



Mühlbauer

High Tech International

AUTOMATION SOFTWARE

COMPETENCE OVERVIEW



State-of-the-Art Technologies and Solutions

Cutting-Edge Technologies and Solutions

The Mühlbauer Group is the only single-source technology partner for the production and personalization of cards, passports and RFID applications worldwide. With around 3,000 employees, technology centers in Germany, Malaysia, Slovakia, the USA and Serbia, and a global sales and service network, we are the world's market leader in innovative systems and software solutions, supporting our customers in project planning, technology transfer including system integration and production support.

Exclusive Manufacturer Service

35 production and service facilities on five continents, worldwide spare parts repositories and individual service and financing concepts enable us to provide a unique service quality, allowing us to react and bring solutions within two hours.

Seeing is Believing

In our global technology centers, such as the ones in Germany, Malaysia, South Africa and the USA, we exhibit our complete range of smart card and ePassport production and personalization products, as well as RFID inlay production and converting processes. Almost any system is available and ready for demonstrations. Additionally the company's know-how can be experienced in the TECURITY EXPRESS show truck, an unrivaled mobile high-security production center. Convince yourself of the superiority of Mühlbauer technologies.

Technology and Market Leadership

To ensure and expand the technology and market leadership, Mühlbauer continuously invests in innovative products and processes. Our research and development centers with over 400 highly qualified engineers and technicians collaborate closely with customers and research institutions in order to efficiently launch reliable solutions in increasingly shorter development and production cycles.

Open Communication

While aiming to extend our current leading market position in the emerging areas of government security and biometric applications, we ensure strict privacy in all projects and serve as a reliable partner for sophisticated industries. We are committed to provide the highest speed, best quality and strict customer oriented services.

Business Unit TECURITY®



Mühlbauer specializes in innovative one-stop solutions encompassing the production, personalization and issuance of ePassports, ID cards and other card related security documents, and fully automatic border control systems. The business unit Tecurity® bundles the extensive know-how of the development of tailor-made security solutions. In the last 30 years we have been intensively involved in over 300 government related ID projects across the globe.

Business Unit Automation



More than 100 different standard and customized products and intelligent software solutions for data enrollment, border control as well as personalization and production management are the core of the business unit Automation. The division is responsible for the development and manufacturing of Mühlbauer technologies. In addition to systems used for high-quality document production and personalization in high-end security products, we manufacture one-stop turnkey solutions for industrial image processing of cards, coins and bank notes, tubes and other products. Moreover we develop and produce innovative systems such as microchip die sorting, flexible solar cells or carrier tape equipment for specific niche applications in the semiconductor back-end area (semiconductor related products), as well as labeling and marking systems for traceability of electronic components (traceability).

Business Unit Parts & Systems



Mühlbauer's Parts & Systems segment produces high-precision components both for the manufacturing of Mühlbauer products and as a supplier to security-sensitive industries such as aerospace, motorsports, semiconductor and medical engineering.

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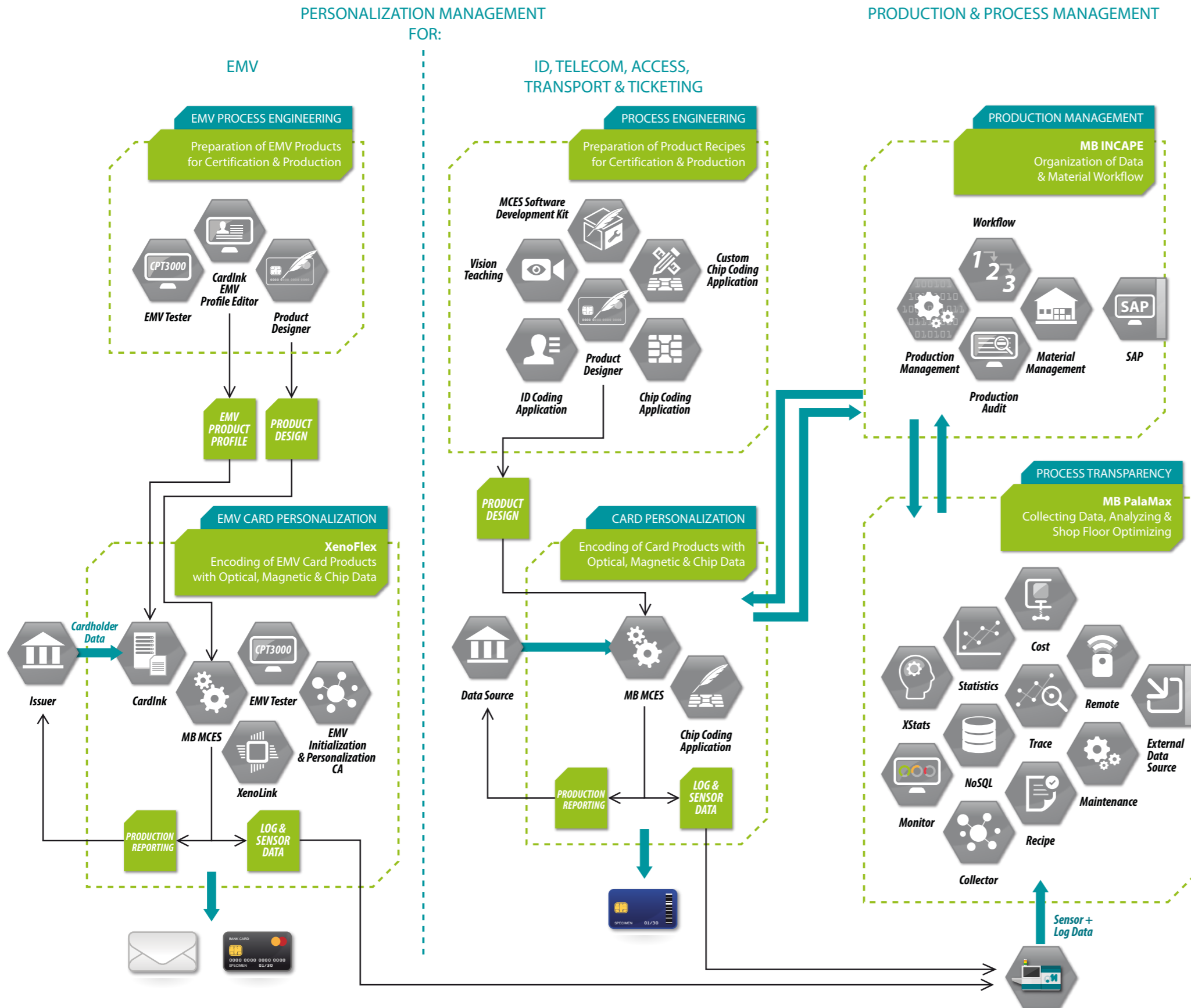
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Automation Software Solutions

Overview



Overview Automation Software Solutions

Production & Process Management

Personalization Management

EMV Software Solutions

Automation Software Solutions

Mühlbauer has developed a broad range of government and industry specific software solutions. Whether it is government ID management and personalization, vehicle licensing, parking management and control or complete EMV solutions for banks. In addition, we also support our customers in the GSM SIM and other specialty card personalization solution markets.

We have extensive experience in the use of cryptographic systems to implement user/customer authentication solutions and keep data secure in sensitive environments.

Mühlbauer has spent considerable effort in making the user experience of our software solutions intuitive and enjoyable. Our data preparation solutions are highly flexible and employ modern graphic user interface technology. In this context we developed probably the best operator interface for our machines in the market.

The accompanying map shows our software products in the areas of:

- Process Engineering
- Data Preparation and Processing
- Card Product Design
- Chip Coding Applications
- Personalization
- Validation Testing
- Collection and Processing of shop floor data
- Production Planning



MB PalaMax®

Total Process Transparency



KEY FEATURES

- Automatic, accurate and unbiased data collection
- Monitor real-time performance and generate real-time production statistics
- Analyze OEE and KPI data in real time
- Continuous visualization allows fast reaction
- Historical data analysis
- Active system supports users with notifications and reports
- Responsive user interface design allows the usage on any chosen device
- Easy to configure, to use and to leverage
- Data collection from the shop floor of Mühlbauer and third-party equipment

ADVANTAGES

Instant Visibility

- Real time KPIs at a glance: Overall Equipment Effectiveness (OEE), Yield, Performance, Availability
- Visualization of all valuable machine data in real-time with interactive charts, graphs and more from any web-enabled device or PC and generate informative reports
- Gives managers the insight they need in order to improve operations while allowing the management to make better fact-based decisions

Return on Investment

- Spot trends and identify opportunities for improvement when they happen due to real-time monitoring
- Immediate intervention before major defects occur
- Run your production with improved security and optimally employed staff

Security and Compliance

- You are in full control of your data
- All data is stored locally on your own servers
- Your data is safe on your IT infrastructure
- Compliance with ISO and PCI standards

Accessibility

- Utilizes responsive web design
- Avoids expensive installation of application software on the individual device
- Accessible from any web enabled device



MB PalaMax®, Mühlbauer's Smart Factory solution, is developed for card, tag or booklet productions, personalization factories and semiconductor backend shop floors. Consisting of an NOSQL database, it is designed to set and collect process data to monitor and improve the efficiency of production and personalization. The collected process data is stored in big data sets for later processing, visualization and statistical analysis.

Overview Automation Software Solutions

Production & Process Management

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EMV Software Solutions



MB PalaMax®

Total Process Transparency

CORE MODULES



PALAMAX.MONITOR

Monitors the real-time performance of the production.



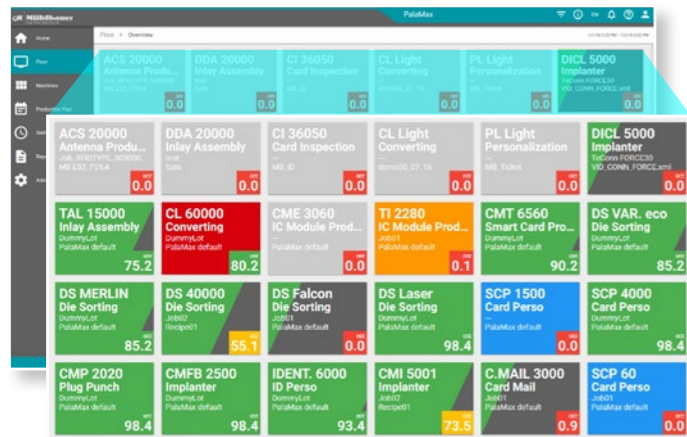
PALAMAX.STATS

Statistical tool which analyzes collected data and delivers customized statistics on OEE.



