
AVG
Fighting Malware
How AV companies fight malware,
How malware fights AV companies,
And why…
Karel Obluk, Chief Scientist, AVG Technologies

Agenda

- Malware history
- Virus detection in a nutshell
- Current threats
- Fighting malware nowadays
- Web Threats
- Behavior Monitoring
- Mobile Malware

Malware History

- Good old times
  - 1987 – cca 1995
  - DOS viruses
  - Spreading fast – how fast? Within a month! Wow!
  - File infectors, memory-resident viruses, boot-sector viruses
  - E-mail? What e-mail?
  - No Linux viruses
- Windows
  - 'Eradication' of DOS viruses (well, not really)
  - Macro viruses – until the release of Office 2000
  - E-mail? Who uses e-mail?
  - First Linux virus (Staog – 1996)

Malware History - continued

- Mass-mailing worms
  - Cca 1999 – 2004
  - Who loves me? Hot tennis players…
  - E-mail scanning on gateways
  - ISPs scanning mails
- Bots and Worms, direct attacks
  - Cca 2001 – 2004
  - CodeRed anyone?
  - Directly attacking PCs
  - Windows XP SP2 released – with firewall on by default (and some other patches)
- Web based attacks
  - That's where the fun begins…
- And going mobile…

Why?

- First PC viruses:
  - Playing melodies
  - Screen effects
  - Computer freezes
  - Political statements
  - Erasing data
  - Blackmailing
- First virus authors:
  - Demonstrate skills

- Now:
  - **REAL MONEY!**

Why? Money Talks!

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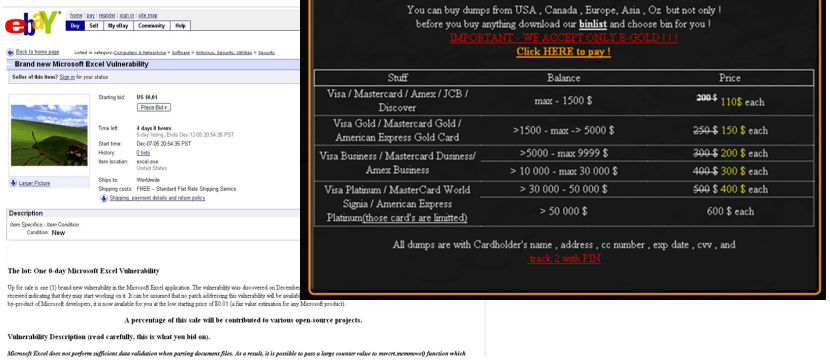
Why? Money Talks!

- Get sensitive data
  - Access codes, passwords
  - Confidential information
- Bank accounts, credit card info
- Spying on you
- Industrial espionage
- Controlling your PC
  - SPAM *(Jeremy Jaynes, $24M, 9 years)*
  - Direct attacks – DDoS *(Estonia, 2007)*
  - Attacking other infrastructure
  - Anonymizing attackers
  - Hosting illegal content

Money Talks

- Highly profitable business
- Selling data, personal information
- Fraud As A Service



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All dumps are with Cardholder's name , address , cc number , exp date , cvv , and track 2 with PIN

Malware, Viruses

- Virus:
  - *"A virus is a program that is able to infect other programs by modifying them to include a possibly evolved copy of itself"*

    Dr. Frederick Cohen, 1994
- Worm
- Trojan Horse, Dialer, Spyware, Adware…
- Infection types
  - File infectors
  - Boot sector, MBR
  - Deep integration into the hosting OS – register system extensions, redirect system functions, DNS changes, …

Virus Detection in a Nutshell

- Integrity checkers
  - First integrity checkers – file dates, …
  - Stealth techniques made it useless for virus detection
  - Even in DOS times (memory resident viruses, …)
  - Still useful as part of IDS
- Innoculation
  - And why it is a stupid idea
- Checksums
  - And how they can be defeated
- Too many files for a user to decide
- Document infection, media files, scripts, …

Virus Stealth Techniques

- Redirecting system calls, boot sector infection
- Preserving time stamp and file size
  - Compression
  - (Mis-)using file system structures
- Hiding within files (parasitic viruses)
  - Cavity viruses
  - Compressing viruses
  - Embedded decryptors (One_Half, Commander_Bomber)
  - Entry-Point Obfuscation (EPO)
- Avoid detection
  - Not trying to be stealth, rather avoid signature detection
  - Encryption
  - Server-side polymorphism

