Fachhochschule
Gelsenkirchen

Trusted Computing
→ Security Platform - Turaya

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internet security.

Content

- Aim and outcomes of this lecture
- Motivation/Approach/EMSCB Project
- Idea/Architecture
- Application Scenarios
- Summary

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Security Platform - Turaya
→ Aims and outcomes of this lecture

Aims

- To introduce the topic Security Platform Turaya
- To explore the general idea of a Security Platform Turaya
- To analyze the goals of a Security Platform Turaya
- To assess the concerns of a Security Platform Turaya

At the end of this lecture you will be able to:

- Understand the basic idea of a Security Platform Turaya.
- Know something about the approach of a Security Platform Turaya.
- Understand the need for a Security Platform Turaya.

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Security Platform - Turaya

→ Motivation

What we need is trustworthy IT that is achievable by means of a **security platform**

- which **solves the security problems** of existing computer systems or **greatly restricts the harmful effects** of e.g. viruses, worms, trojans, phishing, exploits, SW updates
- which **guarantees the trustworthy processing of information** on one's own and on external computer systems
- which **supports the use of existing operating systems**
- which offers **transparent security** or **transparent trustworthiness**

Security Platform - Turaya
→ Approach

What we need is **increased trustworthiness** through the **conception** and **development** of a **trustworthy, fair** and **open security platform.**

Trustworthiness

- Comprehensible architecture, low level of complexity of the technology
- Transparent implementation and **trustworthy execution**
- Functions that guarantee trustworthiness: sealing, attestation, secure (trusted) boot

Fairness

- The enforcement of rights requires the **agreement of all parties**.
- The security platform **can be used, but does not have to be**.
- User (data protection), Organisations (secure handling of important data), External bodies (copyrights and licences)

Openness

- Creation of an open standard to improve interoperability.
- Turaya can be used by all operating systems and platforms. (Desktop, SmartPhone, PDAs, embedded systems)
- Open to all partners - no discrimination against individual suppliers/users

Security Platform - Turaya
→ The EMSCB-Project

if(is) internet security.

Consortium manager

Ruhr-University-Bochum
eurobits

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Security Platform - Turaya
→ Milestones / Applications

- *Turaya.Crypt*

- *Turaya.VPN*

- *Turaya.FairDRM*

  A simple fair DRM system

- *Turaya.ERM*

  Partner SAP

  Policy-based document management

- *Turaya.Embsys*

  Partner Bosch/Blaupunkt

  use of the platform in embedded systems (multimedia)

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Security Platform - Turaya
→ Basic Idea

- Trusted Computing needs a security platform!
- The security platform requires special attributes such as:
  - Trustworthiness
  - Fairness
  - Openness
- With the security platform Turaya we enable Trusted Computing to be "open" within the meaning of our attributes.

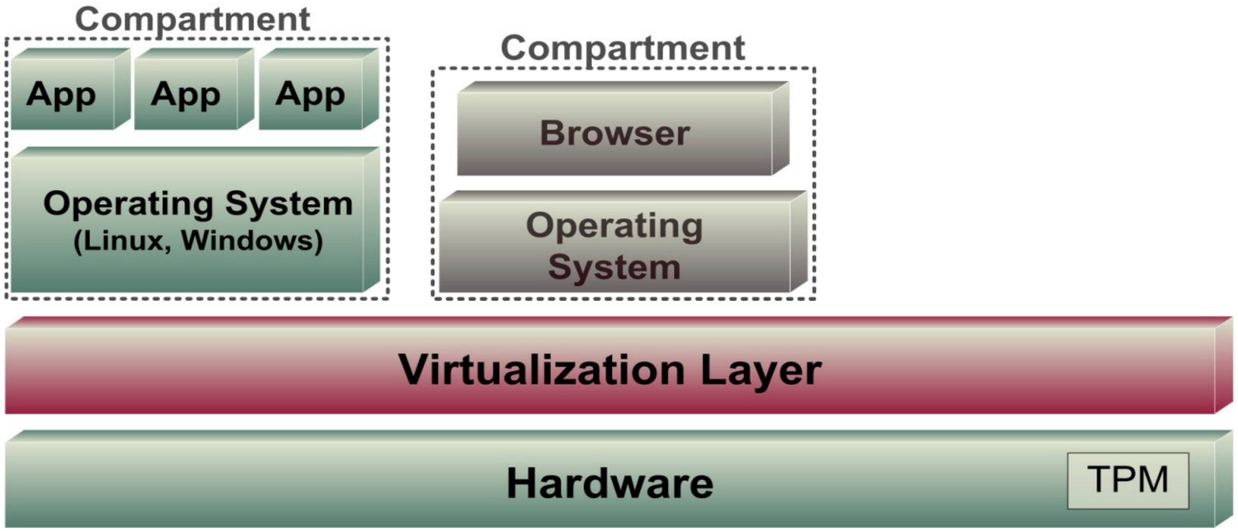
Security Platform - Turaya
→ Architecture and Technology 1/3

- ***Conventional hardware***
  - CPU / hardware devices
- ***TPM***
  - Highest level of protection through hardware-based security
- ***Use the advantages of Trusted Computing technology***

