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Aconite Smart Solutions

Smart Product Lifecycle Management

What's this about?

The world is moving to chip cards. Chips are becoming ubiquitous in everyday items from TVs to refrigerators and from payment cards to mobile phones. Some chips are passive, responding only with fixed information (like an ID number) when activated, but many are active — micro-computers that can receive inputs, process and store data and generate outputs. Any object containing a chip that can support a business application can be considered a 'smart device'.

Some of the most visible applications of chips in recent years have been mobile phones, inventory tags in stores and payment cards. Most consumers are familiar with the SIM in their GSM phone, but not many know what it does or what it is capable of. Many stores now use tags with chips for security and stock control and in many countries credit and debit cards now carry chips.

Any organization whose business has come to rely on the presence of chips now needs to be able to manage the issuance and lifecycle of those chips. This can range in complexity from simply stamping them out, as in the case of ID tags, to managing a varied set of applications each with unique requirements for business data, keys, certificates and personal information. EMV, the global standard for payments using chip cards, is one example of a business application that can reside on a chip-enabled device. That device can, for example, be a regular plastic card, a smart key-fob or a mobile phone. Other business application examples include electronic ticketing, healthcare and insurance records and secure ID.

From the use of chips and the applications they run in smart consumer devices comes the need for a Smart Product Management solution. In an environment where smart devices can be issued with a one of a number of combinations of the available applications, and can have applications added, upgraded or deleted during their lifetime, a Smart Product Management system provides the control of the issuance and post-issuance processes. This includes assembling the business, technical and security information needed for the products to be issued or modified in post-issuance, preparing that data for injection into the chip and tracking changes to the data held on the chip.

Solution Overview

Aconite's solution for Smart Product Management is **Aconite Affina® Enterprise**. Affina Enterprise manages a portfolio of smart products — business applications running on smart devices (chip cards, tokens like key fobs and wrist bands and mobile phones). The functions of each business application are delivered by a module of program code stored and running on the chip in the same way as applications run and can be loaded and deleted on a PC. It also manages legacy products such as magnetic stripe cards, providing a single view of a client's entire portfolio.

Affina Enterprise supports any type of business application. These can include EMV payments, mobile payments, P2P transfers, event ticketing, access control, loyalty, education, healthcare, or any combinations of these and other applications. Features and benefits include:

- simple operational management
- complete issuer control
- scalability
- easy integration with existing systems
- leveraging investment in smart devices by exploiting their ability to support bespoke packages of applications tailored to a customer's needs

- improved customer service by providing a single view of all the products issued to a customer, the data used for personalization etc.
- integration with the Aconite EMV Scripting system to allow tracking of updates to EMV cards or devices
- outstanding performance, reliability and availability.

Affina Enterprise: how it works

Affina Enterprise is a powerful, proven platform that facilitates the development and evolution of smart products, from a simple, single product, low volume implementation to a sophisticated, multi-product, multi-application, multi-institution portfolio. Affina Enterprise frees issuers to develop their smart product business without the constraints of a conventional card management system.

