Trusted Network Access Control

→ Experiences from Adoption

Joerg Vieweg
joerg.vieweg@fh-hannover.de
Trust@FHH Research Group
University of Applied Sciences and Arts Hanover
https://trust.inform.fh-hannover.de

tNAC
trusted network access control

Agenda

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- **Introduction**
- **Network Access Control**
- **Trusted Network Connect**
- **Projects**
- **Summary**

Introduction
→ Motivation

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Current Situation

- **Networking steadily increases**
  - in and between companies
  - public networks (e.g. internet)
- **Critical Applications**
  - B2B transactions, home banking and many more
- **Critical Infrastructure**
  - Communications-Networks itself
  - public power grid

Introduction
→ Motivation

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Current Situation

- **Threats**
  - software vulnerabilities (e.g. buffer overflows)
  - Viruses, Malware
  - ...
- **Problem**
  - Countermeasures protect Network against threats from „outside“
  - what about threats which are „carried“ into the network
    - e.g. employee who uses notebook also at home or as field worker

Introduction
→ Current security technologies

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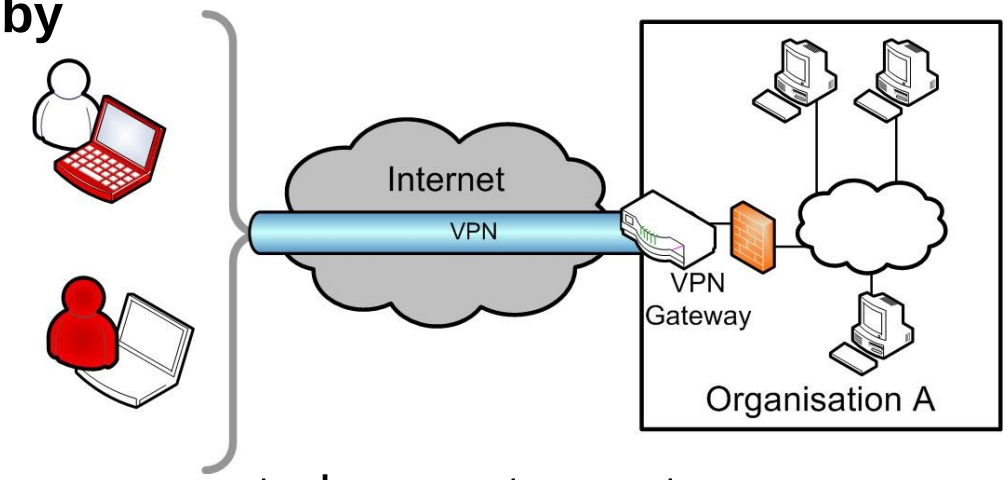
- **Network access protected mainly by**
  - User authentication
  - Firewalls,
  - VPNs, …



- **But**
  - No integrity checks of connecting or connected computer systems
  - No differentiation between trustworthy and not trustworthy computer systems

- **Consequences**
  - Connecting device may be a threat for the otherwise protected network

Introduction
→ Need for new approaches

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- **There's a need for new technologies which**
  - make an access decision before a device get (full) network access
  - permit access to computer systems with trusted configuration
  - deny access to computer systems with untrusted configuration

Approach

Network Access Control (NAC)

Agenda

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- Introduction
- **Network Access Control**
- Trusted Network Connect
- Projects
- Summary

Network Access Control
→ Functions (1/2)

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- **User Authentication**
  - User Authentication (e.g. password or certificates)
  - e.g. VPN and IEEE 802.1X
- **Configuration Assessment**
  - Configuration measurement **before** network access is granted
    - e.g. installed software like antivirus scanner and Firewall
  - Compare measurements to policies of the network to access

  ➔ Integrity check of the computer system
  - Re-assess accepted computer systems in regular intervals
- **Policy Enforcement**
  - Enforce policies to non-compliant computer systems

