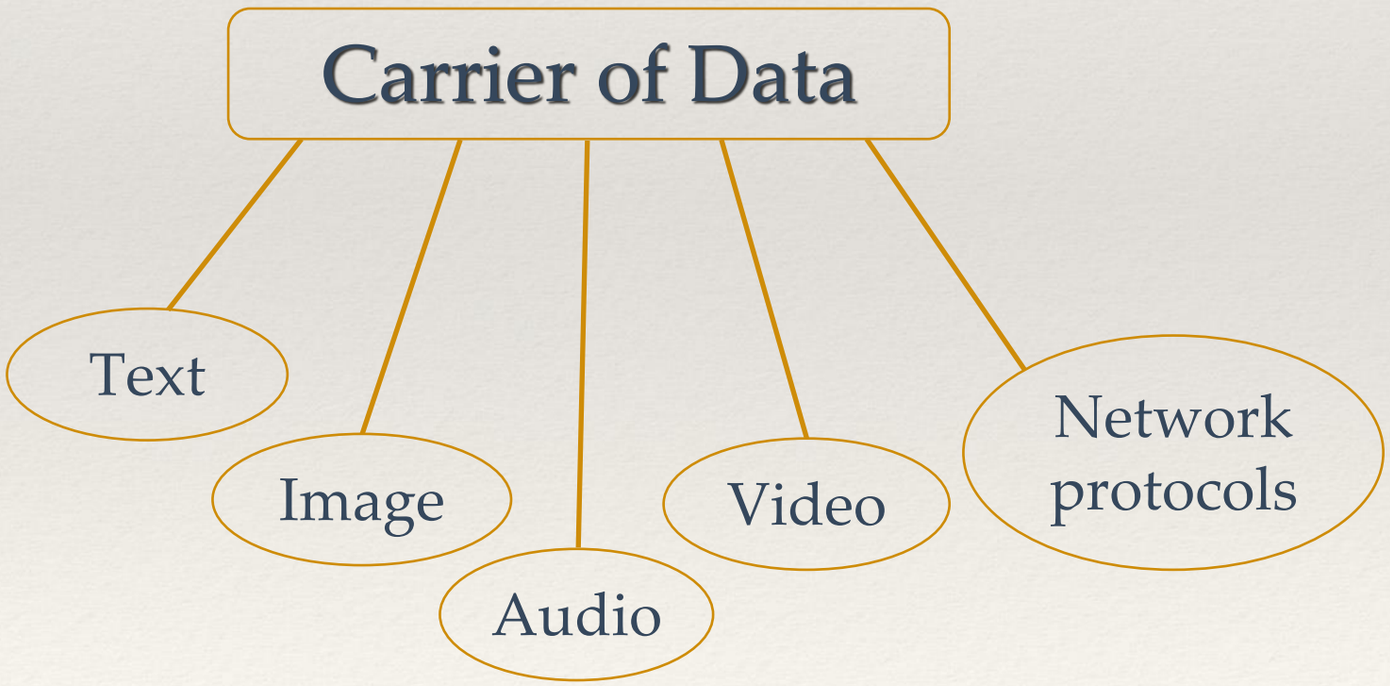
Steganography

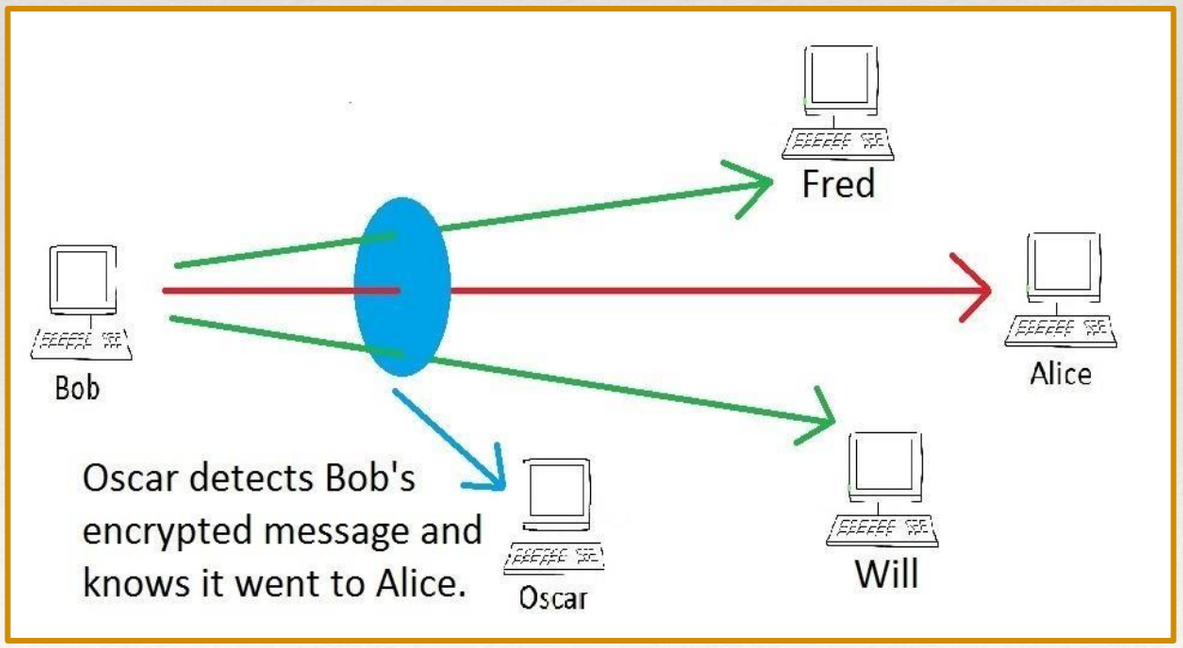
What is Steganography?

- **Steganography** is the art and science of communicating in a way which hides the existence of the communication.
- **The goal of Steganography** is to hide data or messages inside other files in a way that does not allow an enemy to even detect that there is a secret data present

