OpenTC

Executive summary of the first project year

1 Executive summary

Introduction

The Open Trusted Computing (OpenTC) project develops a trusted and secure computing systems based on open source software. This IST FP6 project No 027635 targets traditional computer platforms as well as embedded systems such as mobile phones, aiming to reduce system-related threats, errors and malfunctions. In today's computing platforms, the lack of security has given rise to waves of successful attacks and system crashes, resulting in severe economic damage to enterprises and private users, as well as endangering critical infrastructure. Using the trust and security approach of the OpenTC project, system-protection measures will be an integral part of the computer system kernel. The weaknesses of today's' computers, which require that insecure operating systems are shielded by an ever increasing number of protective layers such as virus scanners and firewalls, will be complemented and potentially replaced by integrated trust and security.

OpenTC will improve reliability during authentication, making it easier to defend against current network threats such as phishing, viruses, trojan horses, corruptive software and other attacks from hostile sources. Another advantage of OpenTC is that it enables computers to run critical applications such as trusted banking or e-commerce software in their own, sealed off, compartments that are protected against external access. The framework developed in this project can eliminate most current assaults and dangers in the computing world.

These techniques can also be employed to ward off threats to the reliability and security of applications and software in devices such as, for example, mobile phones. Insecure and unreliable behaviour can be eliminated from the start in new IT-based equipment and applications by exploiting the results of the OpenTC project. The results will be open source and freely available to users and researchers.

General technical goals

The enabling technology used in OpenTC for computer security is the design and implementation of a layered system architecture in which a special computer chip, the Trusted Platform Module (TPM) – similar to a smart card – performs the security functions in a protected hardware environment. The OpenTC project has three major technical objectives:

- Developing a secure operating system architecture consisting of universal virtualization layers, Trusted Software Stack (TSS) for Linux, and TC and TPM management software
- Producing management infrastructures and software protocols for Trusted Computing in the areas of policy management, including distributed policy enforcement, security state monitoring and management, network management, and configuration management software
- Producing prototype applications for Trusted Computing system support in the areas of CA, PKI, attestation and zero knowledge authentication, Trusted WYSIWYS (What You See Is What you Sign) and Proof-of-Concept for digital signing and verification).

To support these prototypes, OpenTC addresses the Integration of TC into existing Public Key Infrastructures and the adaptation of TC APIs (especially the TSS stack of the TPM) to other programming languages, in particular JAVA.

First years results

The General Requirement and Specification was produced and reviewed within the first six months. Work on this document also yielded a number of convincing use cases that served as guidance for subsequent work on platform, protocol and management characteristics. The document also includes a user survey and a media analysis. It is currently under review for its second version to include additional aspects revealed during the work on prototypes.

At the level of basic interfaces and trust layers, we have produced components for bootup measurement. They cover both the legacy concept of a trusted boot chain as defined by the TPMv1.1b specification (Trusted GRUB v0.9.8) as well as the the new mechanisms provided by the TPMv1.2 specification in conjunction with new CPU initialization features (OSLO boot loader for L4, TPM v1.2/*skinit* support integrated in GRUB 2.0 and *Xen*). A Linux-based implementation for the *Trusted Software Stack* as defined by the TCG was produced. In parallel, a JAVA interface for the TSS was developed using an existing TSS. The integration of both components is currently under test.

At the level of trusted virtualization and operating systems, we developed a first version of a basic management interface common to both virtualization layers (Xen and L4) used by OpenTC. Mechanisms for generic tasks and inter-task communication were developed for Xen that will allow to implement security services with a drastically reduced Trusted Computing Base. Several security services for Xen and L4 were designed and prototyped. Working towards the goal of a unified user experience and common architectural principles we designed and implemented a demonstrator prototype.

At the level of security management and infrastructure we gathered, analysed and compiled requirements for data centre based computing services. The results of this analysis were submitted as input for the specification activities of the Basic Management Interface. The analysis resulted in a comprehensive white paper detailing use case scenarios, corresponding work flows, and management activities. We delivered a life cycle model for managed execution environments and the first version of a design and prototype for configuration management, an analysis of the requirements for property-based attestation and the design of a corresponding system model. Finally, we designed and implemented prototypic security services as part of the the demonstrator prototype.

At the level of prototype and test applications for proof-of-concept and use examples, we have produced outlines of their applications designs as part of the *General Requirement and Specification*. These application designs were refined in a subsequent cycle and broken down into work plans where required by the Technical Annex. The start of implementation activities on the actual OpenTC architecture is linked to the release of the project's first demonstrator prototype, which is scheduled for end of January 2007. One application (multi-factor authentication) was chosen as early proof-of-concept 'yardstick' for the demonstrator prototype.

