Mutual Attestation of IoT Devices and TPM 2.0 Support

TCG Members Meeting June 2016 Vienna

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strongSwan

Where the heck is Rapperswil?

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HSR - Hochschule für Technik Rapperswil

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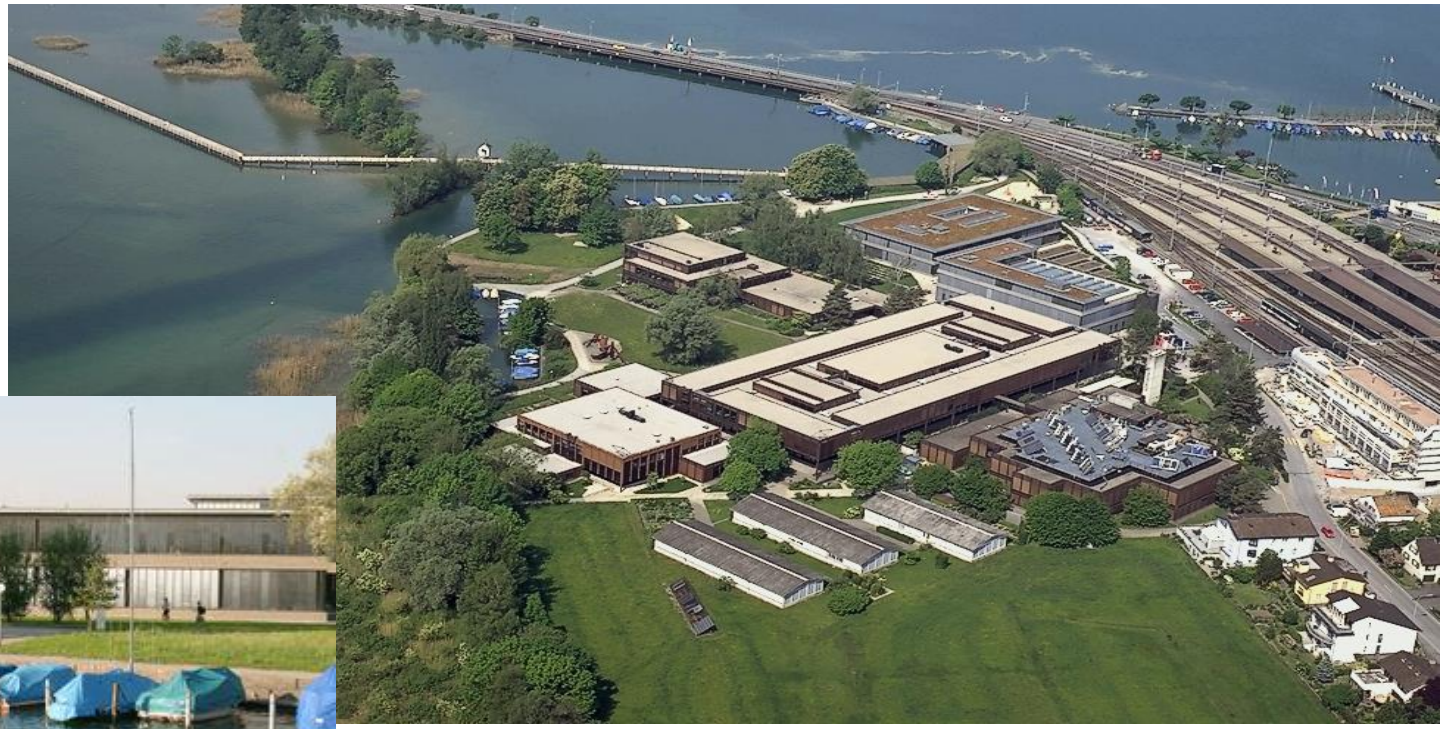
- University of Applied Sciences with about 1500 students
- Faculty of Information Technology (300-400 students)
- Bachelor Course (3 years), Master Course (+1.5 years)



