Cyber Security Landscape: An Academic Perspective

APNIC 46 – New Caledonia

10/09/2018

Outline

- □ WHO AM I?
- □ THREAT LANDSCAPE:
    - □ GLOBAL
- □ CYBER SECURITY – BACKGROUND
- □ TRENDS – WHAT IS OUT THERE:
    - □ ACADEMIC – WAIKATO UNIVERSITY
    - □ SECURITY VISUALIZATION USE-CASE
    - □ LAW ENFORCEMENT USE-CASE
- □ WHAT VANUATU IS DOING
    - □ NATIONAL SECURITY FRAMEWORK
    - □ CERT VANUATU
    - □ CYBER LEGISLATION, REGULATIONS AND POLICIES
- □ SUMMARY

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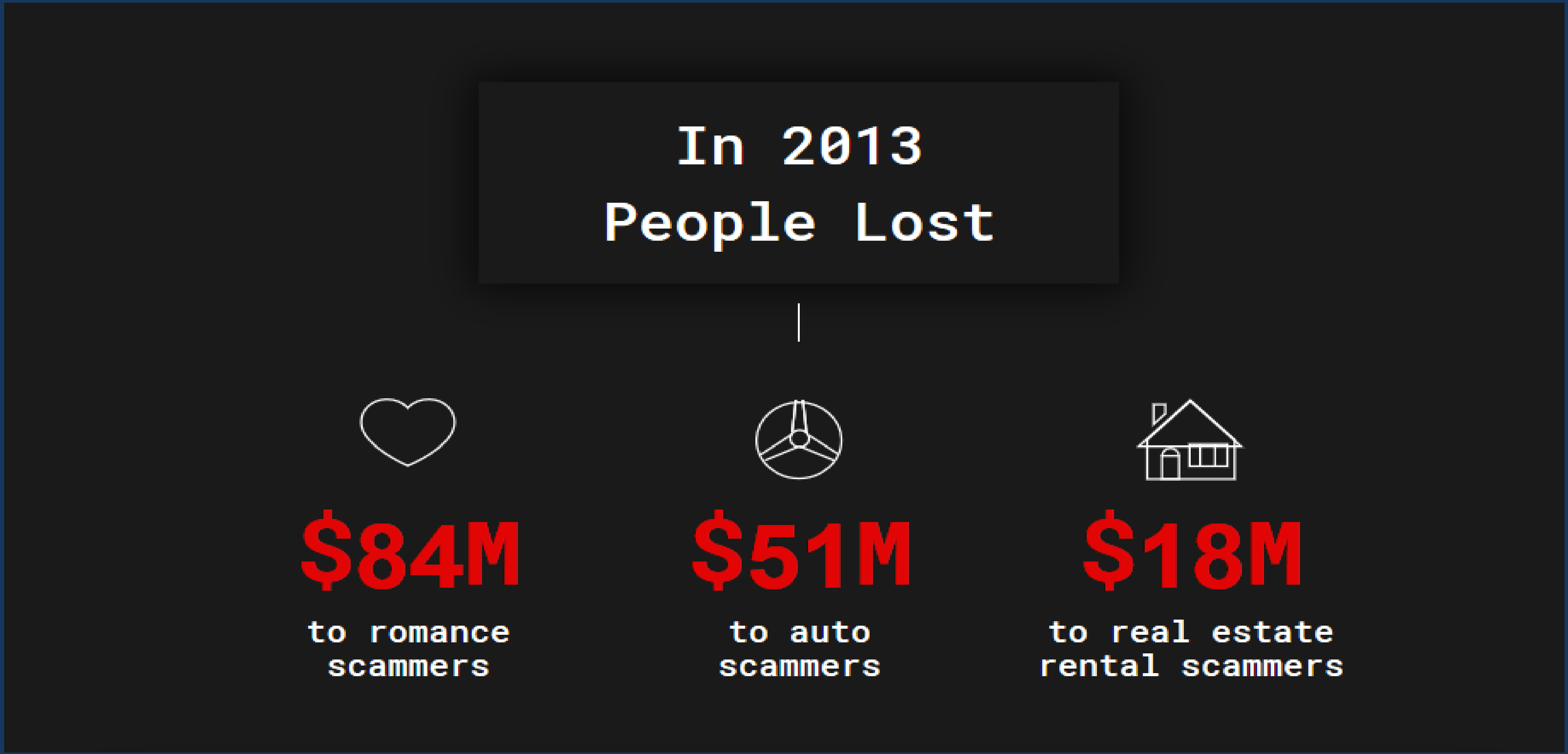
Cyber-threats Landscape

$6 TRILLION

will be spent on cybercrime every year through 2021, according to Cybersecurity Ventures

Src: https://infographicjournal.com/the-trillion-dollar-industry-of-cyber-attacks/

Cyber-threats Landscape



In 2013
People Lost

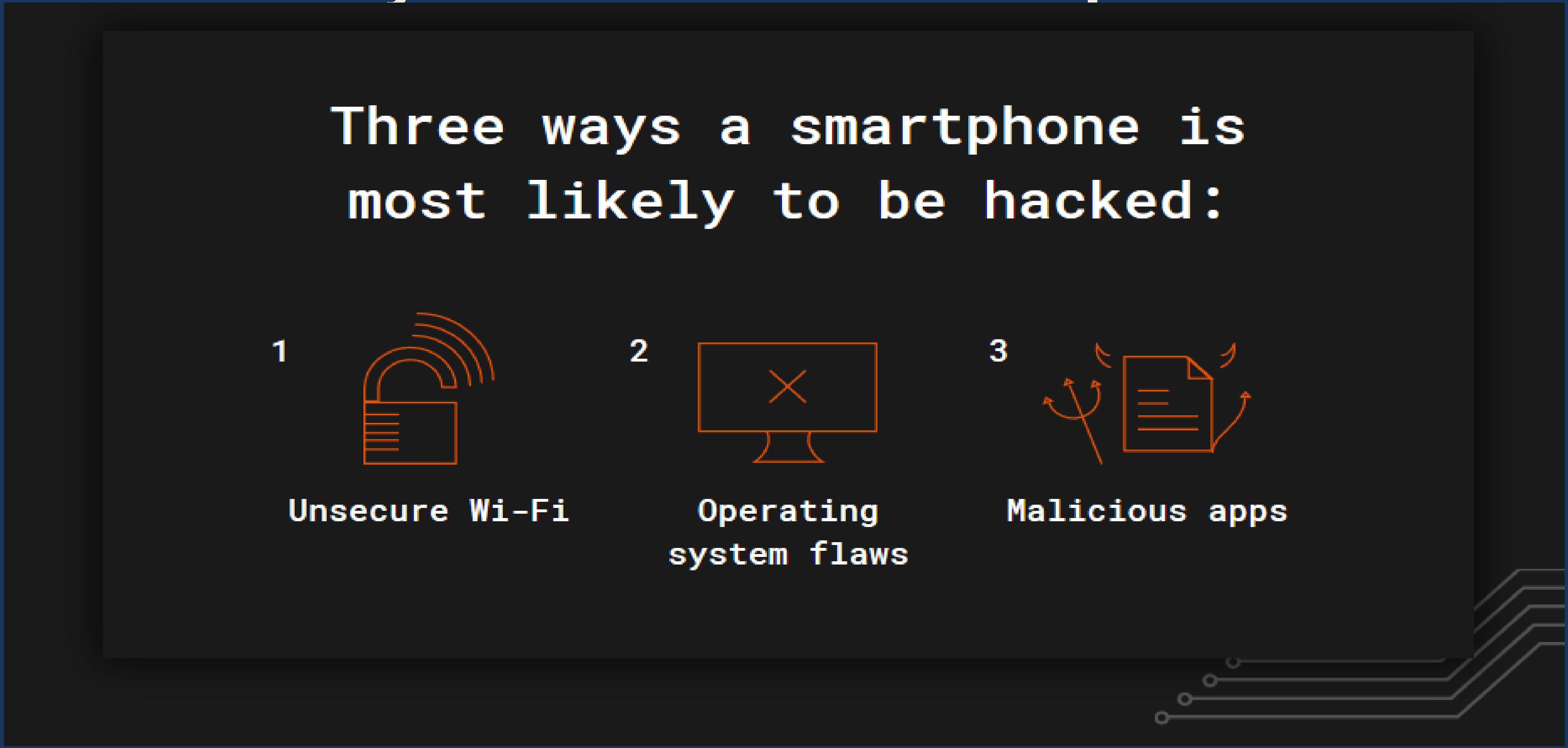
$84M
to romance scammers

$51M
to auto scammers

$18M
to real estate rental scammers

Src: https://infographicjournal.com/the-trillion-dollar-industry-of-cyber-attacks/

Cyber-threats Landscape



Three ways a smartphone is most likely to be hacked:

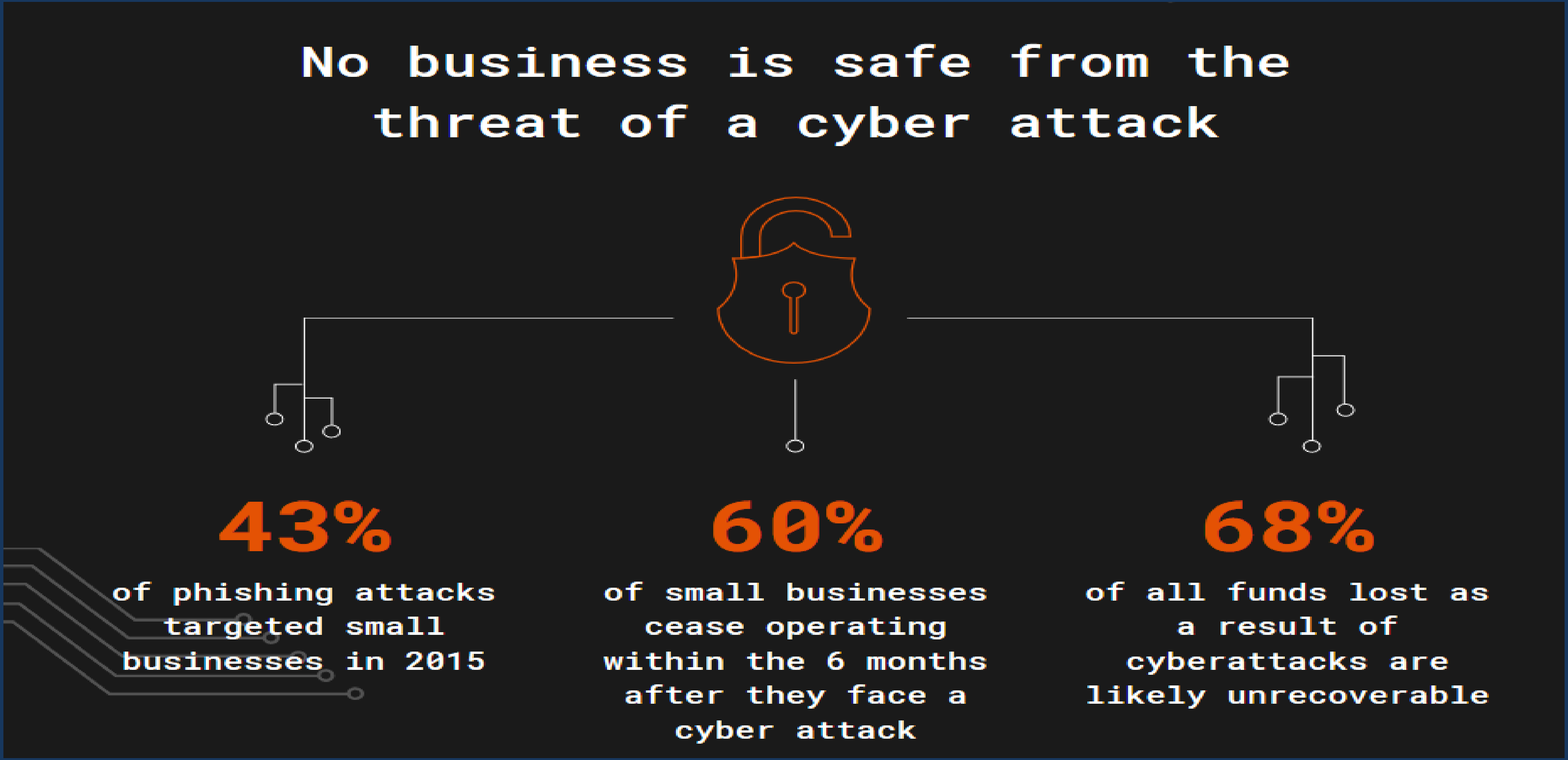
1 Unsecure Wi-Fi

2 Operating system flaws

3 Malicious apps

Src: https://infographicjournal.com/the-trillion-dollar-industry-of-cyber-attacks/