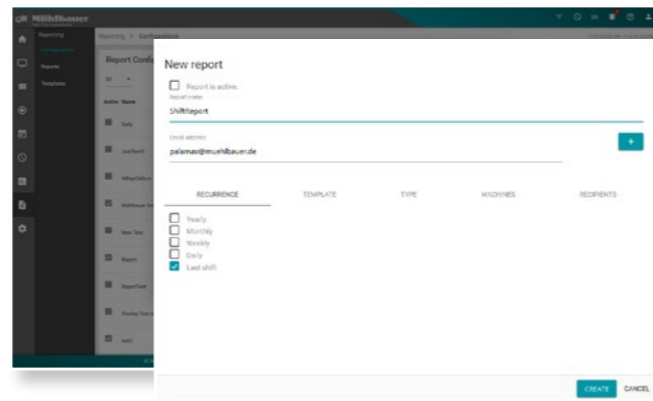
PALAMAX.FACTORY-OVERVIEW

Production overview displays general status of machines. The text fields within the tile show the most important metrics and meta-data of the machine.



PALAMAX.REPORT

Track and document productivity with the MB PalaMax reporting module. The automated data collection delivers unbiased and accurate reports without the need for any manual data entry.



FURTHER MODULES

MB PalaMax® can be extended according to your needs



PALAMAX.REMOTE

Enables the remote operation of machines on the shop floor from a control centre

- Centralized direct access to all machines
- Enormous time and manpower savings
- Improves staff efficiency and security



PALAMAX.TRACE

Allows for the auditing of single manufacturing runs

- Allows the comparison of manufacturing runs between each other
- Detect and define reasons for production faults
- Get better and more useable information about the production process



PALAMAX.MAINTAIN

Enables the implementation of maintenance on demand

- Enables planning of production down times in a deterministic manner
- Supports the maintenance planning and execution to be more efficient
- Save maintenance cost due to the precise determination of the actual need



PALAMAX.COST

Increases effectiveness and efficiency so that production becomes more profitable

- Easier comparison of different production routes for same product
- Enables profit from a tighter cost control



PALAMAX.RECIPE

Enables production engineering to prepare and test a repeatable factory set-up.

Factories can switch between products within minutes.

- Reduces setup times of products on the shop floor
- Ensures the repeatability of produced with qualified qualities
- Enables more comprehensible & specific production

Overview Automation Software Solutions

Production & Process Management

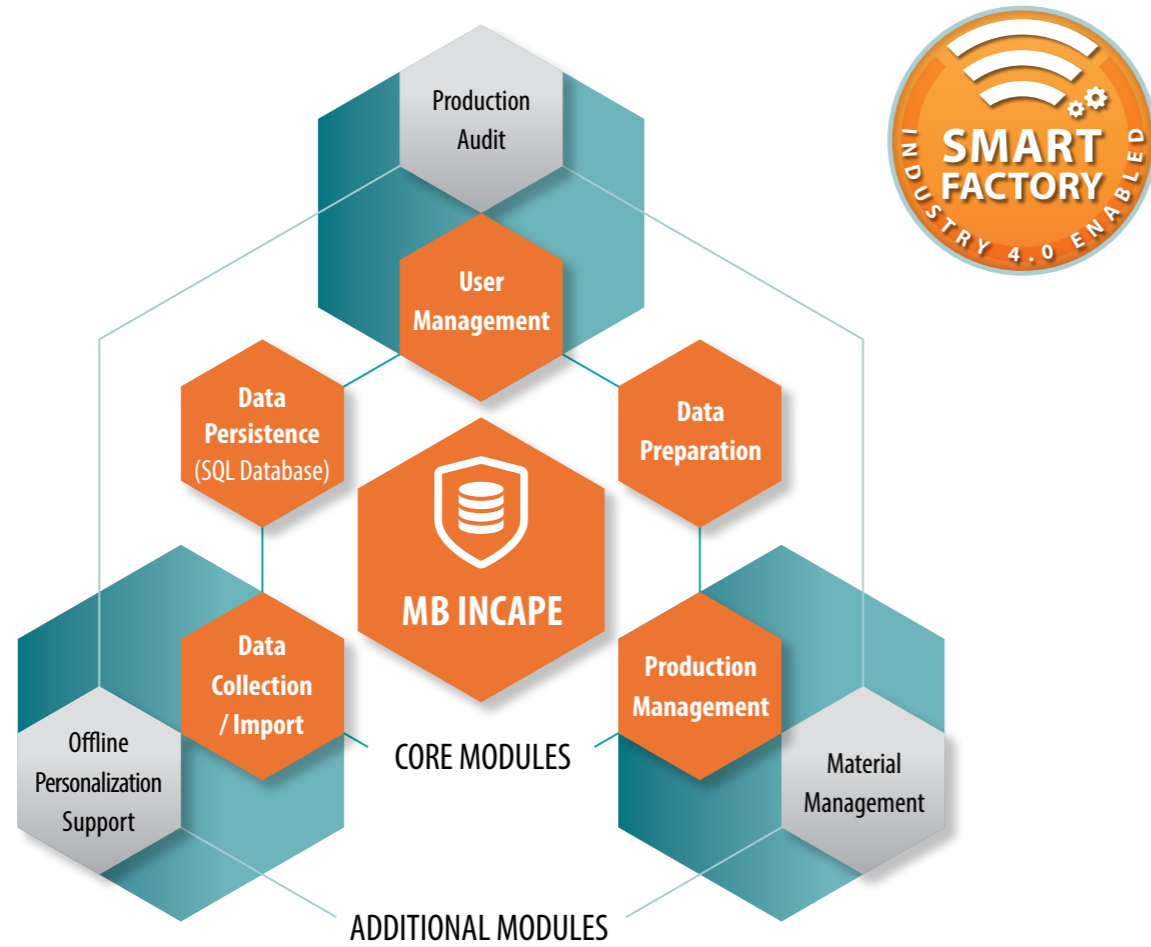
Personalization Management

EMV Software Solutions



MB INCAPE

Integrated Production Management Software

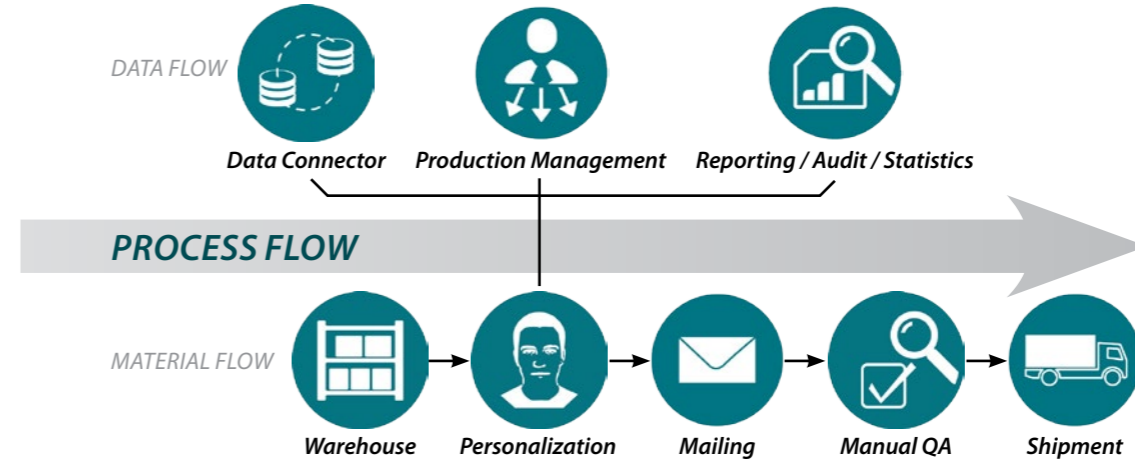


KEY FEATURES

- Configurable workflow steps regarding personalization, quality assurance and issuance
- Fully-automated processing and production management
- Simplified administration due to web-based operator clients
- Customizable UI regarding localization, internationalization and branding
- Scalability regarding different documents, machines and personalization locations
- Seamless tracking of documents from point of production to issuance
- Flawless integration of Mühlbauer material management (MB WAREHOUSE)
- Connection to card/document management systems via web service, database, file-based interface
- Standard interface to personalization machines with integration of third-party machines possible
- Integration of MB User Management
- Full coverage of production control requirements (security industry and EMV standards)
- Seamless connection to MB PalaMax® and MB Data Preparation

ADVANTAGES

INCAPE is Mühlbauer's Production Management Software for the production and personalization of electronic cards and documents (e.g. ID cards, ePassports, driver's licenses, EMV or GSM cards). Combining data management, production control and material management, the system allows for highly automated processes.



Main Functions

- Production management
- Data management
- Seamless integration of Mühlbauer materials management

INCAPE is providing

- Cost-effective and scalable data, workflow and material management for card and document personalization
- Configurable workflow steps (personalization, quality assurance, mailing)
- Main focus on automated processing (minimum operator intervention except for personalization on machines and manual quality checking)
- Web-based operator clients:
 - UI is customizable (localization, internationalization, branding)
- ICAO compliant data preparation
- Scalability regarding:
 - Different document types
 - Connected machines (up to 20 desktop machines)
 - Personalization locations (up to 10 sites)
- Seamless tracking of document life-cycle inside the personalization.
- Direct integration of Mühlbauer materials management (MB Warehouse)
- Connection to card or document management systems (e.g. civil register): Via web service, database or file-based interface
- Direct interface to personalization machines with integration of 3rd party machines possible.
- Integration of MB User Management

MB INCAPE is Mühlbauer's Production Management Software for the production and personalization of electronic cards and documents (e.g. ID cards, ePassports, Driver's Licenses, EMV or GSM cards). Combining data management, production control and material management, the system allows for highly automated processes. MB INCAPE's architecture consists of a modular concept to fulfil the needed scalability in all kinds of document body production

steps, as well as in all types of personalization characteristics, for example centralized and decentralized processes, various types of personalization machines or application-specific data preparation scenarios). It allows to process customer and application specific production, personalization, quality control and document delivery scenarios with highest solution flexibility.



MB MCES

Machine Management Software



KEY FEATURES

- Intuitive and secure user interface
- Open interfaces
- Adaptable for all purposes
 - Identification documents
 - Telecommunication
 - Payment
 - Others
- Multiple data input formats
- Chip OS specific coding applications
- Configurable payment application scripts
- High-secure document and data processing
- In-line card data testing
 - Data pre-test
 - Sample post-test
 - Full test
- Customizable reporting
- Vendor independent extensions through powerful SDK with system simulator
- Highly scalable system
- Runs on all machine sizes

ADVANTAGES

-  Product Designer: layout and product design for different products
-  In-line card data testing data pre-test, sample post-test and full test
-  Flexible reporting
-  Vendor-independent position through powerful SDK
-  System simulator
-  Multiple data input formats
-  Chip OS specific coding applications
-  Configurable payment application scripts
-  High-secure document and data processing
-  User configuration
-  Messenger page displays all production data and incidents

The personalization management system integrates incoming data with product definitions in a similar way as a mail merge process. Additionally the MCES is a personalization management system controlling the associated physical and electrical personalization processes. The MCES handles personalization data from a variety of different input methods, formats and applies them to the cards, regardless whether magnetic stripe,

chip encoding, or one or more of the various optical personalization processes, such as thermo-transfer printing, laser engraving, embossing or indent printing. The MCES manages all personalization processes within one software system. All this technology has to serve the purpose of helping the customer to make the best use of his investment. Therefore the system has been optimized to give every stakeholder the best value for his money.