strongSwan – the OpenSource VPN Solution

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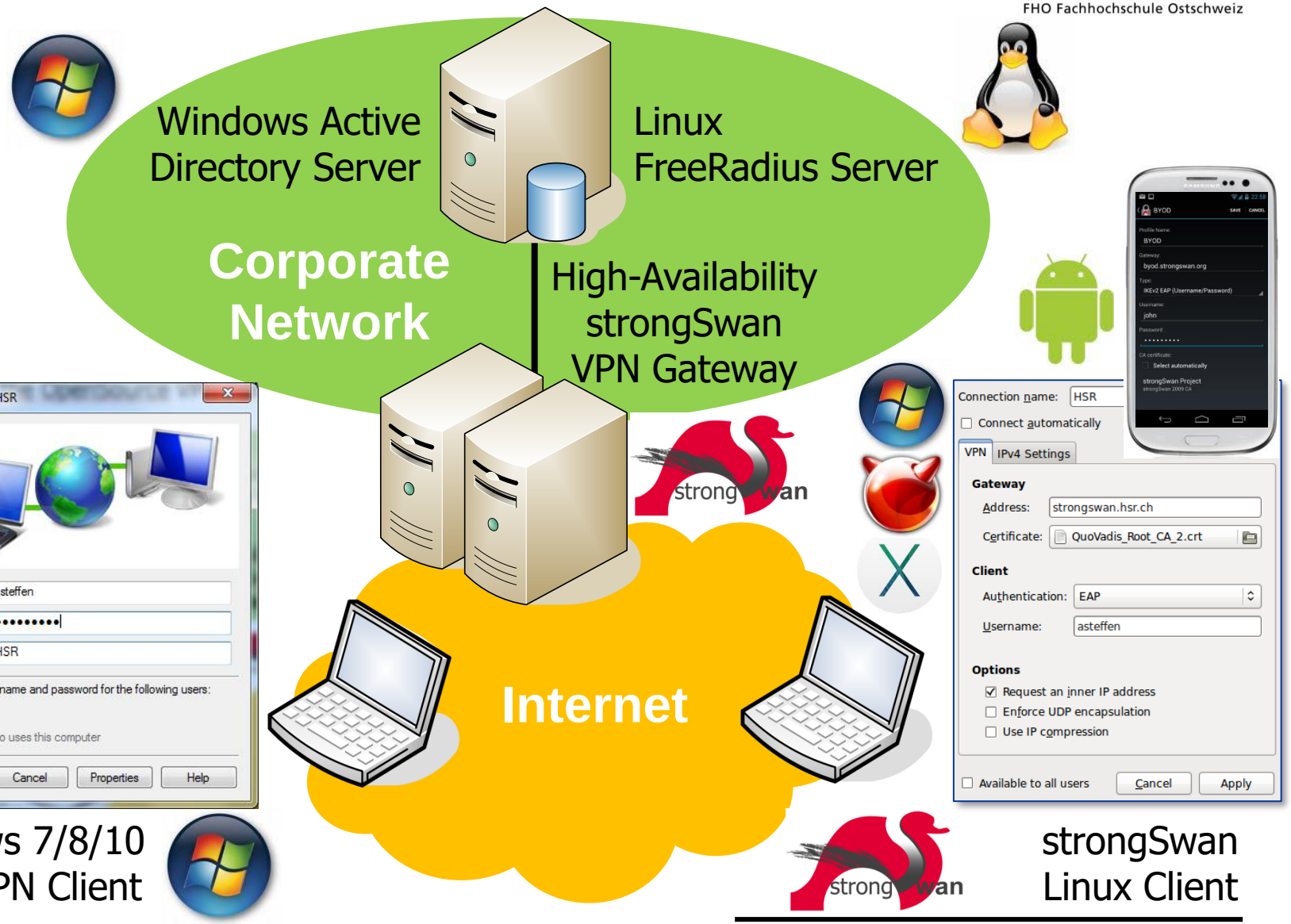

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Trusted Network Communications (TNC)

Current Use Cases:

