TNC Endpoint Compliance and Network Access Control Profiles

TCG Members Meeting June 2014 Barcelona

Prof. Andreas Steffen
Institute for Internet Technologies and Applications
HSR University of Applied Sciences Rapperswil
andreas.steffen@hsr.ch
Where the heck is Rapperswil?
HSR - Hochschule für Technik Rapperswil

- 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

Windows Active Directory Server

Linux FreeRadius Server

Corporate Network

High-Availability strongSwan
VPN Gateway

Internet

Windows 7/8 Agile VPN Client

strongSwan Linux Client

Connection name: HSR

Gateway
Address: strongswan.hsr.ch
Certificate: Quovadis Root_CA_2.crt

Client
Authentication: EAP
Username: steffen

Options
- Request an inner IP address
- Enforce UDP encapsulation
- Use IP compression

Available to all users

Steffen, 25.06.2014, tcg_barcelona_2014.pptx
TNC Network Access Control and Endpoint Compliance Profiles

TCG Members Meeting June 2014 Barcelona

TNC Network Access Control Profile

HSR
HOCHSCHULE FÜR TECHNIK RAPPERSWIL
FHO Fachhochschule Ostschweiz
Network Access Control (NAC)

- NAC Policy Enforcement Point
  - Computer with NAC Client
    - Block
    - Isolate
  - Isolation Network
- NAC Server
  - Corporate Network
  - Policy Manager
    - Attribute Requests
    - Measurement Results
    - Measurement Policy

Steffen, 25.06.2014, tcg_barcelona_2014.pptx
Network Access Control (NAC)

- **User Authentication**
  - Layer 2: IEEE 802.1X (LAN switches and WLAN access points)
  - Layer 3: IPsec-based VPN (IKEv2)
  - Layer 4: TLS-based VPN (proprietary methods)

- **Configuration Assessment**
  - Configuration measurement before network access is granted (e.g. installed software like antivirus scanner and firewall)
  - Compare measurements to network access policies
    - Integrity check of computer platform
  - Re-assess computer platforms in regular intervals

- **Policy Enforcement**
  - Enforce security policies onto no-compliant computer platforms
Trusted Network Connect (TNC) Architecture

Access Requestor
- Integrity Measurement Collectors (IMC)
- TNC Client (TNCC)

Policy Enforcement Point
- RFC 5792
- RFC 5793
- RFC 6876
- RFC 7171
- Policy Enforcement Point (PEP)

Policy Decision Point
- Integrity Measurement Verifiers (IMV)
- TNC Server (TNCS)

Metadata Access Point
- Network Access Authority

Sensors and Flow Controllers
- Sensor
- Flow Controller

VPN Client
- Platform Trust Service (PTS)
- TSS
- Lying Endpoint

VPN Gateway
- Network Access Requestor

IF-MAP
- IF-IMC
- IF-TNCCS
- IF-IMV
- IF-PEP
- IF-MAP
Network Endpoint Assessment (RFC 5209)

- Posture Collectors (1 .. N)
  - Posture Broker Client
  - Posture Transport Clients (1 .. K)

- Posture Validators (1 .. N)
  - Posture Broker Server
  - Posture Transport Servers (1 .. K)

- NEA Client
- NEA Server

- PA
  - RFC 5792
  - PA-TNC

- PB
  - RFC 5793
  - PB-TNC

- PT
  - RFC 6876
  - RFC 7171
  - PT-TLS
  - PT-EAP
Layered TNC Protocol Stack

- **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]

- **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-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

- **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
TNC Network Access Control and Endpoint Compliance Profiles

TCG Members Meeting June 2014 Barcelona

strongSwan Android Client with TNC Support
strongSwan Android VPN Client

Android
Gateway: strongswan.org
Username: android

BYOD
Gateway: byod.strongswan.org
Username: john

Home
Gateway: vpn.strongswan.org
User certificate: android

HSR
Gateway: strongswan.hsr.ch
Username: asteffen

Profile Name: BYOD

Gateway:
byod.strongswan.org

Type:
IKEv2 EAP (Username/Password)

