# The Campuscard System: An innovative multifunctional smartcard solution for higher education institutions

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## 1. Introduction

The Campuscard system is an innovative, integrated card system for universities and colleges, which is introduced as joint project of six universities and colleges in Berlin for over 100 000 students. The system is designed to incorporate multiple card types, from student cards, which are being currently introduced at six institutions, to employee and visitor cards with multiple services included:

- Identification (optical and electronic)
- Electronic payment system (canteens, cafeterias, copy and print services)
- Use of the library (electronic identification and payment of fees)
- Optical and electronic ticketing for public transport
- Access control (employee cards only)

The system is based on Mifare DESfire EV1 cards and is compliant with ISO/IEC 14443 (NXP Semiconductors N.V., 2010) , which can be considered secure. (Oswald & Paar, 2011)

## 2. The challenge of issuing cards to 100 000 users

The system was created as a solution for a problem, which most institutions face when issuing smartcards for their students: The traditional distribution processes of card systems are either time consuming or connected to high costs. There are approximately 150 institutions in Germany as of 2016 with a student card system in operation, which integrates the most common functions relevant for the users.
The card issuing is however the most complex and most expensive process of these systems as it either relies on a high number of employees or on costly card placement machines to enable a postal shipment of the cards to the users.
We have found that institutions try to solve this problem by selecting one of two common solutions to the card issuing problem:

- Several universities (i.e.: University of Konstanz) issue cards with direct personal contact. This process involves the production of the cards from previously uploaded information by the student, either in-house or outsourced by an external card production partner.

This procedure enables to produce a larger number of personalised smartcards in advance of the issuing process and offers a relatively trouble free procedure.
The main disadvantage of this solution is however the reliance on a high number of staff for the card issuing itself. An institution with 20 000 to 30 000 students has to issue approximately 5-8 000 cards every other semester by hand, requiring the high number of employees at peak times for a speedy process, but does not require them in the other eleven month of the year. In addition the card replacement means that even in case of outsourced card production, an in-house system has to be used in parallel.

- An alternative solution used by institutions in Germany (i.e. University Jena) is issuing by mailing the cards to the user. Similar to the first option, this can be done by in-house printing or outsourcing, and enables a relatively cost effective way of issuing a large number of cards. There is however a limitation, batches which are smaller than approximately 1000 cards cannot be produced, which means that replacement cards need a different procedure.

## 3. The solution

We have solved this problem by integrating the different workflows into an identical process, which is almost independent from the cause of issuing. Identical procedure can be used for Initial cards and replacements, with both using a minimum of staff through the use of self-service terminals.
Users receive a one-time QR-code, which allows for printing a single personalised card.
The terminals scan the QR-code, can take a picture of the user and print a dual sided personalised card in approximately 1:10 Minutes.
The kiosk systems have been produced in cooperation with an industry partner. The devices feature the hardware for the card issuing process by integrating all essential components into a single self-service device. The units are built around an Evolis KM500B (Evolis, 2016) thermo-transfer card printer with a card capacity of 500 blanks. This enables to reduce the service cycle as the unit is able to produce 500 student cards on its own, without the need for service personnel. The system is designed with a multilingual touch interface based on a usability study carried out between 2010-2014 (Molnar, 2014). The units also feature a trackball and are ISO 18040 certified for disabled users, by featuring a wheelchair compatible design and a complete multilingual speech output. The integrated wide lens camera system is able to take photos of users between of the height of 130 cm to 190 cm.

The system itself runs on a modified Ubuntu Linux and features remote administration of the device further reducing the needed manpower.

The cards feature a rewritable area (Thermo-ReWrite), which can display the validity of the card, and enables a revalidation every semester.

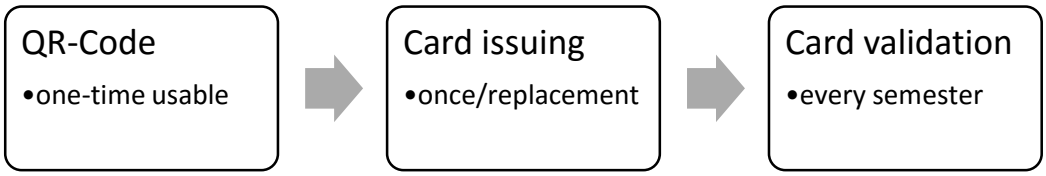


Figure 1: Card issuing process

The system is built upon a card management application (KMS) developed in-house with interoperability in mind, as the integration of different institutions required a flexible solution, which was not available commercially. The KMS is a modular java application for Apache Tomcat,

using RESTful connection for communication with the terminals and a Talend based link to different campus management system as a data source. The KMS works currently with products of the HIS eG, SAP CM and Campusnet, but other products can also be integrated.
The modular approach enables us a tailoring of the KMS to the requirements of the institutions without the need to modify the core of the application. The KMS core is therefore identical at every institution enabling us a fast rollout of new features and bug fixes, thereby offering a high reliability and security for the system.

## 4. References


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## Author´s Biography

Dr. Tamas Molnar is the head of unit of the Service Centre Campuscard since 2015 and project manager for the Campus card system since 2011.

**Education**

Primary and Secondary Schooling – Some in Germany
2001 Completed with Final Examination

09/2001 – 07/2003 University of Technology Budapest – Studies: Electrical Engineering

09/2003 – 07/2008 Corvinus University Budapest – Studies: Business Information Systems
Focus: Electronic Government

2007 - 2008 University Potsdam, Exchange Student Informatics

2008 Degree Business Informatics (Grade: Good)
In cooperation of the University Potsdam and the Corvinus University Budapest

05/2009 - 04/2014 Humboldt-University Berlin – Ph.D. Program
Focus: Software Usability in Electronic Government Systems

2014 Ph.D. in Software Usability (Grade: Magna Cum Laude)

**Work Experience**

09/2005 – 01/2006 Teaching Assistant, Corvinus Universität,

Chair of Theoretical Informatics, Focus: Oracle Database Systems

09/2006 – 10/2007 Project Team Member, Auda GmbH.
Focus: Multimedia Systems in education

10/2007 – 03/2008 Work on the Usability Project of the State Chancellery Brandenburg

01/2009 – 10/2010 Consultant/Project Lead, Brandenburg State Forestry Institute
Focus: IT-Security Projects

Since 01/2011 Project Manager, Humboldt-University Berlin
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