Network Access Control & Endpoint Compliance

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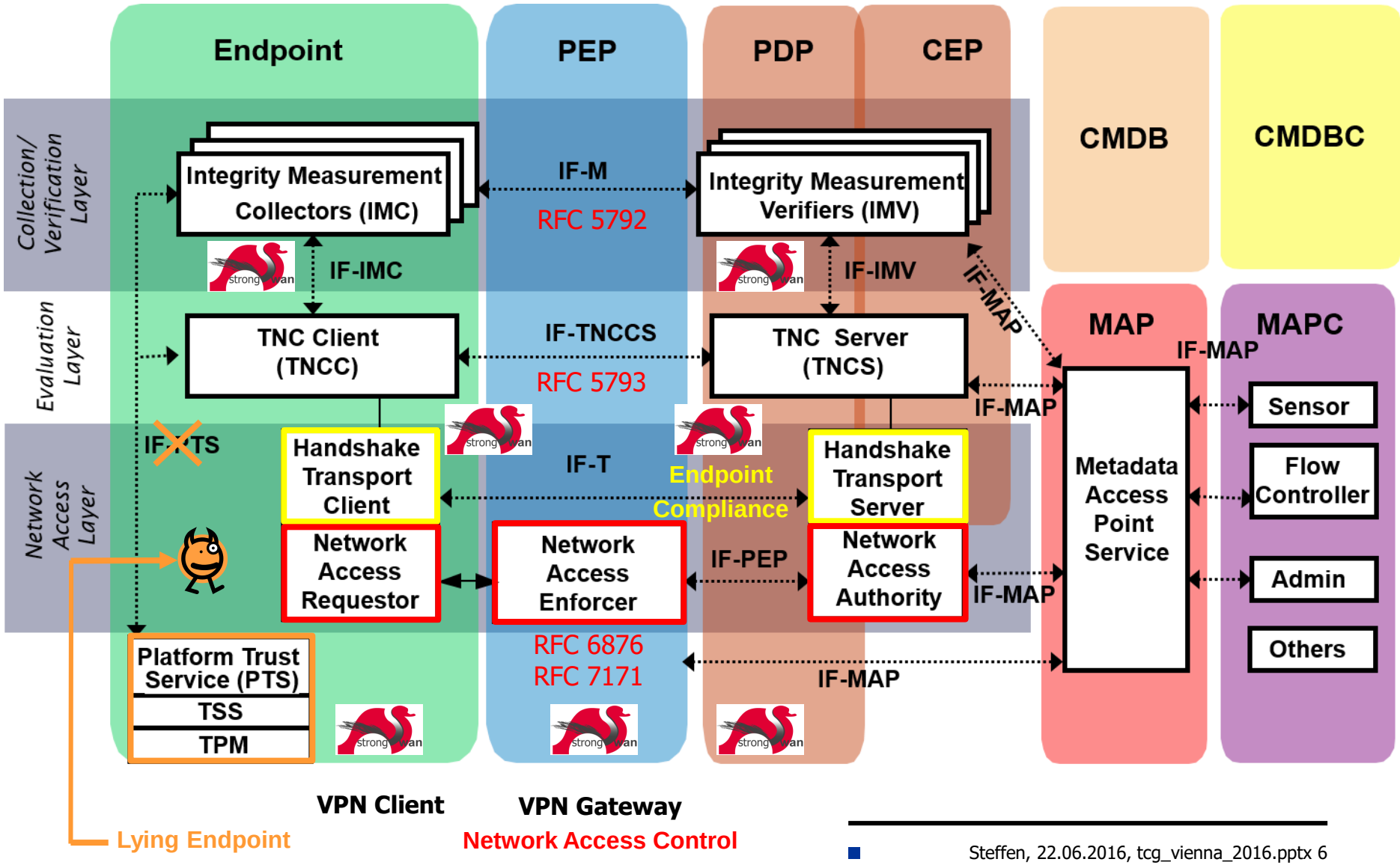
TNC Architecture



Layered TNC Protocol Stack

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- TNC Measurement Data

```
[IMV] operating system name is 'Android' from vendor Google
[IMV] operating system version is '4.2.1'
[IMV] device ID is cf5e4cbcc6e6a2db
```

- IF-M Measurement Protocol — PA-TNC (RFC 5792)

```
[TNC] handling PB-PA message type 'IETF/Operating System' 0x000000/0x00000001
[IMV] IMV 1 "OS" received message for Connection ID 1 from IMC 1
[TNC] processing PA-TNC message with ID 0xec41ce1d
[TNC] processing PA-TNC attribute type 'IETF/Product Information' 0x000000/0x00000002
[TNC] processing PA-TNC attribute type 'IETF/String Version' 0x000000/0x00000004
[TNC} processing PA-TNC attribute type 'ITA-HSR/Device ID' 0x00902a/0x00000008
```

