Cyber Tools and Trends

Next 7 Years: 2018 - 2025

Dr David E. Probert
***VAZA* International**

Dedicated to Grand-Daughters – Abigail, Alice & Tatiana – *Securing YOUR Life !*

35th International East/West Security Conference

- CyberSecurity Tools and Trends -
"From 2018 to 2025 and Beyond! "
*** Genoa, Italy – 5th & 6th June 2017 ***

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Кибер Сервис и Тенденции

Следующие 7 Лет: 2018 - 2025

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"Cybersecurity Trends": *Dual Themes*

Theme (1) – .....Practical Cyber Defence against TOP 10 Cyber Threats.....

We review Practical CyberDefence against Threats, Hacks & Attacks from Ransomware, BotNets(DDoS), Key Logging, Insider Threats, Legacy IoT Hacks, Social Media Phishing, Data Base Hacks(SQL), Advanced Persistant Attacks (APT), Virus/Trojan & Web/Cookie Hacks.

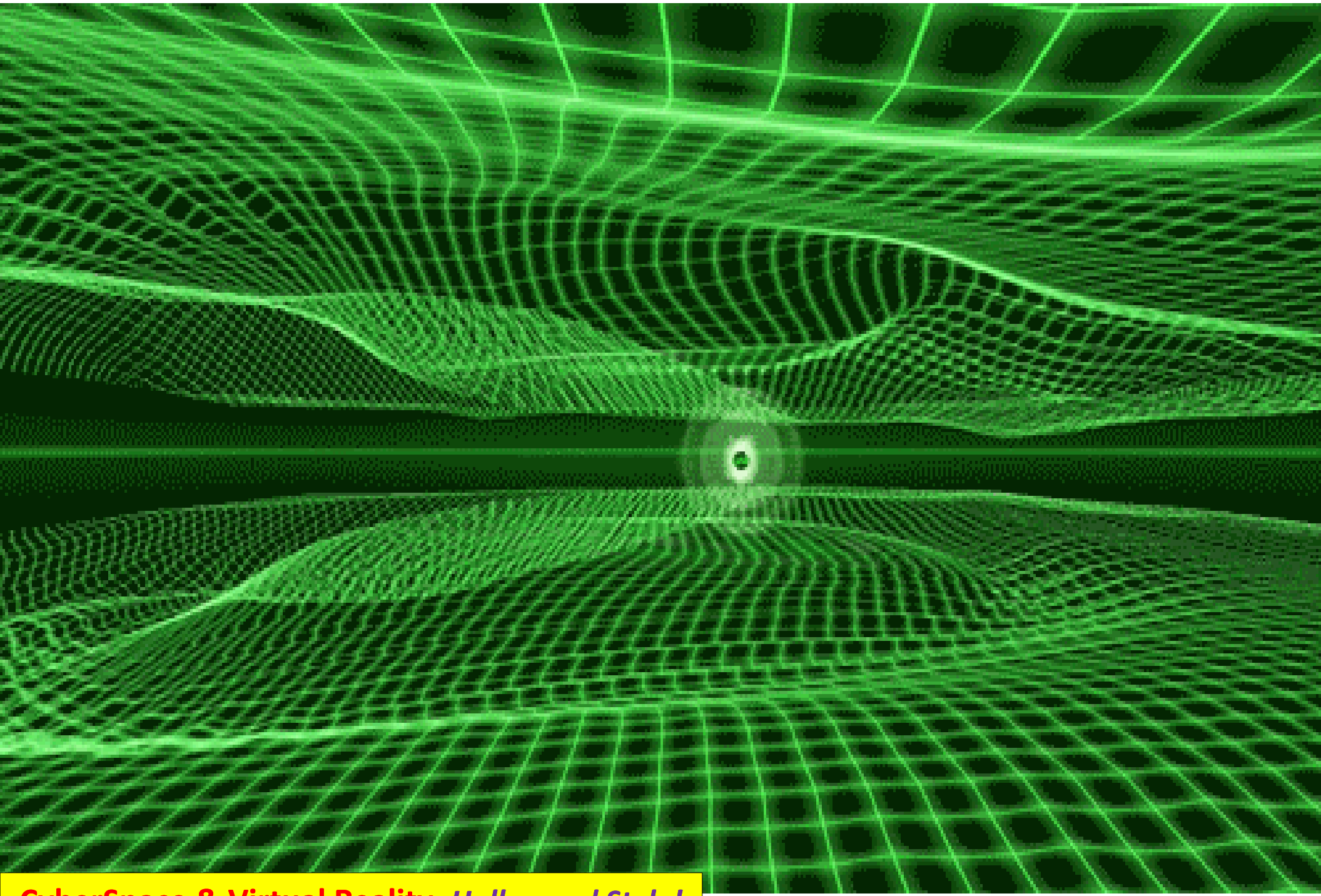
"Networked" : ***"Real-Time Cyber Security & Surveillance"*** ***09:45 6th June 2017***

Theme (2) – .....Cyber Tools & Trends: The Next 7 years: 2018 – 2025.....

We present Cyber Trends & Scenarios for 2018 (Cyber Transition), 2020 (Intelligent Security) and 2025 (Neural Security). We discuss the Evolution of Advanced AI based Cyber Tools with Applications to Smart Devices (IoT), Smart Transportation & Smart Cities.

"Neural" : ***"New Generation Networked Neural Security"*** ***14:15 6th June 2017***

Download Slides: *www.valentina.net/Genoa2017/*



CyberSpace & Virtual Reality: *Hollywood Style!*

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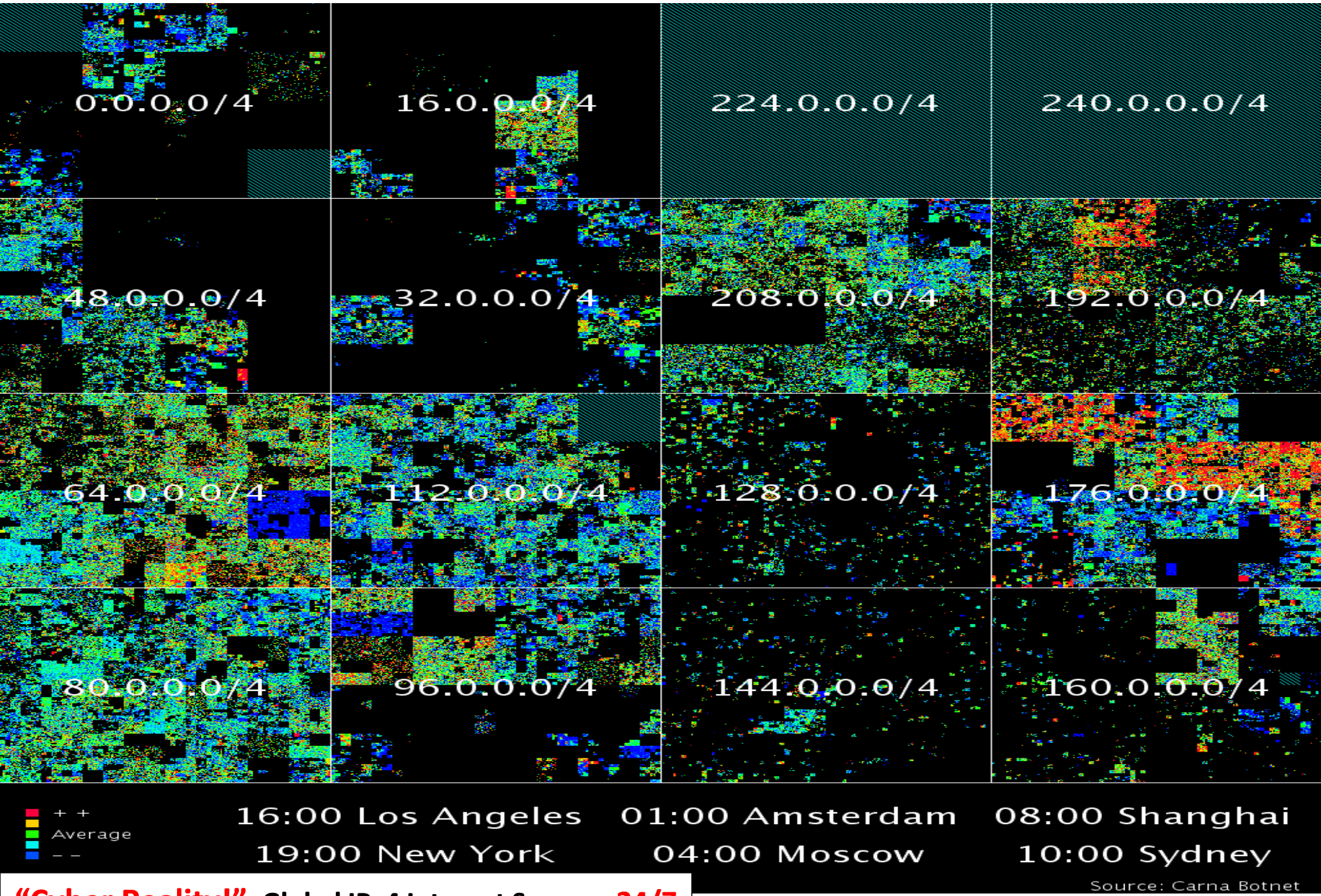
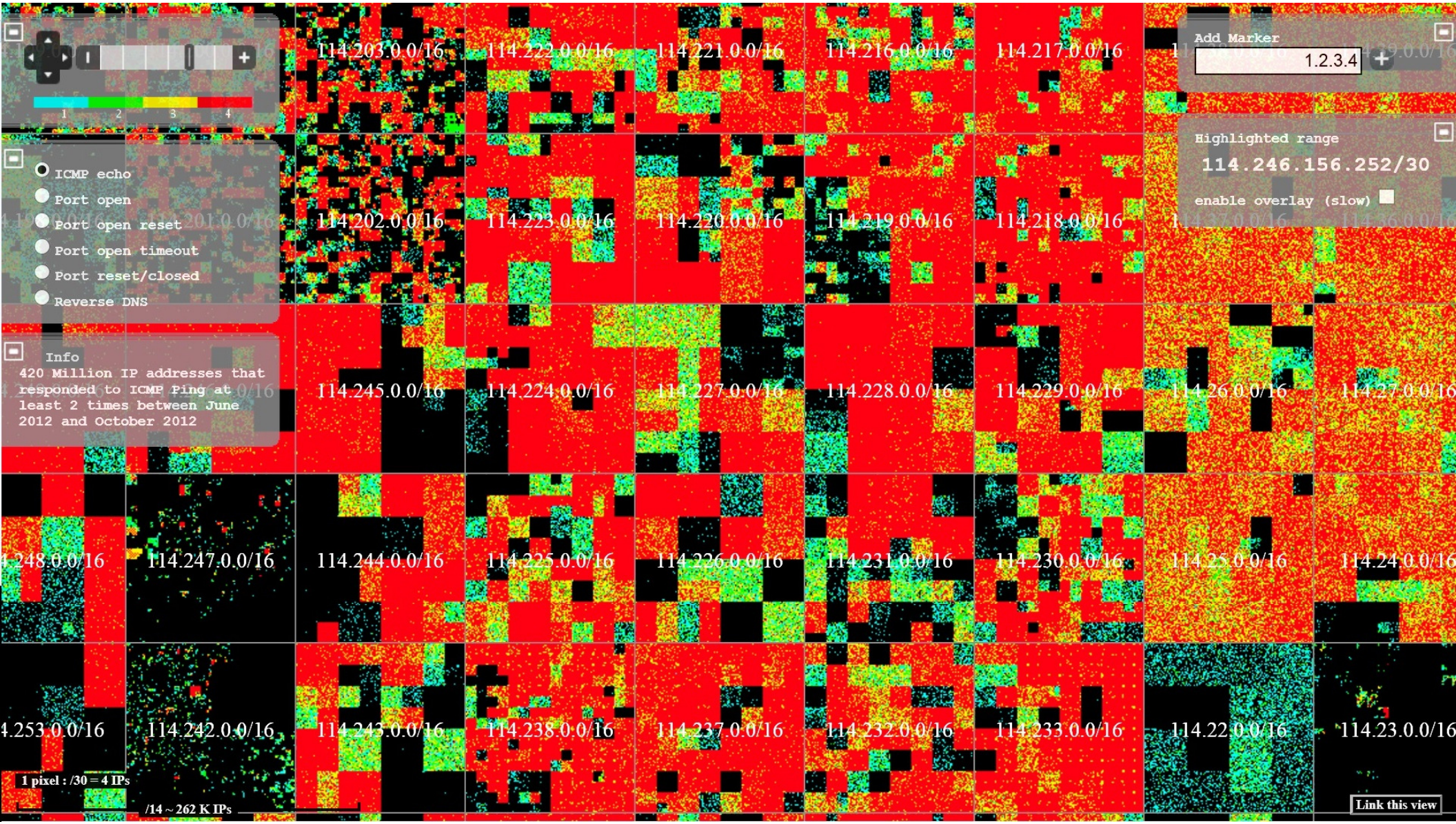


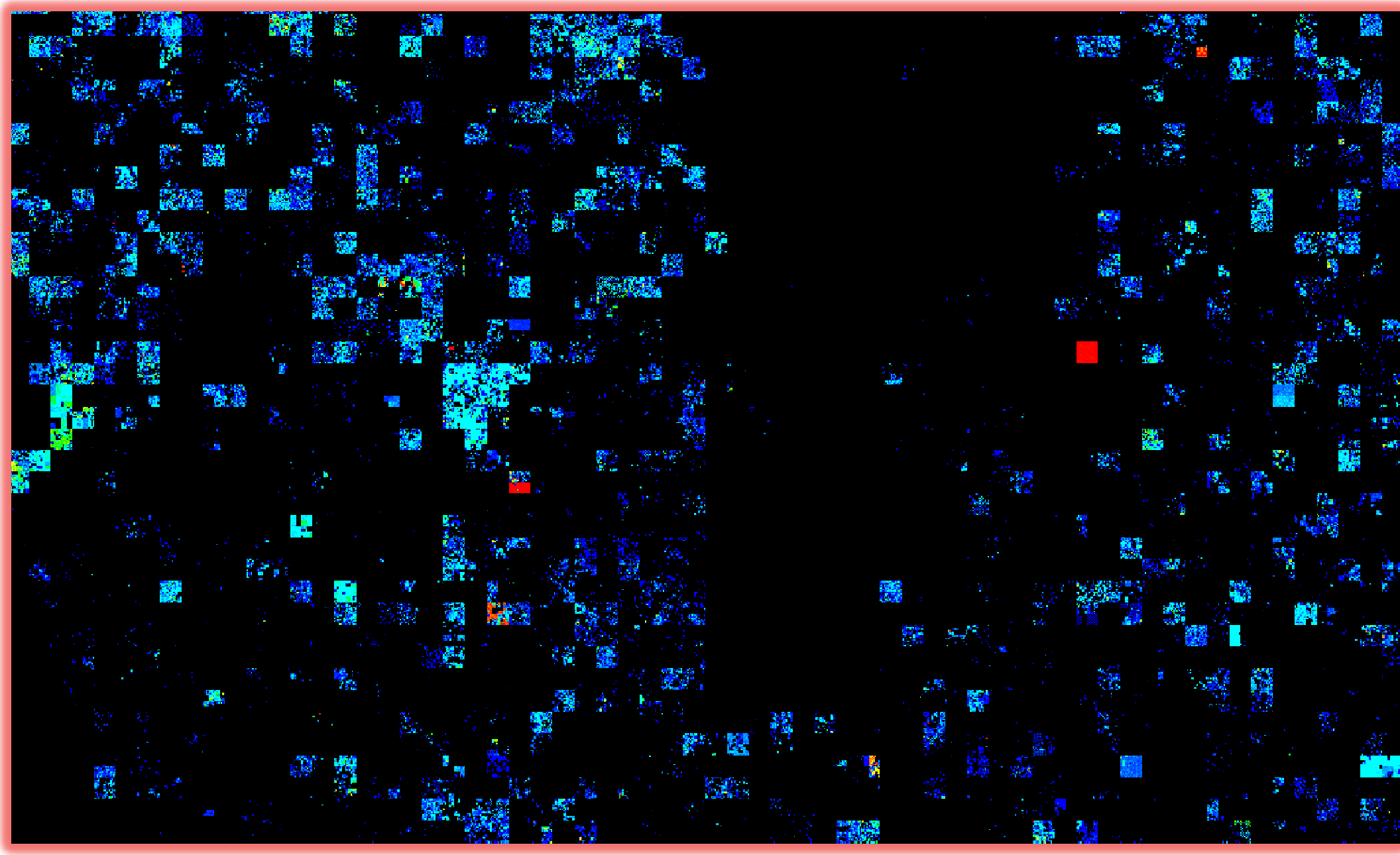
"Cyber Reality!": Global IPv4 Internet Servers: 24/7

Active Internet Domains – "American IP Registry"

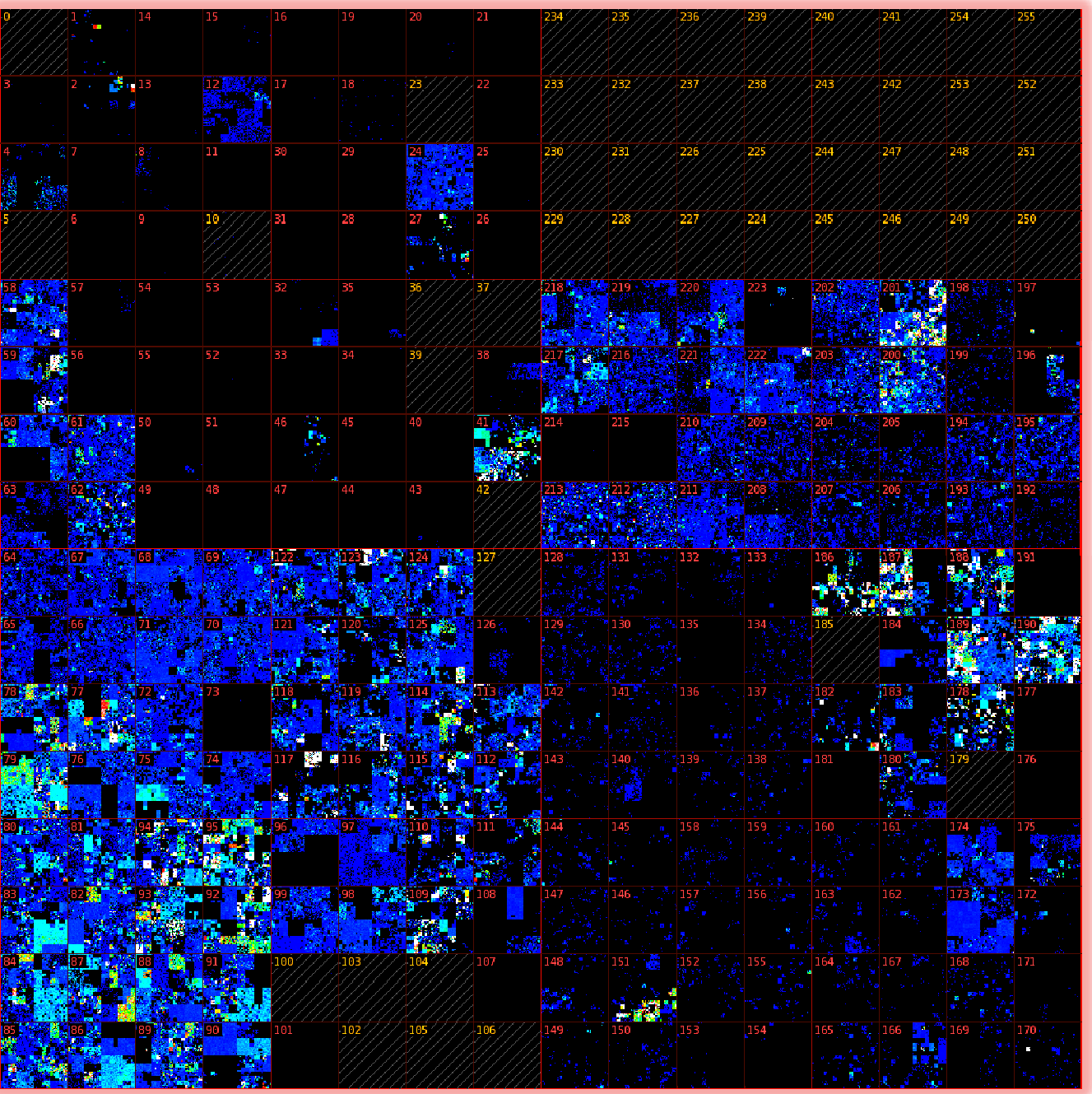
Cyberspace (Hilbert Map): *In-Depth Zoom*



"Outer Galaxies of Cyberspace" – *Other Domain Registries*



Malicious Cybercrime Activity in Global Cyberspace



Animation: Hilbert Space-Filling Curve

EVERY IP Node "Monitored & Mapped" in Hilbert Space"

Link: www.team-cymru.org

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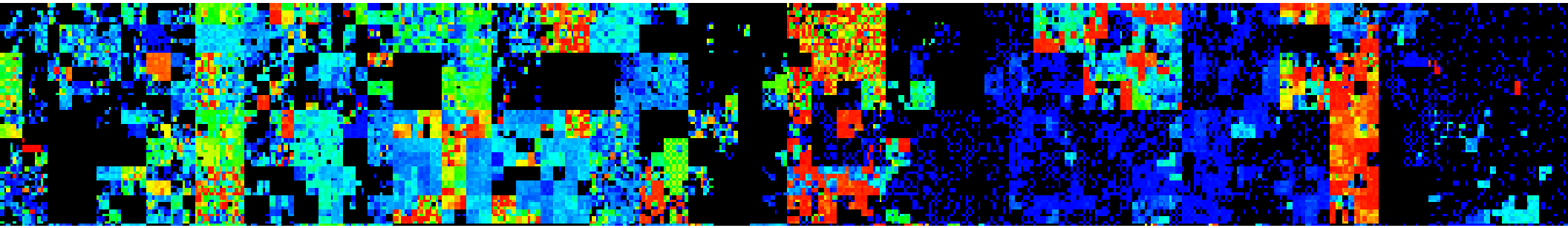
Cyber Crime, *Cyber* Terror & *Cyber* War!

- **21stC *Cyber* Security:** New security threats & attacks hit our media screens **EVERY** Day!
- **Hybrid *Cyber*-Physical:** The **"Bad Guys"** now exploit hybrid weapons with hybrid cyber-physical attacks on critical info infrastructure
- **7 Year *Cyber* Vision:** Business & Government need to Urgently deploy New Generation AI/ML Security Solutions to **"Win"** the **"War"**

Our ***"CyberVision"*** provides the basis for designing practical Strategies, Action Plans and Roadmaps to combat ***CyberCrime, CyberTerror*** & ***CyberWar*** for ***YOUR*** Business!

CyberSecurity Tools and Trends: *2018–2025*

1 – **"CyberSecurity @ Board Level"**	2 –***7 Year*** CyberVision: "The New Toolkit"	3 – CyberSecurity: "21stC Neural Defence"
4 – Scenario 2018: "Cyber Tools Transition" **"Integrated"**	5 –Scenario 2020: AI & Machine Learning **"Intelligent"**	6 – Scenario 2025: Augmented Reality(AR) **"Neural Security"**
7 – "Interfacing Human & Cyber Worlds"	8–From ***7 Year*** CyberVision to Reality!	9 –***YOUR*** Action Plan for 21stC Cyber!...



"CyberSecurity @ Board Level"

- **High** CyberSecurity Risks require Business and Governments to Plan & Invest @ **Board Level**!
- CyberSecurity Tools are now in Transition from:
  - **1st Gen:** Malware Signatures & Perimeter Firewalls
  - **2nd Gen:** Machine Learning & Artificial Intelligence
- Smart IoT Devices, Homes & Cities ALL require Embedded CyberSecurity in Chips & Networks!

....We provide a 7 Year CyberVision & RoadMap for C$O led Investment in Effective Cyber Defence!

CyberAttacks: *"Impact on Share Price"*

CGI & Oxford Economics – April 2017

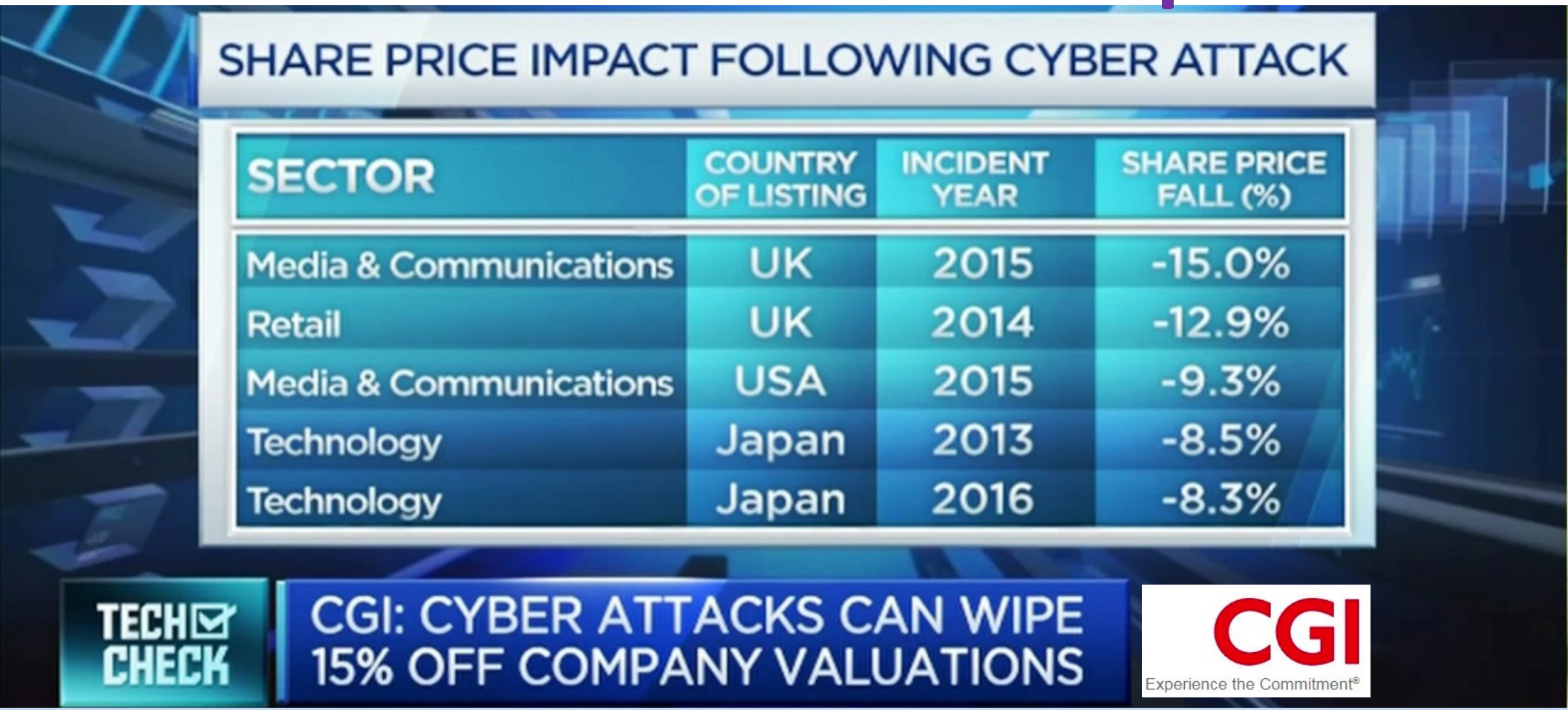
The Cyber-Value Connection

Revealing the link between cyber vulnerability and company value

www.cgi-group.co.uk/CyberValueConnection

CyberAttacks: *"Impact on Share Price"*

CGI & Oxford Economics – April 2017



Investors have lost at least £42Billion since 2013 due to Cyber Attacks

...Severe Cyber Attacks typically *wipe out* £120M of company value!...

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CyberAttacks: *"Impact on Share Price"*

CGI & Oxford Economics – April 2017

Report ***Recommends*** following **CyberSecurity Defence:**

1) Appoint **Board Level CSO** in Leadership Role!
2) Include **CyberSecurity** on **EVERY Board Agenda**
3) Consider **CyberSecurity** as **Trans-Business Risk**
4) **Recruit** & **Train** Professional **Cyber Specialists**
5) Establish **Cyber Operations $$$Budget** & RoadMap
6) Assume that **Cyber Defences** are already **Breached**!...

