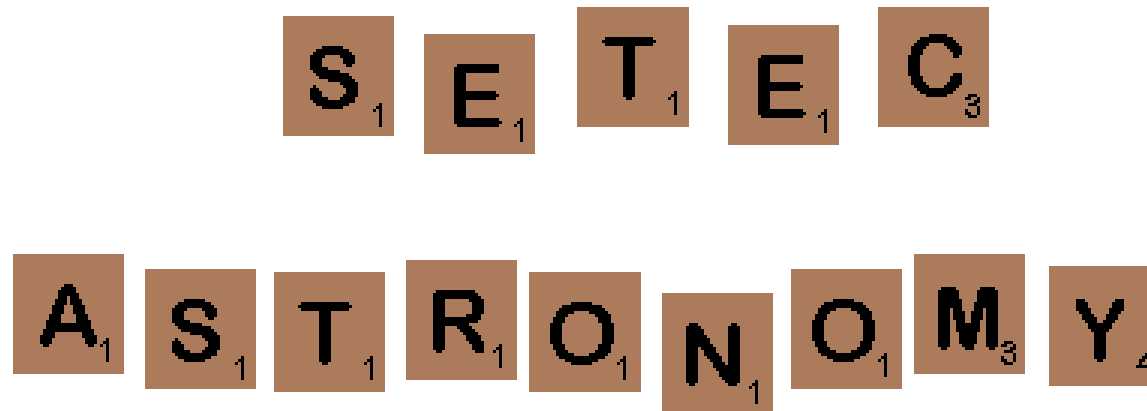




Summary of Recent Pervasive Monitoring Threats

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Potential Threats

- We do not know what exactly has been done
 - Some might be real
 - Some might be pure speculation
 - Some might be research about what could be done in the future
- That said, we can try to reason about *potential* threats
- Allegations often generate demand to defend against threats

“Targeted” vs. “Pervasive” Monitoring

- Targeted: surveillance with a limited scope, e.g. a specific individual
- Pervasive: blanket surveillance, e.g. all users
- To paraphrase Bruce Schneier:

pervasive monitoring often seen as easier than targeted monitoring

- Bruce calls for goal to reverse this
- Goal of privacy mechanisms is usually:

Cost to get the information > Value of the information

Goal of surveillance is to collect information

- Common reasons given
 - Surveillance saves lives, combats crime
 - Surveillance used to protect against viruses, spam, hackers
 - Surveillance protects against information leaks (e.g., corp firewall)
- Information may or may not be encrypted
 - If so, goal is to get decrypted information
- Types of information
 - **Data:** files, email content, phone conversations, chat logs, etc.
 - **Metadata:** address, location, timestamps, size, keywords, etc. about data or traffic
 - **Keys:** secrets needed to decrypt data or metadata, or to impersonate
 - e.g., in order to collect more data via man-in-the-middle

Multiple strategies discussed in news

- I. Overly get a cooperating entity with access to hand over info
E.g. government may legally compel an entity within jurisdiction
- II. Subvert a general service (serving many users) and covertly collect the information
Often easier than overt mechanisms
- III. Subvert target's system and covertly collect the information

Multiple ways to get secret/private keys

- a) Obtain secret keys directly
- b) Lower entropy used to generate keys, in order to more easily break them
- c) Use existing known weaknesses

Multiple points of influence

1. Trusted roots & certificate authorities (e.g. DigiNotar)
2. Software creators & distributors
3. Data repositories (e.g. PRISM)
4. Protocol/algorithm designers (e.g. Dual_EC_DRBG)
5. Network operators (e.g. QUANTUM)
6. Physical fiber, wireless tower, satellite, etc. owners (e.g. MUSCULAR)
7. Hardware designers & factories (esp. with IoT)

Security/privacy is only as strong as the weakest link

Just about every combination of
the last three axes is interesting

1. Trusted roots & certificate authorities

- Could get a fake cert from less trustworthy/compelled/compromised one
 - <https://www.net-security.org/secworld.php?id=15579>
- DigiNotar compromised, issued certs that were then used for impersonation
 - <http://www.net-security.org/secworld.php?id=11555>
- Flame used older cert issuing software to issue bad cert to spoof Microsoft
 - <http://blogs.technet.com/b/msrc/archive/2012/06/03/microsoft-releases-security-advisory-2718704.aspx>
- Debugging tools like Fiddler add another trusted root in order to act as man-in-the-middle and decrypt SSL
 - <http://security14.blogspot.com/2010/07/how-to-use-fiddler-and-wireshark-to.html>

2. Software creators & distributors

- Random number generators in code often unsafe, enables dictionary attacks or compromising a host with a weaker duplicate key
 - [“There no need to panic over factorable keys – just mind your Ps and Qs”](#)
- Compromised crypto APIs might leak key bits via fields that look random but actually relate to key
 - <http://www.metzdowd.com/pipermail/cryptography/2013-September/017571.html>
- Anonymity tools like Tor shift focus to attacking vulnerable software (e.g. browser), influencing development of such tools, or disrupting them to force using something else
 - <http://www.theguardian.com/world/2013/oct/04/nsa-gchq-attack-tor-network-encryption>
 - https://www.schneier.com/blog/archives/2013/10/how_the_nsa_att.html
- Checkin without sufficient review could introduce security backdoor
 - <https://freedom-to-tinker.com/blog/felten/the-linux-backdoor-attempt-of-2003/>
- Could be coerced into building in backdoors or handing over keys
 - http://www.upi.com/Top_News/US/2013/09/06/Documents-show-NSA-can-crack-most-Web-privacy-encryption/UPI-60871378450800/
- Could “Insert vulnerabilities into commercial encryption systems, IT systems, networks, and endpoint communications devices used by targets”
 - http://www.nytimes.com/interactive/2013/09/05/us/documents-reveal-nsa-campaign-against-encryption.html?_r=0