Hardware
TPM

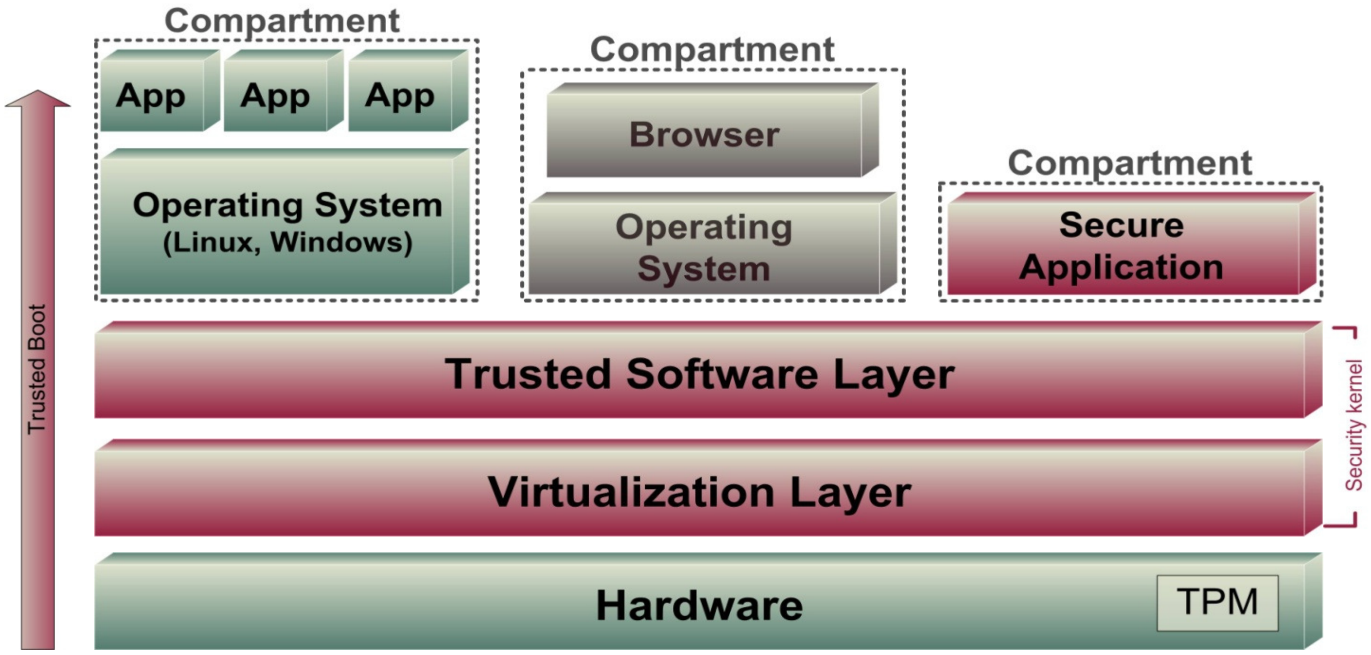
Security Platform - Turaya
→ Architecture and Technology 2/3

- ***Virtualization layer for the purposes of isolation...***
  - Protect applications
  - Protect user data
  - Protect against the manipulation of an application (e.g. browser)
- ***... through modern virtualization technologies***
  - Micro-kernel architecture
  - Use of existing components in compartments



