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Collective Intelligence

Lessons Learned from Physical Tamper-Response Applied to Client Devices

SESSION ID: MBS-F01

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Overview

- What is tampering
- Who/what is vulnerable and where?
- Specific countermeasures
- Framework to evaluate countermeasures
- Lessons learned

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Tampering: The “Evil Maid”

Security is like a layer-cake…

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…Take out the foundations for house of fail

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Attacks on the hardware substrate

- Attacks depending on **physical access**
- Bypass many conventional software security measures
- Hardware security measures relatively weak and outdated
- Invalidate assumptions about scope of system

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Attacker can bypass software protections

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Types of attacks

- Forensic imaging
- Hardware implants
- “Evil Maid”

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Forensic Imaging

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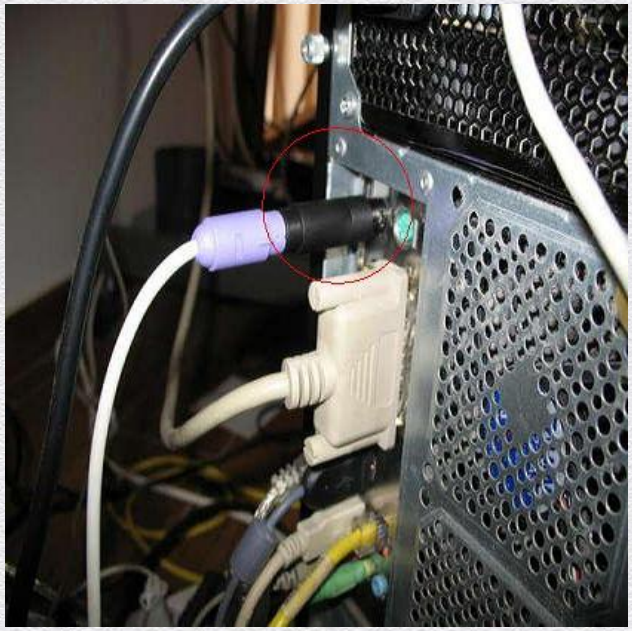
Hardware Implants



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The “Evil Maid”

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Tampering:
In the real world

Major targets

- Laptops
- Cellphones
- Tablets and other electronics
- Non-electronics

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Travel is a major vulnerability

- Increased exposure
- Less defense
- Potentially different laws

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International Borders

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International Borders

Hotels

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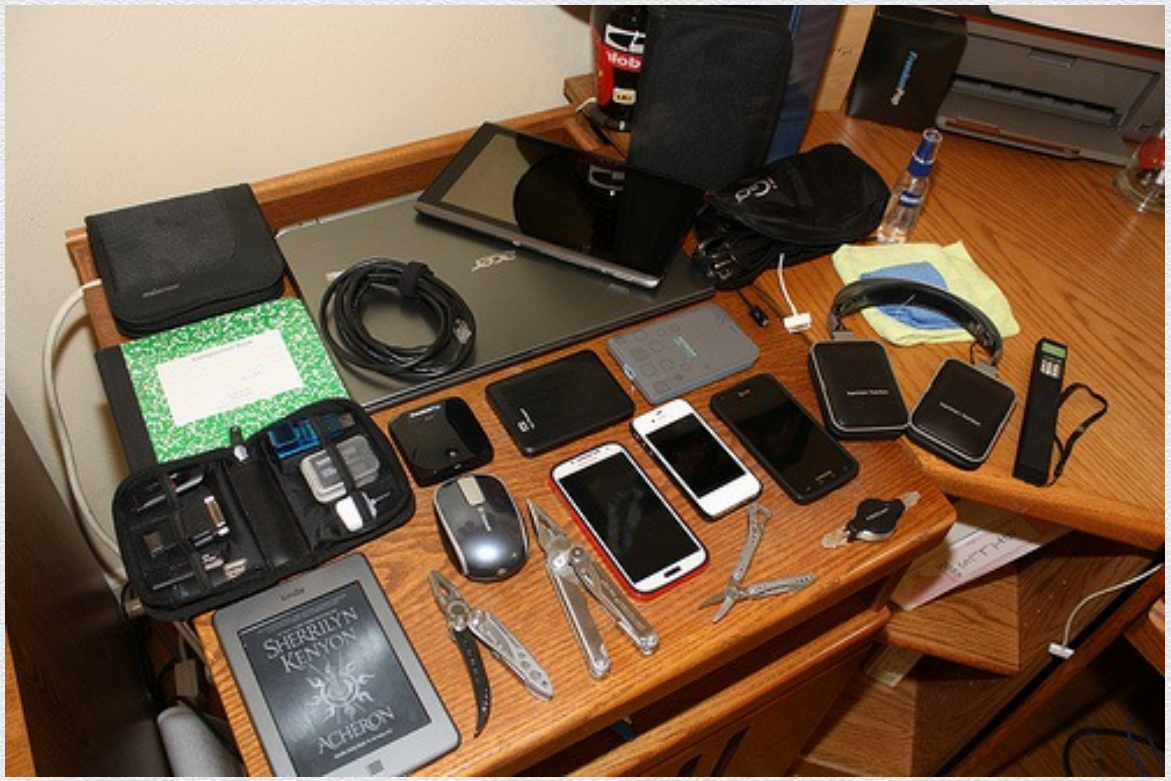
Luggage