Network Access Control
→ Topology

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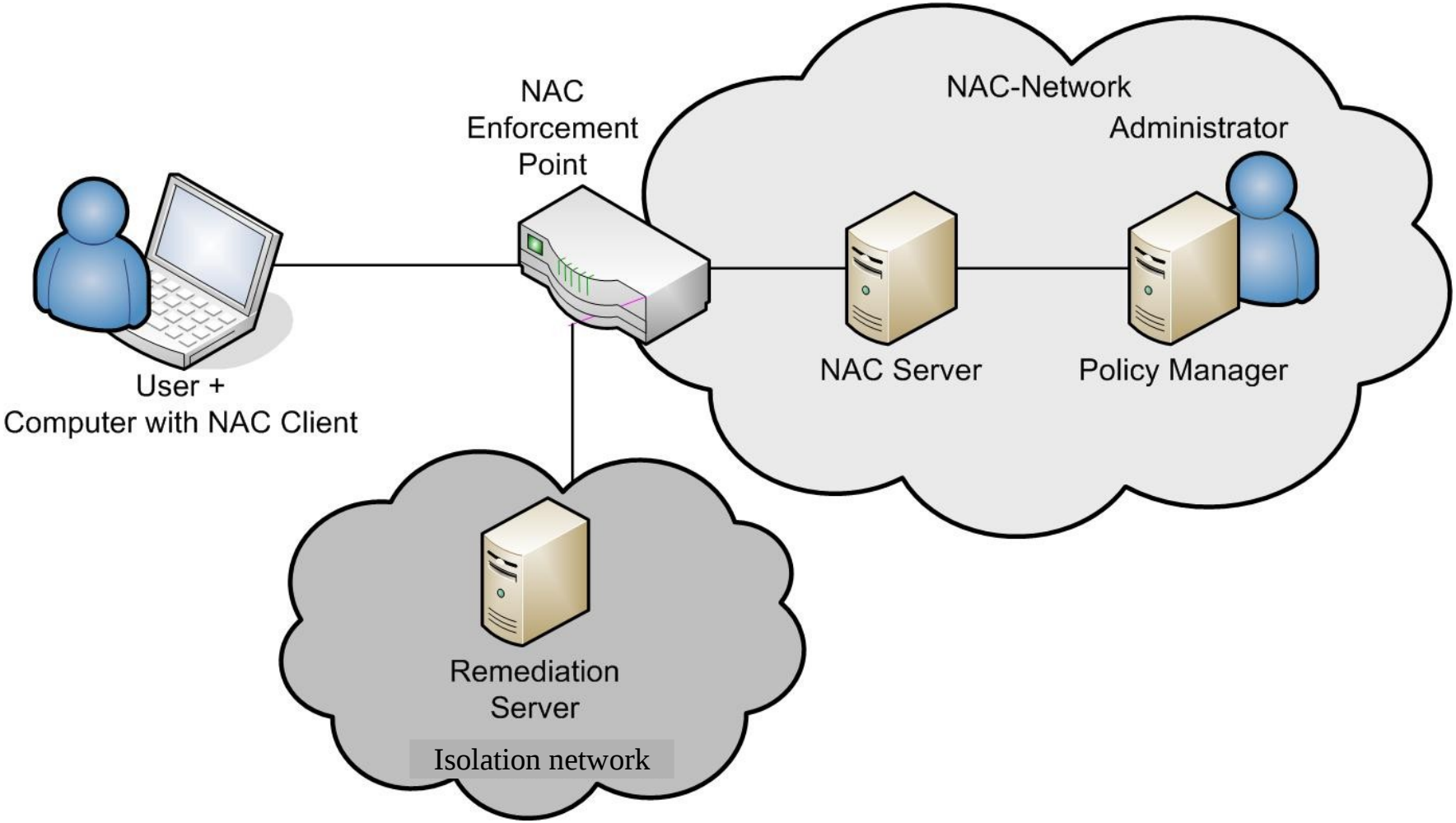