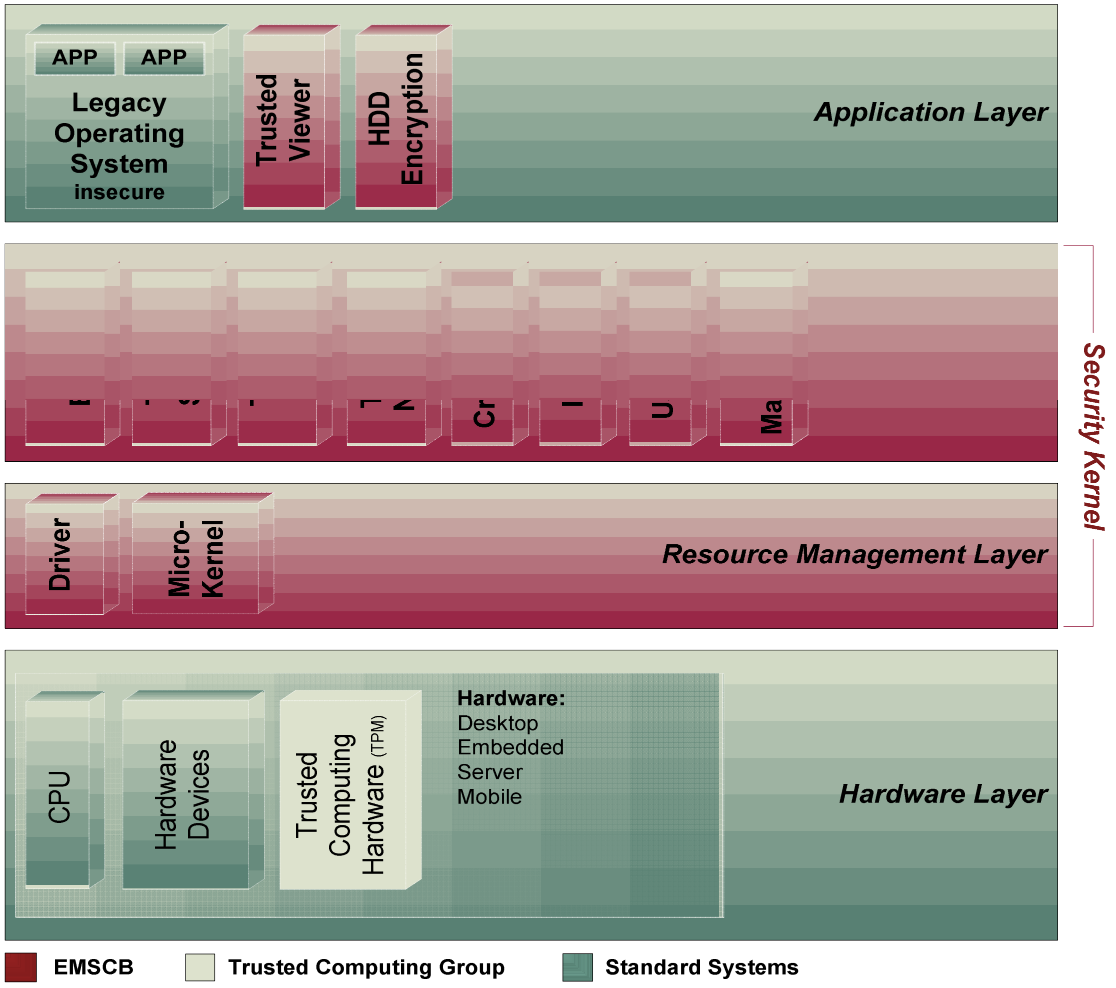
Security Platform - Turaya
→ Architecture and Technology 3/3

- *Security Platform (Trusted Software Layer)*
  - **Authentication** of individual compartments
  - **Binding of data** to individual compartments
  - **Trusted Path**
    - Between user & application / application & smartcard
  - **Secure policy enforcement**



Security Platform - Turaya
→ Architecture in detail - overview

- ***Application Layer***
  - legacy operating systems
  - Secure applications
- ***Trusted Software Layer***
  - Security services
  - Application management
  - Sec. policy management
- ***Resource Management Layer***
  - Mikro-kernel / HW sharing
  - **Policy enforcement**
- ***Hardware Layer***
  - CPU
  - TC technology



Security Platform - Turaya
→ Architecture in detail – secure apps

- **Trusted Viewer**
  - Provides a trustworthy document viewer working with the principle of **What-you-see-is-what-you-get**.
  - Applications can store documents in a certain fashion, only enabling the **Trusted Viewer** to open and display these documents.
  - Output, displayed by the **Trusted Viewer,** cannot be overlaid by a different application.

- **Device Encryption**
  - By the means of **Device Encryption** block orientated devices (hard drive, memory sticks, CD/DVDs) can be encrypted.
  - The **Device Encryption** is transparent to the user depending on the used configuration.

Security Platform - Turaya
→ Architecture in detail – services (1/3)

- **Trusted Storage (Manager)**
  - The **Trusted Storage Manager** provides a trustworthy storage space, which can be used by processes, to store data securely and with a full level on integrity.
  - Data can be bound to a certain configuration (measurements within the **PCRs**), a certain user, or a certain application.
  - The **Trusted Storage Manager** also provides the attribute defined as „freshness“. This allows the detection and prevention of replay attacks.

- **Trusted GUI**
  - Manages the in- and output devices of the user (mouse, keyboard, graphics adaptor, …).
  - Provides a secure path (**trusted path**) between the input of the keyboard up to the secure application, ensuring that no input can be detoured or intercept keyboard data.

Security Platform - Turaya
→ Architecture in detail – services (2/3)

- **Trusted Network**
  - Provides a trustworthy network interface, which verifies the network components and if necessary bans the connection.
- **Crypto/TSS**
  - Forms a centralized contact point for all applications, which need functions of the TSS.
- **Installer**
  - Presents the Loader of the system.
  - It installs and runs services from within the TCB as well as applications of the user.
  - Manages all running processes and offers a trustworthy entity to identify processes.

