

Cyber Security

The threat landscape

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Crossover with
Sun Tzu "The Art of War"

- Know your enemy
- Know your terrain
- Know your economy (waging warfare)
- What are the common tactics?
- Planning strategies
- Spies: Can "we" (or they) truly be anonymous?
- Intelligent threat analysis
- Case study: typical medium-sized corporate spending

Who really are the adversaries? “Know your enemy”



Professional Criminal Gangs £££

- Make it so hacks are not cost-effective

Lone Hackers, Cyber Criminals, Script Kiddies

- Lone hackers are often not worth worrying about, script kiddies are more numerous

Governments

Political Activists

Insiders

Competitors

ISPs? Companies? The University?

- May or may not be attackers
- Humans default to a position of trust (helps us survive in complex environments)



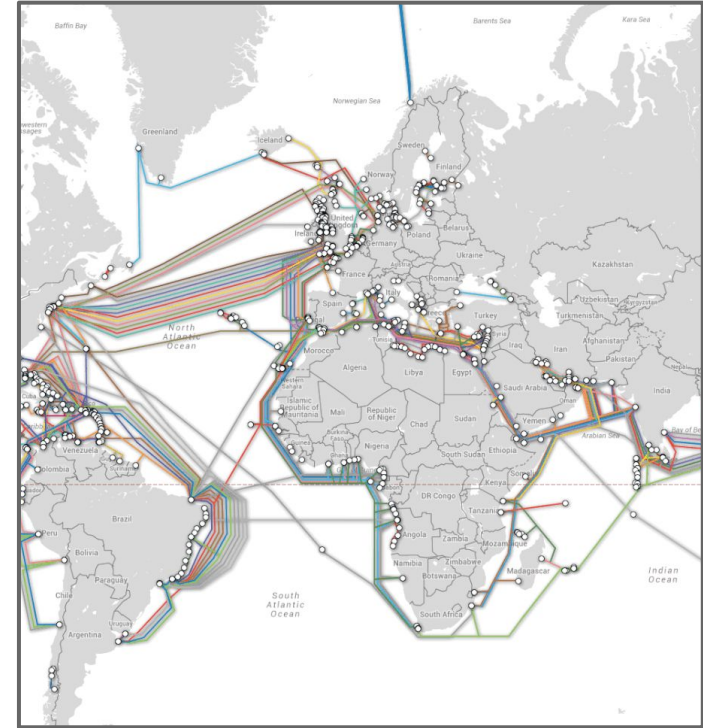
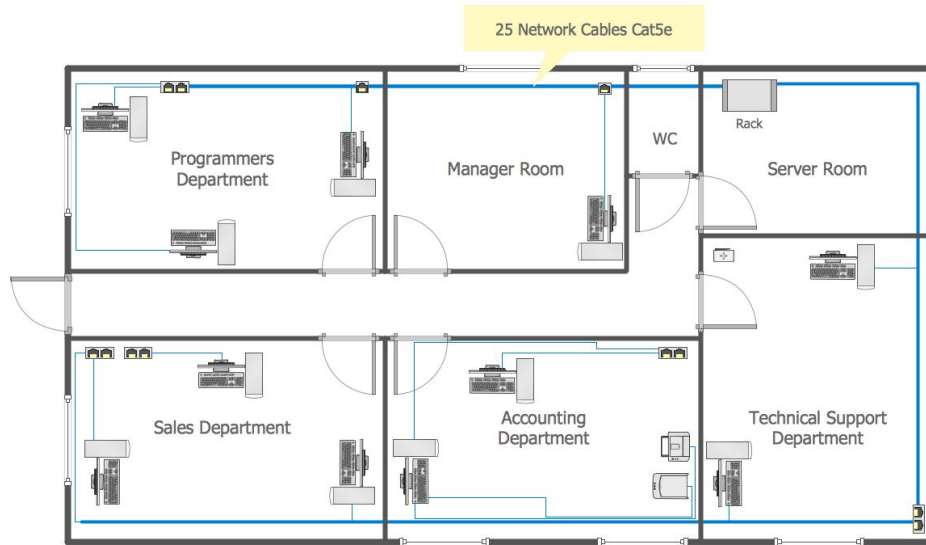
...depending on who the enemy is, different skills are required

Know the battlefield




With the internet, the battlefield is much larger and more complex than in traditional warfare.

