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CIP @ Siemens Mobility
Use Cases

Siemens Mobility – Mobility Management

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Agenda

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1. Harmonization use case
Replacement of old Linux kernel versions

2. Maintenance use case
Benefit from long-term maintained Debian packages

3. Security use case
Create a common platform for IEC 62443 SL-3 ready products

4.-6 Security challenges
IEC 62443 SL-3 challenges and their OSS solutions

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1. Harmonization use case

Replacement of old Linux kernel versions

1. Harmonization use case
Replacement of old Linux kernel versions

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Rail automation specifics

- Long product life-times (20 to 30 years)
- Patching of products is not easy
- Requires safety assessment & certification
- Access to devices is difficult (e.g. no remote access)

Numerous Linux kernel versions in product portfolio

- Hard to maintain
- Even harder to keep up with vulnerability management

Solution: reduction of Linux kernel variants

- Using CIP kernel as basis for product portfolio

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2. Maintenance use case

Benefit from long-term maintained Debian packages

2. Maintenance use case
Benefit from long-term maintained Debian packages

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Benefits of Debian

- Packages come preconfigured (lower effort for integration, compared to „make …“)
- Easier management of Open Source Software (license compliance, vulnerability management, …)
- Reduced build times through ISAR using binary packages
- Covers all required CPU architectures

Requirement from a rail automation customer

- “The used Linux distribution shall be Debian for cybersecurity reasons”

CIP Core

- Efforts for Debian LTS maintenance are a perfect fit for this use case

3. Security use case

Create a common platform for IEC 62443 SL-3 ready products

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Create a common platform for IEC 62443 SL-3 ready products

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CIP Security WG

- Participate in the CIP Security working group
- Provide guidelines for IEC 62443 compliance for products using the CIP

Siemens Mobility OSS contributions

- Contribute security building blocks to OSS community
- Peer review increases security
  - Security by obscurity never works!
- Increase supported hardware
- Possible increase of features through collaboration
- Increase the overall security for the industrial automation domain

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4. IEC 62443 SL-3 Challenge

Certificate enrollment in closed networks

4. Challenges
Certificate enrollment in closed networks

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IEC 62443 requirement for SL-3

- When a Public Key Infrastructure is used, the device shall integrate into a system which ensures that certificates are enrolled securely.

Current situation

- Most rail automation products don't use certificates
- If certificates are used they are typically self-signed
- Typically no integration with PKI possible

4. Solution
Use the Certificate Management Protocol (CMP)

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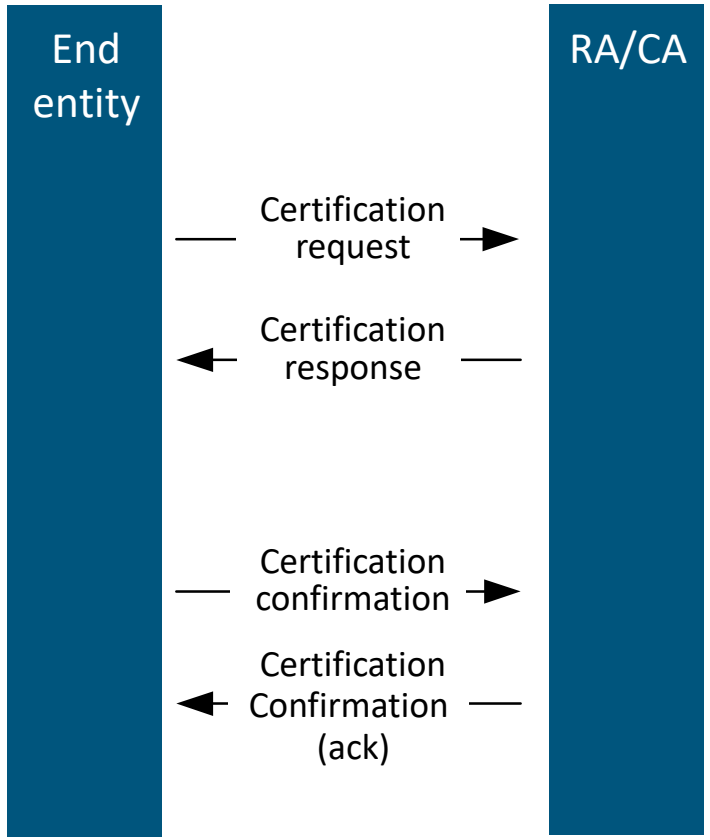
Certificate Management Protocol

- Specified in RFC4210
- Allows to enroll, renew and revoke certificates
- Can be used to distribute CRLs
- Key material is generated on the device only
- Already used in the rail automation domain (UNISIG 137 standard)