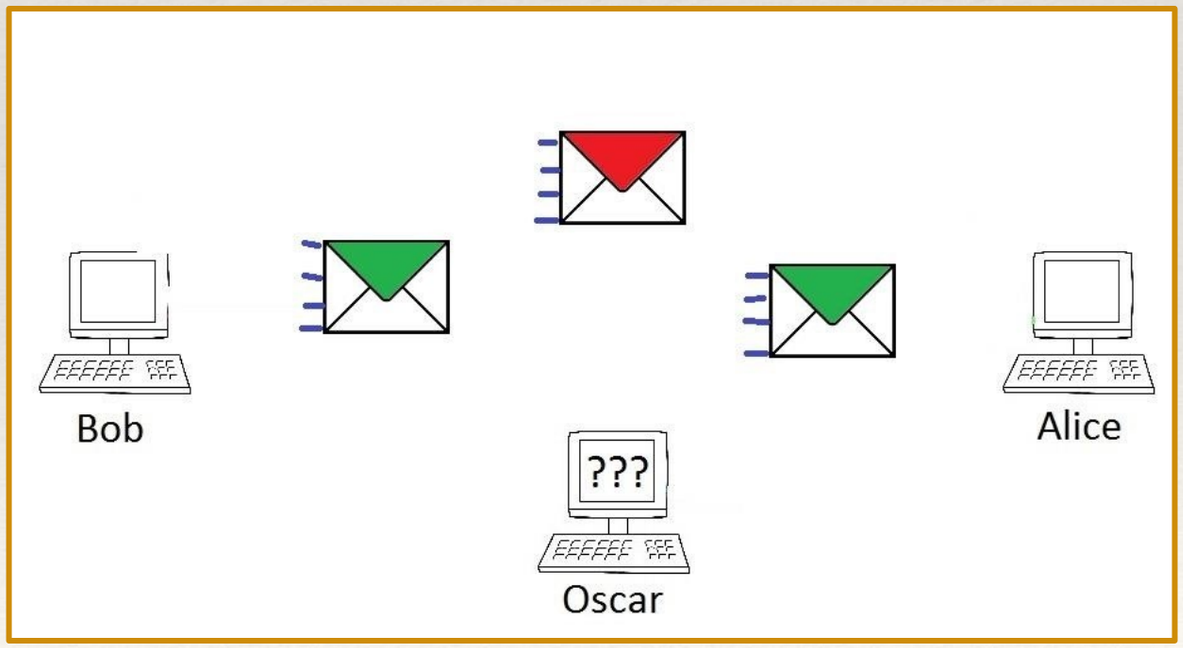


Steganography vs Cryptography

- Steganography and Cryptography are closely related
- The difference is:
  - **Cryptography:** although encypted and unreadable, the existence of data is not hidden
  - **Steganography:** no knowledge of the existence of the data
- Steganography and Cryptography can be used together to produce better protection

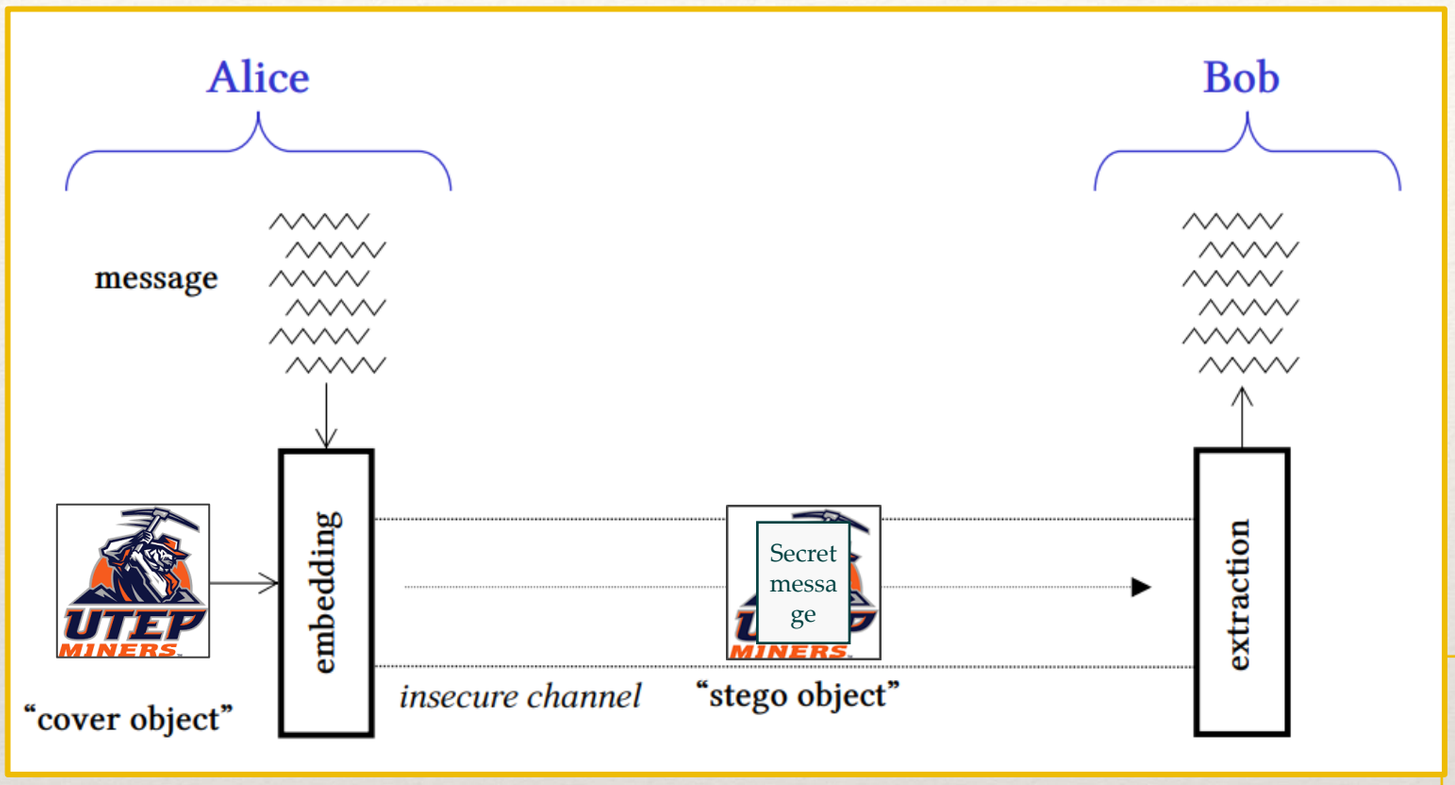


Cryptography



Steganography

How does it work?



