47 billion in 2014, up 35% since 2012 & on track for £2 billion target by the end of 2016. UK Cyber Demonstration Centre, showcasing UK cyber expertise, opened in 2015

AND TACKLING CYBER CRIME

National Cyber Crime Unit in the National Crime Agency: leading 170 domestic & international operations to disrupt serious cyber crime

A Cyber Unit in each of the nine Regional Organised Crime Units

HMRC prevented £103 milion of attempted fraud from government systems during 2014-15

OBJECTIVE 2



A UK THAT IS MORE RESILIENT TO CYBER ATTACK AND BETTER ABLE TO PROTECT OUR INTERESTS IN CYBERSPACE

CERT-UK: Computer Emergency Response Team for national incidents & international CERT liaison

GCHQ: working to detect & defend against cyber threats

Central government departments and over 400 public bodies on the Public Services Network

GOV.UK Verify: a new way for users to prove their identity securely when using digital government services. Almost half a million identities verified during test phase

Centre for Cyber Assessment: provides assessments of cyber threats and vulnerabilities to more than 40 government departments and agencies

A new **Joint Forces Cyber Group**, improved links with industry through the **Defence Cyber Protection Partnership**, and a new **Cyber Reserve** to engage additional cyber experts

OBJECTIVE 3



A UK HELPING TO SHAPE AN OPEN, VIBRANT AND STABLE CYBERSPACE THAT SUPPORTS OPEN SOCIETIES

'London Process' global conferences shaping the debate on cyberspace

30 international projects each year to build cyber security knowledge and skills

£860 million

over 5 years, delivering the **UK Cyber Security Strategy**

OBJECTIVE 4



A UK THAT HAS THE CYBER **KNOWLEDGE, SKILLS AND** CAPABILITY IT NEEDS

SCHOOLS

Cyber Security in computer science GCSE

Cyber Security teaching and learning materials for Key Stages 3-5

Resources for teacher professional development in cyber security

Cyber Security Challenge Schools Programme: 800 schools have taken part and 23,000 students have accessed the complementary learning materials since 2012

FURTHER EDUCATION

Cyber Security: an integral feature of computing and digital further education qualifications at Levels 3 and 4, from September 2016

APPRENTICESHIPS

300 Level 4 cyber security apprenticeships, including 50 within government

GCHQ has its own scheme: over 170 apprentices have either joined or graduated since 2012

CAREERS & PROFESSIONALISM

Cyber Security Challenge & Cyber Growth **Partnership:** mentoring and 'cyber development camps' for computer science students and graduates

'Inspired Careers' online hub for those joining or in the field

Cyber Security Challenge immersive gaming **platform:** a new approach for attracting new talent into the cyber security profession

Cyber Security e-learning for the HR, Accountancy, Legal and Procurement professions

HIGHER EDUCATION

Cyber security included in all computing degrees accredited by the British Computer Society and the Institution of Engineering & Technology

Cyber First: to support exceptional undergraduates in cyber security careers

12 universities awarded grants from the Higher Education Academy

12 Masters Degrees in Cyber Security certified by GCHQ

RESEARCH

3 Research Institutes

13 Academic Centres of Excellence in Cyber Security Research

2 Centres of Doctoral Training, 100 PhDs in cyber security by 2019

WIDER EDUCATIONAL SUPPORT

80,000 sign ups for Open University's Massive Open Online Course "Introduction to Cyber Security"

AND GENERAL AWARENESS RAISING

Cyber Streetwise campaign: Over 2 million adults use safer online behaviours since 2014



CHAPTER ONE

PROGRAMME ACHIEVEMENTS 2015-2016

OBJECTIVE 1: MAKING THE UK ONE OF THE MOST SECURE PLACES IN THE WORLD TO DO **BUSINESS IN CYBERSPACE**

Raising industry awareness and providing guidance

- 1.1 The Government re-launched "10 Steps to Cyber Security" in January 2015 alongside new guidance for businesses: "Common Cyber Attacks: Reducing the Impact". Over half of FTSE 350 companies now use the '10 Steps' guidance and its use continues to rise.
- **1.2** We also launched a second cyber security innovation voucher scheme in 2015 to help small businesses build their resilience and protect themselves from cyber attacks. Over 400 companies have benefitted from both rounds.
- 1.3 Since 2015, the Department for Communities and Local Government (DCLG), GCHQ, CERT-UK and the Government Digital Service (GDS) have led in-depth 'Think Cyber - Think Resilience' briefings for around 700 policy makers and practitioners from local authorities and local resilience forums.

Incentives to adopt good practice: the role of insurance

Insurance does not replace the need for 1.4 companies to have robust cyber security measures but it is an important element of managing cyber risk. In March 2015, the Government and insurance brokers, Marsh, published a joint report: "UK Cyber Security: The Role of Insurance in Managing and Mitigating Cyber Risk", in collaboration with the UK's insurance market and a number of UK companies. It confirmed that participating insurers would include the Cyber Essentials

certification as part of their risk assessment for small and medium businesses. Further information on Cyber Essentials is included in Chapter Two.