Cyber-threats Landscape



No business is safe from the threat of a cyber attack

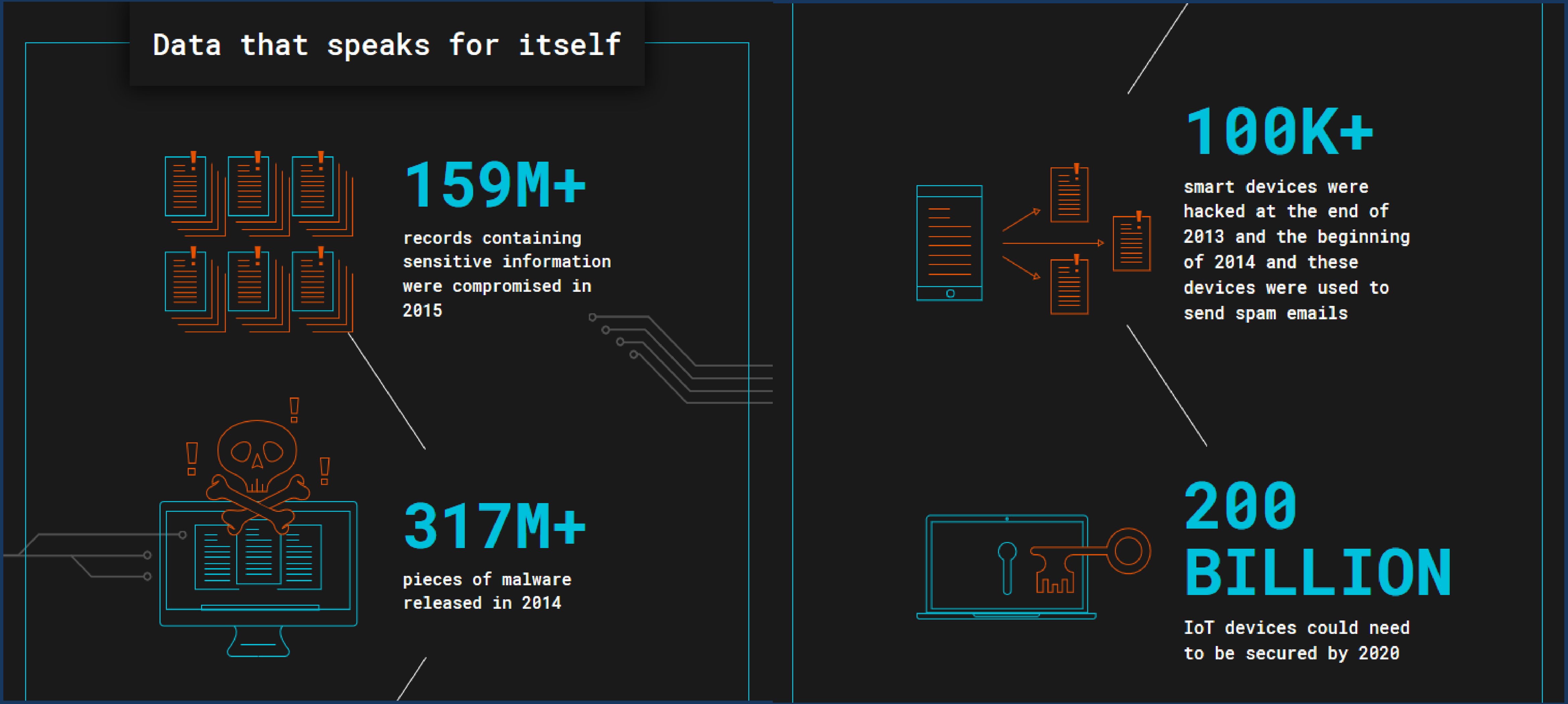
43% of phishing attacks targeted small businesses in 2015

60% of small businesses cease operating within the 6 months after they face a cyber attack

68% of all funds lost as a result of cyberattacks are likely unrecoverable

Src: https://infographicjournal.com/the-trillion-dollar-industry-of-cyber-attacks/

Cyber-threats Landscape



Data that speaks for itself

159M+

records containing sensitive information were compromised in 2015

317M+

pieces of malware released in 2014

100K+

smart devices were hacked at the end of 2013 and the beginning of 2014 and these devices were used to send spam emails

200 BILLION

IoT devices could need to be secured by 2020

Src: https://infographicjournal.com/the-trillion-dollar-industry-of-cyber-attacks/

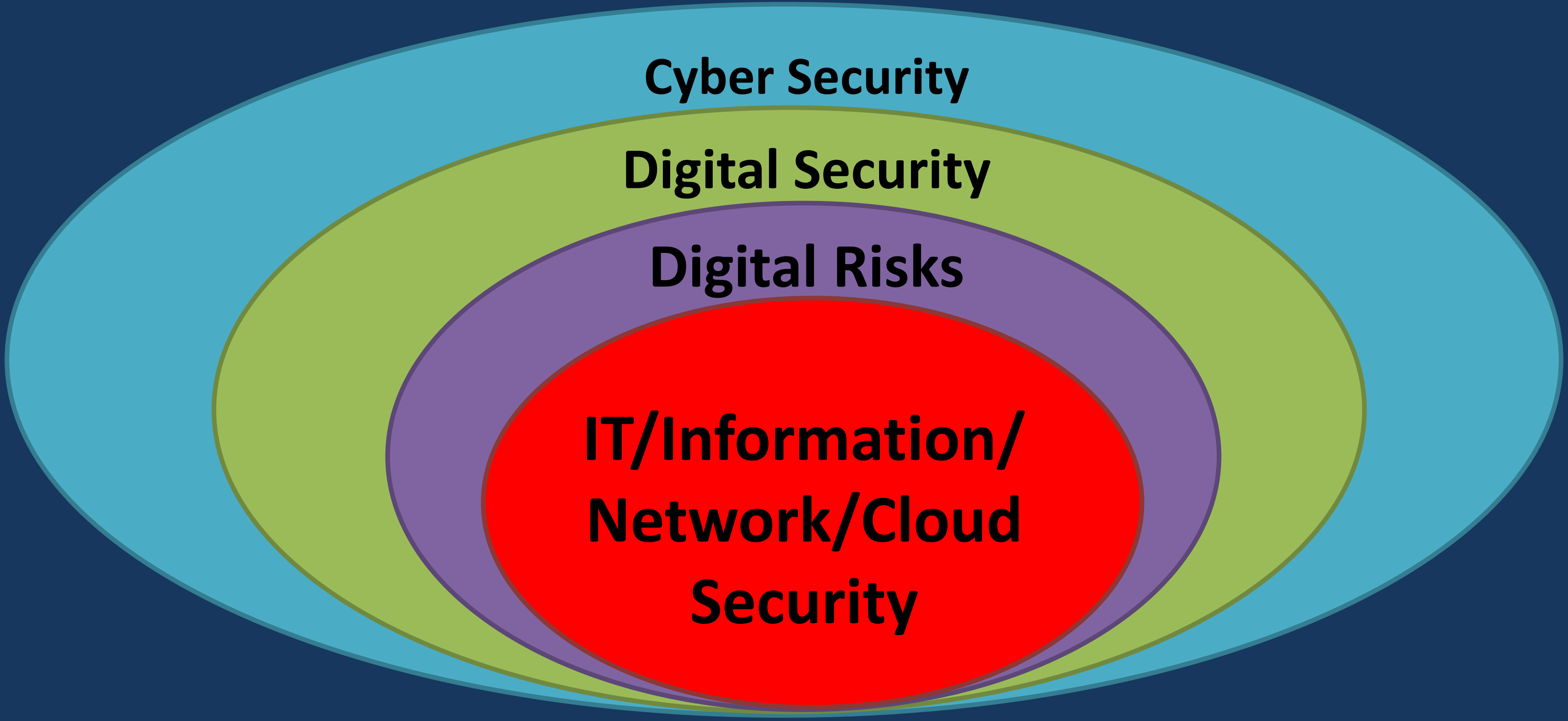
What do We Know?

- ❑ **CYBER SECURITY – BACKGROUND:**
    - ❑ **Cyber Security:**
        - ❑ **Everyone’s Problem across society**
        - ❑ **Everyone’s Obligation & Responsibility,**
        - ❑ **Every Country Governments, organizations are talking Security.**
- ❑ **Cyber Security should be the core of every digital infrastructure, systems and IP communications network.**

But …

What is Cyber Security?

The Buzz Word:



Cyber Security

Digital Security

Digital Risks

IT/Information/ Network/Cloud Security

While various domains define Cyber Security according to their perspective, …

What is common among all?

Data - ***Data is the new Gold***

Threats & Risks - **around every infrastructure, business models, frameworks, domains, nation, and globally**

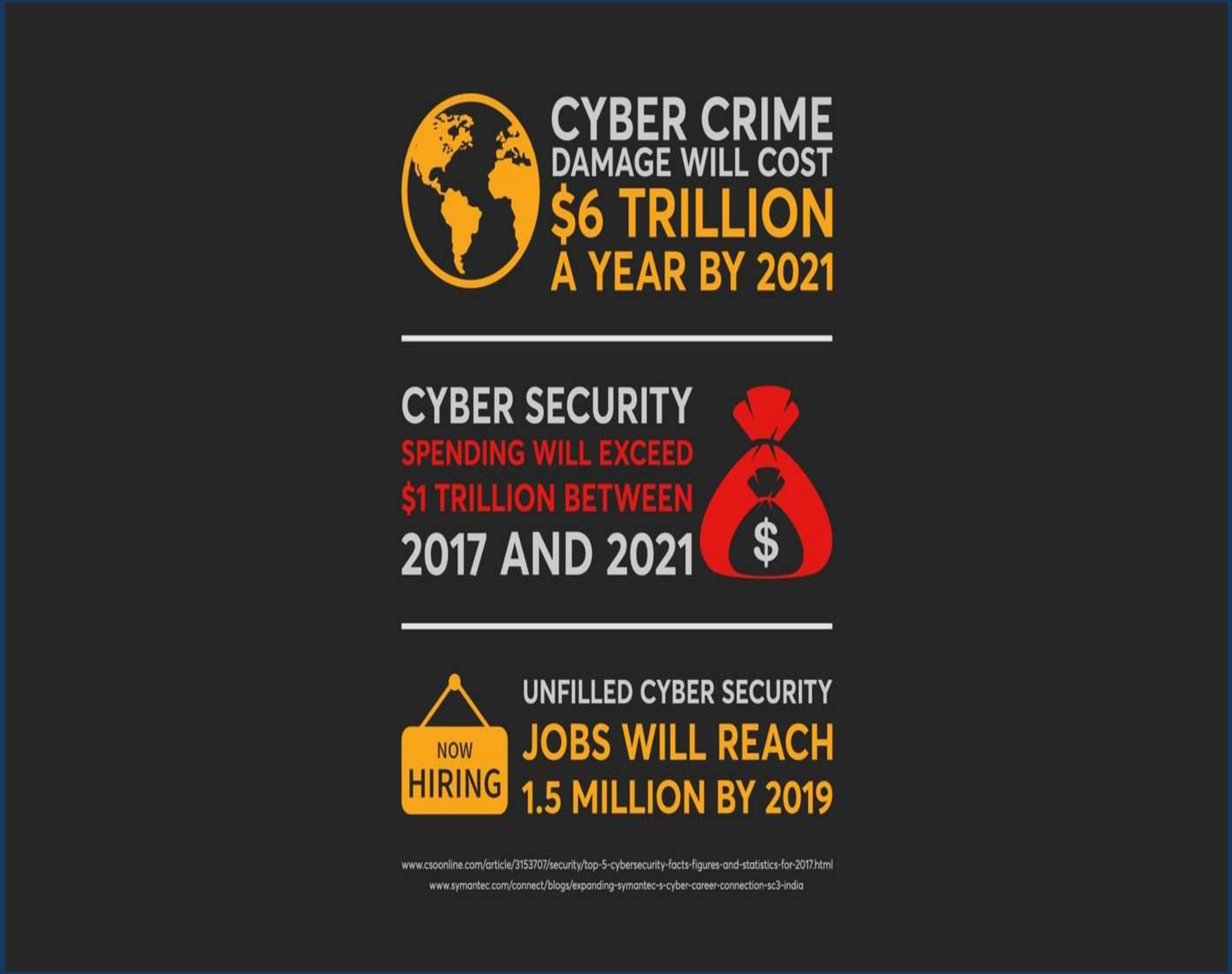
Cyber Security & Government

WE USUALLY THINK THE GOVERNMENT CAN HELP PROTECT US AND KEEP US SAFE FROM CRIMINALS BUT THERE ARE SOME CHALLENGES:

