Tell Me Your IP and I Will Tell You Who You Are

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Agenda

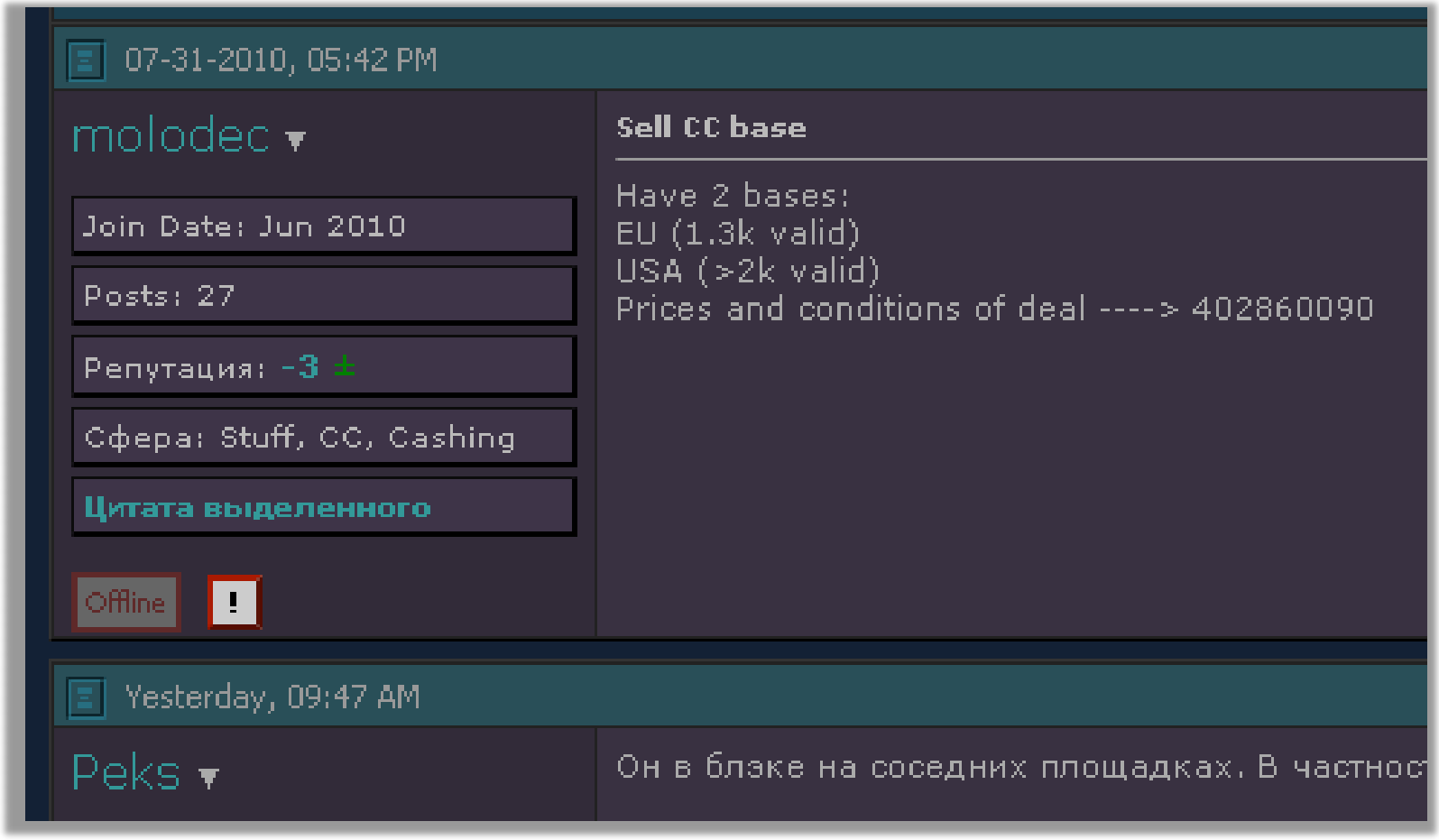
- Different attacks, different sources
- Applying IP Intelligence – determining what, how and why
- Your IP Intelligence toolbox
- Summary

Data At Risk

Total publicly stolen data records by external hackers in the US since 2005.