- Goal: send a secret message embedded in an image
- Sender modifies the image to incorporate the secret message
- Modified image should look like the original one
- Message recipient decodes message from the modified image

Can you see the difference?

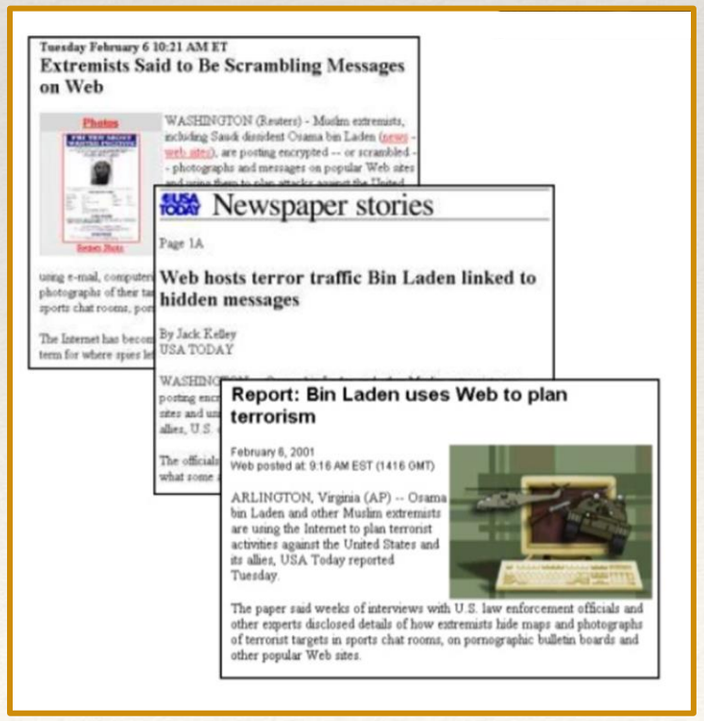
No one does!

Uses of Steganography

- **Economic espionage**
  - used to exfiltrate information from a major European automaker
- **Political extremists**
  - used for secure communications
- **Terrorism**
  - used to hide terrorist communications over the Internet, e.g, Osama bin Laden's alleged use of steganography
- **Fraud**
  - used to compromise sensitive data (SSN, credit cards)