Measuring business awareness

- 1.5 The Government's 2015 Information Security Breaches Survey¹ indicated a rise in the number of security breaches experienced by the organisations surveyed. Almost half of respondents said they were accredited to Cyber Essentials or Cyber Essentials Plus, on their way to accreditation or planned to be accredited in the coming year. Almost three quarters of large organisations and two thirds of small businesses said they provided ongoing security awareness training to their staff. A new survey will be published in 2016.
- In late 2015, the Government launched 1.6 its third Cyber Governance Health Check for the UK's 350 largest businesses. This helps them understand and improve their level of cyber security. The results from the survey as a whole are aggregated to show how well the UK's FTSE 350 are managing their cyber security and help ensure that cyber security risks are considered at board level. Findings from the 2014-15 survey are included in Chapter Two. Results of the 2015-16 survey will be available later in 2016.

Tackling cyber crime

1.7 During 2015, the National Crime Agency's (NCA) National Cyber Crime Unit (NCCU) pursued multiple large scale operations against specific malware threats. These included an operation against Dridex malware, designed to harvest online banking details. Working with the FBI, GCHQ and other law enforcement partners, the NCCU operation has led to significant disruption to the criminal network.

¹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/432412/bis-15-302-information security_breaches_survey_2015-full-report.pdf

Building cyber capacity in the law enforcement community

- GCHQ and the NCA launched a specialist Joint Operations Cell (JOC) in April 2015, bringing together their respective technical and investigatory expertise to improve the national response to cyber crime. The JOC's initial focus is on the analysis of seized media from child exploitation and cyber crime operations.
- 1.9 The Regional Organised Crime Units (ROCUs) set up a cyber protect network in 2015, while the College of Policing and the Crown Prosecution Service (CPS) have continued to train mainstream police forces in tackling cyber crime.

International co-operation on cyber crime

- **1.10** The Government's Cyber Capacity Building Programme strengthens transborder co-operation to reduce the cyber crime threat to the UK. Projects have included a NCCU-led multi-national cyber crime exercise for investigators and prosecutors from six countries, which strengthened their capabilities and their operational links with the UK.
- **1.11** To facilitate international information sharing, HM Revenue and Customs (HMRC) signed a Memorandum of Understanding with the USA's Internal Revenue Service (IRS).
- **1.12** Prosecution is particularly challenging when cyber crimes are committed within another jurisdiction. The CPS has delivered cyber crime training overseas and advised overseas police, prosecutors and judges on the legal aspects of electronic evidence.

Public awareness

1.13 Greater public awareness of the cyber threat and methods of protection means that the public can keep themselves safe and demand better cyber security in the products and services they buy and use.

- 1.14 The Government's "Cyber Streetwise" campaign helps small businesses and consumers protect themselves online. The campaign is working with a wide range of partners to ensure its message reaches as wide an audience as possible. Since 2014, Cyber Streetwise has driven the adoption of secure online behaviour among more than two million adults.
- **1.15** The law enforcement community has also continued its awareness-raising initiatives. Working with local forces, the City of London Police organised events and developed guidance during 2015, while Get Safe Online's most successful week of action to date also helped raise public awareness on how to avoid becoming a victim of online crime.
- 1.16 The public must be able to use securely the increasing range of digital government services. HMRC provides cyber security advice to its customers, for example raising awareness of phishing attacks using fake HMRC emails. Between April and December 2015, HMRC's cyber security pages were viewed more than 800,000 times.

Cyber opportunities: growth, exports and prosperity

1.17 The Government supports growth and exports in cyber security by promoting the sector and facilitating a co-ordinated approach across government, industry and academia. Working with the government / industry Cyber Growth Partnership (CPG), we launched the CGP Exchange, an online hub that maps and promotes the UK's cyber security businesses. We also launched a Cyber Demonstration Centre to enable UK cyber security businesses to showcase their products and capabilities to UK and overseas buyers, while a new Early Stage Accelerator programme will support the next generation of businesses. To promote exports, 15 overseas trade missions and events have taken place, in which 79 companies have participated.

OBJECTIVE 2:

MAKING THE UK MORE RESILIENT TO CYBER ATTACK AND BETTER ABLE TO PROTECT **OUR INTERESTS IN CYBERSPACE**

Understanding the cyber threat

- 1.18 In 2015, the Foreign Secretary publicly avowed the Centre for Cyber Assessment (CCA). The Centre is the government's all-source assessment centre and the UK's independent authoritative voice on strategic cyber issues. It provides assessments of cyber threats and vulnerabilities to policymakers, senior officials and ministers in more than 43 government departments and agencies.
- **1.19** The Centre's reports now include 'threat to' (vulnerabilities) as well as 'threat from' assessments, focusing on critical national infrastructure (CNI). This provides a holistic picture, enabling asset owners and regulatory bodies to prioritise resources.