- Think hierarchically

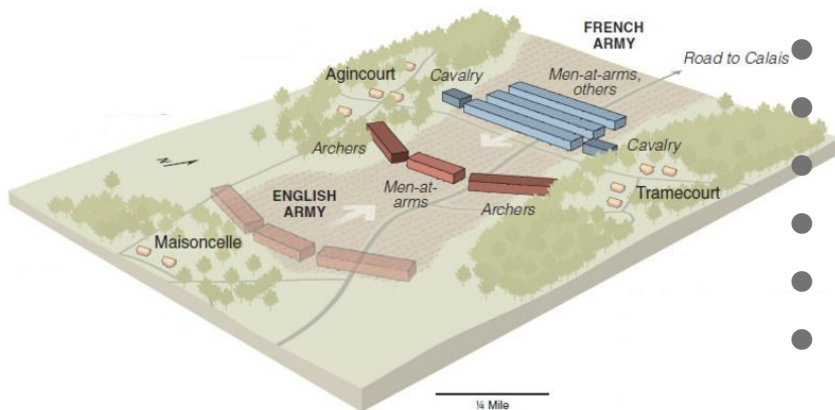


<https://www.submarinecablemap.com>

Know the most common tactics

What is the motivation of most hackers? £££ + 

- Steal credit cards, paypal logins, ...
- Ransomware
- Industrial espionage (steal some sensitive information to sell to someone else)

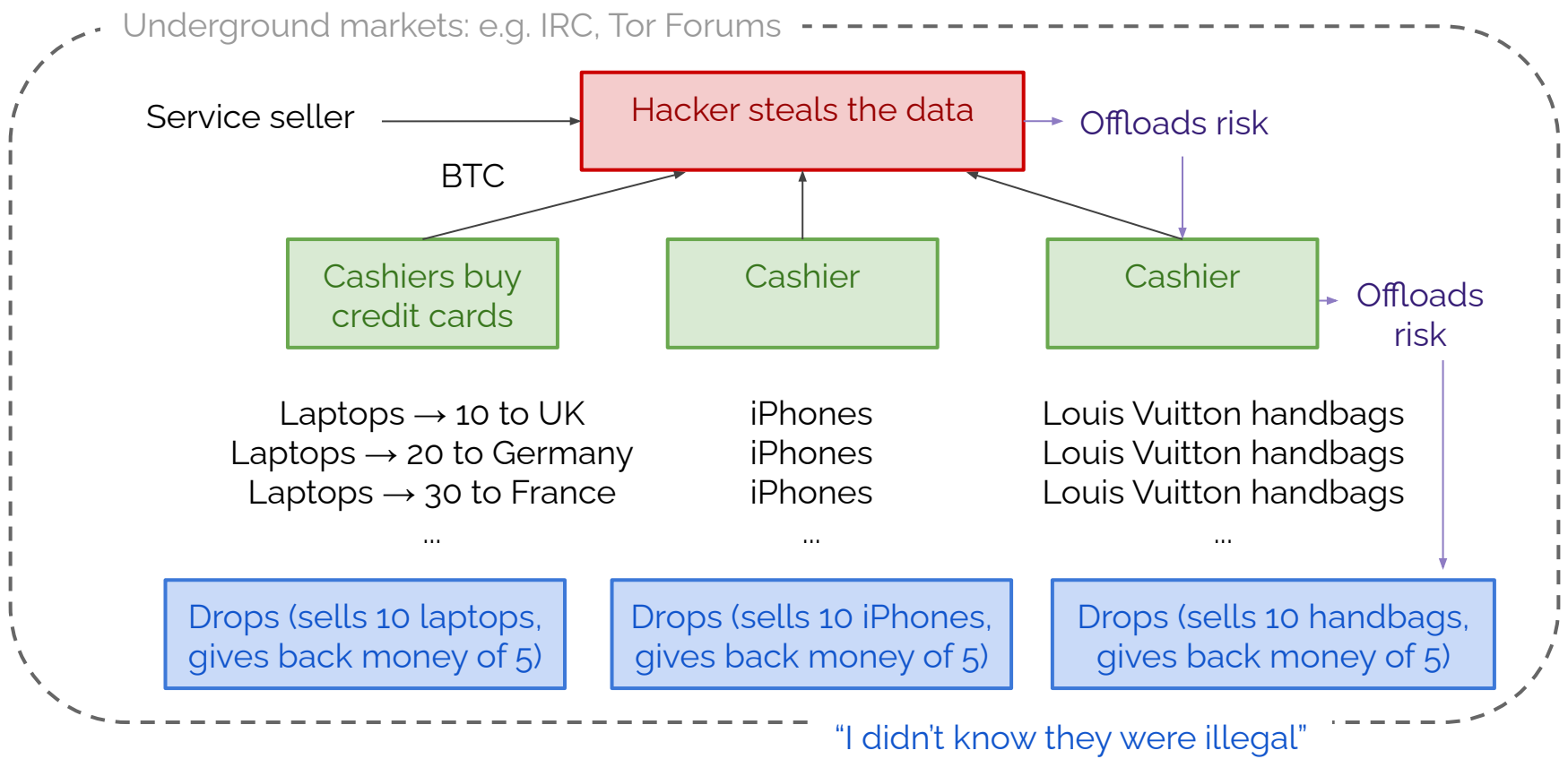


- Database breach, DoS attacks (use worms)
- Botnets, Fast flux, Domain flux
- Spam
- Keyloggers
- Rootkits
- Man-in-the-browser