Username:
john

Password:

CA certificate:
Select automatically

strongSwan Project
strongSwan 2009 CA
Allow Download from Unknown Sources

Your phone and personal data are more vulnerable to attack by apps from unknown sources. You agree that you are solely responsible for any damage to your phone or loss of data that may result from using these apps.
Install Blacklisted Android Web Server Package
Minor Non-Compliance: Isolate Client

Status: Connected
Profile: BYOD

Assessment Result: Restricted

Disconnect
Show

Android
Gateway: strongswan.org
Username: android

BYOD
Gateway: byod.strongswan.org
Username: john

Home
Gateway: vpn.strongswan.org
User certificate: android

HSR
Gateway: strongswan.hsr.ch

Remediation Instructions

The following problems have to be corrected before a VPN connection can be established:

Blacklisted Software Packages
Dangerous software packages were found

Unknown Software Origin
Do not allow the installation of apps from unknown sources

Please remove the following software packages:
org.xeustechnologies.android.kws
Start the Android Web Server
Major Non-Compliance: Block Client

Status: No active VPN
Assessment Result: Failure

Android
Gateway: strongswan.org
Username: android

BYOD
Gateway: byod.strongswan.org
Username: john

Home
Gateway: vpn.strongswan.org
User certificate: android

HSR
Gateway: strongswan.hsr.ch
Username: asteffen

Remediation Instructions
The following problems have to be corrected before a VPN connection can be established:

Blacklisted Software Packages
Dangerous software packages were found

Unknown Software Origin
Do not allow the installation of apps from unknown sources

Open Server Ports
Open Internet ports have been detected

Please close the following server ports:
tcp/8080
TNC Network Access Control and Endpoint Compliance Profiles

TCG Members Meeting June 2014 Barcelona

strongTNC Policy Manager
strongTNC Policy Manager

https://github.com/strongswan/strongTNC
Measurement Policies and Enforcements

Currently supported policy types:

- **PWDEN**  Factory Default Password Enabled
- **FWDEN**  Forwarding Enabled
- **TCPOP**  TCP Ports allowed to be Open
- **TCPBL**  TCP Ports to be Blocked
- **UDPOP**  UDP Ports allowed to be Open
- **UDPBL**  UDP Ports to be Blocked
- **PCKGS**  Installed Packages
- **UNSRC**  Unknown Sources
- **SWIDT**  Software ID (SWID) Tag Inventory
- **FREFM**  File Reference Measurement
- **FMEAS**  File Measurement
- **FMETA**  File Metadata
- **DREFM**  Directory Reference Measurement
- **DMEAS**  Directory Measurement
- **DMETA**  Directory Metadata
- **TPMRA**  TPM-based Remote Attestation

- **Closed Port Default Policy**
- **Open Port Default Policy**
- **SHA1/SHA256 Hash**
- **SHA1/SHA256 Hashes**
- **Create/Modify/Access Times**
Add/Edit Policies

Policy Allowed Open UDP Ports

<table>
<thead>
<tr>
<th>Policy Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Type</td>
</tr>
<tr>
<td>All ports closed except</td>
</tr>
<tr>
<td>Fail-Action</td>
</tr>
<tr>
<td>Noresult-Action</td>
</tr>
</tbody>
</table>

Save, Delete
Define Enforcements

Enforcement Installed Packages on Default

**Enforcement**

- Installed Packages on Default
- Unknown Source on Android
- IP Forwarding Enabled on Linux
- Measure /lib/x86_64-linux-gnu/libcrypto.so.1.0.0 on Ubuntu x86_64
- Measure /lib/x86_64-linux-gnu/libssl.so.1.0.0 on Ubuntu x86_64
- Measure /usr/bin

**Enforcement Info**

- Policy: Installed Packages
- Group: Default
- Max. age in seconds: 86400
- Fail Action: Inherit from policy
- Noresult Action: Inherit from policy

Save | Delete
TNC Network Access Control and Endpoint Compliance Profiles

TCG Members Meeting June 2014 Barcelona

Linux Integrity Measurement Architecture (IMA)
Linux Integrity Measurement Architecture

• **Linux Security Summit 2012 Paper**
  - Presented in September 2012 at LinuxCon in San Diego
  - Remote attestation based on IMA is feasible:
    
    The transfer and database lookup of 1200 file measurements amounting to about 120 kB of IMA measurements and certified by a Quote2 TPM signature takes about 20 seconds.