Current Threats

- File infectors still exist, but significantly fewer
- Files infecting the system
  - OS too complex for a typical user – social engineering
  - Deep integration in the system
- Social engineering attacks
  - Codecs, Rogue antivirus products
- Rootkits
  - MBR rootkits
  - virtualization
- Spearheaded attacks
- Combination of several techniques
- **HUGE** number of threats

Web Threats

- World War Web
  - Web currently the primary attack vector
- HTTP <=> GFBP
  - Generic Firewall Bypass Protocol
- Connection is made from the client
- Client actively downloads content
- Active content, lots of different data sources
- Browsers try to offer rich user experience

Web Threats

- Users nowadays somewhat educated – not to launch attachments, not to run unknown programs
- But visiting web sites is normal
- Nobody expects a 'trusted' website to be infected
- The result
  - Exploits for browsers, applications, OS
  - Social engineering attacks
- Exploit packs available

Even a security expert cannot – without proper tools – tell for sure if a website is safe

Social Networks

- Increasingly popular attack vector
- Key issue is **user trust**
  - *"I am among friends here!"*
  - *"What a great application this must be if Ian is using it!"*
- Not accessible to security crawlers
- Extremely fast spreading
- Combined with phishing / spam
- Social engineering techniques

Social Engineering

- Most popular type of attack
- 5x more attacks based on SE than exploits
- Rogue AV lead the pack
- Survey on social networks:
  - 21% users accept invitations from people they don't know
  - 52% allow their friends to access social networks from their computer
  - 64% will click on a link shared by others
  - 47% have experienced malware infection
  - 20% have experienced identity theft

- **EDUCATION!**

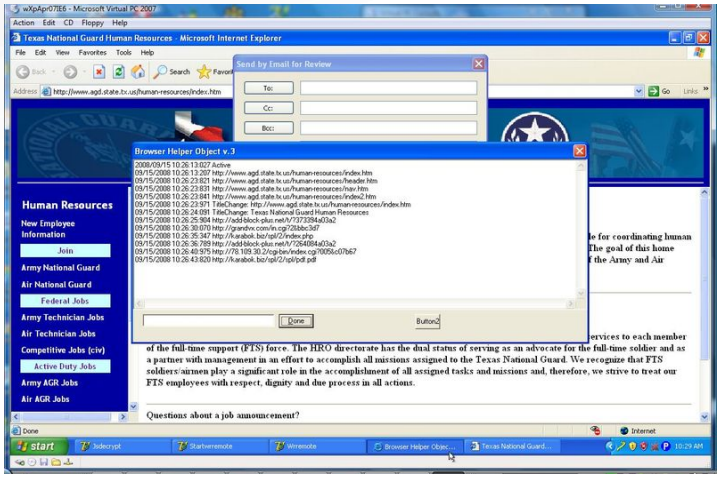
Some Numbers

- 1 out of 5 users infected every week
- 60 – 70 million detections every day
- 30 – 40 thousands new viruses every day
- More than 85% threats coming from web
- More than 85% web threats exist **< 1 day**
- 10 million sites blocked by AVG every day

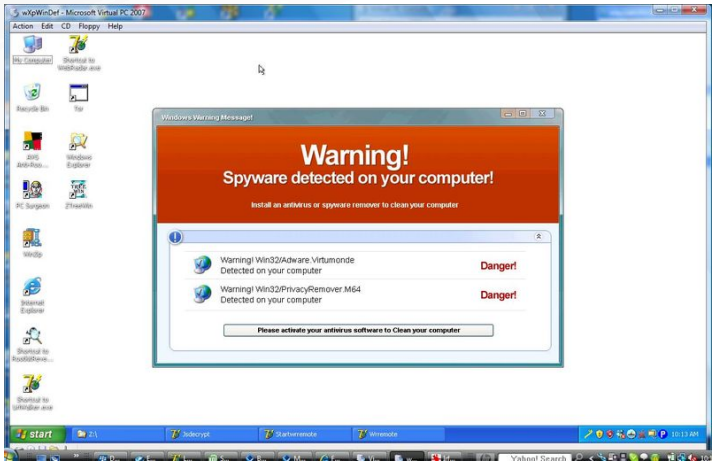
- Income from a single botnet $11,000 a day