Source:
http://www.privacyrights.org/ar/ChronDataBreaches.htm#2

The Value of Data



The Rise of Industrialized Hacking

Roles

Researching Vulnerabilities
Developing Exploits
Growing Botnets
Exploiting Targets
Consuming

Optimization

Direct Value – i.e. IP, PII, CCN
Command & Control
Malware Distribution
Phishing & spam
DDoS
Blackhat SEO

Automation

Growing Botnets and Exploiting Vulnerabilities
Selecting Targets via Search Engines
Templates & Kits
Centralized Management
Service Model

It's Not Going to Stop

The amount of money rolled in the hacking industry.

Source:
Joseph Menn, **Fatal System Error: The Hunt for the New Crime Lords Who Are Bringing Down the Internet, January 2010**

More Hacking Motivations - Competitors

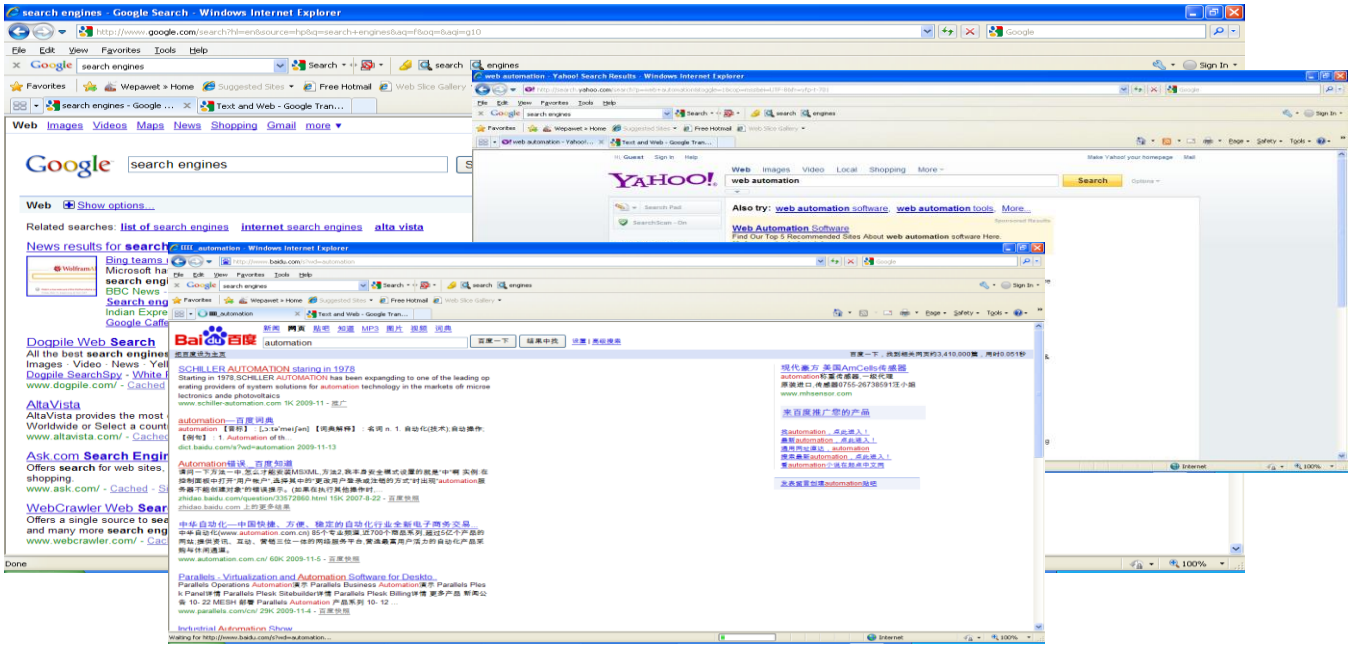
- Data theft
  - Intellectual property
  - Company secrets
  - Business plans
- Blackmail
  - Employee details
  - Company tradings
  - DoS
- Corporate espionage

More Hacking Motivation – Nation States

- Advanced Persistent Threats (APT)
  - Politically motivated
  - Cyber-warfare
  - Government espionage
- When Hactivism Meets Industrialization
  - Stuxnet?!