Network Access Control
→ Solutions

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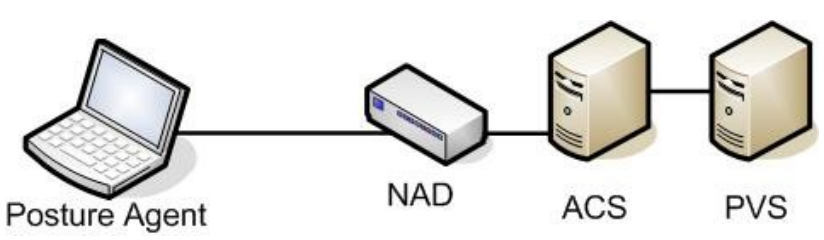
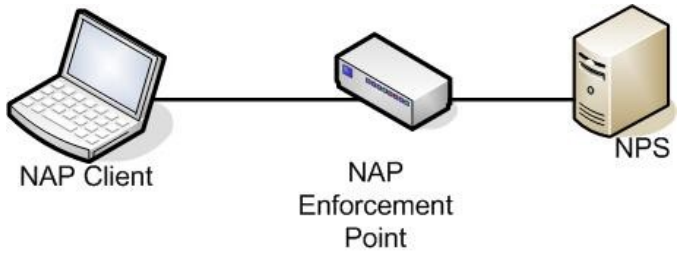
- **NAC solutions already available on the market**
- **The most prominent:**
  - Cisco Network Admission Control (Cisco NAC)
  - Microsoft Network Access Protection (NAP)
- **And many more:**
  - Juniper Unified Access Control
  - StillSecure Safe Access
  - …





Network Access Control
→ Limitations of current solutions (1/3)

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Lack of trust in the measurements
The "lying endpoint problem"

- Caused by current OS without isolation of components
- Measured components can get compromised
- NAC-components can get compromised too
  - Shown on Cisco CTA at BlackHat conference 2007
- Achieve more trustworthiness based on measurements which are not trustworthy?

Lack of trust in NAC enabled networks

- User can't control collected data
- Possible privacy issues

Network Access Control
→ Limitations of current solutions (2/3)

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- **No Standards, no compatibility by design**
- **First approaches**
  - Client sided compatibility of Cisco NAC and NAP
  - Microsoft opened their NAP-Client-Server-Protocol „SoH“
  - Compatibility of „smaller“ solutions to Cisco NAC, NAP or TNC
    - e.g. StillSecure Safe Access
- **Two (but one) approaches for standardization**
  - **TCG: Trusted Network Connect (TNC)**
  - IETF: Network Endpoint Assessment (NEA) – using TNC as outline
    - Goal: Standardize the Client-Server-Protokolls

Network Access Control
→ Limitations of current solutions (3/3)

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- **Platform independence**
  - Support for every common OS is essential
  - Current NAC solutions support primarily Microsoft products

- **Political challenges**

  “Who defines what is considered as being trustworthy?”
  - Vendors of NAC and/or security solutions?
  - Network operator?
  - Third Party?
  - All together?

Agenda

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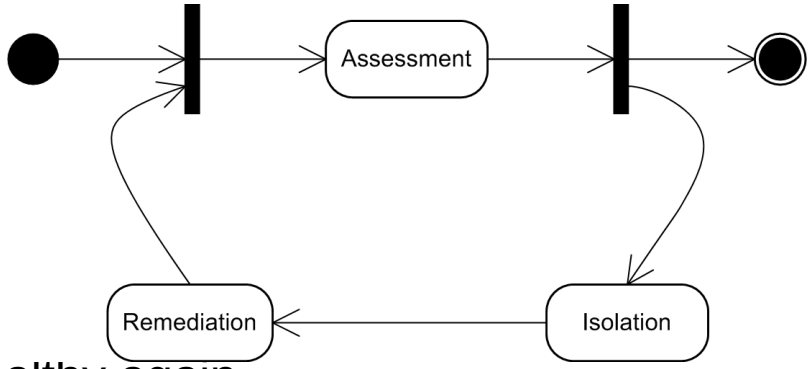
- Einführung
- Network Access Control
- **Trusted Network Connect**
- Projects
- Summary