1. **THE GLOBAL REACH OF CYBERCRIMINALS**
2. **THE SPEED AT WHICH THE CRIME CAN BE COMMITTED**
3. **THE TREMENDOUS SCOPE OF CYBERCRIME IN A VERY SHORT PERIOD OF TIME.**

Trends – What is Out There:

Trend & Prediction



CYBER CRIME DAMAGE WILL COST $6 TRILLION A YEAR BY 2021

CYBER SECURITY SPENDING WILL EXCEED $1 TRILLION BETWEEN 2017 AND 2021

UNFILLED CYBER SECURITY JOBS WILL REACH 1.5 MILLION BY 2019

www.csoonline.com/article/3153707/security/top-5-cybersecurity-facts-figures-and-statistics-for-2017.html
www.symantec.com/connect/blogs/expanding-symantec-s-cyber-career-connection-sc3-india

Src: https://infographicjournal.com/the-trillion-dollar-industry-of-cyber-attacks/

Academics – University of Waikato:

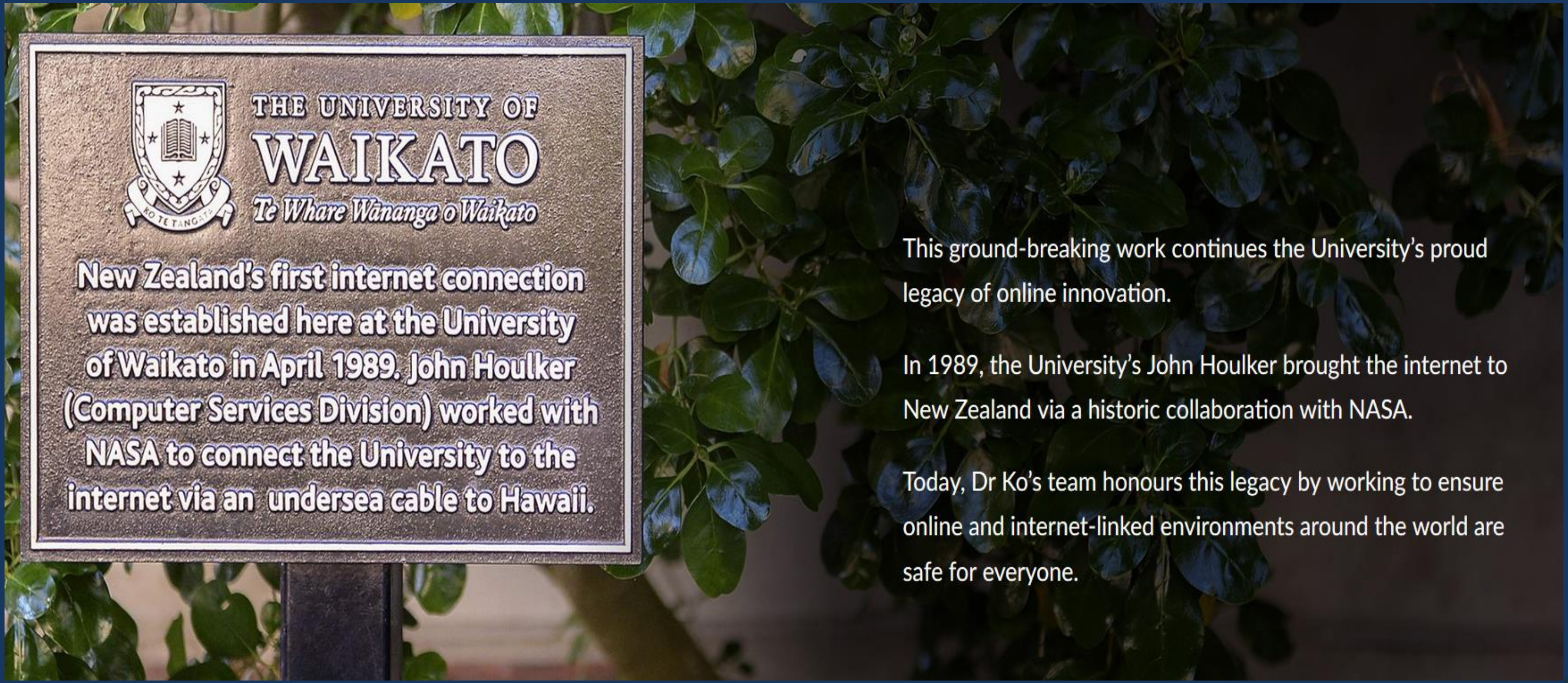
❑Cyber Security Researchers of Waikato (CROW Lab) (2013) https://crow.org.nz/

❑Institute of Security & Crime Science (2017) https://www.waikato.ac.nz/study/qualifications/master-of-security-and-crime-science

https://www.waikato.ac.nz/security-crime-science/

Academics – University of Waikato:

❑New Zealand’s 1st Internet Connection (1989)



THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

New Zealand's first internet connection was established here at the University of Waikato in April 1989. John Houlker (Computer Services Division) worked with NASA to connect the University to the internet via an undersea cable to Hawaii.

This ground-breaking work continues the University’s proud legacy of online innovation.

In 1989, the University’s John Houlker brought the internet to New Zealand via a historic collaboration with NASA.

Today, Dr Ko’s team honours this legacy by working to ensure online and internet-linked environments around the world are safe for everyone.

Academics – CROW Lab:

- **Home of:**
    - **Master of Cyber Security (MCS)**
        - **The MCS Program has both theoretical and Industry aspects.**
        - **It also includes a Law paper – “Legal Aspects of Cyber Security”**

Carriers:

- CHIEF INFORMATION SECURITY OFFICER
- ENTREPRENEURS OF NEW SECURITY
- PRODUCTS AND SERVICE
- PENETRATION TESTERS/ SECURITY
- ASSESSMENT CONSULTANTS
- IT SECURITY CONSULTANT

Academics – CROW Lab:

- ❑ Home of:
  - ❑ New Zealand Cyber Security Challenge (NZCSC)

CROW
Cybersecurity Researchers of Waikato
To return control of data to users
NICT
NIRVANA 改

Academics – CROW Lab:

- ❑ Home of:
  - ❑ Hosted High Research Visitations from famous people, institutions, agencies, etc.
  - ❑ Hosted the ISO/IEC JTC 1/SC 27 Plenary and Working Group Meetings

OBJECTIVE:

“To Return Control to Users”

CertVu

Academics – CROW Lab:

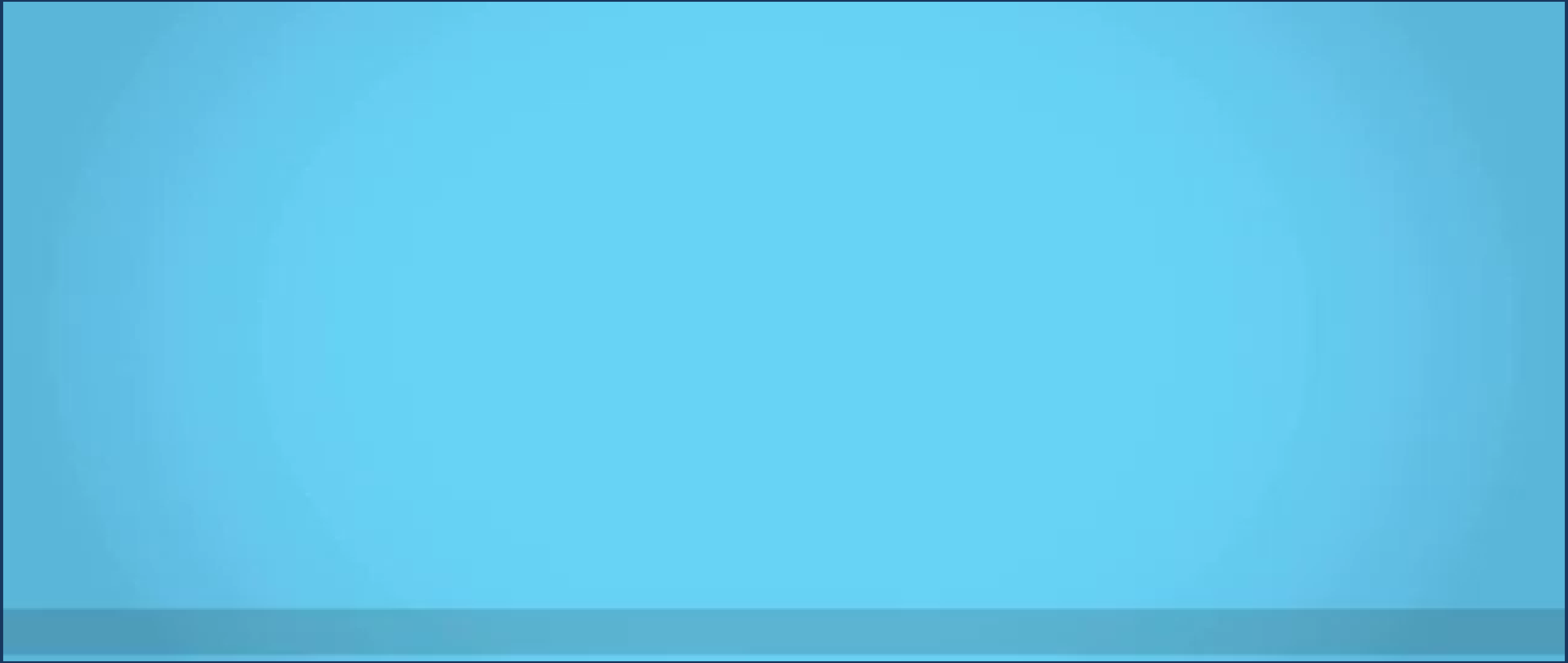
- ❑ **Home of:**
  - ❑ **NZD 12.2m MBIE Cyber Security Project Fund: STRATUS (***Security Technologies Returning Accountability, Trust and User-centric Services in the Cloud*)
    - ❑ **https://stratus.org.nz/**
    - ❑ **https://www.youtube.com/watch?time_continue=123&v=c6fWeHVSPlw**

STRATUS

Returning Data Control to Users

Academics – CROW Lab:

□ **STRATUS:**



Src: https://stratus.org.nz/

Academics – CROW Lab:

- ❑ Home of:
  - ❑ Data Privacy Foundation (DPF)
    - ❑ A Rosetta Stone for Data Privacy Laws
    - ❑ https://dataprivacyfoundation.org/
    - ❑ Data Privacy Matrix:
      - ❑ https://dataprivacyfoundation.org/comparison-tool/
    - ❑ https://dataprivacyfoundation.org/time-series-viz/ (Visualization Map

Academics – Institute of Security & Crime Science:

- ❑ Home of:
  - ❑ Master of Security & Crime Science (MSCS)
  - ❑ The Institute is the primary research partner for the New Zealand Police, and a partner at the Evidence Based Policing Centre in Wellington.
  - ❑ research topics will be delivered by world-leading researchers in psychology, statistics, artificial intelligence including machine learning, cyber security, political science, economics, management, law, education, Māori and indigenous development, and demographic research.
  - ❑ https://www.waikato.ac.nz/security-crime-science/

CROW – Research Directions & Scope:

- ❑ Provenance
- ❑ Hardware Security
- ❑ User-centricity
- ❑ Security Visualization
- ❑ Security Economics
- ❑ Tools & Datasets

Specific Research Approach:

- ❑ **Thesis:**
  - ❑ **“Cyber Security Visualization Effectiveness Measurement”**

Definition

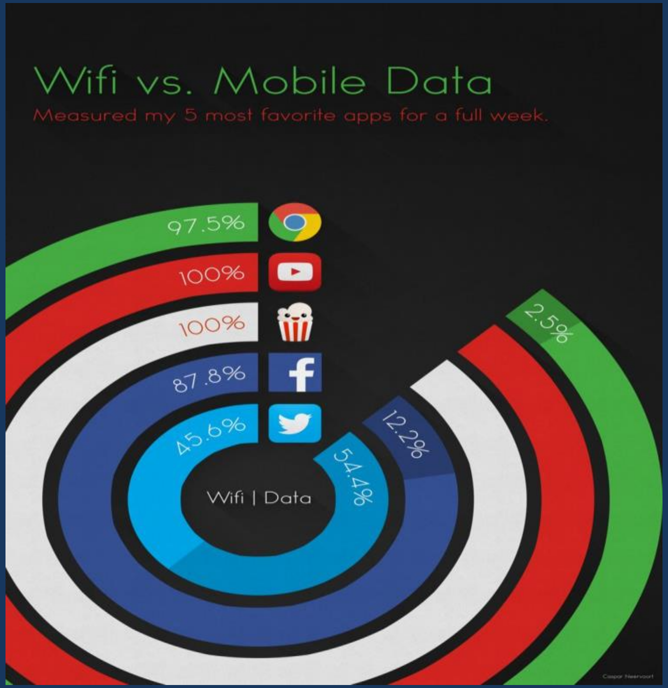
- What is effectiveness?
  - This means executing a process in a faster or efficient way compared to its usual or current way. Improvement has been done to obtain better results.

