Predict

DATA ANALYTICS FOR DIGITAL FORENSICS AND CYBERSECURITY

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Agenda

- Challenges Facing Digital Forensics
- Challenges Facing Cybersecurity
- Where Data Analytics Can Help
  - [Sample Current Research Projects]

Data Analytics for Digital Forensics

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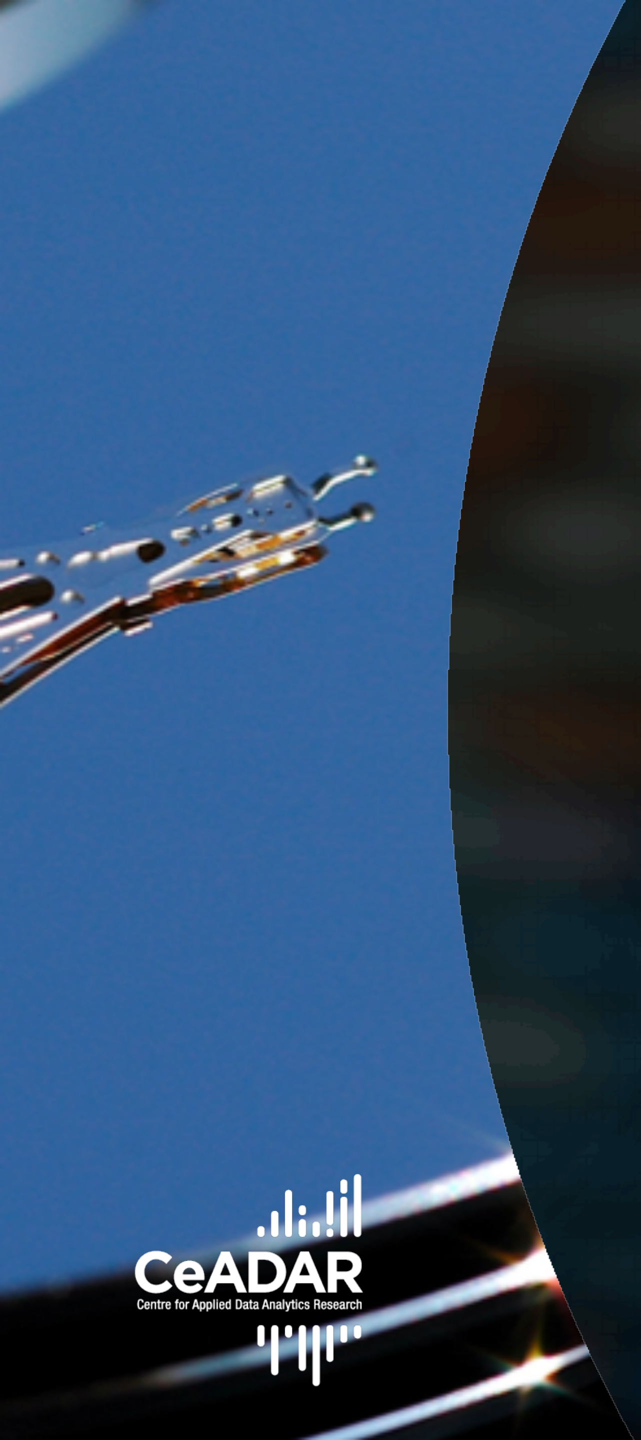
Digital Forensic Challenges

- The consistency and correlation problem
  - Results from the fact that existing tools are designed to find fragments of evidence, but not to otherwise assist in investigations.
- The unified time lining problem
  - Multiple sources present different time zone references, timestamp interpretations, clock skew/drift issues, and the syntax aspects involved in generating a unified timeline.
- The diversity problem
  - Results from ever-increasing volumes of data
  - Lack of standard techniques to examine and analyse the increasing numbers and types of sources, which bring a plurality of operating systems, file formats, etc.

Digital Forensics:
The Volume Challenge



- The number of cases whereby digital evidence is deemed pertinent is ever increasing.
- An increase in the number of devices that are seized for analysis per case.
- The volume of potentially evidence-rich data stored on each item seized is also increasing.