- IF-TNCCS TNC Client-Server Protocol — PB-TNC (RFC 5793)

```
[TNC] received TNCCS batch (160 bytes) for Connection ID 1
[TNC] PB-TNC state transition from 'Init' to 'Server Working'
[TNC] processing PB-TNC CDATA batch
[TNC] processing PB-Language-Preference message (31 bytes)
[TNC] processing PB-PA message (121 bytes)
[TNC] setting language preference to 'en'
```

- IF-T Transport Protocol — PT-EAP (RFC 7171)

```
[NET] received packet: from 152.96.15.29[50871] to 77.56.144.51[4500] (320 bytes)
[ENC] parsed IKE_AUTH request 8 [ EAP/RES/TTLS ]
[IKE] received tunneled EAP-TTLS AVP [EAP/RES/PT]
```

TPM-based Attestation

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2010 Implemented the TCG TNC IF-TNCCS 2.0 Client/Server and TCG TNC IF-M Measurement protocols.

2011 Implemented the TCG Attestation Protocol Binding to TNC IF-M using TrouSerS stack under Linux [later ported to Windows].

2012 Implemented TPM 1.2 based attestation using the Linux Integrity Measurement Architecture (IMA).

2015 Implemented the TCG TNC IF-M Segmentation Protocol allowing the transport of huge IF-M attributes over IF-T for EAP Methods. IF-T for TLS transport also profits from large buffer savings.

2016 Implemented TPM 2.0 based Attestation using the Intel TSS2 SAPI under Linux and an Intel PTT firmware TPM.

➔TSS 2.0 requires an update of the Attestation Binding to IF-M !!!

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New Use Case:

Mutual Measurements of Endpoints

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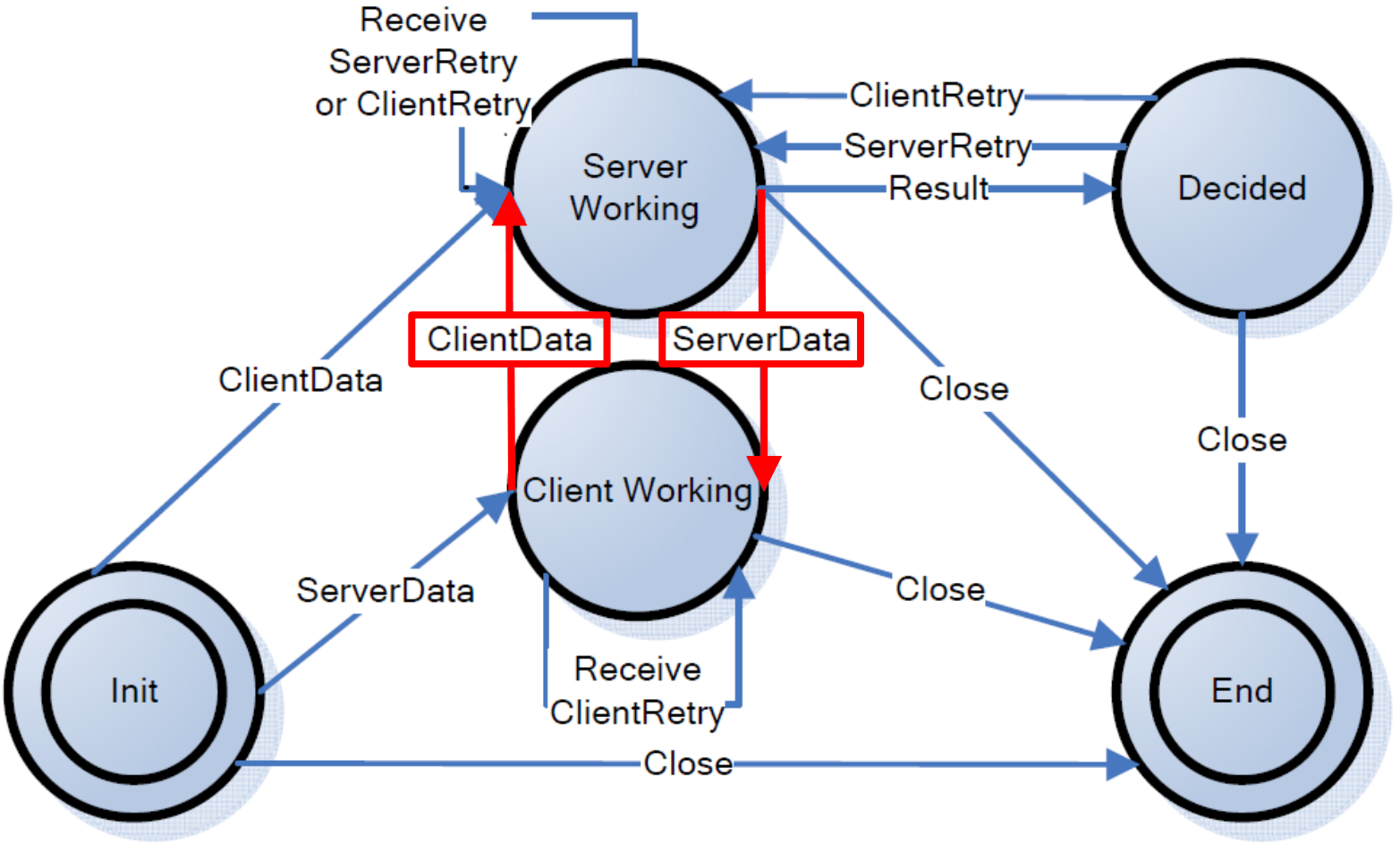
PB-TNC / IF-TNCCS 2.0 State Machine