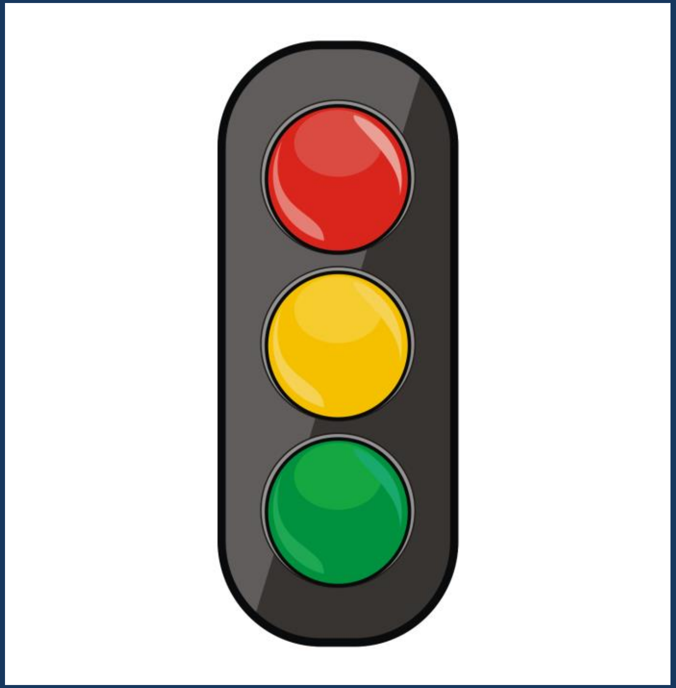
- What is Security Visualization effectiveness?
  - In Security Visualization, Effectiveness is defined as improving visual clarity, rendering and visual processing within the minimal time required to gain insights.

Why Security Visualization?

Motivation

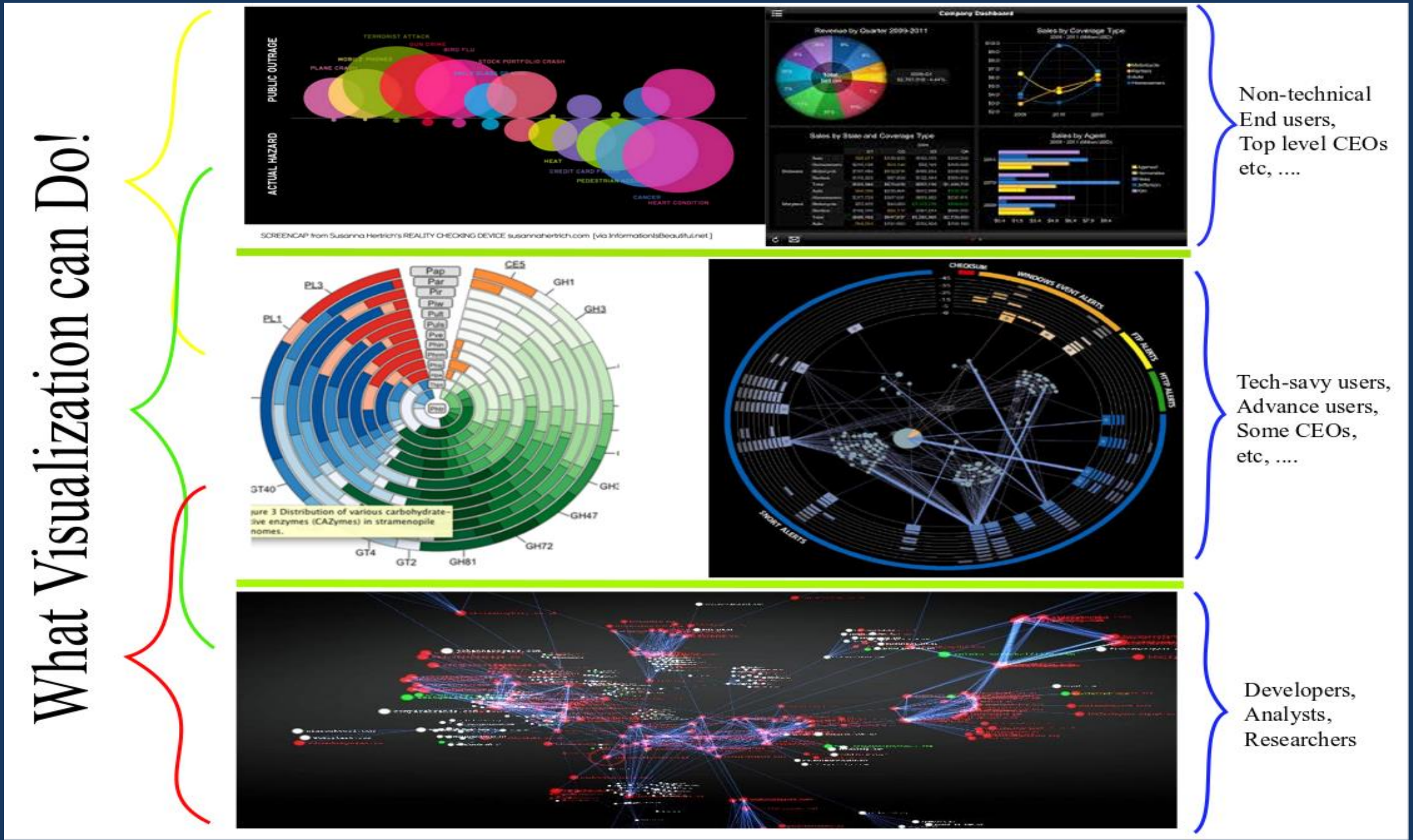
- Research:
  - Security Visualization for Mobile Platforms
  - Effectiveness Measurement in Security Visualization for Mobile Platform





How Users See Visualization

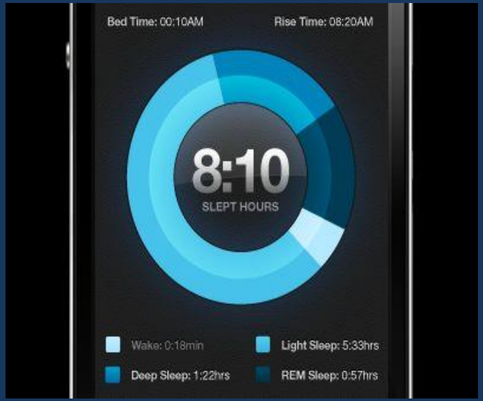
- It is becoming a common medium for reporting findings across academics and industries



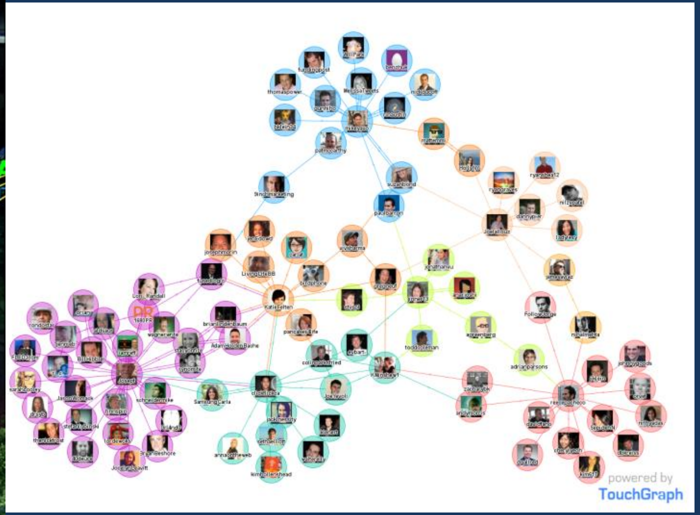
Motivation

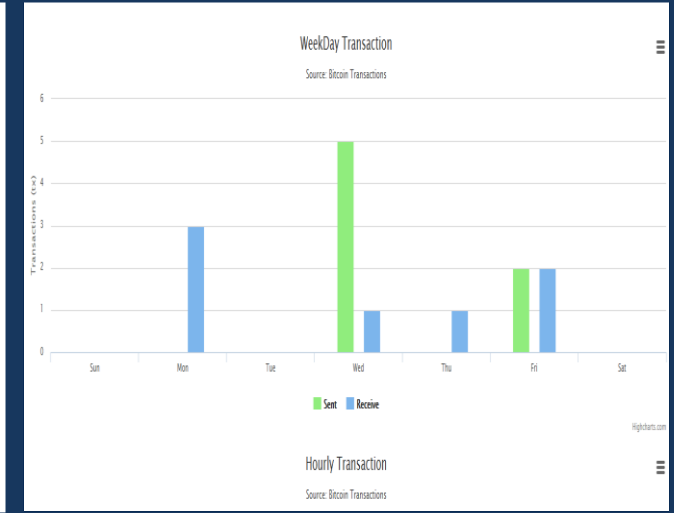
- Why Visualization or Security Visualization?
  - Users say its simple compared to reading reports and logs
  - Interactive
  - Pretty, captures the eye
  - Most importantly, for ***EXPLORING***, ***DISCOVERING***, and ***REPORTING***
  - And more, ….