Tactics

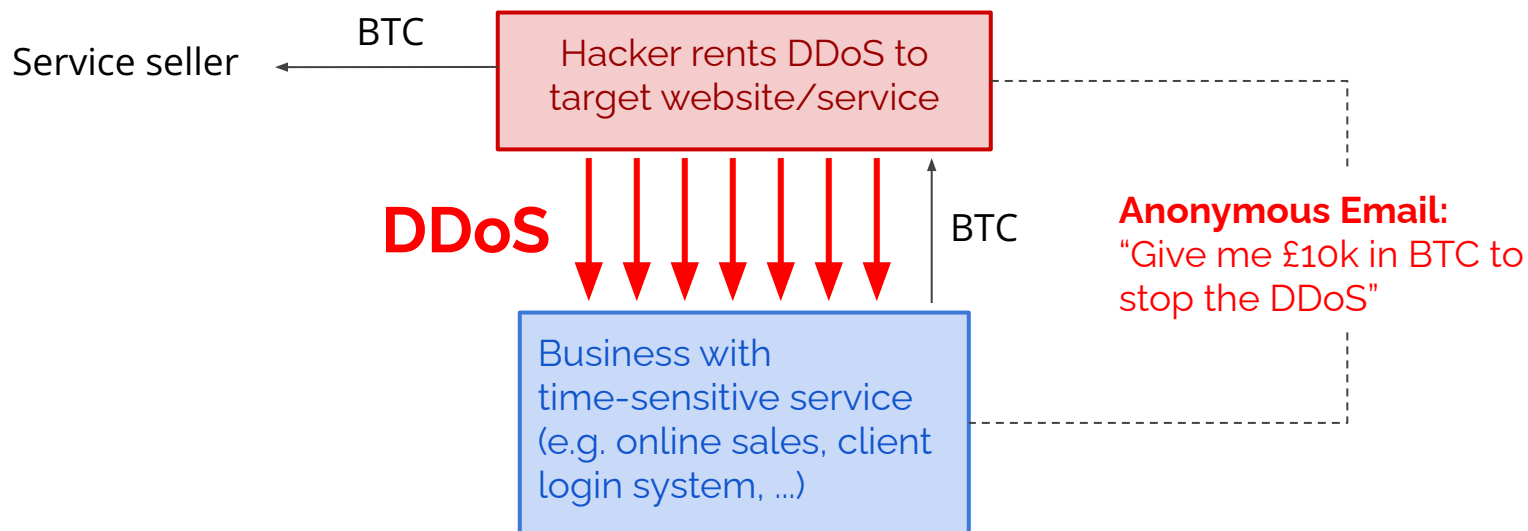
What do hackers do with 1,000,000 credit card numbers?





Recording of underground market I captured recently

...more common tactics



Know the economy

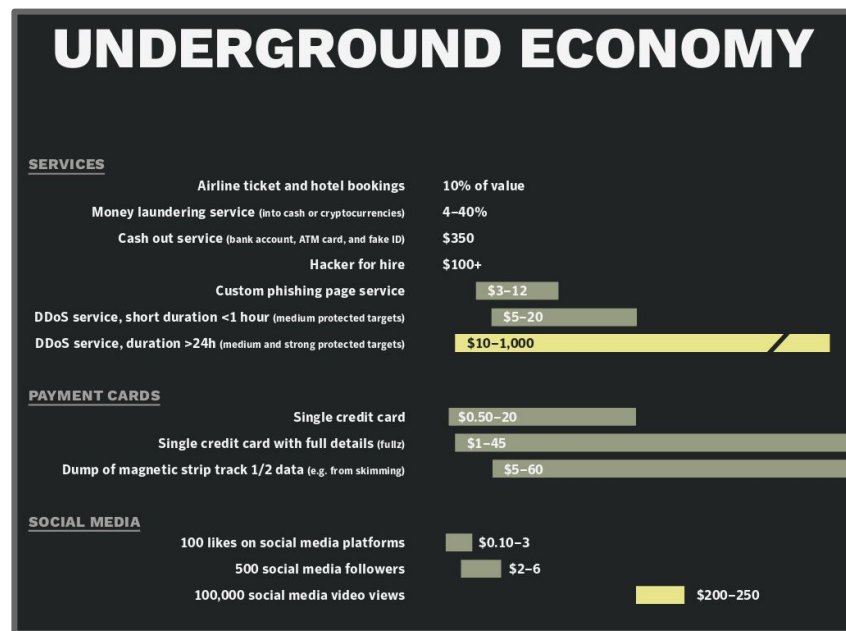
- Bitcoin transactions changes cyber landscape by enabling anonymous transactions

Economy can have fairly deep Hierarchies, for example:

- Hacker steals 1000 *Fullz* (credit card & CCV & name & address)
- Sells on Tor forum for 0.5 BTC (~£5k)
- Buyer sells groups of 20 to cashiers

Recent/weekly NCSC threat reports:

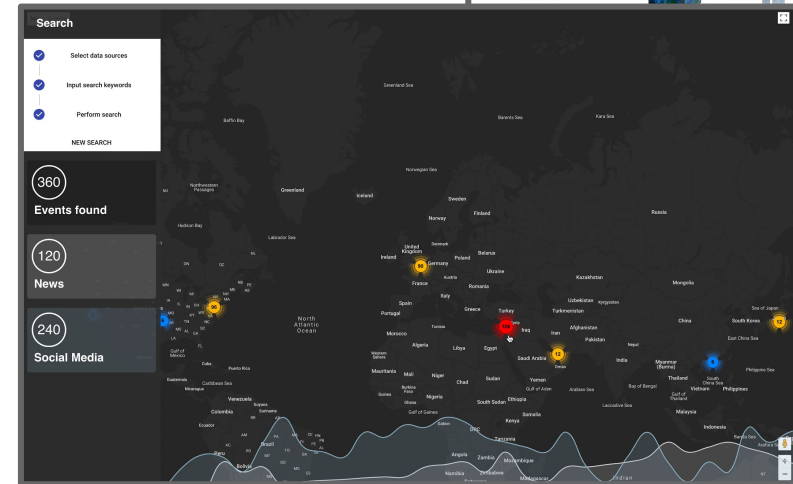
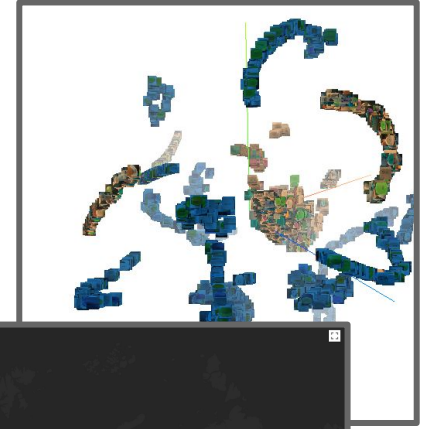
<https://www.ncsc.gov.uk/section/keep-up-to-date/threat-reports>



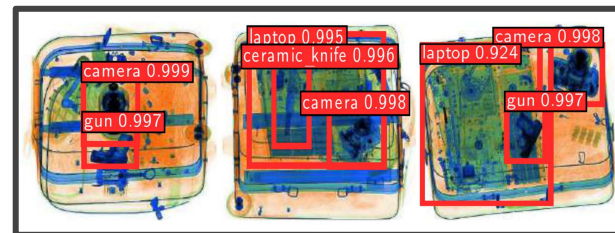
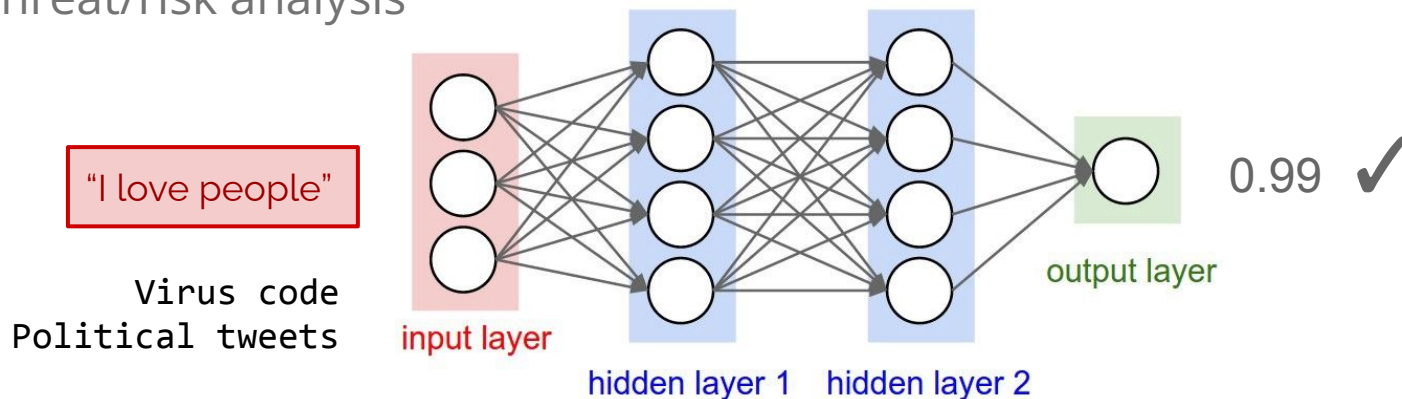
With the advent of Machine Learning, strategies are more intelligent based on large-scale analytics

- Open source intelligence (OSINT)
- Sentiment analysis
- Targeted advertising
 - Targeted political campaigns
- Identifying criminals
 - Identifying threats