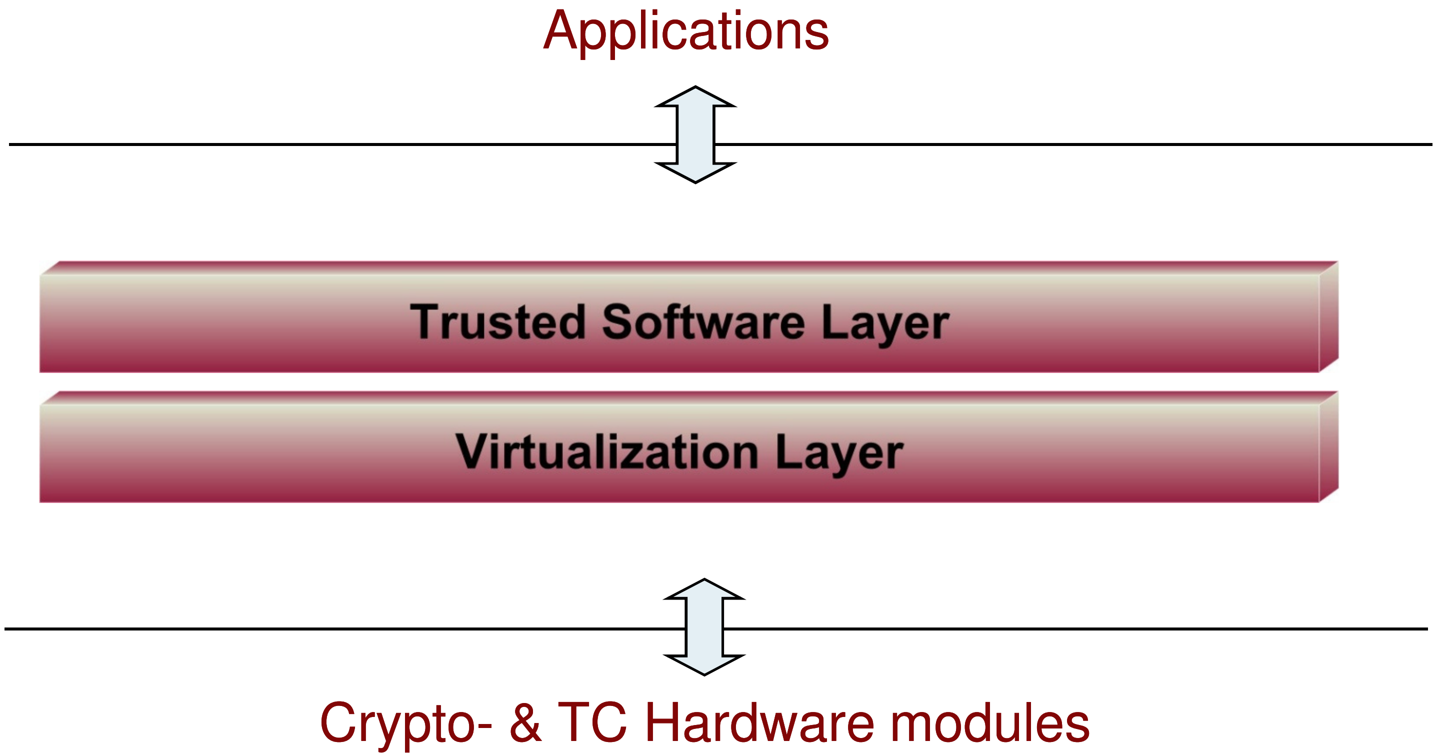
Security Platform - Turaya
→ Architecture in detail – services (3/3)

- **User Auth**
  - Presents the user management for the users of the system and offers this service to the other applications.
  - Applications can use the service to conduct user authentication.
  - This enables the binding of data to a certain user.

- **Policy Management**
  - This service ensures that policies are enforced.
  - Data, that needs to be processed by observing certain policies, is binded encrypted to the **Policy Management**.
  - The policy is checked by the **Policy Management**, before the data can be processed.

Security Platform - Turaya

→ Architecture in detail: hardware module



Examples (with different functions)
TPM, Intel TXT, AMD Presidio, ARM Trustzone
Smartcards, IBM4758

Security Platform - Turaya
→ Additional Properties

- ***Minimalisation***
  - Error avoidance through the **modularity** and **low level of complexity**
- ***Openness:***
  - Design, source code, documentation, standards
- ***A simple application***
  - Standardized management interface for all compartments
  - Small support requirement
  - High level of stability
- ***Compatibility & Interoperability***
  - Different operating systems and versions are possible in parallel
  - The security services are independent of the respective operating system

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Security Platform - Turaya
→ Application Scenarios

- ***Financial Field***
  - Secure online banking
  - Secure communication
- ***Public Authorities and Companies***
  - Secure processes / communication / applications
  - eGovernment, ePassport, eVoting, health card
  - Qualified signature, secure middleware
  - Enterprise rights management (content / document protection)
- ***Content Providers / Commercial Sale***
  - eCommerce
  - Digital Rights Management (DRM)
- ***Secure Client Server Models***
  - External employees, secure supply chain, company communication
- ***Security in Embedded Systems***
  - Mobile devices, automotive

Security Platform - Turaya
→ Pilot: Turaya.ERM (1/2)