Types of Visualization

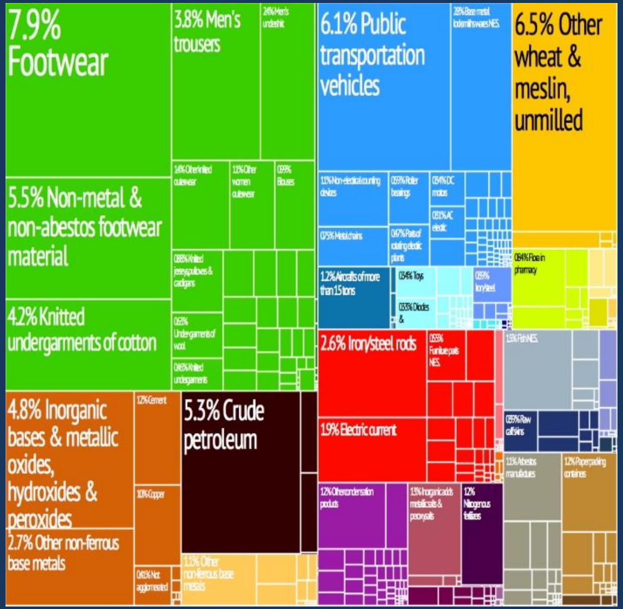


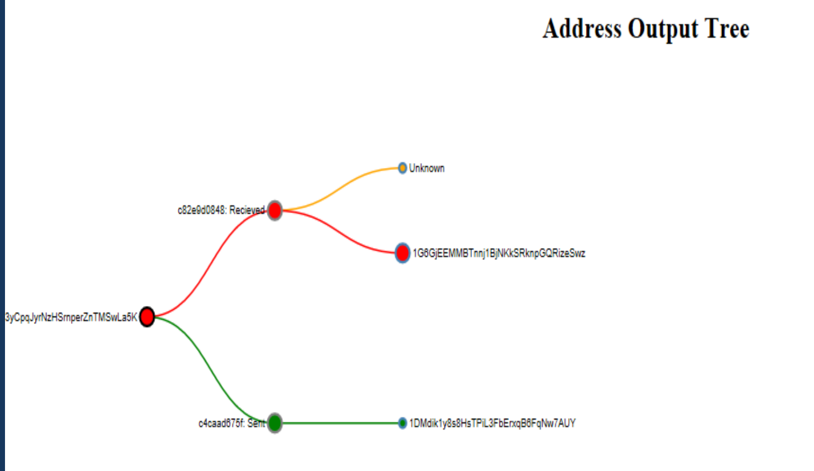
- Common Classification of Security Visualization
  - Graph base visualization: dashboards, charts, line graphs, etc.
  - Many eyes type: bubble Vis, Treemaps, etc.
  - Multivariate, multidimensional Visualization: Parallel coordinates, etc.
  - 3D, Virtual Reality, Augmented Reality Visualization



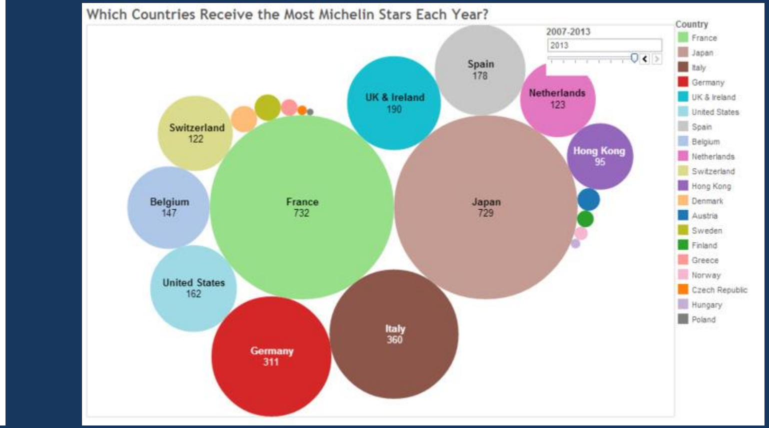


- Others may Classify Security Visualization as/in:
  - Qualitative and Quantitative
  - Distribution
  - Composition
  - Comparison
  - Relationships




Address Output Tree

Unknown
c82e9d0848: Recieved
1G6GjEEMMBTnnj1BjNKkSRknpGQRizeSwz
3yCpqJyrNzHSrnperZnTMSwLa5K
c4caad675f: Sent
1DMdik1y8s8HsTPiL3FbErxqB6FqNw7AUY


Which Countries Receive the Most Michelin Stars Each Year?

Industry Trends with Visualization

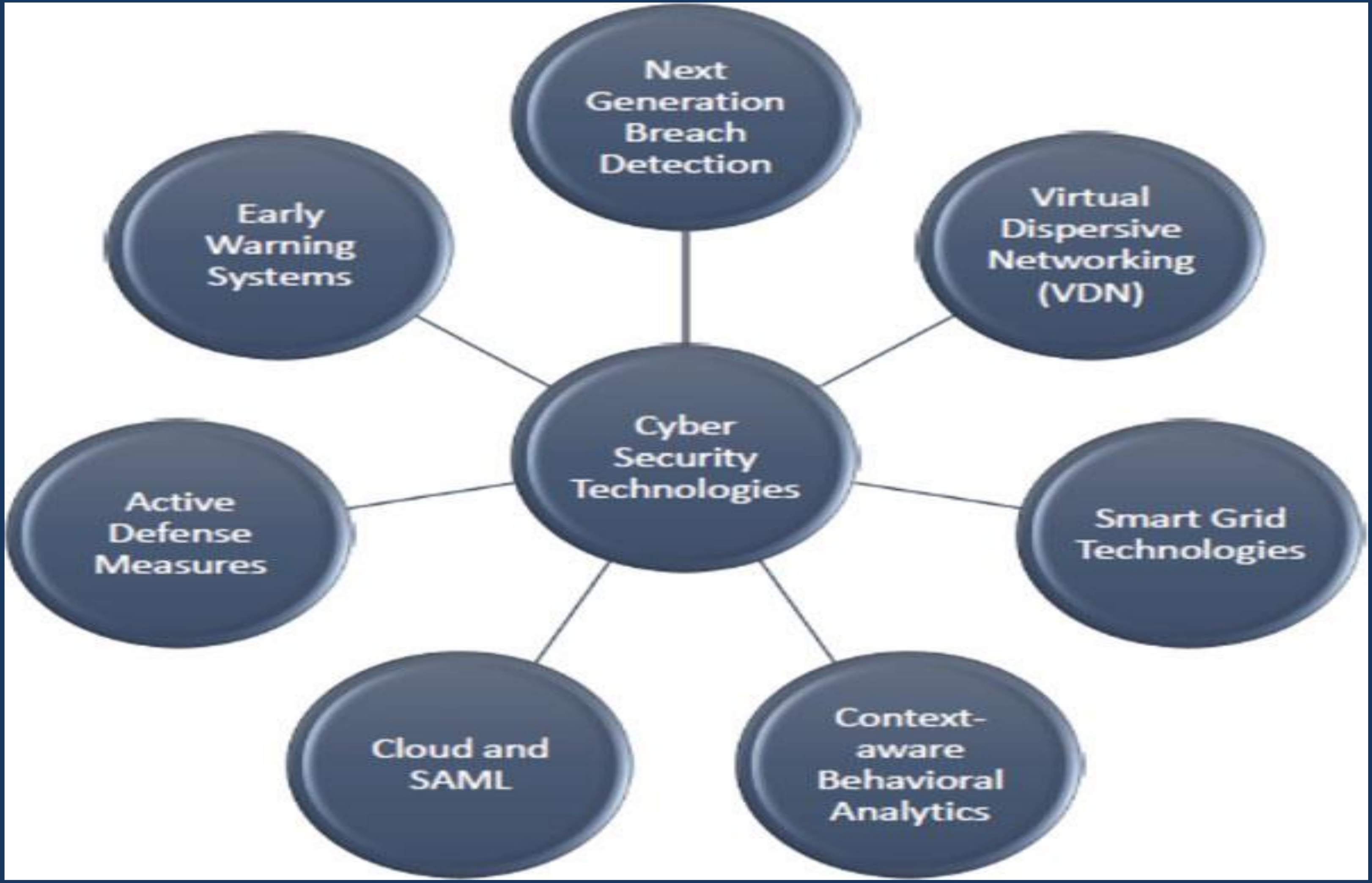
- Security Visualization Trends for Decision making
  - Presentation reasons – bar charts, line graphs, etc.
  - Many eyes visualization – with Dashboards
  - Data Analytics – with Dashboards
  - Tracking and Monitoring Visualization
  - Real-time Visualization

- Security Visualization Trends for Decision making:
  - The use of many eyes type visualization
  - The use of Dashboards (Interactive)
  - The use of Virtual Reality and Augmented Reality
  - Tracking and Monitoring Visualization

Cyber Security Technologies Trends:

- More into security context:

Cyber security technologies trend overview in 2016


Next Generation Breach Detection
Early Warning Systems
Virtual Dispersive Networking (VDN)
Cyber Security Technologies
Active Defense Measures
Smart Grid Technologies
Cloud and SAML
Context-aware Behavioral Analytics

- # Security Visualization Trends for Decision making

However, we start to see a shift!

- – Data Analytics still remains the key for visualization
- – Visualization for Intelligence, tracking and monitoring
- – VR and AR are also coming in strong again
- – Machine Learning & Deep Learning are becoming the join force for improving Visualization

• Security Visualization Trends for Decision making:

The Demand: Effective security visualization approach depends on the following:

1. Who are the users?
2. What do the users want to see?
3. What security tasks can be performed using these visualizations?
4. When would these security visualization be used?

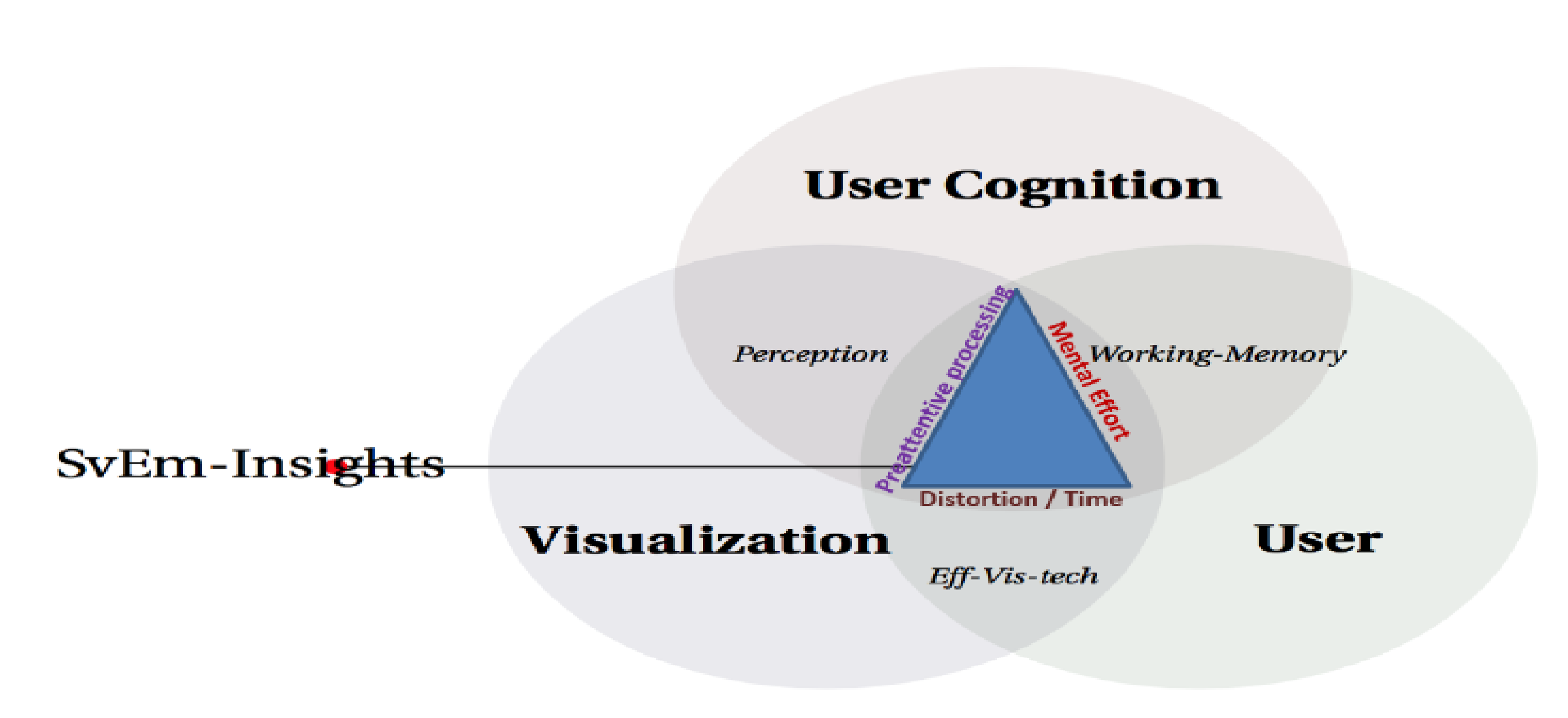
- ## Security Visualization Trends for Decision making

The Attack Landscape: **Effective security visualization approach depends on the following,**

1. **What type of attack is visualized?**
2. **When did the attack take place?**
3. **What is the origin (source) and destination of the attack being visualized?**
4. **What is the reason of visualizing this attack?**