• **http://www.strongswan.org/lss2012.pdf**

• **Update:**
  
  strongSwan 5.2.0 can handle the IMA-NG SHA-1 and SHA-256 hash formats introduced with the Linux 3.13 kernel in order to support TPM 2.0 devices.
Linux IMA - BIOS Measurements

- BIOS is measured during the boot process
  - Many Linux distributions enable BIOS measurement by default when a TPM hardware device is detected.
  - BIOS measurement report with typically 15..30 entries is written to `/sys/kernel/security/tpm0/ascii_bios_measurements`
  - BIOS measurements are extended into PCRs #0..7

<table>
<thead>
<tr>
<th>PCR</th>
<th>SHA-1 Measurement Hash</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4d894eef0ae7cb124740df4f6c5c35aa0fe7dae8 08</td>
<td>[S-CRTM Version]</td>
</tr>
<tr>
<td>0</td>
<td>f2c846e7f335f7b9e9dd0a44f48c48e1986750c7 01</td>
<td>[POST CODE]</td>
</tr>
<tr>
<td></td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>9069ca78e7450a285173431b3e52c5c252999e473 04</td>
<td>[]</td>
</tr>
<tr>
<td>4</td>
<td>c1e25c3f6b0dc78d57296aa2870ca6f782ccf80f 05</td>
<td>[Calling INT 19h]</td>
</tr>
<tr>
<td>4</td>
<td>67a0a98bc4d6321142895a4d938b342f6959c1a9 05</td>
<td>[Booting BCV Device 80h, - Hitachi HTS723216L9A360]</td>
</tr>
<tr>
<td>4</td>
<td>06d60b3a0dee9bb9beb2f0b04aff2e75bd1d2860 0d</td>
<td>[IPL]</td>
</tr>
<tr>
<td>5</td>
<td>1b87003b6c7d90483713c90100cca3e62392b9bc 0e</td>
<td>[IPL Partition Data]</td>
</tr>
</tbody>
</table>
Linux IMA - Runtime Measurements

- **Executable files, dynamic libraries and kernel modules are measured when loaded during runtime.**
  - With some Linux distributions (e.g. Ubuntu 14.04) IMA can be activated via the `ima_tcb` boot parameter but usually the kernel must first be manually compiled with `CONFIG_IMA` enabled.
  - The IMA runtime measurement report with about 1200 entries is written to `/sys/kernel/security/ima/ascii_runtime_measurements`.
  - IMA runtime measurements are extended into TPM PCR #10.

<table>
<thead>
<tr>
<th>PCR</th>
<th>SHA-1 Measurement Hash</th>
<th>SHA-1 File Data Hash</th>
<th>Filename</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>d0bb59e83c371ba6f3adad491619524786124f9a</td>
<td>ima 365a7adf8fa89608d381d9775ec2f29563c2d0b8</td>
<td>boot_aggregate</td>
</tr>
<tr>
<td>10</td>
<td>76188748450a5c456124c908c36bf9e398c08d11</td>
<td>ima f39e77957b909f3f81f891c478333160ef3ac2ca</td>
<td>/bin/sleep</td>
</tr>
<tr>
<td>10</td>
<td>df27e645963911df0d5b43400ad71cc28f7f898e</td>
<td>ima 78a85b50138c481679fe4100ef2b3a0e6e53ba50</td>
<td>ld-2.15.so</td>
</tr>
<tr>
<td>10</td>
<td>30fa7707af01a670fc353386fcc95440e011b08b</td>
<td>ima 72ebd589aa9555910ff3764c27dbda4296575fe</td>
<td>parport.ko</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

