presented by

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Secure Firmware Considerations

Microsoft

Problem

- Firmware updates secured by keys
- Tools use these keys to prevent unauthorized updates

Solution

- **Use** strong RSA keys for firmware updates
- **Safeguard** keys and firmware source code
- **Consider** using more secure methods of updates (e.g. UpdateCapsule)
- **Enable** customers to verify compliance

Background

- Developments in the ecosystem require PC system designers to review system security
- Attacks more likely with increased scrutiny into Secure Boot
- Products, processes, & even factory require thorough security
- Security vulnerability impacts all OS's (Windows, Linux, etc…)
- Trusted Boot impacted by vulnerability in early phase of boot (UEFI SEC/PEI phase).
- Vulnerability is not UEFI-based

Windows Hardware Certification Requirement

- Systems shipping with non-production keys in firmware are in violation of the WHCR for Windows 8

- "The firmware update process must also protect against rolling back to insecure versions, or non-production versions that may disable secure boot or include non-production keys."

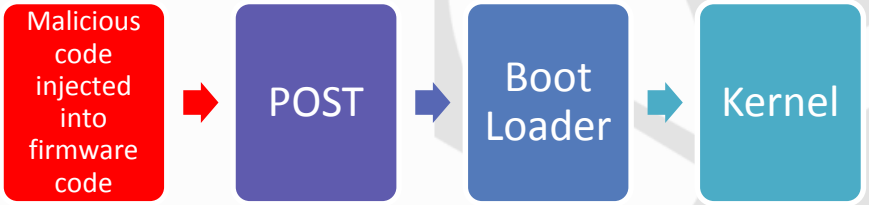
Firmware Design Principles

- Secure Boot requires secure flash
- System Management Mode (SMM) tools use System Management Interrupt to manage NV-flash
- NV-flash is traditionally secured by System Management Mode which verifies update keys (OEM, ODM, IBV)
- Not the same as Secure Boot Keys (e.g. PK, KEK, DB/DBX)
- Proprietary tools use keys to enter into SMM, granting unrestricted access to NV-flash

Infecting Firmware

Normal Power-on procedures:
Code from NV-flash clean, at factory settings, secured with strong keys

Infected Power-on procedures:
Malware injects and infects NV-flash with malicious firmware & possibly new keys



Methods of Injection

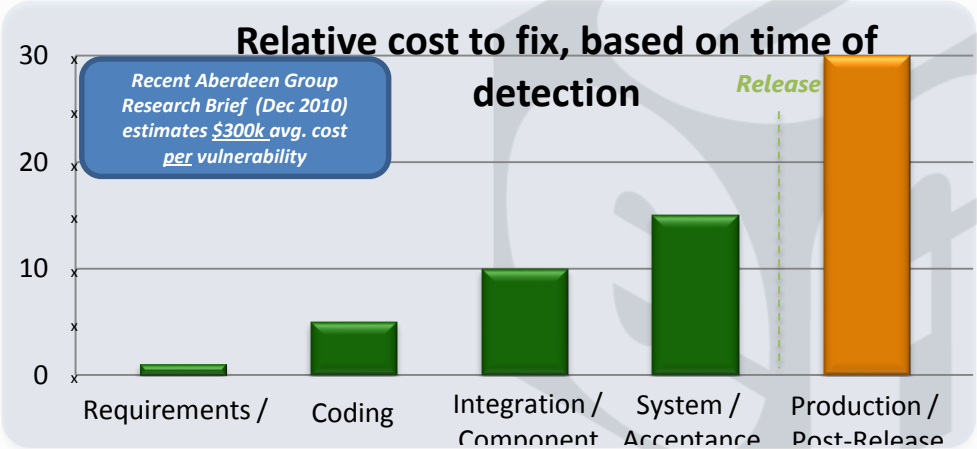
- A customer is lured into clicking on a link to a system firmware update, upon downloading the link the desktop app executes SMI calls with known keys that enables it to modify NV-flash
- A physically present attack would be possible by inserting removable media with a rogue boot loader initiating a code injection of malicious code into NV-flash

Mitigation & Remediation

- No firmware ‘backdoors’ for any purpose
- Use PKI-based keys for platform support tools
- Update tools on the factory floor ASAP
- Notify customers of the need to update firmware
- Publish test key discovery tools
- Use HSMs or contact your BIOS partner for keys

Software bugs are expensive for everyone…

Code fixes performed *after release* can cost up to *30 times* more than fixes performed during the design phase.