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But not only travel

- Unattended offices
- “Interdiction”
- Journalists
- Search incident to arrest

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Countermeasures

Conventional security measures are a baseline

- Screenlockers/access control
- Full disk encryption
- Transport encryption for traffic
- Virtual private networks
- (Mobile) device management
- Backups, user training, …

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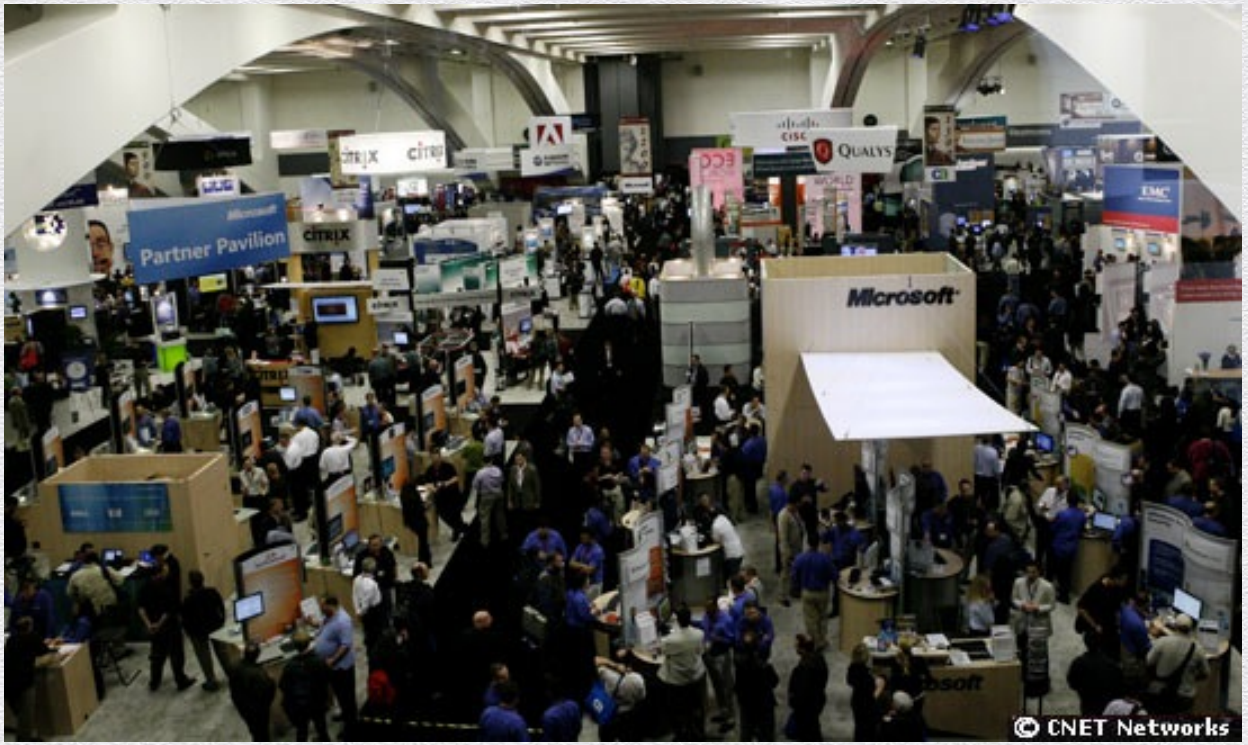
Many vendors of many products



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Travel security policies

- Minimize what you take
- Pre and post trip wipe
- “Download-it-there”
- Dedicated travel pool of equipment

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Physical security

- Difficult in travel environments
- Generally ineffective against powerful (State) threats
- Expensive to maintain
- Insider threats

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Hotel safes

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Door locks

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Under the door tool

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After-hours access

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Government solutions

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Tamper-evidence and Tamper-response

Passive tamper evidence vs. active tamper response

- Passive
  - Seals
  - Stickers
- Active
  - “Trusted Computing”
  - Smartcards
  - HSM

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Seals

Seals

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Stickers and improvised seals

Passive seals

- Low cost
- Relatively unobtrusive to users
- Infrequently verified
- Can be defeated vs. field verification

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DOE VAT Seal Results

Results for 244 Seals

Parameter	Mean	Median
defeat time for 1 person	1.4 mins	43 secs
cost of tools and supplies	$78	$5
marginal cost of attack	62¢	9¢
time to devise successful attack	2.3 hrs	12 mins

- Half of these seals are in use for "critical" opportunities.
- At least 19% are in use and under consideration for nuclear safeguards.