Steffen, 25.06.2014, tcg_barcelona_2014.pptx 26
strongTNC - Remote Attestation Results

Session details

Session Info
ID 1746
Device Lenovo Twist Ubuntu 14.04a (97b685002b)
User steffen
Time Jun 15 11:27:36 2014
Result Block

Results
Policy | Result | IMV Comment
--- | --- | ---
TPM BIOS/IMA Measurements | Allow | processed 1185 IMA file evidence measurements: 1122 ok, 64 unknown, 0 differ, 0 failed; 18 BIOS evidence measurements are ok
IP Forwarding Enabled | Block | forwarding enabled
Allowed Open Linux UDP Ports | Block | violating udp ports: 67 631
Metadata of /etc/tnc_config | Allow | file metadata requested
SWID Tag ID Inventory | Allow | received inventory of 2174 SWID tag IDs and 0 SWID tags
Allowed Open Linux TCP Ports | Block | violating tcp ports: 8834
Installed Packages | Allow | processed 2173 packages: 0 not updated, 0 blacklisted, 82 ok, 2091 unknown
## strongTNC - Reference Values for File Hashes

### File sh

#### File info: /bin/sh

<table>
<thead>
<tr>
<th>OS</th>
<th>Algo</th>
<th>Hash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debian 7.1 arm6l</td>
<td>SHA1</td>
<td>b3e398defaae41435109d5da56a21878aacd0704</td>
</tr>
<tr>
<td>Debian 7.2 arm6l</td>
<td>SHA1</td>
<td>b3e398defaae41435109d5da56a21878aacd0704</td>
</tr>
<tr>
<td>Debian 7.2 arm6l</td>
<td>SHA256</td>
<td>9b81f477ace3c7690c2429480938cbaed58f8...</td>
</tr>
<tr>
<td>Debian 7.5 arm6l</td>
<td>SHA1</td>
<td>b3e398defaae41435109d5da56a21878aacd0704</td>
</tr>
<tr>
<td>Debian 7.5 arm6l</td>
<td>SHA256</td>
<td>9b81f477ace3c7690c2429480938cbaed58f8...</td>
</tr>
<tr>
<td>Ubuntu 13.04 x86_64</td>
<td>SHA1</td>
<td>8f15a2e3ab1a040c6656d068c92b6a7796311</td>
</tr>
<tr>
<td>Ubuntu 13.10 x86_64</td>
<td>SHA1</td>
<td>8f15a2e3ab1a040c6656d068c92b6a7796311</td>
</tr>
<tr>
<td>Ubuntu 14.04 x86_64</td>
<td>SHA1</td>
<td>647437c3d7543c7c83d319033349ef42eb4cf69</td>
</tr>
<tr>
<td>Ubuntu 14.04 x86_64</td>
<td>SHA256</td>
<td>dc3e621772c1e19593c42a7703e1431fd3dad5320</td>
</tr>
<tr>
<td>Ubuntu 14.04 x86_64</td>
<td>SHA256</td>
<td>2934648ffdb7b77f507a5db3d3b2b3bfdfbf5...</td>
</tr>
</tbody>
</table>
TNC Network Access Control and Endpoint Compliance Profiles

TCG Members Meeting June 2014 Barcelona

TNC Endpoint Compliance Profile
Endpoint Compliance

Endpoint
- SWID Collector
  - TNC Client

Compliance Service
- SWID Verifier
  - TNC Server

CMDB
- Configuration Management Data Base

Scan report CMDB Interface
Endpoint Compliance

- **Endpoints** initially report a complete **Software Inventory** to the **Compliance Service** which stores the inventory in a **Configuration Management Data Base (CMDB)** covering all hosts within an organization or network.

- Changes in the software inventory are continuously reported.

- The tracking of the installed software is based on standardized **Software Identification (SWID) Tags**.

- Due to the huge bandwidth requirements (2000+ SWID tags, some of them > 1 MB), the preferred TNC transport protocol for endpoint compliance reporting is **IF-T for TLS** (RFC 6876 PT-TLS).