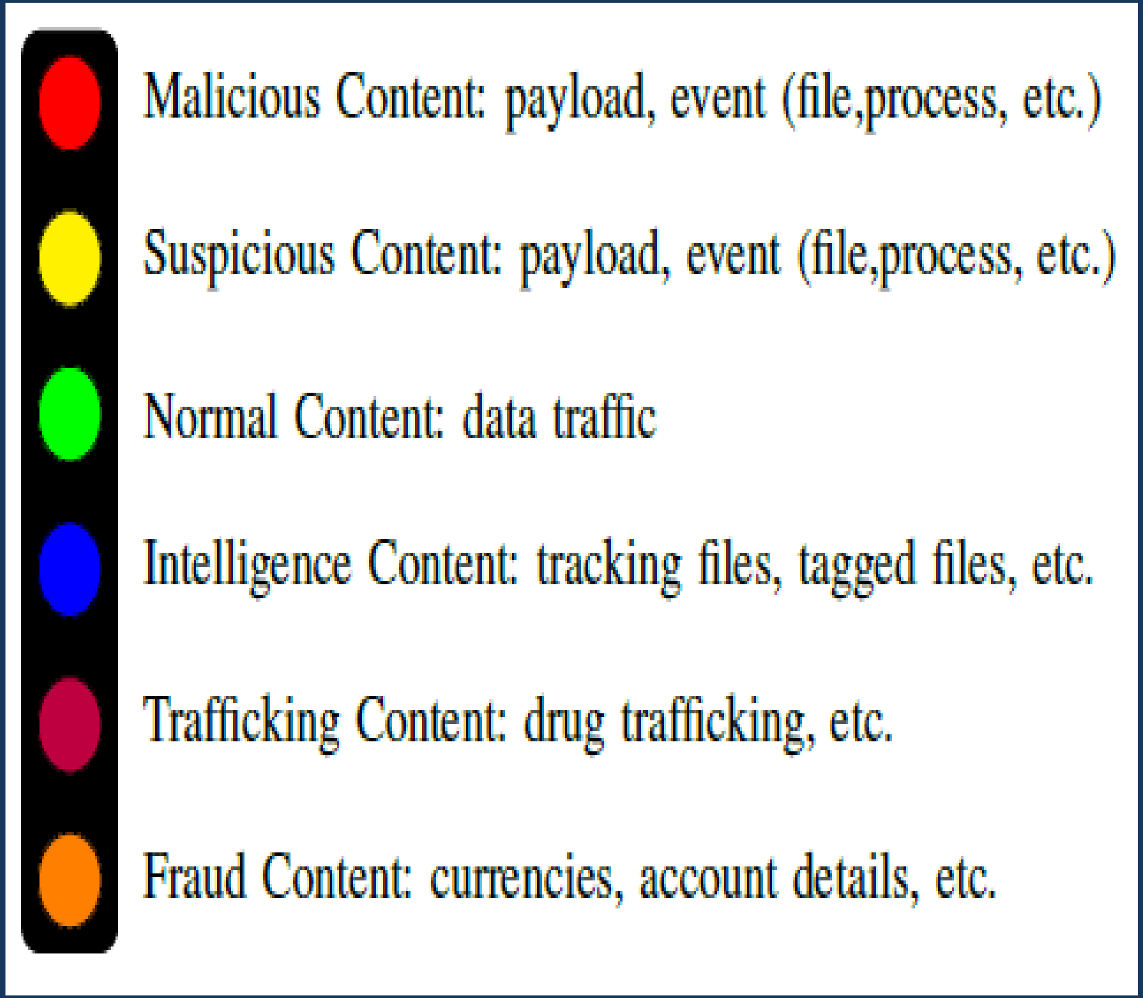
The Full-Scale EM Model

- User → Framework (tool) → Visualization
  - Aim is to address performance & time spent to gain insights (patterns, behaviours, statistics, trends, etc.)



Framework Features

- User Cognitive Activators:
  - Security Visualization Colour Standard



🔴 Malicious Content: payload, event (file,process, etc.)

🟡 Suspicious Content: payload, event (file,process, etc.)

🟢 Normal Content: data traffic

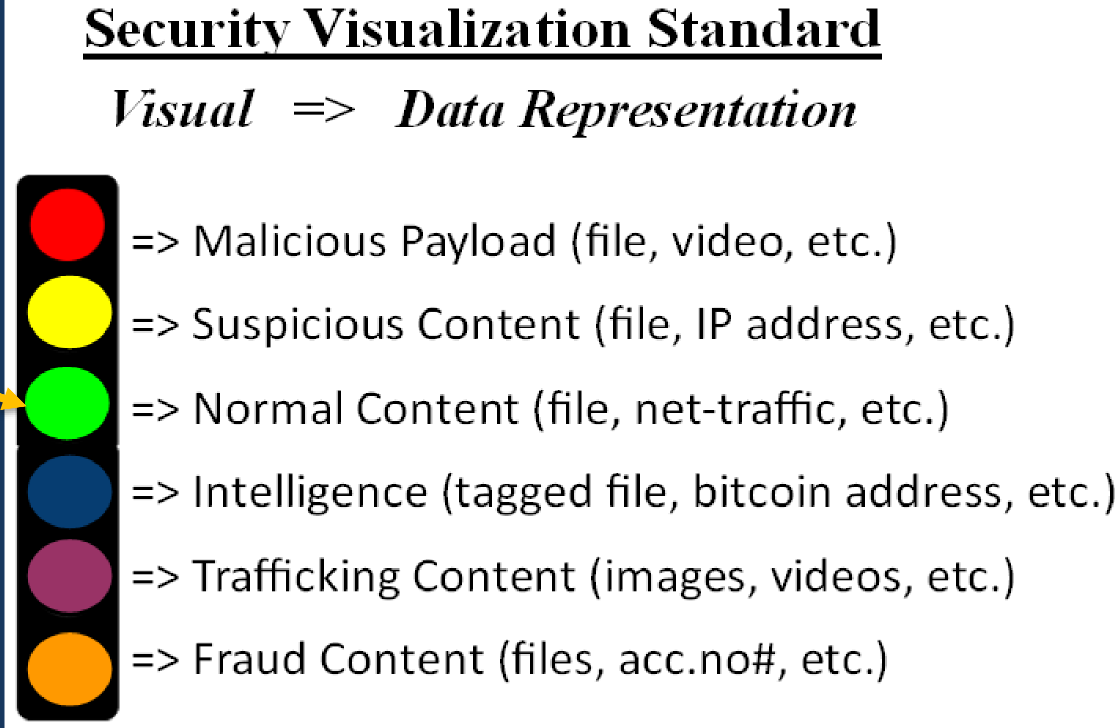
🔵 Intelligence Content: tracking files, tagged files, etc.

● Trafficking Content: drug trafficking, etc.

🟠 Fraud Content: currencies, account details, etc.

Security visualization Colour Standard

- How can we achieve our Security Visualization framework
- Goal:
  - Create a “Set of Markers – flash screen”
  - Markers => Cognition activator
  - Security Visual Markers



Security Visualization Standard

Visual => Data Representation

- 🔴 => Malicious Payload (file, video, etc.)
- 🟡 => Suspicious Content (file, IP address, etc.)
- 🟢 => Normal Content (file, net-traffic, etc.)
- 🔵 => Intelligence (tagged file, bitcoin address, etc.)
- 🟣 => Trafficking Content (images, videos, etc.)
- 🟠 => Fraud Content (files, acc.no#, etc.)

Security Visualization Colour Standard

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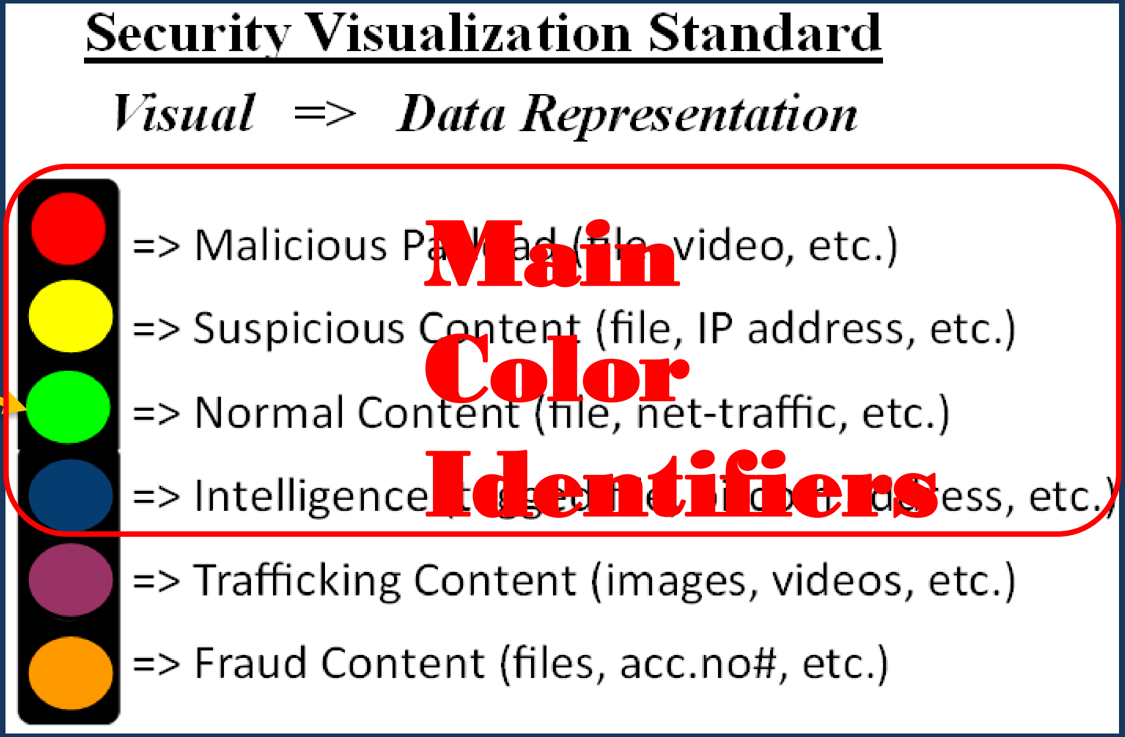

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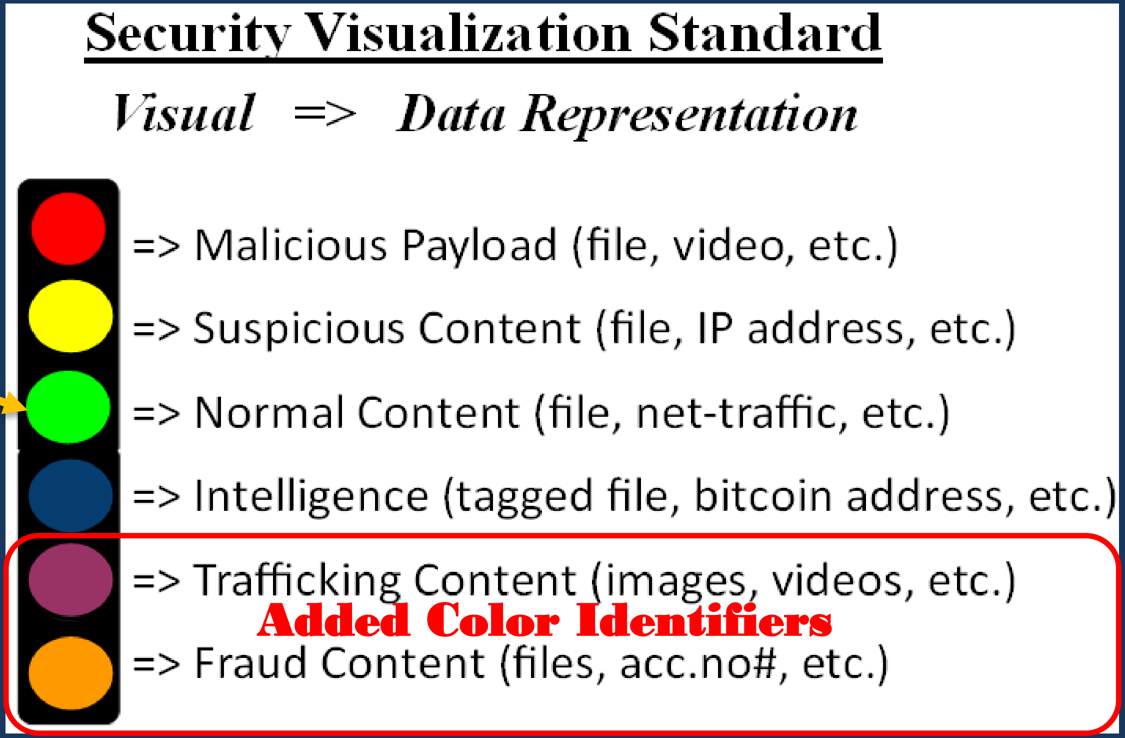

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=> Intelligence (tagged file, bitcoin address, etc.)