Source: National Institute of Standards and Technology

Common Misconceptions about SDL

"…only for Windows"

- *Appropriate for non-Microsoft platforms*
  - *Microsoft is a huge Macintosh ISV…*
- *Based on proven, generally accepted security practices*

"…for shrink-wrapped products"

- *Also covers Line of Business (LOB) and online services (Cloud) development*

"…for waterfall or spiral development"

- *Agile methods are also supported*

"…requires Microsoft tools"

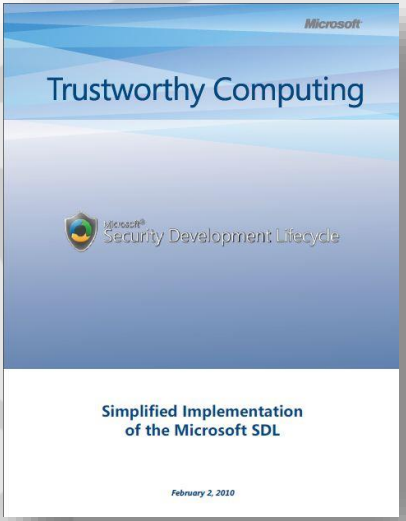
- *Use the appropriate tools for the job – no "rip & replace" required.*

"…requires Microsoft-level resources to implement"

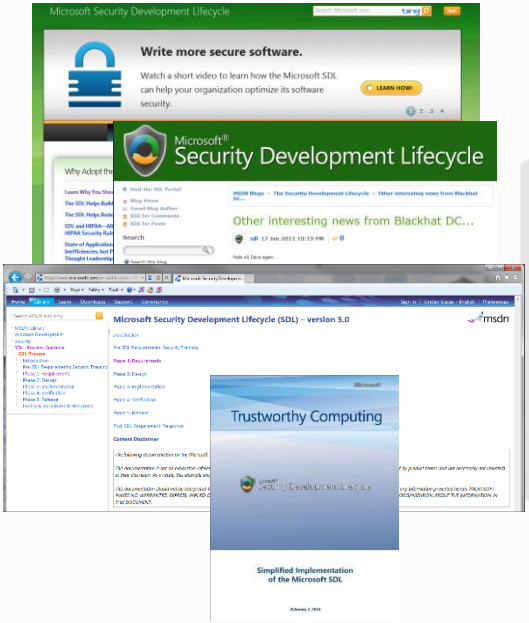
- *SDL as its applied at Microsoft != SDL for other development orgs.*

Simplified Implementation of the Microsoft SDL

- 170+ pages of Microsoft SDL guidance reduced to **17** pages and **16** practices
  - Non-proprietary
    - *Creative Commons License*
  - Suitable for organizations of any size
  - Platform agnostic
  - Mapped to well known compliance regs (PCI, HIPAA, PRINCE2)
  - Core elements based off the SDL process used at Microsoft
  - Holistic – **Not** the typical "list of lists" approach common to other methodologies
- Since April 2008
  - SDL Guidance: ***Over a quarter million downloads***
  - SDL Tooling & Automation: ***Over a half million downloads***



Resources



SDL Portal

http://www.microsoft.com/sdl

SDL Blog

http://blogs.msdn.com/sdl/

SDL Process on MSDN (Web)

http://msdn.microsoft.com/en-us/library/cc307748.aspx

Simplified Implementation of the Microsoft SDL

http://go.microsoft.com/?linkid=9708425

Further Reading

- NIST 800-147, 800-147b
  http://csrc.nist.gov/publications/nistpubs/800-147/NIST-SP800-147-April2011.pdf
- FIPS 140-2
  http://csrc.nist.gov/publications/fips/fips140-2/fips1402.pdf
- CANSEC Presentation
  http://cansecwest.com/slides/2013/Evil%20Maid%20Just%20Got%20Angrier.pdf
- National Vulnerability Database
  http://nvd.nist.gov/