3. Data repositories

- Could be compelled to hand over information, including secret key
 - <http://www.theguardian.com/world/2013/jun/12/microsoft-twitter-rivals-nsa-requests>
- Concerns over cloud storage also negatively affect such companies, e.g. Lavabit
 - http://www.wired.com/threatlevel/2013/10/lavabit_unsealed
- Other repositories may include airlines, energy companies, financial orgs, ...
 - <http://leaksource.files.wordpress.com/2013/09/nsa-brazil-4.png>
- Bank transfers across borders go through a common system (SWIFT)
 - <http://www.spiegel.de/international/world/spiegel-exclusive-nsa-spies-on-international-bank-transactions-a-922276.html>
- Email metadata with two degrees of separation from target could be obtained
 - <http://www.theguardian.com/world/2013/jun/27/nsa-data-mining-authorised-obama>
- Metadata can be correlated with other records (e.g. hotel guest lists) to identify individuals
 - <http://www.theguardian.com/technology/interactive/2013/jun/12/what-is-metadata-nsa-surveillance>

4. Protocol & algorithm designers

- Potential for products influenced to use crypto known to be breakable, e.g. Dual_EC_DRBG (random number generator) is weak
 - <http://arstechnica.com/security/2013/09/stop-using-nsa-influence-code-in-our-product-rsa-tells-customers/>
- Could “Influence policies, standards and specification for commercial public key technologies”
 - http://www.nytimes.com/interactive/2013/09/05/us/documents-reveal-nsa-campaign-against-encryption.html?_r=0
- Fear of influence over standards by governments or companies
 - <http://policyreview.info/articles/news/technical-community-debates-over-taking-back-internet/215>

5. Network operators

- Could install surveillance at exchange point, customer link, etc.
 - http://www.washingtonpost.com/world/national-security/nsa-infiltrates-links-to-yahoo-google-data-centers-worldwide-snowden-documents-say/2013/10/30/e51d661e-4166-11e3-8b74-d89d714ca4dd_story_1.html
- “Tech firms and ISPs said they were coerced into handing over their master encryption keys or building in back doors”
 - http://www.upi.com/Top_News/US/2013/09/06/Documents-show-NSA-can-crack-most-Web-privacy-encryption/UPI-60871378450800/
- Attacker could hack into router to redirect traffic to man-in-the-middle
 - <https://www.net-security.org/secworld.php?id=15579>
- Could redirect target to website that plants malware, e.g. to subvert target
 - <http://www.spiegel.de/international/europe/british-spy-agency-gchq-hacked-belgian-telecoms-firm-a-923406.html>

6. Physical fiber, wireless tower, satellite, etc. owners

- Could tap links if have physical access
- Even those used by private clouds without knowledge of companies (data repositories, etc.) using them
- Especially if data is not encrypted between data centers
 - <http://www.theguardian.com/uk/2013/jun/21/gchq-cables-secret-world-communications-nsa>
 - <http://www.theguardian.com/world/2013/jun/06/us-tech-giants-nsa-data>
 - <http://www.techdirt.com/articles/20131030/09554125066/nsa-breaks-into-yahoo-googles-data-centers-without-their-knowledge.shtml>
 - http://www.washingtonpost.com/world/national-security/nsa-infiltrates-links-to-yahoo-google-data-centers-worldwide-snowden-documents-say/2013/10/30/e51d661e-4166-11e3-8b74-d89d714ca4dd_story_1.html

7. Hardware designers & factories

- Manufacturer could insert a backdoor into product before shipped to a target
 - <http://www.propublica.org/article/the-nsas-secret-campaign-to-crack-undermine-internet-encryption>
- Can insert hardware Trojans at designer or at factory, e.g. to reduce entropy or leak secret keys
 - <http://people.umass.edu/gbecker/BeckerChes13.pdf>
- Could influence encryption chips used in VPN and Web encryption devices
 - http://www.nytimes.com/interactive/2013/09/05/us/documents-reveal-nsa-campaign-against-encryption.html?_r=0

Summary table (rough)

- Current discussions cover many possibilities
- More combinations are possible

		certs	software	repository	spec	operator	cables	hardware
		1	2	3	4	5	6	7
I. Compel/entice non-target		x	x	x		x	x	
	a) Get keys	x	x	x		x		x
	b) Lower entropy		x		x			x
	c) Insert weakness		x		x	x		x
II. Subvert non-target		x	x	x		x		
	a) Get keys		x					
	b) Lower entropy		x		x			
	c) Exploit weakness	x	x	x	x	x		
III. Subvert target		x	x	x				x
	a) Get keys		x					
	b) Lower entropy		x					
	c) Exploit weakness		x	x				