Digital Forensic Backlog

- Backlogs have become commonplace in recent years
  - Commonly exceeds 18 months
  - Often exceeds 2 years
- According to a report by An Garda Síochána, delays of up to four years
  - ``Seriously impacted on the timeliness of criminal investigations'' in recent years.
  - In some cases, these delays have resulted in prosecutions being dismissed in courts.

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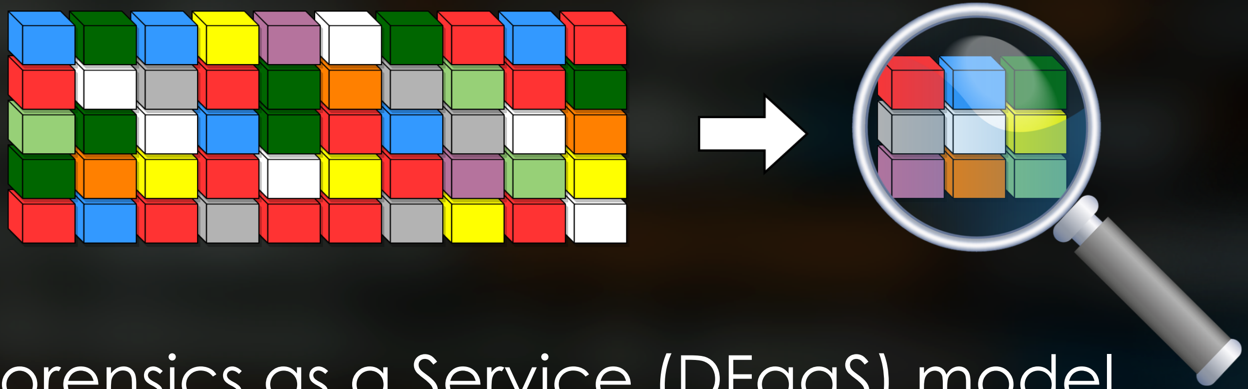
One Solution: Deduplication



- Digital Forensics as a Service (DFaaS) model
- Centralisation of digital forensic processing
- Elimination of duplicated effort from the typical forensic process:
  - Eliminate duplicated acquisition
  - Eliminate duplicated storage
  - Eliminate duplicated analysis and processing

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Intelligent Automated Evidence Processing

- Research towards automated evidence processing
- Leverages centralised record of evidence analysis
  - Learns what makes evidence pertinent/non-pertinent
- Photographic and Video Human/Object Identification
  - Biometric estimation; ageing, height, weight, etc.
  - Location determination

Data Analytics for Cybersecurity

Information Overload

- Information overload facing cybersecurity professionals
  - False positive alert rate is too high
- Attack Sophistication
  - Difficult to identify anomalies
- Data Analytics can enable behavioural anomaly detection
  - Similar premise to what antivirus systems followed to combat polymorphic and metamorphic malware

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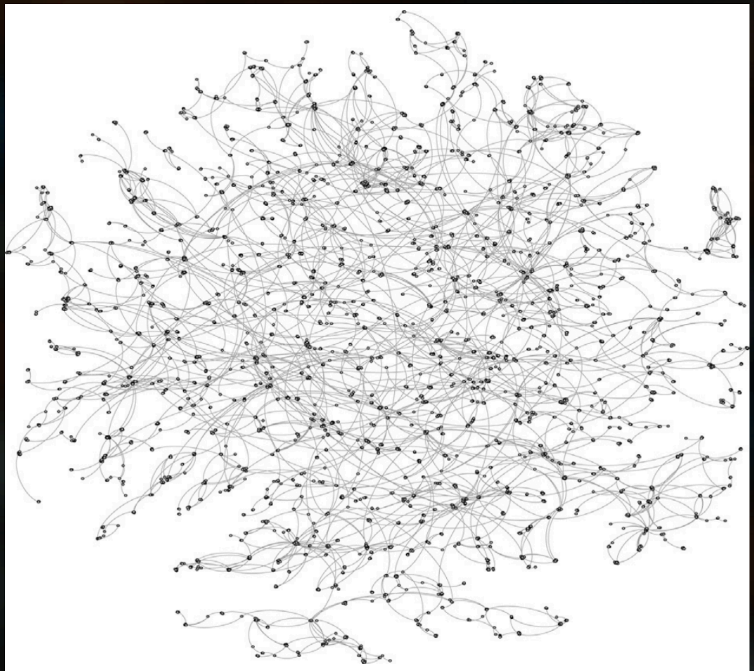
Network Behavioural Analysis