Exchange of PB-TNC Client/Server Data Batches containing PA-TNC Messages

Mutual Measurements in Half-Duplex Mode

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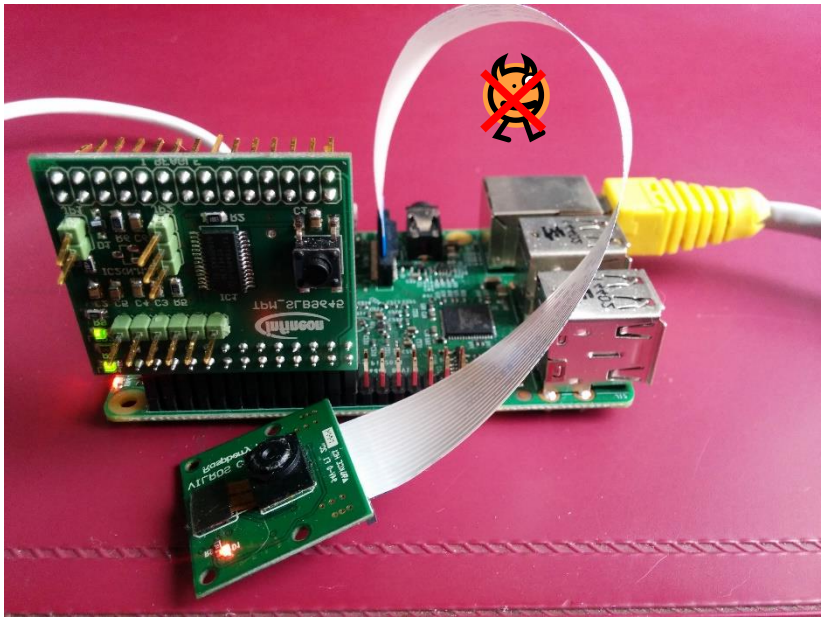
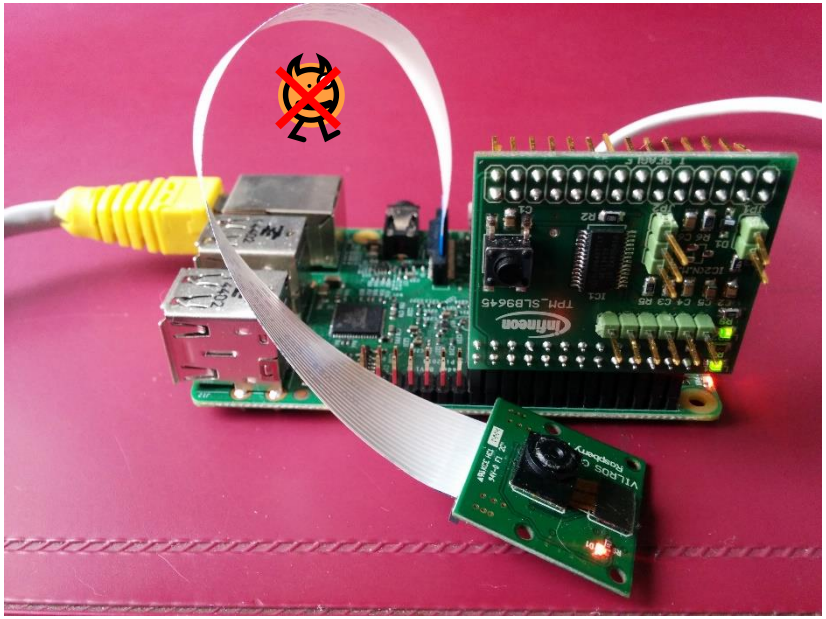
Initiator		PB-TNC Batch[PB-TNC Messages]		Responder
TNC Client	→	CDATA[PB-MUTUAL, PB-PA]	→	TNC Server
TNC Client	←	SDATA[PB-MUTUAL, PB-PA]	←	TNC Server
TNC Server	→	SDATA[]	→	TNC Client
TNC Server	←	CDATA[PB-PA]	←	TNC Client
TNC Client	→	CDATA[PB-PA]	→	TNC Server
TNC Client	←	RESULT[PB-ASSESSMENT]	←	TNC Server
TNC Server	→	SDATA[PB-PA]	→	TNC Client
TNC Server	←	CDATA[PB-PA]	←	TNC Client
TNC Server	→	RESULT[PB-ASSESSMENT]	→	TNC Client
TNC Server	←	CLOSE[]	←	TNC Client
TNC Client	→	CLOSE[]	→	TNC Server