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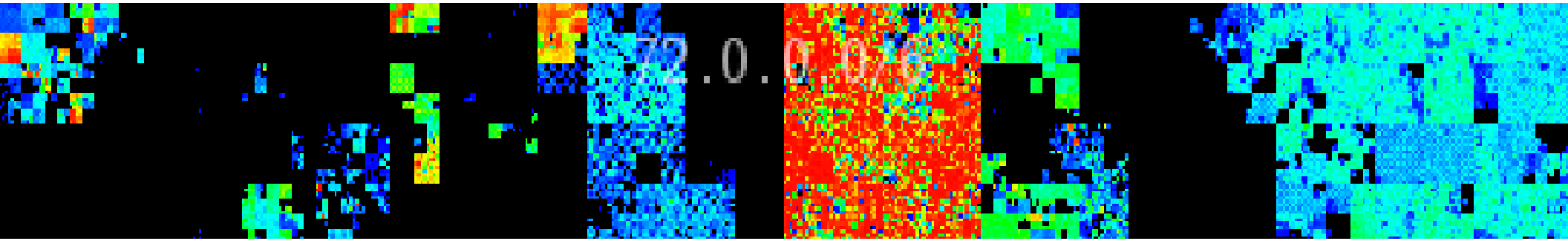

Warning! : CyberTerror Travels @ *"Light Speed"*

Physical Terror = "Spatial": Attacks on Physical Infrastructure , Corporate Assets, Staff and Citizens

**** Sound Waves = 340metres/sec ****

Cyber Terror = "Temporal": Anonymous Attacks on, Network Hubs, Servers, Databases & Social Media

**** Light Waves = 300,000,000 metres/sec ****

Web Archive: www.thrustssc.com

7 Year CyberVision: "The New Toolkit"

- During the last 7 Years CyberThreats targeted:
  - Critical National Infrastructure (CNI): Energy, Banks, Transport, Government, Healthcare, Education...
  - Major Events: Sports, Elections & Culture Festivals...
  - Criminal eCommerce: "The Dark Web" & "SilkRoad"!
- The "New Cyber Toolkit" provides "Real-Time" Defence against "Zero-Day" & "Insider" Attacks!
- Exponential Increase in Device Connections (IoT) requires Cyber Defence through AI/ML "Bots" running 24/7 on ALL Networked System Assets!

"Cyber" Tracking & Profiling: *"Bad Guys"*

- Mitigating Global Crime & Terrorism requires us to **Profile & Track** the "Bad Guys" in "Real-Time" with Intelligent Networked Computing Systems:

  - 3D Video Analytics from CCTV Facial Profiles
  - Track On-Line Social Media, eMail & "Cell" Comms
  - Scan "DarkNet" for "Business Deals", Plans & Messages
  - Check, Track & Locate Mobile Communications
  - Track "Bad Guys" in National Transport Hubs
  - Deploy RFID Devices to Track High-Value & Strategic "Assets"
  - Use Real-Time ANPR for Target Vehicle Tracking

...***Cyber Computing Smart Apps*** can now Track Massive Databases of Target "Bad Guy" Profiles ***@ Light Speed!...***

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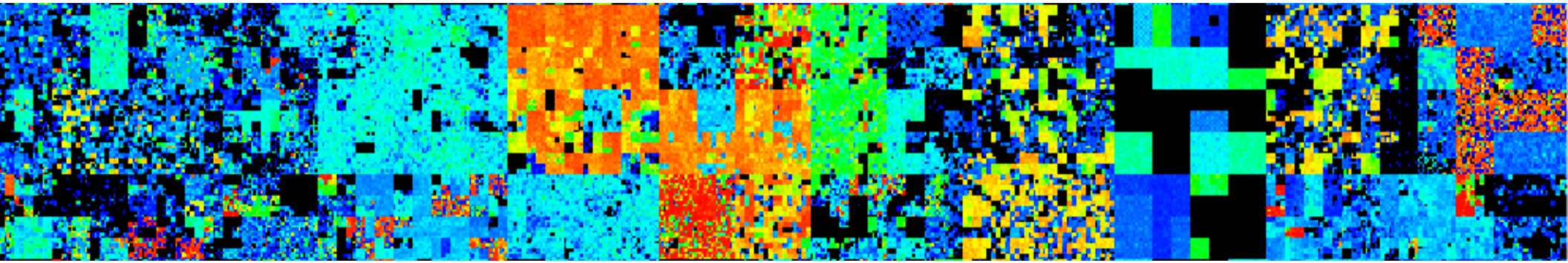

CyberSecurity: "21stC Neural Defence"

- "Bad Guys" are already deploying Advanced CyberTools within Organised Crime Syndicates!
- Legacy IoT Devices in *EVERY Sector* may be "hacked" & exploited with ease by "BotNets"!
- CyberDefence for Business & Government requires Managed 7 Year Transition to *"Speed of Light"* "Neural Defence" and "Augmented Reality"!

...We now *create* & *explore* **CyberSecurity Visions** for:

2018 (Integrated), **2020** (Adaptive) and **2025** (Neural)

Transition from "Cyber Now - 2017" to "Intelligent AI/ML Cyber - 2025"

Sci-Fi Movie – "13th Floor" (1999): "Real-World & Cyber World"

Transition from "Cyber Now - 2017" to "Intelligent AI/ML Cyber - 2025"

2017 - "Cyber Now"

- "Signature" Detection
- Multi-DMZ Firewalls
- Anti-Virus & Malware
- Supervised Learning
- Zero-Day Attacks
- Objects & Assets
- **"Known BAD!"**

2025 - AI/ML Cyber

- Behaviour Modelling
- Learning the Baseline
- "Smart Security"
- Unsupervised Learning
- Zero-Second Attacks
- Events & Experience
- **"Known GOOD!"**

Scenario 2025: Defence In-Depth requires Augmentation of **Traditional " Cyber" Tools** to include **Intelligent AI/ML Security Tools** that model **BOTH "Known GOOD & BAD!"**

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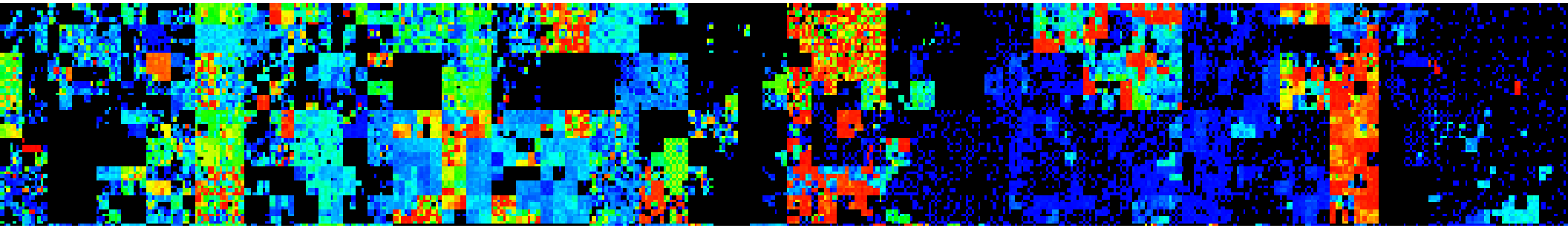

Scenario 2018: "Cyber Tools Transition"

*** Integrated ***

- Major Trends & Developments: **Scenario 2018**:
  - **C$O led Integration** of Physical and Cyber Security Assets across Corporate Business and Government : CCTV, ANPR, Access Control, Cyber Defence & Alerts
  - **Adaptive AI/ML** Solutions launched by Major Cyber Vendors alongside Cylance, Darktrace & Deep Instinct
  - Increased **National Government Priority** & Investment in fighting Organised CyberCrime and CyberTerrorism

…"Cyber" goes **"TOP Agenda"** in **Scenario 2018**!

Integration of *Physical and Cybersecurity*

Integrated CSO-led Management Team – *Merged HQ Operations*

Physical Security Operations

Cyber Security Operations

Shared

Alerts

Smart Security = *Virtual Integration*

Corporate CSO-led Security Team

ONE – Shopping List!

Integrated Management,
Training, Standards, Plans

ONE – Architecture!

Final* phase of *Cyber-Physical Integration* - *Embedded Intelligence in ALL Devices* - *Internet of Things

"Smart Security" = Cyber + PSIM + SIEM

- **Cyber:** Spans **ALL ICT** Networks, Servers & Devices
- **PSIM:** **P**hysical **S**ecurity **I**ntegration **M**anagement
- **SIEM:** **S**ecurity **I**nformation & **E**vent **M**anagement

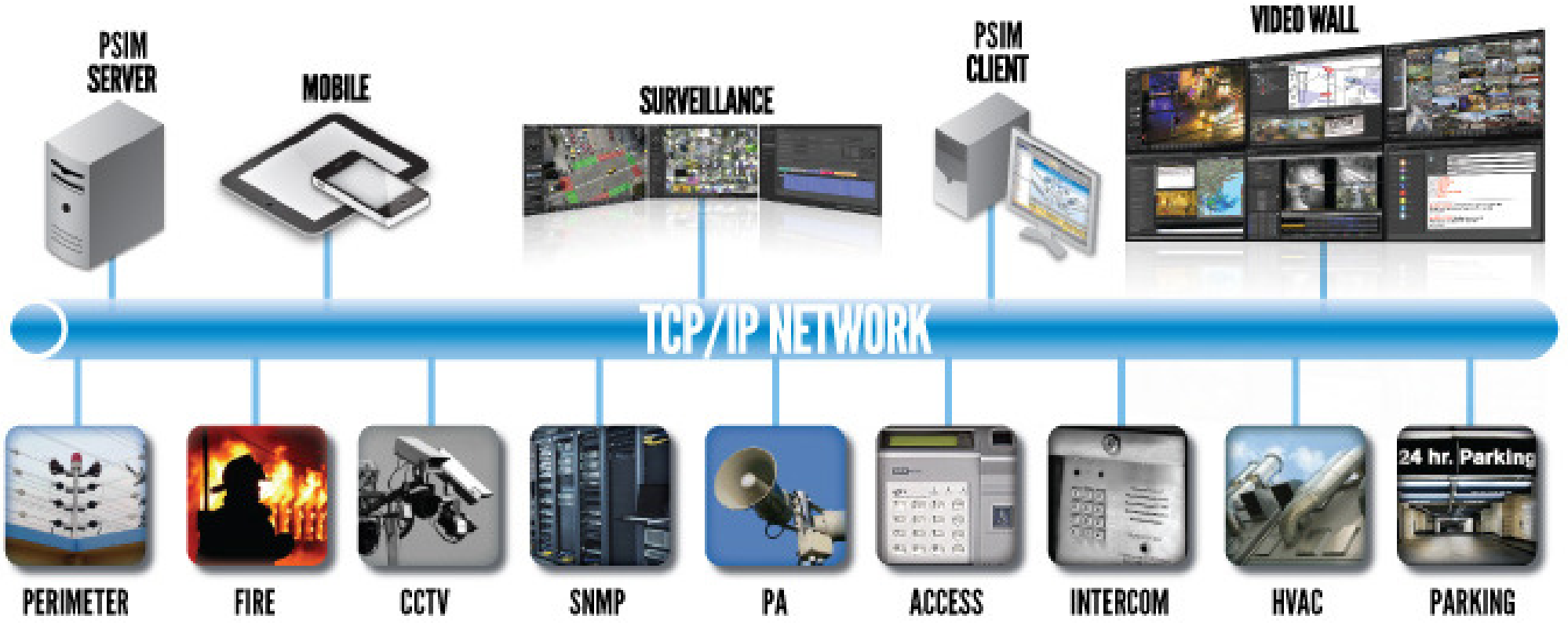

Image: AventuraCCTV.com/PSIM : New York, USA

2017-2025: Migration from IPv4 to IPv6

20thC **– 1st Gen: IPv4 – 2^{32} = 10^{9}+ Devices (*IP Address Space almost fully assigned*)**

21stC **– 2nd Gen: IPv6 – 2^{128} = 10^{38}+ Devices (*Networking "Internet of Things – IoT"*)**

- Expanded IP Address Space for "IoT" sets new "Cybersecurity Challenges"! -

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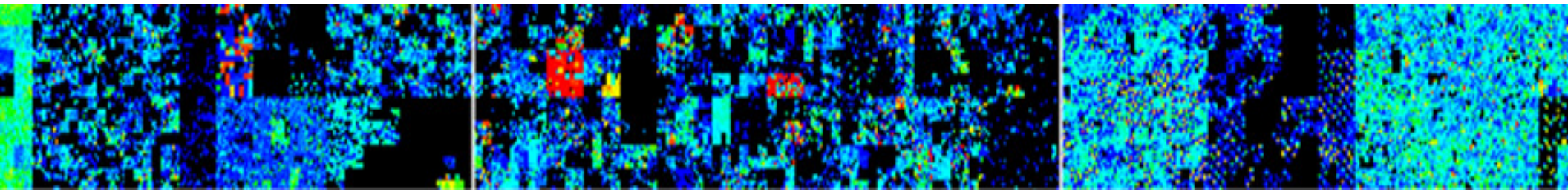


Scenario 2020: "AI & Machine Learning"

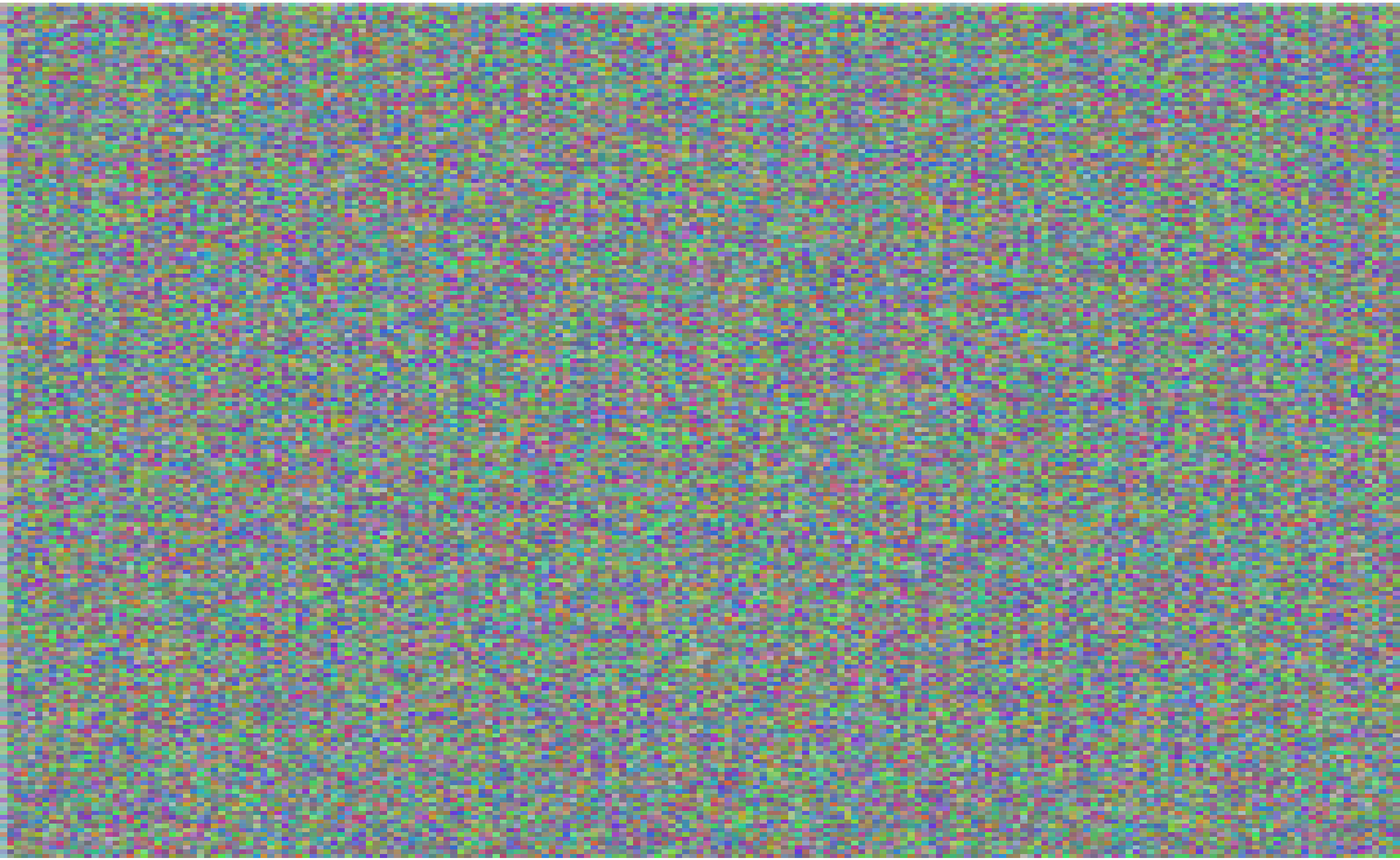
*** Adaptive ***

- Major Trends and Developments: **Scenario 2020**
  - ALL Major Cyber Vendors market AI/ML Solutions
  - Updated **ISO/NIST** Standards with Adaptive Security
  - Embedded "Cyber" in ALL New **Smart IoT** Devices
  - Board Level **C$O in C-Suites** with CEO, CFO & COO
  - International Protocols on **Cyber Warfare** (UN/NATO)

.....**CyberSecurity** now focused on **Self-Adaptive** Modelling of "Normal" Net/User Behaviour & Detection of **Real-Time Anomalies & Threats**!

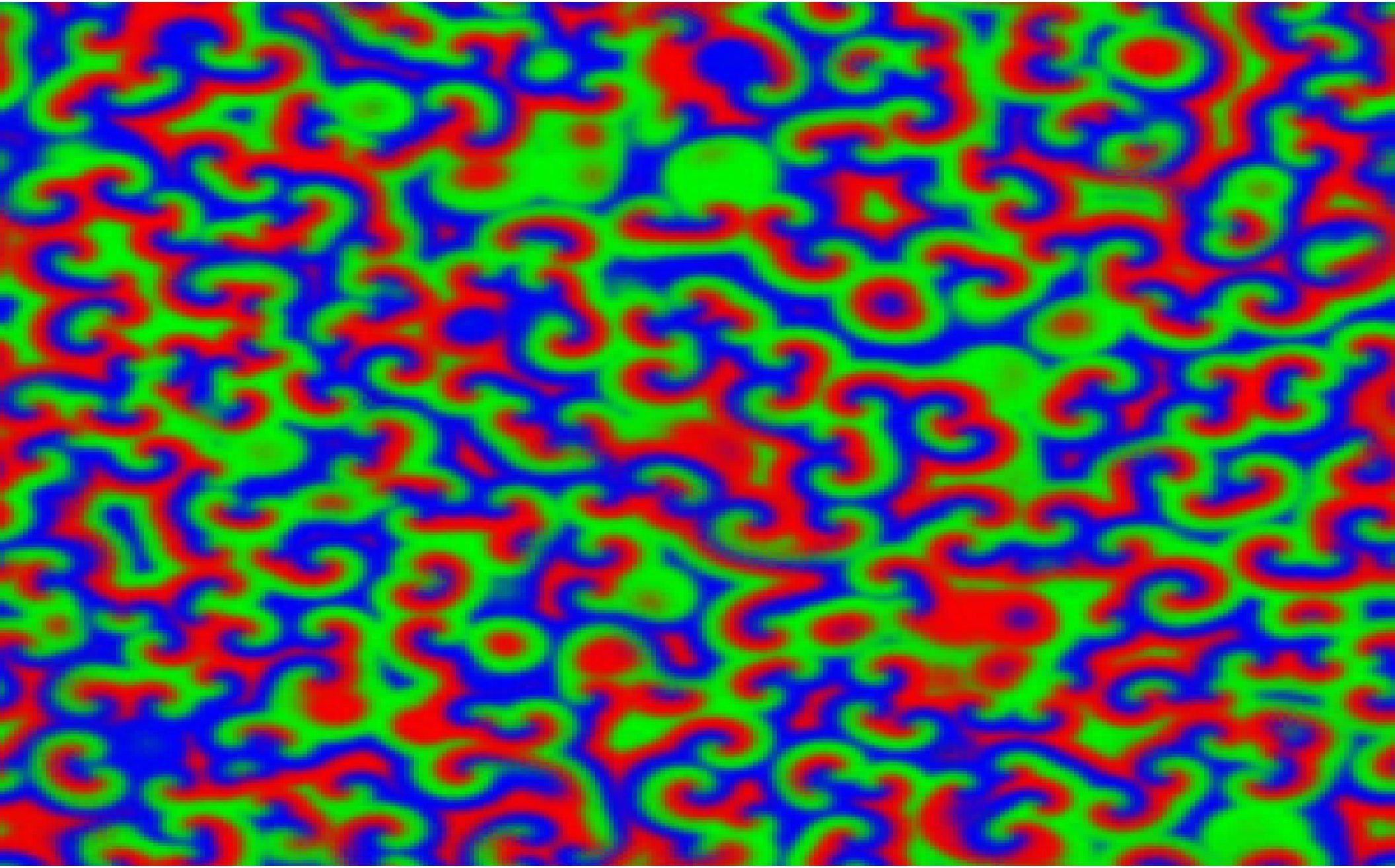
Self-Organisation: Cellular Automaton

*** *Emergence of Patterns from Random Chaos* ***

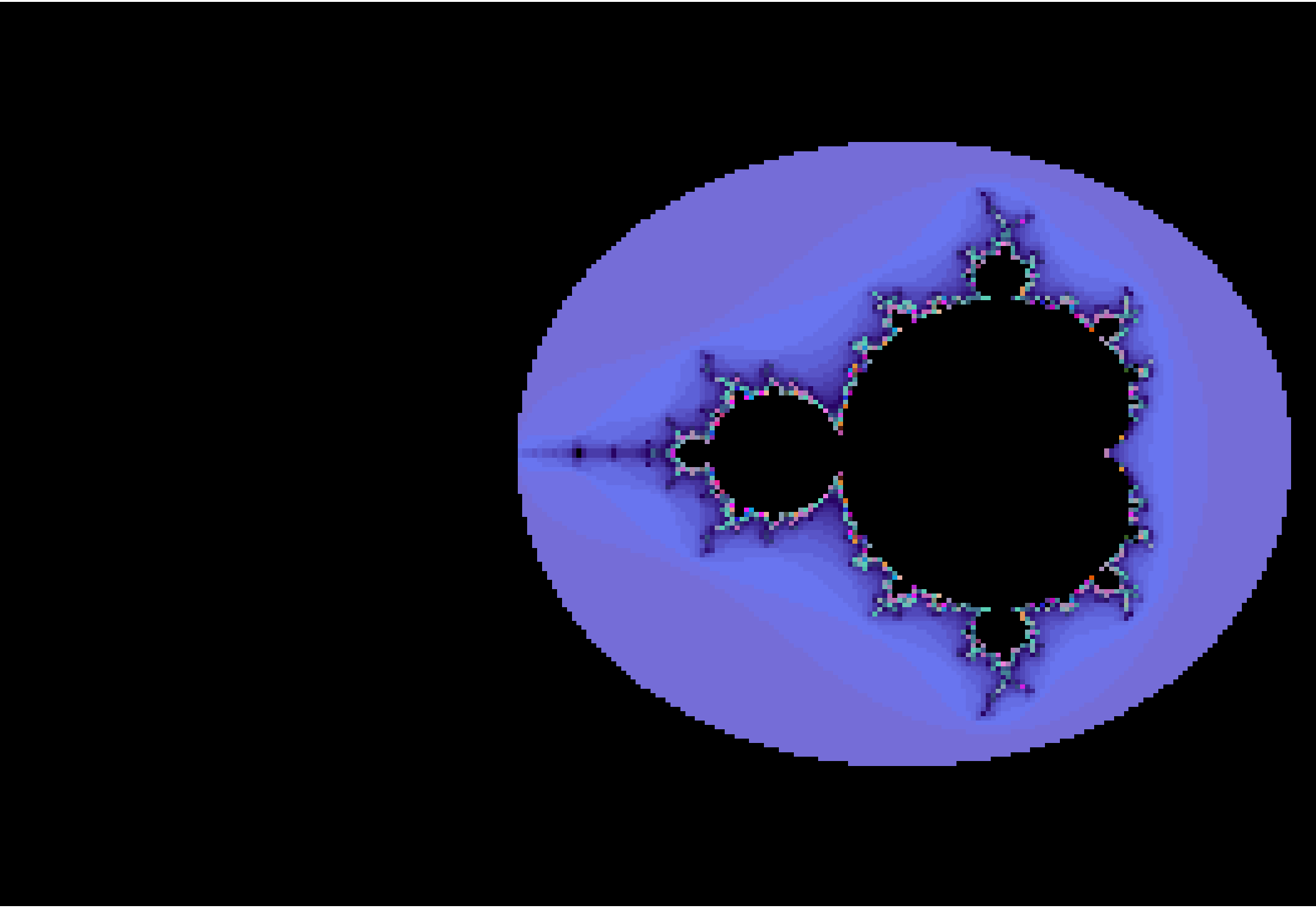


"Smart" Autonomous Chemical Oscillator:

*** Belousov–Zhabotinsky Reaction (BZ) ***



“Smart Scaling”: Fractal Mandelbrot Set



RESEARCH PAPER

on

The Compromised Devices of the Carna Botnet

(used for "Internet Census 2012")

by Parth Shukla,

Information Security Analyst,

Australian Computer Emergency Response Team (AusCERT),

University of Queensland.