Different Hack Sources – Common Ground

- Formalized Attack Tools
- Formalized Attack Services
- Automation



The Security Solution

- Quickly prevent the "Known Bad"
- Focus analysis on the "Unknown Bad"
  - Mixture of sources
  - Different threat levels
  - Varied sophistication

IP Addresses - First Impression (1)

- Connection Aggregators
  - Large organizations, ISPs
  - A single IP represents a group of unrelated sources

IP Addresses - First Impression (2)

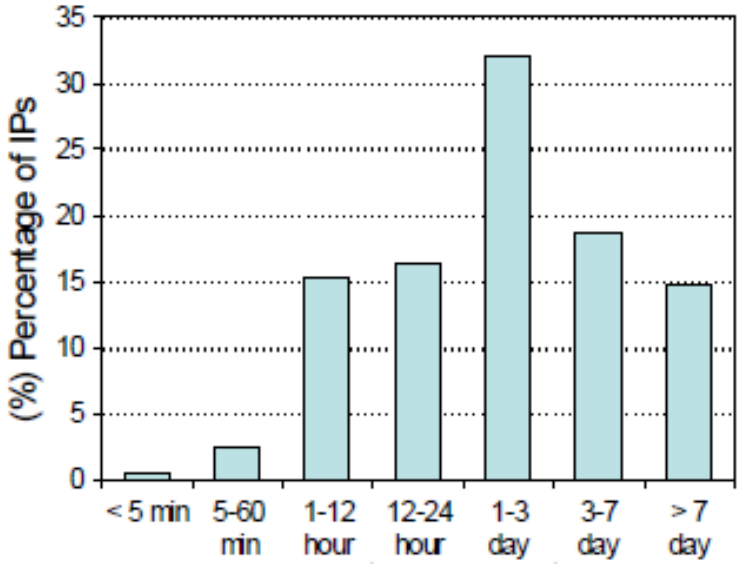
- Masquerading
  - Proxies, relays, TOR
  - The IP address does not represent the true source

IP Addresses - First Impression (3)

- Hopping
  - Dynamic allocation
  - Attacker can alternate between addresses during a single session

IP Addresses – On a Second Look (1)

- Persistent connections for home users (Cable, DSL)
  - 65% of dynamically allocated addresses persist for more than a day
  - 15% for more than a week



Source: http://research.microsoft.com/pubs/63680/sigcomm07-onefile.pdf

IP Addresses – On a Second Look (2)

- Many attacks do not go through aggregators (i.e. home users)
  - IPv4 is still not exhausted
    - <15% of available IPv4 addresses were used in Q3 2009 (Akamai)
    - Only 60% of available addresses are allocated with a growth rate of 11% per year (IP2Location)
- Not all hopping activity matters
  - Usually within the same country or area
- IPv6?

Introducing IP Intelligence

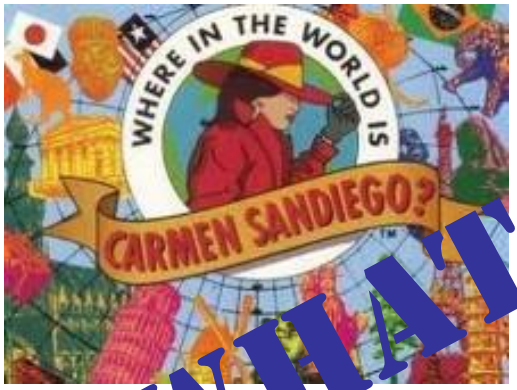
- What IP Intelligence is:
  - **Gather information** – obtain enough information about individual IP addresses
  - **Analyze retrieved information** – analyze what can be used to assist in security decisions and influence them
  - **Apply Intelligently** - apply the information in automated decision engines or manual forensic analysis