- With the CMDB it becomes possible to establish at any time which software (including the exact version) was installed on what endpoints during which time interval.
Software Identification (SWID) Tags


```xml
<?xml version='1.0' encoding='UTF-8'?>
<SoftwareIdentity
    xmlns="http://standards.iso.org/iso/19770/-2/2014/schema.xsd"
    name="strongSwan" uniqueId="strongSwan-5-2-0rc1"
    version="5.2.0rc1" versionScheme="alphanumeric">
    <Entity
        name="strongSwan Project" regid="regid.2004-03.org.strongswan"
        role="publisher licensor tagcreator"/>
    <Payload>
        <File location="/usr/sbin" name="ipsec"/>
        <File location="/usr/libexec/ipsec" name="charon"/>
        <File location="/usr/lib/ipsec" name="libcharon.so.0"/>
        <File location="/usr/lib/ipsec" name="libstrongswan.so.0"/>
    </Payload>
</SoftwareIdentity>
```
swidGenerator - an Open Source Tool

• The **swid_generator** tool allows to generate a complete inventory of the software packages installed on a Linux endpoint consisting either of ISO/IEC 19770-2 **SWID Tags** or concise unique **Software IDs**.

• Supported Linux package managers:
  - **dpkg**  Debian, Ubuntu, etc.
  - **rpm**   RedHat, Fedora, SuSE, etc.
  - **pacman**  Arch Linux

• Use:
  
  ```
  swid_generator software-id
  swid_generator swid [--pretty] [--full] \ 
  [--software-id <id>] \ 
  [--package <name>]
  ```

• Download:  https://github.com/strongswan/swidGenerator
SWID Log for a given Endpoint I

SWID log for Lenovo Twist Ubuntu 14.04a

Set date range
From: Jun 10, 2014 to Jun 17, 2014
Predefined range: Last Week

Changes summary
- Added SWID tags: 59
- Removed SWID tags: 61
- Sessions in range: 4
- First session in range: Jun 10 11:56:01.2014
- Last session in range: Jun 17 11:44:33.2014

Change log
Session | Action | Unique ID | Package name | Version
---------|--------|-----------|--------------|--------