Detecting and defending against threats to our critical infrastructure

- 1.20 Cyber risk reviews of the UK's CNI have increased government, regulator and industry understanding of the risks and have led to further work on mitigations, supported by bespoke guidance.
- 1.21 The Programme has also funded enhanced cyber security training, the development of a rigorous cyber incident response exercising programme, support for the design of new CNI, and forums and briefings for senior managers and industry practitioners to raise awareness of cyber threats.

Building in resilience: cyber security by design

1.22 Good cyber security means understanding the threat and factoring that into the design of new infrastructure and products. For example, GCHQ is providing ongoing support to the Smart Meters programme, the next generation of gas and electricity meters for consumers, to ensure the correct implementation of the agreed security design.

Strengthening and protecting government systems

- 1.23 The Government is developing a new secure IT shared service to enable secure and efficient working across government.
- 1.24 To combat online fraud, HMRC has set up a Cyber Security Command Centre to correlate data across multiple sources to identify potential anomalous or malicious behaviour. Over the recent self assessment filing period, HMRC monitored over nine million transactions.
- 1.25 The Department for Work and Pensions (DWP) has one of the biggest digital estates in Europe. They have continued to transform their cyber security capability to ensure their systems are resilient against interference or attempted fraud and to share information to help protect wider government systems.
- 1.26 The "SNAP" (Security Network Analysis Platform) Project, led by GDS, is an initiative to identify and share information on cross-government threats and trends, so that wider government can put in place proportionate security measures. The project is currently in its pilot phase.
- 1.27 The National Archives has continued to provide briefing and training to public sector staff in information security roles. Over 1500 Information Assurance Managers in 41 public sector organisations have received training in 2015-2016. A "train the trainer" model ensures that this training is spread more widely across organisations.

OBJECTIVE 3: HELPING TO SHAPE AN OPEN, VIBRANT AND STABLE CYBERSPACE THAT **SUPPORTS OPEN SOCIETIES**

International law and responsible State behaviour in cyberspace

- 1.28 The UN Group of Governmental Experts, including an expert from the UK, agreed a report on how international law may apply in cyberspace, and recommendations for voluntary, nonbinding norms of responsible State behaviour, confidence building measures (CBMs) and capacity building. The report builds on the previous Group's conclusion in 2013 that international law applies in cyberspace and is essential to maintaining peace and stability and promoting a secure, stable and accessible online environment. There is likely to be further work in 2016.
- **1.29** The UK also played an active role in negotiations by the Organisation for Security and Co-operation in Europe (OSCE), leading to agreement on additional CBMs for cyberspace to enhance interstate co-operation, transparency, predictability and stability, and to reduce the risks of misperception, escalation, and conflict that may stem from the use of information and communication technologies.

Bilateral relations and multilateral networks

1.30 The UK has continued to strengthen bilateral relations on cyber security. For example, the Minister for the Cabinet Office led a cyber security trade mission to Israel in February 2016, which has strengthened business and academic collaboration, including in research and CERT-to-CERT co-operation on incident management.

- 1.31 During 2015, the India-UK Cyber Dialogue and Prime Minister Modi's visit to the UK strengthened our ongoing collaboration with India on cyber issues. Both countries reaffirmed their commitment to combating cyber crime and advancing voluntary norms of responsible State behaviour and the application of international law in cyberspace.
- **1.32** Following President Xi's State Visit to the UK in October 2015, the UK and China agreed not to conduct or support cyberenabled theft of intellectual property, trade secrets or confidential business information with the intent of providing competitive advantage.
- 1.33 A UK expert seconded to the NATO Co-operative Cyber Defence Centre of Excellence in Estonia has led projects during 2015 to support the Centre's strategic priorities. GCHQ have also shared with NATO details of their work to certify Masters Degrees in cyber security. This has sparked interest from both NATO and individual Allies keen to replicate the programme in their own countries.
- 1.34 The UK successfully helped shape the EU Cyber Security Strategy and its implementation, providing a stronger basis for co-operation with other EU member states. The UK was also instrumental in securing informal agreement for the EU Network and Information Security Directive to improve levels of cyber security across Europe. Formal agreement is expected in Spring 2016.

OBJECTIVE 4: BUILDING THE UK'S CYBER SECURITY KNOWLEDGE, SKILLS AND CAPABILITY

1.35 The Government is working with academia and industry to improve cyber skills, education, and research. We have commissioned research from The Work Foundation (part of Lancaster University) and Databuild to identify the UK's current and future cyber security skills. This will inform the Government's strategy for cyber security skills over the coming years.

Schools

1.36 The Programme has funded new materials at Key Stage 3, GCSE and A-level, available to schools from September 2015. This means that everyone will leave education with a basic understanding of cyber security. The Programme has also funded support and accreditation for professional development in cyber security for teachers.