Overview Automation Software Solutions

Production & Process Management

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EMV Software Solutions



MCES Software Development Kit

Component Development for Personalization Software



KEY FEATURES

- Rapid in-house development: Development of own software components for the MCES platform
- Quick and cost-effective reaction to new market demands and opportunities
- Test and pre-production setup allows flawless production
- Microsoft® Visual Studio as powerful development IDE (Integrated Development Environment)
- Simple and fast development of new key components, like chip coding applications, data exchange libraries, data matching libraries, personalization report generation and input data adapters

ADVANTAGES

MCES Software Development Kit (SDK)

The MCES Software Development Kit is a software package which provides a complete suite of tools and libraries to independently develop MCES software components for the MCES personalization systems.

The MCES SDK suite allows you to develop, enhance and test your own applications (DLLs) for monitoring, reporting, data exchange as well as data matching, and of course chip coding.

- Independent development of:
 - Processing applications
 - Interface extensions
 - Monitoring libraries
 - Data exchange libraries
 - Data matching libraries
 - Reporting libraries
 - Chip coding applications
- Immediate reaction to changes of requirements or personalization system
- Powerful development and test tool in conjunction with the MCES Development Workstation and System Simulator
- Based on Microsoft Products:
 - Microsoft® Visual Studio
 - Microsoft® SQL Server
- Easy debugging and testing

MCES Development Workstation & MCES System Simulator

The MCES Development Workstation is a fully fledged MCES System Simulator based on a normal MCES installation, where the processing units or workstations are substituted by simulating processing units, except for the chip coding processing unit, which connects to a Mühlbauer card reader.

It is an essential tool for the process engineering in a personalization center, as it allows the testing of coding applications and payment application scripts on a real Mühlbauer card reader with a genuine target smart card.

This allows the preparing of work packages for actual Mühlbauer personalization systems on the shop floor of the personalization center, without having to stop production for testing.

- Preparation of job setups
- Creating of layout files
- Adaptable for all purposes
- Running of test procedures offline without affecting production
- Simulation of interfaces to production management software
- Validation of updates and upgrades
- Installation according to existing or future personalization systems
- Integration of new personalization systems possible

The MCES Software Development Kit gives you the independence to add new hardware or software components to MCES. It provides all necessary libraries and wizards for a smooth start of your development. Microsoft®s Visual Studio is a feature rich IDE and helps you to flawlessly develop your customized MCES components.

The MCES Software Development Kit integrates seamlessly with the MCES System Simulator to provide you a powerful and easy to use debugging and testing environment.

Overview Automation Software Solutions

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EMV Software Solutions



MB ID Chip Coding Application

For ID Documents

ADVANTAGES



Electronic ID documents following the ICAO standard provide highest security for the identification and the authentication of the cardholder. Electronic ID cards and passports have a security chip embedded, which stores personal and biometric cardholder data. There exist several security mechanisms to protect the cardholder data against unauthorized access, to ensure the authenticity of the ID document and to protect it against forgery.



Basic Access Control (BAC) / Supplemental Access Control (SAC)

Basic Access Control (BAC) protects the chip against skimming (reading content from a distance) and ensures the information exchanged with the reading device is encrypted. BAC and PACE (Password Authenticated Connection Establishment), i.e. Supplemental Access Control (SAC), strengthen the chip access control mechanism.



Extended Access Control (EAC)

Extended Access Control (EAC) provides the full BAC functionality, but includes also several advanced security protocols like chip authentication (detection of cloned chips) and terminal authentication and provides additional security.

An ID chip personalization application takes the personalization information of the document holder and encodes it to the integrated chip in the security document like an ePassport or an ID card. The application encodes the chip's files and datagroups securely according to the individual project requirements which results in a fully personalized and valid ICAO document.



Raw Data



Data Preparation



Personalization

KEY FEATURES

- Personalization of Basic Access Control (BAC) and Supplemental Access Control (SAC) or Extended Access Control (EAC) passports and ID cards
- Increased security: Uses PACE v2 (Password Authenticated Connection Establishment) and asymmetrical encryption
- SAC and EAC strengthen the chip access control mechanism and allow the usage of the Card Access Number (CAN)
- Mandatory for electronic passports issued in Europe from 2014 on and recommended by ICAO for all new issued passports worldwide
- Fully compliant to BSI (Federal Office of Information Security) and international standards
- Seamless transition: Backwards compatible to BAC
- Easy to use chip coding applications, customized to your requirements
- No modification of personalization hardware necessary

Mühlbauer's customized Chip Coding Application guarantees the successful personalization of ICAO (International Civil Aviation Organization) compliant ID chip applications with BAC and SAC functionality or EAC functionality. Mühlbauer develops ID personalization applications according

to your individual requirements with state-of-the-art technology based on our broad experience and background in ID projects. Furthermore we support you with our professional services during each step of the development process: specification, design, implementation and testing.

Overview Automation Software Solutions

Production & Process Management

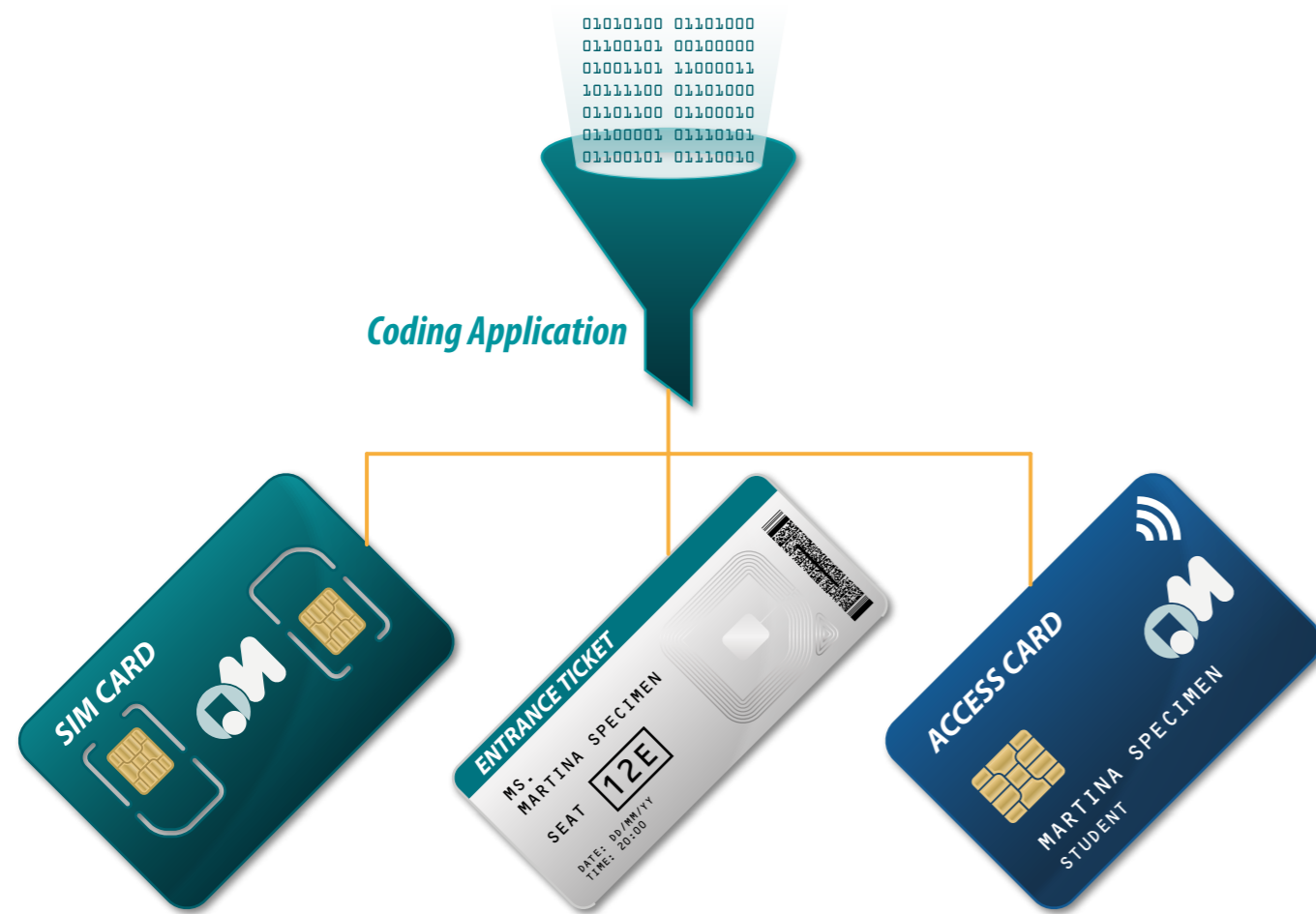
Personalization Management

EMV Software Solutions



MB Chip Coding Application

For Telecom, Access Control, Transport & Ticketing



KEY FEATURES

- Chip Coding Application converts an incoming data set into the command stream of a chip.
- Highest flexibility: Chip Coding Application is a chip operating system adapter for chip application data .
- Rapid product deployment: Encoding of all chips of one chip operating system type with the same coding application.
- Easy change of chip supplier: No additional software license fees.

ADVANTAGES



Telecommunication

The Mühlbauer Telco Coding Application is a scripted download tool that can communicate with a range of different SIM silicon. The actual codes required for the download are supplied in the form of a script file. The coding application uses this script file upload a specified Application Data File, which is a binary image of the data to be written into the chip. This Chip Coding Application can be procured from Mühlbauer. It is highly re-usable and the customer can adjust it to suit their requirements easily at no additional cost.



Transport Ticketing

There are a number of well entrenched public transport ticketing chips available such as MiFare, CIPURSE, Calypso, or FeliCa. Mühlbauer has implemented custom personalization coding applications for many systems using these types of chips. Mühlbauer has provided an SDK, or has implemented custom Coding Applications for such application. In some cases such fare apps can be easily added to other card applications, such as Calypso in Java Cards to create multi-application cards.