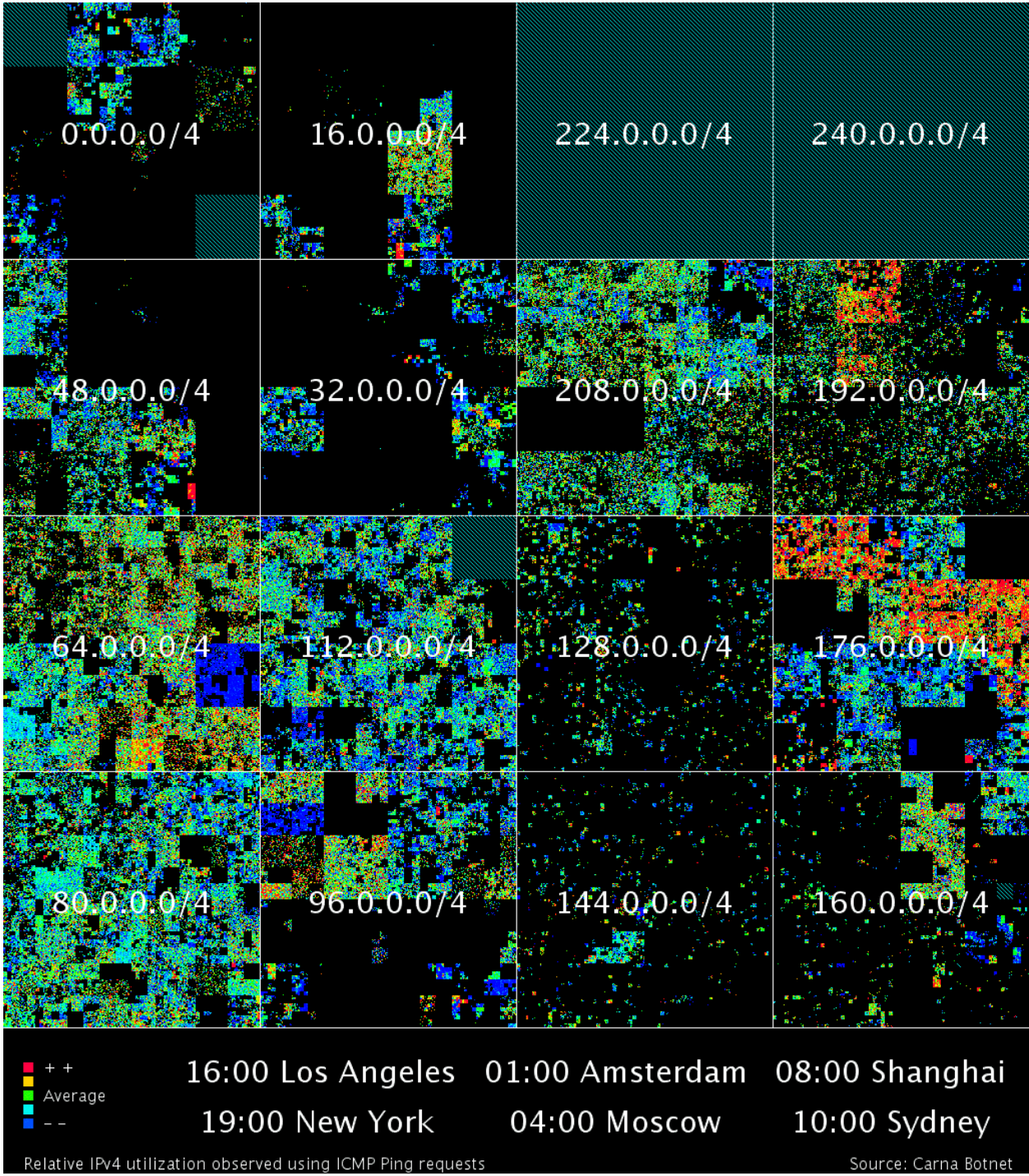
Email: pparth@auscert.org.au

Twitter: http://twitter.com/pparth

Version 1

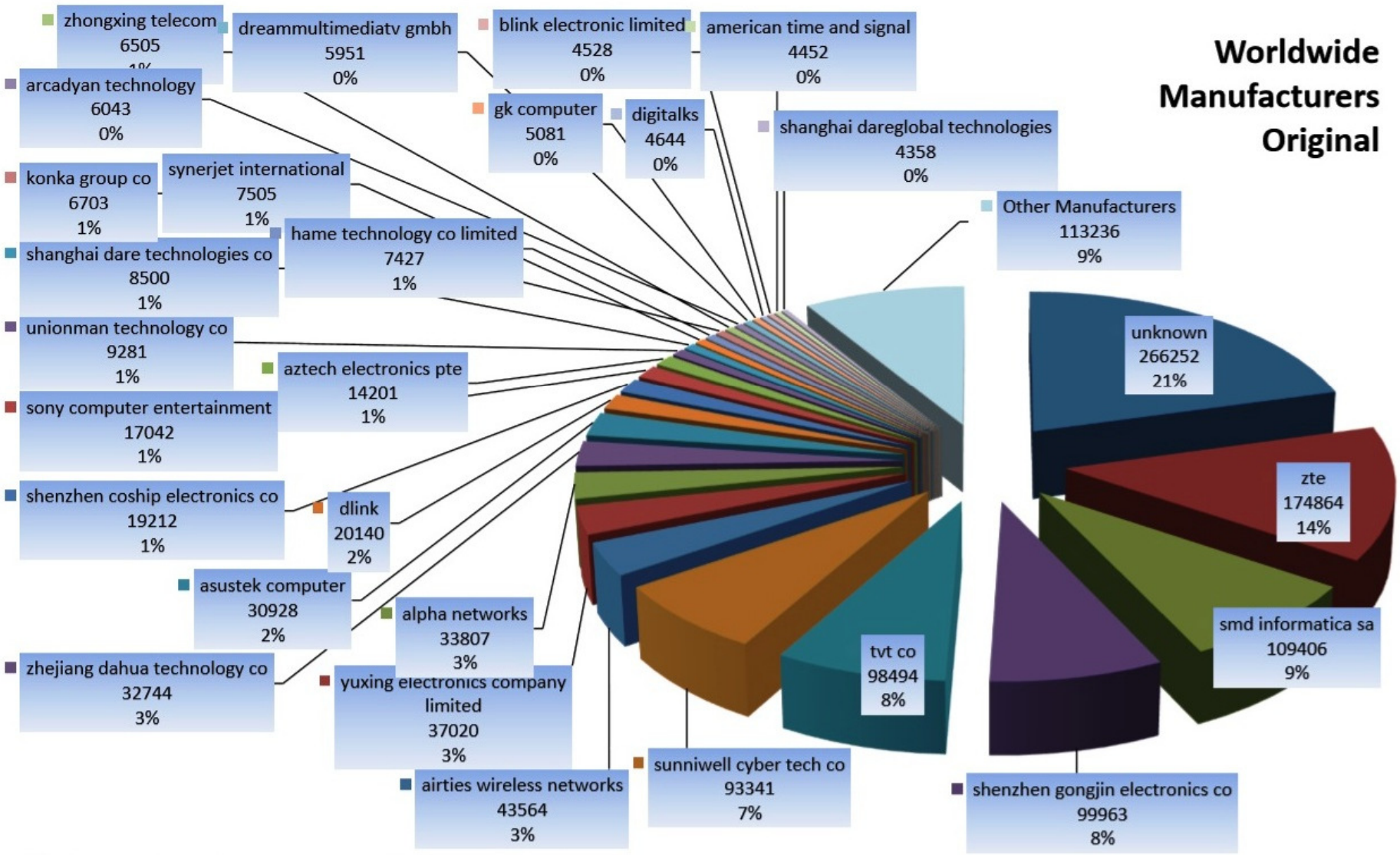
20 August 2013 – Released to AusCERT members

25 August 2013 – Released to the Public

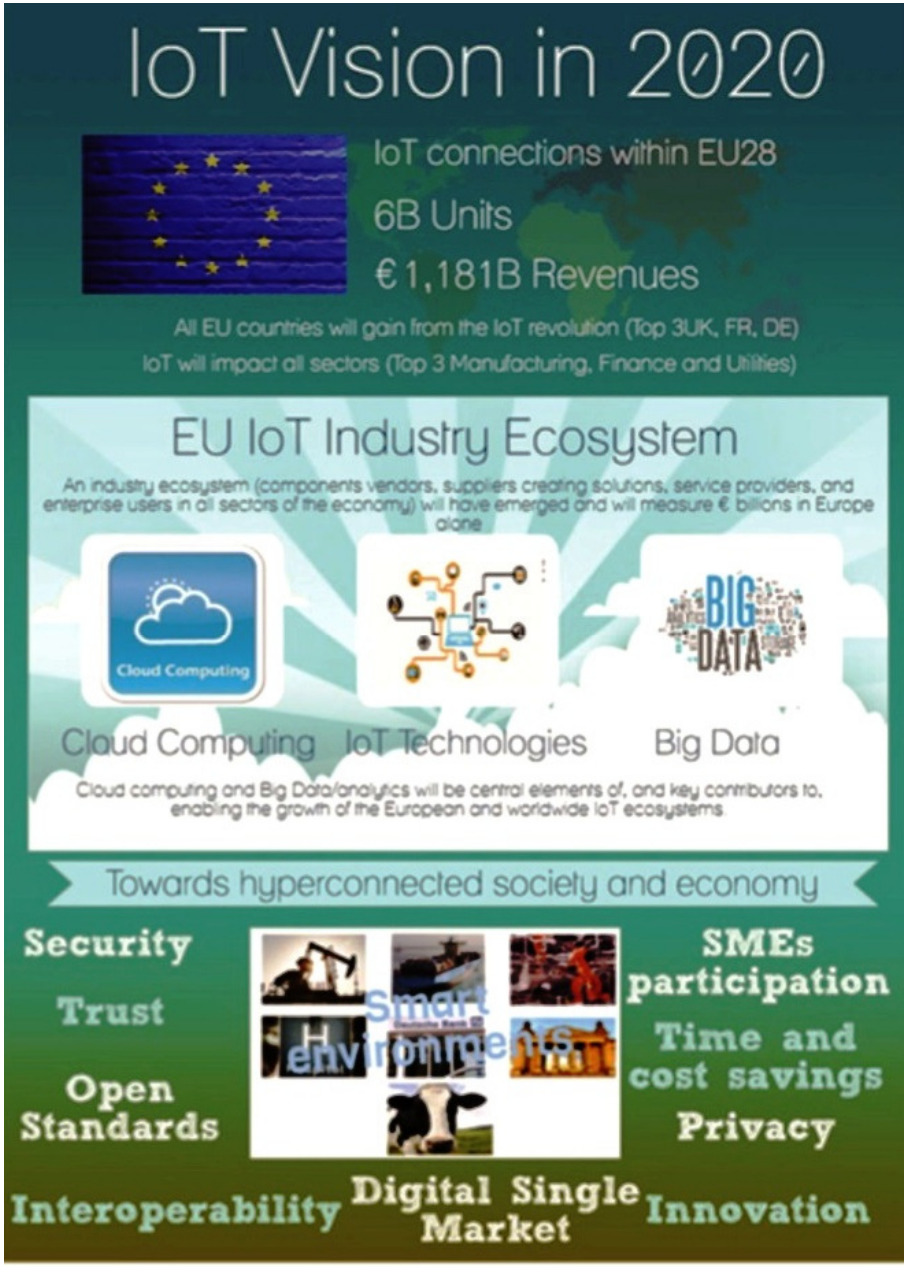


Carna Botnet exposed Legacy Vulnerabilities in *"IoT" Devices*

Vulnerable Legacy Devices: "IoT"

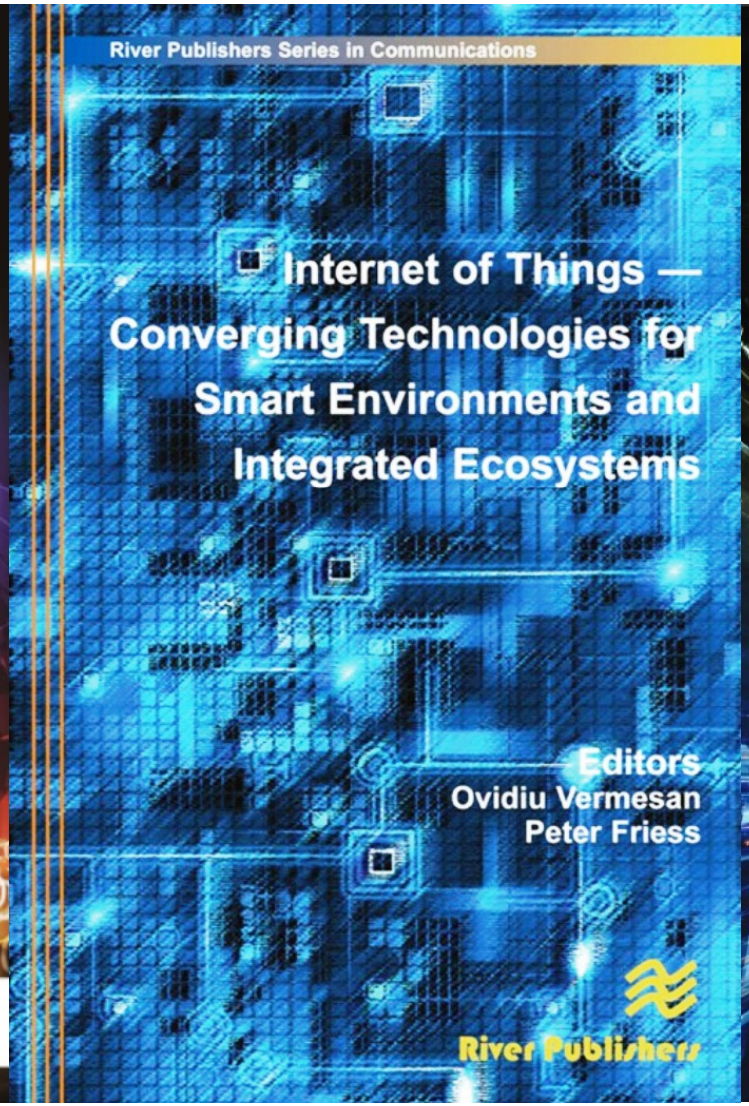


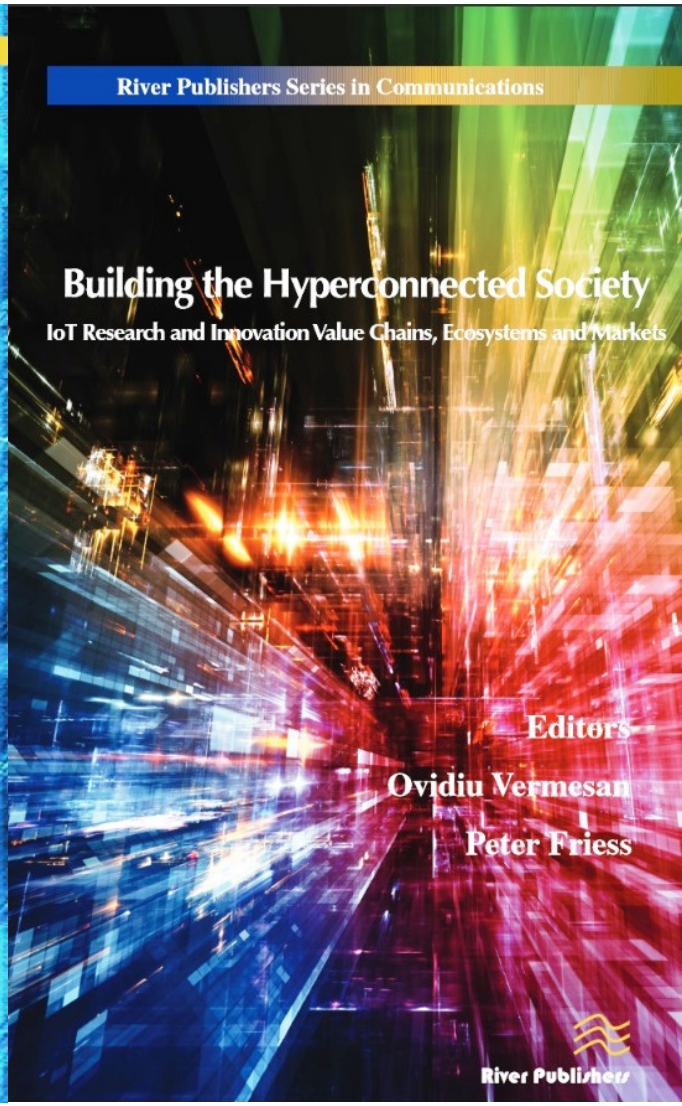
EU "IoT" Programme Visions for 2015 and 2020



IERC – Research Cluster Reports on

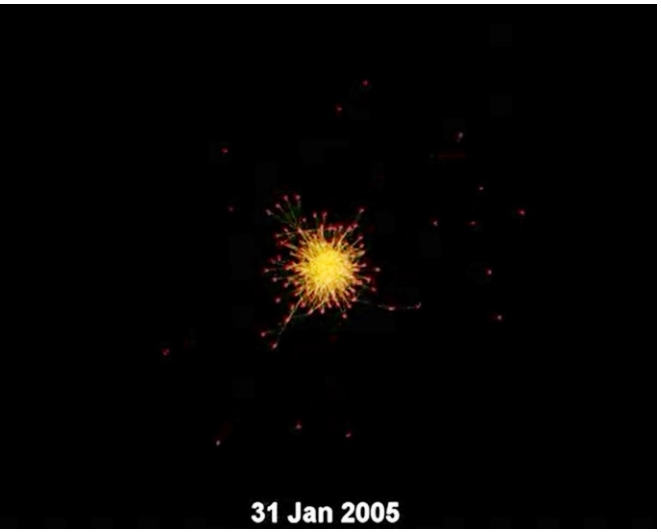
"Smart Systems" & the Internet of Things

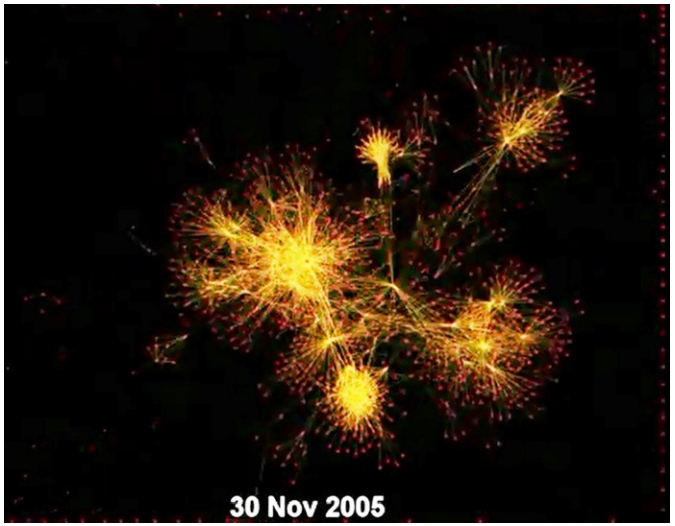


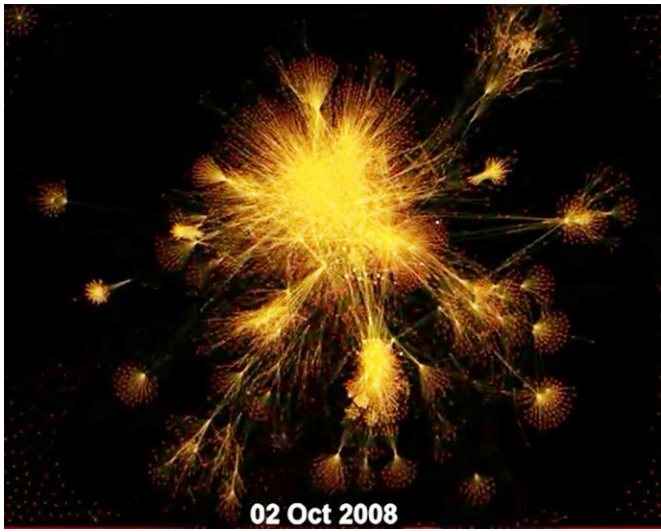


Multi-Year Evolution of Wiki-Web

Complex Adaptive System : "Wiki.tudelft.nl"

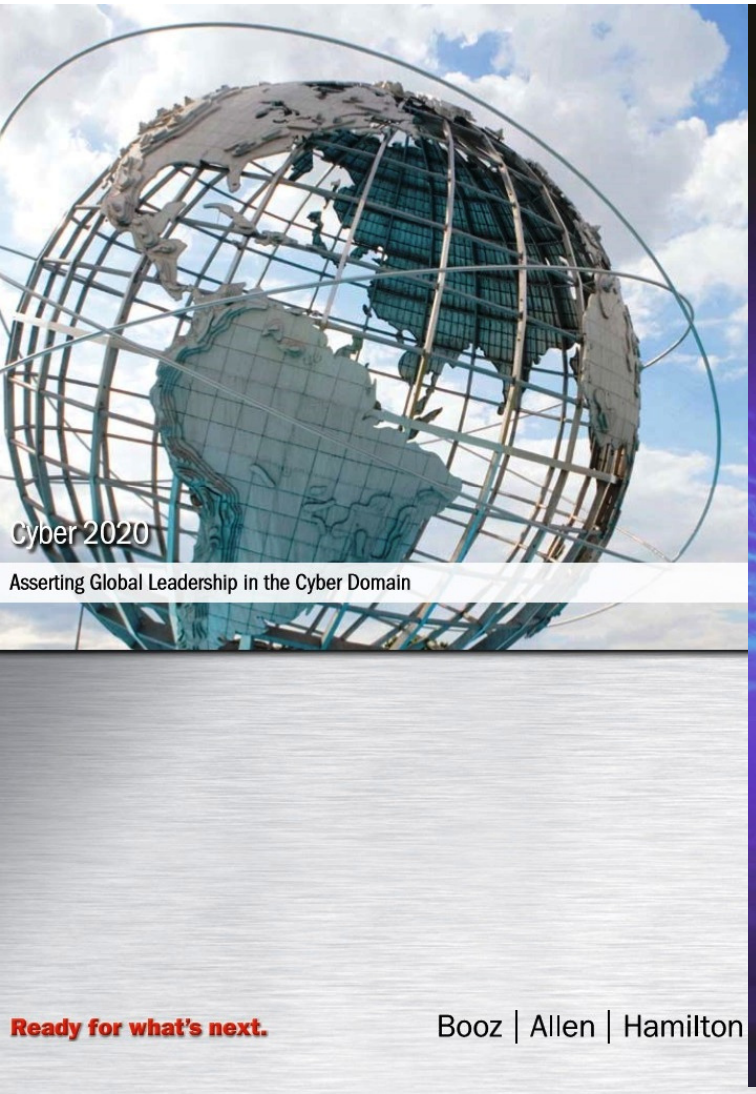


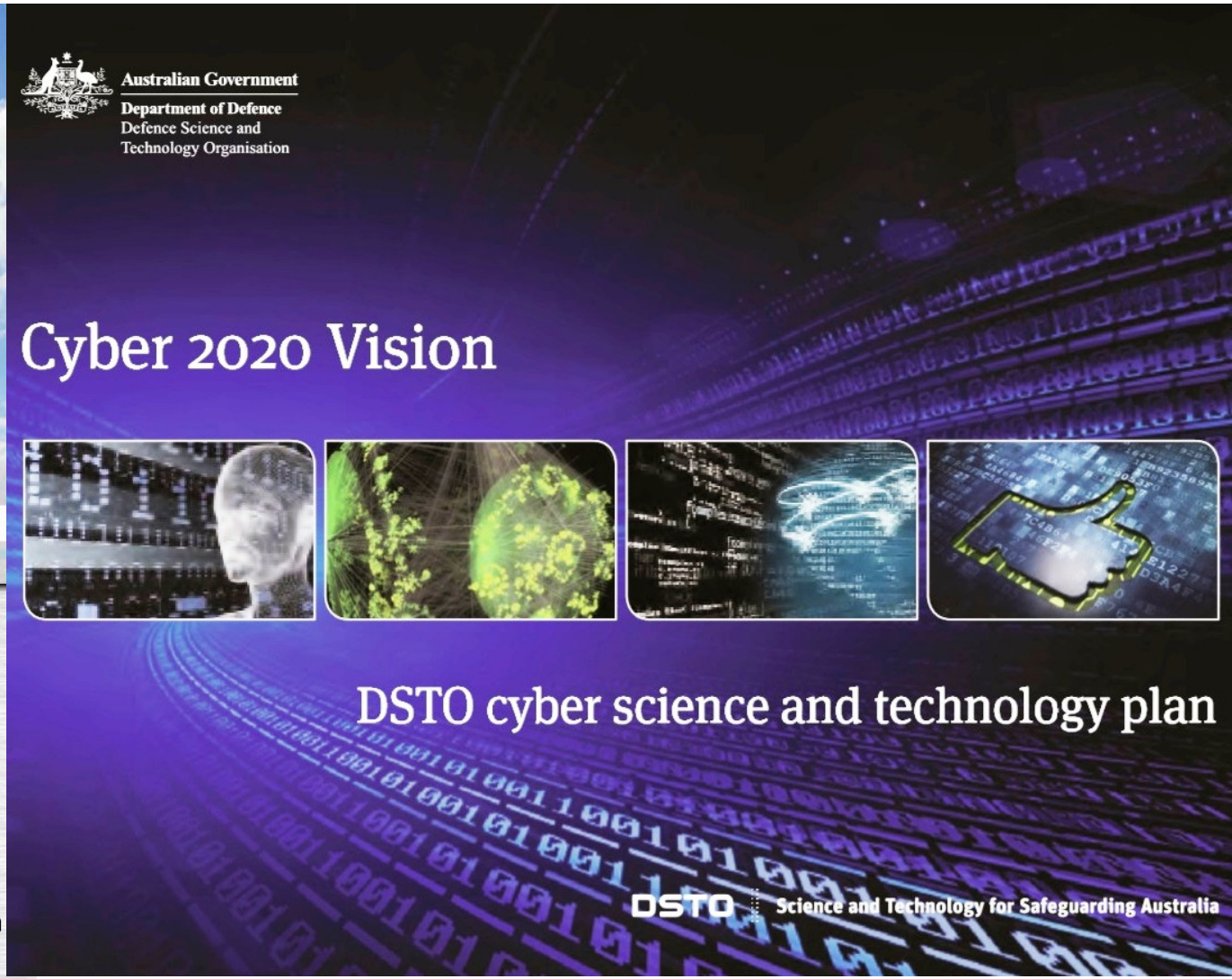




Delft University of Technology - Netherlands

Cyber 2020 Visions: Booz, Allen & Hamilton and The Australian Government (Defence)





Darktrace: AI/ML CyberSecurity

- The Enterprise Immune System -

DarkTrace: **CyberSecurity Solution** that **"Learns"** ALL Net Traffic, Assets & User Behaviour...
...Real-time Alerts provided & **Assets Quarantined** whenever **"Non-Normal"** Events Detected!

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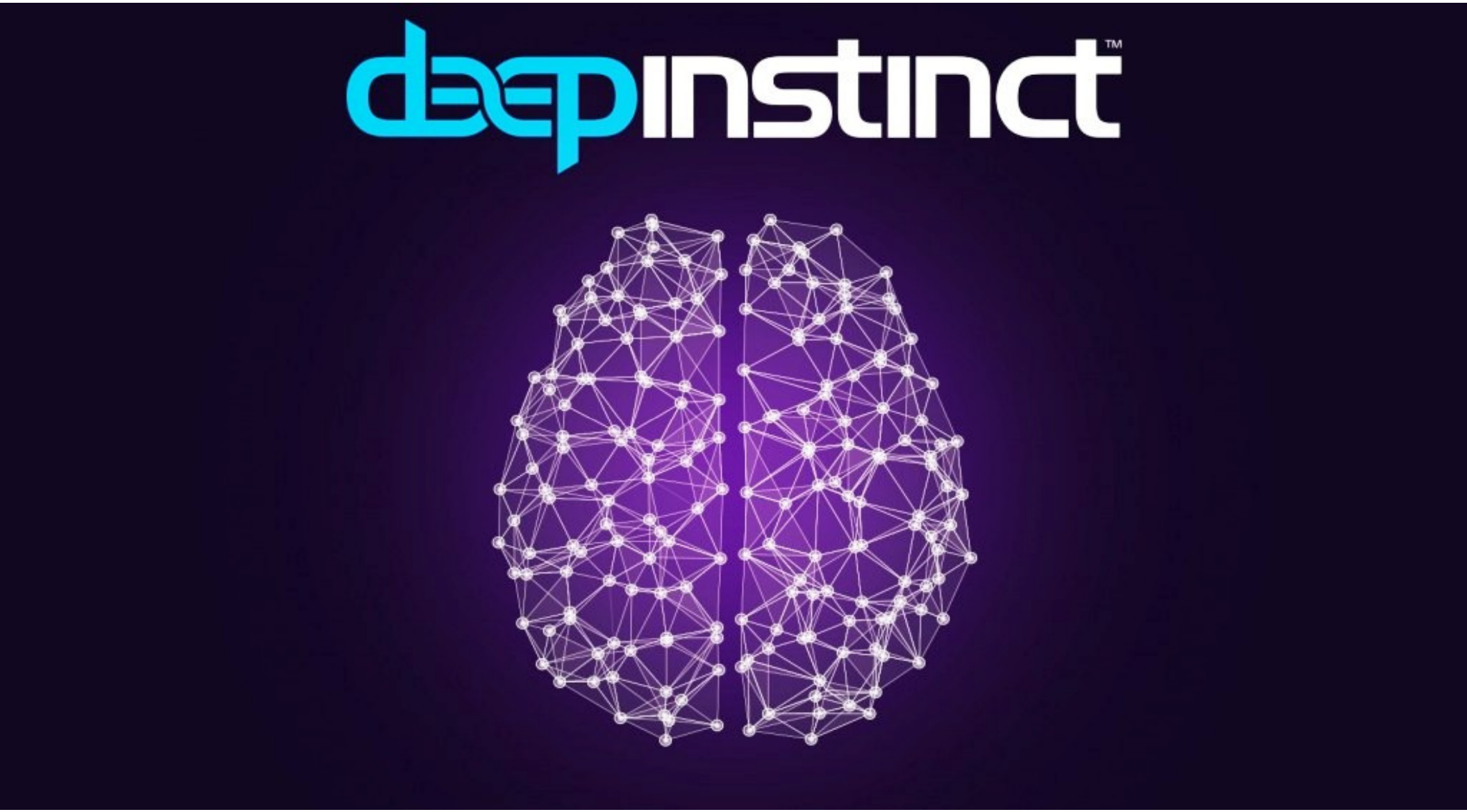
DeepInstinct: Real-Time APT Protection

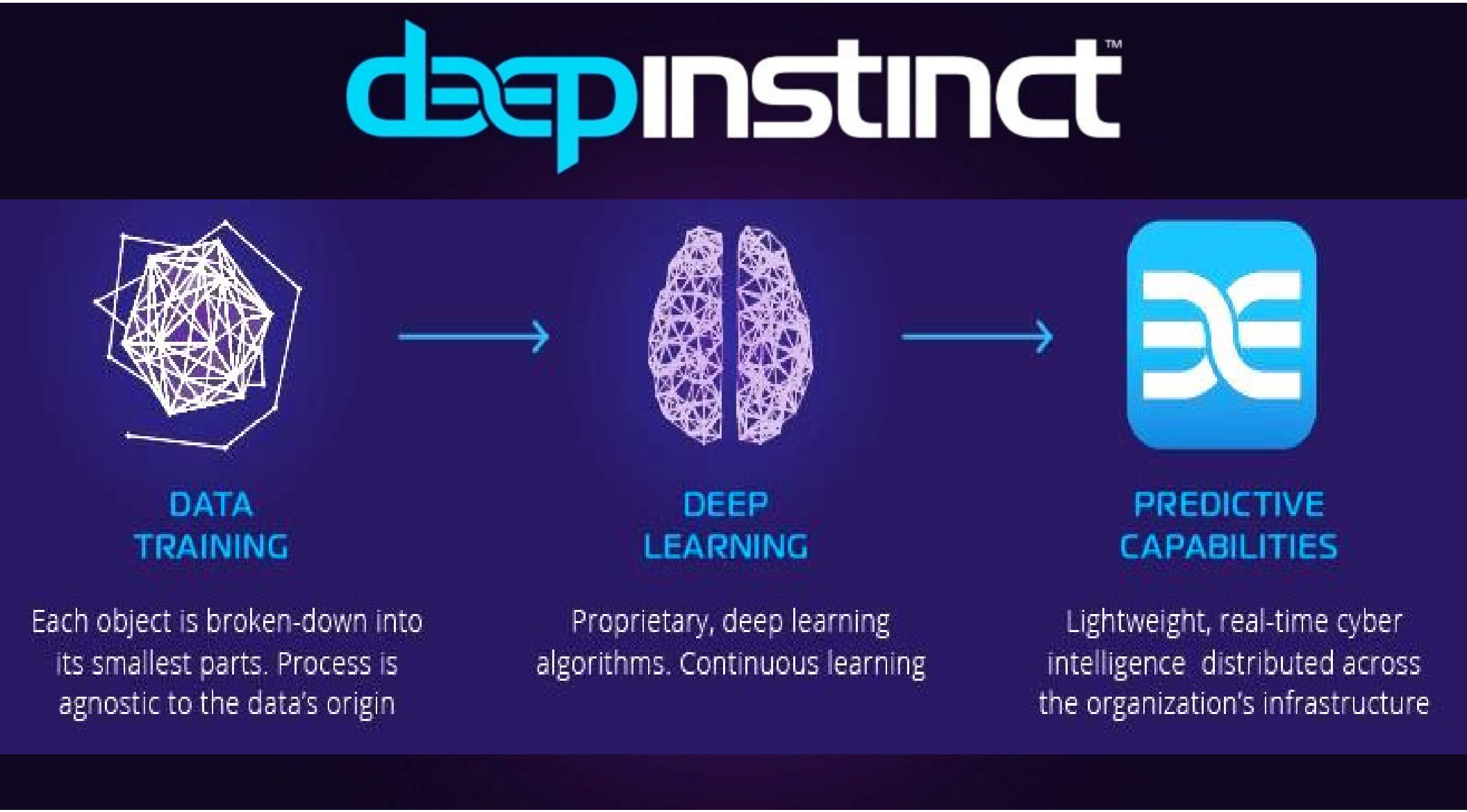


Provides **Deep Learning CyberSecurity** for **APT Protection** of **Mobile** & **End-Points**!