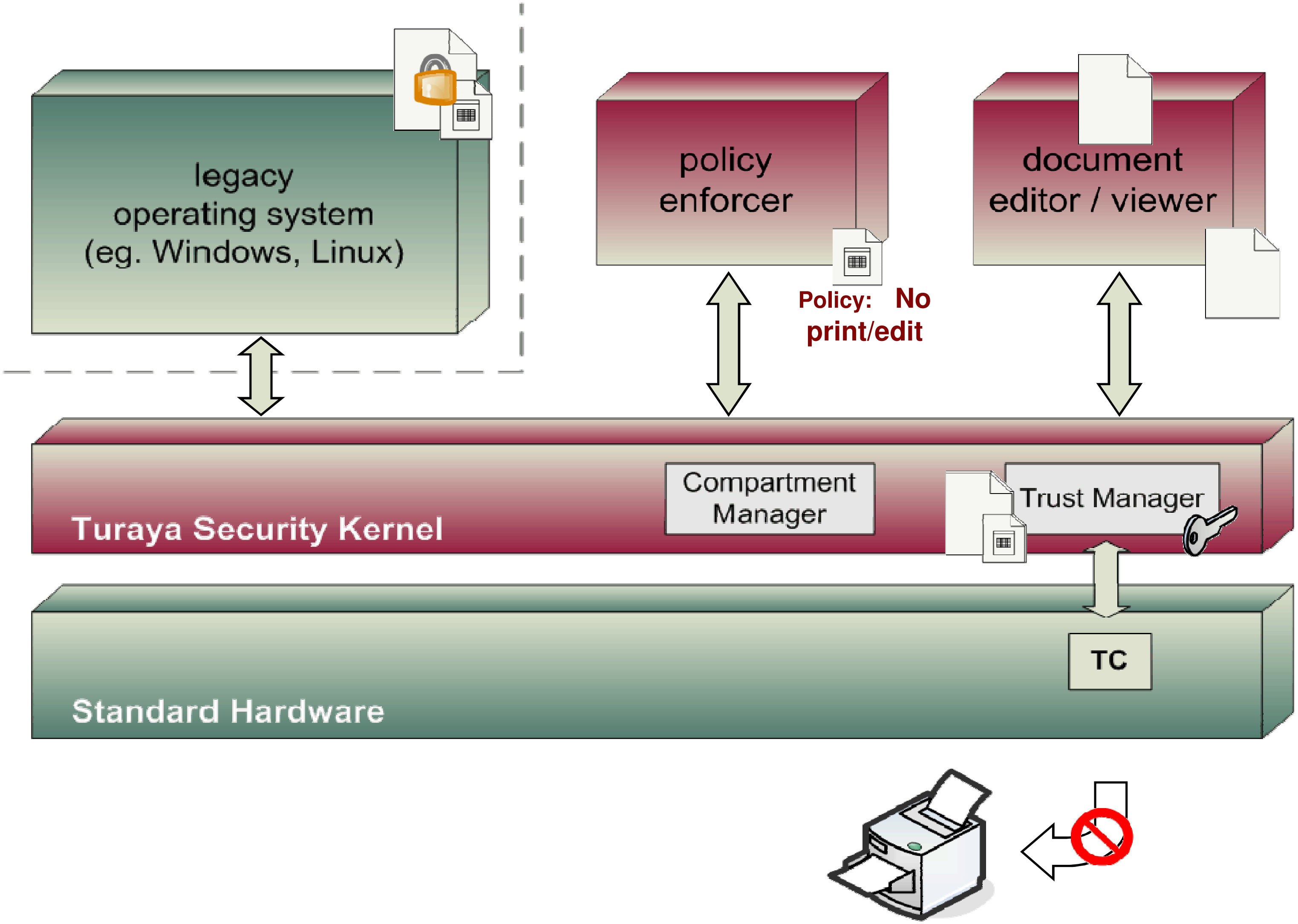
Fair Enterprise Rights Management (ERM)

- **Open** Security Platform which gives **equal** consideration to the requirements of the **content provider** and the **content consumer**
- Runs in **parallel** to the conventional operating system
- Independently of conventional operating systems

Properties and services

- License negotiations
- License transfer
- Protection of user data

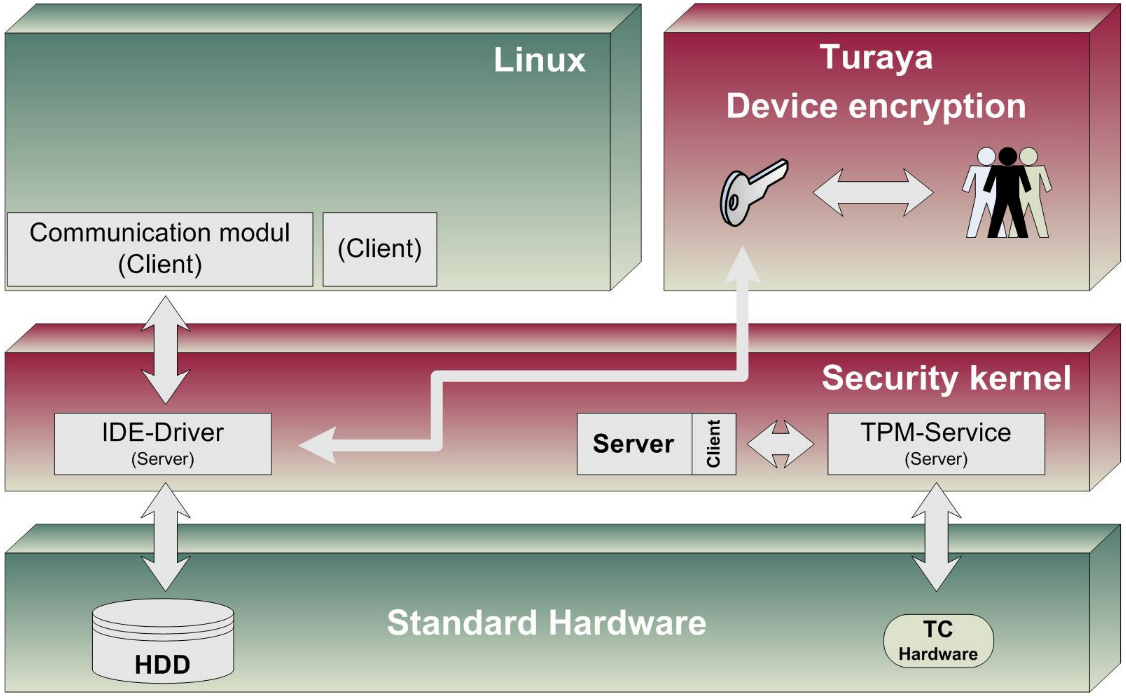
Security Platform - Turaya
→ Pilot: Turaya.ERM (2/2)



