Can Crypto Hardware be Trustworthy?

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November 2014

Part I

The Current Situation

So-called “IT Security”

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- For more on this:
  `http://www.youtube.com/watch?v=7bTaKSZQKhc`

"Secure Hardware" I

- What do names like
  - Trusted Computing Platform Alliance (TCPA)
  - Trusted Computing Group (TCG)
  - Trusted Platform Module (TPM)
  - Secure Boot
  - . . .

  try to insinuate?

“Secure Hardware” II

- Do we blindly want to trust all the
    - manufacturers
    - component suppliers
    - logistics operators
    - distributors
    - customs authorities
    - investigative authorities
    - so-called “intelligence” agencies
    - standard issuing authorities
    - . . . and whoever else

  involved?

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In some cases, this is

- unnecessary
- exceedingly difficult
- or a convenient excuse to peddle snake oil.

Auditability I

- Can I audit a TPM module or the crypto features of a CPU. . .
- . . . without destroying it?
- . . . with affordable and available tools?
- . . . with available know-how?
- . . . and with a reasonable amount of effort?

Auditability II

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  - have unlimited insider knowledge
  - have unlimited political and judicial backing
  - nonchalantly ignore applicable laws
  - have support from the manufacturers
  - don’t make mistakes

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  - don't make mistakes
- But we can and should raise the bar for real world attackers

Risk Assessment of Attacks

- Rational vs. irrational motivation
- Extent of access
- Risk of discovery
- Personal risk for attacker
- Scope, or targeted vs. blanket attack

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- Manipulation of entire product series or product families
- Manipulation of standards and specifications
- Attacks at the political level

Defense Strategies I

- Technical
- Economic
- Political

Defense Strategies II

- Restore the burden of proof
- Restore vendor liability
- Diversity
- Auditability

Part II

Current Projects

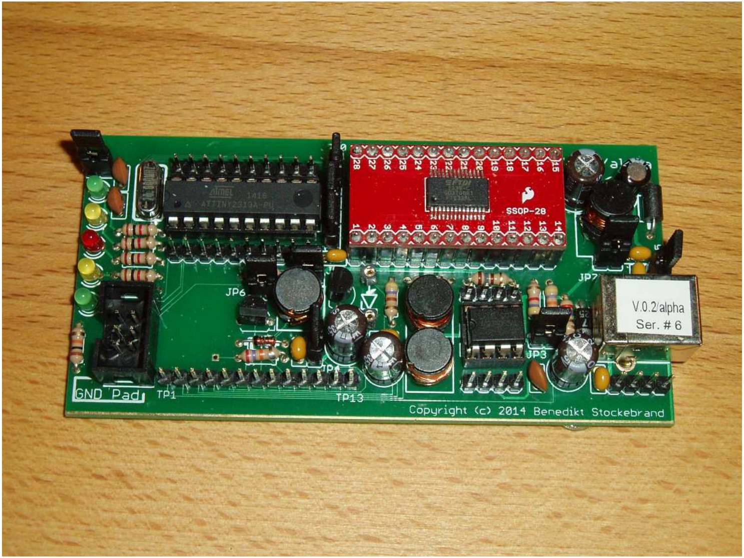
The Cryptech Project

- Complete crypto chip (HSM, hardware security module)
- FPGA based (with an option to go ASIC later on)
- Includes
  - Hardware random number generator (HWRNG)
  - Cryptographically secure pseudo random number generator (CSPRNG)
  - Cryptographic checksums/hashes
  - Encryption/decryption
  - Key store
- Fully open design
- Designed for auditability

My ARRGH Project I

- Auditable Real Random Number Generator Hardware
- Hardware random number generator (HWRNG) only
- No need for tamper protection
- DIY oriented
- No need for FPGA
- Intended to support various microcontrollers

My ARRGH Project II



Part III

Surprises

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- Compliance mandatory for various uses
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- . . . in what is used as seed for CSPRNGs.

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  - pseudo random number generators
- . . . rather than crypto grade true random number generators

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- The Linux `rngtools` (`rngd`, `rngtest`) implement FIPS 140
- So open source alone is obviously not enough

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- . . . which effectively bricked even more fake chips
- . . . and all without any physical access.

Part IV

References

Ressourcen

The Limits of Cryptography
EasterHegg 2014, Stuttgart
`http://www.youtube.com/watch?v=7bTaKSZQKhc`

BIVBlog: Benedikt's IT Video Blog
`http://www.stepladder-it.com/bivblog/`
Video-Blogs rund um IT im allgemeinen und Crypto-Hardware (und IPv6) im speziellen

The Cryptech Project
`https://cryptech.is/`

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