-*** **APT** = **Advanced Persistent Threat** ***

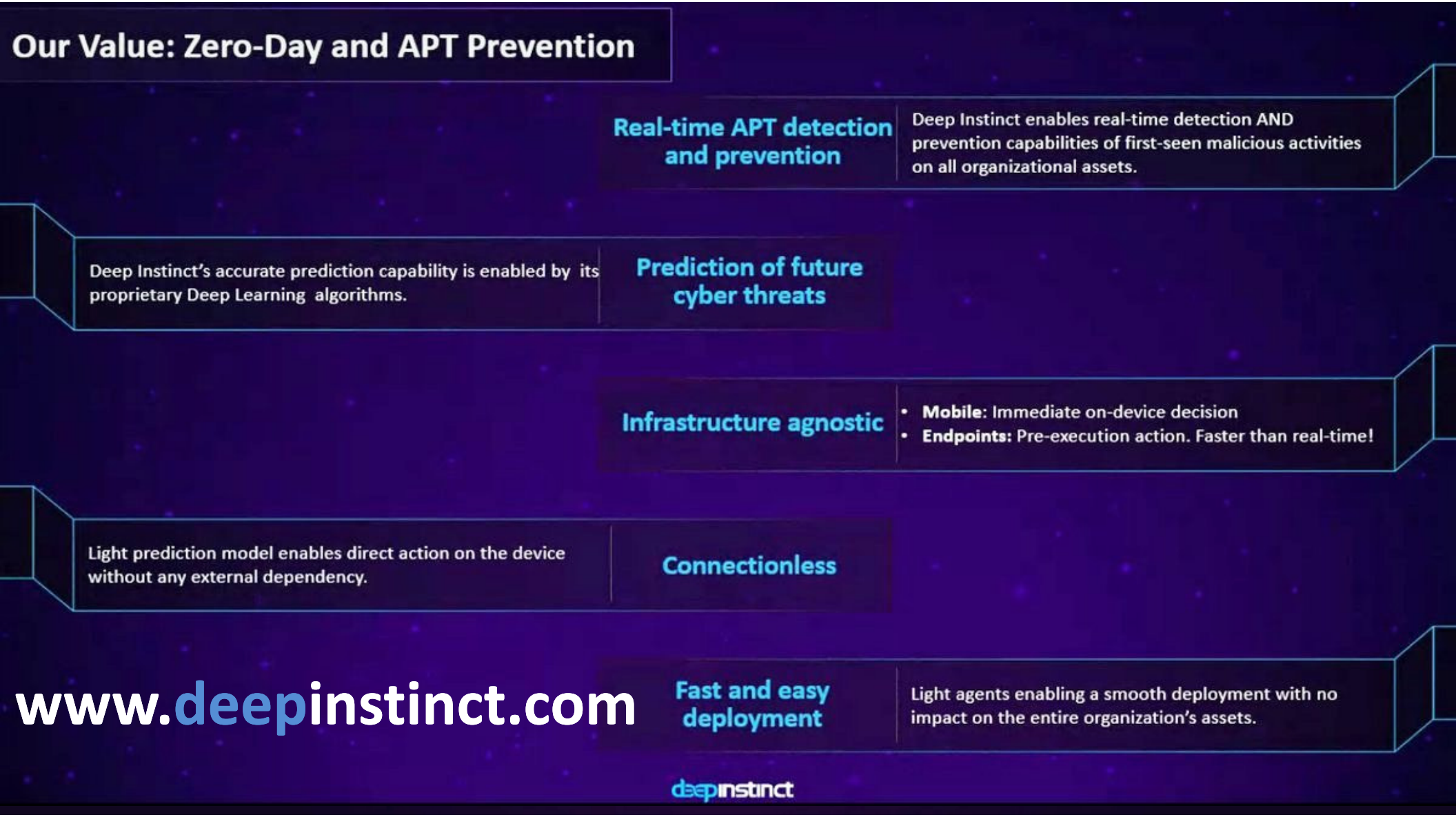
35th International East/West Security Conference

DeepInstinct: Real-Time APT Protection



Provides **Deep Learning CyberSecurity** for **APT Protection** of **Mobile** & **End-Points**!

DeepInstinct: Real-Time APT Protection



Provides **Deep Learning CyberSecurity** for **APT Protection** of **Mobile** & **End-Points**!

-*** **APT** = **Advanced Persistent Threat** ***

35th International East/West Security Conference

Google I/O: AI/ML Futures – 17th May 2017

Ultra High Speed – Tensor Processing Unit: TPU

*** AL/ML/Big Data Apps - 180 TeraFlops ***

Google I/O: AI/ML Futures – 17th May 2017

"Integrated Intelligent CyberSecurity"
using Google TPU within 5 Years running
***Ultra-Fast Real-Time* AI/ML/Big Data!**

Google I/O: AI/ML Futures – 17th May 2017

Google Machine Learning Research Centre: Zurich - 2016

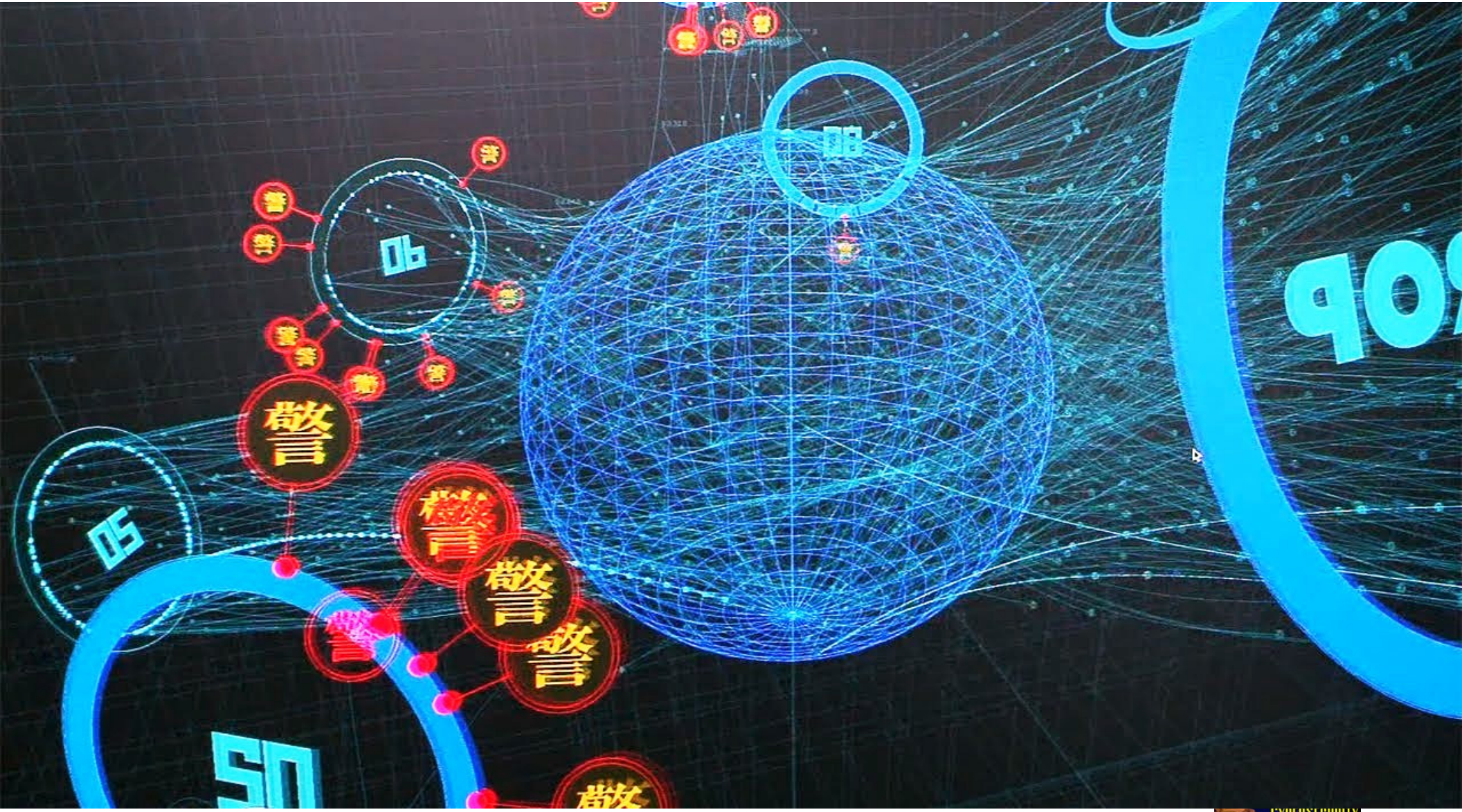
CyberSecurity: Big Data Visualization

Japan – NICT: "Daedalus" - *Cyber Alert*

NICT = National Institute of Information and Communications Technology

CyberSecurity: Big Data Visualization

Japan – NICT: "Daedalus" - *Cyber Alert*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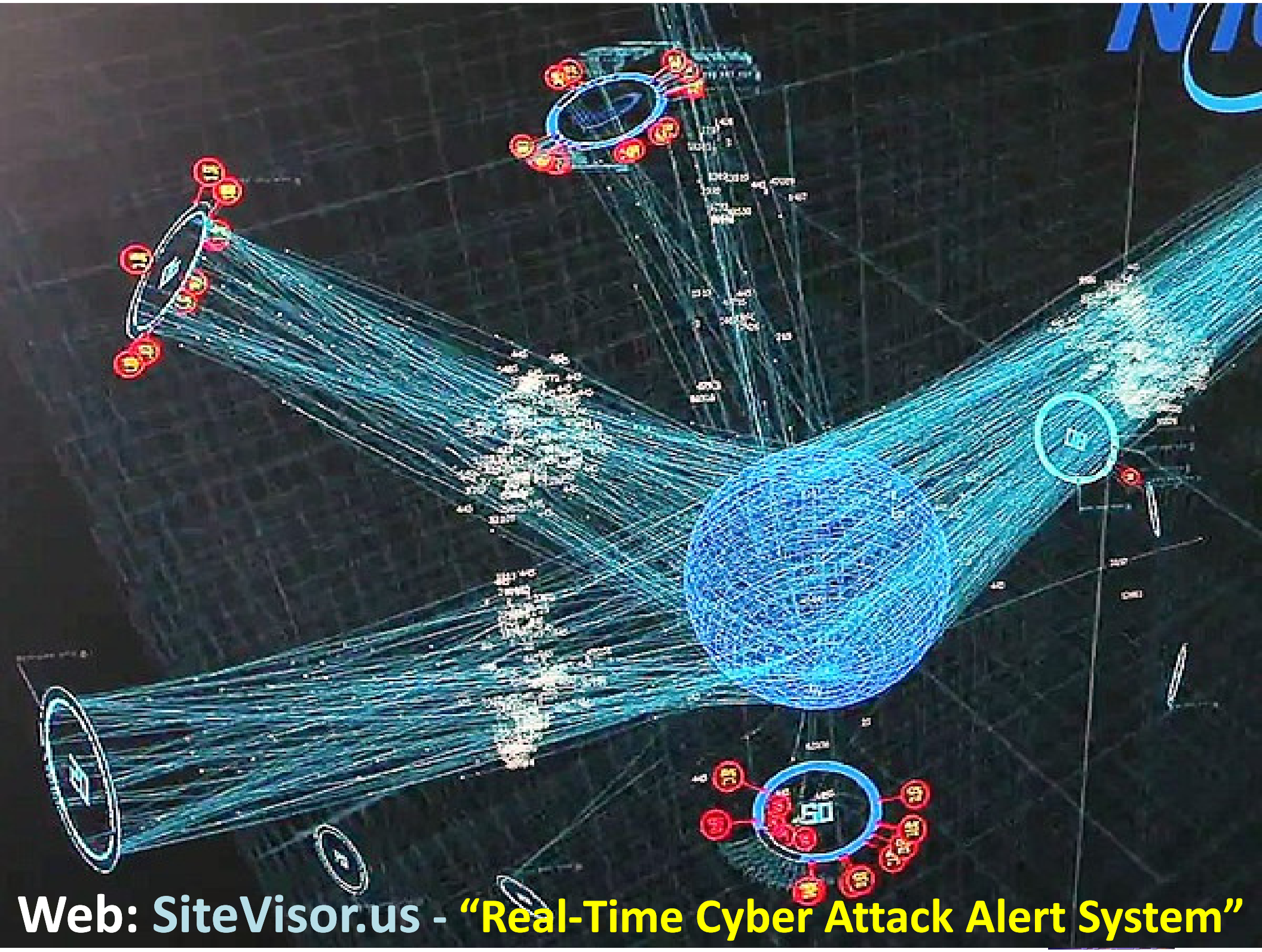
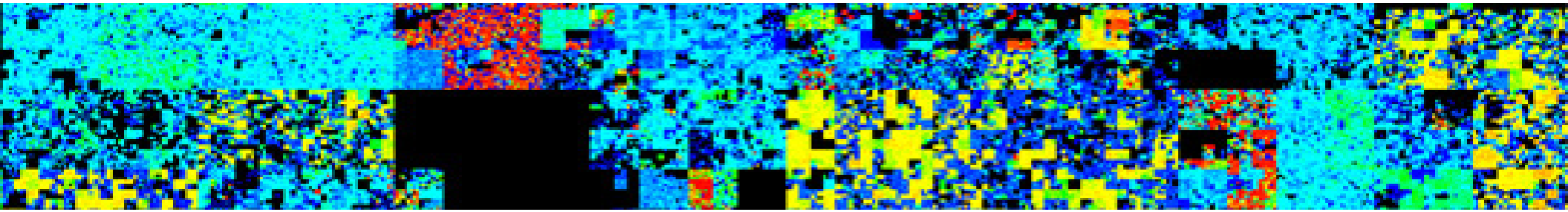

Web: SiteVisor.us - “Real-Time Cyber Attack Alert System”

CyberSecurity Tools and Trends: *2018–2025*

1 – **"CyberSecurity @ Board Level"**	2 –***7 Year*** **CyberVision: "The New Toolkit"**	3 – **CyberSecurity: "21stC Neural Defence"**
4 – **Scenario 2018: Cyber Tools Transition** **"Integrated"**	5 –**Scenario 2020: AI & Machine Learning** **"Adaptive"**	6 – **Scenario 2025: Augmented Reality(AR)** **"Neural Security"**
7 – **"Interfacing Human & Cyber Worlds"**	8 – **From *7 Year* CyberVision to Reality!**	9 – ***YOUR*** **Action Plan for 21stC Cyber!...**



Scenario 2025+: "Augmented Reality"

*** Neural Security ***

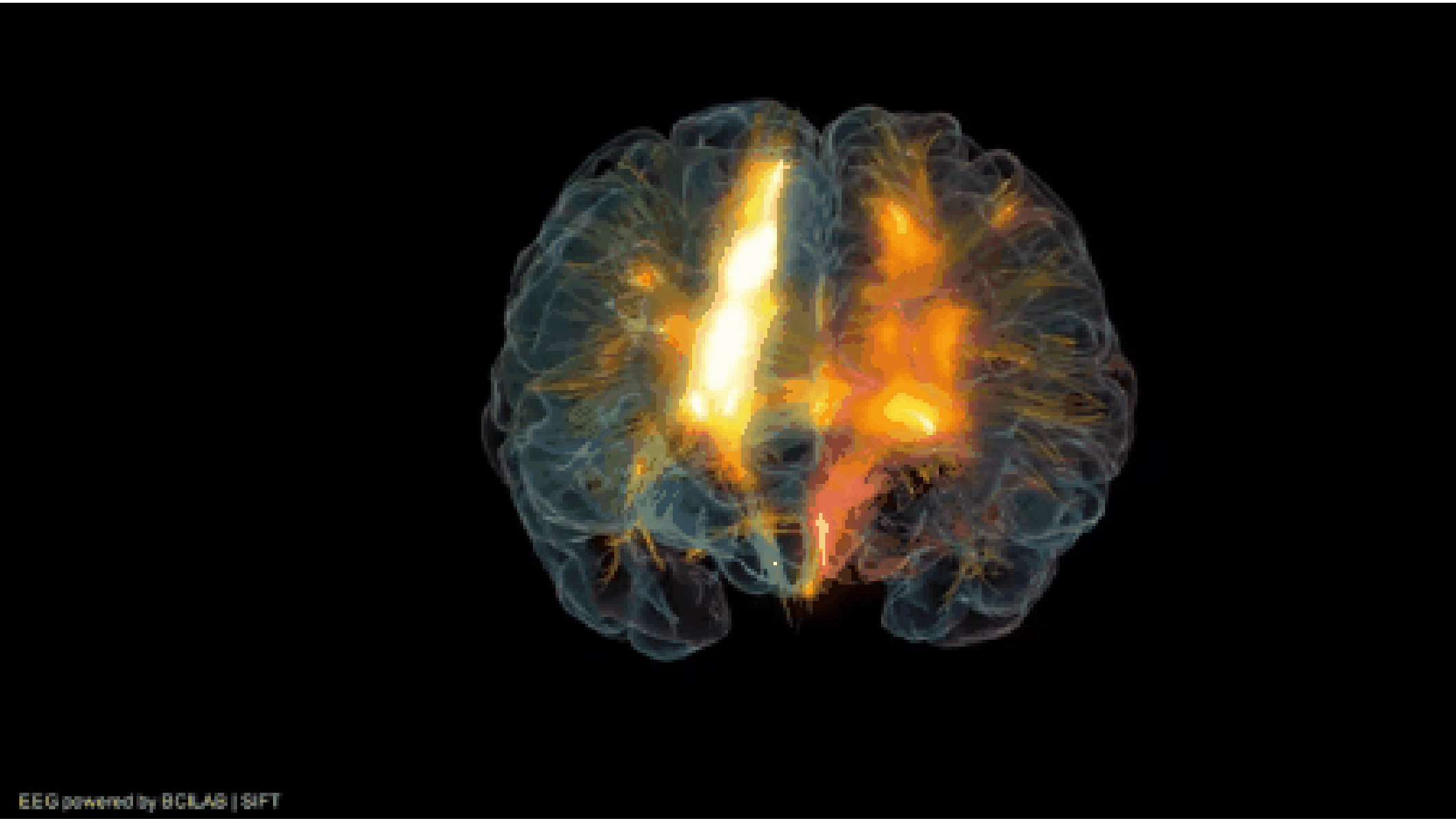
- Major Trends and Developments: **Scenario 2025**
  - Enterprises now deploy **AI/ML** Based **CyberSecurity Tools**
  - **"Augmented Reality"** Cyber Software & **Smart Devices**
  - **C$Os** provide Pan-Enterprise **Physical/Cyber Security**
  - **ICT Networks** migrate to **Self-Learning Neural Security**
  - Intelligent **"AI Bots"** act a *Real-Time* **"Cyber Police"** to Search & Quarantine Resources linked with suspected **CyberCriminals, Political Hacktivists** & **CyberTerror Cells**!

....Business & Government **Cyber** Networks & Assets now Secured **24/7** through "**Intelligent AI/ML Bots**"

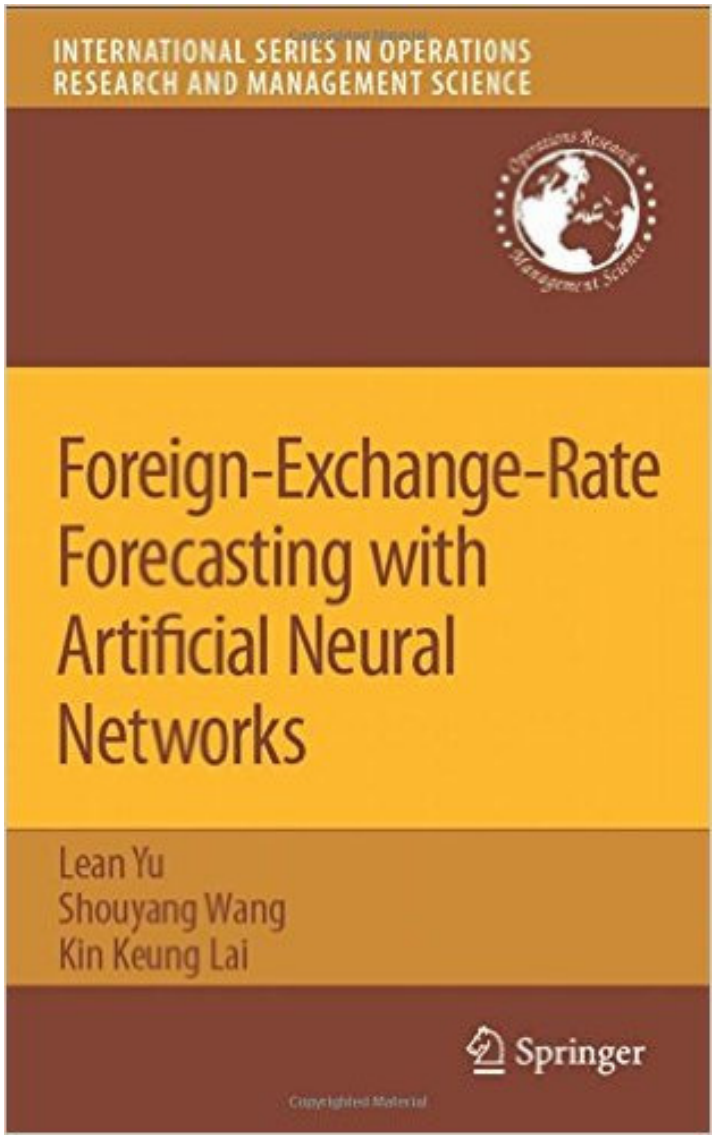
Scenario 2025+: *"Neural Security"*

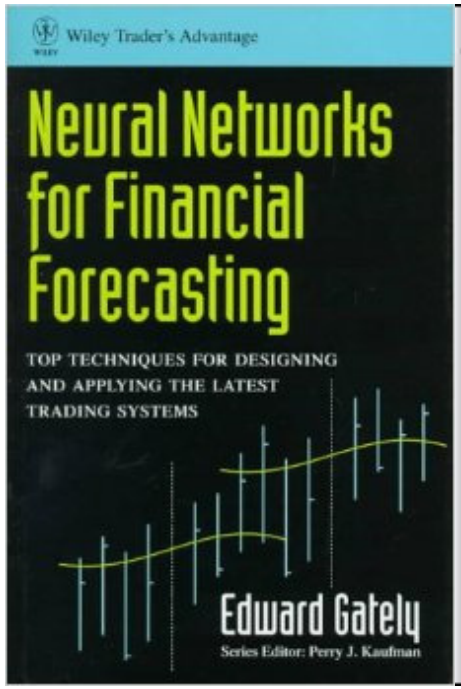
- Full Implementation of Intelligent & Adaptive Cybersecurity across the ***Extended Enterprise***
- ***Autonomous "Alerts"*** and Real-Time AI/ML-based Cyber Event, Traffic & User Modelling
- New Scaled Architectures and Operational Standards for ***"Smart Systems"*** – Smart Devices, Business, Cities, Government, Economy & Society
- Cybersecurity Operations transition to become Ultra-Intelligent – ***"Neural Security"*** – through Embedded "AI-Security Bots" for Real-Time Defence

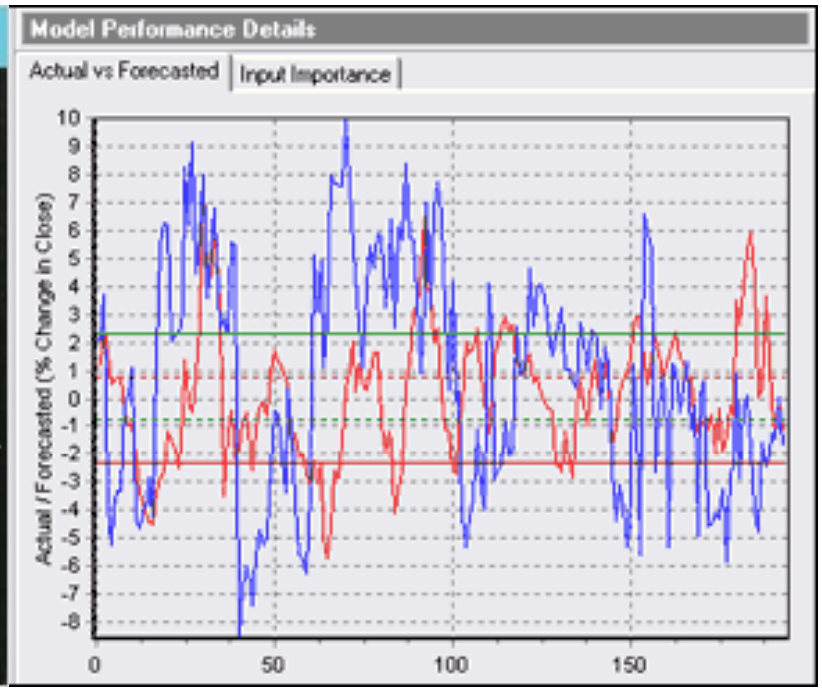
Scenario 2025+: *"Neural Security"*



Artificial Neural Networks applied to Real-Time Foreign Exchange Dealing





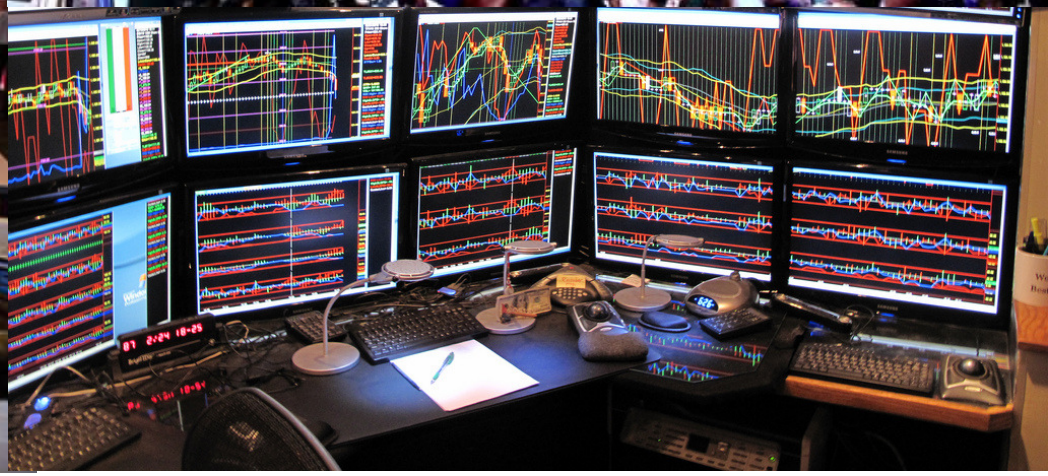


Algorithmic Computer Trading using Real-Time Neural Nets & Statistical Maths Tools have been used for 25+ Years!