Architektur und Technologie
→ Turaya.Crypt

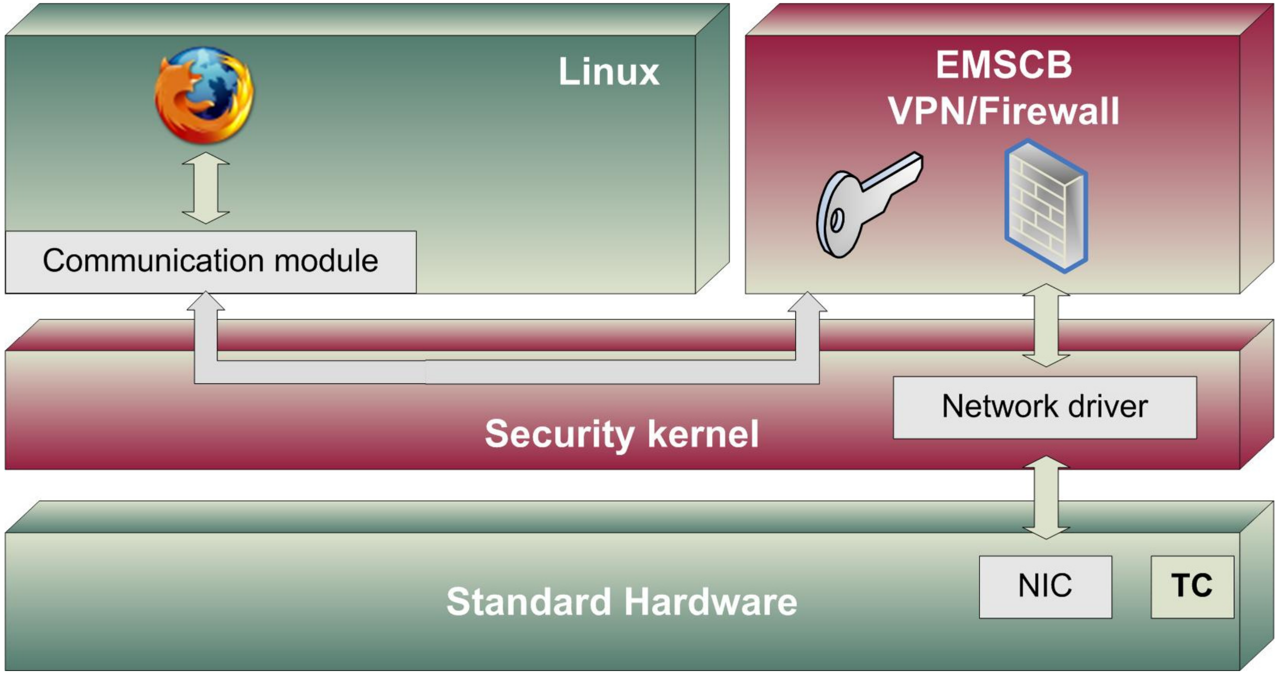
- ***Transfer of data*** between Linux und the evacuated IDE driver
- ***IDE driver*** communicates with the device encryption
- ***Authentication of the user,*** cryptographic keys and functions are isolated from Linux
- ***Encryption is transparent*** to the user and the legacy operating system

- ***Supported devices***
  - Hard drives
  - USB memory sticks
  - CDR/DVDs



Architektur und Technologie
→ Turaya.VPN

- ***Isolated from the legacy operating system :***
  - Network device drivers
  - Client software for VPNs and keys as well as certificates
  - Firewall and firewall policies
- ***Encryption is transparent to the user and the legacy operating system***



Usage scenarios
→ ERM?

Usage scenarios
→ What‘s ERM?