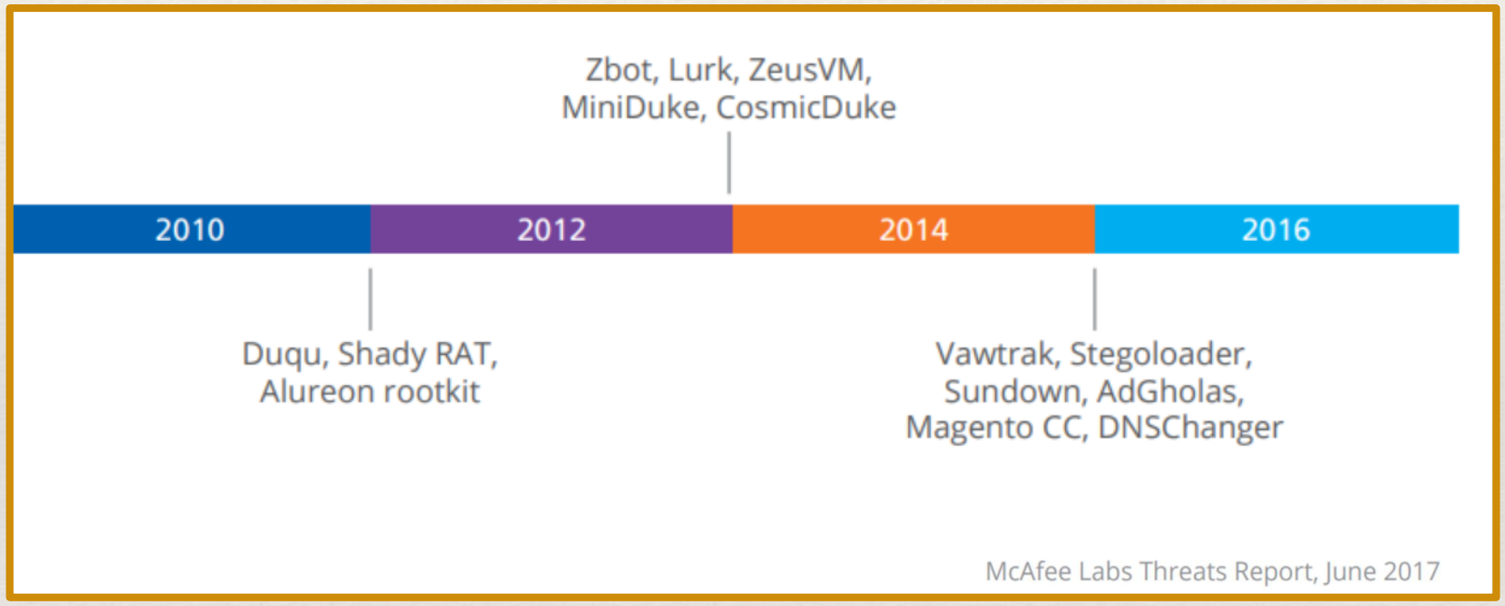
  by hiding malware in media files
  - used to compromise data a "digital dead drop"

  to hide stolen card numbers on a hacked Web page



Steganographic Cyberattacks