Retail Cards

Retail cards are used to improve customer binding to a retail outlet by offering extra points for every purchase, to be redeemed later. Thus retail cards are very similar in function to a standard foreign currency savings account and require a fair amount of administration from the issuing organization. Banks are set up for such business in their Card Management System. Therefore such schemes can be easily administered in such systems and provide banks added value to their retailers. Mühlbauer has implemented coding applications or has provided SDKs for the development of coding applications for such schemes.



Special Application Cards

Specialty card applications Company Staff Cards or University Campus Cards often support premium features by using a simple signed ID string which identifies a card uniquely. This authentication allows the provisioning of a wide variety of value added services like Access Control Devices opening doors, to pay incidentals or sign out books at the library. Mühlbauer has implemented a number of such schemes in the past or has provided the SDK toolset for it. This allows third party solutions to integrate cost efficiently, easily and speedily with a Mühlbauer personalization system.

The Chip Coding Application provides a tool for the chip initialization (pre-personalization with generic basic keys and applets) and the actual personalization (Chip Coding Application) of a document-holder specific set of application data for a specific purpose.

These Coding Applications are re-usable for different products within the same Industry, like telecom or transportation. This simplifies the personalization set up of applications running in a specific Chip Operating System. The advantage is that this philosophy protects your investment. It speeds up product deployment tremendously, because there is no need to involve a software developer or an external company.

Different products within the same industry may be able to reuse the same coding application. Mühlbauer does not charge any additional fees for such uses giving you not only implementation speed, but also flexibility to pursue smaller business opportunities and grow them.

Mühlbauer has implemented a whole host of Chip Coding Applications: Multos, Java and a host of native Chip OS.

Overview Automation Software Solutions

Production & Process Management

Personalization Management

EMV Software Solutions



MB Image Enhancement

Image Enhancement Software











Typically, a biometric facial image and the printed information of the document are to be stored on a contactless high-security microchip inside an identity document. The compliance with the ICAO Doc. 9303 standard ensures that facial portraits can be used for biometric face identification and verification.

KEY FEATURES

- Rotation adjustment
- Background removal
- Image cropping
- Color & contrast optimization
- Background refilling
- Image evaluation

ADVANTAGES

The MB IMAGE ENHANCEMENT software provides all the necessary features for the automated and/or manual processing of live-captured or scanned portraits:

-  **FACE FINDING**
Recognizing the face in a captured image and extracting it
-  **IMAGE CROPPING**
Cutting and resizing the image according to defined settings
-  **POSITION CORRECTION**
Rotating and aligning the image horizontally and vertically
-  **COLOR CORRECTION**
Adjusting color palette and white balance
-  **BRIGHTNESS AND CONTRAST ADJUSTMENT**
Optimizing image appearance with lighting & shadow correction
-  **BACKGROUND REMOVAL / MANIPULATION**
Extracting the face from the background and inserting a new background
-  **IMAGE CHECK AND EVALUATION**
Checking and evaluating image quality according to ICAO recommendations
-  **INTUITIVE APPLICATION PROGRAMMING INTERFACE (API)**
Easy to integrate into any software solution

MB Image Enhancement is the most advanced feature in the market which - according to international standards - allows the fully-automated and/or manual enhancement and correction of digitally captured images. Compliance with the ICAO Doc. 9303 standard ensures that facial portraits can be used for biometric face identification and verification. Moreover, most printing technologies for identity documents require different image properties in terms of resolution, brightness and contrast.

Overview Automation Software Solutions

Production & Process Management

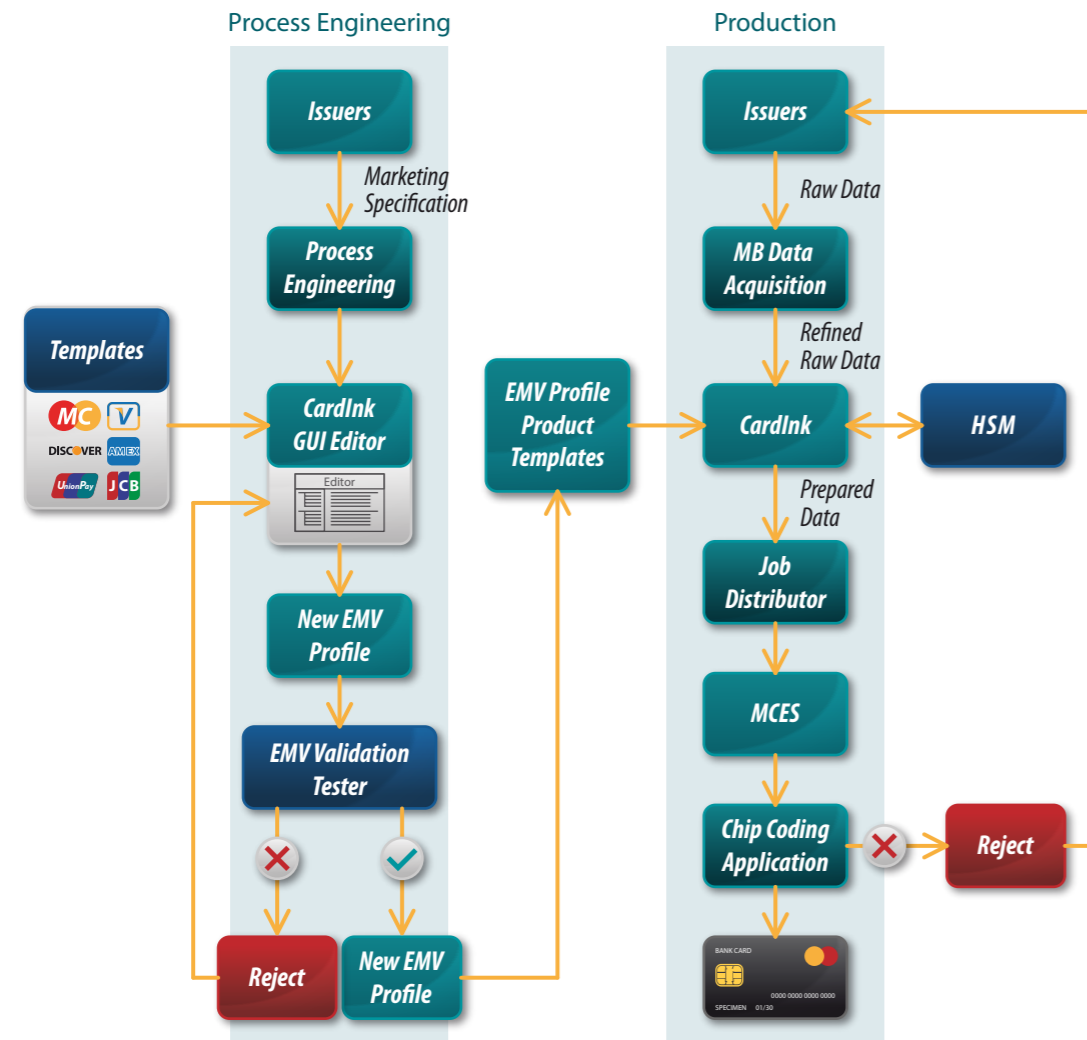
Personalization Management

EMV Software Solutions



MB XenoFlex

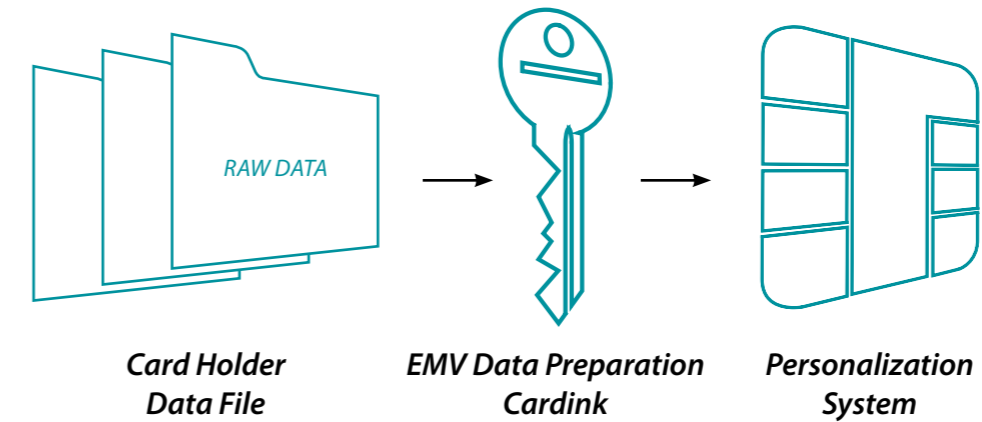
The complete EMV Issuance Solution



KEY FEATURES

- Centralized data preparation
- Industrial grade personalization equipment
- Support for
 - Contact, contactless and dual interface cards
 - Credit, debit and prepaid cards
 - Non-EMV banking cards
 - Magnetic stripe cards
- Hybrid operation
 - Centralized
 - Decentralized
 - Instant
- Open solution
 - Open interfaces
 - Excellent documentation available
 - Open APIs (Software Development Kit)
- Technology transfer
 - Installation support
 - Training
 - Consulting

ADVANTAGES



Components

- Data acquisition: Intuitive production setup of personalization equipment. The application accepts and transforms raw cardholder data
- Cardlnk data preparation: Processes raw cardholder data for personalization – for a fast and easy way to prepare all the personalization data not only for the chip
- EMV chip coding application: Converts EMV personalization data into the correct APDUs for the chip operating system
- EMV framework in combination with FIPS 140-2 Level 3 Hardware Security Modules (HSM) for secure usage and storage of cryptographic keys and secure re-encryption of secret data

Main Functions

- Built-in support of XML, P3, DC and text formatted input files
- Quick reaction – rapid product development: GUI tool for quick, easy and free creation of new card profiles
- Rapid product deployment: One coding application per Chip OS - encoding of all chips of one Chip OS type
- Independence: No need for source code modifications for new EMV profiles
- Saving of money: No extra costs or limitation of number of issuers and EMV profiles. No additional costs for additional machines, card products, chips or additional sites, and no annual or usage based costs

Mühlbauer's EMV solution provides an easy and cost efficient way to produce EMV products. A key feature is the Chip Operating System (COS) specificity of the chip personalization application, allowing the personalization of chips with a specific chip operating system with different applets using the

same personalization application. Mühlbauer has implemented a large number of such applications for various different chip operating systems on the MULTOS, Java card platforms, as well as Native OS from many different vendors.