Affina Enterprise brings together and tightly integrates the core processes that are needed to provide a fully featured Smart Product Management system. These, together with examples of external entities that Affina Enterprise can interface with are shown in the diagram below.
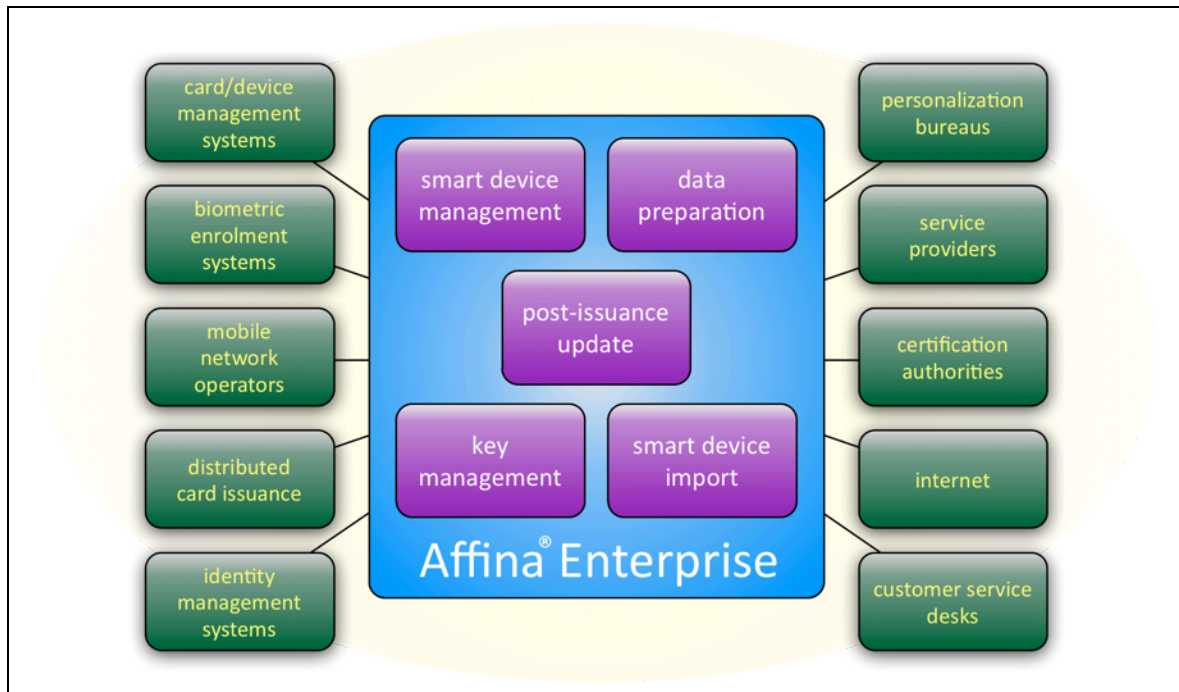
The major functions of Affina Enterprise:

- Smart Device Management maintains the databases of business rules and smart devices:
    - The **Configuration** holds details of the supported products, each version of each application that can be loaded and which can co-exist and the details of each type of chip that can be or has been used (e.g. chip type, storage capacity)
    - The **Manifest** holds details of each smart device issued or awaiting issue, including type of chip, applications loaded, personalization data used, etc.
- Data Preparation generates personalization data for writing to a chip in a smart device
- Post-Issuance adds, upgrades or deletes applications on smart devices in the field
- Smart Device Import allows details of cards and/or smart devices issued outside Affina Enterprise to be imported and taken under management
- Key Management supports the secure use of cryptographic keys within the system.

The Affina Enterprise Configuration Editor

Affina Enterprise's Configuration Editor supports the set-up and maintenance of the information needed to operate the system. Support is provided for:

▸ all products that can be issued on smart devices; a product is the business level entity as seen by the business or the cardholder — for example, a Gold Card with an EMV and a loyalty application would be defined as a product within the system; all the underlying product details are managed by the system

▸ the applications available for use in products, detailing the requirements for the associated data and keys. Using the Gold Card described above as an example, the configuration editor would hold details of the EMV credit application that requires personal data, cryptographic keys and Issuer data to personalize the application pre-loaded on the chip, and the loyalty application that requires personalizing with a personal ID number and cryptographic keys before being written to the chip

▸ for post-issuance addition or upgrade of applications, Affina Enterprise also provides the application code to be updated onto the chip

▸ cryptographic keys — Affina Enterprise manages keys and certificates for the chips and applications under management and these functions can be extended to import or export keys and certificates securely from or to any system with which Affina Enterprise is integrated

▸ delivery channels through which smart devices can be created or updated. Smart devices are manufactured in specialist facilities and then delivered to a personalization bureau. This is where the required applications and data are loaded. Affina Enterprise can control the delivery of content to multiple bureaus or to remote distributed personalization machines and, where supported, can update devices remotely over channels such as the internet or mobile networks for instant or deferred issuance

▸ the types of smart chips available for the supported products. The many varieties of chips use different operating systems supporting different versions of applications, keys and channels, on platforms with varying memory capacities, processing capabilities and functions. Affina Enterprise ensures that all product level management, as seen by both the business and cardholder, abstracts away this level of detail allowing analysts and cardholders to focus on the business functions.

All of these elements — products, applications, keys, channels and chip types — are held in the Affina Enterprise Configuration database. The Configuration determines how the system will behave when a request for production of a smart product is received.

The Affina Enterprise Manifest

The Manifest maintains records of all smart devices that are controlled by Affina Enterprise. Each record can be queried using a number of different keys to provide a configurable list of data about the device, including its unique identifier, chip type, applications and key identifiers (e.g. tracking reference, account number, card number). These records are also used to manage devices for update after issuance, as knowing the current contents of the chip determines the options available to update it.