### SWID Log for a given Endpoint II

<table>
<thead>
<tr>
<th>Session</th>
<th>Action</th>
<th>Unique ID</th>
<th>Package name</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun 17 11:44:33 2014</td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-evince-3.10.3-0ubuntu10.1</td>
<td>evince</td>
<td>3.10.3-0ubuntu10.1</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-evince-common-3.10.3-0ubuntu10.1</td>
<td>evince-common</td>
<td>3.10.3-0ubuntu10.1</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-libudev-3.4-3.10.3-0ubuntu10.1</td>
<td>libudev-3.4</td>
<td>3.10.3-0ubuntu10.1</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-libudev-3.4-3.10.3-0ubuntu10.1</td>
<td>libudev-3.4</td>
<td>3.10.3-0ubuntu10.1</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-tzdata-2014-0ubuntu0.14.04</td>
<td>tzdata</td>
<td>2014-0ubuntu0.14.04</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-usb-creator-common-0.2.56.1</td>
<td>usb-creator-common</td>
<td>0.2.56.1</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-usb-creator-gtk-0.2.56.1</td>
<td>usb-creator-gtk</td>
<td>0.2.56.1</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>strongSwan-5.2-0rc1</td>
<td>strongSwan</td>
<td>5.2-0rc1</td>
</tr>
<tr>
<td></td>
<td>REMOVED</td>
<td>Ubuntu_14.04-x86_64-evince-3.10.3-0ubuntu10</td>
<td>evince</td>
<td>3.10.3-0ubuntu10</td>
</tr>
<tr>
<td></td>
<td>REMOVED</td>
<td>Ubuntu_14.04-x86_64-libudev-3.4-3.10.3-0ubuntu10</td>
<td>libudev-3.4</td>
<td>3.10.3-0ubuntu10</td>
</tr>
<tr>
<td></td>
<td>REMOVED</td>
<td>Ubuntu_14.04-x86_64-libudev-3.4-3.10.3-0ubuntu10</td>
<td>libudev-3.4</td>
<td>3.10.3-0ubuntu10</td>
</tr>
<tr>
<td></td>
<td>REMOVED</td>
<td>Ubuntu_14.04-x86_64-libudev-3.4-3.10.3-0ubuntu10</td>
<td>libudev-3.4</td>
<td>3.10.3-0ubuntu10</td>
</tr>
<tr>
<td></td>
<td>REMOVED</td>
<td>Ubuntu_14.04-x86_64-libudev-3.4-3.10.3-0ubuntu10</td>
<td>libudev-3.4</td>
<td>3.10.3-0ubuntu10</td>
</tr>
<tr>
<td></td>
<td>REMOVED</td>
<td>Ubuntu_14.04-x86_64-tzdata-2014-0ubuntu0.14.04</td>
<td>tzdata</td>
<td>2014-0ubuntu0.14.04</td>
</tr>
<tr>
<td></td>
<td>REMOVED</td>
<td>Ubuntu_14.04-x86_64-usb-creator-common-0.2.56</td>
<td>usb-creator-common</td>
<td>0.2.56</td>
</tr>
<tr>
<td></td>
<td>REMOVED</td>
<td>Ubuntu_14.04-x86_64-usb-creator-gtk-0.2.56</td>
<td>usb-creator-gtk</td>
<td>0.2.56</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-indicator-printers-0.17+14.04.20140527-0ubuntu1</td>
<td>indicator-printers</td>
<td>0.17+14.04.20140527-0ubuntu1</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-intrinsics-tools-0.103-0ubuntu4.2</td>
<td>intrinsics-tools</td>
<td>0.103-0ubuntu4.2</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-intrinsics-tools-bin-0.103-0ubuntu4.2</td>
<td>intrinsics-tools-bin</td>
<td>0.103-0ubuntu4.2</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-libgcal-3.3-3.10.8-0ubuntu1.1</td>
<td>libgcal-3.3</td>
<td>3.10.8-0ubuntu1.1</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-libgcal-3.3-3.10.8-0ubuntu1.1</td>
<td>libgcal-3.3</td>
<td>3.10.8-0ubuntu1.1</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-libgcal-3.3-3.10.8-0ubuntu1.1</td>
<td>libgcal-3.3</td>
<td>3.10.8-0ubuntu1.1</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-libgcal-3.3-3.10.8-0ubuntu1.1</td>
<td>libgcal-3.3</td>
<td>3.10.8-0ubuntu1.1</td>
</tr>
<tr>
<td></td>
<td>ADDED</td>
<td>Ubuntu_14.04-x86_64-libgcal-3.3-3.10.8-0ubuntu1.1</td>
<td>libgcal-3.3</td>
<td>3.10.8-0ubuntu1.1</td>
</tr>
</tbody>
</table>

---

*Steffen, 25.06.2014, tcg_barcelona_2014.pptx* 35
List of Endpoints for a given SWID Tag

<table>
<thead>
<tr>
<th>Description</th>
<th>First reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lenovo Twist Ubuntu 14.04</td>
<td>May 27 12:10:38 2014</td>
</tr>
<tr>
<td>Lenovo Twist Ubuntu 14.04a</td>
<td>May 24 10:31:07 2014</td>
</tr>
<tr>
<td>Raspberry Pi 1 Debian 7.2a (1083f03988)</td>
<td>May 25 08:46:29 2014</td>
</tr>
<tr>
<td>Raspberry Pi 1 Debian 7.5a (1063f03983)</td>
<td>May 25 13:08:08 2014</td>
</tr>
<tr>
<td>Raspberry Pi 2 Debian 7.2 (34069147ac)</td>
<td>May 25 18:29:30 2014</td>
</tr>
<tr>
<td>Raspberry Pi 2 Debian 7.5 (34069147ac)</td>
<td>May 25 18:59:06 2014</td>
</tr>
</tbody>
</table>
Thank you for your attention!

Questions?

www.strongswan.org/tnc/