Gathering IP Information

- Inherent Information
  - Type of allocation (Dynamic/ Static)
  - Ownership (ISP/ Individual)
  - Geo Location
- Reputation-based
  - Known infections
  - Reported nefarious behavior

Aspects of IP Intelligence

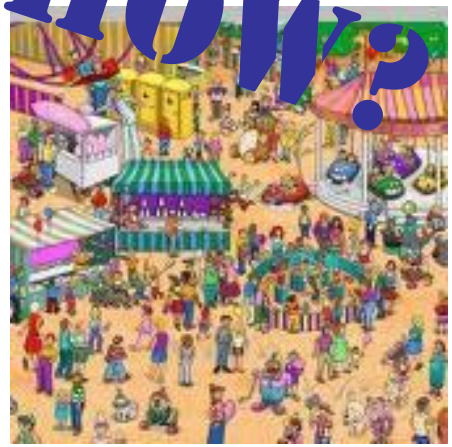
Geo Location



WHAT?

Connection and Allocation Attributes

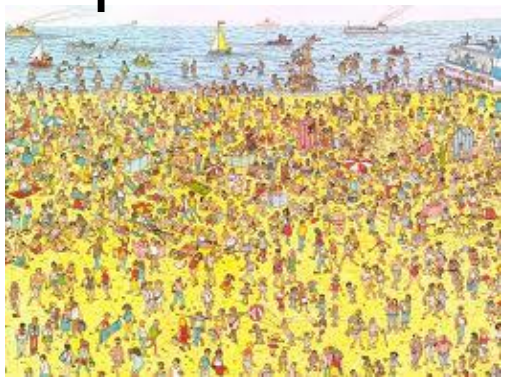
HOW?



Thwarting masquerading

WHY?

Reputation

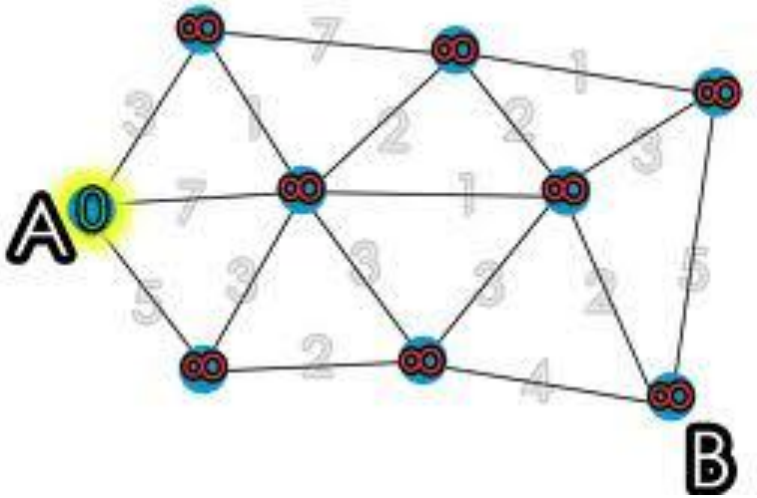


Geo Location - What

- Assign a physical geographical location to a network address
- Different levels of granularity
  - Country (usually reliable)
  - City ("Greater Area")
  - POP