Flexible support of transport protocols

- Message exchange can be done via various protocols
- Plain TCP
- HTTP
- Using files (e.g. SCP, usb drive, …)



4. Solution
Use the Certificate Management Protocol (CMP)

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Noteworthy Implementations

CMPforOpenSSL (https://github.com/mpeylo/cmpossl)

- Initially started by Nokia, Siemens joined several years ago
- Already integrated in many industrial products
- Integrated in upcoming openSSL 3.0

CMP in memory constrained environments

- mbedCMP (https://github.com/siemens/mbedCMP)
- CMPclient-embedded-lib (https://github.com/nokia/CMPclient-embedded-lib)

For less constrained environments

- Bouncy Castle (https://www.bouncycastle.org/)

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5. IEC 62443 SL-3 Challenge

OSS has to access credentials in a secure way

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OSS has to access credentials in a secure way

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IEC 62443 requirement for SL-3

- Credentials which are used by the component shall be protected by hardware means

Typical OSS components load credentials from files

- Usually the password for the private key is stored in plain text in a configuration file

Many available hardware key store implementations

- Different functionality
- Different software interfaces

5. Solution
The Trust Anchor API

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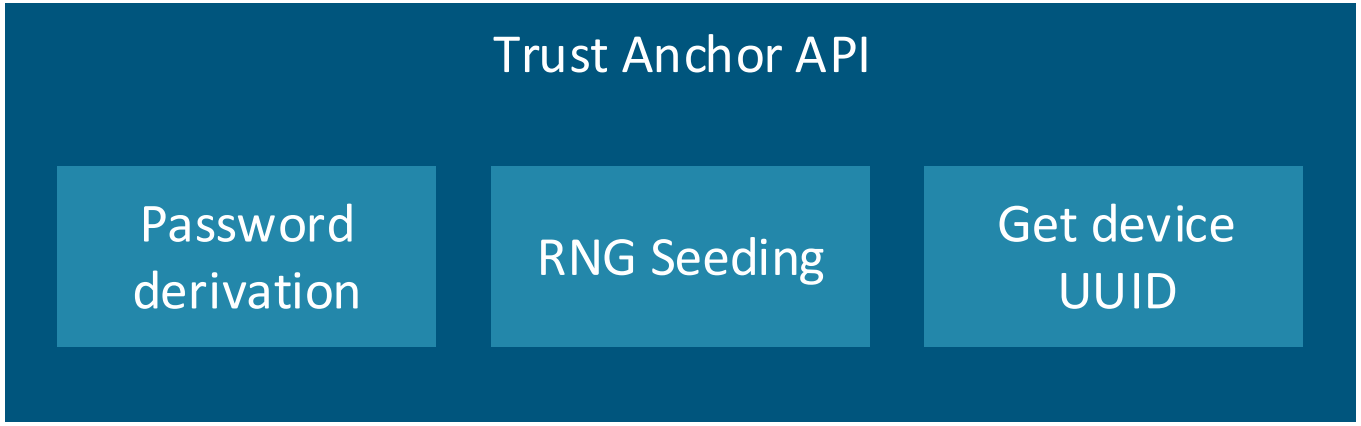
Trust Anchor functionality

- Derive individual passwords for each device
- Seed the random number generator (esp. for devices with low entropy)
- Get an UUID identifying the device

Derive hardware-specific passwords

- Allows applications to use these passwords to protect its credentials
- E.g. by an OpenSSL engine



5. Solution
The Trust Anchor API

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Bound to the hardware

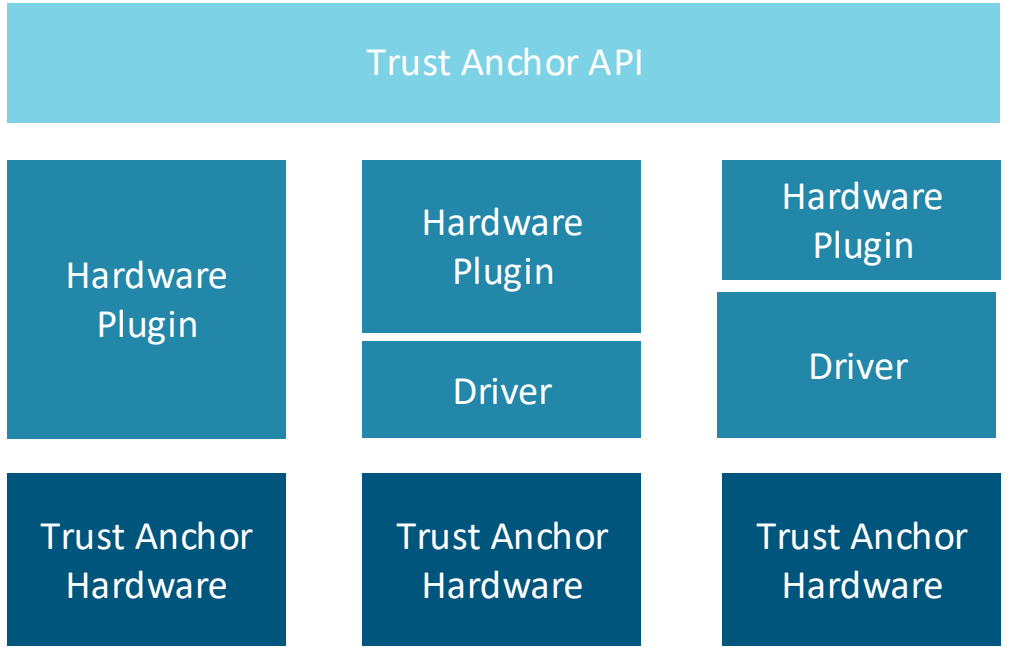
- Requires live OS access to get the password
- Reading the flash/stealing the HDD does not reveal the credentials