Vocational training and apprenticeships

- 1.37 Cyber security will be an integral feature of all computing and digital further education qualifications at Levels 3 and 4 from September 2016, providing cyber security awareness for people entering the world of work.
- 1.38 GCHQ are already using an apprenticeship scheme with success: since 2012. over 170 new apprentices have either graduated or joined the tailored two year foundation degree course.
- **1.39** The Government is helping to promote this approach more widely. We have supported a Cyber Higher Apprenticeship programme delivered by the Tech Partnership with Training Provider, QA, creating more than 250 new roles across industry for school leavers. We have

worked with the Tech Partnership to develop new Cyber Intrusion Analyst and Cyber Security Technologist Trailblazer Apprenticeships. We have also integrated a cyber stream into the Fast Track Civil Service Apprenticeship scheme, offering 50 new roles in IT Security and Digital Forensics across government.

Higher education

- 1.40 The Government has worked with academia, professional bodies, trade associations and industry to define a framework for the cyber security skills and knowledge that students are expected to achieve in computing science and related courses. Universities will use these guidelines for updated courses for 2016-2017.
- 1.41 In 2015, the Government launched Cyber First to identify individuals with exceptional aptitude to become the UK's next generation of cyber security experts. Cyber First will offer financial assistance for those studying relevant Science, Technology, Engineering and Mathematics (STEM) courses at undergraduate level, and includes work experience and the offer of a job in the field upon graduation. 20 students have now joined the scheme, which will be expanded to 1000 students by the end of 2020.
- 1.42 Cyber security mentoring and cyber camps allow undergraduates studying computer science or related degrees to gain work experience, and enable employers to recruit the best new talent directly from university. Four university cyber camps were held during 2015 across the UK. Many of the participants have gone on to secure jobs or placements in the field.

Broadening the pool of talent

- **1.43** The Government continues to be an active sponsor of the Cyber Security Challenge UK and has contributed to several initiatives over the year, including providing technical content for the successful Challenge Masterclasses in March and November 2015.
- 1.44 In September 2015, using the Massively Multiplayer Online Game (MMOG) format, the Cyber Security Challenge UK launched an immersive 3D gaming experience. This will provide a constantly changing and challenging environment for current and future cyber security professionals to test their skills. The platform is the first of its kind in the world and the UK is leading the way with a new approach to attracting talent into the profession.

Professionalisation and careers

- 1.45 'Inspired Careers', an online careers hub funded by the Programme and developed by CREST, went live in 2015. This helps young people and existing professionals move into the sector, including through internship and apprenticeship opportunities, work experience and senior level vacancies.
- **1.46** The Government has continued to invest in the specialist cyber security skills of its employees. During 2015, HMRC, on behalf of wider government, worked with the cross-government security profession and professional bodies to define career paths for the Government Security Profession, including cyber security. HMRC will use this to embed cyber security best practice in the 26 government professions. The department will also re-develop and manage the Government's cyber apprenticeship scheme.

Research

- 1.47 Launched at IA15, GCHQ's information assurance event for government, industry and academia, Cyberlnvest brings together government and industry to invest in and support the development of cutting-edge cyber security research in UK academia. 19 companies have signed up to the scheme, ranging from large global corporations to micro companies. Industry members have already committed over £7 million over the next five years.
- **1.48** The UK is also collaborating with international partners. In February 2016, the Minister for the Cabinet Office announced new academic engagement with Israel in the emerging area of cyberphysical security to build system and infrastructure resilience, while the call for joint UK / Singapore research proposals resulted in six further successful applications in late 2015.
- **1.49** We are also supporting universities in identifying opportunities to commercialise their research. This includes a programme in 2016 for UK academics to learn from leading US universities who have developed successful cyber security businesses.



CHAPTER TWO

PROGRAMME
IMPACT
2011-2016

- 2.1 Chapter One highlighted initiatives launched during 2015-2016 to support the objectives of the National Cyber Security Programme. This chapter reviews the broader impact of the Programme since 2011.
- **2.2** Through the combined efforts of government, industry, academia and international partners, the UK now has:
 - Enhanced national capabilities to protect and defend ourselves against those who would do us harm.
 - Expert guidance for businesses of all sizes and sectors.
 - A greater share of the international cyber security market.
 - Online government services that are more secure than ever.
 - Proven capability to tackle cyber crime.
 - A leading role in shaping the international debate on cyber.
 - Mechanisms to build our cyber skills and knowledge.
- **2.3** The illustration on pages 8 and 9 summarises achievements across the four Programme objectives.
- 2.4 There is more to do. But we have laid solid foundations.

We have enhanced national capabilities to protect and defend ourselves against those who would do us harm

2.5 Building on GCHQ's world-class expertise in cyber security, the Government has invested in new capabilities and technical infrastructure which have increased our ability to identify - at scale and pace the evolving and complex threats to UK networks from cyberspace.