Trusted Network Connect
→ Overview

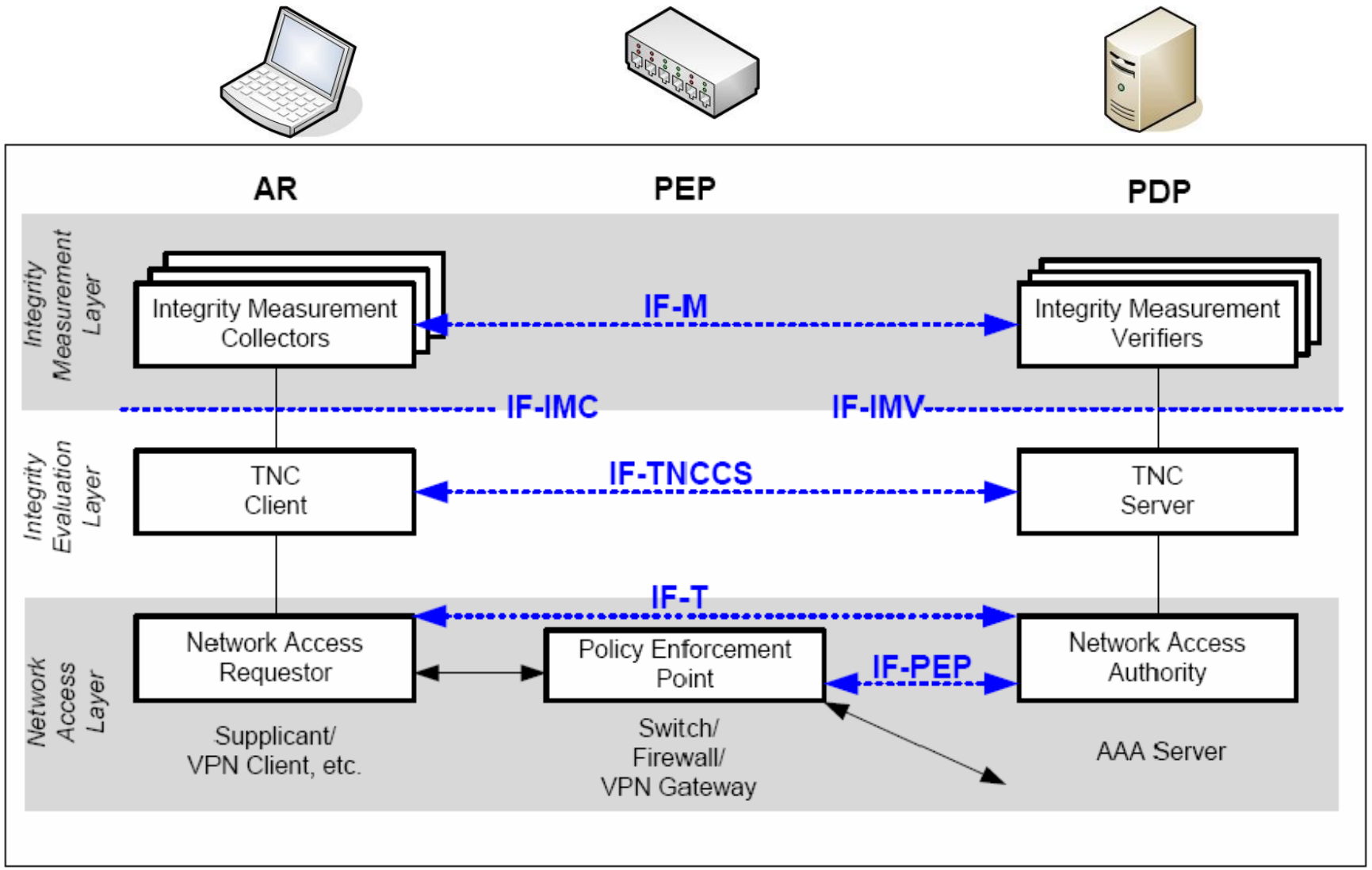
- **Open Architecture for NAC**
  - Specified by the TNC Subgroup of the TCG
  - All specifications are publically available
    - Enables multi-vendor interoperability
  - Supports existing technologies (802.1X, EAP)

- **TNC Handshake consists of 3 phases**
  - Assessment
    - TNC Platform Authentication
      - Identity + integrity of platform
  - Isolation
    - Quarantine non-healthy endpoints
  - Remediation
    - Fix problems and make endpoint healthy again



Trusted Network Connect

→ Basic Architecture



[TNC Architecture for Interoperability Specification version 1.3 revision 6]

Trusted Network Connect
→ TPM Support

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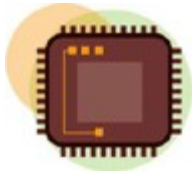
- **One main advantage of TNC compared to other NAC solutions**
  - Supports use of the TPM during TNC Handshake
  - Promising approach to solve the „lying endpoint problem“
  - Goal: Ensure integrity of TNC subsystem located on the AR