Designed for embedded systems

- Limited feature set allows to use various kinds of embedded hardware (no TPM required)

Plugin architecture

- Hardware specific implementation of the trust anchor can be loaded as a plugin
- Allows hardware manufacturers to implement hardware access (driver / hardware plugin)
- No changes in applications required for different hardware



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6. IEC 62443 SL-3 Challenge

Securely boot x86 devices

6. Challenge
Securely boot x86 systems

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IEC 62443 requirement for SL-3

- The products manufacturers root of trust shall be used to verify the boot process.

Root of trust

- For x86 UEFI devices the manufacturer root of trust has to be installed in the UEFI

Dual boot

- A/B partition scheme required for reliable remote software update

6. Solution
Use efibootguard

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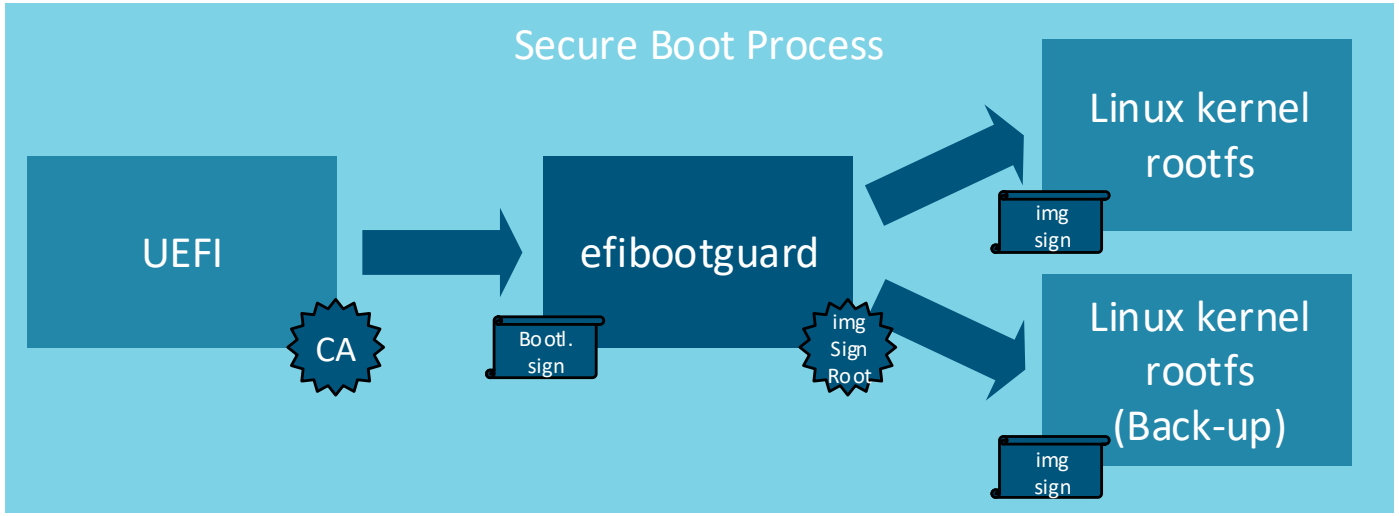
Open Source UEFI Bootloader

- https://github.com/siemens/efibootguard
- GPL-2
- Already supports swupdate for A/B partition update
- UEFI Secure Boot support planned for Q3/2020



Possible scheme for Secure Boot implementation, final solution t.b.d.

Outlook: Siemens Mobility OSS Projects

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New projects

Trust Anchor API

Target: Q2/20

Sponsorship

CMPforOpenSSL/openSSL 3.0

Target: Q1/20

efibootguard – Secure Boot

Target: Q3/20

ISAR

Continuous

A lot of space for upcoming contributions!

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Stay safe and secure

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