... positive and negative applications



- Classifiers
- Sentiment analysis
- Threat/risk analysis



<https://github.com/bentrevett/pytorch-sentiment-analysis>



<https://github.com/bentrevett/pytorch-sentiment-analysis/blob/main/4%20-%20Transformers.ipynb>

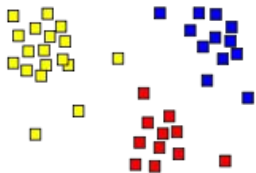


<https://www.sbert.net/> - recommended for OSINT final year projects

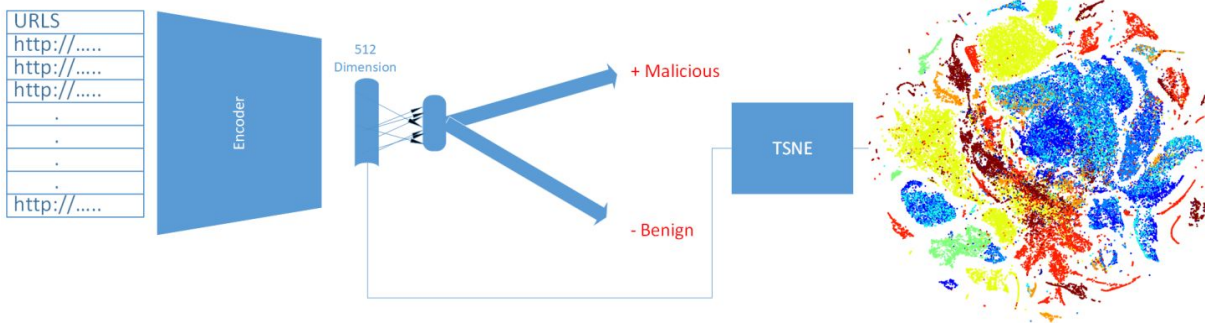
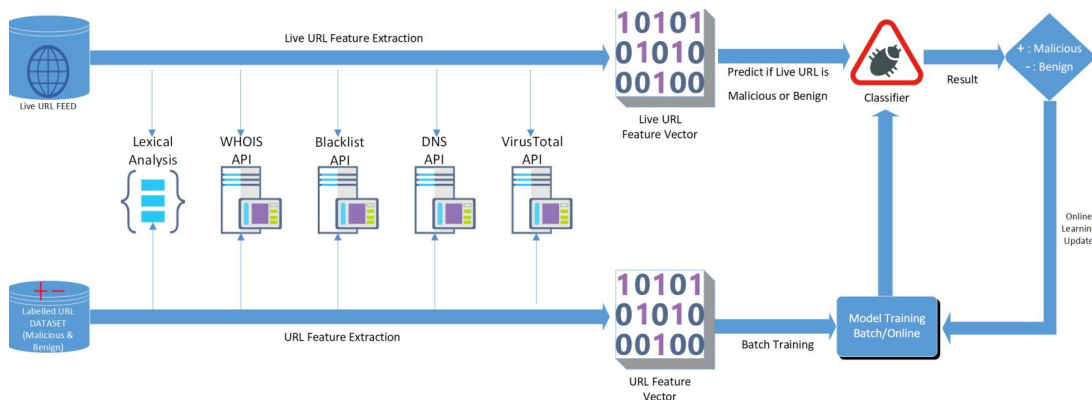
Planning strategies ML techniques