- The initiating TNC client sends CLOSE batch last
- Works over PT-EAP and PT-TLS

Example: Mutually Trusted Video Phones





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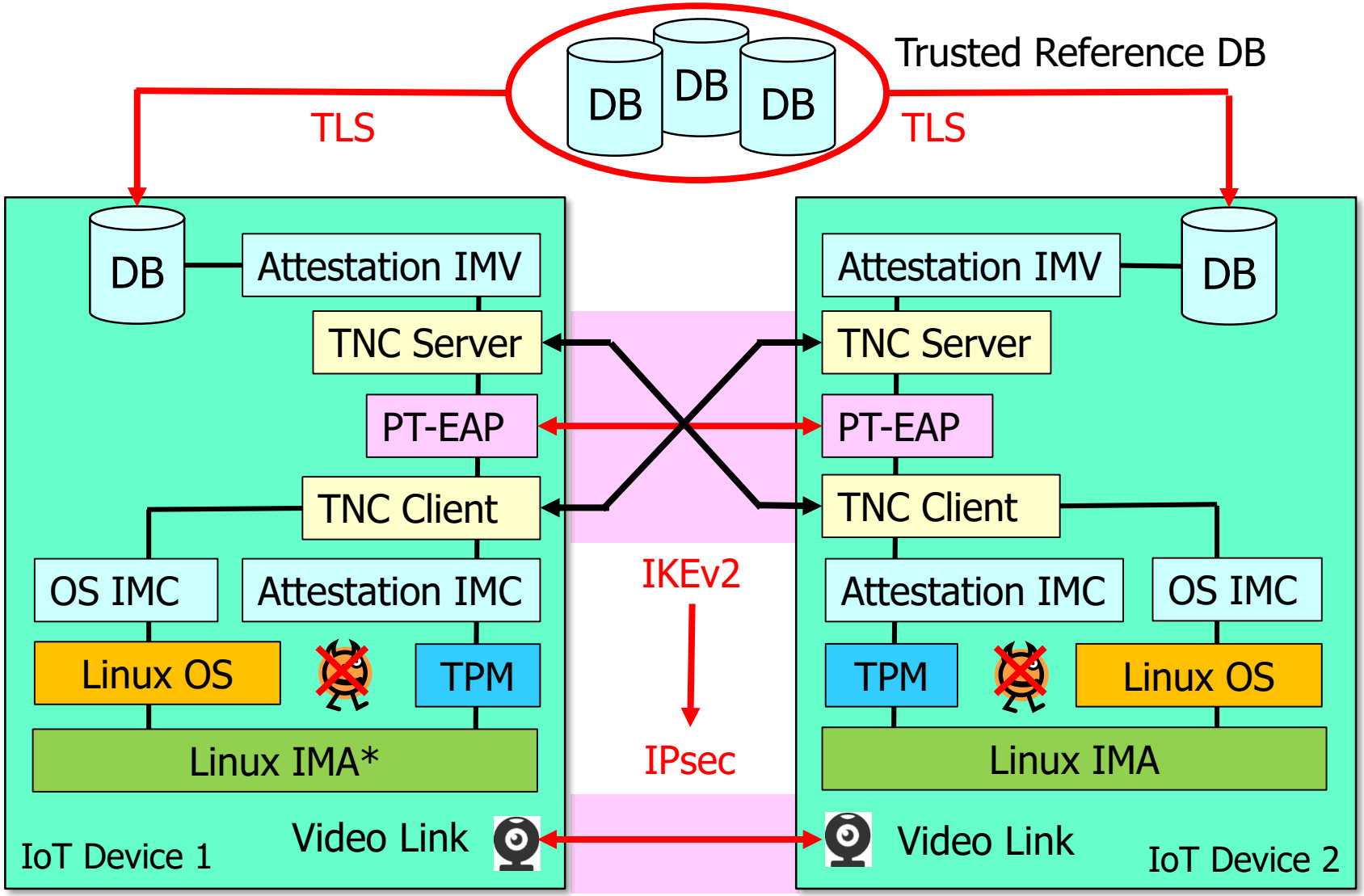