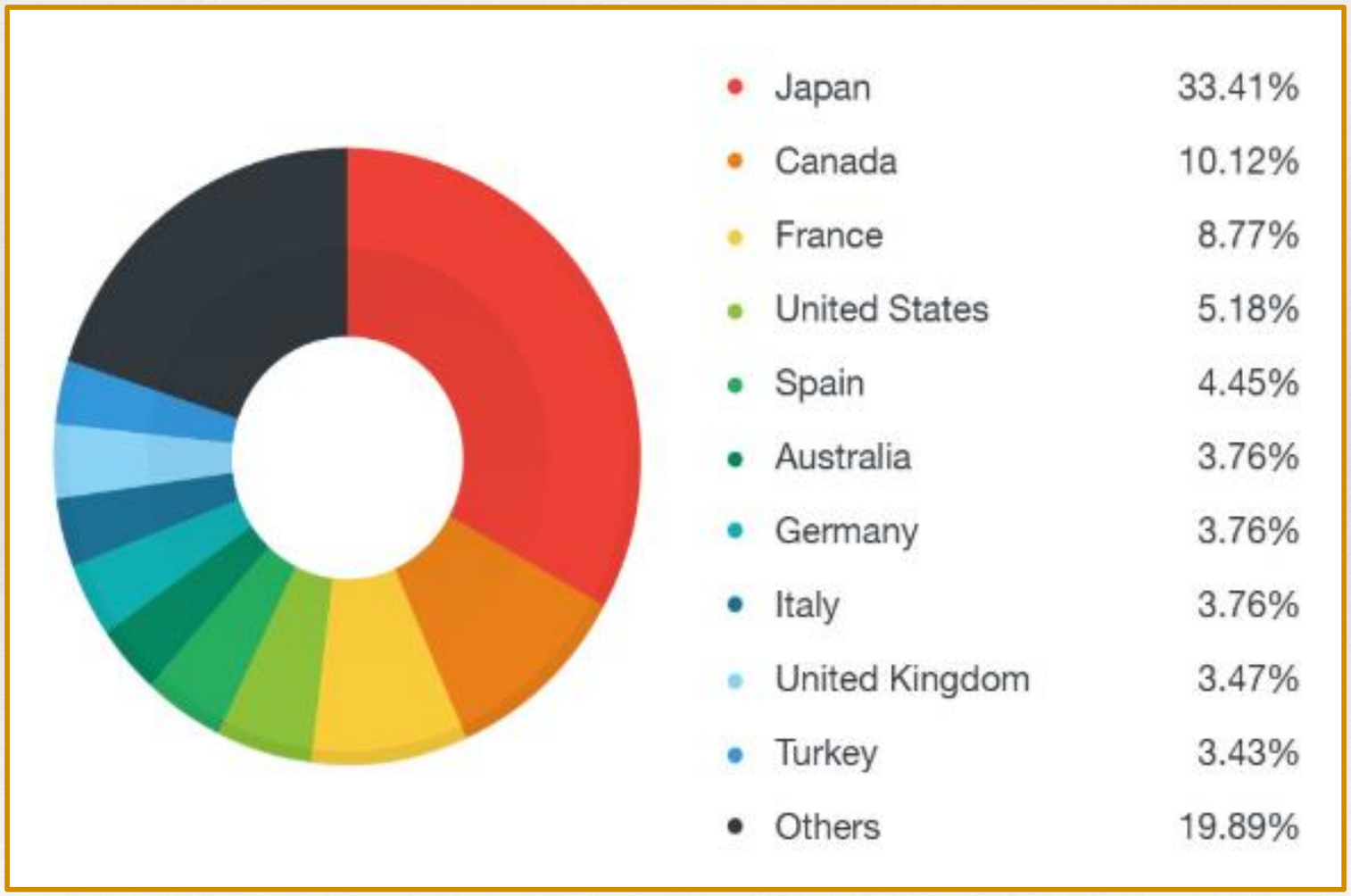
- **Malware** constantly progresses to avoid surveillance and detection.
- To avoid detection, some malware uses **steganography** to hide its malicious content within an innocent cover file.