- The Government has also continued 2.6 to strengthen the cyber security of the armed forces and military supply chain. The Joint Forces Cyber Group was stood up in 2013 to deliver the MOD and Armed Forces' cyber capability and continues to develop new tactics and techniques to defend against hostile foreign actors. We established the Defence Cyber Protection Partnership in 2013 as a joint government and industry initiative to address the cyber threat to the defence supply chain by embedding proportionate cyber security measures in the contractual process, while also preserving existing investment in cyber security measures. In 2015, a Cyber Essentials-based scheme was developed for defence suppliers to government. It will apply to all defence contracts from 2016.
- 2.7 The Armed Forces launched a Cyber Reserve in 2013 to engage additional cyber experts. Interest in joining is strong. All cyber units now have Cyber Reservists supporting them and recruitment is on track to deliver the Cyber Reserve by 2017.

With the establishment of CERT-UK, we now have a national approach to cyber incident management.

2.8 We launched CERT-UK, the UK's national Computer Emergency Response Team, in 2014. Since then, it has worked closely with industry, government and academia to enhance the UK's ability to prepare for, respond to and recover from national cyber security incidents. It works primarily with other CERTs and companies that manage the UK's CNI. Internationally, CERT-UK is the UK point of focus for incident handling and for coordination and collaboration between the national CERTs of other countries.

2.9 But there is more to do. The 2015
National Security Risk Assessment²
noted that the "cyber risks to the UK
are significant and varied" and that they
"underpin many of the other risks we
face". The scale, complexity and pace of
the evolving cyber threat mean that we
cannot afford to relax our efforts.

Better protected businesses of all sizes and sectors

Expert guidance, training and exercising opportunities are now in place to help the UK's critical national infrastructure manage the cyber threat.

- 2.10 Helping our CNI remain secure against cyber attacks is a continuous task. The threat continues to increase and evolve. Responsibility for defending the UK's CNI sits firmly with industry, but government works closely with them to provide advice, assurance and expertise.
- 2.11 The Government has also worked closely with CNI sectors on joint exercises to improve preparedness. On average, CERT-UK supports three exercises per month to test cyber resilience and response.
- 2.12 As well as training, information sharing and exercising, we have also focused efforts on ensuring that systems are cyber-secure by design. The UK's Centre for the Protection of National Infrastructure (CPNI) has influenced cyber security standards, researching vulnerabilities and focusing on the key technologies and systems of cyber infrastructure. Through this, it has been able to advise organisations both in the CNI and more widely on applying critical controls so that they build more resilient systems.
- 2.13 In 2014, GCHQ introduced a new initiative to enhance the protection of UK critical networks from threats in

- cyberspace. The organisation shares threat information on cyber crime activity with security cleared personnel in trusted Communications Service Providers (CSPs), enabling them to take early action on the networks they manage. GCHQ has attracted a number of partners who have demonstrated their ability to counter threats at scale using the information provided.
- 2.14 To support organisations which may have been the victim of a cyber attack, GCHQ and CPNI have also established Cyber Incident Response schemes which enable organisations to gain access to incident response services tailored to their specific needs. 31 incidents have already been tackled under the schemes.

Businesses now have access to guidance, training and a real-time information-sharing network, to help them manage cyber threats.

- 2.15 There is now best practice cyber security guidance available to help protect large and small businesses. This is supplemented by free online training for employees and small business owners as well as specific training for a range of professions.
- 2.16 CPNI has also produced information on cyber threats, such as social engineering as well as the safe use of digital devices and services, to encourage employees, wherever they work, to adopt secure online behaviour both in and out of the office.
- 2.17 Sharing information about new and evolving cyber threats is a key part of CERT-UK's role and it now manages the UK's CiSP. Launched in 2013, this is a government / law enforcement / industry initiative to share securely real-time information on cyber threats and vulnerabilities and to provide advice on how businesses can protect themselves.

² National Security Strategy and Strategic Defence Review 2015 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/478933/52309_Cm_9161_NSS_SD_Review_web_only.pdf

Ten regional branches of the CiSP are now in place across the UK, with members from the UK's CNI, smaller businesses and public sector organisations, supply chains and academia.

CiSP currently has over 1750 UK organisations and 5000 individuals as members. CiSP remains a free resource.

For the first time, there are recognised cyber security standards, so that businesses can demonstrate that they take the issue seriously.

- **2.18** We developed the Cyber Essentials scheme to give industry a clear baseline for addressing risks to business. It is designed to ensure that, by focusing on basic cyber hygiene, companies are better protected from low level cyber threats. This can also give competitive advantage over other businesses that may not be managing their risks adequately. Since its launch in 2014, the Government has issued over 2000 Cyber Essentials certificates, including to FTSE 100 organisations. Cyber Essentials received an industry award in 2015, in recognition of the scheme's influence in driving up information security standards.
- 2.19 In order to reduce cyber security risks in the government supply chain, central government departments have included Cyber Essentials since 2014 as part of their procurement processes for certain contracts, such as those involving the provision of certain ICT products and services.