- ***Enterprise Rights Management***
  - Approach for the management of the flow of information of sensitive documents.
  - Access privileges for documents with mandatory enforcement
  - Provided with a policy label (xml) on a technical level most of the time

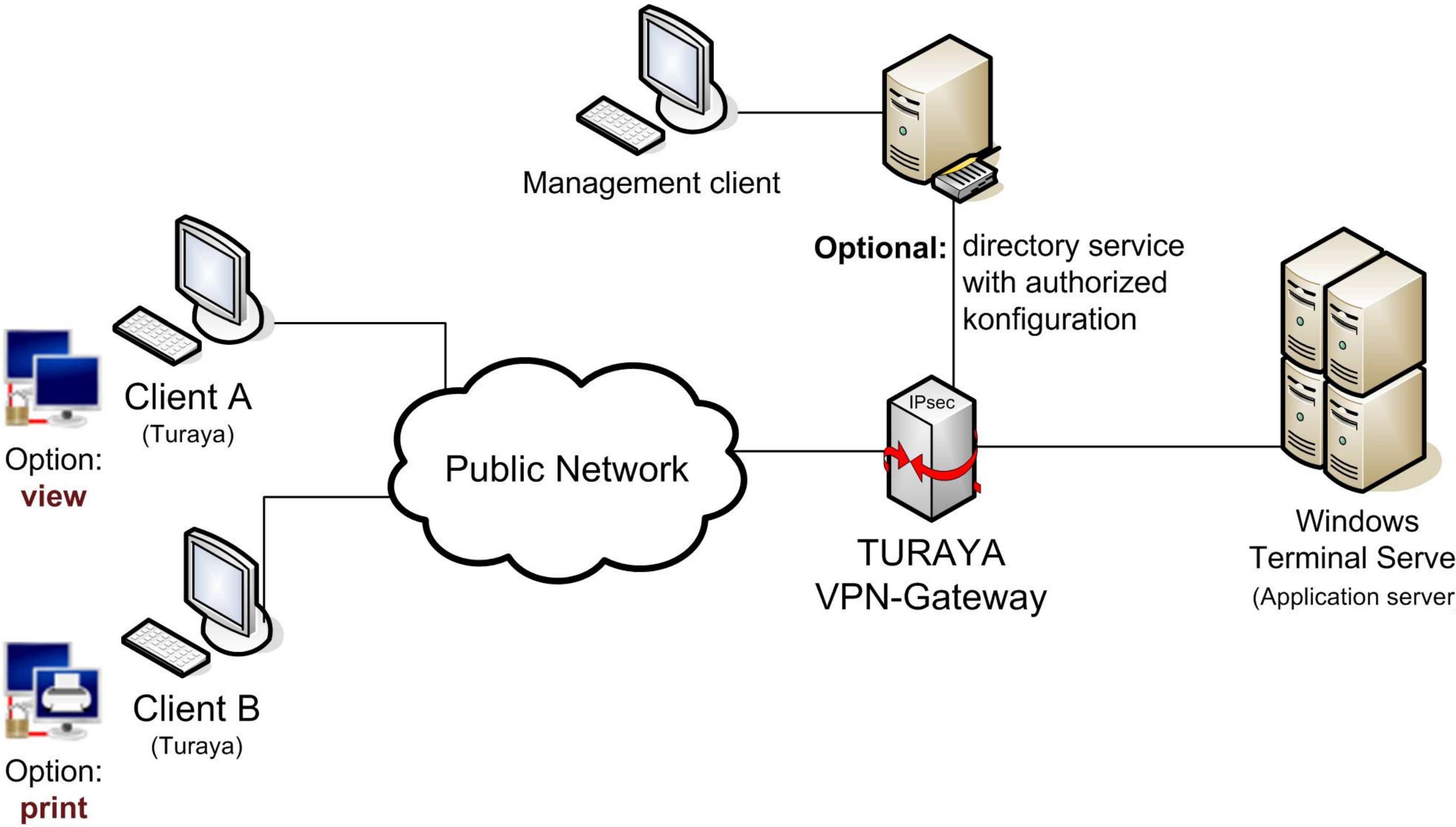
- ***New protection approach***
  - „Link security“ ←→ „object security“
  - So far the transport of the data has been secured ((VPN, PGP, …)

- ***Problems of current ERM systems***
  - Systems are as secure as the underlying operating systems
  - No trustworthiness of the computer systems can be attested