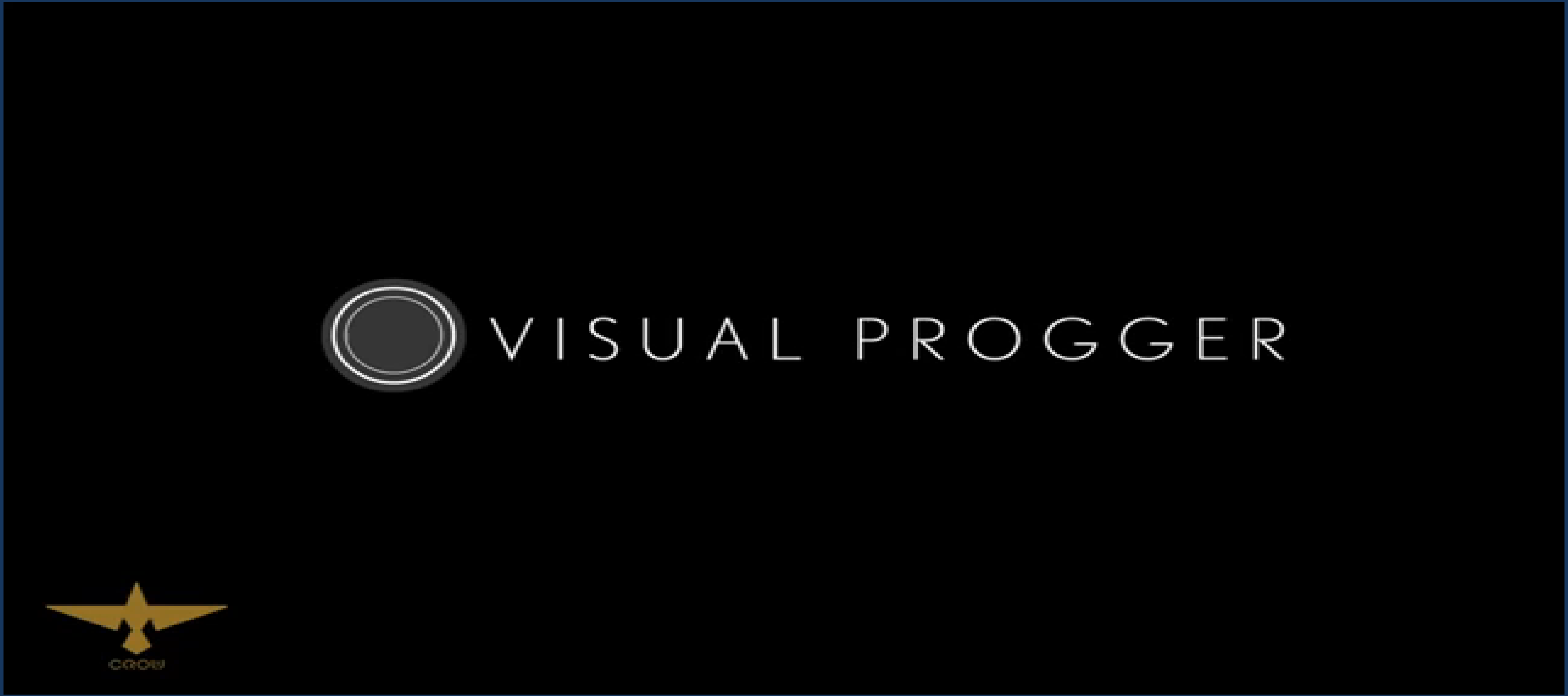
=> Trafficking Content (images, videos, etc.)

Added Color Identifiers

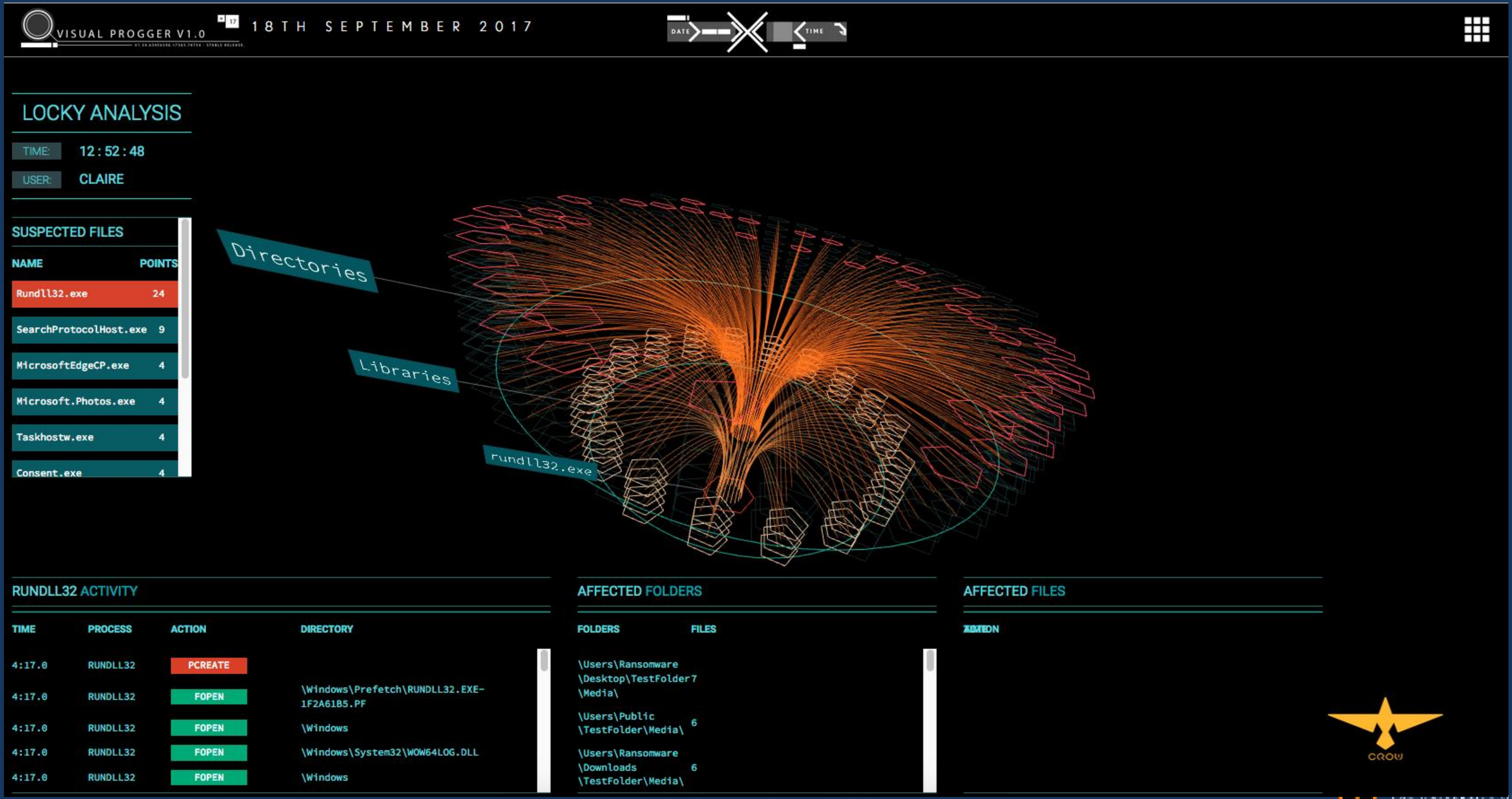
=> Fraud Content (files, acc.no#, etc.)

- **Security Visualization Sample:**
  - **Visual Progger:**
    - **Locky Ransomware**
    - **Real-time Monitoring**

- **Security Visualization Sample 1: Visual Progger – Locky Ransomware**



• Security Visualization: Locky Analysis:



LOCKY ANALYSIS

TIME: 12 : 52 : 48

USER: CLAIRE

SUSPECTED FILES

NAME	POINTS
Rundll32.exe	24
SearchProtocolHost.exe	9
MicrosoftEdgeCP.exe	4
Microsoft.Photos.exe	4
Taskhostw.exe	4
Consent.exe	4

RUNDLL32 ACTIVITY

TIME	PROCESS	ACTION	DIRECTORY
4:17.0	RUNDLL32	PCREATE	
4:17.0	RUNDLL32	FOPEN	\Windows\Prefetch\RUNDLL32.EXE-1F2A61B5.PF
4:17.0	RUNDLL32	FOPEN	\Windows
4:17.0	RUNDLL32	FOPEN	\Windows\System32\WOW64LOG.DLL
4:17.0	RUNDLL32	FOPEN	\Windows

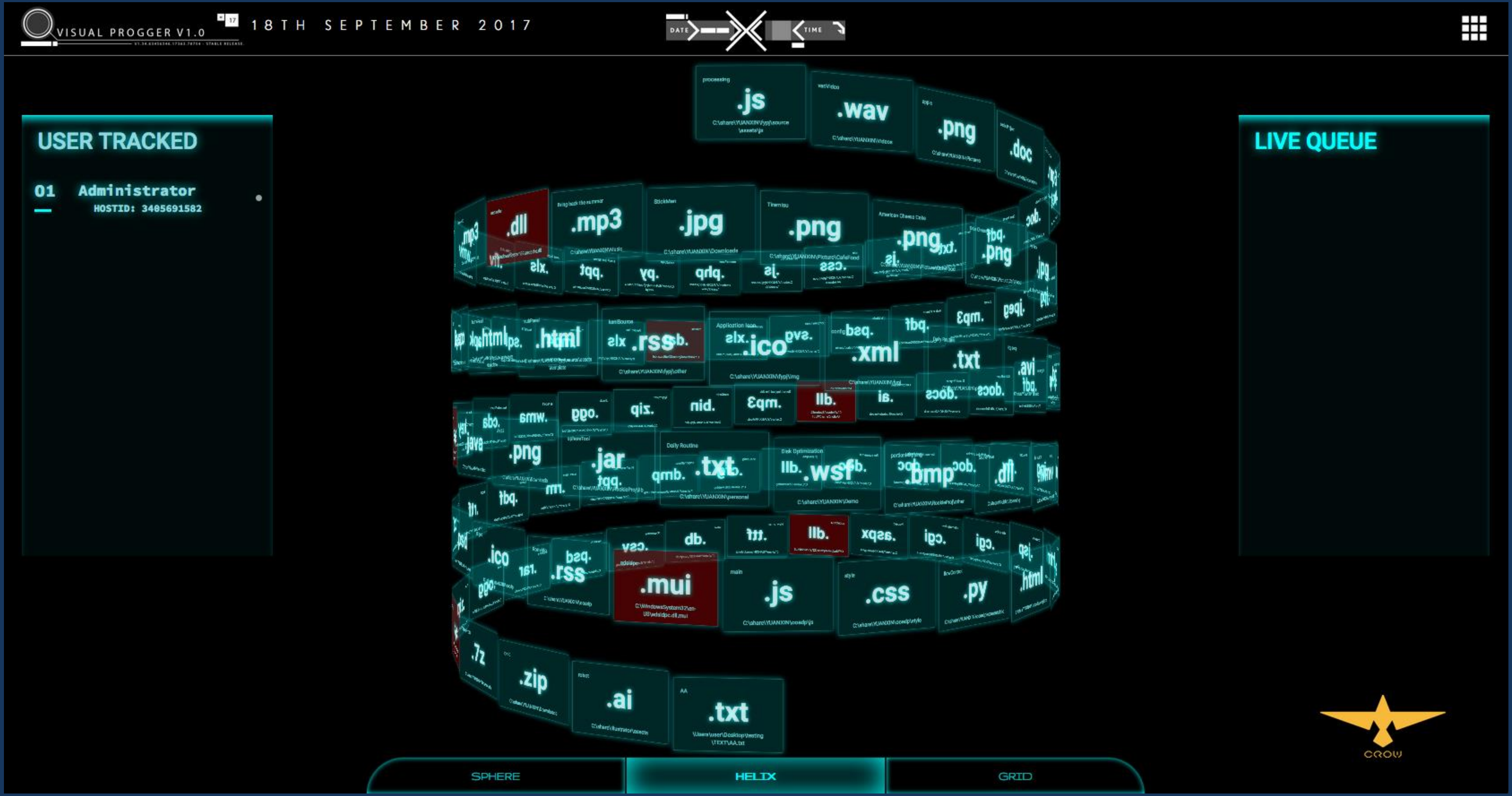
AFFECTED FOLDERS

FOLDERS	FILES
\Users\Ransomware\Desktop\TestFolder\Media\	7
\Users\Public\TestFolder\Media\	6
\Users\Ransomware\Downloads\TestFolder\Media\	6