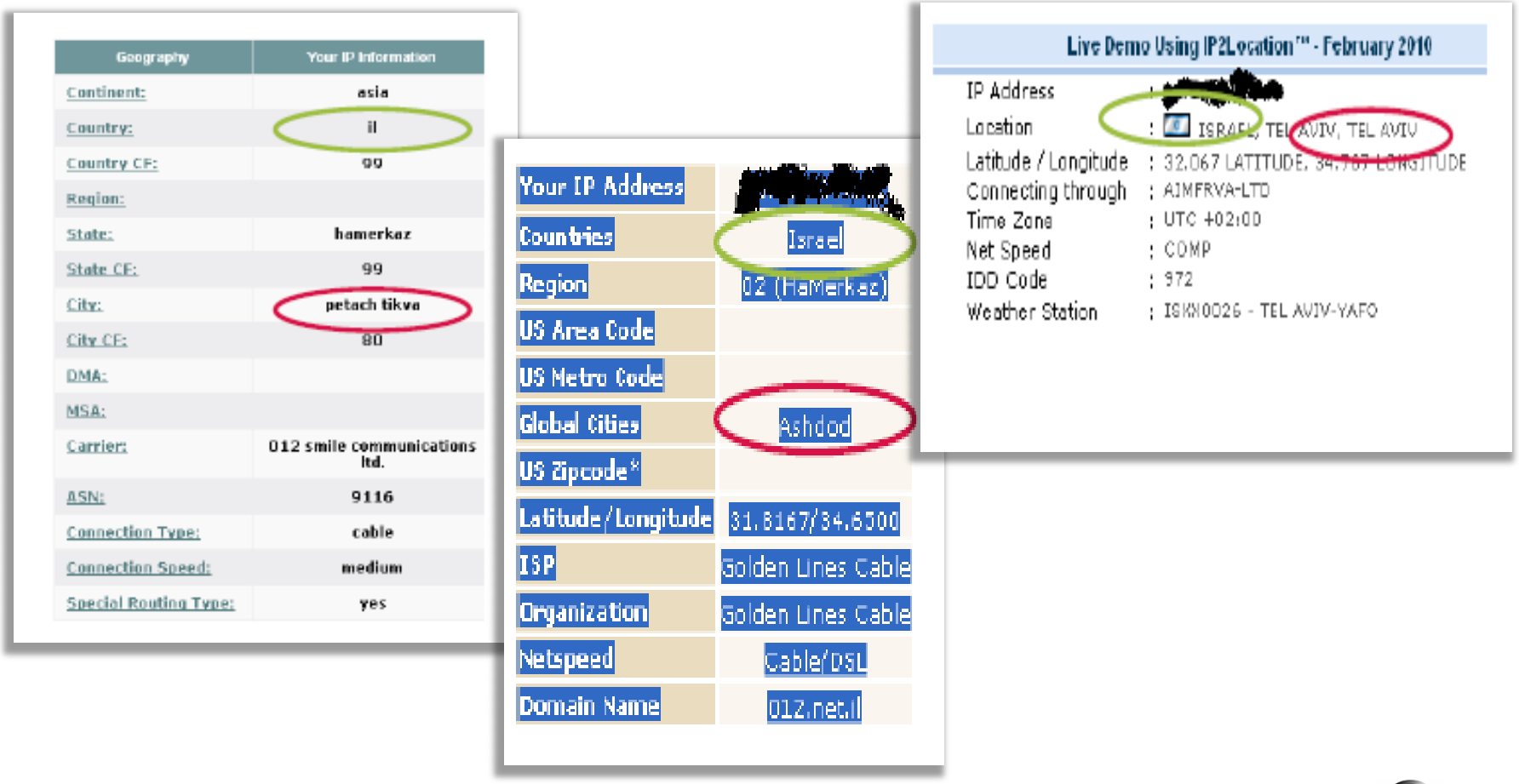
Geo Location – How (1)

- Explicit Registrar Information
- Network Analysis
  - Route
  - Timing



Geo Location – How (2)

- Degree of Accuracy



Geography	Your IP Information
Continent:	asia
Country:	il
Country CF:	99
Region:	
State:	hamerkaz
State CF:	99
City:	petach tikva
City CF:	80
DMA:	
MSA:	
Carrier:	012 smile communications ltd.
ASN:	9116
Connection Type:	cable
Connection Speed:	medium
Special Routing Type:	yes

Your IP Address	[redacted]
Countries	Israel
Region	02 (HaMerkaz)
US Area Code	
US Metro Code	
Global Cities	Ashdod
US Zipcode*	
Latitude/Longitude	31.8167/34.6500
ISP	Golden Lines Cable
Organization	Golden Lines Cable
Netspeed	Cable/DSL
Domain Name	012.net.il