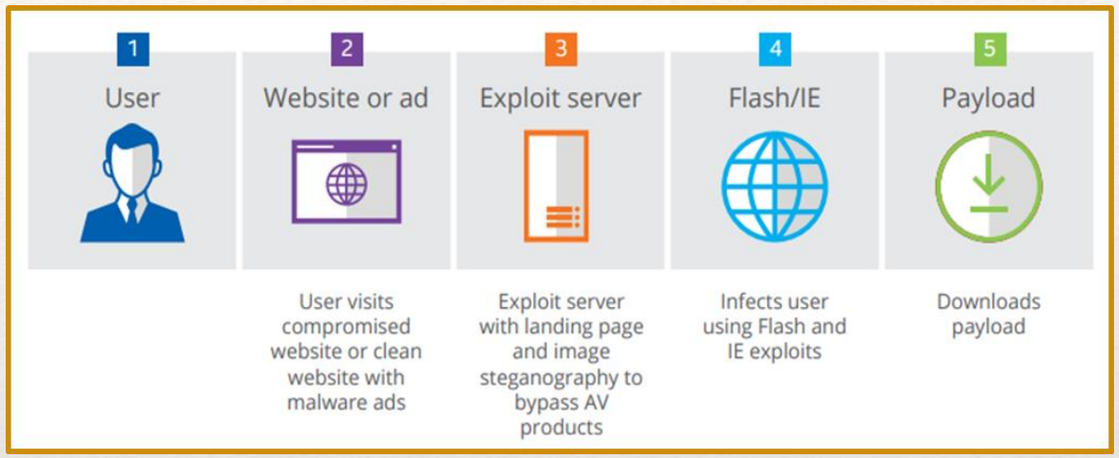
- The most common techniques:
  - Conceal malware settings or a configuration file
  - Provide the malware a URL from which additional components can be downloaded from
  - Store directly the whole malicious code

Steganographic Cyberattacks

- On December 2016, Sundown Exploit Kit started to use steganography to hide their exploit code.
- It is used by multiple malvertising campaigns to distribute malware.