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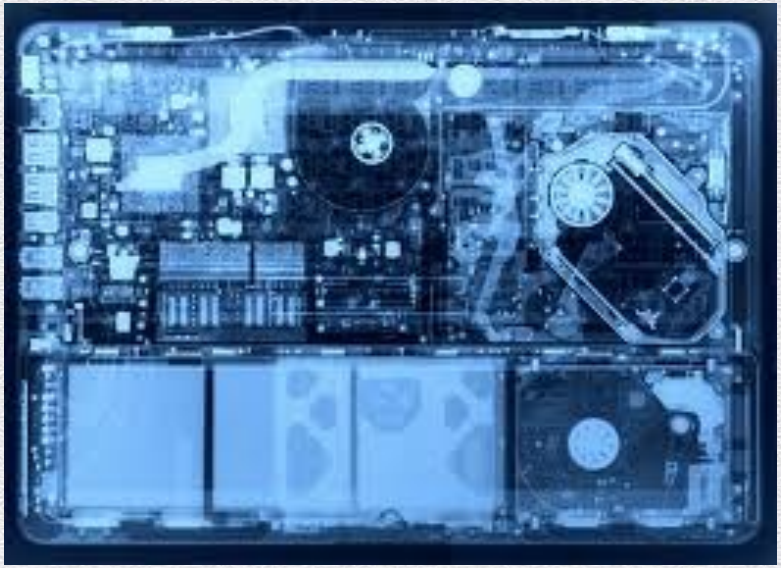
Forensic analysis



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Active tamper-response: TCG/Trusted Computing

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PIN processors

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Smartcards

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Hardware Security Modules

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Threats

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Threats

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Active tamper-response drawbacks

- Expensive
- Specialty hardware
- Can be bypassed, don’t protect entire computing device
- Impractical for “office automation” uses

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Automatic verification of seals

Active seals exist

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Active seal drawbacks

- Expensive
- Specialty hardware
- Still highly vulnerable
- Generally designed for large cargo containers

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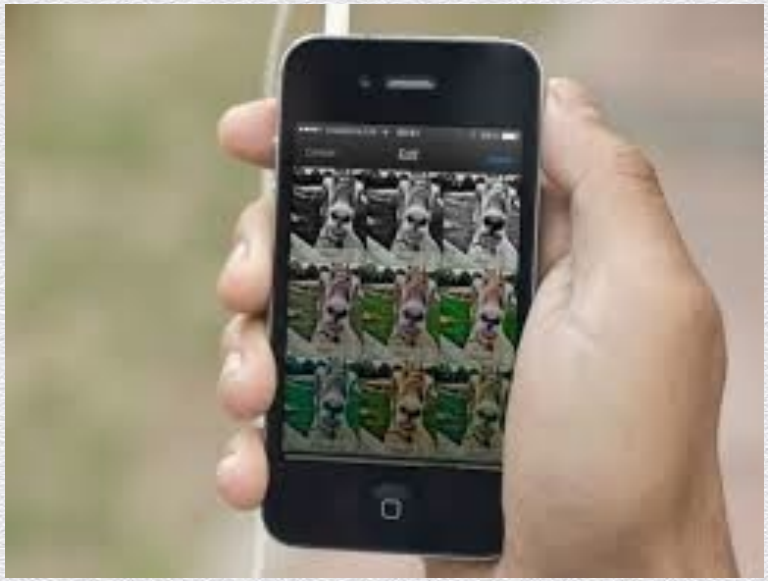
Smartphone validation of seals



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Smartphone software validation of passive seals

- Inexpensive and practical: “Blink comparison”
- Existing hardware (cellphones running iOS or Android)
- Non-suspicious hardware (“arrested in China for spying”)
- Applicable to a range of hardware
- Many difficult technical challenges (image processing, coatings, integration with enterprise IT)

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Lessons Learned

Major lessons of 2013

- Users in the field are exposed to many threats
- Must be unobtrusive to users, but not “click yes to proceed”
- “Travel naked”: equipment setup in-country
- Separate infrastructure from low-threat defaults
- Seal technology, especially when machine-verified, very promising

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2014 goals

- Integration of the machine-verification technique into enterprise IT tools (VPN, mail, DLP, …)
- Improvement of seal coatings (pearlescent paint? anti-tamper?)
- Production-quality client software
- Application of smartphone validation to non-computer seals

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