Live Demo Using IP2Location™ - February 2010

IP Address	[redacted]
Location	ISRAEL, TEL AVIV, TEL AVIV
Latitude / Longitude	32.067 LATITUDE, 34.767 LONGITUDE
Connecting through	AIMFRVA-LTD
Time Zone	UTC +02:00
Net Speed	COMP
IDD Code	972
Weather Station	ISXX0026 - TEL AVIV-YAFO

Geo Location – Why (1)

- Business Logic Attacks
  - Unexpected geographic locations
  - Functionality limitations
    - EU regulations restrict access of personal information from outside the EU

Geo Location – Why (2)

- Fraud Detection
  - Unusual geographic locations
  - Simultaneous access from different locations
  - Account differences
    - Physical location
    - Shipping
    - Billing

Geo Location – Why (3)

- Analyze distributed attacks
  - Manually or automatically
  - Examples:
    - Scalping Attack
    - Comment Spam

Geo Location – Why (4)

- Influence Fuzzy Decisions
  - Flag as: suspicious, malicious or benign
- May require further investigation
  - Adaptive authentication
  - Reduced functionality

Connection and Allocation - What

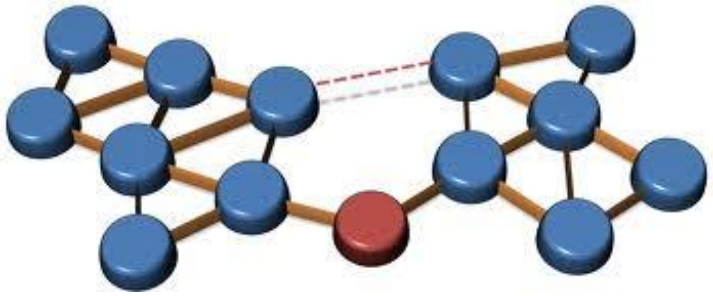
- Allocation
  - Dynamic
  - Static
- Connection
  - Dial-up
  - Cable
  - T1
- Speed

Connection and Allocation - How

- Network Analysis
  - Route
  - Timing

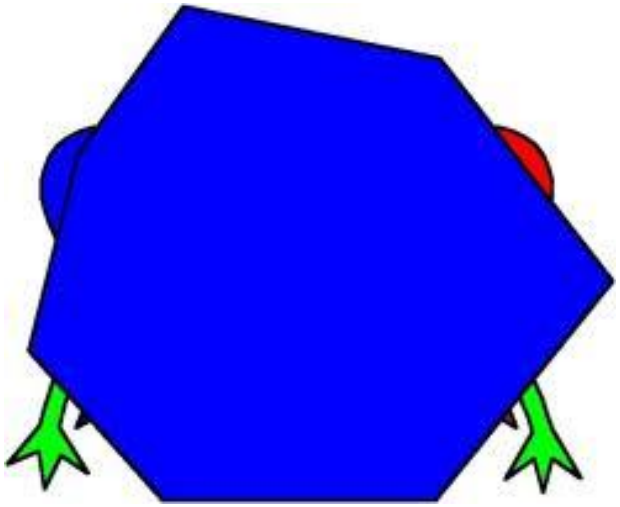
Connection and Allocation – Why

- Dynamic allocations are usually not servers
  - According to Microsoft the vast majority (96%) of SMTP traffic originating from dynamically allocated addresses is spam.
- Dynamic allocations are usually not aggregators
  - Easier to detect brute force attacks
  - Expected application events rate is low
    - Regardless of connection speed



Thwarting Masquerading - What

- Identify attackers hiding their true source
- Hiding places
  - Network relays (SOCKS Proxy)
  - Anonymous proxies
  - TOR network (Onion routers)



Thwarting Masquerading – How (1)

- Blacklist known IP masquerading addresses
  - TOR servers
  - Anonymous proxy computers