- Build a baseline of each node's activity on the network
- Categorise nodes based on their normal behaviour
- Alert when a deviation from this norm is identified

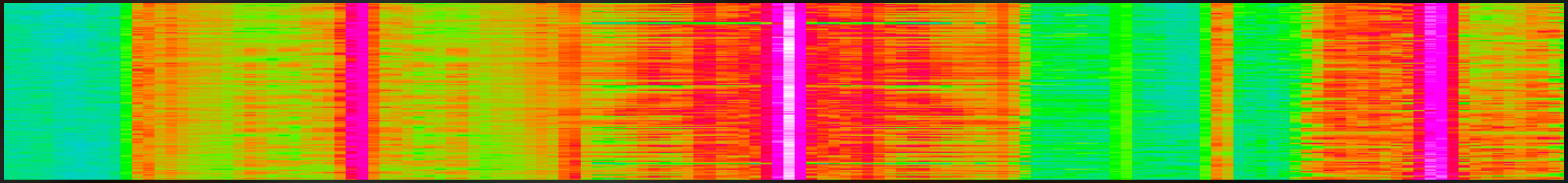
- Intrusion Detection
- Botnet Investigation



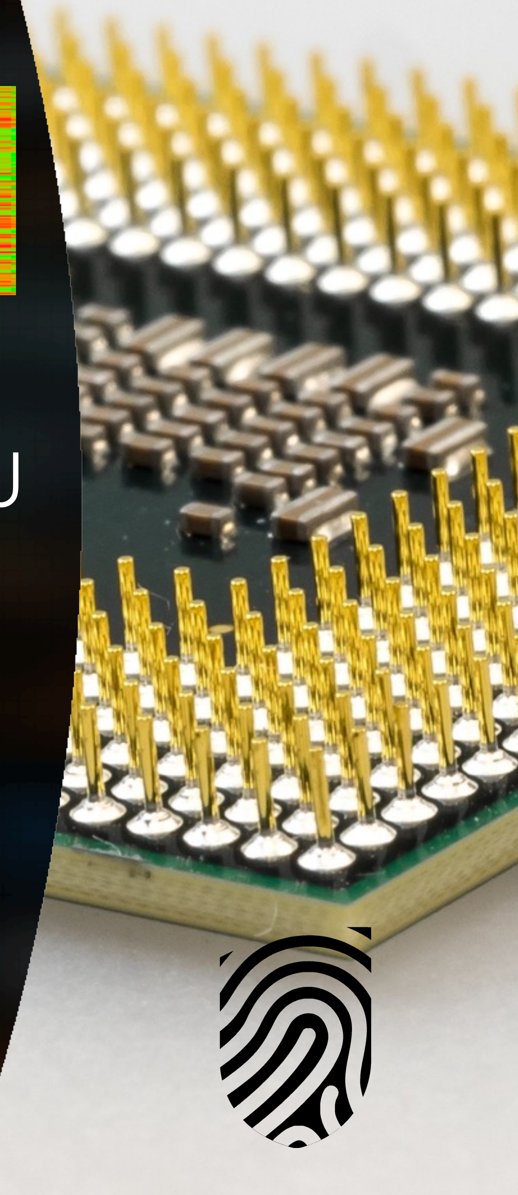
User Behavioural Analysis

- Effectively the same idea! Includes:
  - Network Traffic
  - Device Utilisation
  - Correlation between devices
- Can identify specific users in multiuser environments