.....Now they are being applied to provide intelligent real-time forecasts for enterprise cybersecurity threats!

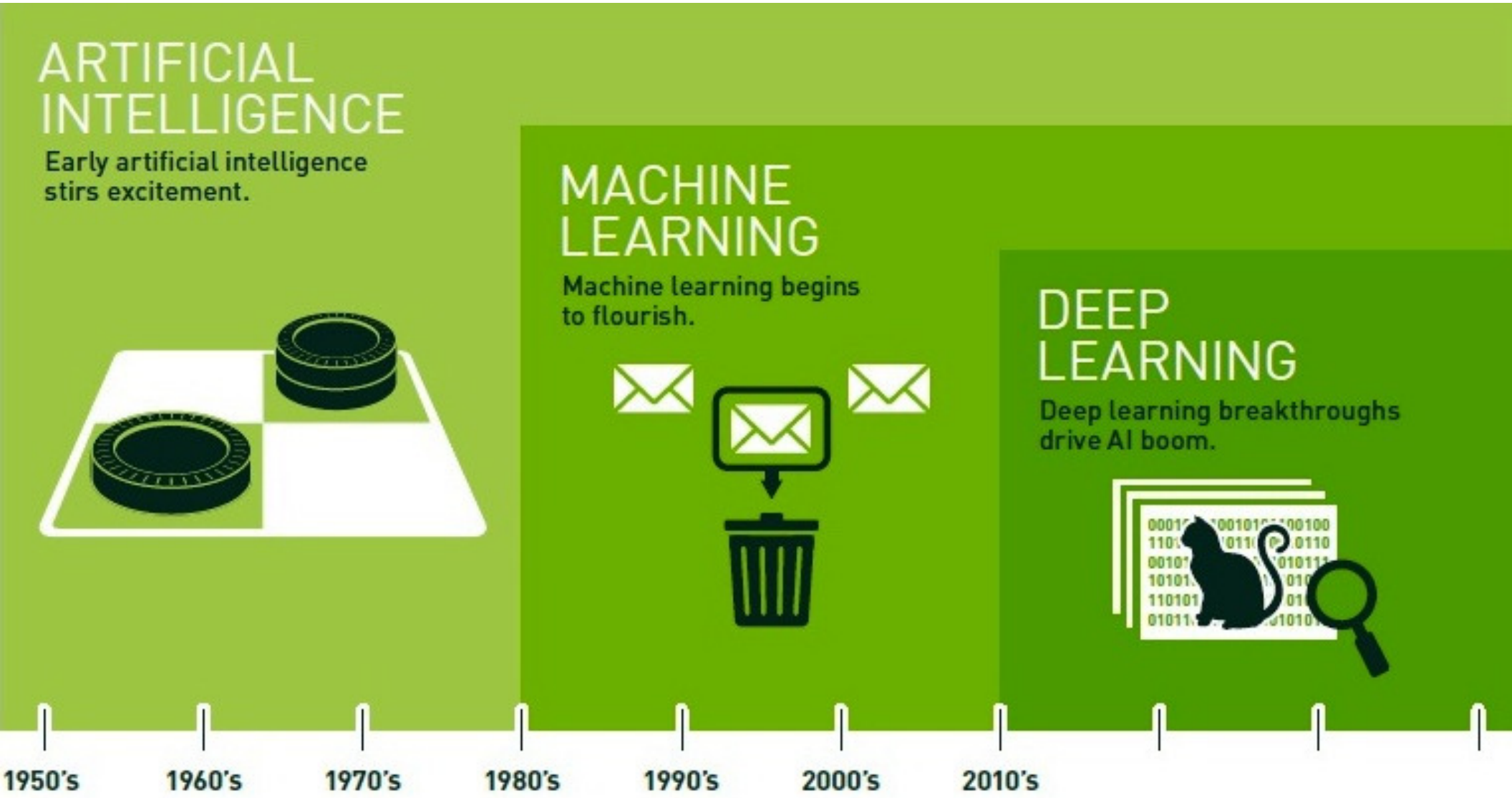
Worldwide Real-Time Financial Trading

@Light Speed – 24/7 – Global Networks



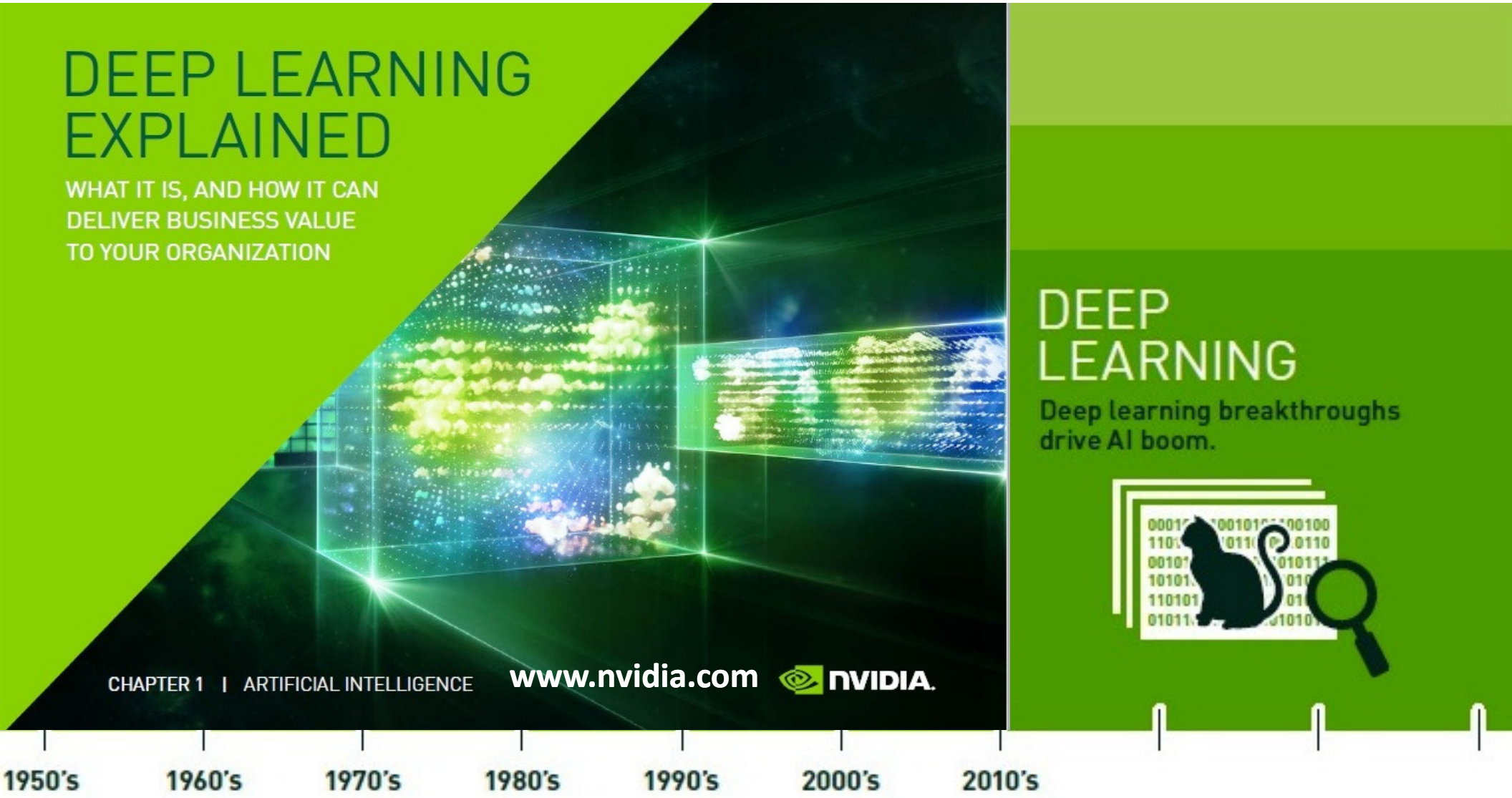
Deep Learning & Neural Networks

Advanced CyberSecurity Solutions



Deep Learning & Neural Networks

Advanced CyberSecurity Solutions



Deep Learning & Neural Networks

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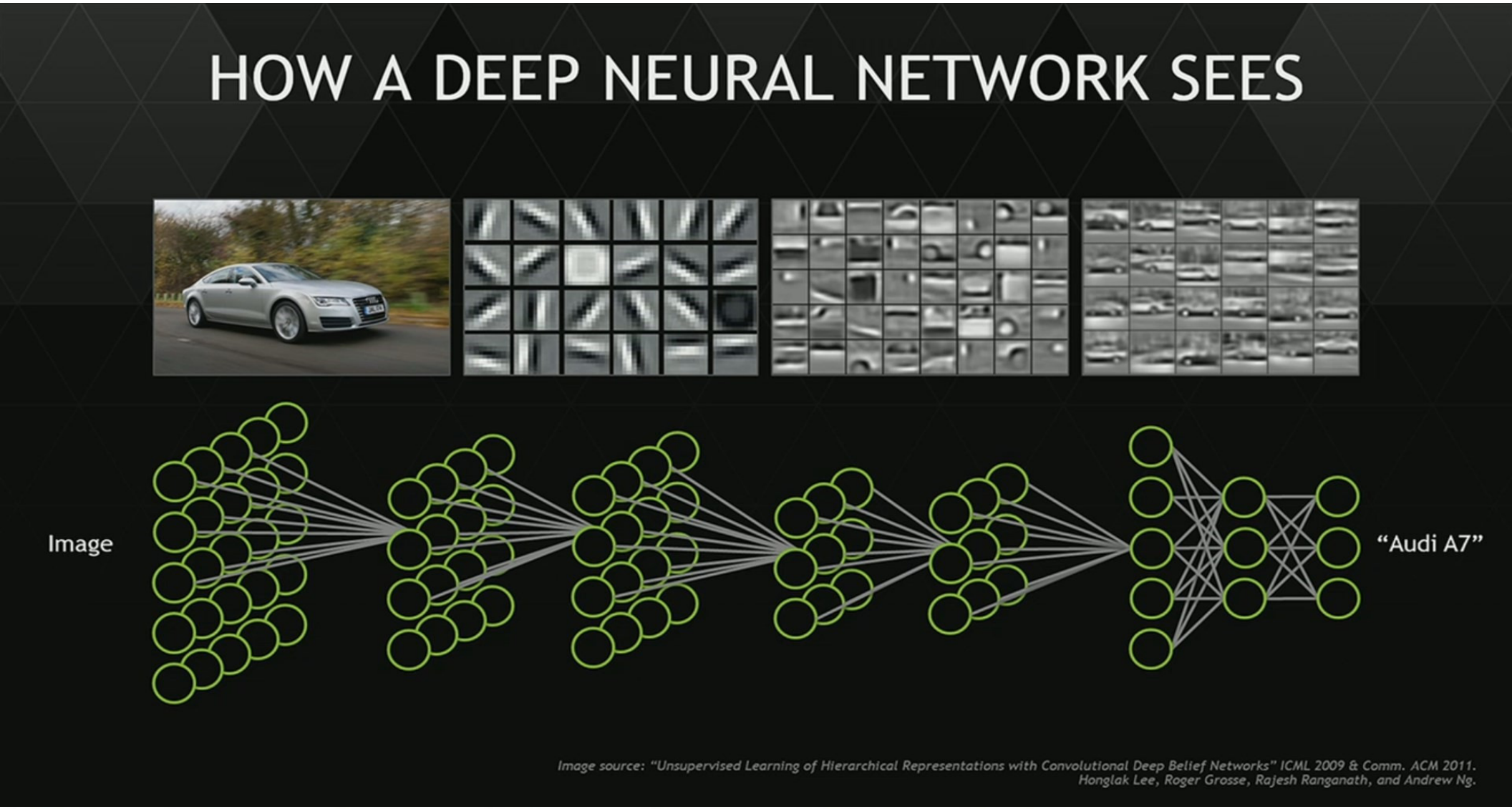
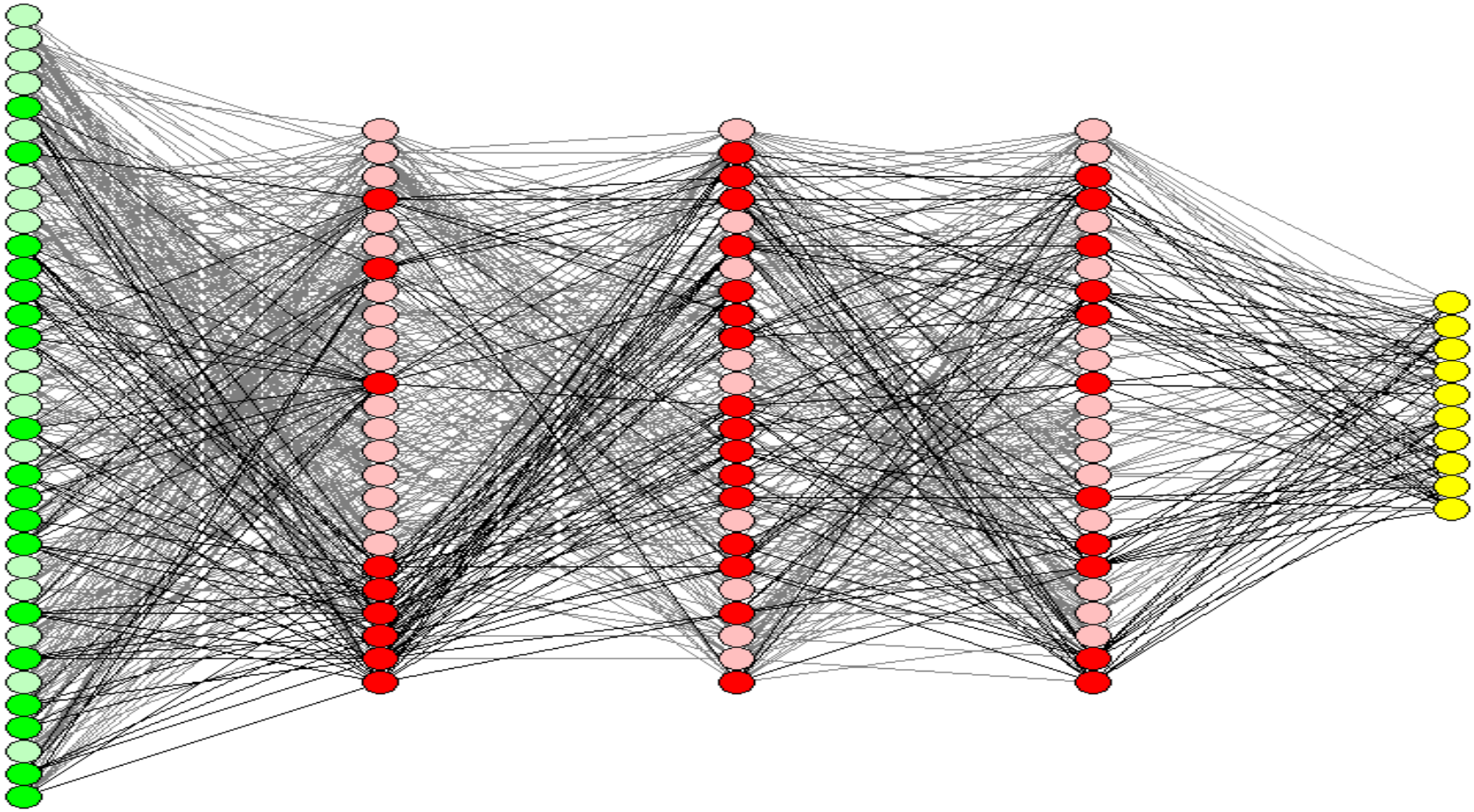


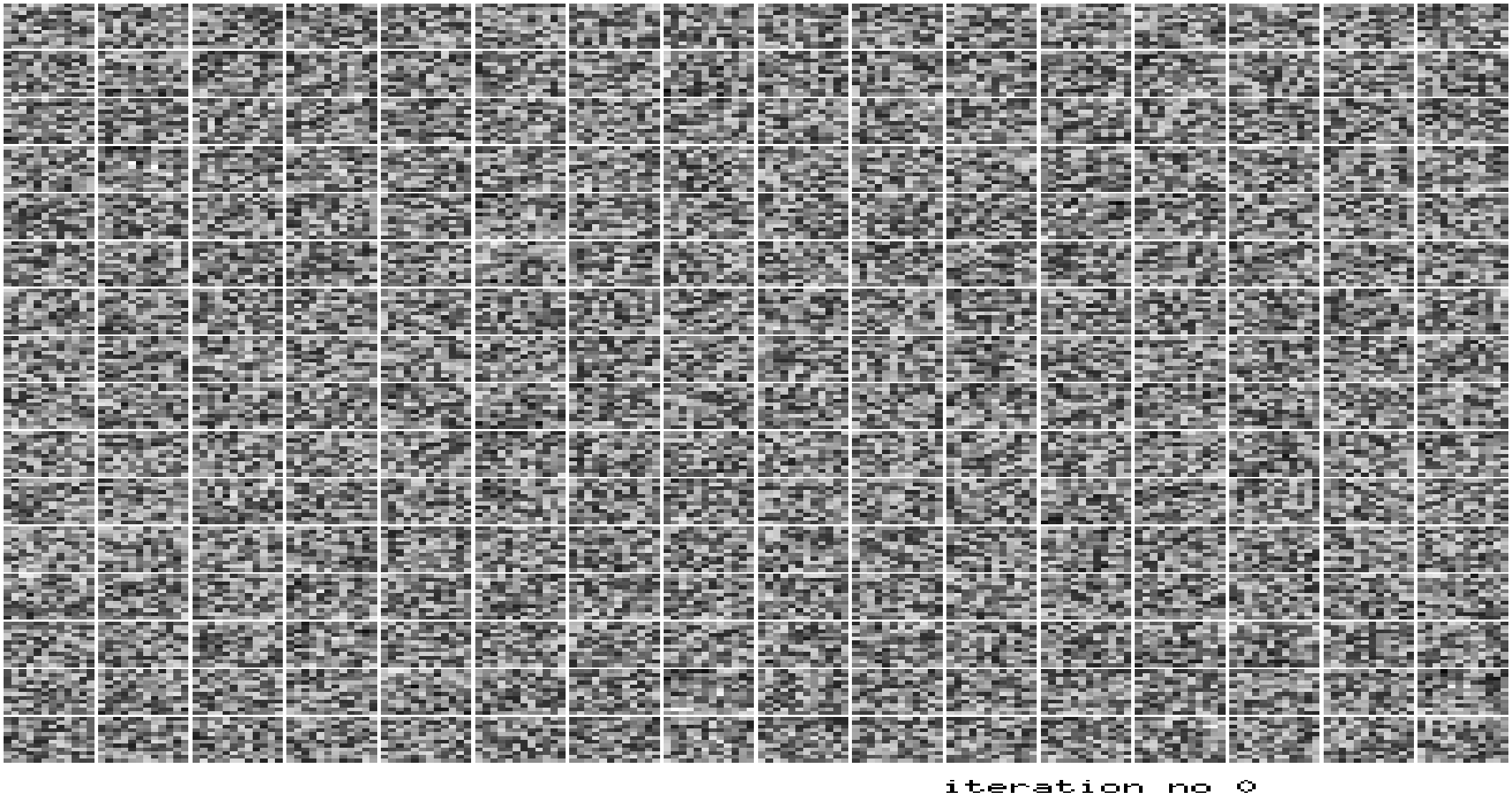
Deep Learning & Neural Networks

Advanced CyberSecurity Solutions

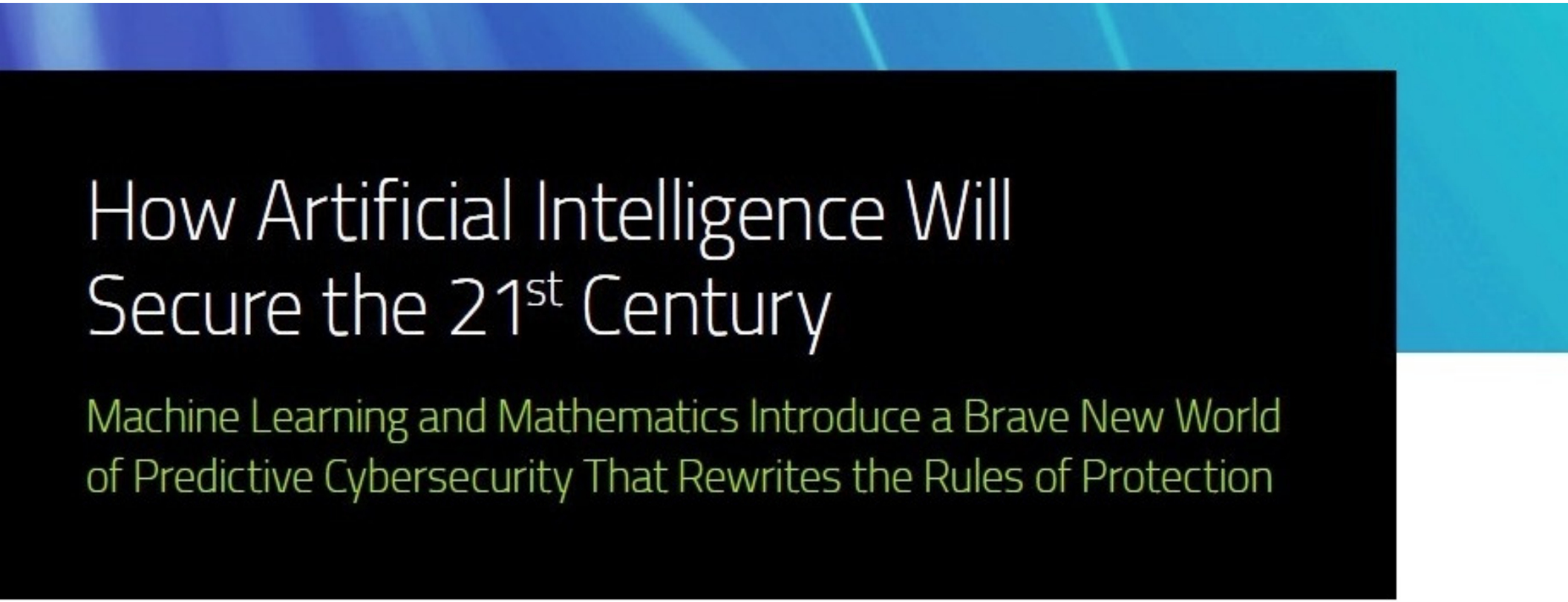


Deep Learning & Neural Networks

Advanced CyberSecurity Solutions



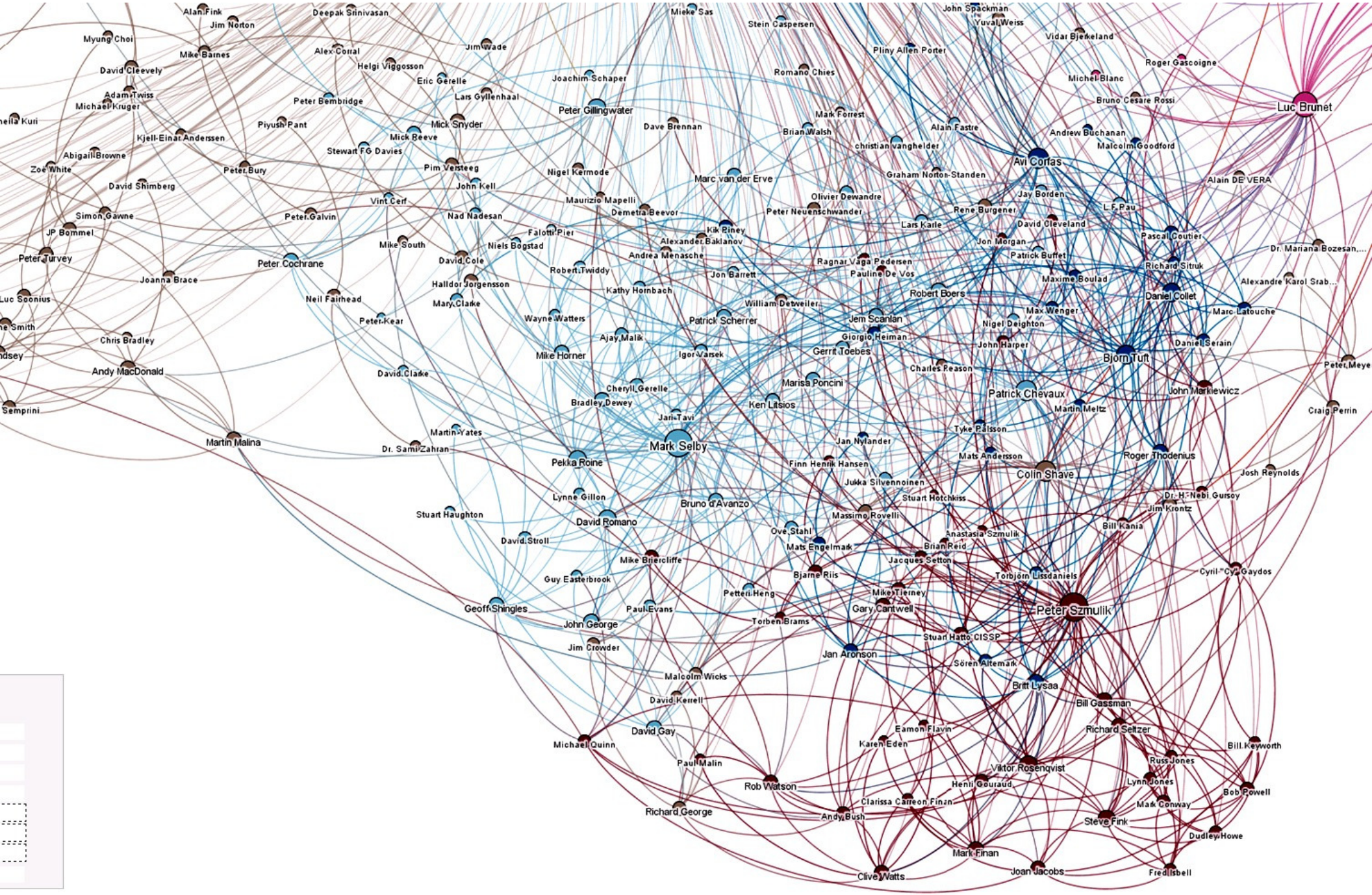
Deep Learning & Neural Networks
Advanced CyberSecurity Solutions



www.cylance.com/content/dam/cylance/pdfs/white_papers/AI_and_Machine_Learning.pdf