Overview Automation Software Solutions

Production & Process Management

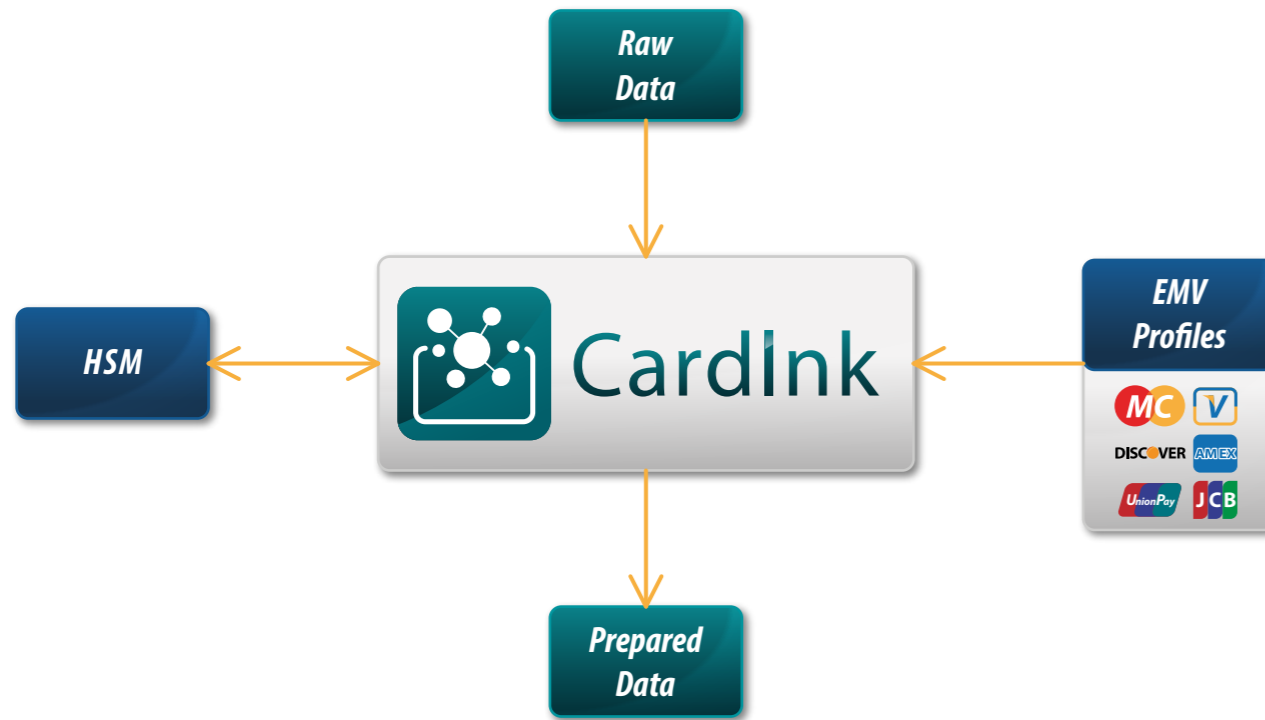
Personalization Management

EMV Software Solution



MB CardInk

Quickest EMV Data Preparation



KEY FEATURES

- Quickest data preparation solution: CardInk is extremely scalable, perfect for high-volume production and also suitable for small-scaled production environments
- CardInk is the most comprehensive EMV data preparation solution in the market
- CardInk is used by more than 100 customers across the globe
- HSM vendor and card platform independent: CardInk is the only major system which supports:
 - Global Platform
 - Multos
 - Native, proprietary Chip Operating System (COS)
- Highly versatile through product templates
 - Easy to modify EMV product templates via Graphic Profile Editor
 - No limitation in the amount of data preparation products
- Multi-issuer and multi-card scheme support

ADVANTAGES & TECHNICAL DATA

CardInk is an EMV data preparation system, which offers best-of-breed centralized data formatting and key management while maintaining flexibility to meet any card issuing environment (e.g. mag stripe, chip, single- and multi-applications, instant issuance, NFC). CardInk is used by bureaus, data processors and card issuers alike.

CardInk comes with a user-friendly graphical application editor. With this, an operator can configure the TLV structure of the data for individual applications based on built-in application templates. This feature makes it possible to design customized applications within the frameworks of the supported international standards.

Parameterization of single- and multi-application smart cards is easily done through the concept of card profiling. It is possible to graphically design the data structure of a multi-application smart card by determining which applications and default operational parameters to use.

Technical Specification

Applications supported

- MasterCard M/Chip, CAP, PayPass, Advance
- Visa VSDC, VSDC SDA & DDA (VIS), qVSDC
- AmEx AEIPS, Mag stripe & PIN, Expresspay
- EMV Common Payment Application
- BMS Monéo
- Discover D-PAS
- Diners
- Interac
- SAMA SPAN2
- SIA Bancomat
- China UnionPay

Platforms

- EMV
- GlobalPlatform
- MULTOS / MULTOS step one
- Native cards

Formats supported:

- Tag-Length-Value (TLV)
- Common Personalization (CPS)

Security architecture

- AES protected network communication
- Access control via smart cards
- Secure audit log

Main Functions

- Card issuer flexibility – CardInk is suitable for in-house card production. The system offers security, stability, and low maintenance, and suits any card strategy.
- Card bureau flexibility – CardInk is the most versatile data preparation solution available imposing no limitation on the number of cards issued or issuers supported, hence guaranteeing a high return of investment. The system is easy to set up, which means that bureaus can instantly issue cards across a number of different issuers and payment brands.
- Key management – The core objective of CardInk is the management of cryptographic keys related to data preparation. All keys are handled in HSMs and CardInk providing secure import / export facilities. This applies to 3DES and RSA keys and includes end-to-end certificate management. CardInk supports certificate requests for application provider certificate authorities.

CardInk is one of the Key Elements in the XenoFlex EMV Personalization tool chain. It takes Raw Card Data an interpreter working on a product template file to generate prepared data which is ready to write to a document or card. It can prepare data for all types of personalization processes, i.e. embosser, magnetic stripe, chip and others.

The powerful interpretation feature means that new EMV profiles or Product Templates can be prepared without the need to involve a programmer to modify

the source code or wait for an outside company to perform this work. This makes CardInk together with our EMV Validation Tester a complete Product Development process which allows the creation, test and improvement of your description. It is fast and powerful and best of all it can be done easily in a easy-to-use Graphic User Interface Profile Editor.

CardInk is implemented in about 100 highly successful personalization centers around the world.

Overview Automation Software Solutions

Production & Process Management

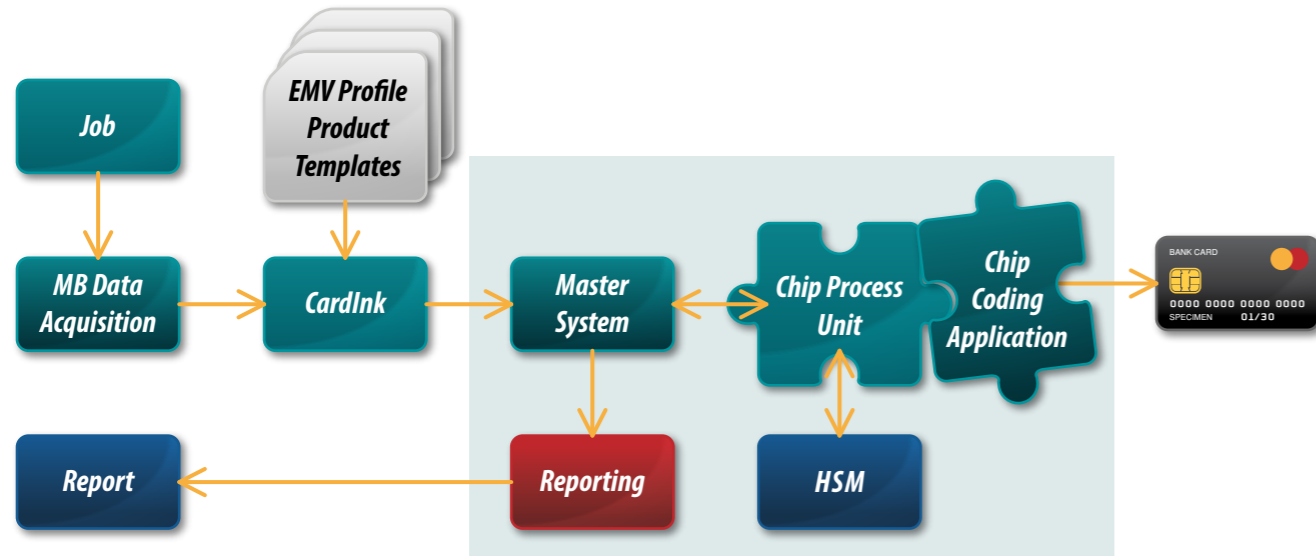
Personalization Management

EMV Software Solution



MB EMV Personalization Package

Software for EMV Chip Personalization



Components

- EMV crypto framework
- Hardware Security Module (HSM)
- EMV personalization application

KEY FEATURES

- Highest flexibility: EMV coding application is the converter of the abstract data tree into the Chip OS specific commands of a chip - one coding application per Chip OS
- Easy and cost efficient way of EMV chip personalization
- Rapid product deployment: Encoding of all chips of one Chip OS type with the same coding application
- Easy change of chip supplier: No additional software license fees

ADVANTAGES & TECHNICAL DATA

EMV Initialization / EMV Personalization Package

The Mühlbauer EMV Personalization Package is the ready-to-go set of components to enable equipment to personalize the chips of EMV cards or modules. The particular EMV package consists of the EMV crypto framework, an EMV chip coding application and a report logger.

Currently Supported Chip Types for EMV Personalization

MULTOS

- MULTOS Step One
- MULTOS Full

JavaCard (any JavaCard supported, a selection can be found below)

- Gemalto GemXpress
- Infineon Kaffee, Macchiato, SecoraPay
- KONA I Kona
- Morpho JMV
- NXP JCOP
- ST Micro ST Pay
- Ubivelox Ucard

Native

- AustriaCard ACOS
- Gemalto Clarista / Optelio / eGalleon
- ServiRed Advantis
- Trüb Combos

Coding Time

Depending on the Chip OS and the amount of data the personalization time is approximately between 5-15 seconds per application.

The EMV Personalization Package provides a number of re-usable chip coding tools for chip personalization (Chip Coding Application) of a document-holder specific set of application data for a specific purpose, like EMV.

These Coding Applications are re-usable for different products within the same Industry, like EMV. This simplifies the personalization set up of EMV Chips for specific Chip Operating Systems. The advantage is that this philosophy protects your investment. It speeds up product deployment tremendously, because there is

no need to involve a software developer or an external company.

Different EMV products can re-use the same Coding Application without additional charges, giving you not only implementation speed, but also flexibility to pursue smaller business opportunities and grow them.

Mühlbauer has implemented a whole host of Chip Coding Applications: Multos, Java and many of native Chip OS.