1. Automatic Classification ✓
✓
X
X
✓

2. Automatic Clustering



3. Automatic Localisation



State-of-the-art: <https://umap-learn.readthedocs.io/en/latest/supervised.html>

IPs → ISP → identify you

<https://whatismyipaddress.com/>

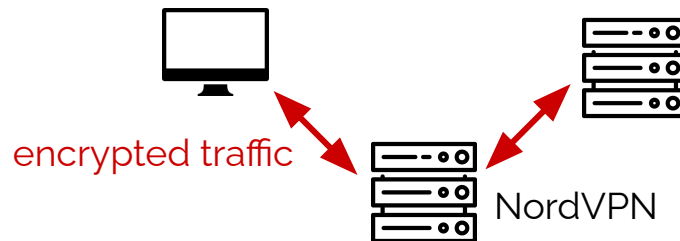
Law: “Snoopers' Charter” & RIPA

Public WiFi → MITM/identify you

University Wired/Wireless → identify you

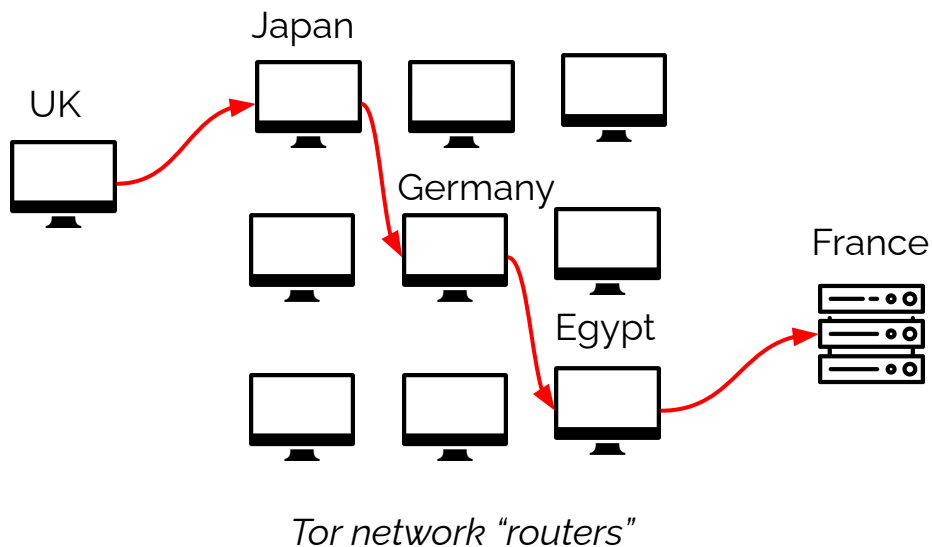
VPNs (Virtual Private Networks)

- Free VPNs log your information and sell them to 3rd parties.
- This is [how they make money](#) & survive
- Carefully check the T&C of the VPN
- Nice phone App & browser extension

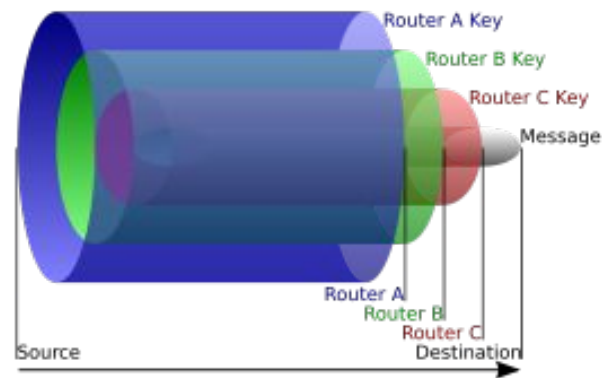


Tor enables *mostly* “anonymous” communication by onion routing

- Tor browser gives properly configured web browser (doesn't collect your history or cache your results). Javascript can be disabled easily.



Onion routing encapsulates packets with layers of encryption



Case study: typical medium-sized corporate spending



The remaining slides cover a small case study, which is the result of interviewing a local NE SME on appropriate Cyber Security budget & official guidance from the NCSC.

More links:

<https://www.ncsc.gov.uk/guidance/security-operations-centre-soc-buyers-guide>

https://www.ncsc.gov.uk/files/small_business_guide_actions.pdf



National Cyber
Security Centre

a part of GCHQ

Cyber Security:

Small Business Guide Actions



Security Operations Center (SOCs)



Teams proactively monitor the infrastructure

Tools/communities:

- Alien Vault
- Snort
- SNAIL
- OSEC
- OTX
- Logrhythm

The screenshot displays the Alien Vault Professional SIEM interface. The top navigation bar includes a sidebar with menu items: Dashboards, Incidents, Alarms, Tickets, Knowledge DB, Analysis, Reports, Assets, Intelligence, Monitors, Configuration, Tools, Logout [admin], and Maximize. The main content area is titled 'Alarms' and shows a list of security alerts. The interface includes a search bar, filters, and a table of alerts with columns for Alarm ID, Risk, Sensor, Since, Last, Source, Destination, Status, and Action. The table lists several alerts, including 'AV Hariposa Botnet Activity on Server-Win', 'AV Spyware Baidu.com Agent detected on Server-Win', 'AV Possible port 445 Worm Scan Behaviour on Server-Win', 'AV Trojan Downloader detected on Server-Win (Emo)', 'AV Hardware Salty detected on Server-Win', 'AV Anonymous Proxy usage on 192.168.1.1 (Judge)', 'AV Possible Hardware Kooface activity on Server-Win', 'AV Trojan LDPinch Activity on Server-Win', and 'AV Possible Log4j/Swizzor infection on Server-Win'. Each alert entry includes a risk level (e.g., 2 or 3), a sensor name (e.g., ossim), and a status (e.g., open). The interface also features a 'Global score' section on the right with a green bar and a 'Service level' section with a red bar.