Steganographic Cyberattacks



- A Sundown attack begins when a victim visits any website with malicious ads
- The victim is automatically redirected to the exploit kit

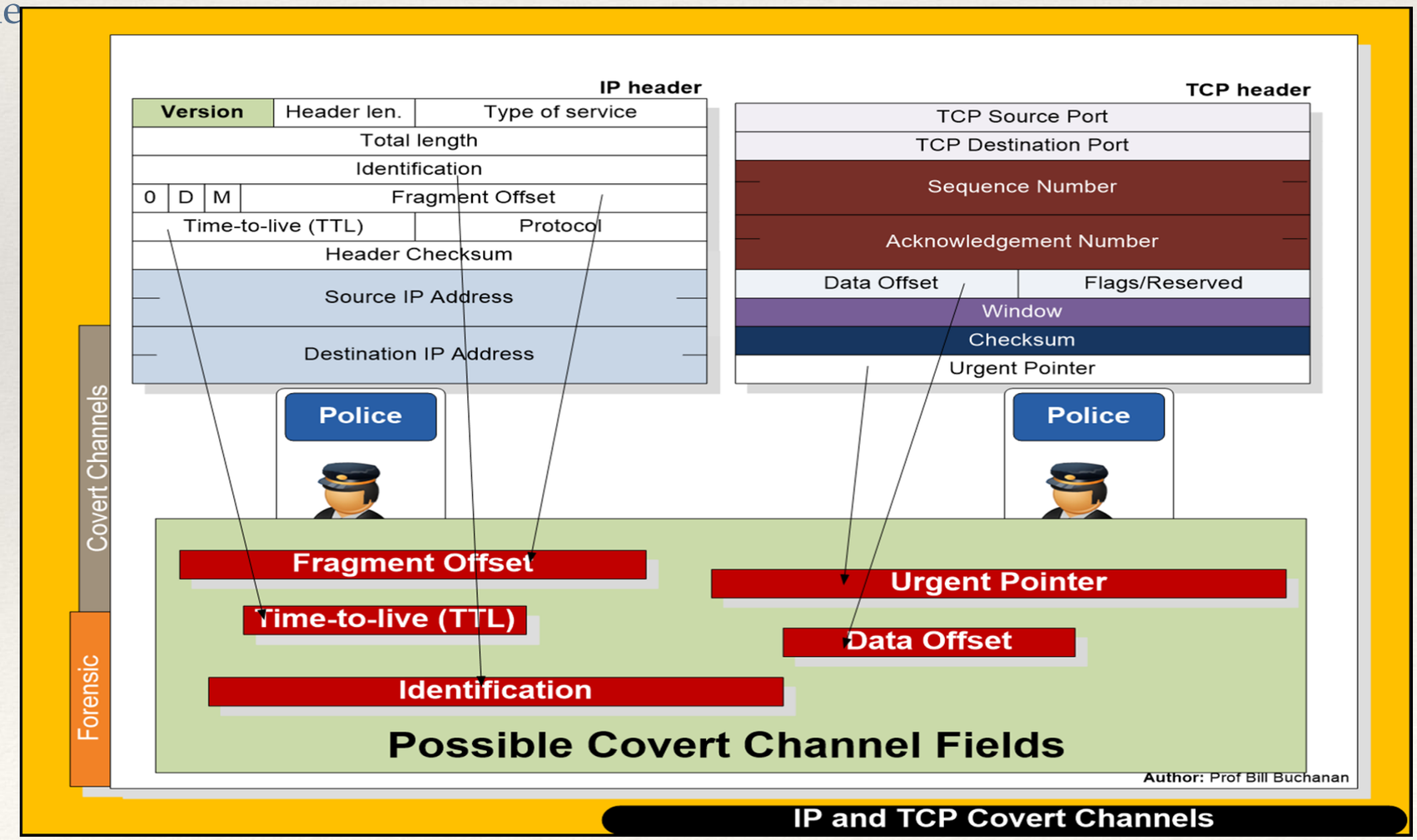
- Victims are redirected toward the Sundown landing page
- The page retrieved and downloaded PNG images.