CYLANCE™

Mapping 21stC Social Media Networks: *LinkedIn (Probert)*



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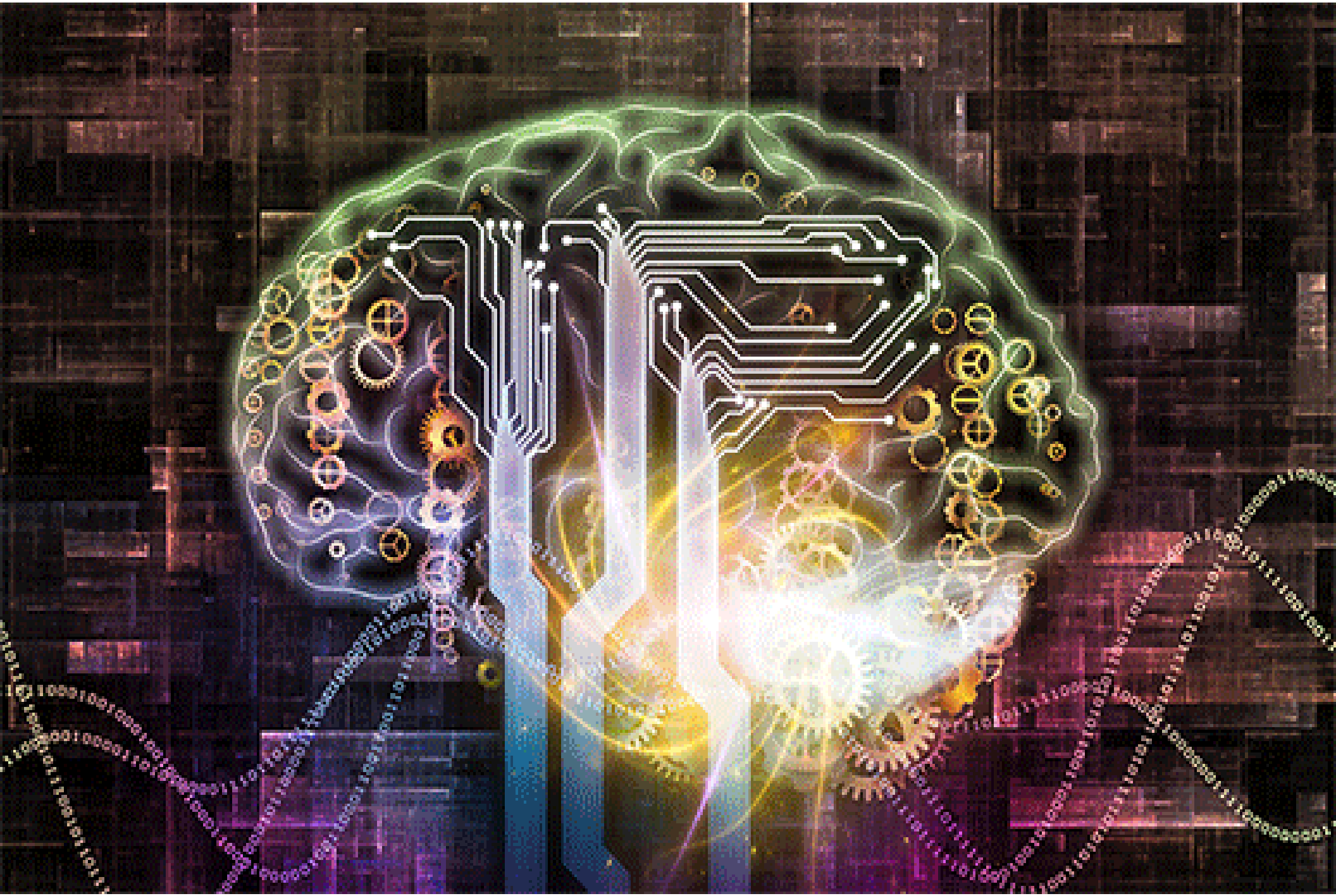
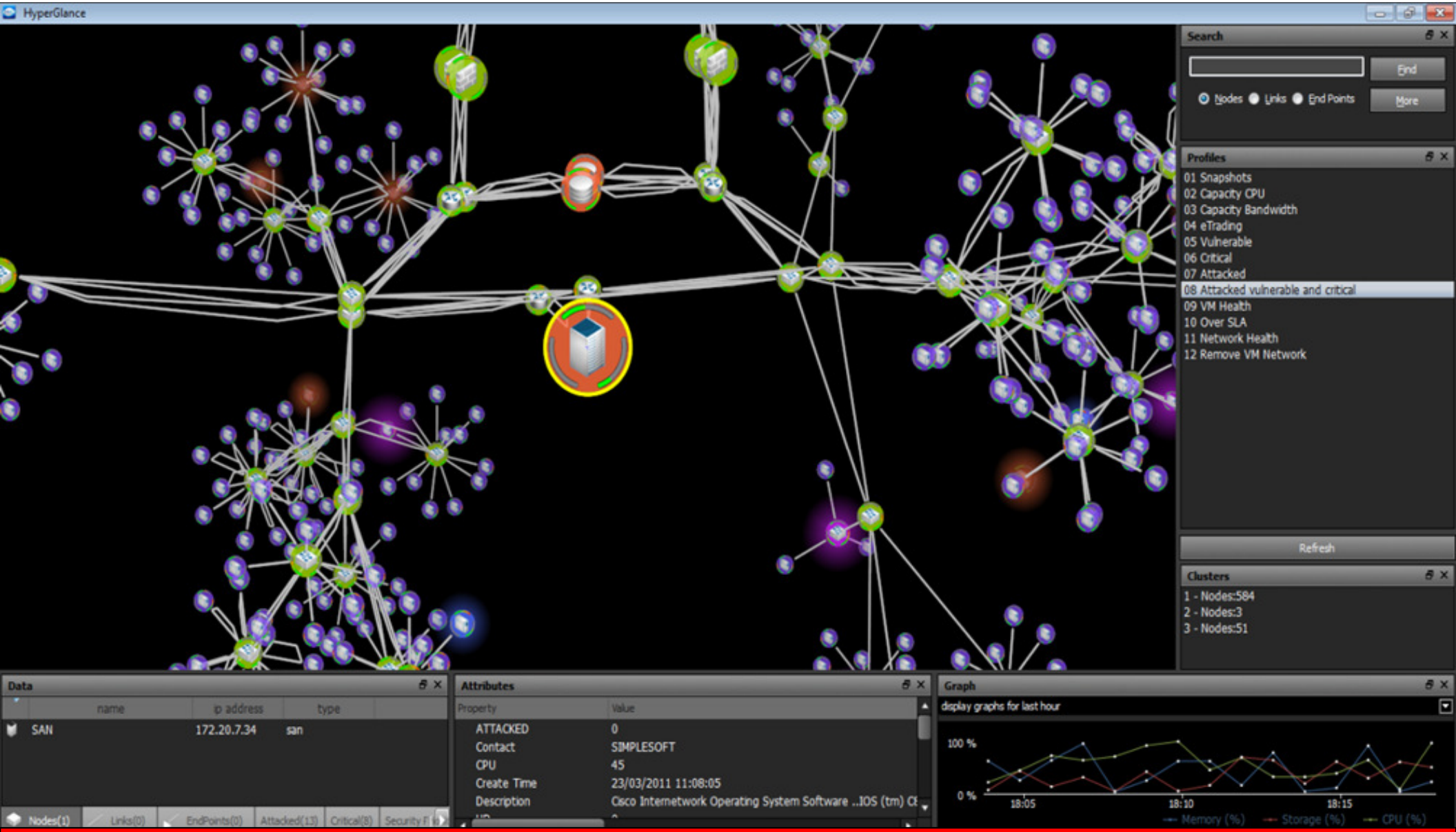
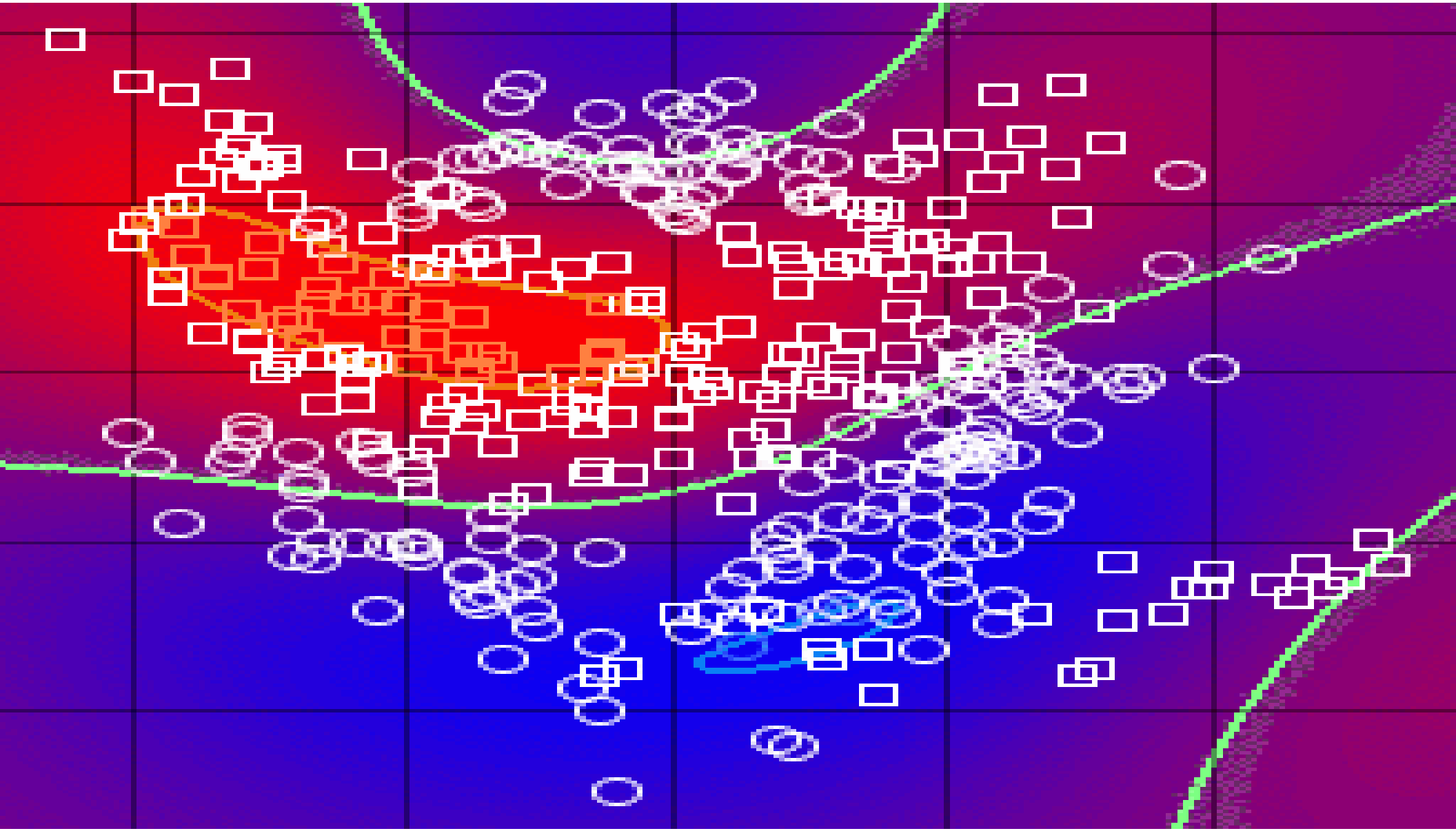


Hyperglance: *Smart 3D Network Modelling*



Hyperglance Real-Time Visualisation Software: Real-Status.com - *London, UK*

Typical "Machine Learning" Algorithm



"Smart Glass": Augmented Reality

- Meta Vision AR HeadSet: 2017 -

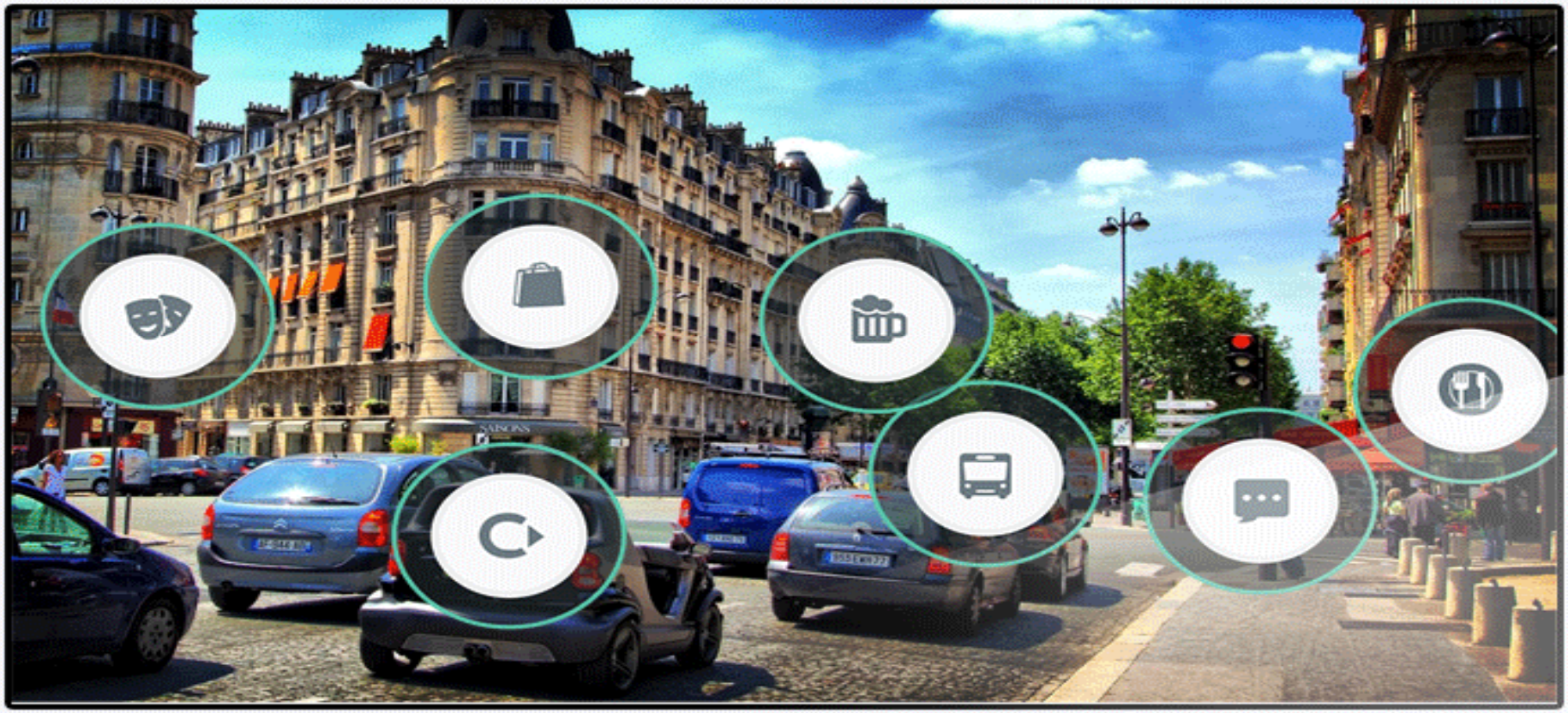
INTUITIVE ACCESS TO DIGITAL INFORMATION

Work the way your brain works

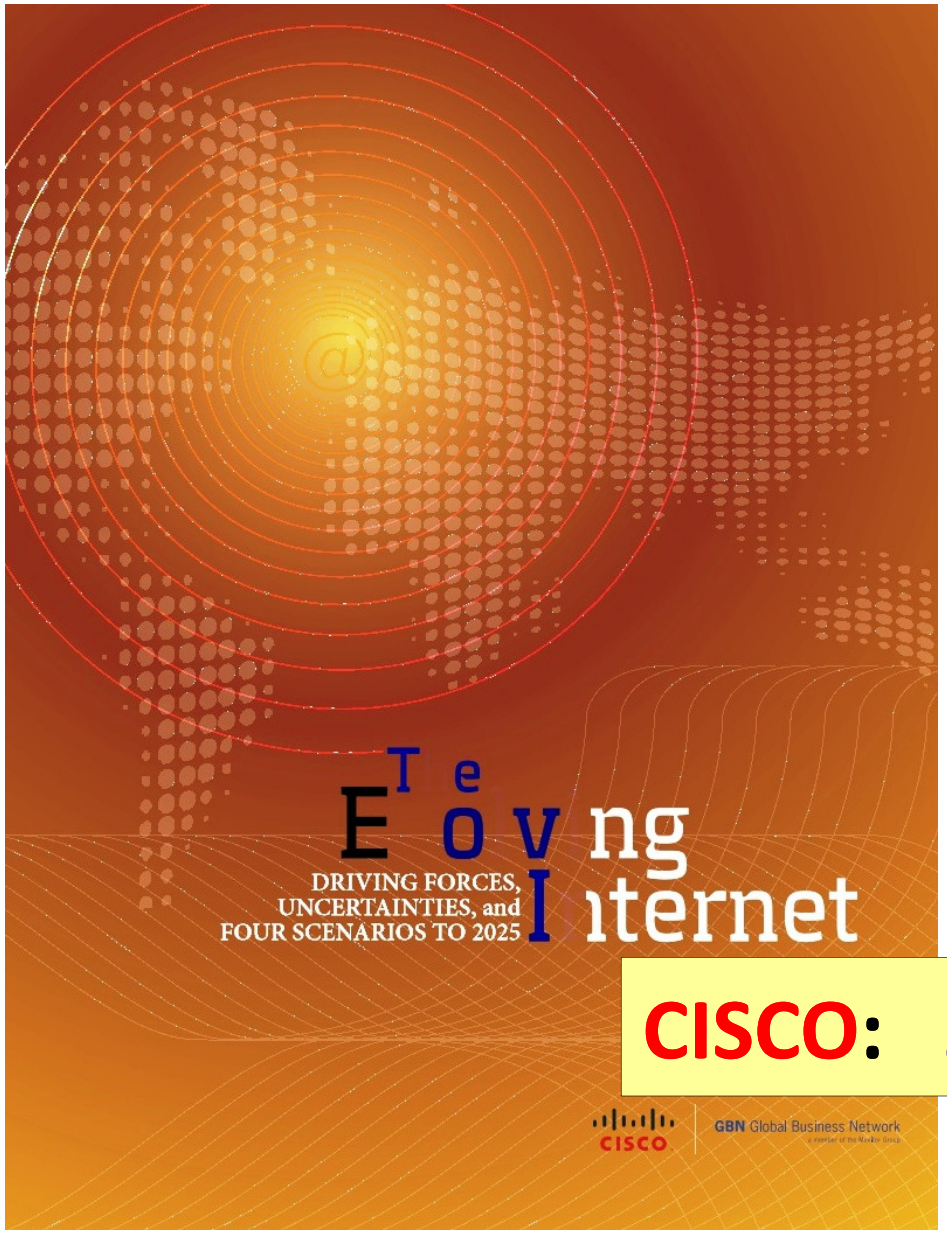
Meta 2's unique neuroscience-driven interface design principles allow you to access, manipulate and share digital information easily and naturally. We call this The Neural Path of Least Resistance™, a new zero-learning-curve approach to computing.

Augmented Reality: "Skiing Challenge"

Augmented Reality – "*Location Paris*"



Technology Visions: Scenario 2025



The Future Internet in 2025

Open paradigms for personal data and platforms?

M14117MRA – November 2014

- a dataset in Excel,
- a state-of-the-art report in PowerPoint,
- six market reports in Word, each with its synopsis in PowerPoint
- Privileged access to our lead OTT analysts

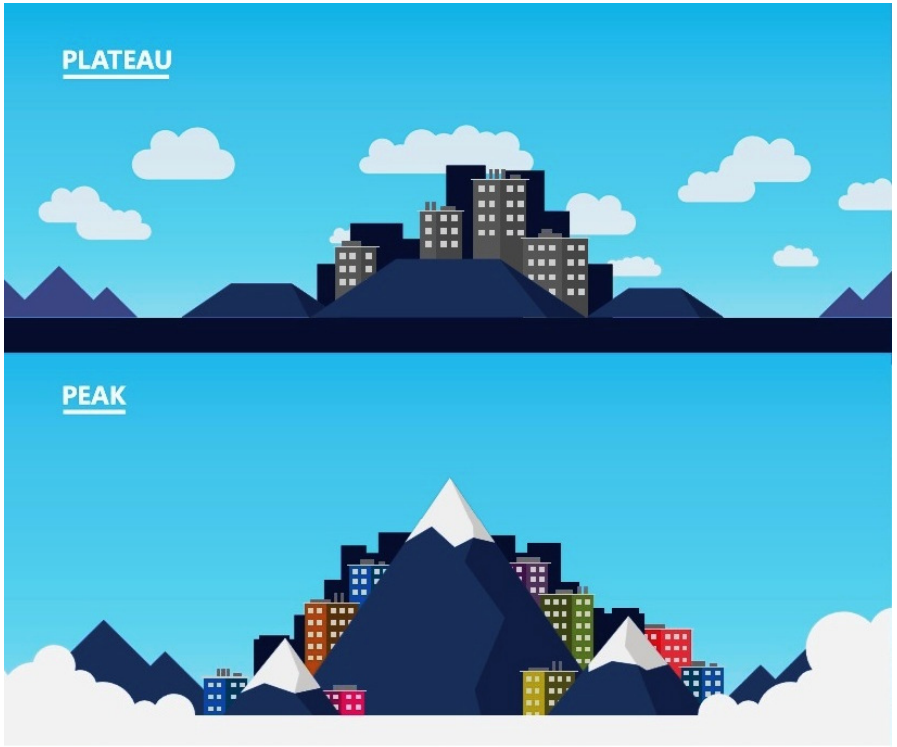
www.idate.org

DIGIWORLD by IDATE

CISCO: 2025 Scenarios: IDATE

Cyberspace 2025: *Microsoft Scenarios*

*** Plateau – Peak – Canyon ***



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BBC Worldwide Internet Scenario: 2040

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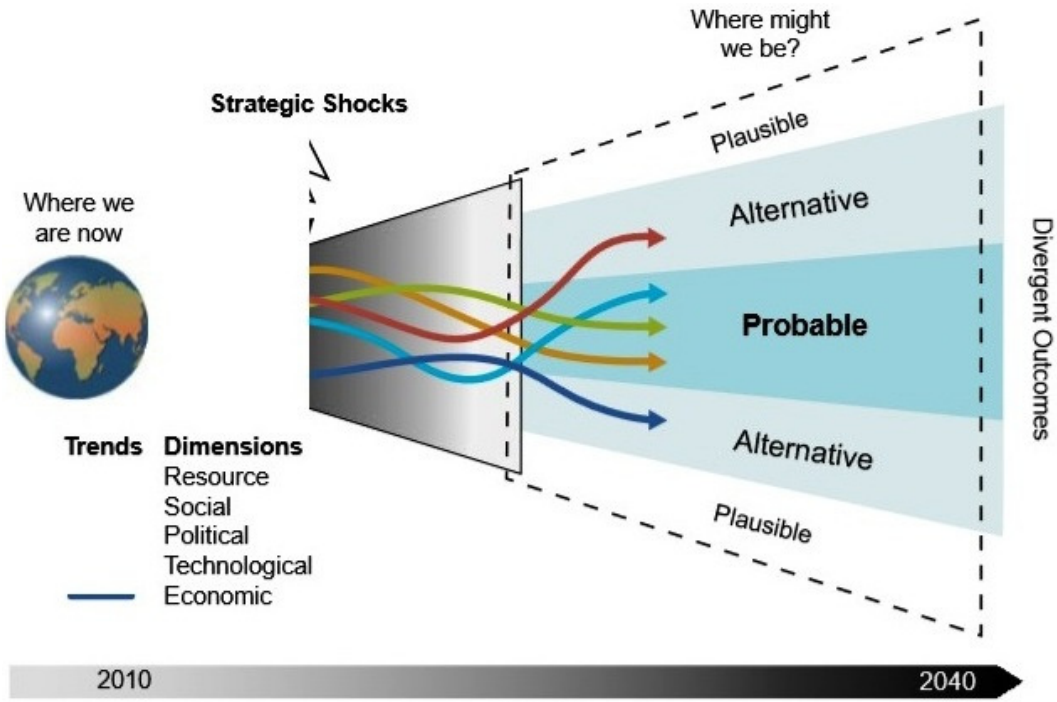
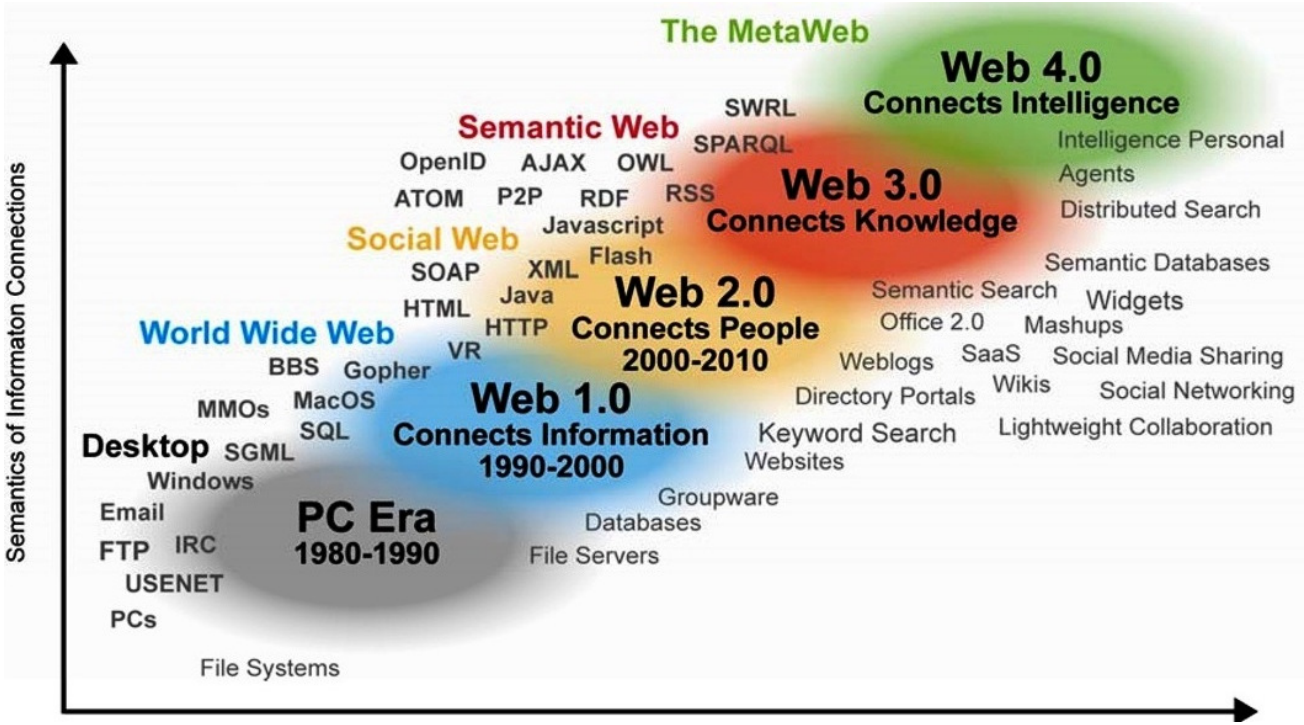
What will the internet look like in 2040?

In 25 years, will life online be bright or bleak? Chris Baraniuk analyses competing visions for the future of the internet.

Related Stories

Scenario 2040: *Cyber Defence:*
UK Ministry of Defence - MOD





Scenario 2040: Cyber Defense – NATO & Canada

The Future Security Environment 2013-2040

2011 3rd International Conference on Cyber Conflict
C. Czosseck, E. Tyugu, T. Wingfield (Eds.)
Tallinn, Estonia, 2011 © CCD COE Publications

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Artificial Intelligence in Cyber Defense

Enn Tyugu
R&D Branch
Cooperative Cyber Defense Center of Excellence (CCD COE)
and Estonian Academy of Sciences
Tallinn, Estonia
tyugu@ieee.org

***Abstract*- The speed of processes and the amount of data to be used in defending the cyber space cannot be handled by humans without considerable automation. However, it is difficult to develop software with conventional fixed algorithms (hard-wired logic on decision making level) for effectively defending against the dynamically evolving attacks in networks. This situation can be handled by applying methods of artificial intelligence that provide flexibility and learning capability to software. This paper presents a brief survey of artificial intelligence applications in cyber defense (CD), and analyzes the prospects of enhancing the cyber defense capabilities by means of increasing the intelligence of the defense systems. After surveying the papers available about artificial intelligence applications in CD, we can conclude that useful applications already exist. They belong, first of all, to applications of artificial neural nets in perimeter defense and some other CD areas. From the other side – it has become obvious that many CD problems can be solved successfully only when methods of artificial intelligence are being used. For example, wide knowledge usage is necessary in decision making, and intelligent decision support is one of yet unsolved problems in CD.**

Keywords: applied artificial intelligence; intelligent cyber defense methods; neural nets in cyber defense; expert systems in cyber defense.