At the level of development support, quality evaluation and certification, we have investigated the appropriateness of currently available tools, development models and procedures for Open Source software development in general and OpenTC's development efforts in particular. This yielded a general methodology for the production of trustworthy systems and software. Within the first year we developed, extended and adapted tools for automated source code analysis and vulnerability testing to make them applicable for the code base of OpenTC. They are the starting point for an in-depth analysis to carefully chosen, security critical components of the OpenTC architecture (e.g., memory or I/O management and sharing). We have also worked on best-practice principles and programming guidelines for developers that are geared towards the production of evaluable code.

In the work area of applying trusted computing for embedded controllers and mobile phones, we have produced an analysis of market, user and mobile network provider requirements which yielded a minimum set of trust functionalities for this application context. Security and policy requirements for TC on a mobile platform were determined by analysing key application requirements, resulting in an initial design overview of a trusted mobile OS. The L4/fiasko microkernel was selected as appropriate starting point and partially ported to the S-GOLD platform. We have produced OMA DRM v2 and IMEI: use case description, requirement analysis and TPM and TSS mapping/profiling and is currently competing the same procedure for software download and secure software use.

Dissemination of knowledge and results

To enable maximum community benefit, the project results will be integrated into, and distributed as, Open Source software, supporting Linux in particular. A main objective is the development of complete trusted Linux kernels for different use classes, which will be distributed as part of the Novell/SUSE (a project member) Linux distribution package.

At the level of dissemination and training, we have worked on establishing concepts and results of OpenTC in the areas of scientific activities, standardization, and education. OpenTC partners were present at 12 national and 14 international presentations at public events (conferences, business events), 10 national and 12 international articles published in various media, ranging from scientific conferences to Internet websites. Further, 2 national and 12 international collaborations were set up between project partners and other institutions or companies, and a close partnership with the German EMSCB project was established. Activities on standardization included a proposal for the Open Release MAF (MPEG Application Format) in particular within the MPEG-A Standard, and collaborations on standardization activities with companies from Spain and Korea. We actively participated at the First European Summer School on Trusted Infrastructure Technologies in Oxford, including a research workshop on “Future TPM Functionalities”.

By making the project results widely available, the OpenTC consortium expects to encourage Europe’s IT industry to invest in trust and security development. Especially small and medium-sized enterprises, industry, and research institutions will be enabled to develop and market trusted computing systems and applications independently. The integration of trust and security into next-generation European products will make these more competitive on the world market.

Open Trusted Computing partners

The OpenTC project is formed by an international multidisciplinary consortium consisting of 23 partners: Technikon Forschungs- und Planungsgesellschaft mbH (project coordination, AT); Hewlett-Packard Ltd (technical leader, UK); AMD Saxony LLC & Co. KG (DE); Budapest University of Technology and Economics (HU); Commissariat à l’Energie Atomique – LIST (FR); COMNEON GmbH (DE); Forschungszentrum Karlsruhe GmbH – ITAS (DE); Horst Görtz Institute for IT Security, Ruhr-Universität Bochum (DE); IBM Research GmbH (CH); Infineon Technologies AG (DE); INTEK Closed Joint Stock Company (RU); ISECOM (ES); Katholieke Universiteit Leuven (BE); Politecnico di Torino (IT); Portakal Teknoloji

(TR); Royal Holloway, University of London (UK); SUSE Linux Products GmbH (DE); Technische Universitaet Dresden (DE); Technische Universitaet Graz (AT); Technische Universitaet Muenchen (DE); Technical University of Sofia (BR); TUBITAK – UEKAE (TR); and University of Cambridge (UK).

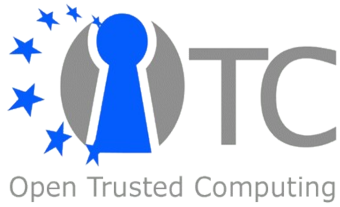
Open Trusted Computing consortium

Picture 1: OpenTC Consortium at General Assembly Meeting in Zurich Sept. 2006

The total volume of the project is estimated to 17.1 Million Euros, part of which will be contributed by the EC. Visit www.opentc.net to learn more.

For further information please contact:
Technikon Forschungs- und Planungsgesellschaft mbH
Richard-Wagner-Strasse 7, 9500 Villach, Austria
Tel.: +43 4242 233 55-0, Fax: +43 4242 233 55-77
Email: coordination@opentc.net

OTC Logo



OTC Disclaimer

The information in this document is provided “as is”, and no guarantee or warranty is given that the information is fit for any particular purpose. The user thereof uses the information at its sole risk and liability.