Thwarting Masquerading – How (2)

- Detect discrepancies between information implied by IP address and the actual request
  - "Accept Language"
    - Value is local (en-us) but address is foreign
    - Value is foreign but address is local
  - Response time
    - In accordance to what is implied by location
  - Abnormal path
    - Analyze BlueCoat headers

Thwarting Masquerading – Why

Reputation – What (1)

- Listings of IP addresses with bad reputation
  - Compromised servers
  - Botnet C&C servers
  - Infected servers
  - Infected computers
  - Active spam sources
  - Crawlers
  - …

Reputation – What (2)

- Listings of IP addresses with impeccable reputation
  - Legitimate search engine bots
  - Aggregators (Akamai, Limelight)

Reputation – How

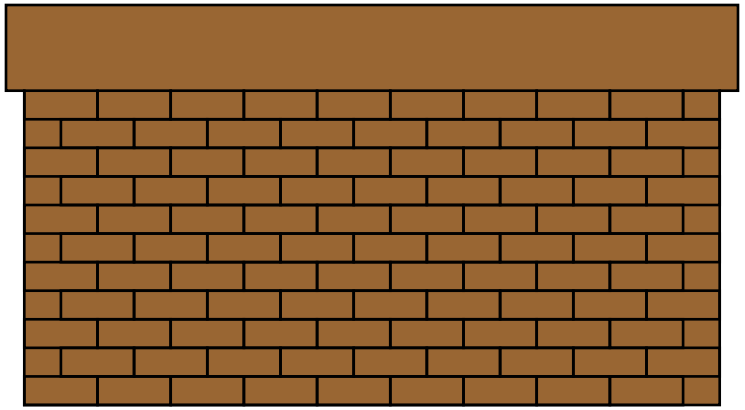
- "Real-time" feeds for blacklists
  - Information should be updated and queried with high frequency (at least hourly)
  - Aging mechanisms must be applied
- Honeypots
- Community effort
- Dynamic Allocation
  - Usually static for days

Reputation – Why (1)

- Form spam / Comment spam
  - Identify potentially vulnerable resources
  - Block access by known active spamming sources
- Business Logic Attacks
  - Reduced functionality for known infected sources
  - Require extended authentication

Reputation – Why (2)

- Automation
  - Challenge for anti-automation
- Block active attack sources
  - 0-days can be blocked based on who is actually using them.



IP Intelligence Tools

Geo Location Tools (1)

- Two major form factors
  - Online service
    - Forensic analysis
    - Non-stream applications (email)
    - e.g. Quova
  - On-premise database with API
    - Online security decisions
    - e.g. Maxmind

Geo Location Tools (2)

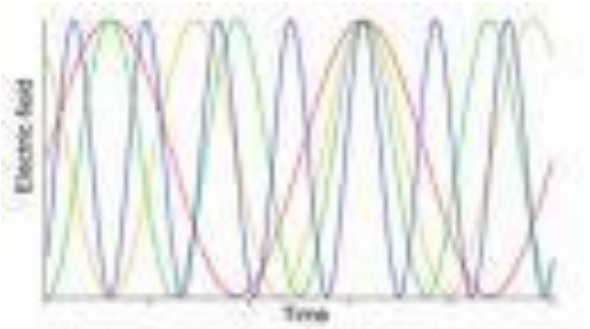
- Different levels of granularity
  - Connection and allocation
  - Proxy detection

Reputation Data (1)

- Multiple providers
  - Different data sets and information
  - Specialize towards specific type of malicious activity
    - Spam
    - Botnet
    - …
- Data provided in various forms
  - Web Service
  - Incoming feed
  - On premise database/ appliance shielded by an API