Data Analytics to Break Encryption



- Software defined radio to capture leaking CPU electromagnetic radiation
- Becomes a Big Data/Data Analytics problem



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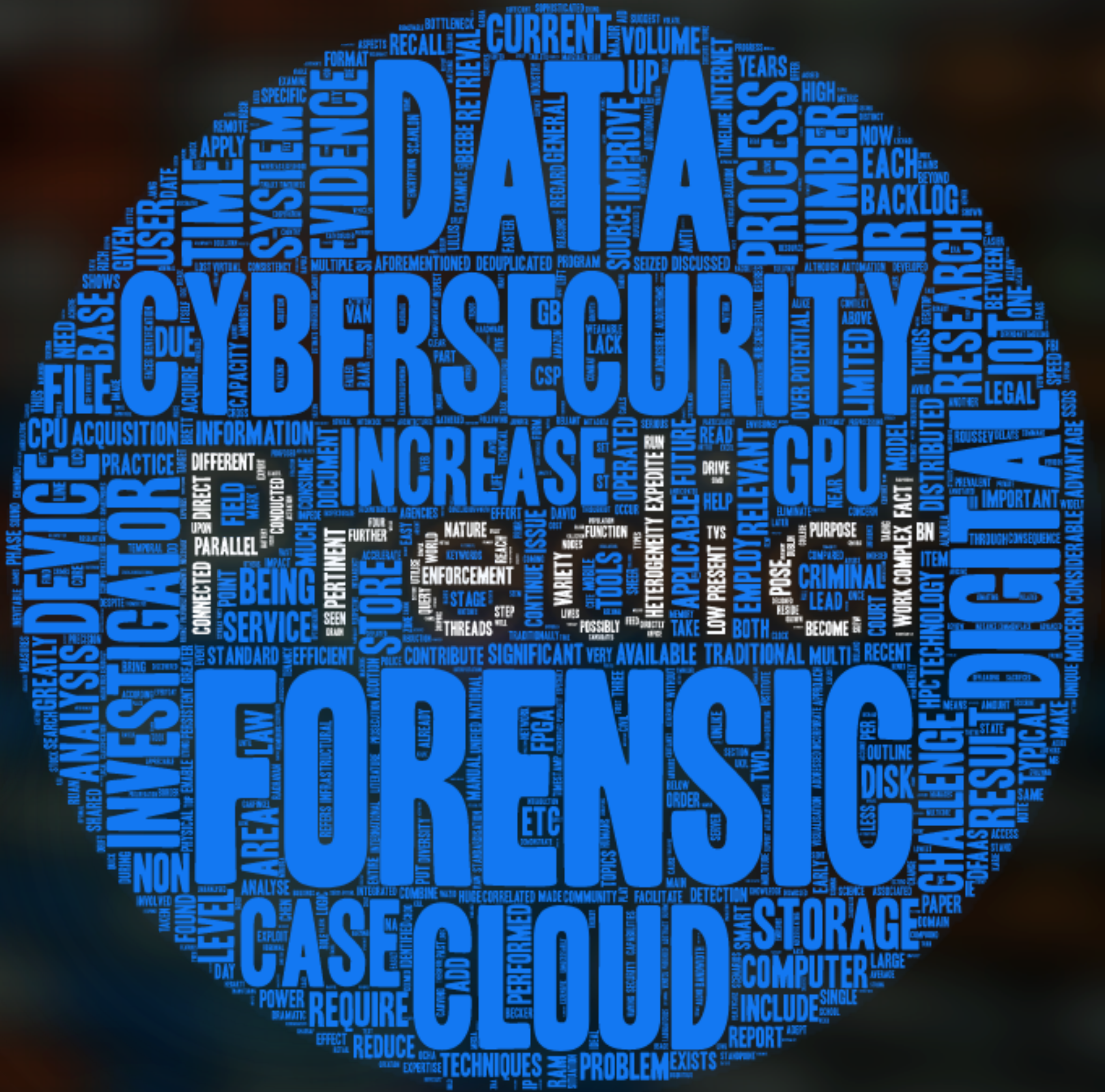

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