Overview Automation Software Solutions

Production & Process Management

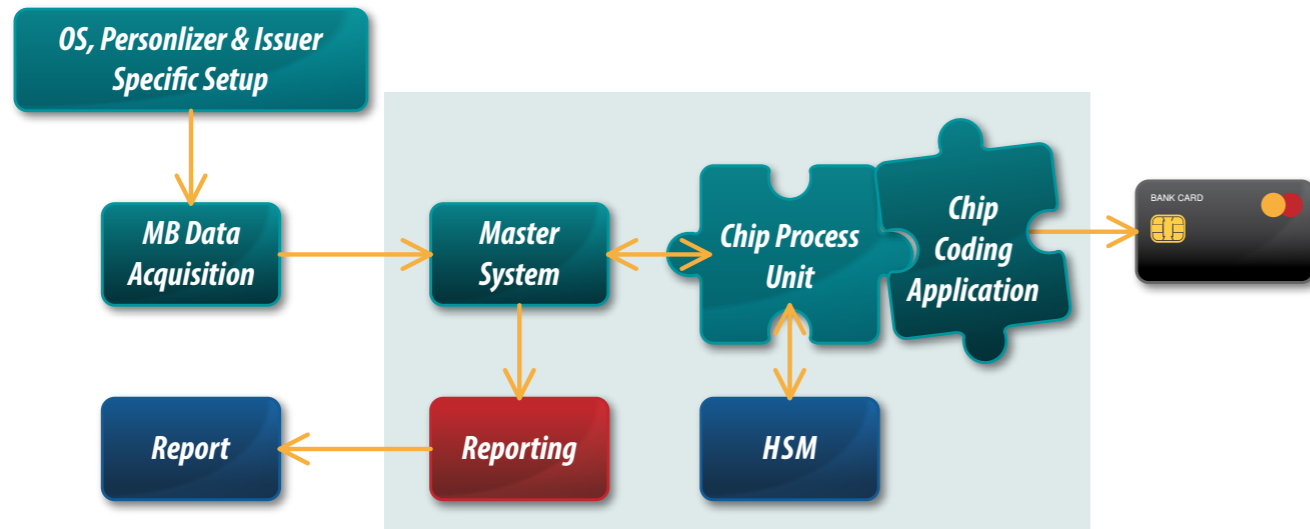
Personalization Management

EMV Software Solution



MB EMV Initialization Package

Software for EMV Chip Initialization



Components

- EMV crypto framework
- Hardware Security Module (HSM)
- EMV initialization application

KEY FEATURES

- Key rotation from Factory Key to Personalizer & Issuer specific key
- Change of card state of chip operating system initialized
- Update of Card Production Life Cycle Data (CPLC) with initialization information.
- Reusable for all applications of one chip operating system.
- Capable of loading additional applets into JavaCard operating system (.CAP file).

ADVANTAGES & TECHNICAL DATA

EMV Initialization Package

The Mühlbauer EMV Initialization Package is the ready-to-go set of components to enable equipment to initialize the chips of EMV cards or modules. The particular EMV package consists of the EMV crypto framework, an EMV chip coding application and a report logger.

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- Gemalto GemXpress
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- KONA I Kona
- Morpho JMV
- ST Micro ST Pay
- Ubivelox Ucard

Native

- AustriaCard ACOS
- Gemalto Clarista / Optelio / eGalleon
- Morpho EMV Plus Y, EMV Pro Y, EMV Pro Digit
- NXP JCOP
- ServiRed Advantis

Coding Time:

Depending on the Chip OS and the amount of initialization data the initialization time is approximately between 1-5 seconds per chip.

The EMV Initialization Package provides a number of re-usable chip coding tools for chip initialization (pre-personalization with generic basic keys and applets) of a document-holder specific set of applications for a specific purpose, like EMV.

These Coding Applications are re-usable for different products within the same Industry, like EMV. This simplifies the personalization set up of EMV Chips for specific Chip Operating Systems. The advantage is that this philosophy protects your investment. It speeds up

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Overview Automation Software Solutions

Production & Process Management

Personalization Management

EMV Software Solution



MB CPT3000v3/iCPT

EMV Validation Test



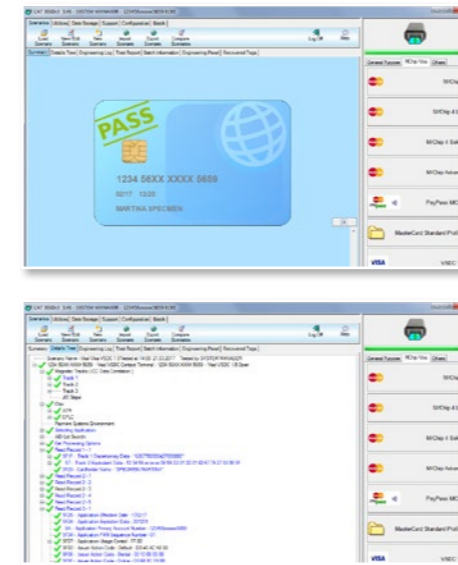
KEY FEATURES

- Quick and accurate tests of personalization data in single or multiple applications on the EMV chip and magnetic stripe to ensure the data is correct and valid according to issuer templates / card profiles and all major payment scheme specifications and standard profiles
- Test results include pass / fail data displays and detailed test result logs with hyperlinks to the EMV and payment scheme specifications to **allow the user to quickly identify and resolve problems**
- Supports all EMV payment applications (contact / contactless): Visa (VIS), MasterCard M / Chip, Amex AEIPS, JCB, Discover / Diners, UnionPay / PBOC, national payment scheme rules and many others
- Developed in collaboration with Visa, MasterCard, Amex and other payment schemes; used by Visa, MasterCard, American Express, JCB, major banks and card bureaus globally

ADVANTAGES

To achieve payment scheme certification, card issuers must ensure their cards comply with their chosen payment scheme's personalization requirements. To prevent the costly production of invalid EMV cards and delays in the formal card personalization process required by the payment schemes, the EMV Card Testing Solutions enables issuers and card personalization bureaus to validate and certify their cards against the latest payment scheme requirements, as well as their own business requirements.

CPT 3000v3 – Offline Tester



The EMV offline validation tester CPT 3000v3 is essential for all EMV chip card issuance, personalization, implementation and support operations. Chip and magstripe data can be quickly verified for conformity to the complex and strict rules laid down by the payment system operators as well as the issuer's own business requirements.

- Magstripe / chip personalization data correlation validation
- Verification of mandatory data objects
- Test scenarios easily set up with centralized scenario management facilities
- Multi-application test capability and multi-interface scenario capability
- Report with test summary and individual fail / observations with explanatory annotations and hyperlink reference to applicable payment scheme specifications

iCPT – Inline Tester

The Inline EMV Card Test application allows the examination and testing of personalized cards. The test tool is executed inside a personalization system and it is operated in silent mode, without any user interaction. A hardware upgrade of the personalization machine is not necessary.

- Inline testing of personalized EMV banking cards for data integrity, plausibility and EMV standard compliance in less than 5 seconds
- The validation station is integrated into the Mühlbauer personalization solution: No manual sample testing and no re-sorting of test samples into the card batch
- Chip personalization is followed by card testing with almost no performance interference
- Zero-fault-delivery policy: Comprehensive performance testing conducted on all personalized cards
- Guaranteed delivery of validated cards – No shipping of any defective or faulty cards
- Personalization report contains the test result showing the type of EMV profile personalized and the validation result (pass / fail) for each tested card
- Labor saving and security improving product: Improves the delivery quality due to the reduction of the human error factor

Mühlbauer offers the complete toolchain for the verification of EMV payment cards. The customer gets the best available test tools starting with the Resonance Frequency Tester for contactless cards which provides 100% measurement of resonance frequency, Q-factor and band width. The offline and inline version of CPT3000v3 verifies EMV compliance of payment cards to banking clients, while banks or personalizers

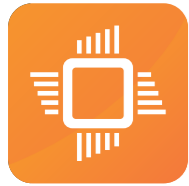
operating their personalization system can rest assured not to ship any dead or faulty cards. The resulting personalization report contains the test result showing the type of EMV profile personalized and the validation result (pass / fail) for every tested card. This is a major step for the implementation of traceability and transparent quality control systems.

Overview Automation Software Solutions

Production & Process Management

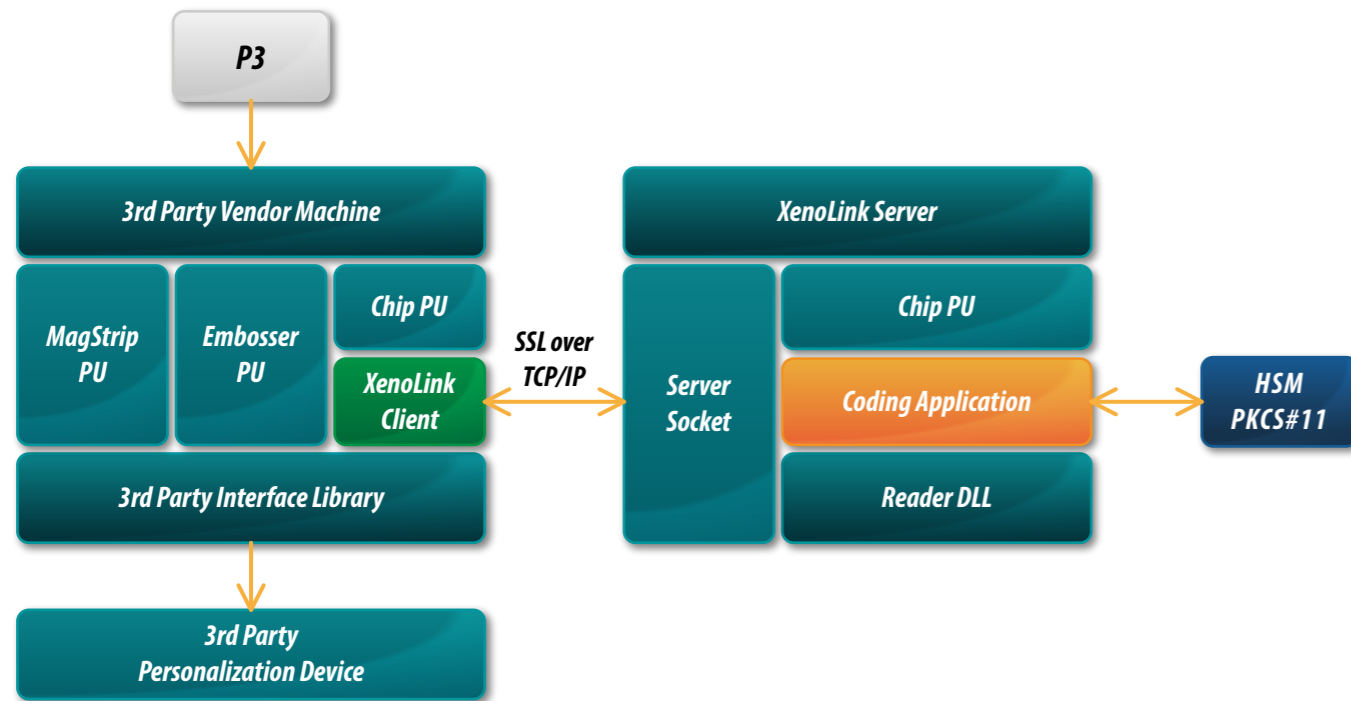
Personalization Management

EMV Software Solution



MB XenoLink

Chip Personalization Software



KEY FEATURES

- XenoLink job manager user interface (GUI) to generate and distribute personalization jobs
- Connectivity for XenoLink clients on personalization equipment
- Unified coding application code base throughout personalization center
- Execution of Mühlbauer coding applications
- Provision of connectivity to Key Management System and HSM
- Administration of clients and licenses
- Centralized Chip Coding Application
- Centralized Hardware Security Module (HSM)

ADVANTAGES



XenoLink Server

XenoLink is the Chip Coding Server that uses Mühlbauer Coding Applications and runs them on any hardware that is integrated to support XenoLink server. The XenoLink client implements the connection from the XenoLink server to the chip coding hardware. It encapsulates the communication from and to the card reader and communicates it to the XenoLink server. This allows the remote personalization of cards through the Coding Application from the XenoLink Server.