Destination	Dest Port	Protocol	Host	Cont	Info
50.62.37.1	80	HTTP	activaclinics._		GET / HTTP/1.1
93.190.143.82	80	HTTP	hco.huc.mobi		GET /index.php?z3HbOH2_tdcCHS-bjw=uHq=
93.190.143.82	80	HTTP	hco.huc.mobi		GET /7/?9643522803 HTTP/1.1
93.190.143.82	80	HTTP	hco.huc.mobi		GET /7/?947545190441&id=265 HTTP/1.1
93.190.143.82	80	HTTP	hco.huc.mobi		GET /7/?78493521 HTTP/1.1
93.190.143.82	80	HTTP	hco.huc.mobi		GET /bvfhjgejhfrg.png HTTP/1.1
93.190.143.82	80	HTTP	hxrheg.fve.mobi		GET /[illegible].php?id=265 HTTP/1.1

- PNG file data is encoded and hides malicious code within it
- The Sundown kit landing page contains a decoding routine that unlocks the PNG file and extracts the malicious content.

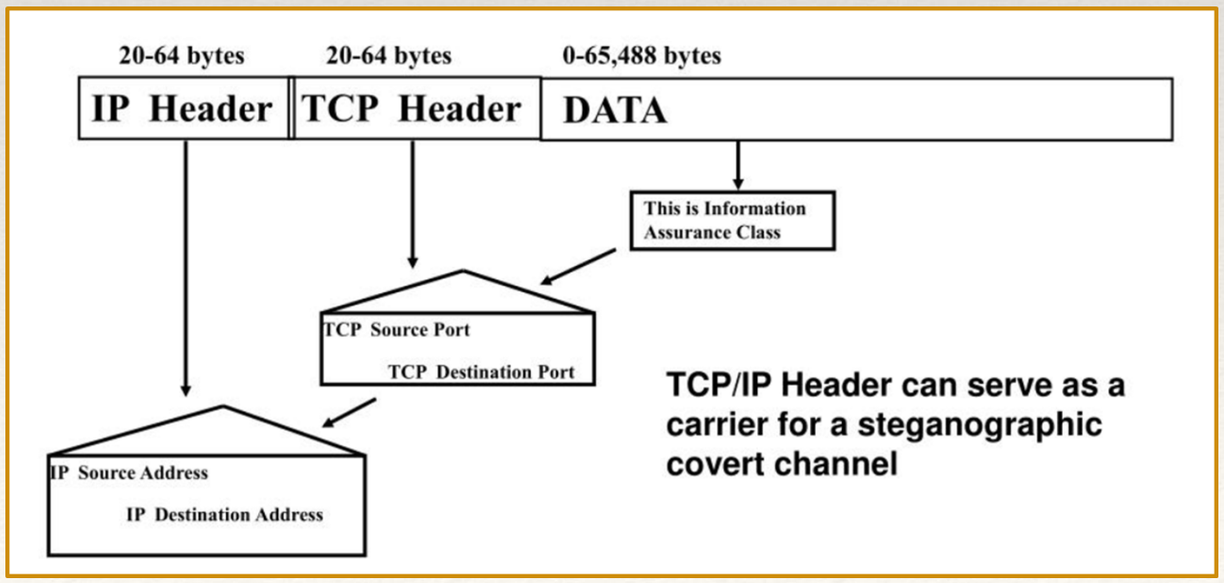
Protocol Based Steganography

- **Network steganography** is the newest form of this discipline
- Unused fields within the **TCP/IP protocol header** are used to hide data.
- This method is on the rise because attackers can send an unlimited amount of information through the network using this technique



Protocol Based Steganography

- Within each subsequent packet that is that is transmitted using the **TCP/IP protocol**, there is a "header" area which provides information about the packet, such as its size, identification and IP address.
- Within each **header**, there are a multitude of areas that are not used for normal transmission or are "optional" fields to be set as needed by the sender of the data
- These areas can be exploited and used for concealing information in the **packet headers**.
- The actual message being transmitted would be considered the carrier file since the information to be hidden is embedded within the **packet header**.
- The intended recipient would simply need to capture these **packet headers** and to reveal the hidden information.



Sources

https://securityintelligence.com/steganography-a-safe-haven-for-malware/

https://securelist.com/steganography-in-contemporary-cyberattacks/79276/

https://null-byte.wonderhowto.com/how-to/introduction-steganography-its-uses-0155310/

https://www.mcafee.com/enterprise/en-us/assets/reports/rp-quarterly-threats-jun-2017.pdf