* IMA: Integrity Measurement Architecture

File Version Management using SWID Tags

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- ISO/IEC 19770-2:2015 Software Asset Management Part 2: Software Identification Tag:

```
<SoftwareIdentity xmlns=http://standards.iso.org/iso/19770/-2/2015/schema.xsd
   name="libssl1.0.0" uniqueId="Ubuntu_14.04-x86_64-libssl1.0.0-1.0.1f-1ubuntu2.15“
   version="1.0.1f-1ubuntu2.15" versionScheme="alphanumeric">
  <Entity name="strongSwan Project" regid="regid.2004-03.org.strongswan“ role="tagcreator"/>
  <Payload>
    <File location="/lib/x86_64-linux-gnu" name="libcrypto.so.1.0.0"/>
    <File location="/lib/x86_64-linux-gnu" name="libssl.so.1.0.0"/>
    <File location="/usr/share/doc/libssl1.0.0" name="copyright"/>
    <File location="/usr/share/doc/libssl1.0.0" name="changelog.Debian.gz"/>
    <File location="/usr/lib/x86_64-linux-gnu/openssl-1.0.0/engines" name="libpadlock.so"/>
    <File location="/usr/lib/x86_64-linux-gnu/openssl-1.0.0/engines" name="libcswift.so"/>
    <File location="/usr/lib/x86_64-linux-gnu/openssl-1.0.0/engines" name="lib4758cca.so"/>
    <File location="/usr/lib/x86_64-linux-gnu/openssl-1.0.0/engines" name="libaep.so"/>
    <File location="/usr/lib/x86_64-linux-gnu/openssl-1.0.0/engines" name="libubsec.so"/>
    <File location="/usr/lib/x86_64-linux-gnu/openssl-1.0.0/engines" name="libchil.so"/>
    <File location="/usr/lib/x86_64-linux-gnu/openssl-1.0.0/engines" name="libgost.so"/>
    <File location="/usr/lib/x86_64-linux-gnu/openssl-1.0.0/engines" name="libgmp.so"/>
    <File location="/usr/lib/x86_64-linux-gnu/openssl-1.0.0/engines" name="libcapi.so"/>
    <File location="/usr/lib/x86_64-linux-gnu/openssl-1.0.0/engines" name="libnuron.so"/>
    <File location="/usr/lib/x86_64-linux-gnu/openssl-1.0.0/engines" name="libsureware.so"/>
    <File location="/usr/lib/x86_64-linux-gnu/openssl-1.0.0/engines" name="libatalla.so"/>
  </Payload>
</SoftwareIdentity>
```

Thank you for your attention!

Questions?

www.strongswan.org/tnc/