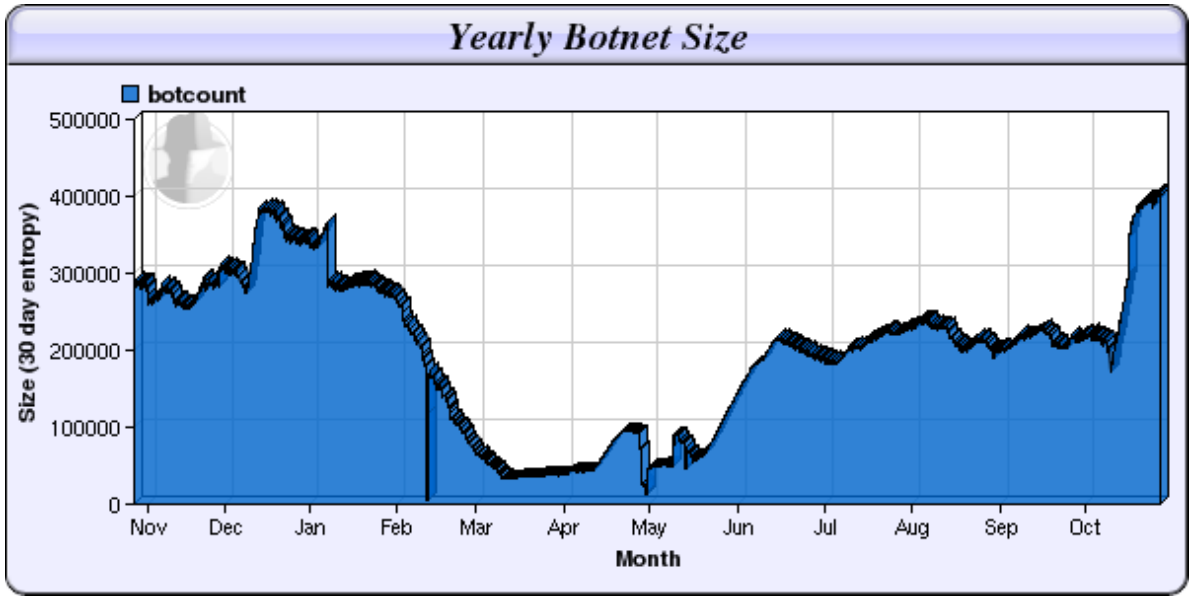
Reputation Data (2)

- Various data attributes
  - Raw data – use with discretion
  - Processed data
  - Gradual score
- Data includes various indicators
  - A measurement for intensity of malicious activity
  - Activity duration information (last seen, first seen, etc.)



Reputation Data (3)

- Non-commercial sources
  - Dshield (www.dshield.org)
  - ShadowServer (www.shadowserver.org)



Reputation Data (3)

- Commercial providers
  - Verisign (iDefenceLabs)
  - RSA
  - McAfee (TrustedSource)
  - CommTouch
  - ThreatMetrix
  - Cyveillance
  - Unspam

Putting It All Together

IP Intelligence – Step #1

- Incorporate IP Intelligence into your security process
  - Geo Location as a forensic tool
  - Incorporate Geo Location into many frameworks
    - Supported by log aggregators
    - SIEMs can be customized

IP Intelligence – Step #2

- Integrate with IP reputation services at different points
  - Some vendors (FW, WAF) offer it
  - Some reputation vendors offer their own independent solution
  - Most email protection solutions already have their integration out of the box

IP Intelligence – Step #3

- Evaluate which vendor provides the most suitable solution for you
  - Form factor
    - High speed streaming
    - Manual forensic process
  - Focus of data
    - Spam
    - Web attacks
    - Bot infection
  - Data attributes
    - Raw data
    - Processed, scored feed

IP Intelligence – Summary (1)

- Changes in threatscape make the use of IP Intelligence valuable for detecting and mitigating attacks.
  - Quickly identify known bad and keep your focus on complex issues
  - Mitigate 0-day attacks before they are well-analyzed and have specific protection
  - Fight online fraud with tools that help evaluate transactions and user behavior.

IP Intelligence – Summary (2)

- Commercial tools of various shapes and different purposes are available
  - Some are forensic analysis-oriented. Others can integrate with online security devices
  - Some vendors provide packaged solutions

Q & A

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