Knowledge of the current status of a device allows re-issuance in the event of loss, theft or damage with a replicated contents set, regardless of any changes in the type or specification of the chips used to issue the product. Affina Enterprise manages at the product level to remove dependence on a particular chip type.

The system can also support automated re-issuance (for both renewal and replacement) of devices in response to an external request. A re-issue can require new data to be provided or the system can automatically regenerate and re-issue the device in its last known state.

As the Manifest is the sole record of the detailed chip information it is a business critical system, requiring constant availability in order to support the various business functions that use its services, in particular customer service systems. The ability of the system to update chips on products in the field is also a 24×7 function that is supplied on demand to customers by the post-issuance function.

Affina Enterprise Data Preparation

When Affina Enterprise is requested to personalize a chip (or a batch of chips) for issue, re-issue or post-issuance update, it needs to prepare all of the data that a personalization service or the distributed channel requires. The main role of data preparation is the generation of chip personalization data, but Affina Enterprise can also generate related data — for example to support an EMV card product, magnetic stripe data, card verification values (CVVs) and pin verification values (PVVs) can all be generated.

Data preparation starts by checking Affina Enterprise's configuration for the requested product. The configuration will identify the applications to be personalized and the data needed. The next stage is to assemble all of the data. The data and the sources from which it can be accumulated can include:

- data included in the issuance request
- sets of fixed data held within the Affina Enterprise configuration, with Affina Enterprise selecting the actual set to be used based on input parameters
- data generated or derived by Affina Enterprise (e.g. device specific keys)
- data supplied in the request (e.g. customer name)
- data obtained from one or more external systems
- for card re-issuance, data from the manifest for the current device.

Once the data has been assembled, Affina Enterprise will populate an application image with the data ready to be written to a chip. The form of the image will depend on the chip type and its operating system.

Data preparation can also manipulate non-chip data. For example, if a payment card issuing system has not been upgraded from magnetic stripe capability, Affina Enterprise can enrich the magnetic stripe data in the embossing files generated by that system to add or replace the additional or changed data needed for chip.

Although Affina Enterprise has its own data preparation capability, it can also output files to be used by other data preparation systems, such as the Thales P3 or Datacard's ADP, to allow clients to integrate Affina Enterprise into their existing system infrastructures with minimal change.

Post-Issuance

Affina Enterprise provides mechanisms to allow smart devices to be modified after issuance. This is achieved by:

- providing data securely to third party systems (such as web sites) that are authorized to perform card updates:
  - customer and account details (e.g. name, account number)
  - chip manifest, identifying the applications that are currently loaded on the chip, their size and the total space on the chip
  - application options, identifying the available options for each application that is on (or could be on) the smart device. Available options include: adding an application, deleting an application, updating an application and re-personalizing an application with new data)
- receiving requests from third party systems to carry out one of the 'available options' and building the appropriate commands to create, update or delete applications, similarly to the activities undertaken for data preparation; once a response has been built, it is staged, awaiting delivery to the card
- providing third party systems with a list of updates that have been staged for delivery to a particular smart device
- for MULTOS and Global Platform operating system devices, writing the staged updates to the target chip and providing recovery mechanisms in case the update fails.

Importing Device Details

Affina Enterprise can import details of magnetic stripe cards, paper cards and smart devices personalized elsewhere and then take over their management. Affina Enterprise can then:

- update existing applications and download new applications to imported smart devices
- include imported cards and devices in its reports to cover the complete portfolio
- control re-issuance of these imported items, re-using personalization data from the original card or device creation process
- store the data associated with the card and provide a single data source e.g. for customer services.

Key Management

All Affina Enterprise components utilize an underlying Key Management System (KMS) which is fully integrated into the overall architecture. KMS provides full key management including key import, export and generation along with support for all the cryptographic operations needed to support the system's functionality. Affina Enterprise KMS uses HSMs (hardware security modules) to perform all cryptographic operations in a secure environment.

Card/Product Issuing

Requests for the issuance or re-issuance of products are received as messages or batches from external systems such as a conventional card management system (for payment cards) or, for example, from a membership administration system (for a healthcare benefits scheme).