- **Idea: Use TPM capabilities during TNC Handshake**
  - Create integrity reports (signed)
  - AR sends integrity report to PDP
  - PDP compares received values to known good reference values
    - PDP can verify integrity of TNC subsystem

- **AR cannot successfully lie about its current integrity state!**

Trusted Network Connect
→ TPM Support – additional components

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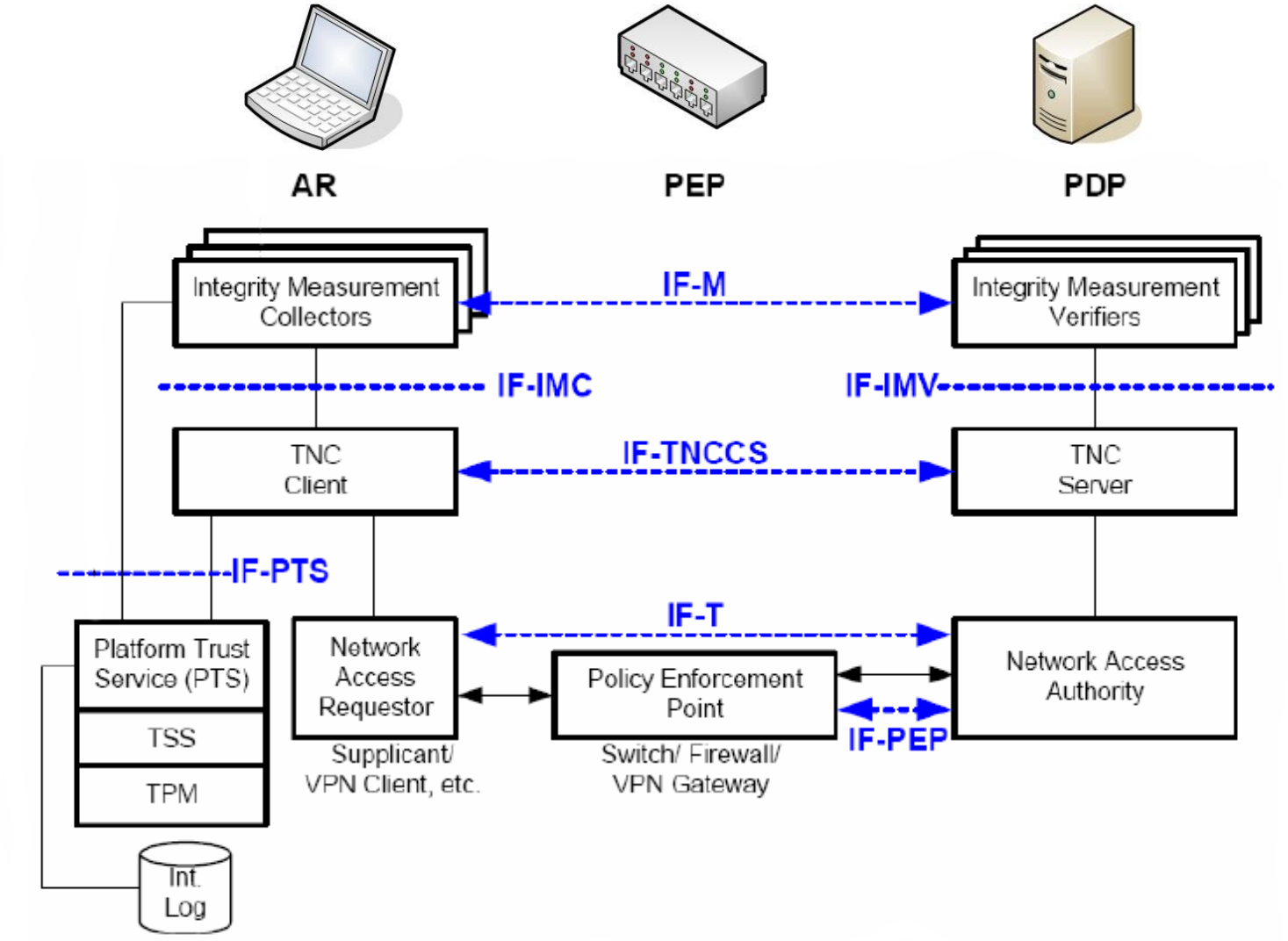
- **PTS (Platform Trust Services)**
  - System service on the AR
  - Exposes Trusted Platform capabilities to TNC components