AFFECTED FILES

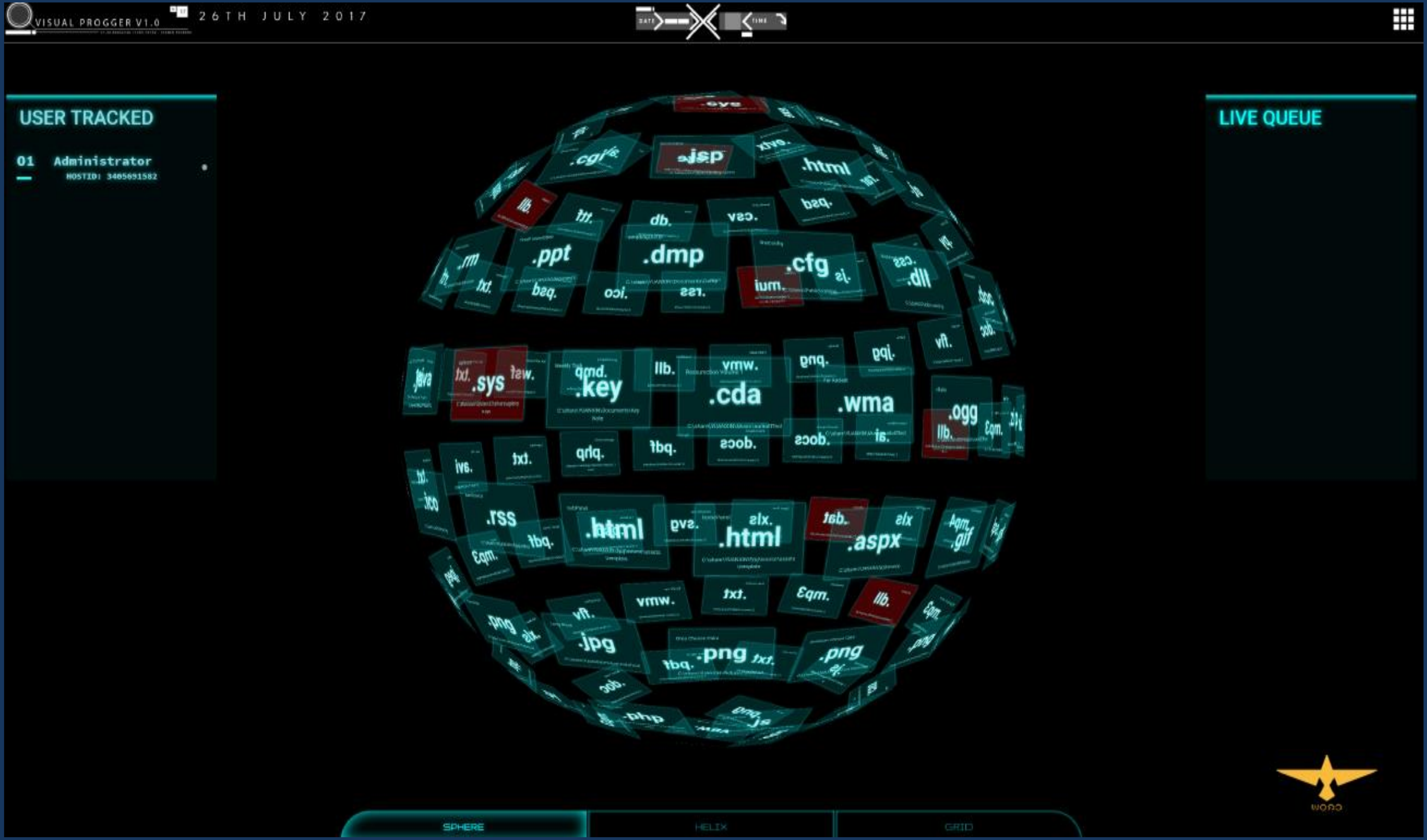
ADMEON

- ## Security Visualization: Real-time Monitoring:



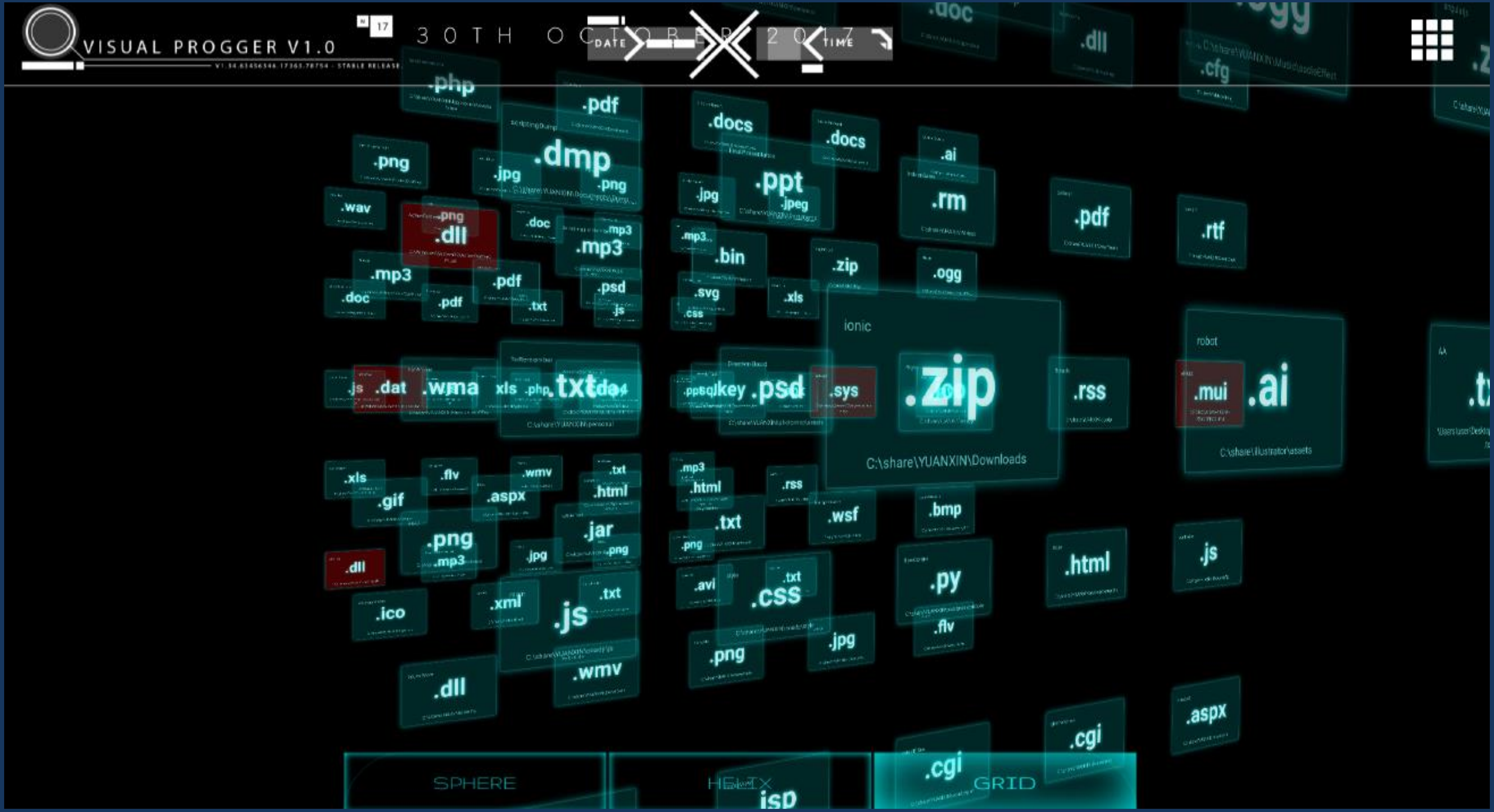
01 Administrator
HOSTID: 3405691582

- # Security Visualization: Real-time Monitoring:



01 Administrator
HOSTID: 3405691582

- ## Security Visualization: Real-time Monitoring:

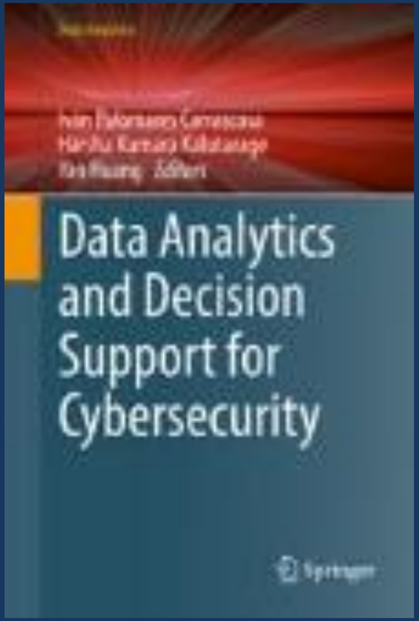


- **More reading if interested**

2 Book Chapter Contents

- Springer Book Chapter 1 (02/07/2017):

  “Visualization and Data Provenance Trends in Decision Support for Cybersecurity”



Data Analytics

Ivan Palomares Carrascosa
Harsha Kumara Kalutarage
Yan Huang *Editors*

Data Analytics and Decision Support for Cybersecurity

Springer

- Chapter Authors: Jeff Garae & Ryan K.L.Ko
- Editors: Palomares Carrascosa, Ivan, Kalutarage, Harsha Kumara, Huang, Yan (Eds.)
- Part of Data Analytics book series (DAANA)
- https://doi.org/10.1007/978-3-319-59439-2_9

2 Book Chapter Contents

- IET Book Chapter 2 (Sept. 2017):

“Security Visualization for Cloud Computing: An Overview”

- Chapter Authors: Jeff Garae, Ryan K.L.Ko & mark Apperley
- Editors: Vimal Kumar, Ryan Ko & Sivadon Chaisiri (Eds.)
- Source: Data Security in Cloud Computing, 2017
- Part of IET Digital Library
- Book DOI: 10.1049/PBSE007E
- Chapter DOI: 10.1049/PBSE007E_ch13
- e-ISBN: 9781785612213

Vanuatu's Computer Emergency Response Team (CERT VANUATU | CERT VU)

CERT VANUATU (CERT VU)

- ❑ **Launched Date:**
  - ❑ **19 of June 2018**
  - ❑ **Workshop by APNIC**

CertVu
CERT VU is your first point of call when you need support with cyber security problems.
Responding to cyber security threats in Vanuatu
CERT VANUATU

AWARENESS AUDIENCE

Awareness Audience:

1. Government Users
2. Organization users
3. IT Technicians, Technical staff, Law Enforcement
4. Teachers
5. Students
6. End-users / Users
7. Kids
8. Banks, ISPs, etc.
9. And more …

AWARENESS LOCATION

Awareness Locations:

1. Port Vila
2. Luganville
3. Islands – Through Schools, Provincial Headquarter, Community Centers, UAP Centers (Note: See TRBR)
4. And more …

CAPACITY BUILDING

Capacity Building Plan:

1. In-house Trainings (CERT VU Staff)
2. External Trainings (CERT VU staff, Gov IT Staff, Law Enforcement staff, others)
3. Specific Trainings (e.g. malware analysis, forensics training, security tool trainings, etc.)
4. And more …

Cyber Security - Future Work

1. The NATIONAL SECURITY & ICT REGULATORY PANEL (NSICTRP)
2. Vanuatu Government Ethics Panel (Basically around data collection, handling, sharing & privacy, etc.)
3. Vanuatu National Cyber Security Centre (VNCSC)
4. Cyber Security Capacity Building & Awareness

Acknowledgement

Special thank you to:

- APNIC
- CERT Vanuatu / OGCIO
- CROW Researchers
- Waikato University
- Stratus Project
- Interpol
- NICT - Japan

Thank You!

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