The configuration process described above will have determined for each application and product the source of the data required to be fed into the data preparation stage (the 'input') and the end-point or channel to which the personalization data (the 'output') will be sent. The data can either be stored in Affina Enterprise, be imported from other systems at the time that an issuance request is processed or supplied in the request itself. As the possible combinations of sources of issuance requests, the input data and the destination of the output data are virtually limitless; each client's issuing workflow for each product will be created and maintained by the system administrator.

Affina Enterprise will then automatically and seamlessly receive issuance requests, create and dispatch personalization data, create or update the Manifest and track the progress of each order, managing the feedback from the personalization service or delivery channel.

Post-Issuance

Post-issuance — the addition, deletion or modification of applications on an existing card or device — follows much the same process as initial issuance except that requests may be driven from the Issuer or generated on request from the cardholder. In either case, a request will be received and Affina Enterprise will apply the rules held in the configuration for the product concerned, determining if the request is viable. A request may be rejected due to insufficient space on the actual chip or due to a request for an incompatible application.

Post-issuance requests may come in real-time from a customer whose card or device is available for instant updating — they have inserted their card into a kiosk card-reader, for example, or they have a mobile phone whose phone is always available for update over-the-air when it is turned on. Alternatively, the request may come via a customer service desk or website. This is known as a staged delivery — the update will take place when the cardholder presents their device at a suitable location — an ATM or branch kiosk, for example.

Reporting

The Affina Enterprise Manifest (see p. 4) is the source of all information for enquiry and reporting on the smart product database. Reports can be produced covering all statuses of devices: issued, awaiting issue,

pending re-issue etc. Reports can drill down into the Manifest to provide information and statistics on the products and applications issued and the performance of personalization services and delivery channels.

The Manifest also supports ad hoc enquiries from customer service systems allowing agents to retrieve details of an individual customer's devices and products.

The system administrator will work with each client to set up the reporting schedule and to enable access to the Manifest for customer service or back office systems.

Affina Enterprise in Action: Case Studies

ICBC

Affina Enterprise is used by the Industrial and Commercial Bank of China, one of the largest banks in the world, to support post-issuance update at regional and local level with new and updated applications. The solution is integrated into the branch network, allowing individual cardholders to request and receive updates to their cards which can be generated in real-time. The updates offered are targeted to individual regions, allowing the general card offering to be localized and constantly updated. By enhancing card functionality and increasing utility to the individual cardholder the system helps reduce cardholder turnover and increase card usage. While maintaining a diverse portfolio based on China Union Pay smart debit and credit cards, the bank is planning to introduce over twenty new applications in the near future and the cardholder base will potentially grow to over 100m cards. Only Affina Enterprise met all the bank's stringent requirements for service levels and security and provided a scalable and future-proof solution capable of managing a cardholder base of this size.

TLS

The Netherlands' **Trans Link System** is owned by a consortium of transit operators and manages the national transit ticketing system. It issues smart transit cards and manages the acceptance points for trains, buses, trams and the metro. Affina Enterprise has been used for many years to manage the complex issuance of dozens of card types (personalized, anonymous, concessionary, staff cards etc.) for each participating company. The system also provides the ability to have ticket data added or removed by any transit operator. Recently Affina Enterprise has also been selected to manage the issuance and update of the SAM (Secure Access Module) chips that validate smart transit cards when presented for entry to the system. The solution provides an open mechanism to update chips, application and key data and allows the network's security to be instantly updated to add new functionality, update risk parameters or manage keys. By introducing remote management of the SAMs the solution reduces the physical involvement of operators and overall costs, while providing a capability to instantly respond to new threats at the lowest possible cost.

Luottokunta

Luottokunta are a Finnish processor who issue credit and debit cards on behalf of several banks and who also run the Finnish national acquiring system. In a program to replace all of their card issuing and acquiring systems, Luottokunta selected Affina Enterprise for card lifecycle management, data preparation and chip personalization. Luottokunta use Affina Enterprise to personalize EMV credit, debit and combined credit/debit on Global Platform cards, supporting approximately 100 different products. Luottokunta currently have around 2m cards under management

and plan to expand rapidly to more than 10m cards across multiple countries using multiple personalization bureaus.

Next step…

Contact Aconite. Find out more about Aconite's **Affina Enterprise** and other smart product solutions. Learn about Aconite's MasterCard-accredited consulting support that can help to streamline your chip program. Put yourself on the path to innovative business opportunities based on smart products.

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