Businesses are starting to take notice of the cyber risk

- 2.20 Cyber Essentials has been downloaded over 50,000 times since its launch. Over 77,600 people have completed the online training for smaller businesses.
- **2.21** According to the 2014-15 Cyber Governance Health Check of FTSE 350 companies³:
 - More were getting the basics right: 58% had assessed themselves against the '10 Steps' guidance, up from 40% the previous year.
 - 88% of companies now actively considered cyber security as a business risk and included it in their risk register, up 30% on the previous year.
 - Companies are getting better at understanding the supply chain risk: 59% have a basic or clear understanding of where their critical information and data sets are shared with third parties, up from 52% the previous year.
- 2.22 The most recent FT-ICSA Boardroom Bellwether survey⁴ (Winter 2015) has found that: "82% the highest rating since we began asking about cyber risk two years ago regard the threat of cyber attack to be increasing. Three quarters of companies have assessed the risk and are mitigating against it, with external help if necessary."
- 2.23 But there is more to do to turn awareness into action. While many businesses are becoming increasingly aware of the cyber risk, there is still a gap between being aware of the risk and taking practical steps to mitigate it.

³ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/399260/bis-15-37-ftse-350-cyber-governance-health-check-tracker-report-2014.pdf

⁴ https://www.icsa.org.uk/knowledge/research/ft-icsa-boardroom-bellwether-survey-winter-2015

- 2.24 The 2014-15 Health Check of FTSE 350 companies identified that businesses could do more to deepen their understanding of the threat: less than a third (30%) of boards received high level cyber security intelligence from their Chief Information Officer or Head of Security, while less than a quarter (24%) of companies based their cyber risk discussion on comprehensive or robust management information.
- 2.25 With smaller businesses, awareness of the personal relevance of the cyber risk is patchy. A 2016 survey of small and medium-sized businesses by KPMG and the Government's Cyber Streetwise campaign⁵ found that: "cyber security was cited as one of the top concerns by less than a quarter of small businesses (23%), yet it is fast becoming the only way to do business." And this is also despite 83% of consumers surveyed being "concerned about which companies have access to their data" and over half (58%) saying that "a breach would discourage them from using a business in the future."

A greater share of the international cyber security market

2.26 The UK has a strong and innovative domestic cyber security sector which contributes over £17 billion to the economy. Our cyber security exports are growing, with a rise in market share from 3.6% to 4.4%. This amounts to £1.47 billion in 2014 – up 35% since 2012. This puts the UK on course to meet our target of £2 billion cyber security exports by the end of 2016 and indicates strong progress towards our aspiration of £4 billion by 2020.

Online government services are increasingly secure

Government services are increasingly delivered online. Our systems are now more resilient and better protected, with secure means of collaboration across departments.

- 2.27 The Government takes seriously the security of its systems and has invested in enhancing their resilience. We have a long-standing framework in place which specifically addresses security requirements for government departments and agencies. GCHQ, though its technical and information arm, CESG, plays an essential role this.
- 2.28 Central government departments, local authorities and councils now use the Public Services Network, the government's IT network which connects public sector organisations, enabling secure collaboration between them.
- 2.29 The Government has also invested in enhancing its capabilities to identify cyber threats and protect its systems and the information they hold from attack. These include capabilities to detect fraudulent websites and other threats, and measures such as GOV.UK Verify. This is a new way for users to prove who they are online and therefore access digital services securely The system has been used more than a million times and has verified almost half a million identities during the test phase.
- 2.30 Specific training has been provided for staff in specialist roles, while e-learning on handling data securely has been provided for staff at all levels across the public sector.

⁵ www.cyberstreetwise.com/smallbusinessreputation

Over 480.000 public sector staff have been trained in handling data securely.

We are actively tackling cyber crime

Specialist capability is now enabling UK police forces actively to disrupt serious cyber crime.

- 2.31 The Government has invested in law enforcement capabilities at national, regional and local level to ensure that police forces have the capacity to deal with the increasing level and sophistication of online crime.
- **2.32** The National Cyber Crime Unit (NCCU) is part of the NCA. It was established in 2013 as the national lead for serious and organised cyber crime. Since then, it has increased its capability to investigate the most serious cyber crimes, working both domestically and with international partners. There are currently NCCU officers seconded to partners in Europe, the USA and Singapore.

The NCCU is leading 170 domestic and international operations to disrupt serious cyber crime.

2.33 Each of the nine Regional Organised Crime Units (ROCUs) now has a cyber unit. With their operational, intelligence and investigative capability, the ROCUs are a focal point for advice and assistance to regional forces on cyber crime. The ROCU network's operating model is considered best practice internationally and has been adopted by a number of law enforcement agencies in other countries.

2.34 Providing the ROCU response for London, the Metropolitan Police Service set up a Fraud and Crime Online (FALCON) team in 2014, which brings together their specialist cyber crime investigators to pursue and disrupt cyber criminals.