Mühlbauer Coding Applications

XenoLink utilizes the concept of Mühlbauer coding applications in order to reuse coding logic already developed within existing coding applications, and adds a separation layer between the generation of APDUs and the execution of the APDUs.

This layering concept enables the reuse of Mühlbauer coding applications on 3rd party personalization platforms by supplying native coding application which which implement the XenoProtocol and execute all commands received from XenoServer on a target platform using the native smart card communication framework.



XenoLink Client – 3rd Party Machine Integration

XenoLink enables personalizers to run the same code base on Mühlbauer personalization equipment as on 3rd party personalization machines.

Moreover it provides the opportunity of setting up a unified operation of chip coding processes for the MCEs personalization platform in heterogeneous personalization centers.

The XenoLink client is installed as a coding application on the personalization system and it can be run in parallel to normal coding applications on the target platform.

XenoLink is a platform which offers an integrative and distributed approach to chip personalization. The distributed nature of XenoLink enhances the scalability and maintainability of chip personalization solutions for bigger personalization centers and for a set of small personalization offices spread around a large geographical region. In both cases XenoLink helps to keep the cost of maintaining MCEs Coding Applications independent of the number of affected personalization units.

Overview Automation Software Solutions

Production & Process Management

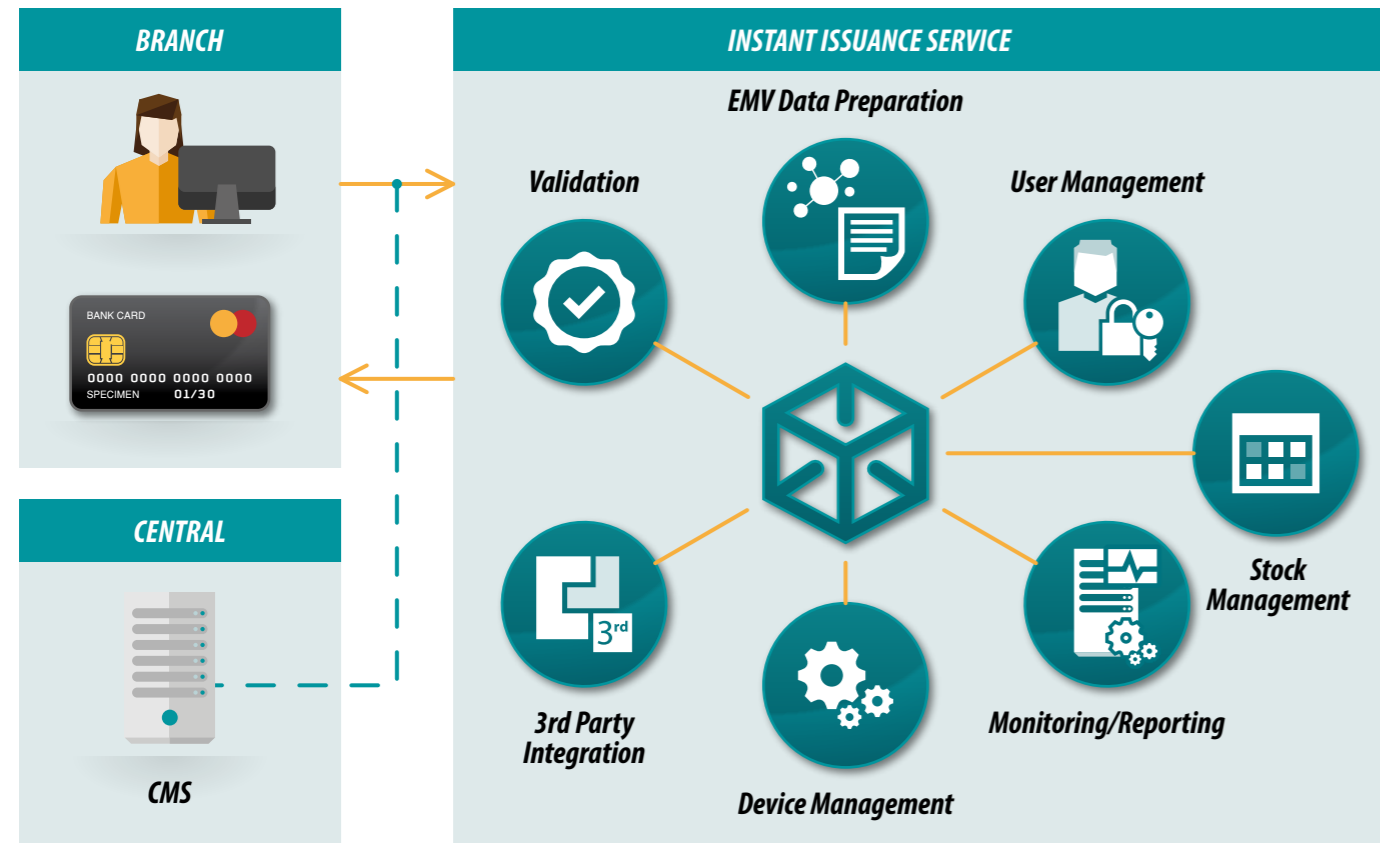
Personalization Management

EMV Software Solution



MB XenoFast

Instant Issuance Solution



KEY FEATURES

- Strong user authentication and administration
- Inventory management
- Production reporting
- Auditing and tracking mechanism
- Cardholder PIN selection
- Centralized Hardware Security Module (HSM)
- Network diagnostic service
- Automatic update management
- Support of EMV cards: Chips of all leading chip providers
- Platform independence: Integration of any personalization device possible
- Interface to the bank core / card management system

ADVANTAGES



Instant Issuance

Traditionally, bank cards, whether magnetic stripe or EMV, are personalized in batches, in a highly secure environment and usually at a centralized facility. Although this is an efficient and secure way, there are certain situations that require a different approach: Instant issuance. With Mühlbauer's instant issuance system cards are immediately produced and issued to the customer. This results in an improved cardholder experience and customer satisfaction, allows emergency card replacement, reduces card delivery costs and allows banks to differentiate from their competitors.



Instant card issuance enhances customer satisfaction as customers receive their new or reissued card immediately and can leave a bank branch with the new fully functional card in a few minutes without having to wait several days for a card.

Moreover, this way of card issuance allows customers to choose their own PIN and therefore eliminates the waiting time for a PIN mailer and the need to change the PIN later on. As a consequence, this way of card personalization can reduce the distribution costs and ensures that it is secure and reliable. This is achieved by removing the need of sending the cards and PIN mailers to the customers (usually in the post) as the new card is physically handed over to the cardholder.



Mühlbauer's Instant Issuance System enables you to:

- Improve the document owner experience by delivering differentiated card lifestyle products
- Increase the profitability and revenue of cards issued: Within seconds increased activation and utilization
- Enhance security with handover of fully tested and verified cards
- Prevent complex or costly delivery of cards
- Issue cards in new and different ways with support of major brands of personalization equipment
- Stay flexible and future proof with an open and modular system that can be extended at any time for future requirements

The solution requires minimum setup time, offers flexible customization capabilities and ensures low setup and running costs. It provides the all-in-one solution as it combines magnetic stripe and EMV card data preparation, card personalization and issuance procedures.

Mühlbauer's product philosophy is to provide you with the tools necessary for setting up and running their own business. The instant issuance solution provides an outstanding and unique flexibility and convenience with its hybrid approach of standalone application and service oriented architecture.

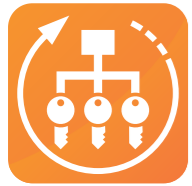
The architecture and concept of the solution provides plenty of space and flexibility to grow your business in new ways and take advantage of changing market conditions.