Security Information & Event Management

Third party monitoring (£8k per year)

Log rhythm

- Create rules for alert types
- People review alerts & report back.
- **~£5k per year** (standard package, what they choose)
- (~£70k per year for 24/7 package)

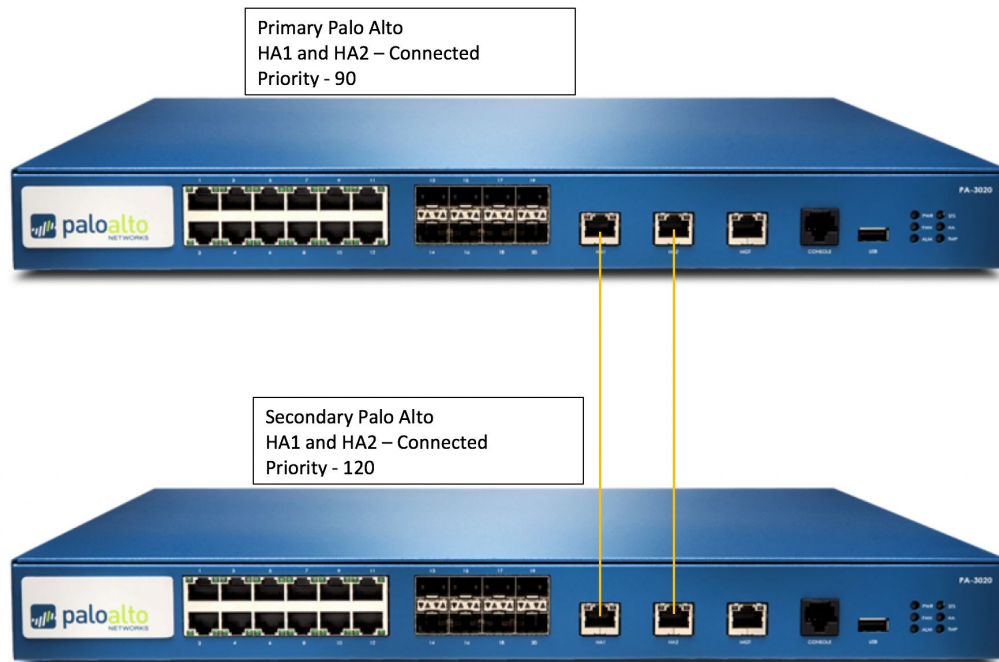




High Availability Pair

2 firewalls in active-active pair (means e.g. VOIP availability during updates)
Network/switches updated out-of-hours

1. Verify HA functionality before an upgrade
2. Confirms update on first device before updating the 2nd
3. Rollback w/o downtime
4. When finish the state will be unchanged.





Automated Patch Management

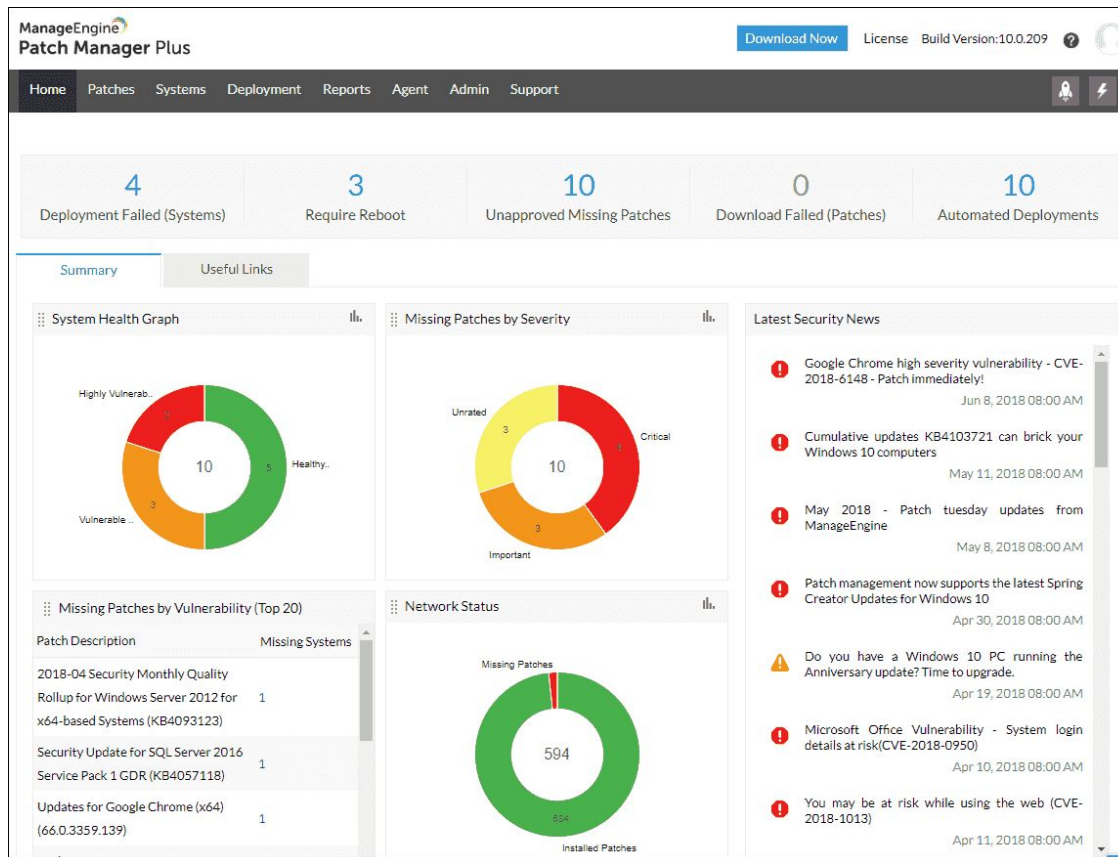
Patch manager plus pro
(£2k per year)