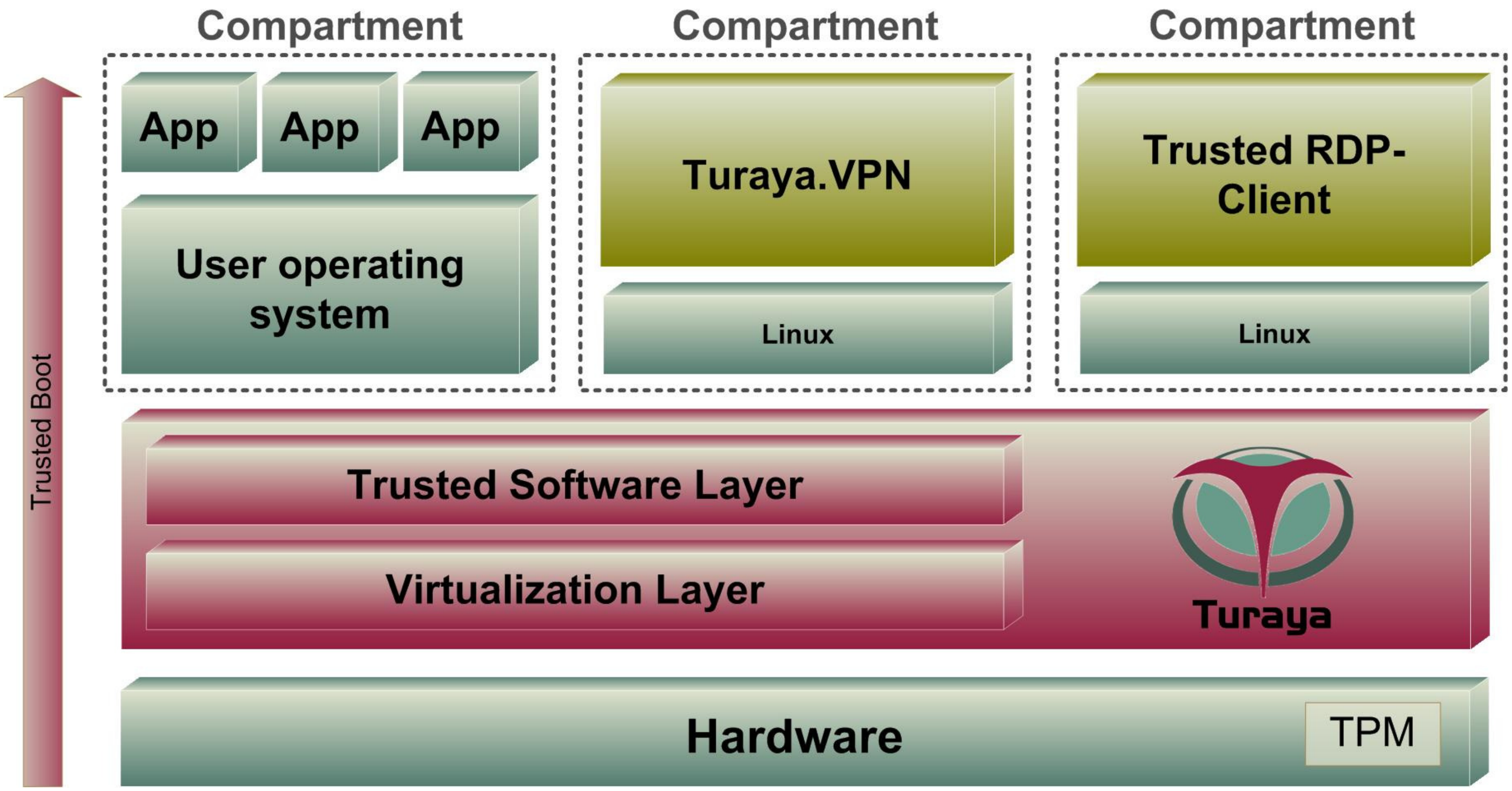
Usage scenarios
→ What does a trustworthy ERM have to achieve?

- ***Document life cycle protection:***
  - The guaranteed enforcement of document specific access and processing policies across platforms and company borders and through the entire life cycle of a document: from creation to destruction.
- ***Verifiability of the IT systems handling the data :***
  - Only IT systems, which can attest their trustworthiness, can access the protected documents.
- ***Trustworthiness of the IT systems handling the data:***
  - Trustworthy IT system are those, which on the one side enable the processing of data along policies in a functional manner and on the other side offer an inherent higher level of protection against external manipulation.

Usage scenarios
→ Overview Turaya.WTS



Usage scenarios
→ Architecture Turaya.WTS



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Security Platform - Turaya

→ Summary

- The security platform Turaya enables the trustworthy, fair and open use of Trusted Computing technology
- The security platform Turaya is freely available
- Turaya is one of the leading developments in the field of TC
- Important industrial partners are developing interesting pilot applications together with the EMSCB team utilizing the Turaya security platform.

→ **Trusted Computing will spread anyway, but without a security platform like Turaya to an extent over which the user has little influence!**

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Trusted Computing

→ Security Platform - Turaya

Thank you for your attention!
Questions?

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Security Platform - Turaya
→ Literature

- [1] N. Pohlmann, A.-R. Sadeghi, C. Stüble: "European Multilateral Secure Computing Base", DuD Datenschutz und Datensicherheit – Recht und Sicherheit in Informationsverarbeitung und Kommunikation, Vieweg Verlag, 09/2004
- [2] M. Linnemann, N. Pohlmann: “An Airbag for the Operating System – A Pipedream?”, ENISA Quarterly Vol. 3, No. 3, July-Sept 2007 (see link)

Links:

Institute for Internet Security:
http://www.internet-sicherheit.de/forschung/aktuelle-projekte/trusted-computing/

ENISA
http://www.enisa.europa.eu/doc/pdf/publications/enisa_quarterly_09_07.pdf