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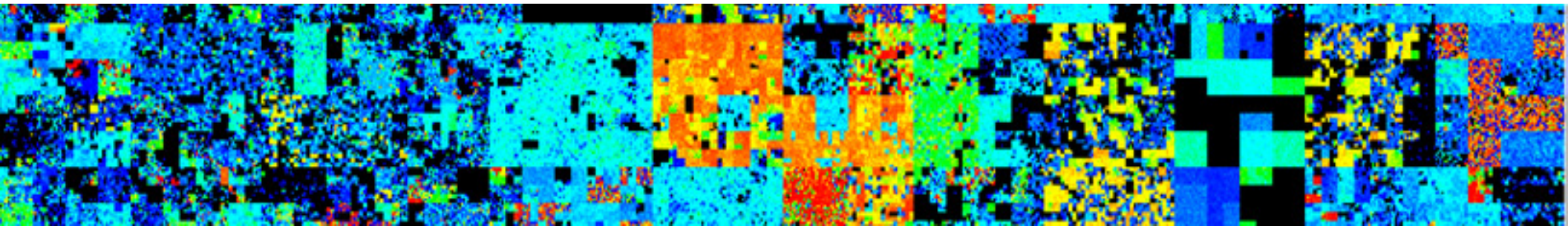


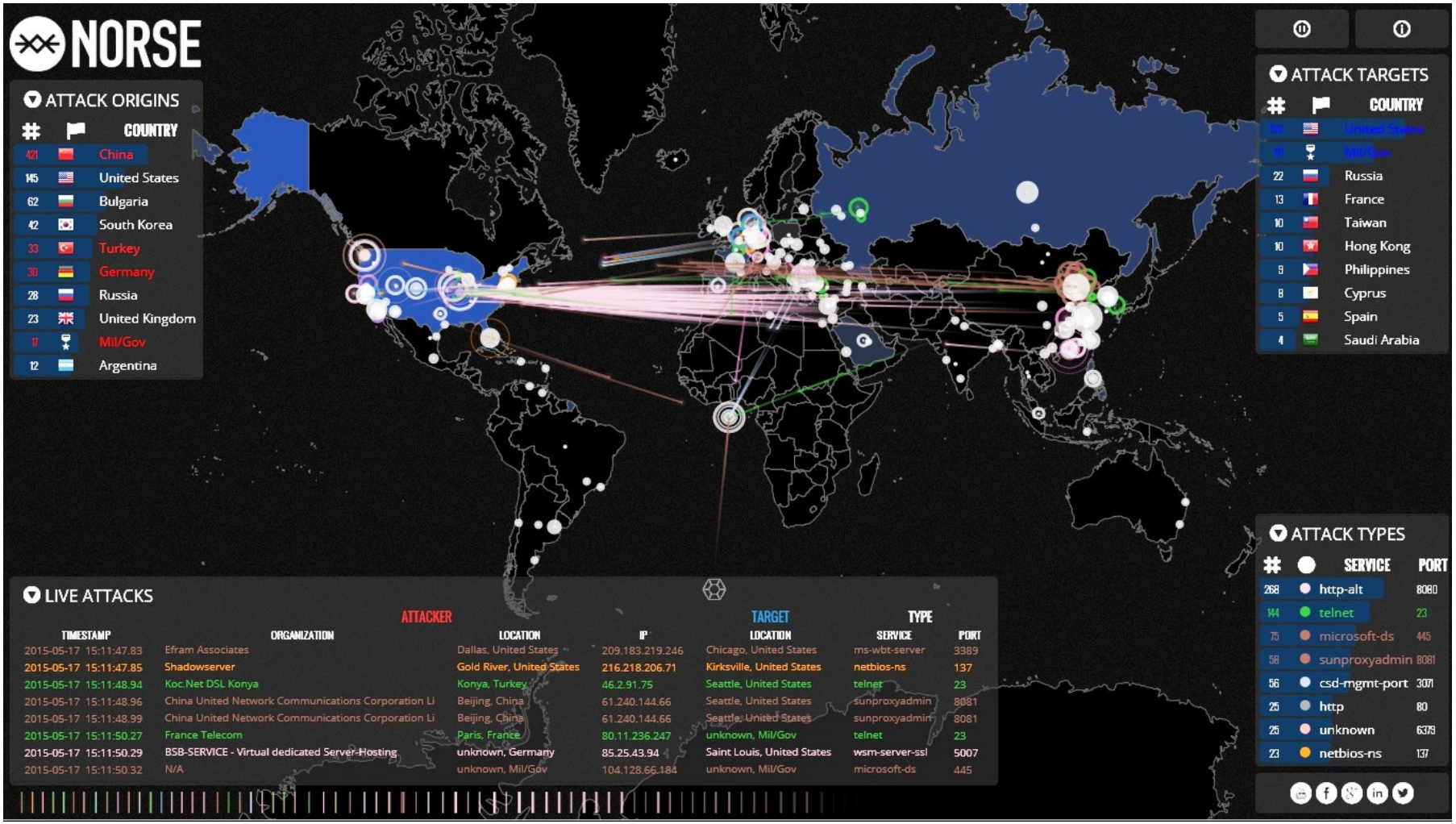
Interfacing "Human" and "CyberWorlds"

- Neural AI/ML CyberSecurity Solutions will require enhanced Intelligent Human/Machine Interfaces!
- Human Communications run **@ Sound Speed....** whilst Cyber Worlds run ***1 Million X*** faster **@ Speed of Light!..**
- Virtual, Mixed & Augmented Reality(AR) Devices & Software(SW) will "Bridge" Human & Cyber Worlds!

....Expect **New Generation AR Devices** & SW Interfaces for Security Management during the next **7 Years!....**

The Cybersecurity Industry 10 Year Challenge:

- Apply AI Apps for Real-Time Cyber Defence -



Deploy *Light-Speed "AI-Neural Security"* against 24/7 Attacks from *"Bad Guys"*

The Cybersecurity Industry 10 Year Challenge:

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Deploy *Light-Speed "AI-Neural Security"* against 24/7 Attacks from *"Bad Guys"*

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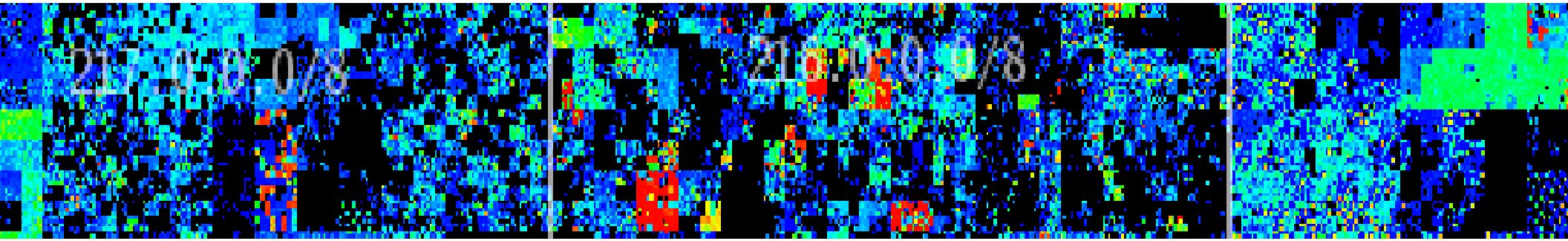
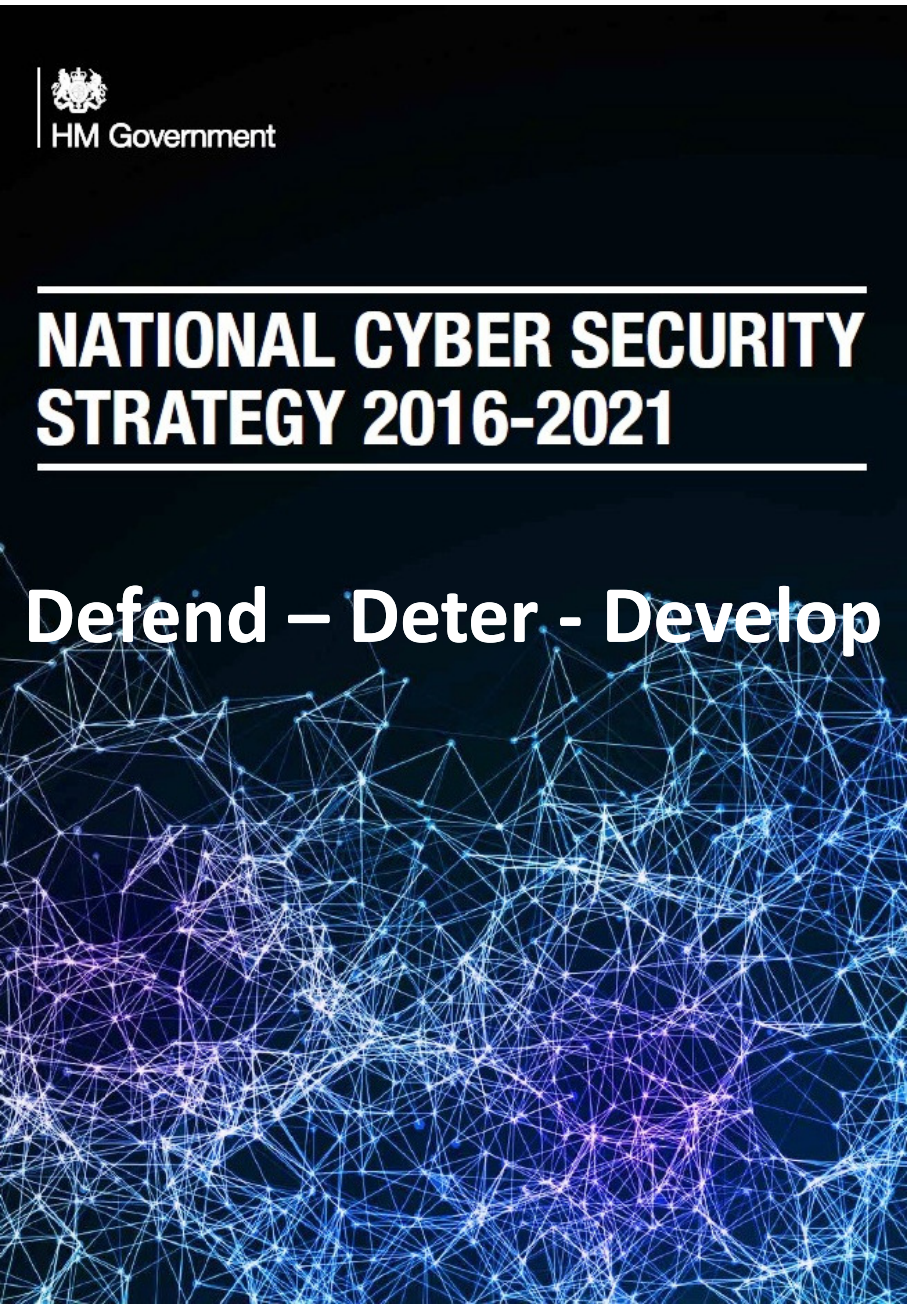


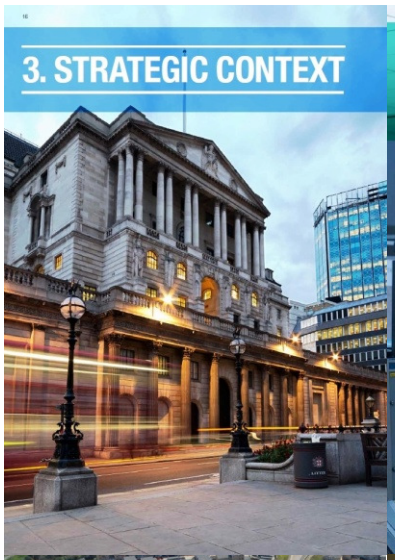
"From 7 Year CyberVision to Reality!"

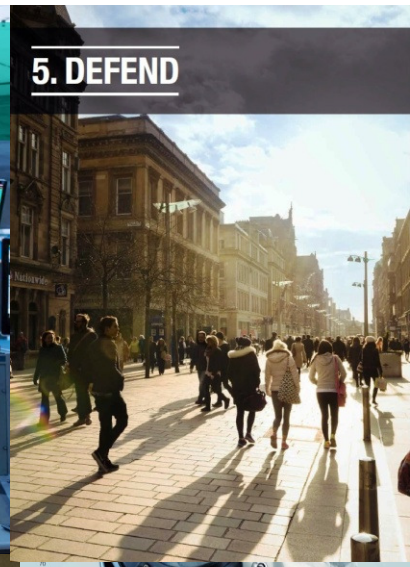
- 7 Year Evolution of Business **"$ecurity Culture"**
- **Cyber RoadMap** managed by Board-Level C$O
- Integrated Security with **Intelligent AI Alerts!**
- Professional **Cyber Training** for EVERY Business
- **"Sell"** Security Policy & Culture to ALL **"Staff"**
- **Trial and Deploy** Adaptive AI Security Solutions

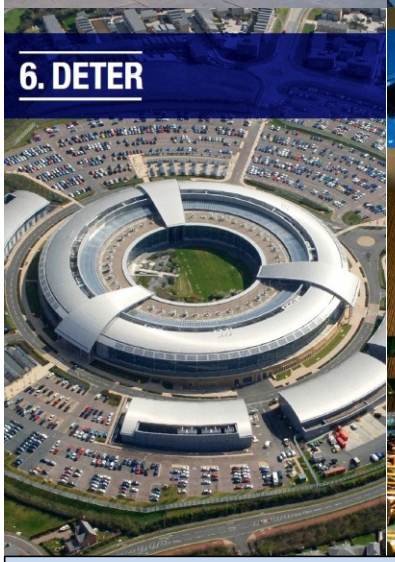
.....**CyberSecurity** now requires **$$$** Investment in Teams & Technology to **Mitigate Major Risks!...**

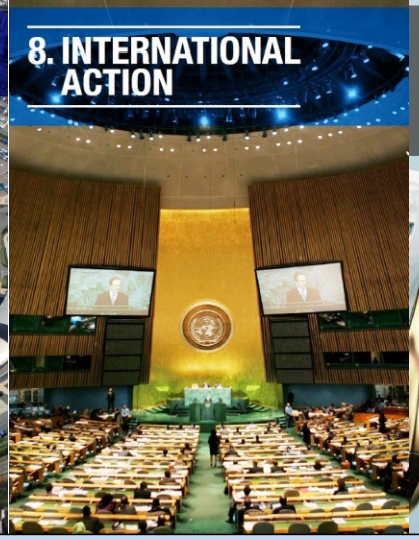
UK CyberSecurity Strategy: 2016 - 2021





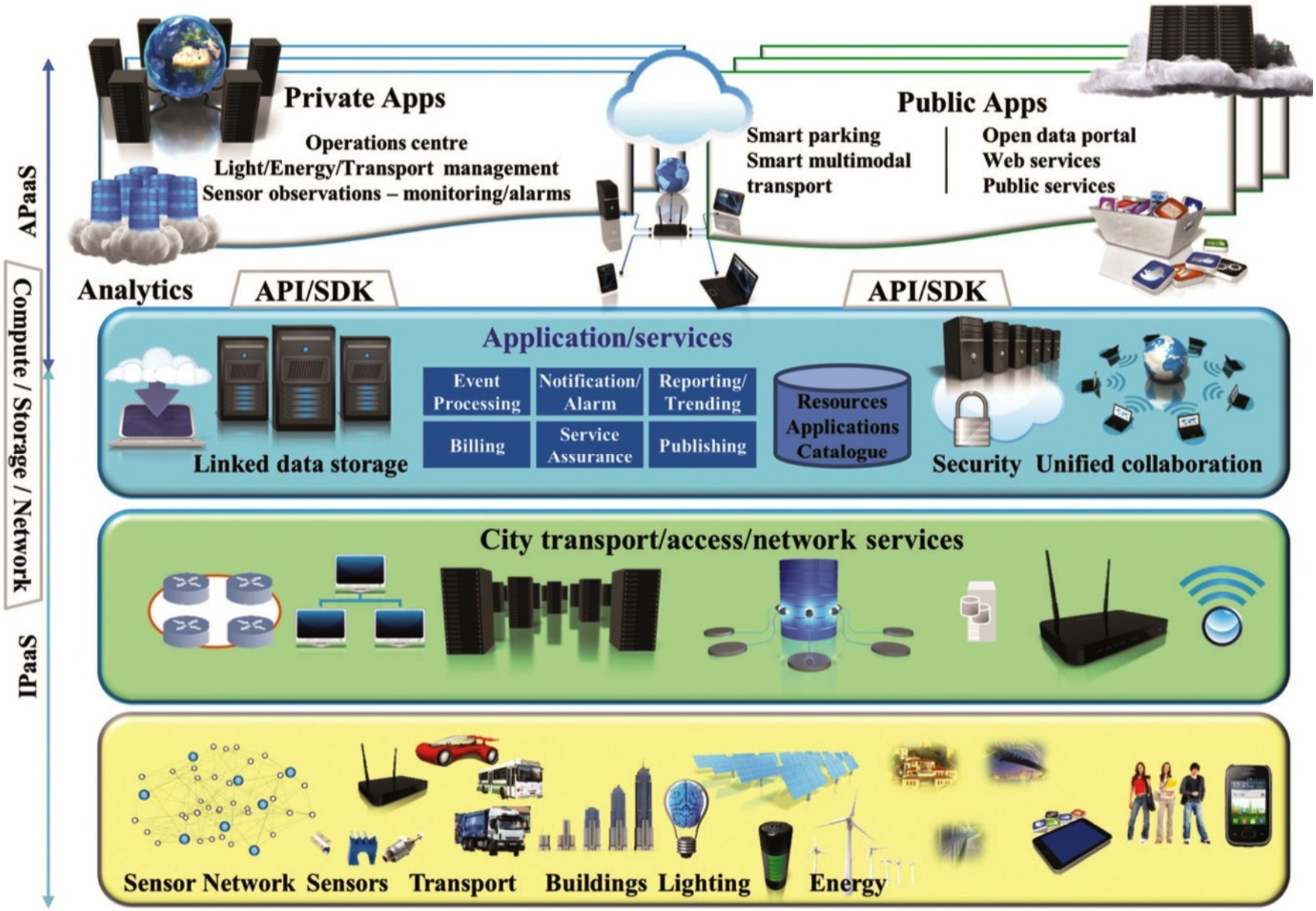




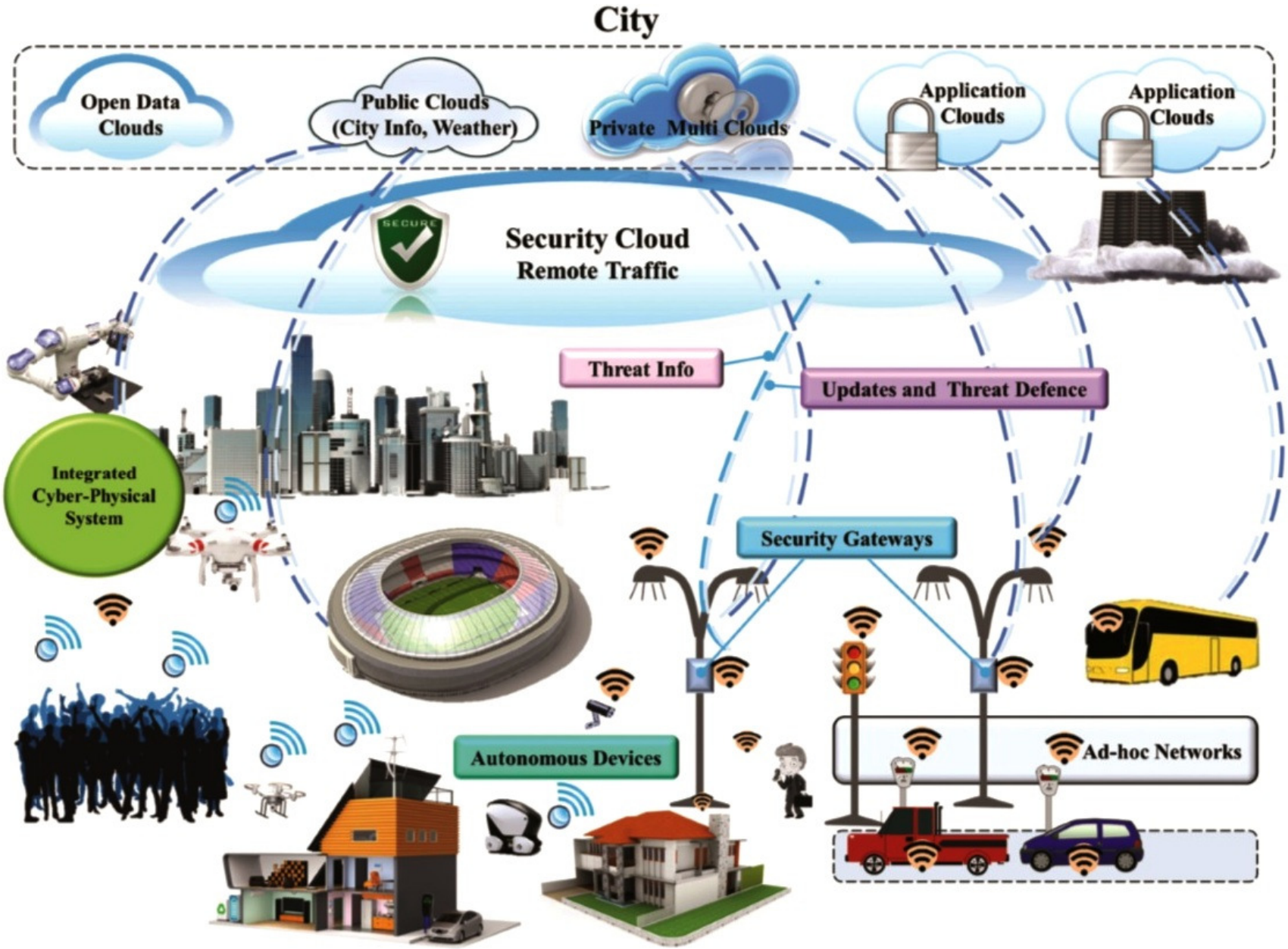


5 Year Programme Launched by UK Chancellor Philip Hammond: **Tuesday 1st November 2016**

Smart City: *Multi-Layered Architecture*



Smart City: *Multi-Layer Security Framework*



MSc CyberSecurity Courses: Certified by the UK Government – **GCHQ/CESG**

Edinburgh Napier University

University of Surrey

Security Lancaster | Lancaster University

Royal Holloway University of London

Warwick – The University of Warwick

Queen's University Belfast

University of Southampton

University of Oxford

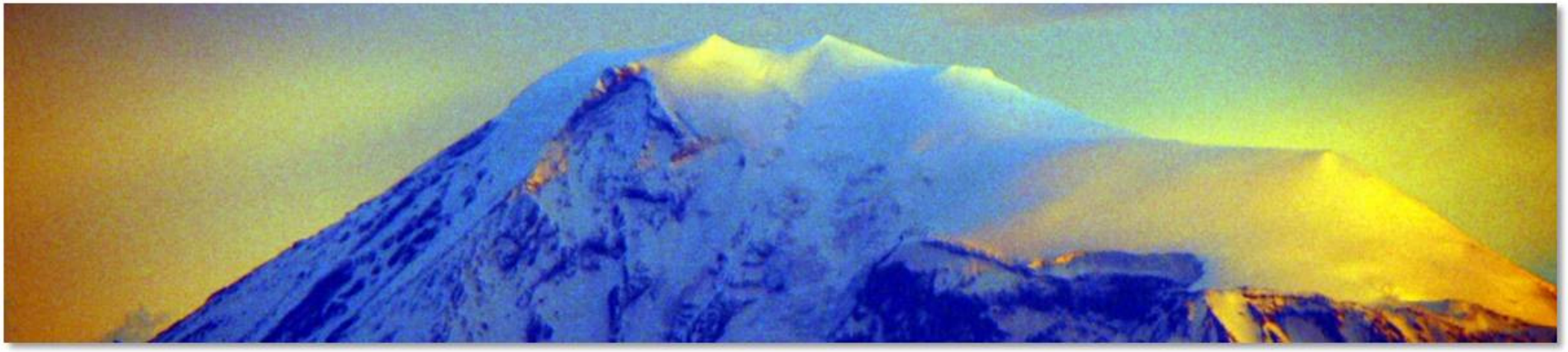
Cranfield University

UCL

University of York

CyberTerrorism @ World Counter Terror Congress – Olympia, London – April 2017

CyberSecurity Tools and Trends: *2018–2025*



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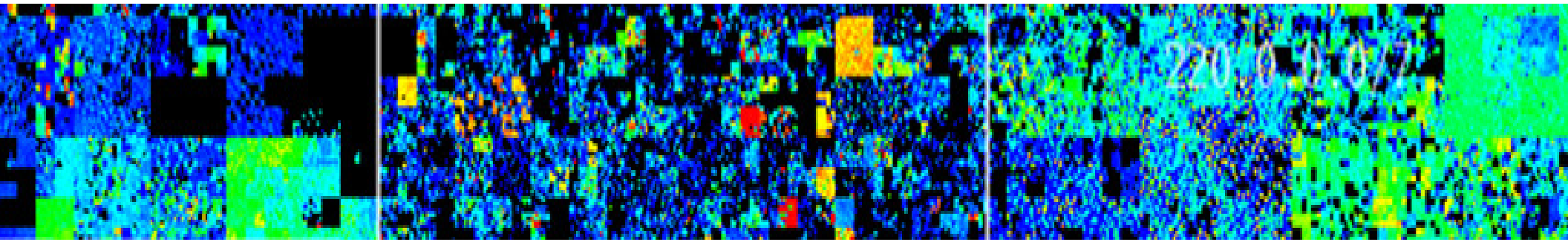


YOUR Action Plan for 21stC Cyber!...

- Every CSO needs Board-Level Approval for Annual Security Business Plan that includes CyberSecurity
- **YOUR CyberSecurity Plan Actions** will include:
  - Investment Budget for Integrated Security Solutions
  - Job Specifications for Professional "Cyber" Team
  - Security Staff Training & Professional Development
  - Technical & Operational Plans & Upgrades
  - Actions for Compliance, Security Audit & ISO Standards

.....Invest & Equip **YOUR** Business with **21stC CyberDefence**

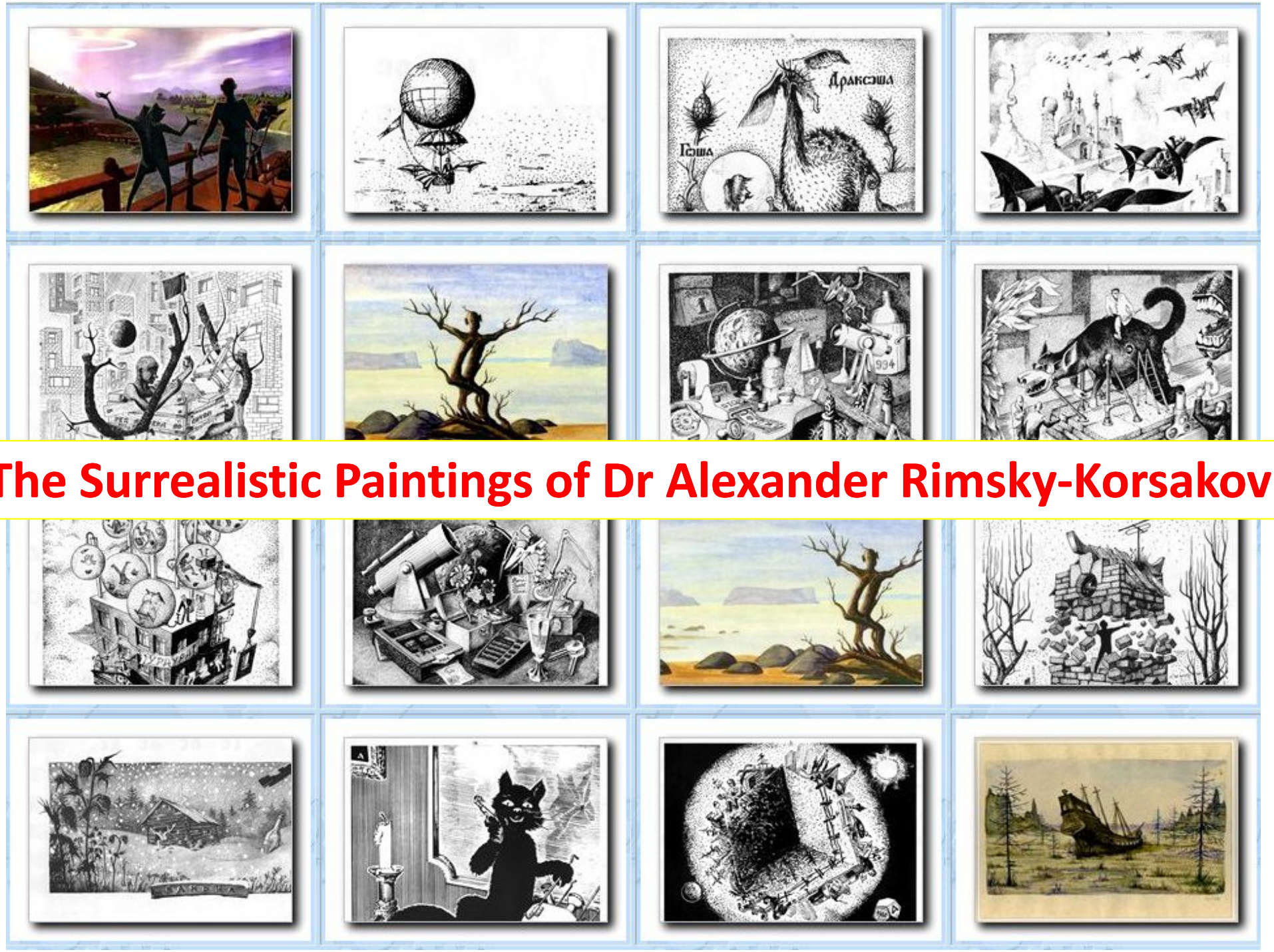
"Cyber Defence" against "Organised Crime"

Adaptive Security provides Intelligent Cyber Defence against **21stC Cyber Crime**!

"Plan **YOUR** Cybersecurity Defence Campaign **NOW**!"

Bulgakov's Devil Cat – Беремот - Master & Margarita - 1972

Pen & Ink Drawing by **Dr Alexander Rimski-Korsakov**



The Surrealistic Paintings of Dr Alexander Rimsky-Korsakov

Web Link: www.valentina.net/ARK3/ark2.html

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The Final Countdown!: *CyberTerror* Strikes @ *"Light Speed"* across Global Networks!