> The work of the FALCON team has resulted in 985 arrests, 431 people charged, 241 convicted and £3.1 million confiscated.

Cyber security skills are being mainstreamed across UK police forces.

2.35 Volunteer 'Cyber Specials' will also be in place across police forces by March 2018. This initiative will continue to harness expertise from relevant sectors to increase further police capability to investigate cyber crime.

> Since the introduction of the College of Policing's **Cyber Crime Training course** for all police forces, over 150,000 modules have been completed.

Tackling online fraud is a top priority.

2.36 Government systems present an attractive target to cyber criminals and the threat has grown significantly over the life of the Programme. During 2012, HMRC took down almost 1000 fraudulent websites; during 2015, that figure rose to more than 11,000. To ensure that government finances are secure against cyber threats, HMRC established a dedicated Cyber Security team in 2012. The team assisted in the prevention of frauds totalling more than £103 million in 2014-15.

More than £103 million of attempted fraud from government systems was prevented in 2014-15.

There is now a single point for the public to report online fraud.

2.37 Action Fraud is managed by the City of London Police, the national lead force for fraud. It provides a centralised point for members of the public to report incidents. It also provides advice on how to avoid fraud. The National Fraud Intelligence Bureau, also run by the City of London Police, has expanded to include dedicated cyber focus teams and disruption teams. The service now supports 43 forces in their investigations into cyber crime.

> In the year ending September 2015, recorded fraud offences more than trebled from 72,000 before the centralisation of reporting, to over 230,000.

There are consequences: people are being prosecuted for cyber crime.

2.38 The number of cyber crime cases prosecuted by the CPS Organised Crime Division has increased significantly over the life of the Programme. The number of live cyber crime cases rose from 13 in October 2011 to 50 in December 2015. The number of finalised crime cases increased over the same period from 2 to 43, not including cyber cases dealt with by other sections of the CPS.

- 2.39 The CPS has developed strong expertise in cyber crime in response to increasingly complex cases. Specialist lawyers are involved in obtaining evidence from overseas, building the overall evidential package and ensuring that disclosure obligations are properly discharged. These investigations include cases involving the distribution and use of malware, the illegal importation of firearms and child sexual exploitation.
- **2.40** But there is more to do to make the UK and its citizens a harder target for cyber criminals. In 2015, the Office for National Statistics piloted new fraud and cyber crime questions for the Crime Survey of England and Wales. The results indicated an estimated 5.1 million incidents of fraud and 2.5 million incidents of computer misuse per year. The Government's Modern Crime Prevention Strategy, published in March 2016, commits to working with the private sector and the public to reduce opportunities for crime online.

We are playing a leading role in international cyber security

The UK is a key player in international efforts to tackle cyber crime.

2.41 In addition to active law enforcement operations with international partners to disrupt serious cyber crime, we have reduced the cyber crime threat to the UK through our Cyber Capacity Building Programme. Results include working with the Council of Europe to develop a state-of-the-art cyber crime capacity building centre, new cyber legislation and national strategies in a number of countries and capacity building to enable cyber fraud prosecutions.

⁶ http://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/bulletins/crimeinenglandandwales/ yearendingseptember2015

The UK is helping shape the international debate on cyber.

- 2.42 The UK is taking an active role in the international debate about the future of cyberspace, pursuing consensus with the international community on international norms and confidence building measures in cyberspace and internet governance. We are doing this through our strong bilateral and multilateral networks as well as through the "London Process" series of conferences on cyberspace which began in London in 2011, and continued in Budapest in 2012, Seoul in 2013 and The Hague in 2015. These have helped build a consensus among like-minded States on a range of cyber security issues, particularly international cyber security capacity building.
- 2.43 The conference in The Hague saw the launch of the Global Forum on Cyber Expertise (GFCE) – a global platform to co-ordinate and share best practice in cyber security capacity building. This includes an online portal designed by the Global Cyber Security Capacity Centre (GCSCC) at Oxford University, which has been funded through the UK's Capacity Building Programme. The portal is an analysis tool for assessing a nation's cyber capability. It also helps countries target capacity building where it is most needed. To date, over 50 governments, companies and bodies have signed up to participate in the Forum, exchanging best practice and expertise to strengthen capacity for all.
- 2.44 The UK has also funded the development and deployment of the Commonwealth Cyber Governance Model. This promotes Commonwealth principles and UK best practice through national cyber security strategies across the Commonwealth.

The UK is leading cutting-edge research in cyber security, reaffirming its academic credentials.

- 2.45 13 UK universities are now Academic Centres of Excellence in Cyber Security Research (ACE-CSR), recognised as conducting internationally leading cyber security research. GCHQ is sponsoring 33 doctoral studentships at the ACE-CSR. By 2019, almost 100 new doctoral level research projects will have been completed. Our two Centres for Doctoral Training are also continuing to educate the next generation of cyber security experts.
- 2.46 Three virtual Research Institutes, founded with Programme funds to address the most strategically important cyber issues, facilitate collaboration between leading researchers from different countries. The Research Institutes each focus on a specific area of cyber security.