Windows updates at
appropriate times

- Adds control

Keeps software up to
date but maintains
compatibility

Includes third party
(java, flash etc)



Endpoint protection, NG firewalls & full disk encryption



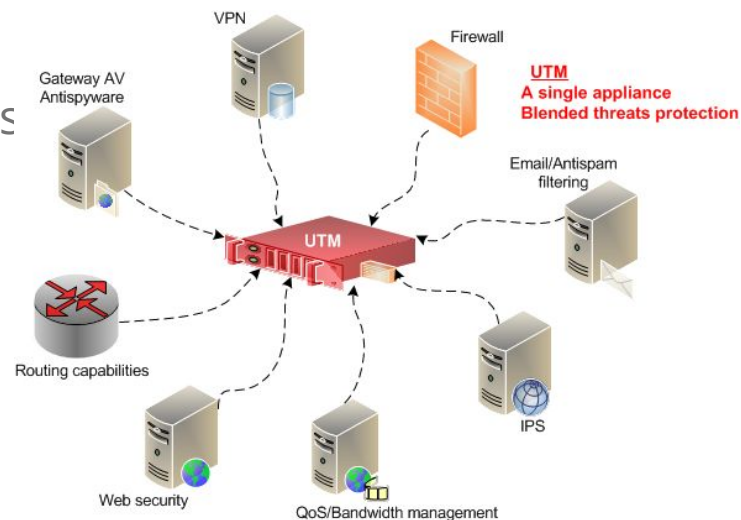
Safend data protection suite (DPS) endpoint protection

- e.g. locks down USBs ~**£20k+£2k** per year

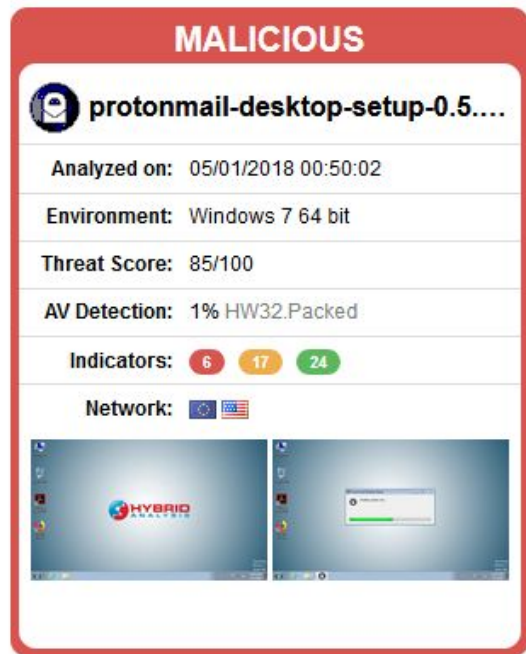
UTM firewall (next-generation NG firewall, inspects packets in flight) ...simple ones just blocks a port.

In-line antivirus, web filtering - ensure the firewalls don't slow e.g. uploading to Dropbox, advanced ones use AI to analyse threats

Hard drive encryption (TrueCrypt was compromised) - VeraCrypt



Falcon Sandbox Reports



Suspicious file?

Spins up a VM, executes, sends screenshots/report of what it does

(balancing confidentiality - e.g. do we want to send personal details to third party?)

There are automated sandbox analysis such as Cuckoo, but can be a lot of effort to set up

- Delivers bite sized learning schedules, sends a link to half a dozen slides, reports back how many people and how long people spend on it - also does phishing exercises (e.g. new Costa shop example)

HOW RANSOMWARE WORKS

First, the attack locks down all the files you have access to, including files on our servers.

Next, you are asked to pay an amount of money in order to regain access to your files.

- Your files are encrypted and cannot be opened without a password.
- Unless you have a backup, your files may be lost forever.
- Paying is no guarantee for getting your files back.

What can the consequences be, for yourself and for us, if such a virus finds its way to your PC?

A screenshot of a ransomware message displayed in a dark-themed window titled "Your personal files are encrypted by CyberBacon". The text explains that personal photos, documents, and other important files have been encrypted with unique keys and stored on remote servers. It states that the user must pay \$99 to get their files back and receive online guidance. A red warning icon is present next to the payment instruction. At the bottom, there is a timer showing "95 20 15" seconds remaining, along with "Pay Now" and "Send Mail" buttons.

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