"CyberSecurity Tools and Trends": *2018-2025*

International East-West Security Conference: Genoa

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Thank-You!

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East-West Security Conference – Genoa 2017

-"21stC CyberSecurity Trends"-

Practical Cyber Defence

-TOP 10 Cyber Threats-

Theme (1) –"TOP 10 Cyber Threats"

Cyber Tools and Trends

Next 7 Years: 2018 - 2025

Theme (2) –"CyberTrends: 2018-2025"

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Thank you for your time!

Additional *Cybersecurity* Resources

Link: www.valentina.net/vaza/CyberDocs

Professional Profile - *Dr David E. Probert*

- ***Computer Integrated Telephony (CIT)*** – Established and led British Telecom's £25M EIGER Project during the mid-1980s' to integrate computers with telephone switches (PABX's). This resulted in the successful development and launch of CIT software applications for telesales & telemarketing

- ***Blueprint for Business Communities*** – Visionary Programme for Digital Equipment Corporation during late-1980's that included the creation of the "knowledge lens" and "community networks". The Blueprint provided the strategic framework for Digital's Value-Added Networks Business

- ***European Internet Business Group (EIBG***) – Established and led Digital Equipment Corporation's European Internet Group for 5 years. Projects included support for the national Internet infrastructure for countries across EMEA as well as major enterprise, government & educational Intranet deployments. Dr David Probert was a sponsoring member of the European Board for Academic & Research Networking (EARN/TERENA) for 7 years (1991 ➔1998)

- ***Supersonic Car (ThrustSSC)*** – Worked with Richard Noble OBE, and the Mach One Club to set up and manage the 1st Multi-Media and e-Commerce Web-Site for the World's 1st Supersonic Car – ThrustSSC – for the World Speed Record.

- ***Secure Wireless Networking*** – Business Director & VP for Madge Networks to establish a portfolio of innovative fully secure wireless Wi-Fi IEEE802.11 networking products with technology partners from both UK and Taiwan.

- ***Networked Enterprise Security*** - Appointed as the New Products Director (CTO) to the Management Team of the Blick Group plc with overall responsibility for 55 professional engineers & a diverse portfolio of hi-tech security products.

- ***Republic of Georgia*** – Senior Security Adviser – Appointed by the European Union to investigate and then to make recommendations on *all* aspects of IT security, physical security and BCP/DR relating to the Georgian Parliament, and then by UN/ITU to review Cybersecurity for the Government Ministries.

- ***UN/ITU*** – Senior Adviser – Development of Cybersecurity Infrastructure, Standards, Policies, & Organisations in countries within both Europe & Americas

Dr David E. Probert is a Fellow of the Royal Statistical Society, IEEE Life Member and 1st Class Honours Maths Degree (Bristol University) & PhD from Cambridge University in Self-Organising Systems (Evolution of Stochastic Automata) , and his full professional biography is featured in the Marquis Directory of Who's Who in the World: 2007-2018 Editions.

"Master Class": Armenia - *DigiTec2012*

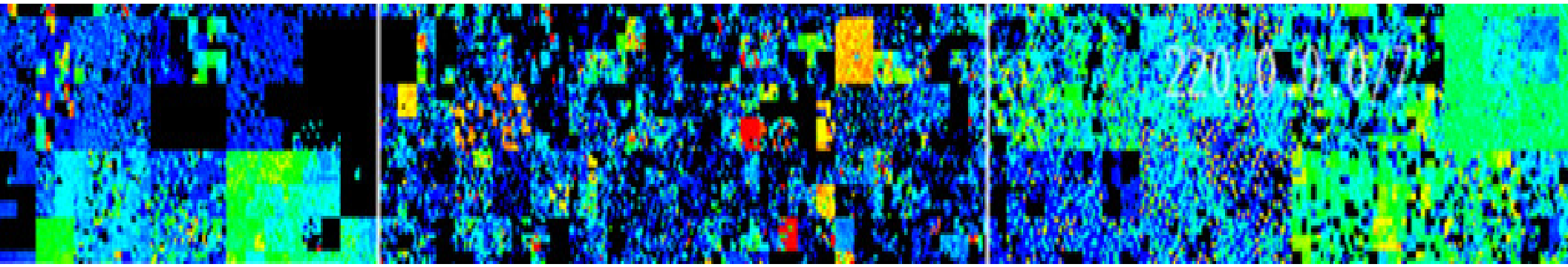
- Smart Security, Economy & Governance -

Download: www.valentina.net/DigiTec2012/

"CyberSecurity Trends & Tools": *2018–2025!*

35th International East-West Security Conference: Genoa, Italy

BACK-UP SLIDES



"Surfing the Evolutionary Cyber Waves"

- *More than 45 Years of AI & CyberSecurity!* -

- 1970 – BT Research Labs – IBM 360 –Digital PCM
- 1976 – AI Thesis – Stochastic Learning Automata
- 1982 – AI & Expert Systems: UK Govt Programme
- 1991 – EARN/TERENA: European Networks Board
- 1992 – International Net Conference: RAS, Moscow
- 1994 – EMEA – Internet, Security & eCommerce
- 2007 – Georgian Parliament Security Projects
- 2009 – Armenia eGovernance & CyberSecurity
- 2010 – Georgian Cybersecurity Audit & Roadmap

.....Global Marketplace for "Cyber" AI/ML Apps will mainstream during the Next 7 Years: 2018 – 2015 !

BT Research Labs: Digital Systems-1970

FIG 5

EVALUATION OF P.C.M. FOR

P.C.M. SYSTEM WITH D.

```
LIST

OFFSET      9:05    GEIS D 09/07/70

10 BEGIN
15 REAL PO,A,B,C,D,F,L,N,P,R,S,T,U,Y,Z,S
20 INTEGER I,J,M;
40 ARRAY V[-64:64], W[-64:64], INT[-64:6
52 REAL PROCEDURE NORM(Z);VALUE Z;
54 REAL Z;
55 IF Z>7.5 THEN NORM:=0 ELSE IF Z<-7.5
56 IF Z=0 THEN NORM:=0.5 ELSE
57 BEGIN REAL T,Y,P;
58 P:=Z; Z:=ABS(Z);
59 Y:=0.5*Z*Z;
62 IF Z<1.28 THEN
64 T:=0.5-Z*(0.3989422804-0.3999034385
66 -29.8213557808/(Y+2.624331216794-48.69
68 5.928857244381))))
69 ELSE BEGIN Y:=0.398942280385*EXP(-Y);
70 T:=IF Y/Z=0 THEN 0 ELSE
72 Y/(Z-0.0000000380521.000006153021(Z+
74 15381364/(Z-0.151679116635+5.293303241
76 15.1508978451/(Z+0.7423809240271-30.781
78 (Z+3.990194170111)))))
79 )
80 END;
81 NORM:=IF P<0 THEN 1-T ELSE T;
82 END;
87 V[0]:=0;
90 FOR I:=1 STEP 1 UNTIL 64 DO BEGIN
92 READATA(INPUT,V[I]);DATA INPUT:=
94 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,1
100 22,24,26,28,30,32,36,40,44,48,52,56,
110 112,120,128,144,160,176,192,208,224,
120 384,416,448,480,512,576,640,704,768,
121 END;
125 FOR I:=1 STEP 1 UNTIL 64 DO V[-I]:=-
130 FOR I:=-64 STEP 1 UNTIL 64 DO V[I]:=
140 FOR I:=1 STEP 1 UNTIL 64 DO W[I]:=(V
145 FOR I:=-64 STEP 1 UNTIL -1 DO W[I]:=
155 D:=0.5/1024;
160 FOR I:=-64 STEP 1 UNTIL 64 DO V[I]:=
170 PRINT("OFFSET","N-VALUE-DB","S-TMAX-
180 FOR N:=-83 STEP 10 UNTIL -63 DO BEGIN
190 FOR S:=-93 STEP 10 UNTIL -63 DO BEGIN
200 B:=PO:=MENU:=0;
220 SDN:=10↑(N/20);
230 SDS:=10↑(S/20);
240 U:=SQRT(SDN↑2+SDS↑2);
245 F:=V[0]↑2/(2*U*U);
250 ERR[0]:=IF F>39 THEN 0 ELSE EXP(-F);
260 FOR I:=1 STEP 1 UNTIL 64 DO BEGIN
300 INT[I]:=NORM(V[I-1]/U)-NORM(V[I]/U);
```

GPO

Research Group: R9.3.1
Research Memo: 160/10

Evaluation of Distortion and Loss for Digital *"PCM"* Transmission Systems in the presence of Gaussian Noise.

Author: David E. Probert Date: July, 1970

- Post Office Research Labs – Dollis Hill, London –

APPENDIX 2

he analysis of m for a symmetrical P.C.M. with Noise

μ_{11}/σ_v^2 gradient of regression line

$\Sigma f_i(U_i-\bar{U})(v_i-\bar{v})/\sigma_v^2$ but $\bar{v} = \bar{U} = 0$ for symmetrical system.

$$\sum_{i=1}^{i=64} U_i \int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-n^2/2} \int_{v_{i-1}-N}^{v_i-N} \frac{1}{\sigma_v\sqrt{2\pi}} e^{-v^2/2\sigma_v^2}\, dv\, dn \ldots \Big) \Big/ \sigma_v^2$$

..... + term from v_{64} to ∞.

lise by putting $Z = v/\sigma_v$.

$$\sum_{i=1}^{i=64} U_i \int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-n^2/2} \int_{\frac{v_{i-1}-n\sigma_n}{\sigma_v}}^{\frac{v_i-n\sigma_n}{\sigma_v}} \frac{1}{\sqrt{2\pi}} e^{-Z^2/2}\, dz\, dn \Big) \Big/ \sigma_v$$

erm in dotted lines:-

$$2\pi \int_{-\infty}^{\infty} e^{-n^2/2} \left[EXP - \frac{1}{2\sigma_v^2}\left((v_{i-1}-n\sigma_n)^2\right) - EXP - \frac{1}{2\sigma_v^2}\left(v_i-n\sigma_n\right)^2 \right] dn$$

is will be symmetrical for analysis in v_i and v_{i-1}.

g term in v_{i-1}:-

$$\int_{\infty} EXP - \left[n^2\sigma_v^2 + (v_{i-1})^2 - 2n\sigma_n v_{i-1} + n^2\sigma_n^2\right] / 2\sigma_v^2$$

$$\int_{\infty} EXP - (\sigma_v^2+\sigma_n^2)/2\sigma_v^2 \left[n^2 - 2n\sigma_n v_{i-1}/\sigma_v^2+\sigma_n^2\right] EXP \left[-\frac{(v_{i-1})^2}{2\sigma_v^2}\right] dn$$

exp is constant and now by completing the square:-

$$\int_{\infty} EXP - (\sigma_v^2+\sigma_n^2)/2\sigma_v^2 \left[\left(n-\sigma_n v_{i-1}/\sigma_v^2+\sigma_n^2\right)^2 - \sigma_n^2 (v_{i-1})^2 / (\sigma_v^2+\sigma_n^2)^2\right] dn$$

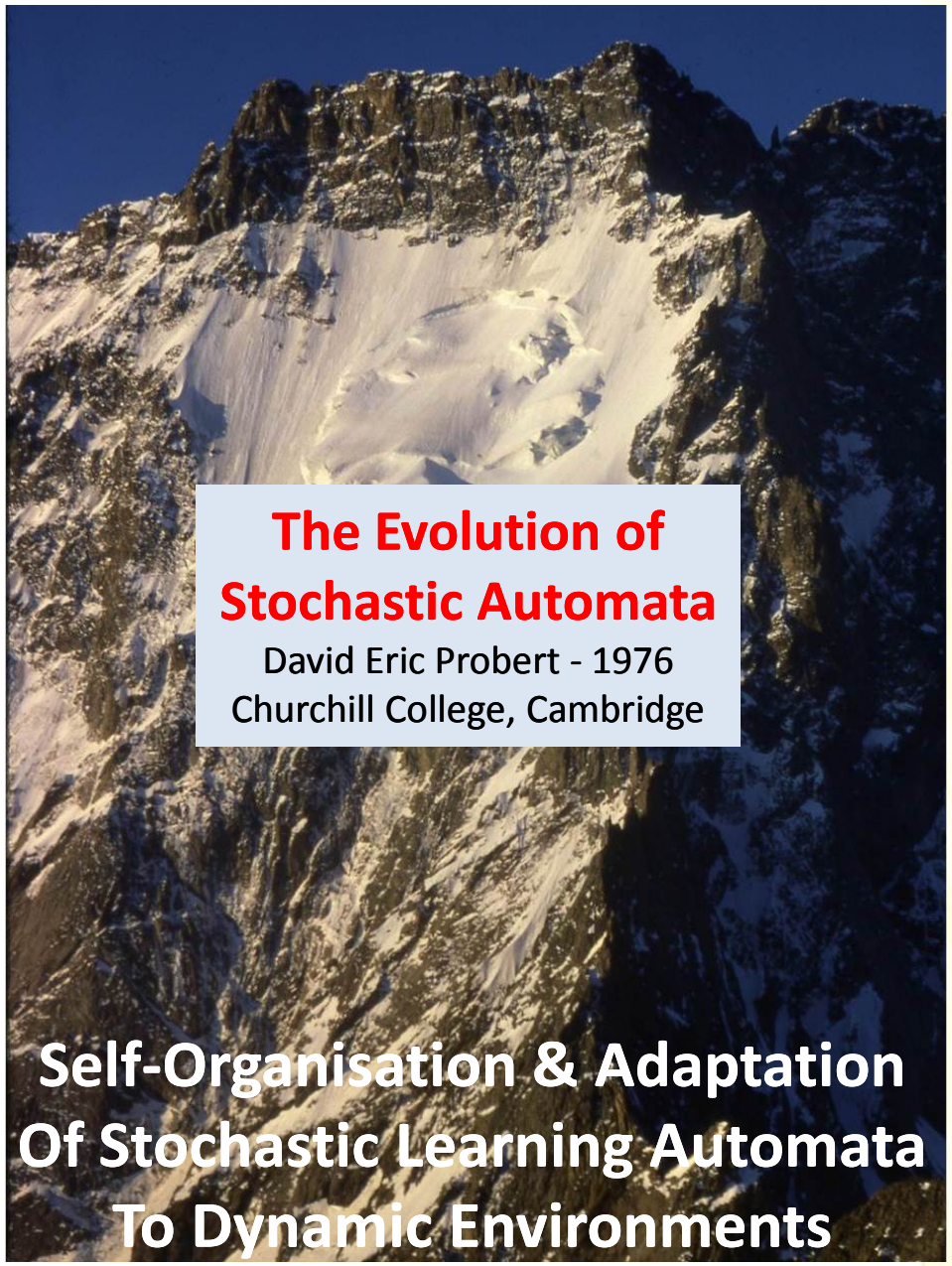
12

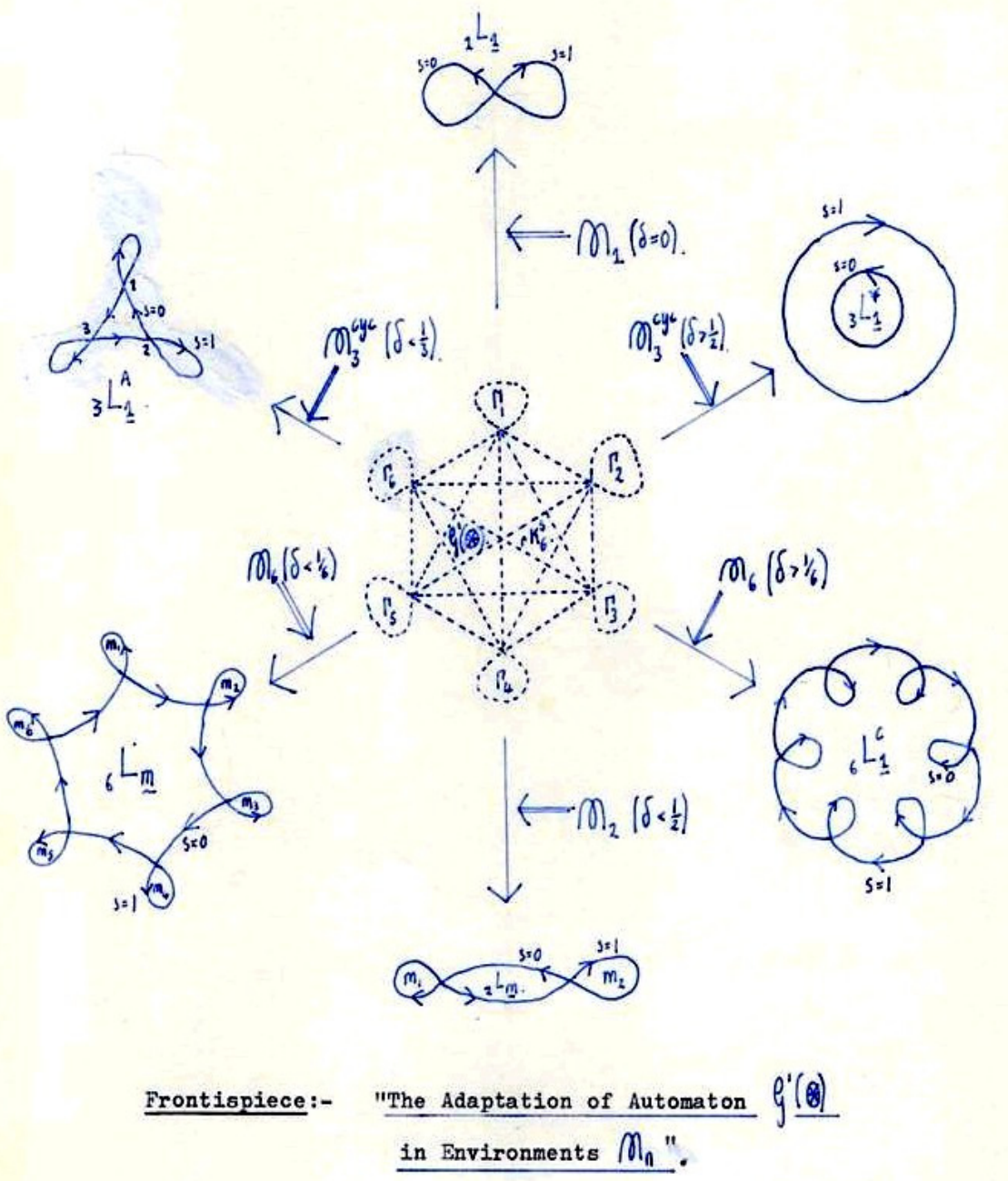
Download: www.slideshare.net/DrDavidProbert/dep1970pcm

- Dept of Mathematics & Statistics -

Cambridge University : 1973 - 1976

Evolution of Stochastic Automata – *Cambridge, June '76*





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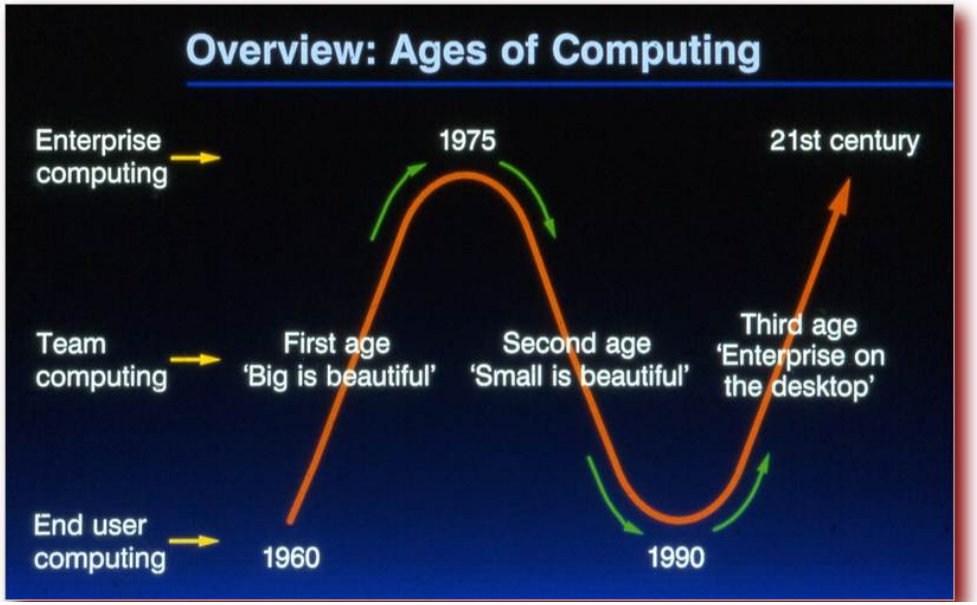
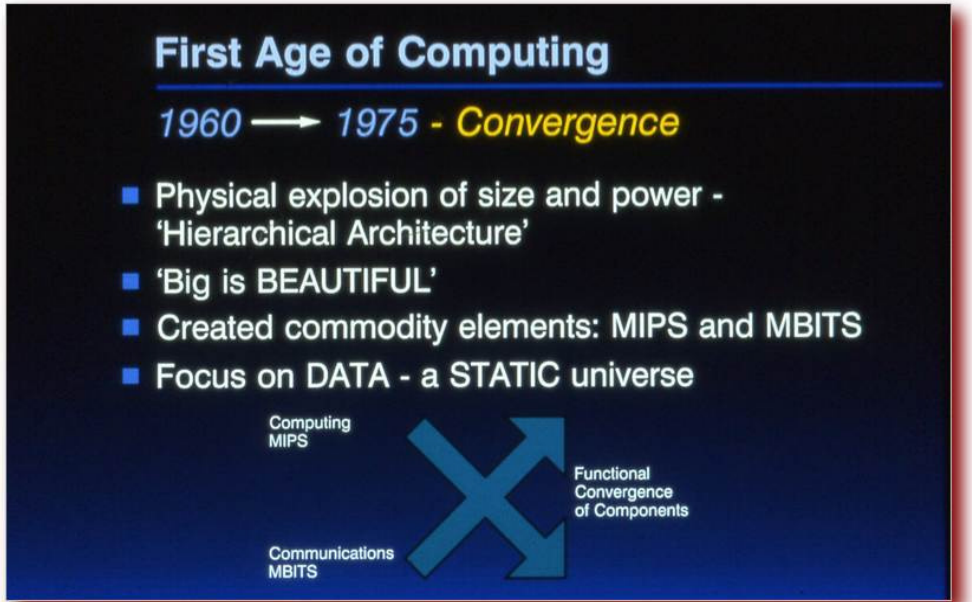
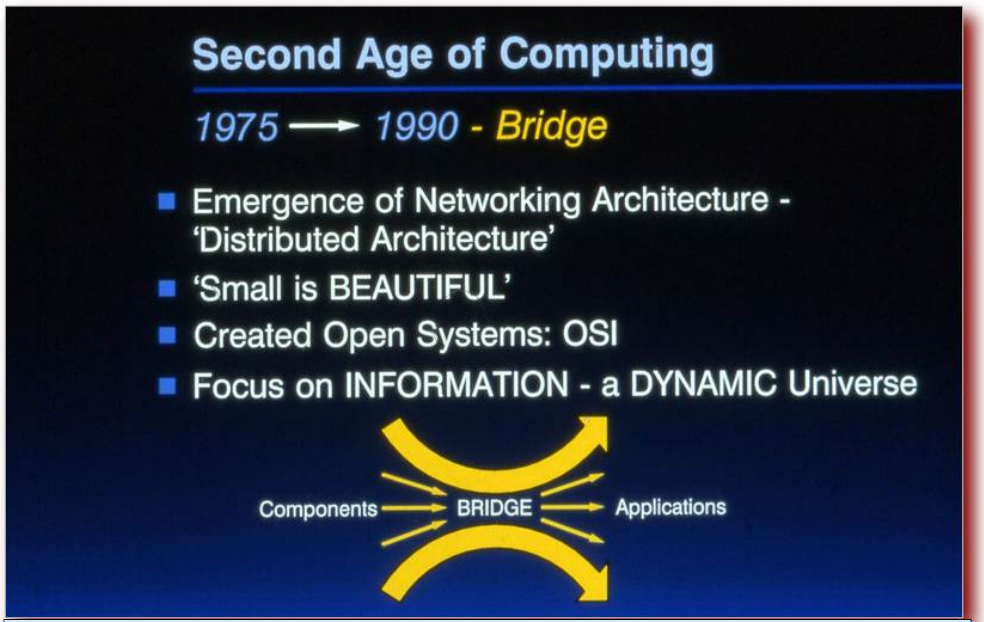
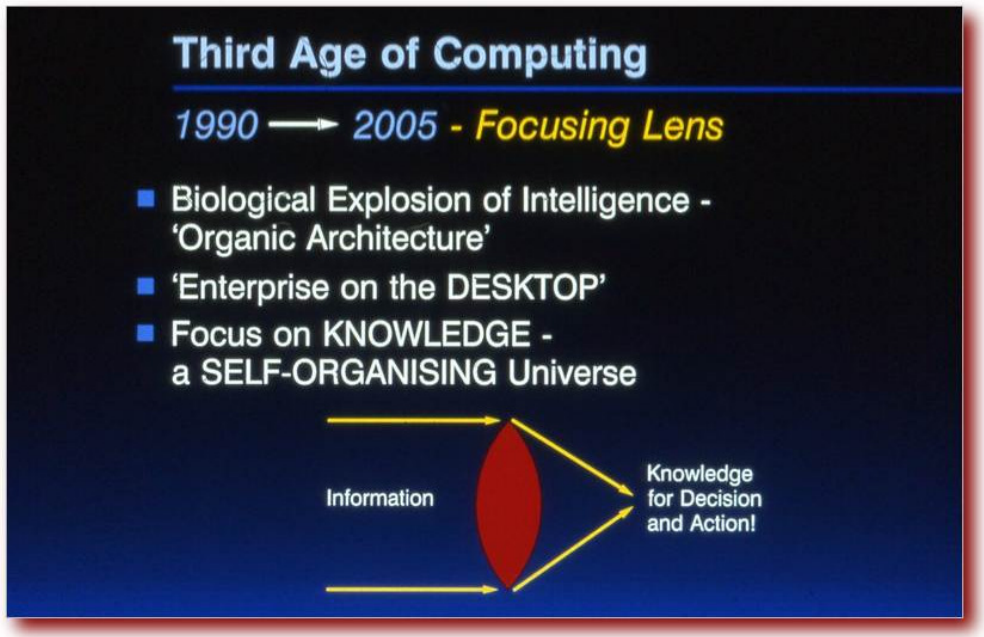
Ages of Computing, Networking & Intelligence: *1960 - 21stC*









From: "Business Blueprint": Probert – July 1989

25th Anniversary: "KolaNet" - *Nuclear Security*

KolaNet Project: 1992 to 1997 – *Kola Peninsula – Russian Arctic*

Control Room - *Kola Nuclear Power Station* - Russia

KolaNet Project for *Nuclear Security* :1992-1997

"Human Adaptation in the Arctic"

* Kola Science Centre : Apatity, Russia *

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Protecting Ukraine & Georgian Parliaments

- Integrated Cyber and Physical Security -

Ukraine Parliament *: Kyiv*

Georgian Parliament: *Tbilisi*

Internet, Web Sites, & IT Security Programmes initiated 1994

Project Team: *Almaty, Kazakhstan* - 1995

Cybersecurity for Georgian Parliament: *2007 - 2010*

...Critical Infrastructure Review & RoadMap: UN/ITU Cybersecurity – Georgian Government

Cybersecurity for Armenia and Georgia

*** "Proposals for e-Government, e-Commerce and e-Security Development in Armenia ***

"Roadmap for Real-Time Armenia"

**E-Government, E-Commerce and E-Security **

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"Increasing Business Opportunities for the Armenian ICT Cluster through the development of E-Government, E-Commerce and E-Security"

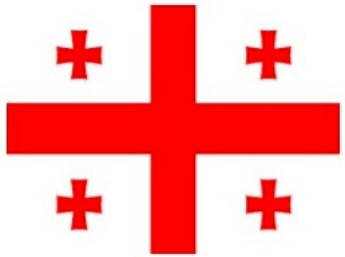
**** Report Prepared by: Dr David E Probert – VAZA International ****

Author: Dr David E Probert : Final Report to USAID/CAPS : June 2009 : Page 1

*** "Real-Time" Georgia : Securing Government & Enterprise Operations ***

"Real-Time Georgia"

Securing Government & Enterprise Operations



Dr David E Probert

VAZA International

1st Georgian IT Innovation Conference

Tbilisi : 29th & 30th October 2008

1 Author : Dr David E Probert Copyright : www.vaza.com – Oct 2008

Link: www.valentina.net/vaza/CyberDocs/

Cybersecurity & eGov Missions: 2009-2012

*Mt Aragats – South Summit(3879m): **Armenia***