We are actively building our cyber skills and knowledge

From age 11 onwards, cyber security is now included at every level of the UK's education system.

- **2.47** Cyber security is now a component in teaching at every level of the education system. We grant fund the Cyber Security Challenge schools programme, which engages pupils through competitions to complement the computing curriculum. Over 800 schools have taken part and 23,000 students have accessed the complementary learning materials.
- **2.48** At undergraduate level, cyber security is now a mandatory part of all courses accredited by the British Computer Society and the Institution of Engineering and Technology. At post-graduate level, GCHQ has now published standards for Masters Degrees in a range of cyber security disciplines and certified

12 Masters Degrees meeting those standards. The Masters certification programme is an important step towards recognising Academic Centres of Excellence in Cyber Security Education

There is now a variety of routes into the cyber security profession.

- 2.49 As detailed in Chapter One, we have developed and promoted academic and vocational routes into the cyber security profession, as well as the possibility of coming into the profession mid-career.
- 2.50 A range of initiatives is also in place to broaden the pool of talent further. In addition to Cyber Security Challenge UK's Masterclasses and new MMOG (discussed in Chapter One), these also include the Open University and FutureLearn's Massive Open Online Course in cyber security. This free online course is enabling members of the public to improve their cyber security skills. Over 80,000 people have now completed it.
- 2.51 But there is more to do. Our pool of cyber skills and knowledge is not keeping pace with rapid developments in technology. Our ability both to defend ourselves in cyberspace and to benefit from the opportunities it offers, depends on building a strong skills and knowledge base. The Government will therefore continue to work closely with academia and industry to boost the pipeline of talent into the profession.



CHAPTER THREE

LOOKING AHEAD

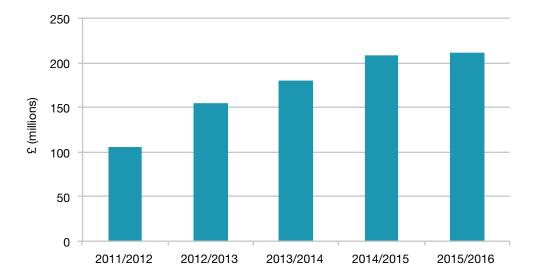
- 3.1 Over the past five years, the Government has worked in partnership with business, academia and the international community to deliver improved cyber security and resilience. As Chapters One and Two of this report describe, we have made tangible progress in galvanising the national response to the cyber threat.
- 3.2 The cyber threat, however, is not abating. The 2015 National Security Strategy re-affirmed the 2010 assessment of cyber as a Tier One risk to UK interests. The volume and complexity of cyber attacks against the UK are rising sharply. Digital technology is revolutionising every aspect of our lives. But the changing technological landscape is opening up new vulnerabilities and new opportunities for our adversaries. We need to work even harder to keep pace with the evolving threat.
- 3.3 The Government will therefore launch a new five year National Cyber Security Strategy later in 2016. This will set out the Government's vision for cyber security in 2021 and the objectives and respective roles and responsibilities that will enable us collectively to achieve that goal.
- **3.4** As part of this new Strategy, the Government will invest £1.9 billion to provide the UK with the next generation of cyber security to defend our data, systems and networks, deter our adversaries, grow our cyber security sector and develop the critical capabilities that will make us a global leader in cyber security.
- 3.5 A new National Cyber Security Centre will bring together the UK's cyber expertise, working hand in hand with industry, academic and international partners to keep the UK secure in cyberspace. It will create a single point of contact in government and a unified source of advice and support on cyber security for businesses of all sizes and sectors.

- An ambitious cyber skills programme will 3.6 build on existing initiatives to increase significantly the number of cyber security experts in the UK and produce the next generation of cyber skilled professionals.
- 3.7 We will also launch a programme to grow further the UK's cyber sector, encouraging movement between the public and private sectors to share expertise and innovation and bring ideas to market.
- 3.8 In doing so, we will ensure that all parts of government and the public sector play their full part in delivering efficient and secure services. But government alone cannot provide for all aspects of the UK's cyber security. All sectors of society have a role to play and it is vital that everyone plays their full part, adopting secure cyber behaviours that, together, will help protect the UK.

ANNEX A

PROGRAMME
FUNDING
2011-16

From the Spending Review settlements of 2010 and 2013, the National Cyber Security Programme was allocated £860 million to spend over the five years of the Programme. Our spend profiles over those five years are as follows:



Through rigorous financial management, as recognised by the Major Projects Authority and National Audit Office, we came within 1% of this budget. The table below details how funding has been spent over the past five years by thematic area of work. This best reflects the achievements of the Programme as a government-wide delivery programme, with cross cutting objectives as set out in the National Cyber Security Strategy.