Overview Automation Software Solutions

Production & Process Management

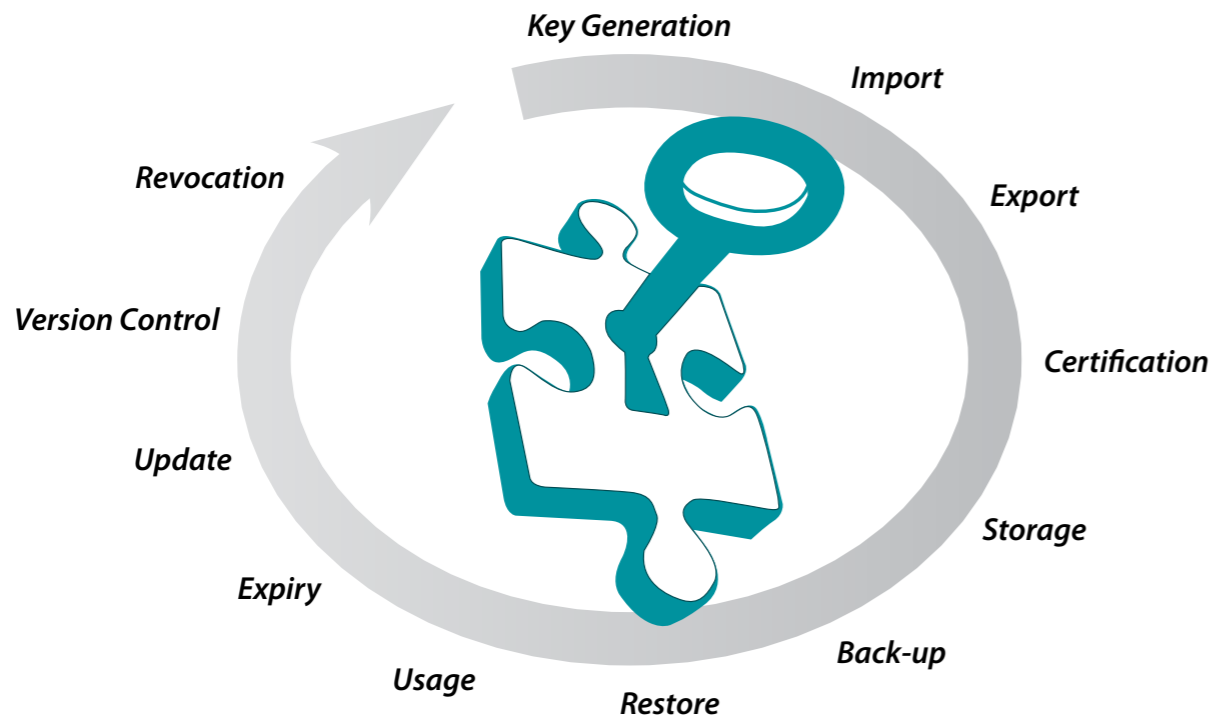
Personalization Management

EMV Software Solution



MB CKMS

Software for Cryptographic Key Management



KEY FEATURES

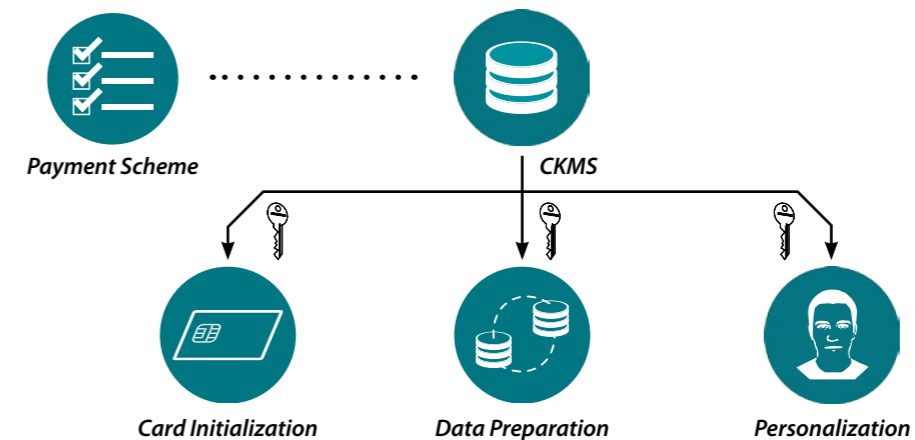
- Centralized life-cycle management of a high number of cryptographic keys and their related properties: Key generating, import, export, renewing and many more
- Secure management of keys across multiple parties / key-zones, i.e. banks, personalization bureaus, payment schemes
- Automated key distribution and updating of decentral key targets
- User-friendliness: Flexible at your desk key ceremonies and elimination of paperwork
- Secure: Automated and tamper-evident audit logs are maintained for all keys, allowing complete accountability and the restoration of keys to a given state at any time
- Strong user authentication: Sophisticated user management system and user authentication via smart cards
- Time saving: Allowing key custodians to add components securely as they are available. Get rid of inefficient and time consuming paper-based procedures and multi-party key ceremonies
- Various key targets: Data-preparation, card personalization systems, support of internal or network HSMs, and many more
- Fully compliant with all relevant industry and government regulations

ADVANTAGES

Across all industries the requirements for managing cryptographic keys are becoming more and more complex. Ensuring that the right key is in the right place at the right time is mandated by many organizations, i.e. major card payment scheme providers. This is a complicated requirement as most businesses need to manage an ever-increasing number of keys, while reducing the risk of internal and external fraud, as well as keeping costs at a minimum.

The Central Key Management System (CKMS) streamlines administration and reduces costs associated with traditional key management. Through its flexible and automated protocols, CKMS gives users the flexibility to manage a very large number of keys - throughout their entire life-cycle - without drowning in work. Using CKMS, administrators can uniformly and centrally manage the life-cycle of all cryptographic keys across a range of encryption platforms.

Keys can be securely generated and pushed to any key distribution target as and when required, and key custodians can use asynchronous log-on to projects for adding components securely - reducing the need for manual key ceremonies, while vastly improving workflows.



Main Functions

- Consolidated management – Security officers can set up templates to manage logical sets of keys, exchange them with relevant parties (issuers, payment scheme etc.) and securely push those keys to their intended target as and when required to quickly personalize new payment products.
- Reduced dependency – Asynchronous log-on allows for key custodians to add components securely as they are available, reducing the need for key ceremonies.
- Demonstration of compliance – Tamper-evident audit logs are maintained for all keys, allowing for complete accountability and the restoration of keys to a given state at any time.

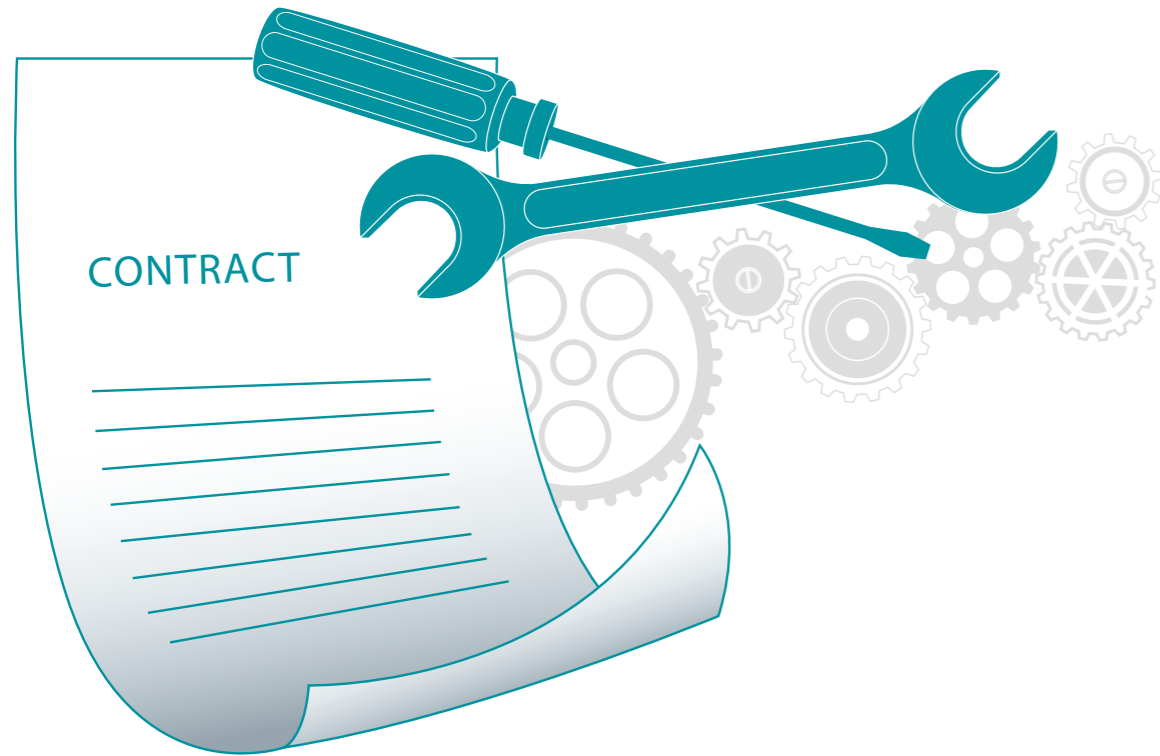
CKMS uses a client-server based architecture with shared HSMs to provide a centralized key management solution. The system is accessed by operators using desktop computers equipped with secure PIN pads for key component entry. An extremely flexible 'key-push' protocol allows the CKMS server to securely connect with practically any secure host system that supports exchange of cryptographic keys. Each key is assigned its current state and specific set of attributes, including its history and general life-cycle

management. CKMS facilitates efficient operation through the ability to automate and optimize the working processes adhering to the strictest set of security standards. Full compliance with all relevant industry and government regulations and best business practice is maintained throughout, with the added benefit of automated key management across multiple subsystems and a central view of all cryptographic keys within the business as a whole.

Stay updated with Mühlbauer's Software Maintenance Contract

Software may not get outdated, it needs refreshing from time to time, as the underlying hardware changes. Furthermore a living software product sees continuous improvements that the customer can only part take when software is refreshed through a new release. The software maintenance contract provides you with increased system security, better productivity and long-term maintenance.

Especially for the market participants in the production and personalization environments of the Payment Card Industry (PCI) it is mandatory to have the latest software versions installed and to keep the system always up to date and secure.



- Regular software updates which include documentation to maintain the ability to update the existing system
- Stringent version and configuration control allows the application of any required release version
- Ensures the upgradeability of the software solution and also the full compatibility and integration of existing software components
- Additions in the software life-cycle at ISO/IEC 12207 (corrective, adaptive and improving maintenance)
- Access to the Software Service Portal
- Provides security patches on a regular basis
- Support of new operating system environments
- Fast deployment of new technology from development to customer
- Support for customer system maintenance and therefore reasonable and predictable IT costs

Technical Features:

Software and its functionalities are subjected to a fast and innovative change. To ensure that a Mühlbauer installation is up-to-date at any time, we recommend a Software Maintenance Contract as a guarantee for actuality, progress and support.

The Software Maintenance Contract guarantees that the provided software is maintained.

- Corrective: Correction of bugs and errors
- Adaptive: Software adaptations to changed environments
- Perfective: Improving of performance and maintainability
- Preventative: Prevention of problems before they occur

The Software Maintenance Contract gives the following benefits:

Software Maintenance - Basic

- Update of Software
 - Provision of the latest Bug Fixes, in the context of regular software development, including new software-technologies or adaption of the software to operating system upgrades
 - Preservation of functionality and operability of the system excluding new or customized functions
- Software Service Portal
 - Access to ticket based Mühlbauer Service Desk
 - Access to Customer Maintenance Portal
 - Monthly information about security patches
- Support for new operating systems
- Recommendation of anti-virus software and description on how to use and make regular definition update
- Backup and reconstruction
 - Software backup (partition / images before delivering machine) incl. system software on MCES PCs and machine PCs
 - Software (no data) is backed up within a regular software maintenance intervention
 - Secure storage of this customer backups (no data) at Mühlbauer premises
- Data archiving
 - Archiving of temporary and no longer required files
 - Archiving of the MB-MCES database
- Software upgrade consulting
 - Presentation of improvements on software products
 - Presentation about innovations of the program modules used by the customer
 - Propose an intervention date for the software upgrade implementation

Software Maintenance - Telephone Support / Error Diagnosis

- Registration and analyzing of software issues or user based scenarios of MB machines
- Diagnosis of error messages on the production machine or the MCES System
- Recovery from erroneous activities on the production machine

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