Web Threats

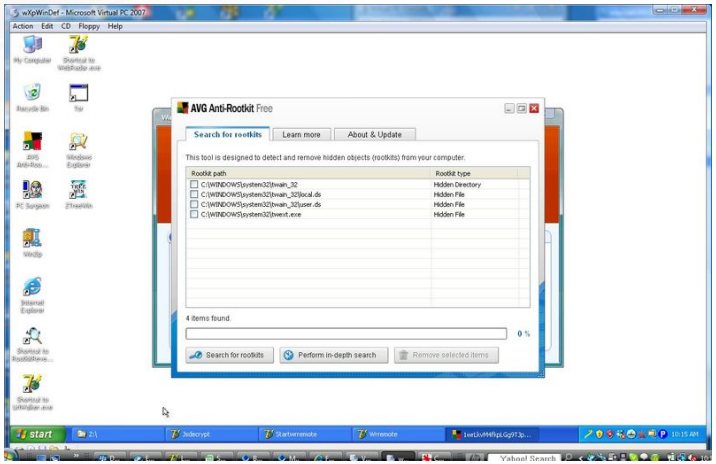
Web Threats – Texas NG



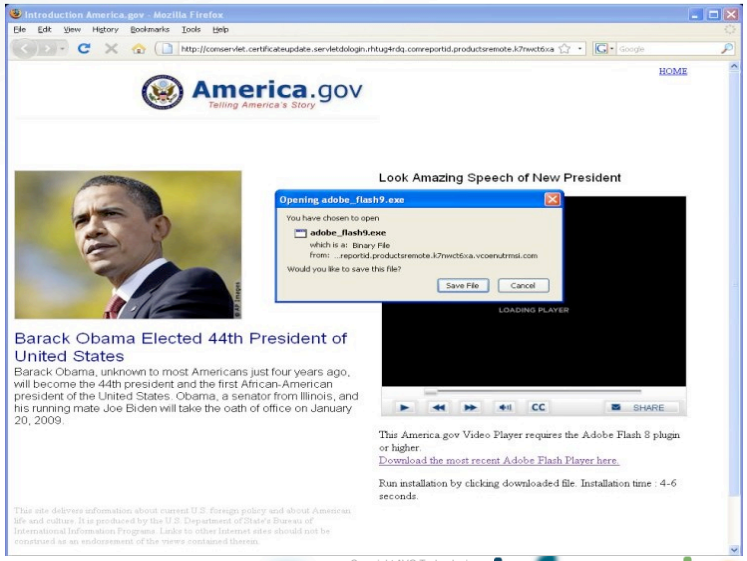
Web Threats – Texas NG



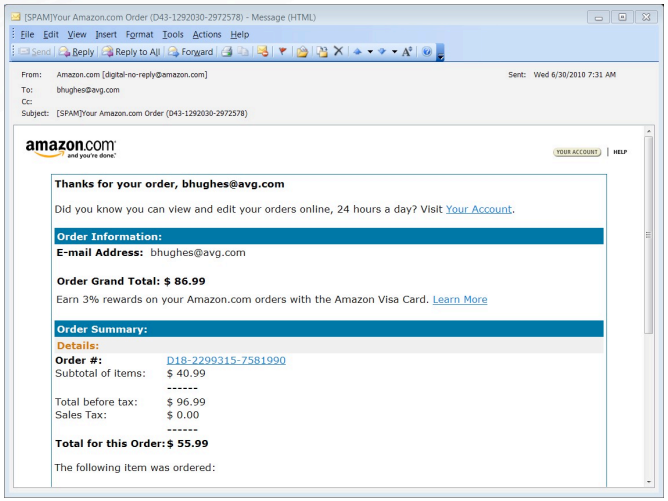
Web Threats – Texas NG



Web Threats – codecs



Fake e-mails



Fighting Malware Nowadays

- Simple checksums – ineffective since early 90s
  - Even though some 'antispyware' products used it
- Simple pattern matching – ineffective since early 90s
  - Even though some 'antimalware' products still use it!!!
  - Cannot cope with polymorphism, file infectors, new threats
- Sequences, generic detection
  - Similar to regexp but designed for code detection
- Patterns/checksums over some code ranges
  - Definition contains instructions on 'where to look', algorithmic