- **Further components**
  - TPM (Trusted Platform Module)
    - Implements Trusted Platform's capabilities
  - TSS (Trusted Software Stack)
    - Exposes high level interface to TPM for applications
  - IML (Integrity Measurement Log)
    - Stores list of integrity measurements on AR

Trusted Network Connect
→ TPM Extended Architecture



[TNC Architecture for Interoperability Specification version 1.3 revision 6]

Trusted Network Connect
→ PTS Features

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- **Creates integrity reports**
  - Makes them available to IMCs / TNCC
  - Enables them to be used during TNC Handshake
  - Ensures that they are rendered in an standardized format
    - TCG Schema Specifications

- **Measures integrity status of …**
  - TNC components
  - On disk & in memory measurements
  - Appends measurements to IML

- **Why should one trust the PTS ?**
  - Part of the so called Chain of Trust

Trusted Network Connect
→ Chain of Trust

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- **Transitive measurement chain**
  - started at the Root of Trust for Measurement (Trust Anchor)
  - components are measured before they are started
  - measurement values are safely stored
  - result is a integrity statement about the platform
    - compromising of components can be detected when checking integrity value against known good values
  - PTS part of the Chain of Trust

Trusted Network Connect
→ Further Integrity Checks

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- **Motivation**
  - Check integrity of further applications on the AR
  - E.g. Anti Virus, Firewall … in addition to its configuration

- **Application specific IMC/IMV pair interacting with PTS**
  - IMC/IMV pair measures configuration and integrity
  - Needs to interact with PTS … standardized but quite involved
  - What about standardized IF-M?

Agenda

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- **Projects**
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Projects
→ Introduction

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- **Currently, three projects with trust@fhh research group involvement**
  - TNC@FHH
  - IFMAP@FHH
  - tNAC

Projects
→ TNC@FHH

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- **TNC@FHH**
  - Open source based implementation of TNC
  - Developed at University of Applied Sciences and Arts Hannover
  - Implements all core TNC components/layers/interfaces
  - No TPM support … yet
  - Been tested within several TNC Environments
  - No AR component
    - relies on standalone products
      - wpa_supplicant
      - XSupplicant
  - only support for 802.1X... yet
  - used within the tNAC-Project

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- **Research Project:**
  - Started on July, 1st 2008
  - Scheduled for 3 years
- **Consortium consisting of**
  - University of Applied Sciences Gelsenkirchen
  - University of Applied Sciences and Arts Hannover
  - Ruhr-Universität Bochum
  - Datus AG
  - Sirrix AG
  - Steria Mummert Consulting AG
- **Sponsored by the Federal Ministry of Education and Research**

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tNAC
→ Goals

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- **Develop a Trusted Network Access Control Solution**
  - TNC compatible NAC solution with full TPM support
- **Integration of a security Platform**
  - Turaya (EMSCB)
- **Participate in TCG‘s specification process**
  - Contribution to IF-M between PTS-IMC/IMV
- **Management**
  - Keep (t)NAC manageable (Policy-Manager, Management-Console)
    - Focus on usability as well as technology

Projects
→ IFMAP@FHH

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- **Another Project, besides the direct TNC-Context:**
  - IFMAP@FHH
- **Implements TCG's IF-MAP specification**
  - Server component:
    - MAP: Metadata Access Point
    - Component which collects network-related information and makes those information available for use
  - Client components
    - possess context-related information (e.g. firewall knows sth. about blocked traffic)
    - send (publish) those information to the MAP Server
    - receive (subscribe) information from the MAP Server for further use (e.g. firewall responding to threats detected by the IDS)

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Summary

tNAC
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- **Endpoint becoming critical point**
- **Lack of trust against the Endpoint**
- **NAC concept seems to be a good approach**
- **Current solutions can’t achieve the promised trust level**
- **TNC is open and supports the utilization of the TPM**
  - may need more work...
- **Several OSS Projects showing that Trusted Computing an OS works together**

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Thank You

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