Fighting Malware Nowadays

- X-ray detections (cryptographic)
- Statistical methods
- Heuristics
- Emulators
  - Built-in virtual machine
  - Each executable run within this machine, observing actions and events
  - Also used to defeat encryptors or packers – scanning after some emulation (code decrypts itself)
- Behavior – not to be mistaken for emulation and heuristics!
  - More on behavior later

Detecting Web Threats

- Billions of web sites on the Net
- Database of good sites?
  - Huge! Ask Google
- Database of bad sites?
  - Inefficient! Ask Google
- Bad sites are highly transient
- Some threats active only at specific times
- Database approach:
  - Obsolete for most of threats
  - Outdated information for cleaned sites

Detecting Web Threats

- Threats are avoiding detection
  - Goal – maximize return on investment
  - Keep machines infected for as long as possible
  - Delay AV detection as much as possible
- Controlled distribution
  - Keeping below the radar, < 10k installations then different malware
- Avoiding crawlers
  - Different content for different geographies, IP blocks
  - Different content for different clients, marking clients
  - Different content based on where the user comes from
- Infected content in protected areas (behind login)
- Dynamically generated content, 3rd party content

Detecting Web Threats

- Detecting content!
  - Cca 40k new unique malware files / day
  - Only about 1000 exploits
- Centralized vs distributed approach
- Seeing what clients see

- Legitimate pages serving malware through 3rd party content
- Blended threats
  - Combining information theft with malware infection
  - Infrastructure attacks – DNS, fake certificates, …

Behavior Monitoring

When web threat gets in …
… or when user is tricked to launch malware …
… and signature scanner does not detect it …
the malware gets active!

Sending sensitive data, getting instructions from C&C, attacking other systems, …

- Behavior monitoring collects information about active processes
- Evaluates suspicious behavior
- Reports and remediates

Behavior Monitoring

- The good
  - Can detect completely new malware
  - Small footprint – very small database of rules
  - Detects what matters
- The bad
  - Cannot detect file infectors
  - Focused on malicious processes only
  - Lots of false positives

Let’s Go Mobile

- Mobile devices = ideal attack target
- Always online, increasing computing power
- Social engineering methods especially efficient
- New forms of monetization
  - Premium SMS
  - PIN and authentication eavesdropping
  - Sensitive data, GPS
- Android currently the most endangered

Android

- Not just mobile platform – GoogleTV etc.
- Very popular, also among developers
- Very well documented, based on Linux
- More open than iOS
  - Open appstore, yet high degree of trust
- Already numerous exploits
- Many attack vectors
- Need to check number of different data formats (media, wallpapers, …)
- Permission system does not guarantee 100% security
  - Known exploits, user is the weakest link

Some interesting attacks

- Estonia - 2007
  - Whole country without internet connectivity, economy severely damaged. DDoS, botnets as well as 'volunteers'
    http://en.wikipedia.org/wiki/2007_cyberattacks_on_Estonia
- Georgia - 2008
  - Severe disruptions in connectivity, attack on network infrastructure re-routed traffic. Performed and coordinated by RBN ('Russian Business Network)
    http://en.wikipedia.org/wiki/Cyberattacks_during_the_2008_South_Ossetia_war
- SCADA systems - 2010
  - Iran: Stuxnet worm, spread via USB sticks, focused on specific industrial equipment
  - Similar bugs discovered in Chinese SCADA systems (different vendor) – no known exploits
- Unintentional(?) attacks on the infrastructure
  - Hospital networks infected: London 2008, New South Wales Ambulance 2011 - http://www.bartsandthelondon.nhs.uk/formedia/press/release.asp?id=2077
    http://www.smh.com.au/technology/security/nsw-ambulance-service-back-online-after-virus-infection-20110214-1asv1.html
  - Power plant systemts infected: Cleveland 2003 - http://www.redorbit.com/news/technology/8586/computer_virus_may_have_caused_blackout/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